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Agency for International Development

Cairo, Egypt

7-26-79

PROJECT PAPER

Egypt: Agricultural Mechanization Project

263-0031

DEPARTMENT OF STATE
AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D.C. 20523

NEAR EAST ADVISORY COMMITTEE MEETING

DATE: August 17, 1979
TIME: See Agenda
PLACE: 6439 NS

SUBJECT: Egypt, Agricultural Mechanization, Project Paper 263-0031

The Near East Advisory Committee will meet as scheduled above to discuss the attached Project Paper. The Issues Paper is attached.

Please refer all questions to Robert Morrow, Chairperson, tel. 28586.

Attachment:
Project Paper
Issues Paper

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2

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UNITED STATES GOVERNMENT

Memorandum

TO : See Distribution List on Cover Sheet DATE: 8/9/79

FROM : NE/TECH/AD, Robert Morrow, Project Review Committee Chairman

SUBJECT: Egypt, Agricultural Mechanization, PP, 263-0031

The Project Review Committee (PRC) has reviewed the project paper and the Feasibility Study which provided much of the analysis underlying the formulation of the project.1/ The project has several major components which add to a program of supporting and improving the effectiveness of mechanization efforts already underway.

The life of project costs are planned at $40 million plus a GOE investment of $15,156,000 in Egyptian Pounds. Of the $40 million dollars $21 million will be for local cost funding. The project proposes incremental funding for $21 million in FY 79. The Project Review Committee recommends approval of the project.

The major issues discussed and committee conclusions are as follows:

1. Importing U.S. Farm Tractors

The Feasibility Study recommended importing 3000 tractors to sustain mechanization until local manufacturing capability could be established. The Feasibility Study estimated this to be in about 1982. The project does not contain a general tractor component although there are 80 relatively heavy tractors in the soil ameloriation component. These tractors will be used for deep chisel plowing to improve drainage. The general farm tractor component was dropped for the following reasons:

(a) price analysis revealed that U.S. tractors are not price competitive with European tractors, particularly East Block tractors, and to market U.S. tractors would probably entail subsidizing them or embargoing European trac-

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1/ERA 2000, Further Mechanization of Egyptian Agriculture Gaithersburg, Maryland, March 1979.

5010-110

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tors. Embargoing European tractors would, therefore, result in farmers paying prices for U.S. tractors well above internationally competitive prices; (b) there appears to be a larger pipeline of tractors in country, and on order, than was estimated in the Feasibility Study; and (c) a substantial portion of tractor power requirements can be met by reducing down time of the present fleet (a project component). The conclusion reached by USAID, and with which the Project Committee is in agreement, is that the project does not require a general tractor component to make a substantial contribution to agricultural mechanization and development.

2. Labor Displacement

While many benefits from agricultural mechanization are yield increasing due to timeliness of operations, and greater intensity of land use, and better animal production, a significant benefit is due to the cost reduction aspects steming from the speed and ease by which machines can do a job relative to use of oxen and its attendant labor. Using a tractor rather than an ox for plowing, water lifting and threshing directly displaces labor. Unemployment and poverty are major problems in Egypt hence the appropriatness of using machines is in question. The labor displaced by the type of mechanization which this project supports is not, in the main, the low income, rural laborer. Rather it's most likely to be farm family labor since little hired labor or rented oxen are used for plowing, water lifting, or threshing. Given that mechanization has yield increasing aspects, creates some new service jobs, frees family labor for other activities and reduces drudgery while also displacing some hired labor the study team, the GOE, and the USAID Mission all concluded that the pace and type of mechanization supported by this project would not be unduly labor displacing. It is nevertheless a subject which should be closely examined and reviewed by the research component of the project. This particular research should be autonomous from any groups which may be biased for or against mechanization on subjective grounds.

3. Size of Project Components

The Project Review Committee discussed in considerable detail the size of various project components. There were concerns that some components (sakia replacement) may be underfunded and others (technical assistance) may be overly ambitious.

The Feasibility Study Team recommended $16 million for replacing oxen powered water wheels (sakia) yet the project

proposes only 2 million. The reasons given for the more modest approach were that the program for motorizing sakias is quite new and has a number of social organizational as well as technical aspects which make the effective demand somewhat uncertain. The Project Review Committee assumes that the project can be implemented with enough flexibility to accomodate the actual demands for services and equipment as they emerge over time.

With respect to the level of technical assistance the Project Review Committee accepts the PP recommendation. Further elaboration on this issue is set forth in the attached memo from the USAID/Mission Director to NEAC.

4. Energy

With petroleum prices sharply higher and with an option for Egypt to export its oil there is a concern as to the economic wisdom of Egypt moving away from an animal and labor intensive agriculture to one where a significant portion of the future agricultural energy requirements would be supplied by petroleum.

In view of Egypt's very scarce arable land base and alternative uses of this land it does not appear economic to retain the land in feed crops for draft animals even though they produce a joint product of power, meat, milk, hides and return some plant nutrients to the farm. Unless oil prices move to extremely high levels the land should likely be used for high intensity production of food crops, export crops or feed crops fed to animals which utilize feed in an effective manner, i.e. highly productive dairy cattle or poultry.

The feasibility study did not present data on the sensitivity of the economic or financial returns to varying fuel and oil cost. Our own calculations, using the basic data of the study, reveal that for plowing the economics are not very sensitive to an increase in fuel cost. At currently subsidized fuel costs (about half of international values) tractor plowing costs about $3 an acre while imputed oxen plowing costs range from $10 to $20 per acre depending upon assumptions as to labor costs or values of meat and milk lost by working one's cattle or rental costs for oxen. Of course tractor plowing is also much faster than with oxen. If Egyptian fuel costs are increased four times -making them about twice current international rates-the cost comparisons become only $4 per acre against $10/$20. Fuel costs may be more important in threshing and for diesel powered water wheels but it is unlikely that petroleum costs will be a very significant determinant with respect to mechanization.

UNITED STATES GOVERNMENT

memorandum

DATE: July 24, 1979

REPLY TO ATTN OF: Donald S. Brown, Director, USAID/Egypt

SUBJECT: Agricultural Mechanization Project Paper

TO: Near East Advisory Committee

The attached Project Paper is the result of over two years of considerable effort by Mission, contract, GOE and AID/W personnel. During this period in response to serious concern about the desirability of rapid tractorization, the project design underwent substantial revision, changing from a capital oriented effort to a strategy of supporting and rationalizing GOE efforts in mechanization. The current design emphasizes the role of the public sector in developing, introducing and extending new technology and evaluating the benefits of mechanization, and supports private sector provision of services on a competitive basis.

We believe the attached Project Paper addresses all major issues and fully justifies the proposed range of activities in the subject project. There is one recently-expressed concern, however, on which I believe some additional comments would be useful, that is, the size of the technical assistance input.

We appreciate the need to keep the American presence to the absolute minimum and to ensure that the technical assistance provided is really desired by the GOE and not just accepted. The TA proposed in this project is sizable reflecting overall project complexity. Assistance is directed to each of the five project components which have widely differing technical needs. The level starts from Study Team recommendations, which were developed with an extensive input from Ministry of Agriculture and related organization staff. From that base and as a result of further discussions with the Ministry a number of modifications were made, primarily to expand planning and

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evaluation inputs, where the Ministry recognizes there is a need, while reducing staff in technical areas, where the Ministry believes Egyptian capacity will be sufficient. The resulting TA package has been agreed upon by both Ministry technical staff and the Minister. It is interesting that in final discussions with Ministry staff the high cost per technician was raised but there was no suggestion of reducing staff size. Obviously the Ministry feels, as we do, that the complexity of the effort will necessitate considerable assistance if the project is to meet objectives, but also recognizes cost as a concern.

Attachment: Agricultural Mechanization Project Paper

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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

1. TRANSACTION CODE: C (A = ADD, C = CHANGE, D = DELETE)

PP

2. DOCUMENT CODE: 3

3. COUNTRY ENTITY: Egypt

4. DOCUMENT REVISION NUMBER:

5. PROJECT NUMBER (7 digits): 263-0031

6. BUREAU/OFFICE: A. SYMBOL: NE; B. CODE: 03

7. PROJECT TITLE (Maximum 40 characters): Agricultural Mechanization

8. ESTIMATED FY OF PROJECT COMPLETION: FY 85

9. ESTIMATED DATE OF OBLIGATION: A. INITIAL FY 79; B. QUARTER 4; C. FINAL FY 82 (Enter 1, 2, 3, or 4)

10. ESTIMATED COSTS ($000 OR EQUIVALENT $1 –)

A. FUNDING SOURCE	FIRST FY B. FX	FIRST FY C. L/C	FIRST FY D. TOTAL	LIFE OF PROJECT E. FX	LIFE OF PROJECT F. L/C	LIFE OF PROJECT G. TOTAL
AID APPROPRIATED TOTAL	13,662	7,338	21,000	18,824	21,176	40,000
(GRANT)	(13,662)	(7,338)	(21,000)	(18,824)	(21,176)	(40,000)
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST COUNTRY	–	2,657	2,657	1,047	14,109	15,156
OTHER DONOR(S)						
TOTALS	13,662	9,995	23,651	19,871	35,285	55,156

11. PROPOSED BUDGET APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. 1ST FY 79 F. GRANT	E. 1ST FY 79 G. LOAN	H. 2ND FY 80 I. GRANT	H. 2ND FY 80 J. LOAN	K. 3RD FY 81 L. GRANT	K. 3RD FY 81 M. LOAN
(1) SA	140	010		21,000		15,500		1,500	
(2)									
(3)									
(4)									
TOTALS				21,000		15,500		1,500	

A. APPROPRIATION	N. 4TH FY 82 O. GRANT	N. 4TH FY 82 P. LOAN	Q. 5TH FY ___ R. GRANT	Q. 5TH FY ___ S. LOAN	LIFE OF PROJECT T. GRANT	LIFE OF PROJECT U. LOAN
(1) SA	2,000				40,000	
(2)						
(3)						
(4)						
TOTALS	2,000				40,000	

12. IN-DEPTH EVALUATION SCHEDULED: MM 03 YY 82

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14. ORIGINATING OFFICE CLEARANCE

SIGNATURE: [signature]

TITLE: Director

DATE SIGNED: MM 7 DD 26 YY 79

15. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION: MM DD YY

AID 1330-4 (3-78)

I. Recommendation

A. It is recommended that AID/W authorize a project in the amount of $ 40 million to improve the effectiveness of Egyptian farm mechanization programs. The grant will cover foreign exchange costs of $ 18.8 million and local currency costs equivalent to $ 21.2 million. The GOE will contribute the equivalent of 15.2 million, or 27.5% of project costs, including $ 1.0 million in foreign exchange. An obligation of $ 21.0 million is proposed for FY 1979 with the remaining amounts obligated according to the schedule shown in Section III.C.

II. Introduction, Brief Project Description, and Background

A. Introduction

For some time the government of the Arab Republic of Egypt (GOE) has viewed additional mechanization as a means of raising agricultural production. However, in view of Egypt's apparent resource endowment, there are questions whether pursuing such a strategy is appropriate. In an effort to resolve these uncertainties, the GOE requested a USAID-financed feasibility/project design study of mechanization in Egypt to determine if additional mechanization was desirable and, if so, what role the government should play. The study was conducted by ERA 2000, one of the few U.S. firms with experience in conducting such studies, over a 9-month period in 1978-79.[1] The following project, although utilizing information generated by the study, deviates significantly from the project recommended by the feasibility team reflecting additional analysis and a more conservative approach.[2]

B. Brief Description

The proposed project will support Egyptian efforts to implement selected mechanization activities over a six-year period and to create a sound planning, implementation and support base for future mechanization programs. The strategy is to increase the effectiveness of current programs that merit support, and to develop capabilities required for the design and pursuit of alternative mechanization options, without committing Egypt at this point to a particular mechanization path.

Tactics are to relieve constraints to the more productive conduct of certain on-going mechanization activities where Egyptian Government interest and returns are high, to finance experimentation with certain types of mechanized activities that currently seem appropriate and to assist in the development of elements that are currently missing but needed and wanted by the ARE for the planning and support of future activities.

1/ "Further Mechanization of Egyptian Agriculture" ERA 2000, Incorporated, under AID Contract No. AID/NE-C-1513. April 15, 1979.

2/ See Annex XVI for study team recommendations and a discussion of principal differences with the Project proposed here.

3/ GOE and ARE are used interchangeably throughout the paper in referring to the Government of the Arab Republic of Egypt.

Together this adds up to a rather wide-ranging package of assistance activities. Areas scheduled for assistance are (a) Planning and Evaluation; (b) Land Improvement; (c) Service-Center Development; (d) Research and Development; and (e) Machinery Management Extension. Assistance will be in the form of technical assistance ($ 7.7 million), capital for loan funds ($ 7.0 million); research funds ($ 1.2 million); training ($ 2.1 million); commodities and equipment ($ 7.6 million); miscellaneous costs ($ 0.6 million) and contingency/inflation ($ 13.8 million). Certain project elements will be national in scope from the outset (R & D, Planning/Evaluation, Service-Centers) while others will be confined to particular areas (Soil Improvement, Machinery Management) with a possibility of future expansion to other geographic areas.

In implementation terms, the intent is both to build general capabilities to meet demands for services and information and to affect demand growth through extension, planning and funding mechanisms. In the process, the growing tendency to allow farmers to set the pace and scope of mechanization will be strengthened. Part of the strategy is thus to maximize private sector provision of mechanization services.

The heavy technical assistance input reflects the capability-building emphasis of the project, where the inauguration of new types of activities will require considerable guidance and help to provide needed coordination between different elements. Because some activities are relatively new, and there is little history on which to base demand estimates, certain project components will be phased, specifically those including the provision of loan funds.

In summary, the strategy is to assist the GOE to plan and implement mechanization activities more rationally. Capabilities are to be developed in several key areas that are now or will be required to support a range of mechanization activities. The range, composition and timing of assistance is geared to demand for services and a need to inaugurate activities quickly in response to GOE plans to push ahead.

C. Background Information and Problem Identification

1. National Perspective

Egyptian agricultural sector yields are quite high reflecting the use of fairly good varieties and irrigation practices, moderate fertilizer applications, and the employment of considerable human and animal power. During the past few years, however, yields have stagnated so that Egyptian agricultural production has grown more slowly than population and acted as a drag on overall growth. A direct result has been a dramatic rise in food imports, while export growth has fallen behind. Significant rural-urban migration has occurred

as growth in the agricultural sector has lagged behind growth in off-farm sectors. Government plans and outside assessments recognize that increased agricultural output is an absolute necessity to achieve a more rapid rate of overall growth with the benefits more equitably divided.

Numerous technology options are feasible in seeking production increases including additional fertilizer use, new varieties, new land cultivation, appropriate mechanization and better cultural practices. The most promising approach requires progress simultaneously on several fronts--not only because of obvious complementarities among alternatives, but also to maximize the probability of achieving needed increases. In Egypt, this strategy is being pursued with donor-assisted efforts underway and/or planned in many of these technology application areas.

A gap remains in agricultural mechanization. As indicated below efforts to date in this area have been limited in scope and effectiveness. The GOE plans a significantly expanded range of activities--some of which seem reasonable while others are questionable. Despite past GOE experience many endeavors will probably continue to be implemented rather haphazardly and ineffectively. With assistance and better planning based on better analysis, more effective implementation would be achieved, enabling the economy to realize a higher return on funds and time invested (problems and proposed assistance in specific areas are discussed in subsequent sections of this paper).

A very fundamental question remains as to why we even consider assistance to mechanization. To date, power requirements in Egyptian agriculture have been met largely by human and oxen power. Mechanization has been linked in other countries to serious economic and social problems, including rural unemployment, concentration of land ownership and skewing of the income distribution. Moreover, several researchers have questioned whether mechanization in fact increases production.

While these issues are addressed in detail in later sections and in Annex XVIII, several reasons may be cited here to sketch the rationale for supporting mechanization in the face of these strong arguments against it. The most important of these is that wage rates have risen[1/], cost/price relationships have shifted due to new technology and changes in the value of livestock products, and other structural

1/ Wage rates for day labor in the agricultural sector have tripled in current terms since 1974, increasing 59% in real terms and more rapidly than wages in nearly all other sectors. However, rates still remain lower than off the farm.

changes have occurred, making mechanization an economically efficient method of meeting some of the power requirements and strongly suggesting that greater labor intensity is no longer appropriate. While there is little evidence that Egyptian land yields have actually turned down because of lack of adequate power, stagnant production in the face of biological and economic opportunities point to a need for other technological changes. Specifically, additional mechanization creates an opportunity to increase agricultural production by allowing farmers to: (1) carry out farming operations in a more timely and technically effective fashion, (2) intensify land use by growing more crops or increasing forage cuttings and (3) put land to higher uses by devoting less land to draft-animal forage.

Additional benefits from and objectives for farm mechanization from a national perspective include: (a) relief of drudgery in performing basic tillage and other farming operations, (b) an opportunity to shift labor from extensive low-value crop production to production of higher value labor-intensive crops, (c) improvement of the transportation/marketing network by greater use of farm tractors and (d) increasing the return from capital embodied in the existing farm machinery stock.

2. Current Mechanization Situation

Farm mechanization in Egypt is currently little more than the partial tractorization of traditional plowing and threshing operations. About 40 percent of the plowing is done by tractor-drawn chisel plows, predominantly on a custom hire basis. The remaining plowing and all other agricultural operations are performed by animal and hand labor. Roughly half of the wheat and rice crops are threshed with motorized equipment. The entire threshing-winnowing operation is much less mechanized than this figure implies, however, because currently-used methods continue to require winnowing by hand. Mechanization of rice threshing is even less complete as the drum thresher used for wheat produces a high percentage of cracked grain and consequently, tractor-threshing of rice usually involves simply running a tractor-drawn sledge over the grain in essentially the traditional manner.

Outside of the sugarcane growing areas of Egypt, the lifting of irrigation water is predominantly done by animal-drawn sakias (water wheels) or man-powered "tambours." Irrigation accounts for about two-thirds of all animal work time and hence is the principal cause of the one-third loss in milk and meat production estimated to result from current animal use.

Tractors are presently used relatively little for farm transportation. The bulk of transportation use of farm

tractors is for non-farm activities such as brick hauling.[1]

The Study Team estimated that 24,680 farm tractors were in operation in Egypt in 1978. This represents a near-doubling in the 17-year period since the last thorough census, which showed 12,800 tractors in 1961. Current machines are also more powerful, with 95% over 25 HP (averaging 58 HP) compared to 36% in 1961 (averaging 40 - 45 HP). The current stock, of which over two-thirds are concentrated in Lower Egypt, provides one tractor for every 249 feddans, or .23 HP per feddan.

Pumps, particularly the 7 - 10 HP mobile units, have also increased rapidly and now number roughly 27,000. Stationary threshers, generally powered by tractors as well, are increasingly popular. The Study Team estimate of 3,600 appears low compared to the 1961 census figure of over 9,000. Other statistics support a more reasonable estimate of 12,000.

Overall, the GOE's farm mechanization program to date has consisted mainly of (a) establishing a custom service system for tractor usage that has made tractor power available to even the smallest farms, but in insufficient quantities to meet demands, and (b) managing the supply of tractors to the agricultural sector through imports and local assembly of imported components. There has been no comprehensive planning and no machinery management extension program for assisting farmers to make more efficient use of farm equipment. No organized training for drivers and service personnel has been provided. Nor has adequate research upon which to base either mechanization planning or advisory services to farmers been conducted. Finally, the development and introduction of new types of machinery has been meager, episodic and generally ineffective.

However, the GOE is beginning to broaden their effort in mechanization, reflecting their firm commitment to pursuing some form of mechanization to relieve what are perceived as real problems. Talks are underway regarding the development of domestic capability for manufacturing appropriately-sized tractors with a progressively higher percentage of locally fabricated components. With IBRD assistance, a comprehensive pilot mechanization project utilizing the local cooperatives was initiated in 1978 in Sohag and Minufia Governorates. Through the Soil Amelioration Organization[2] the government has made a good start on providing custom land improvement services. As a temporary expedient, MOA recently has sought to ease the chronic shortage of tractor spare parts by pooled procurement and organized distribution of major items, although this has been only partly successful. Despite these efforts, inadequate repair facilities and spare parts shortage significantly

1/ See Annex X for several tables on machinery availability and tractor use.

2/ The complete title of this organization is The General Authority for Land Improvement Activities. Both titles and the acrynom SAO are used in this paper.

reduces the potential output of Egypt's aging tractor stock, particularly in the cooperative network where down-times are excessive. Finally, a machinery extension program has just started with a small group of extension agents having received limited training and now occupying field positions.

To summarize, Egypt's farm mechanization strategy to date has concentrated on making tractor power available to farmers with limited attention to other areas. Even in the provision of tractor power, the scope of activities has been limited and inadequately supported. A number of areas requiring assistance remain to be addressed.

III. Detailed Project Description, Relation to Objectives, and Funding

A. Project Description

1. Goal

The proposed project will contribute to the goals of increased agricultural production and higher farm incomes. These goals are fully consistent with GOE objectives, as articulated in recent planning documents, and with AID's strategy of supporting more effective resource use to increase the value of agricultural production, as set forth in the CDSS.

The project will contribute to goal achievement directly, by improving soil resources, promoting better utilization of present equipment, bringing new types of equipment into use, and raising livestock productivity. Better planning and more effective agricultural institutions will also contribute directly to project goals. The Study Team estimated that, over the next decade, mechanization and other related changes could raise yields over 50%, even without a shift toward higher-value crops.1/

The specific subgoal of the project will be to provide the Egyptian farmers with adequate power to carry out needed agricultural operations in a timely, effective and economical manner. The analysis summarized in this paper shows that a lack of power inhibits the farmers' ability to prepare the land, plant, cultivate, irrigate and harvest their crops, which in turn restrains their production and income.

In designing this project, the Mission has directed a great deal of attention toward minimizing conflict with another important sectoral goal--that of increased employment in rural areas. The effects of the project on employment will probably be mixed. The productivity, and perhaps total employment, of those directly involved in mechanization--farmers, repair and

1/ This increase resulted from better seedbed preparation (14%), timeliness of planting (13%), reduced harvest losses (9%), better seed placement (4%). While the Mission does not expect such a large increase to occur nationwide within five years real production increases should result from the indicated changes.

service personnel, custom operators--will be increased from present levels, but some hired and family labor may be displaced. The labor market will absorb some of this displaced labor and some farmers will choose greater leisure and more education for their families. The net employment loss, as discussed in the social soundness and labor market analyses, will be limited.1/

2. Purpose

The project purpose is to build Egyptian capabilities to plan, support and carry out appropriate mechanization efforts. Simply stated this means developing ARE abilities to effectively choose and implement mechanization efforts that provide needed services and inputs to rural producers when and where needed and at reasonable prices. The substantive measure of successful project achievement will be well-formulated and effectively-implemented farm equipment projects, programs and support services contributing to increasing production and farmers' incomes.

The purpose will be attained through the initiation of activities to fill gaps in the current range of mechanization analysis and support efforts and the strengthening of on-going programs to reach more individuals with additional information and services. The ultimate result will be a comprehensive program of planned, inter-linked and mutually-complementary parts capable of providing the farmer with the support he needs to produce his crops more efficiently.

3. Outputs--Assistance Strategy for Components2/

To promote attainment of this purpose, the project will provide assistance to the Undersecretary for Engineering Affairs of the Ministry of Agriculture and other related organizations. The project will create an Agricultural Mechanization Group to carry out a range of activities in support of mechanization.

The specific problem being addressed, expected outputs and assistance strategy for each proposed project component are as follows:

a. Planning and Evaluation

Current mechanization planning in the Ministry of Agriculture is largely short-term and based on project and program proposals put forward. There is no systematic flow of information nor are in-depth analyses and projections of the individual or combined effects of various programs prepared. Evaluations of on-going or past activities are seldom conducted on a cost/benefit or incidence of benefits basis.

1/ See Economic and Social Soundness Analyses and Annex XVIII for details.
2/ To keep the paper brief the following presents only a short summary of each component. The detailed description is provided in Annex VI.

To provide needed overall assistance in planning, implementing and monitoring national mechanization efforts as well as to coordinate and oversee project components, a Planning and Evaluation Unit will be established as part of the overall group for mechanization. The contract team leader will direct the three-person technical assistance team for this component and advise the Undersecretary for Engineering Affairs, with special responsibility for establishing a system to provide information needed for effective decision-making. A planning and financial officer will assist the Egyptian staff in developing implementation plans for Project and other Ministry mechanization activities, in developing lending criteria and procedures for loan funds provided through the Project and in exercising financial management in project implementation. An evaluation officer will assist Egyptian staff in planning and implementing necessary surveys and other data collection activities to measure the effect of both Project and other mechanization programs in Egypt. Together the group will aim to improve both project effectiveness and overall MOA mechanization planning, evaluation and implementation.

b. Land Improvement

Over-irrigation, inadequate drainage and soil salinity are yield-reducing problems in large areas of Egyptian farm land. Subsoiling to improve drainage, gypsum applications to reduce salinity and precision land leveling to facilitate better irrigation practices are three techniques that help reduce the problem. Available resources allow these activities to be carried out on only a small percentage of the area requiring treatment. In Middle Egypt, a small program has been started in only one governorate although severe drainage and land leveling problems exist in all four governorates.

Under the project, assistance is proposed to the Soil Amelioration Organization (SAO) under the Ministry of Agriculture in the form of equipment and technical assistance (2 technicians) to carry out the planned land improvement activities in Middle Egypt. Working with the Middle Egypt Division of the SAO, to be established, one technician will concentrate on drainage and subsoiling activities while the other will focus on beginning the land leveling program. In both instances close collaboration with the Machinery Management Extension group will be needed to improve water-lifting and water utilization along with soil improvement and to lengthen the time period that yield increases are maintained from soil improvement activities. A total of about 216,000 feddans of old lands will be subsoiled by the SAO while roughly 12,000 feddans of land will be leveled. Additional New Lands areas nearby will be assisted in

"off seasons." In addition, particularly for land leveling, a major emphasis will be on encouraging the private sector to assume this responsibility. It is hoped that land leveling and, to a lesser extent, subsoiling will be established as private sector activities by the project's end.

c. Machinery Service

The lack of adequate service and repair facilities, particularly for motorized equipment, severely reduces operating time for Egypt's stock of farm machinery. Consequently returns from the capital represented are lower than necessary and farmer needs are not met. Unless this problem is solved, any additions to the equipment pool as part of mechanization efforts will achieve results below their potential.

To provide the necessary services, a network of roughly 20 private area service centers or groups of specialized shops located throughout Egypt and 50 or more satellite centers will be established by strengthening existing private shops, or, where necessary, establishing new ones. The mix between centers and smaller shops will be determined by demand and entrepreneur interest. A credit fund will assist these activities. A service-center specialist will assist MOA personnel in identifying entrepreneurs, working out individual development plans, setting up new shops and centers, and assisting them to become viable. A mechanical specialist will develop a program, utilizing the private sector shops, to put currently inoperable tractors back into operation. Cooperatives will be encouraged to develop service contracts with private centers.1/ Training of local mechanics and short-courses in workshop operations will be important responsibilities of all technical staff. The planning/financial advisor in the Planning and Evaluation group will assist in necessary financial planning for the workshops.

Thes subactivity will raise equipment repair capability in the rural areas of Egypt and allow more use of the stock of equipment. The tractor repair will allow an increase in available power supplies. The emphasis on the private sector will help the government to disengage from this activity while a small number of additional off-farm jobs will be created.

d. Research and Development Center Establishment

Little attention is currently being given to farm equipment research by government, universities or equipment manufacturers. The results are a lack of relevant data on the costs, benefits and other socio-cultural effects of mechanization and few, if any, new equipment items modified to Egyptian conditions. Without odditional funds, a systematic focus on practical problems, and a leadership organization, this situation is likely to continue.

1/ A special covenant in this regard is included.

To stimulate, coordinate and conduct research on technical, economic and social aspects of mechanization, to introduce continuity in research activities, to encourage a systematic focus on practical problems and to meet the need for a central facility that is well equipped and intensively utilized, the Project will fund the establishment of a Farm Mechanization Research and Development Center, and capitalize a fund to be used in making research grants to other Egyptian institutions, such as universities and manufacturers. An individual experienced in research station administration and development management will be provided along with a farm machinery specialist. The Center will be located near Alexandria, on the site of the tractor-testing facility. Facilities will be provided by the GOE and equipment by USAID. The Center will conduct some research but act primarily as a funding and coordinating body. Through these inputs, a focal point for farm equipment research and a source of information for continuing changes in and evaluation of farm equipment use in Egypt will be created. At the same time the need to duplicate facilities will be avoided. Capabilities in planning and conducting research and in developing appropriate equipment will be strangthened. The ultimate result will be more rational and realistic planning of future farm mechanization programs based on equipment suited to Egyptian conditions.

e. Machinery Management Extension

The existing machinery pool consisting of a very limited range of items is not being used effectively, partially because farmers do not know how to employ existing equipment optimally and are unaware of the opportunities that exist and results to be expected. This situation stems from the lack of sources of information. Equipment dealers have thus far failed to provide information on a systematic basis. Mass media channels have scarcely been utilized. Only very recently has the Ministry of Agriculture started an extension effort in the farm equipment area and the program is very limited. Overall extension service problems are likely to minimize results in the short-term, furthermore, unless assistance is provided.

Through the project, it is proposed to assist the Ministry in establishing a meaningful farm machinery extension program. Emphasis will be on tillage and seedbed preparation, farm operation, maintenance and repair of equipment, water-lifting implement selection, assistance to small manufacturers, and cost and return evaluation. Particularly close coordination will be maintained with the soil improvement and service-center activities. In addition the program will introduce modest numbers of selected new equipment items that appear to offer

substantial returns in production and benefit/cost terms. Threshers, disc harrows and row planters are a few of these items. The introduction of improved water-lifting equipment will be facilitated by technical assistance aimed at developing techniques for user group establishment and by a credit fund specifically for water-lifting equipment. Technical assistance will also be provided in the areas of agricultural engineering, farm management, extension and small equipment manufacture. Finally, training programs for extension staff, farmer owners and operators of equipment, service-center staff and small manufacturers will be developed with the assistance of technical assistance staff.

Through these activities Ministry capabilities in several areas will be expanded, on-farm equipment use will be improved and additions to the pool of trained manpower will be made. The overall effect should be increases in the production and productivity of individual farmers.

4. Inputs

a. Overall

The principal USAID-financed inputs to this project are technical assistance, commodities and loan/research funds with smaller amounts provided for training and other costs. GOE staff, facilities and operating funds are critical host-country inputs. The breakdown by category of inputs, excluding contingency and inflation, is as follows: 1/

b. Technical Assistance

A total of 14 long-term advisors will be provided for a total of 696 work-months over the six-year life of the project, in a variety of technical fields supporting the range of project activities. Long-term staff will be supplemented by 17 months of short-term services. The projected cost of the technical assistance input is $ 7.7 million to be funded by AID.

c. Commodities

Two types of commodities will be provided at a total cost of $ 7.6 million mostly funded by AID. The first type will support project operations and consist primarily of vehicles and office equipment. The second type will support implementation or establishment of GOE capabilities in specified areas. Commodities required include heavy equipment for the Soil Amelioration Organization, shop and research equipment for the R & D Center and machinery for extension/demonstration purposes.

1/ See Annex VI for additional detail.

d. Loan/Research Funds

Two specific loan funds will be capitalized by AID funds. The first will be for service-center development in the amount of $ 5.0 million. The second is to support improved water-lifting and other equipment introduction activities. Credit funds for this purpose in the amount of $ 2.0 million will be provided. Research activities in the R & D Center will be funded through an input of $ 1.2 million.

e. Training

In-country training will be provided for mechanization and extension staff, mechanics, tractor drivers, service personnel, farm equipment manufacturers, and shop operators. A total of $ 720,000 is budgeted for this training, to be funded by AID.

Up to 45 person years of long-term academic training will be funded for 25 individuals involved in the agricultural mechanization area. Training at the M.S., Ph.D. and post doctoral levels would be provided, at an estimated cost for this training of $ 780,000 to be funded by AID. Short-term training in various areas related to agricultural mechanization will be provided to roughly 75 individuals at a projected cost of $ 563,000.

f. Other Costs

Miscellaneous other costs, also to be funded by AID, will include building renovation ($ 70,000), a Small Equipment Manufacture Feasibility Study ($ 400,000), vehicle operating costs ($ 80,000) and evaluation ($ 60,000).

g. GOE Inputs

The major GOE contributions to the project will be staff, facilities and operating funds. The 1700 person-years to be provided will cost an estimated $ 3.6 million, with $ 2.5 million in land and facilities also to be made available. In addition the GOE will supply operating costs for the project activities in the estimated amount of $ 2.0 million, and $ 828,000 in commodities.

5. Administrative/Management Responsibilities

a. Central Level

Overall direction of the project will be the responsibility of an Agricultural Mechanization Group, to be

established by the Minister of Agriculture, reporting to the Undersecretary for Engineering Affairs. The Group will function as a semi-autonomous body in the administration of project resources and activities, while also serving as an overall farm mechanization policy and planning information body for the Ministry of Agriculture. The Group will consist of Co-Directors, units for Planning and Evaluation and Training Support and four program divisions: 1) Soil Improvement; 2) Machinery Extension; 3) Service-Center Development and 4) Research and Development. Staff will be from the Undersecretariat or seconded from other involved organizations.

Because the project implementation involves the active participation and strengthening of organizations and bodies not under the administrative control of the Undersecretary for Engineering Affairs, an Advisory Implementation Board will also be established by the Minister of Agriculture. This Board, composed of representatives from each organization involved and chaired by the Project Director, will serve as a forum for the exchange of ideas on project components and a means of keeping the parties informed of project activities. Further, the Board will provide a mechanism for securing the necessary coordination among organizations receiving assistance to carry out different project elements and/or having a capability needed to support implementation. In this manner, the expected day-to-day coordination by technical assistance and mechanization group operating staff will be legitimized and strengthened. The rationale for this structure is further discussed in Section IV D.

b. Implementation Level

The Machinery Management Extension Group will work directly with the Undersecretariat for Extension in establishing and institutionalizing a capability in farm machinery, greater provision of mechanically powered water-lifting equipment on a demand basis and in-service training for farmers and service personnel. The Agricultural Bank will handle the loan fund for water-lifting and the new equipment while one or more commercial banks will handle the Service-Center Development loan funds. The Soil Amelioration Organization will implement the subsoiling, land leveling and drainage activities with the active involvement of and close coordination with the Extension Service. Establishment of the Research and Development Center will be the direct responsibility of the Undersecretariat for Engineering Affairs with close links to the University of Alexandria Agricultural Engineering Faculty. Table 3 shows the various project components and the organization involved in each.

Table III - 1 Implementation Responsibilities

Component	Implementing Division or Organizations	Major Cooperating Organizations	Other Collaborating Organizations
1. Planning and Evaluation	Planning & Evaluation Division	All project divisions	Agricultural Economic Research Inst. R & D Center
2. Research and Development Center	R & D Division	U. of Alexandria	Other Universities
3. Service Center Development	Service Center Development Division	Machinery Management Unit Bank Misr	Syndicate of workshop operators
4. Soil Improvement	Soil Improvement Division	Machinery Management Unit Soil Amelioration Organization	Min/Ag Extension
5. Machinery Extension	Machinery Management Extension Division	Soil Improvement Unit PBDAC Min/Ag Extension Planning and Evaluation Local Manufacturers	AGR Economics Research Institute Ministry of Irrigation

B. Relation To Program Objectives

1. Relation To Country Development Strategy and AID Program

Overall the AID agricultural sector assistance strategy, as articulated in the CDSS, is to utilize production growth as the means to more effective resource use and greater rural sector employment. To achieve this growth requires simultaneous and mutually supportive efforts in agricultural technology, agricultural policy and institutional development. This Project with a horizontal approach across the range of elements comprising a mechanization support system addresses all three concerns in the agricultural mechanization area: policy through research, planning, evaluation, and generation of policy-useful information; technology through research and application of research; and institutional development through training, building of new organizations, expansion in existing structures and upgrading of organizational effectiveness. But even more importantly this Project, as do the Agricultural Development Systems project concerned with planning and policy and the Small Farmer Production project concerned with agricultural credit and farm management, provides broad horizontal support across the sector to a number of projects with a more vertical focus on a particular crop, such as rice, or a particular problem, such as water management, but each containing a spectrum of activities from research through extension and processing to marketing.

The CDSS Agricultural Annex also noted Mission concern with the potential harmful effect of mechanization. These concerns are reflected in the project design summarized above and largely underlay the decision to omit certain components recommended by the Study Team and in general to scale down the size of portions of the Project while building up the evaluation activities. The selected mix of components encourages a mechanization strategy that emphasizes production-increasing technologies such as mechanical seeders over innovations that save costs via extensive labor displacement.

Given the CDSS conclusion that additional energy application, through mechanization, does have a role to play in increasing both production and productivity, this Project occupies a pivotal supporting position vis-a-vis other activities in the sector. Some specific examples are: 1) increased cereal production may partially depend on better seedbed preparation and more timely planting and harvesting, probably only possible through mechanization; 2) the better water control required to reduce over-irrigation is facilitated by motorized water-lifting; and 3) subsoiling to improve drainage is possible only

through mechanization. Similar examples of the support function mechanization can play to production- and productivity-increasing activities are available across the range of projects. The bottom line is that assistance in mechanization fills a gap in AID activities and helps prevent energy application from being a serious restraining factor to agricultural growth. Simultaneously the Project provides an additional opportunity to influence policy not only in mechanization per se, but also in those areas that affect mechanization efforts, e.g. pricing, interest rates, etc.

Specific project relationships are foreseen with six approved agricultural projects--Cooperative Marketing, Water Use and Management, Small Scale Agricultural Activities, Small Farmer Production, Rice Research and Major Cereals and, to a lesser extent with capital projects such as PVC Pipe Drainage, and Irrigation Pumps. The six agricultural projects each have a research and/or extension component relating to mechanization. The mechanization project will help to establish the effective public and private systems needed to execute the more specific activities planned in these projects. The research center, for example, will help in the further development and testing of machinery initially introduced by SSAA. The upgrading of the service facilities will support the spread of equipment recommended by the rice and major cereals research activities. More effective equipment use will improve returns to credit provided under the Small Farmer Production and Cooperative Marketing Projects. Potential areas of duplication, as between the sakia replacement component and a follow-on water use project, have been eliminated to the greatest extent possible, by the redesign or reduction of the component mix recommended. In the case of Pipe Drainage and Irrigation Pumps the soil amelioration activities provide an immediate but short-term solution to the drainage and irrigation problems addressed by these projects.

2. GOE Objectives

Mechanization of agriculture is a principal objective of GOE policy in the sector, as articulated in the 5-year plan and high-level policy statements. The GOE has set a target date of 1985 for full mechanization of primary tillage. This policy reflects underlying objectives of increasing production, relieving labor from "drudgery," and raising the productivity of land now devoted to fodder.

The overall design of the project is in line with increasing GOE orientation toward the private sector and bringing the performance of government institutions to the level of private enterprise. Specific components address GOE emphasis on training skilled manpower, developing a base for policy-making and a concentration on research and extension as public sector

activities. Other concerns addressed include rationalizing water use and maintaining soil resources.

3. Other Donor Activities

The principal other donor in the area of mechanization is the World Bank which is currently funding a large-scale pilot project in Sohag and Menufia Governorates developed with the FAO. The project, which will import 1,000 tractors and over 4,000 pumps, is oriented more toward public-sector provision of services than is the project proposed here, although the Mission understands that this is being renegotiated. Total project cost is $ 45.7 million. Plans for the AID project have been discussed extensively with Bank representatives to ensure that the two are mutually supportive. Other prospective Bank activities include provision of 3 mobile training units for tractor maintenance.
The German-aid agency, has been involved for some time with Alexandria University in the development of mechanization research. Progress in this project appears to be stalled at present due to organizational difficulties. The Japanese recently signed a CIP-type agreement, part of which is to be used to finance tractor imports, but further details are not available.

4. The Farmers' Perspective

While there may be numerous reasons and expectations for greater mechanization at the national level, an important concern is the degree to which farmers perceive these same needs and benefits. A partial answer is provided by a survey of farmers undertaken by the feasibility study team[1/], in which farmers ranked very highly a number of problems related to mechanization, as shown in Table III-2.

Regarding benefits from mechanization, the survey indicated that farmers believe mechanization will provide substantial relief in "problem" areas. Interestingly, benefits relating to an improved quality of life ranked highest with perceived production and income benefits receiving a lower ranking.

However, since improvement in quality of life generally requires a higher income, the seeming divergence between national and farmer objectives is probably more illusory than real. The costs of improving the quality of life must be met by increased production or reduced costs. Nevertheless, it cannot be taken for granted that the economic opportunities offered by mechanization will be exploited unless the probable rewards are apparent, substantial and attainable for the majority of farmers.

1/ See Annex XVII for more details on the study.

Table III-2

Farmers' Problems

Responses	No.	%
More fertilizer 1/	92	24
More water for irrigation 1/	87	23
Shortage of and high wages of labor	50	13
Shortage of and high price of machines	47	12
Mismanagement of cooperatives	37	10
Drainage problems	31	8
Miscellaneous	35	9
	379	99

Table III-3

Perceived Benefits from Mechanization

Responses	No.	%
Less drudgery	139	34
More leisure time	96	24
Education for children	57	14
Increased production	33	8
Increased income	24	6
Improved land	22	5
Reduced hard labor	14	4
Release animals from work	8	2
Miscellaneous	11	3
	404	100

1/ It should be noted that to some degree these problems are addressed by other AID assisted activities--Small Farmer Production and Water Use and Management--with further assistance in rationalizing the fertilizer system under discussion

In this regard, the average Egyptian farm poses special problems. 92 percent of the farmers operate less than 5 acres. The great bulk of the farms cannot support a line of equipment but must rent machinery services or share ownership. Custom operations (renting out equipment and services) can be efficient and effective where demand and competition are sufficient. Where rental is possible, a machinery-owner can engage in commercial service operations or farm his own land and rent out excess capacity. To the extent these services are widely available, both price and quality competition will exist. Conversely, if demand exceeds supply, incentives are created for custom operators to cover as much land as rapidly as possible and to charge higher prices for less service.

C. Funding

The more conservative project recommended by the Mission has reduced the projected AID contribution to $ 40 million, from the original planning figure of $ 44 million and the Study Team recommendation of $ 78 million. The GOE contribution of $ 15.2 million will cover 27.5% of total project costs and 40% of local currency costs. The AID contribution will cover the remaining 60% of local currency costs ($ 21.2 million) and nearly all of the foreign exchange costs ($ 18.8 million). The AID funds will be obligated over several years and expended over a six-year period ending in FY 85, as shown below.

The breakdown of project costs by component is as follows:

Summary of Funding
(U.S. $'000 or LE - equiv.)

Component	AID		GOE		Total	
	$	%	$	%	$	%
Planning and Evaluation	2,999	11.4	829	9.3	3,088	11.0
Machinery Management Extension	7,779	29.7	2,701	30.3	10,480	29.9
Service-Center Development	5,964	22.8	1,341	15.1	7,305	20.6
Soil Improvement	5,577	21.3	2,414	27.1	7,991	22.8
Research and Development	3,876	14.8	1,618	18.2	5,494	15.7
Subtotal	26,195		8,903		35,098	
Inflation 1/					16,548	
Contingency 1/					3,510	
Total					55,156	

Proposed Obligation Schedule for U.S. Funding
(U.S. $'000)

FY 1979	FY 1980	FY 1981	FY 1982	FY 1983	FY 1984
$ 21,000	15,500	1,500	2,000		

1/ See note, Table V-1, for an explanation of contingency and inflation factors.

A. Economic Analysis

1. Summary of Cost-Benefit Analysis

The economic analysis conducted by the Mission shows that the proposed activities are economically beneficial to the Egyptian Economy, with an internal rate of return of over 12%, based on an estimate of partial benefits. Some project components such as soil improvement and machinery introduction, can be analyzed in a straight-forward manner because research results and other sources provide a firm basis for estimating benefits. Other components, such as Planning and Evaluation and the Research Center, cannot readily be analyzed, since the results are totally dependent on open-ended estimates of benefits. Consequently, the Project was evaluated taking into consideration the cost of all project activities, and the benefits of only those activities where a firm estimate is possible (see Table IV-1). In other words the analysis does not assume any benefits from the other components (R & D, training, planning and evaluation, and parts of other components), and may thus be viewed as a "worst case" or a "fortiori" analysis. Clearly, only modest benefits need be assumed for the other components to suggest an IRR over 15 percent, the guideline generally used by AID and others.

In all calculations, international prices have been used for shadow prices for tradables. No value has been assigned to saved labor although in reality most farmers would consider this a benefit and labor released during peak periods would probably increase production somewhat.

Even for those components where a sound estimate of benefits is possible, different assumptions on costs to be included, prices, and the level of benefits can yield widely varying estimates. As the following table shows, Mission estimates are quite conservative. In all cases, furthermore, the IRRs suggest a comfortable margin for error in the estimates. See Annex XIX for further details on the analysis.

Table IV-1

Internal Rates of Return

for Selected Program Components 1/

Item	Mission	IRR Study Team	IRR Ford Foundation
Subsoiling	39%	98%	
Land Leveling	22%	37%	
Service-Centers		33%	
Sakia Replacement 2/	65%	17%	108%
Thresher 3/		31%	25%
Mechanical Planter		41%	

1/ See Annex XIV for detailed analysis of each component. Mission calculations are based on full component costs while Ford Foundation and Study Team estimates include only capital costs.

2/ Pumpset requires engine replacement after 10 years.

3/ High-capacity (2.5 mt/hr) used for two crops per year, e.g., wheat and rice for Study Team analysis; IRRI-type thresher used for Ford Foundation analysis.

The above tabulations indicate that selective mechanization furthers farmer and national production and income goals and therefore contributes to quality of life objectives.

In general, the benefits included in the analysis flow largely from additional power allowing more timely planting of crops and better soil preparation and from increasing the productivity of livestock freed from draft work. Even higher returns would be possible for an individual farmer who selects a mix suited to his particular operation (see farm level analysis in this section).

The economic analysis presented here is not based on assumed yield gains from mechanization of current field operations, per se. Experience in developing countries and limited evidence from Egypt suggests that the simple mechanization of primary tillage and water-lifting reduces costs but it does not increase yields. A tractor pulling a chisel plow, operated with indifferent skill, simply does not represent an improvement over a baladi plow. Furthermore, labor savings are usually a large component of the cost savings, with questionable net social benefits.

The availability of additional power in agriculture, however, paves the way for changes in technology that do increase yields, such as use of seed drills, land leveling and inter-row cultivators. Efficient management and operation of even simple plowing can provide a better seedbed, more timely operations and greater yields.

Most of these improvements do not necessarily require a tractor to perform them. Animal-drawn implements or merely greater hand labor can provide most, but not all, of the same benefits. However, this option, while it can make a large contribution, is not adequate in the Egyptian case. Labor shortages in critical periods and geographic regions make greater labor use unlikely. The reverse can be expected to occur as outmigration and longer education continues (see section IV B). Furthermore, Egyptian farmers show limited interest in nonmechanized implements. A Ford Foundation designed seed drill, which offered a 50% savings in seed, was rejected by farmers as not providing a large enough step towards mechanization. The Mission believes, however, that substantial opportunities exist for providing appropriate technology. The Small Scale Agricultural Activities project (and successive efforts in this area) will fully explore the area of small equipment and further action in this area would be duplicative at this time.

Egypt is now partly through a transition to mechanical power for the performance of traditional cropping operations. Without intervention the progress of mechanization would probably stall at this phase, as it tends to do in developing countries, with increasing use of tractors for plowing and threshing, and of pumps for irrigation. This will result in some displacement of labor (though it is believed to be minor in this case), a reduction in costs, and few if any productivity increases.

The benefits from this project will derive from assisting the farmer to exploit the increase in power availability to make technological changes in his operations that can increase yields. Other benefits will flow from increasing the effectiveness of basic operations by decreasing tractor down-times and providing better training for machinery operators.

Project benefits also derive from increased annual production from the current animal stock on-farm. Further gains in production are likely through the "rationalization" of the cattle industry, although no benefits from this change have been included in the economic analysis. At present, the animals kept are multipurpose, providing draft power at a cost of low productivity and requiring large amounts of feed for maintenance before any production is obtained.

It is expected that farmers will keep their animals after mechanization, since they are profitable even when not used for draft and produce foods highly valued for home consumption as well as sale. Scientific herd improvement will continue, but is inevitably a slow process. In Egypt, however, there is another option--that of switching to buffaloes from cows. Cows are preferred for plowing, while buffalo are preferred for milk production, producing 32% more by value. Both are used for sakias. This process is already underway. Cow numbers peaked in 1974, while buffalo numbers continue to increase. The buffalo herd, which in 1960 was 86,000 less than the cow herd, outnumbered it by 157,000 in 1976.

2. Farm Level Analysis

While returns to the economy as a whole provide a justification for project components in an overall sense, the pace and content of mechanization will depend primarily on what it pays farmers to adopt. Therefore, it is appropriate to examine what effect mechanization would have on a typical farm or farms.

To make the analysis manageable several simplifying procedures have been used. First, two farm sizes were selected--2 feddans and 8 feddans. These two sizes approximate two general categories of farms--those of 2 feddans or less which are estimated to include 47 percent of all farms and which are largely labor self-sufficient and those over 2 feddans which make up the remainder and are less labor self-sufficient. Next a cropping pattern was specified. For both sizes cotton-general and rice-general patterns were utilized because they seem to represent the most common types of farm. Specific areas under each crop are based on survey data and are shown in Table IV-2. It will be noted that cropping intensity varies between the two sizes--a survey finding--and is reflected by an idle-land component in the larger sizes. Also the ratio of cows and buffaloes to cropland is much higher on smaller sized units. Again this reflects survey data.

TABLE IV-2

SIGNIFICANT CHARACTERISTICS OF TYPICAL FARMS OF SPECIFIED TYPES AND SIZES UNDER ASSUMED DEGREES OF MECHANIZATION

Item	Rice Farm				Cotton-general Farm			
	2 Feddan		8 Feddan		2 Feddan		8 Feddan	
	Non-Mech.	Fully Mech.	Non-Mech.	Fully Mech.	Non-Mech.	Fully Mech.	Non-Mech.	Fully Mech.
Cropping Intensity (%)	200	200	170	200	200	200	180	200
Crops Grown (fd)								
Cotton	.70	.70	2.90	2.90	.65	.65	4.00	4.00
Wheat	.70	.70	2.70	3.80	.75	.75	3.00	3.20
Rice	.87	.87	3.40	3.40	-	-	-	-
Maize	.43	.43	1.70	1.70	1.35	1.35	3.60	4.00
Berseem	1.30	1.30	2.90	4.20	1.25	1.25	3.80	4.80
Idle	-	-	2.40	-	-	-	1.60	-
Total Crops Grown	4.00	4.00	13.60	16.00	4.00	4.00	14.40	16.00
Livestock (No.)								
Cows	.85		1.70	.80		1.50		
Buffaloes	.94	Same	1.30	Same	.95	Same	1.50	Same
Donkeys	.88		1.90		.40		1.10	
Other[1]	*		*		.15		2.40	
Total Animal Units	2.50		4.30		2.60		4.40	

* Insignificant

[1] Sheep and/or goats

A final step in making the analysis manageable was to assume that all farms are completely nonmechanized at the outset and utilizing land preparation, harvesting-threshing and irrigation equipment under full mechanization. This obviously represents extreme situations since farmers have already adopted certain mechanized practices and full mechanization is not likely in the near future. However, the data still do provide a meaningful estimation of change directions and magnitudes. Labor is assumed to be available. Yield increases made possible by mechanization are assumed to be 10% for the 2 feddan units and 5% for the 8 feddan units. Grain savings from mechanization were assumed to be 2 - 5 percent. Family labor savings do not figure into the net benefit calculations.

Calculation results utilizing prevailing custom machine rates and 1978 yields and farmgate prices are shown in Table IV-3. This portrays the situation the individual farmer currently faces and indicates mechanization is very profitable.

Table IV-4 shows a hypothetical case of employing world market prices for cotton, wheat, rice and fuel (wheat and rice prices increased by 10 percent, cotton prices are doubled and fuel costs increased by a factor of about 3). This approximates what would be the case as Egypt moves toward a free market.

Under both sets of conditions the operators of the farms could well afford to hire mechanized services and, with the exception of 2 feddan cotton-general operations, even if it was necessary to borrow necessary operating capital. The fact that farmers are already hiring and purchasing machines for the identified functions demonstrates that the profitability has already been established for many users. Unless costs rise dramatically without parallel increases in prices one can continue to expect farmers to utilize increasing amounts of mechanization.

B. Social Soundness Analysis

Possible socio-cultural effects have been a major concern from the start of investigations regarding an agricultural mechanization activity. Early on it was recognized that, since mechanical power and farm equipment are already being used to a major extent, the analysis should concentrate on the effect of additional mechanization on different groups and the access of different groups to mechanization services rather than on whether mechanization itself was socio-culturally feasible.

Beneficiary Analysis

Four groups of beneficiaries can be identified: farmers; providers of machinery services; family laborers, especially children; and consumers. Individual farmers will benefit from cost savings and yield increases as the increased and improved

Table IV-3

Impact of Full Mechanization on
Typical Farms of Specified Types and Sizes
(Current Prices)

Item	Change Due to Mechanization			
	Rice Farms		Cotton-General Farms	
	2 Feddans	8 Feddans	2 Feddans	8 Feddans
Land Use 1/				
Cotton		-		-
Wheat	No Change	+1.1	No Change	+ .2
Rice 2/		-		-
Maize		-		+ .4
Berseem		+1.3		+1.0
Idle		-2.4		-1.6
Total Crops Grown		+2.4		+1.6
Value of Production (LE)				
Crops	+ 60	+378	+57	+315
Milk and Meat	+102	+350	+88	+309
Grain Saved	+ 15	+ 59	+ 6	+ 25
Total	+177	+787	+151	+649
Cash Costs (LE)				
Machine Hire	+ 95	+391	+ 85	+342
Hired Labor	+ 1	-138	+ 1	-110
Berseem Bought 3/	- 69	- 34	-	-
Total	+ 27	+219	+ 86	+232
Net Change (LE)				
Net Returns (LE	+150	+568	+ 65	+417
Increase in Net Return	19%	29%	9%	19%

1/ Both types of 2 feddan farms double crop all cultivated ares under both nonmechanized and mechanized conditions. In the nonmechanized situation the 8 feddan rice farm has 2.4 feddans idle during the winter season; the 8 feddan cotton-general farm has .40 feddans idle during summer season and 1.20 feddans idle during the winter season.

2/ Cotton-general farms grow no rice

3/ Value of calculated berseem shortage under nonmechanized conditions are: 2 feddan rice farms LE 69; 2 feddan cotton-general LE 132; 8 feddan rice LE 68; and 8 feddan cotton-general none, i.e., production just meets needs in both situations.

Table IV-4

Impact of Full Mechanization on
Typical Farms of Specified Types and Sizes
(Free Market Prices)

Item	Change Due to Mechanization			
	Rice Farms		Cotton-General Farms	
	2 Feddans	8 Feddans	2 Feddans	8 Feddans
Land Use 1/				
Cotton		-		-
Wheat	No Change	+1.1	No Change	+ .2
Rice 2/		-		-
Maize		-		+ .4
Berseem		+1.3		+ 1.0
Idle		-2.4		- 1.6
Total Crops Grown		+2.4		+ 1.6
Value of Production (LE)				
Crops	+ 79	+429	+ 74	+368
Milk and Meat	+102	+350	+ 88	+310
Grain Saved	+ 16	+ 65	+ 7	+ 27
Total	+197	+844	+169	+705
Cash Costs (LE)				
Machine Hire	+115	+471	+105	+422
Hired Labor	+ 1	-138	+ 1	-110
Berseem Bought 3/	- 69	- 34	-	-
Total	+ 47	+299	+106	+312
Net Change (LE)				
Net Returns (LE)	+150	+545	+ 63	+393
Increase in Net Value	15%	23%	7%	12%

1/ Both types of 2 feddan farms double crop all cultivated area under both nonmechanized and mechanized conditions. In the nonmechanized situation the 8 feddan rice farm has 2.4 feddans idle during the winter season; the 8 feddan cotton-general farm has .40 feddans idle during summer season and 1.20 feddans idle during the winter season.

2/ Cotton-general farms grow no rice

3/ Value of calculated berseem shortage under nonmechanized conditions are: 2 feddan rice farms LE 69; 2 feddan cotton-general LE 132; 8 feddan rice LE 68; and 8 feddan cotton-general none, i.e., production just meets needs in both situations.

use of mechanical power and other equipment on the farm allows more timely and lower-cost performance of critical farming operations. Since small farmers already utilize custom equipment services at about the same rate as larger farmers, they are expected to benefit along with larger farmers. However, because larger farmers currently utilize their land less intensively than smaller ones and hire more of their labor, large farm operations are perhaps in position to benefit relatively more than those tilling family-sized units. Offsetting part of the larger farm advantage in comparative cropping benefits is the value of milk and meat saved on smaller farms. Because there is a higher ratio of cattle to crop land on smaller farms net milk and meat benefits from relieving animals from draft work will be proportionally higher on smaller farms.

The second group of direct beneficiaries are people who participate in performing services where their labor productivity (and wages) will be higher than presently. These include tractor drivers, repair and service personnel, research and development staff, local manufacturers, credit and banking staff, extension staff and the staff of the soil amelioration organization. It is likely that participation in the above array of activities will, in effect, serve as training needed to move up to higher level jobs in a society in transition from the use of large quantities of relatively unskilled labor to one where a growing array of skills are increasingly required.

A third group of beneficiaries are family members, particularly children, working as agricultural laborers. Since many of the labor intensive farm tasks can be adequately performed by children at wages roughly a third to one half those of adults, children have been employed as family labor or wage earners in very large numbers. Laborers under 18 constituted over 40% of the agricultural labor force in 1970. Release from the monotonous and time-consuming tasks of tending animal-powered water wheels or threshers would open up opportunities for higher productivity on the farm or in the household, for learning new tasks or for general education. Increasing recognition of the value of education is in fact already seriously reducing the availability of children for agriculture, thus tightening the labor supply.

A fourth group of beneficiaries are consumers. Although not direct participants in the project, as farm mechanization stimulates greater production at lower costs, this should mean additional food supplies and slower increases in food prices.

Despite the considerable benefits from mechanization, there are real economic and social cost effects for some groups. While one can assume that a farmer who substitutes mechanical power for his own cattle does so because he believes he and his family benefit, in cases where a farmer who previously rented cattle and attendant labor services changes to mechanical services, the

cattle owner suffers a loss of revenue--unless he in turn becomes the lessor of mechanical power. Data on numbers possibly affected are incomplete, but some sample survey information is available on the extent of renting out of oxen, equipment and attendant labor services. The table below summarizes the information.

Information is not available on the income provided by renting out oxen, the economic status of lessors, or the percent of annual family income derived from rental of traditional equipment. It is not, however, believed to be a large proportion since renting out cattle has seldom, if ever, been recorded as a significant income source.

Table IV-5

Percent of Respondents Reporting

Owning, Sharing Ownership and Renting of Farm

Capital Investments

Capital Investment	Own	Share Ownership	Rent
Sakia	9%	81%	10%
Pumpset	26	3	71
Tambour	14	83	3
Animal turning the Sakia	74	12	13
Tractor	1		99
Local Plow	82	0.3	18

Source: "Further Mechanization of Egyptian Agriculture."

Nevertheless, replacement of animals with mechanical power would result in some lost income. A significant part of the loss to animal owners will be made up by increased animal meat and milk production. Further, it doesn't seem likely that a long-standing sakia ring would convert to mechanical pumping without the consent of or some compensation to, the member presently renting out sakia services. Presumably, cattle owners can make greater productive use of the animals on their own farms since most farms are not fully exploited. Farm family members freed from work can, of course, enter the hired labor market, where some, but not all, will find jobs. Farmers' stated objectives in mechanizing, however, (freedom from drudgery, leisure, children's education) indicate that many family members will not choose to enter the market.

Hired farm workers are the second group most often identified as one that will be hurt by mechanization. Analysis indicates that the projected drop in employment due to mechanization of 12 percent by 1990 will be offset by planned increases in cropping intensity and the decline of family labor. Thus, after 10 years, the total

use of hired labor may be unchanged. Table IV-6 below summarizes the projected changes. It should be noted, however, that the table is based on a mechanization program larger than the one contained in this paper. Therefore the changes are likely to occur more slowly than indicated.

Table IV-6

Effects of Mechanization on Hired Labor Requirements

Under Alternative Conditions

Item	Base Year 1/	Years after Base 2	5	10
		Million Man Years		
1. Total Labor Requirements 2/	722	766	750	676
2. Hired Labor Required 2/	104	101	91	56
Change in Hired Labor Required Due to:				
3. Increased Cropping Intensity 3/	---	*	+ 4	+19
4. Reduced Family Labor Supply 4/	---	+ 5	+14	+27
Hired Labor Required				
5. Total	104	106	109	102
		Days per Year		
6. Days per adult-equivalent available in base year	90	92	95	89
7. Days per adult-equivalent available after migration	90	102	123	167

1* Insignificant
1/ Estimated 1977 levels from Chapter VI, Feasibility Report.
2/ Assumes no change in cropping intensity.
3/ Assumes cropping intensity increases from current national average of 190 to 200 over 10-year period at the same rate as mechanization reduces labor requirements.
4/ Assumes continuation of permanent and temporary migration at 1973-77 average rate.

There would be a shift, nevertheless, in the tasks to be performed--custom winnowing for example would be reduced while row crop cultivation would increase--and labor would have to adapt. Certain groups could still be negatively affected. Overall, it seems that unless opportunities for off-farm and off-shore employment decrease sharply from present levels labor savings by farm mechanization in the decade ahead will largely substitute for labor lost to agriculture through temporary and permanent migration. In addition there should be some growth in off-farm employment stemming from the need to provide equipment support services and additional crop marketings.

Another group that has suffered from mechanization in other settings is tenants, if land owners purchase tractors and evict the tenants to operate the land directly or if tractor-owners buy rented land and evict the tenants. In Egypt, where over 40% of the land is rented, the high profitability of mechanical operations could create an incentive to displace tenants. Whether this is happening and, if so, whether mechanization is a cause is not clear. Certain factors in the Egyptian context seem to mitigate against such a process. First, land ownership is highly fragmented with only 12 percent of the holdings large enough to occupy a tractor fully. The pattern of large holdings farmed by several tenants is extremely rare. Strong values against land sale make accumulation of land through purchase very difficult. Furthermore, Egypt's Land Reform Acts place strict ceilings on land ownership while controlling rents and safeguarding tenant security and these laws are largely, but not completely, enforced. Also, given the profitability of renting there seems to be little actual incentive to seek to evict tenants. Our judgment is that any land accumulation which might result in tenant eviction is likely to result from a desire to own the land and only secondarily from a desire to apply mechanized practices. Such accumulations are believed to be minor and, unless legislative changes are enacted which make them easier, likely to continue to be so. Tenant eviction by existing owners is also believed to be minor due to existing safeguards with this condition likely to persist in the future.

The Role of Women

Regarding the effect of farm mechanization on the role of women, the data are unclear. On the one hand indications are that participation by women in crop operations has declined considerably since 1960 particularly as hired laborers. The official estimate is that 3 percent of the rural labor force are women. While the true figure is doubtless much higher, this indicates that female participation as hired labor is much below that in the LCD's. This seems to reflect a tendency for farm women to withdraw from field work as incomes rise. Mechanization may reinforce this trend, however, women continue to bear major responsibility for livestock care and the preparation and marketing of animal products. Thus, while mechanization may further reduce the participation of women in the field labor force and narrow the scope of their participation, the parallel increase in amounts of animal products handled will increase womens' economic role. In light of the importance of animal products to total income on most small Egyptian farms, mechanization may have a neutral or narrowly positive impact on women.

Overall, there is no reason to expect farm mechanization to radically alter the role of farm operator's wives. The kinds of crop operations that women currently perform cannot be mechanized in the forseeable future. Influence in decision-making should not be lessened if income contributions are not reduced. Finally, additional educational opportunities for girls may be conducive to a slow but steady elevation of status for women.

Population

Over time, an increase in mechanization will affect the growth of population by interactions with a number of variables affecting birth rates, migration and, to a lesser extent, mortality rates. The net effect should be a slight reduction in the rural growth rate, but further study will be required to reach a firm conclusion. The World Fertility Study, now underway, is expected to provide more information on this subject. Mechanization will reduce the demand for child labor, promote greater education and raise rural incomes, all of which tend to lower birth rates. The displacement of female labor, which would tend to raise the birth rate, is expected to be minor, as noted above.

Mechanization is not expected to have a large impact on migration under Egyptian conditions, due to the presence of strong forces encouraging migration that are unaffected by mechanization, the minor amount of labor being displaced, and the countervailing impact of greater status and income for farm workers. This issue is further discussed in Annex XVIII.

Mechanization will bring about some improvement in rural health and working conditions, generally tending to reduce mortality and morbidity. The impact of the project in this area will be extremely limited and the resulting effect on population will be virtually nil.

Other Considerations

On the question of class differentiation, project-induced differences in access and control of resources will tend to widen existing gaps in the near term. This is inherent in most situations of increasing commercialization, particularly in a free enterprise system. If remedial measures are necessary appropriate actions to reduce these disparities should probably be institutional (taxes, unions) rather than restrictions on the use of capital. Increasing competition by adding to the supply of demanded services may, in effect, reduce growth in class differentiation.

A final consideration is the degree to which additional mechanization will make farm families more dependent on forces outside their immediate control and increase risk, i.e., reduce self sufficiency. In Egypt nearly, if not all, farm families are

already in the market economy and therefore dependent on certain market elements. Custom-based mechanization would increase this dependency to a certain extent, but the decision to utilize these services will be left to the farmers and presumably based on his assessment of costs and benefits, including risk. In most instances any transitions to hired or mechanized services will be gradual with alternative methods of performing necessary tasks available, in at least the short-run. Over a longer period the efforts to create adequate support capabilities should reduce the possibility of equipment breakdowns which might seriously harm Egyptian farm operations. All in all the project will slightly increase dependency, a normal result of development.

C. Technical Feasibility

1. Overall

The technical feasibility of the program proposed in this paper is readily demonstrated by the situation prevailing in Egypt at present. The technical aspects of most project components have been well tested in Egypt. The strategy is generally to support changes already underway or develop present capabilities. The proposed pace reflects USAID judgments on what is a feasible, desirable rate of change, and the need for on-going evaluation and study.

The technology supporting those elements largely new to Egypt--the Farm Equipment Research and Development Center, the machinery extension effort and precision land leveling--has been employed successfully elsewhere in countries lacking the advantages of Egypt's large pool of skilled manpower. In each instance the technology is quite simple and very similar to technology already employed. No particular technological problems are therefore foreseen in introducing programs of the types proposed, nor in maintaining and continuing these programs after project termination.

It must be noted that the significant number of well-trained Egyptian agriculturalists helps assure the technical feasibility of a broad range of programs. The relative sophistication of the Egyptian farmer also means that new ideas are sought and accepted if benefits are perceived. The tradition of custom-hire services and share ownership means costly items can be used jointly and facilitates the spread of new ideas.

The technical feasibility of achieving the program's purpose is supported by the range of activities to be assisted. The project includes assistance in planning, research and development, service and credit provision, extension in several areas including local manufacture, and manpower development. This spectrum of assistance represents a broad attack on the

array of identified constraints and is designed to prevent a problem in a particular area from frustrating attainment of overall project objectives. In contrast a more selective approach might result in a failure to reach the farmer (if extension were excluded), or to develop and manufacture needed equipment (if the Research and Development Center or local manufacture were ignored) or to make service available (if service-center developemnt were eliminated). Any one such problem could severely reduce overall project effect.

The technical rationale supporting increased mechanization has been discussed in Section IV A above. It should be noted that, from a strictly technical perspective, production increases due to more timely operations, better seedbed preparation, better drainage and irrigation and higher cropping intensity might be achieved by labor intensive methods or more use of animal power. From an economic and social perspective, however, labor intensive techniques to achieve production increases possible with mechanization do not appear to be feasible as discussed above. Of course, other agricultural production increasing techniques not directly related to mechanization should be pursued in conjunction with efforts to provide appropriate power and equipment.

Choice of equipment size is also a technical consideration. Egyptian farms are too small for efficient use of most equipment by an individual owner/operator. In light of the implied need for joint use, the smaller the equipment, the fewer the organizational and management problems created. Project choice of equipment for pumping and threshing is based on this argument. Nevertheless, soil types, availability and farmer preference indicate that items for use with 65 HP tractors are best suited to the current tractor stock and Egyptian conditions generally.

2. Engineering Analysis

Construction will not be directly funded by the Project. However, construction of facilities is expected under the loan fund for service-center development. Each of these facilities will reflect the specific requirements of the applicant(s) and therefore no standard design or amount has been allocated for each center. For budgeting purposes L.E. 30,000 per major facility or group of shops based on L.E. 100 per square meter have been included. Specific building designs and/or plans and specifications for construction/renovation will be submitted along with each loan application. For satellite centers an estimate of L.E. 10,000 per facility for renovation and upgrading is included. Again specific plans and specifications will be part of each application. For both the major centers and satellites AID will approve the general renovation/construction criteria to be applied but not each application.

In addition to the above a small amount of funding will be used to rehabilitate some existing facilities for use as the Research and Development headquarters. AID will provide up to $ 100,000 ($ 70,000, plus an allowance for inflation) for this rehabilitation on a reimbursement basis. Criteria and procedures will be spelled out in an exchange of implementation letters.

The estimates for the construction financed through loan funds and for the facility renovation are based on findings of the study team and current costs, are reasonably firm and meet the requirements of Section 611(a).

3. Energy Concerns

An accurate estimate of energy use in Egyptian agriculture is unavailable and would require an extensive study. A Mission estimate of total horsepower potentially available from tractors (excluding transport use), pumps and animal draft suggests that roughly .80 HP is available per feddan, as follows:

Source	Total HP ('000)	% of Total	HP/Feddan
Tractors	1202	.24	.19 1/
Animals	3517	.71	.57
Pumps	216	.04	.04
Total	4935	100	.80

This number clearly overestimates the actual energy use since it does not allow for down-time and unused capacity. An estimate of .33 - .40 HP per feddan is probably closer to the current use from all sources.

This level is less than one-third that of other intensive agricultural systems, such as Japan and Israel and is low even in comparison to extensive developed systems such as the U.S. (with roughly 1 HP per feddan). The lack of energy at critical points in the rotation is a constraint to increasing production. Current sources cannot generate sufficient power to perform operations rapidly and some, such as subsoiling, cannot be accomplished at all.

The need for an increase in energy use must be balanced against other factors in the current situation favoring uneconomic use, particularly the prices of capital goods and fuel. Several indirect subsidies (tariff, e.g., interest rates) tend to encourage investment in capital goods. This is in line with GOE policies and is expected to continue to some degree despite overall efforts to rationalize prices. Fuel prices were recently raised 50%, but are still far below world prices. As in developed countries, fuel prices are a volatile political issue and a rapid rationalization in view of Egypt's self-sufficiency is highly unlikely.

1/ This is slightly lower than the Study Team estimate of .23.

At the micro level the price situation may tend to encourage a shift from manual to mechanical labor, although no evidence of this taking place exists. At the macro level, however, agriculture will remain under-capitalized. The subject of prices will continue to be discussed with the government.

D. Administrative Feasibility

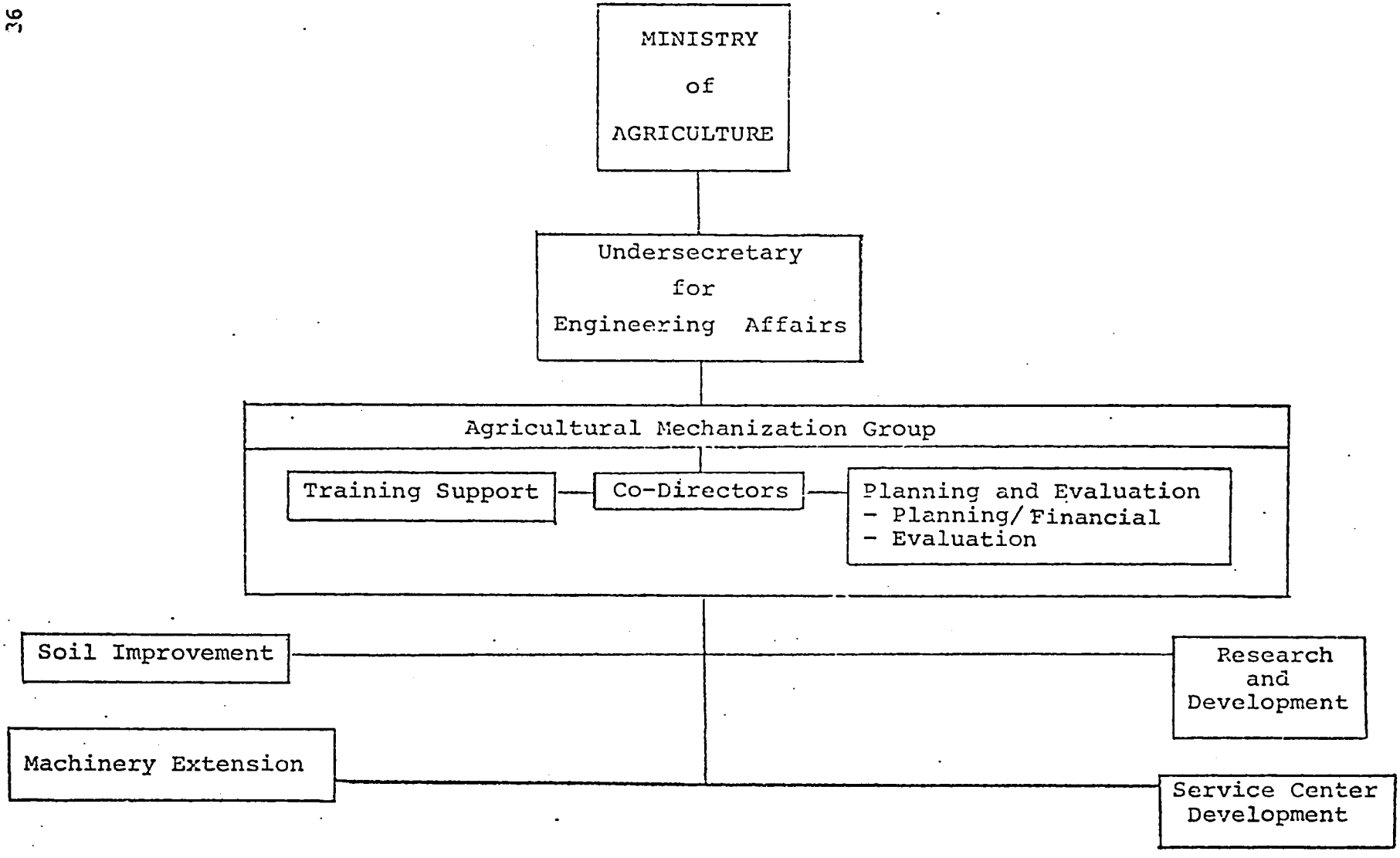
As described in Section III, the project will be implemented by several organizations in the agricultural sector, under the direction of an Agricultural Mechanization Group to be established in the office of the Undersecretary for Agricultural Mechanization. (Figure 1)

While the structure proposed is not ideal it provides the best available alternative. The alternative of a task force reporting directly to the Minister offers the advantage of providing autonomy and relief from the normal bureaucratic structure, but is not conducive to achieving eventual institutionalization of capabilities and activities. A dispersed approach dividing both administrative and implementation responsibility among the various implementing organizations, would maximize involvement of these groups but would complicate administration overall without guaranteeing the desirable degree of coordination. The proposed approach balances the advantages of each alternative to achieve a degree of independence of action, active involvement of implementing agencies in planning, and good coordination, while avoiding the pitfalls cited.

Certain start-up administrative problems are expected for the Agricultural Mechanization Group itself, since it will be a new body with no administrative experience behind it. The presence of an experienced MOA official as Project Director and the input of the technical assistance team, however, will ensure that the necessary administrative capacity is achieved. The establishment of clear operating procedures, as part of the Group establishment process, will also facilitate administration as will the assignment of experienced personnel from the Ministry and other organizations. Individual project components will be implemented by the Agricultural Bank (loan fund for new equipment), the Extension Service (machinery management extension and contributions to other activities), Bank Misr or other Commercial Bank (Service-Center Loan Funds), the Soil Amelioration Organization, and the Research and Development Center to be established.

In all instances, the Project will increase implementation and administrative demands on these organizations. Im most instances, however, the increase will be quantitative rather than qualitative and, with the assistance of the Mechanization Group and the technical advisors, the organizations should be capable of effectively discharging administrative responsibilities.

Figure 1


MINISTRY
of
AGRICULTURE
Undersecretary
for
Engineering Affairs
Agricultural Mechanization Group
Training Support
Co-Directors
Planning and Evaluation
- Planning/Financial
- Evaluation
Soil Improvement
Research
and
Development
Machinery Extension
Service Center
Development

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Turning to the specific organizations, there is little doubt that the Agricultural Bank can handle the volume of funds indicated. The funds will be earmarked for the purposes specified and will follow normal bank procedures, which currently support Bank lending in excess of $ 100 million annually. Bank staff are qualified and the assistance provided by the AID-funded Small Farmer Production Project and the World Bank should further increase administrative capacity.

The MOA Extension Service, on the other hand, has a reputation of being quite ineffective and the Machinery Extension Division has only recently been established. The problems seem to reflect low budgets, low motivation and insufficient staff development rather than administrative difficulties. The Project will directly address the above problems in the Machinery Management areas while the relatively heavy input of technical assistance and training will upgrade both personnel and organization/administrative management.

A successful commercial bank, such as Bank Misr, with branches and preferably an agricultural department should be able to handle the Service-Center Loan Fund with few difficulties. Establishment of agreed upon criteria and procedures should further facilitate the process.

The Soil Amelioration Organization is currently conducting soil improvement activities in the Delta. The organization has a large number of experienced staff and seems to be fairly efficient in performing its functions. Expanding operations to Middle Egypt and adding land leveling to their range of activities will increase administrative responsibilities but the expansion should not exceed capabilities. One objective of the technical assistance input will be to strengthen overall management and attain greater operating efficiency than currently achieved.

The Research and Development Center will be a new organization, and will need assistance in developing administrative procedures. A U.S. research administrator will be provided for five years to inaugurate operations and develop sustainable procedures. The substantial input by this individual should be fully adequate to develop the necessary institutional capacity.

E. Environmental Concerns

The proposed project will not have a measurable negative impact on the environment and will support improvement of the use of soil and water resources.

The Project is expected to promote increased use of mechanized equipment in the rural environment. Pollution levels from this increased activity will not reach levels posing a threat to humans or animals. The extension, soil amelioration, and machinery introduction activities will lead to better soil management and will therefore correct any tendency for the current set of practices to damage rural environments, for example by leading to the formation of a hardpan. Overall, better soil management and improved control of water application will promote an improvement in the on-farm environment.

The village environment will be affected primarily through an increase in machinery service-centers. The potential for a negative environmental impact created by this activity, minor in any case, will be contained through careful design of the facilities.

Other project activities, including establishing a research and development center, strengthening planning and evaluation in the Ministry of Agriculture and improving machinery management will have no measurable negative environmental effects.

The possible problem of direct physical impact of project activities on recorded and unrecorded archeological sites is recognized. However, the types of activities to be funded pose no real threat since the Project focuses on lands continuously and discontinuously cultivated for centuries and already highly disturbed. In any case project supported activities will not disturb strata more than 70 cm below the surface. Materials on technical issues and the current state of the art regarding archeological sites are being developed by AID/Washington and will be provided to appropriate Egyptian officials.

Due to the wide range of social and economic concerns raised by mechanization, evaluation will be a critical project component. The issue of environment will be among those receiving close attention. Plans for evaluation are further discussed in a later section.

V. Financial Plan and Analysis

A. Analysis

Funds will be provided to the Ministry of Agriculture on a grant basis. Funds in support of activities in other government entities such as the Soil Amelioration Organization and the Agricultural Bank will generally be regranted to these organizations as discussed below. Where project activities result in the sale of goods and services to farmers, private entrepreneurs, cooperatives or government entities, a covenant will require the GOE to ensure that

Table V-2 Funding of Project Inputs/Outputs

	Planning & Evalua'n			Service Center Dev.			Soil Improvement			Research & Dev.			Machinery Management			Total		
	AID	GOE	Total	AID	GOE	Total	AID	GOE	Total	AID	GOE	Total	AID	GOE	Total	AID	GOE	To
	2,128	272	2,400	915	234	1,149	1,044	1,057	2,101	1,174	547	1,721	2,483	1,463	3,945	7,744	3,573	11,
	1,956			915			1,044			1,174			2,483					
	172																	
		272			234			1,057			547			1,463				
lities	67	-	67	38	357	395	4,331	-	4,331	,993	-	1 993	2,144	471	2,715	7,573	828	8,
.es	58			38			30			71			130					
:quipment							3,925						1,926	471				
	9				357		376			,922			88					
.ng	330	-	330	-	-	-	193	-	193	420	-	420	1,120	-	1,120	2,063		2,
:ipant	330			-	-	-	193	-	193	420	-		400					
ıntry													720	-				
:ing Expenses	14	214	228	11	36	47	9	857	866	14	357	371	32	512	544	80	1,976	2,
.es	14			11			9			14			32					
		214			36			857			357			512				
.ties		343	343	-	714	714	-	500	500	70	714	784		255	255	70	2,526	2,
; Facilities								500			714			255				
.ng Renovation										70								
: Funds	460	-	460	5,000	-	5,000	-	-	-	1,205	-	1,205	2,000	-	2,000	8,665	-	8,
:ch Support				5,000	-	5,000	-	-	-				2,000	-	2,000			
ıl Studies										1,205	-	1,205						
ıluation	460	-	460															
Subtotal	2,999	829	3,828	5,964	1,341	7,305	5,577	2,414	7,991	3,876	1,618	5,494	7,779	2,701	10,480	26,195	8,903	35,
Contingency 1/	300	83	383	596	134	730	558	241	799	388	162	550	778	270	1,048	2,619	891	3,
Inflation 1/	1,281	499	1,780	2,547	810	3,357	2,381	1,453	3,834	1,655	975	2,630	3,322	1,625	4,947	11,186	5,362	16,
Total	4,580	1,411	5,991	9,107	2,285	11,392	8,516	4,108	12,630	5,919	2,755	8,674	11,879	4,596	16,475	40,000	15,155	55,
: Contribution	11.4	9.3		22.8	15.1		21.3	27.1		14.8	18.2		29.7	30.3		100	100	
f Total Costs	8.3	2.6	10.9	16.5	4.1	20.6	15.4	7.4	22.8	10.7	5.0	15.7	21.5	8.3	29.9	72.5	27.5	1

ee notes Table V-1 Slight discrepancies
ue to rounding error.

payments generated are used to further project objectives rather than flowing into the Treasury, and to discuss with AID the plans for ensuring these reflows. In the case of funds handled by the Agricultural Bank, such as the water-lifting fund, reflows will generally be used to capitalize future loans to farmers for machinery purchase in line with AID policy to build up the Bank's capital. The Service Center Loan Fund, if administered by Bank Misr or another non-agricultural bank, may be handled on a fee basis or loaned to the bank with reflows to the Ministry of Agriculture, the R & D Center, etc., or it may be used to capitalize a revolving fund for continued lending for the same purpose.

The project will furnish equipment to the SAO to provide a service that is sold to private farmers. It would not be appropriate to provide the equipment on a loan basis, however, because the organization is funded by a budget allocation and does not receive farmer payments, which flow to general revenues via the Agricultural Bank. This situation, which does not appear likely to change, has encouraged the SAO to charge a rate below true costs. The issue of costs will be discussed with the SAO on a continual basis, to encourage a move in their rate structure toward economic rates. Rates somewhat below full costs are justified at present by the need to demonstrate the value of the service to build demand in a new area, by the need for fast action to stop soil deterioration and by the spillover of benefits to soils that are not treated. Over time, however, a low rate structure will block market entry by entrepreneurs and should be discouraged.

B. Funding Summary

The total cost of the Project is estimated at $ 55,156,000. AID will provide a grant of $ 40,000,000 or 72.5 percent of total costs. Details are shown in Tables V-1, V-2, and V-3.

VI. Implementation Arrangements

A. General

The Project is to be implemented over a six-year period. Technical assistance will be provided through one AID-financed Host Country Contract with a U.S. firm selected through the competitive selection procedures set forth in AID Handbook 11, Chapter 1. Technical assistance for all components will be provided under one contract with subcontracts as necessary.

Project commodities will be procured by the Ministry of Agriculture utilizing AID-financed procurement procedures established in Handbook 11. USAID officers and a short-term contractor will assist the Grantee in developing specifications and the evaluation of bids for award. Prior AID approval of all procurement procedures and awards in excess of $ 40,000, or the Egyptian pound equivalent, will be required. Contracting procedures will also be approved by AID for those host-country procurements under $ 50,000. The Technical Service Contractor may assist and advise on procurement, including development of specifications and bid evaluation, but most commodity procurement

Table V-1

Summary Financial Plan

	AID			GOE			Total		
	$	LE Eq.	T	$	LE Eq.	T	$	LE Eq.	T
Staff	6,195	1,549	7,744	-	3,573	3,573	6,195	5,122	11,317
Commodities	6,324	1,249	7,573	828	-	828	7,152	1,249	8,401
Training	1,286	777	2,063	-	-	-	1,286	777	2,063
Operating Expenses	-	80	80	-	1,976	1,976	-	2,056	2,056
Facilities	-	70	70	-	2,526	2,526	-	2,596	2,596
Other	529	8,136	8,665	-	-	-	529	8,136	8,665
Credit	-	(7,000)	(7,000)	-	-	-		(7,000)	(7,000)
Research Support	(299)	(906)	(1,205)	-	-	-	(299)	(906)	(1,205)
Special Studies & Evaluation	(230)	(230)	(460)	-	-	-	(230)	(230)	(460)
Subtotal	14,334	11,861	26,195	828	8,075	8,903	15,162	19,936	35,098
Contingency	1,433	1,186	2,619	82	809	891	1,515	1,995	3,510
Inflation	3,057	8,129	11,186	137	5,225	5,362	3,114	13,354	16,548
Total	18,824	21,176	40,000	1,047	14,109	15,156	19,871	35,285	55,156

1/ 10% of Subtotal.
2/ 8% for foreign exchange. Domestic cost inflation at 25% in FY 1980, 15% in FY 1981 and 10% thereafter.

Table V-3 Projection of Expenditures by Fiscal Year

	1980			1981				1982			1983			1984			1985		
	AID		GOE	AID		GOE		AID		GOE	AID		GOE	AID		GOE	AID		
	$	LE	LE	$	LE	$	LE	$	LE	LE	$	LE	LE	$	LE	LE	$	LE	
Staff	268	67	40	1,344	336		375	1,473	368	869	1,442	361	869	1,114	279	869	554	138	
TA	268	67		1,344	336			1,473	368		1,442	361		1,114	279		554	138	
LT	211	53		1,328	332			1,457	364		1,426	357		1,098	275		538	134	
ST	57	14		16	4			16	4		16	4		16	4		16	4	
GOE			40				375			869			869			869			
Commodities	6,157	599	-	20	300	828	-	-	-	-	147	350	-	-	-	-	-	-	
Vehicles	200										127								
Farm Equipment	4,602	599			300	828						350							
Other	1,355			20							20								
Training	190	34	-	304	158		-	337	153	-	262	148	-	193	144	-	-	140	
Participants	190	14		304	18			337	13		262	8		193	4				
In-country		20			140				140			140			140			140	
Operating Expenses	-	-	-	-	19		164	-	19	453	-	19	453	-	16	453	-	7	
Vehicles					19				19			19			16			7	
Other							164			453			453			453			
Facilities	-	-	1,928	-	70		103	-	-	124	-	-	124	-	-	124	-	-	
Land, Offices, Other			1,928				103			124			124			124			
Building Renovation					70														
Other	-	10	-	35	1,605		-	275	895	-	110	2,830	-	60	2,680	-	49	116	
Credit Funds					1,500				500			2,500			2,500				
Research Support		10		35	105			60	180		110	330		60	180		34	101	
Special Studies & Evaluation								215	215								15	15	
Subtotal	6,615	710	1,968	1,703	2,488	828	642	2,085	1,435	1,446	1,961	3,708	1,446	1,367	3,119	1,446	603	401	1,1
Contingency 1/	662	71	197	170	249	82	64	208	143	145	196	371	145	137	312	145	60	40	1
Inflation 1/	529	177	492	283	1,087	137	280	544	834	840	706	2,740	1,069	641	2,848	1,320	354	443	1,2
(	7,806	958	2,657	2,156	3,824	1,047	986	2,837	2,412	2,431	2,863	6,819	2,660	2,145	6,279	2,911	1,017	884	2,4
TOTALS (		8,764			5,980		2,033		5,249			9,682			8,424			1,901	
(			11,421				8,013			7,680			12,342			11,335			4,3
Inflation Factors																			
$:	.080			.166		.166		.261			.360			.469			.589		
LE:		.250	.250		.437		.437		.581	.581		.739	.739		.913	.913		1.104	1.1

1/ See Table V-1. Slight discrepancies due to rounding error.

All commodities financed through project capitalized credit funds will be procured directly by the borrowers. Procurement procedures will be established by the various Fund Managers with the assistance of the Technical Services Contractor and establishment of procedures for management of the fund will be required, in form and substance satisfactory to AID, prior to any disbursements thereunder.

Award of research grants under the R & D project component will be made by the Center in accordance with criteria to be agreed upon between AID, the MOA and the Research Center. The criteria will be established with the assistance of the Project Technical Services Contractor and, pursuant to anticipated conditions precedent, must have AID prior approval prior to any disbursement for this activity.

The funds for medium and long-term credit, for farm equipment and Service Center Development respectively, will be provided in a series of tranches either directly by AID to the lending institutions, or on a reloan basis. Loan terms and conditions and procedures for selection of borrowers pursuant to conditions precedent to be contained in the Grant Agreement will be required to be approved by AID prior to the actual provision of loan funds. The criteria for loans and procedures to be utilized by the fund will be established by the Grantee with the assistance of the Project Services Contractor.

Arrangements for all offshore training will be the responsibility of the Training Support Unit in the Central Project Directorate. Contractor personnel will assist in this unit in making necessary arrangements. In-country training will be coordinated by the Training Support Unit and provided in Ministry of Agriculture facilities. Funds for all training will be released directly to the Ministry of Agriculture on the basis of training plans submitted to AID. Disbursement will also be the subject of a condition precedent in the Grant Agreement in order to assure development of effective training plans.

B. Specific AID Responsibilities.

The USAID/Egypt Assistant Director for Agricultural Development, or his designee, will have AID Management responsibility. Day-to-day monitoring will be performed by the appointed USAID Project Officer. Management and monitoring will be facilitated by project implementation plans, and annual up-dates, to be prepared by the Ministry of Agriculture and the Technical Services Contractor with AID staff assistance.

Following signature of the Project Agreement, the Project Officer will assume all project management responsibilities. Technical backstopping will be provided by the Assistant Director for Agricultural Development, the Project Officer and other USAID offices as required.

C. GOE Responsibilities

As specified earlier, an Agricultural Mechanization Group, to be established within the Undersecretariat for Engineering Affairs in the Ministry of Agriculture, will have overall project implementation responsibility. This group will coordinate and direct project activities to meet project objectives. Specifically, the group will: (a) submit implementation plans covering project activities; (b) maintain all financial records; (c) procure all commodities; (d) make all necessary arrangements for offshore and in-country training in cooperation with the Contractor and USAID; (e) maintain and evaluate project activities; and (f) support activities being carried out in other administrative units. AID and, upon their arrival, the Technical Assistance Team will assist the GOE in managing these activities. In addition, the Group will establish and maintain coordination with the Director, USAID/Egypt, or his designated representative, for the purposes of keeping the USAID informed of project activities and allowing on-going and specific evaluations of progress. Actual implementation of the various project elements will be performed by the designated organizations with the assistance and guidance of technical assistance staff. Under these arrangements the GOE should be able to handle implementation responsibilities.

D. Technical Services Contractor

The Technical Service Contractor, including any subcontractors, will have the day-to-day responsibility for advising the Agricultural Mechanization Group Project Director and the Ministry of Agriculture on all operational aspects of the project. Technical assistance staff will provide necessary technical advice in planning and implementing activities, in preparing work plans and reports, in identifying and placing trainees and in evaluating activities. Annex XII identifies the positions to be supplied under the contract and briefly describes the duties and responsibilities of each position.

E. Logistics

Office space for those project work force members to be stationed in Cairo will be provided in three Ministry of Agriculture buildings. The Central Directorate will be housed in one building, the Machinery Management Extension Division in a second and the Service-Center Development Staff in a third. In each instance the space is limited but should be adequate. At the proposed R & D Center office space is ample in the three-story building to be renovated. For the Soil Improvement Staff the SAO will rent or obtain Ministry space in the governorate capital.

Because MOA holdings of essential office equipment are less than adequate limited amounts will be procured for use of project staff. Most of these items will be procured in Egypt by the MOA.

To ensure that project staff are mobile it is proposed that a number of vehicles be procured. These will be assigned to the different operating divisions for use of both Contractor and GOE staff.

F. Implementation Plan

1. General

8/79	PP Approved
9/79	Grant Agreement Signed
9/79	Agricultural Mechanization Group Established
9/79	Technical Assistance RFP Issued
10/79	Project Director Appointed
3/80	Technical Assistance Contract Signed
7/81	Contract Signed for Feasibility Study
3/82	In Depth Evaluation
12/83	In Depth Evaluation
7/85	Project Completed

2. Agricultural Mechanization Group

12/79	Initial Commodities and Equipment Ordered
6/80	Contract Team Leader Arrives
7 - 12/80	Group Staff Appointed
7/80	Evaluation Officer & Financial Support Officers Arrive
8/80	Work Plan Submitted
8/80	Participants Depart
9 - 12/80	Baseline Data Collected
12/80	Commodities Arrive
1/81-1/85	Participants Depart at Various Times
1/82	Commodities and Equipment Ordered

3. Research and Development Center

10/79	Center Formally Established
12/79	Director Named
8/80	Renovations Completed
8/80	Research Administration Advisor Arrives
8/80-12/80	Staff Appointed
9/80	Work Plan Prepared
10/80	Operational Details of Applied Research Fund Established
12/80	Equipment and Commodities Arrive
1/81	Research Fund Capitalized
4/81	Machinery Development Expert Arrives
4/81	First Research Center Grant Made

6/81 First Collaborative Research Started
6/81-
10/85 Work of Center Continues
10/85 Research Administration Advisor Departs

4. Service-Center Development

10/80 Center Development Advisor Arrives
10/80 Equipment Repair Specialist Arrives
12/80 Agreement Reached with Lending Organization and AID on Loan Fund Procedures
12/80 GOE Staff Assigned
12/80 First Tranche of Loan Funds Provided
2/81 First Facility Development Loan Made
4/81 Second Equipment Repair Specialist Arrives
12/81 Second Tranche of Loan Funds Provided
6/83 Third Tranche of Loan Funds Provided

5. Soil Improvement

9/80 First Technician Arrives
10/80 Office and Workshop Facilities Provided
11/80 Work Plan Prepared
11/80 Links with Extension Department Established
11/80 Staff Assigned
12/80 Equipment Arrives
1/81 Subsoiling and Drainage Work Begin
3/81 Land Leveling Demonstrations Begin
9/81 Second Technician Arrives
12/81 Private Sector Land Leveling Begins
12/82 Work Underway in 3 Governorates

6. Machinery Management Extension

8/80-
9/80 Technical Assistance Staff Arrives
8/80 GOE Staff Assigned
11/80 Work Plan Developed
12/80 Procedures for Placement of Demonstration Equipment Established
12/80 In-Service Training Courses Started
2/81 Extension Training Started
2/81 First Equipment Distributed

VII. Evaluation Arrangements

Because the experience gained in this project will be important in planning future mechanization strategies and elements evaluation to record and assess these experiences will be an integral part of project operations. The planning and evaluation unit of the Agricultural Mechanization Group will bear major

responsibility for supervising and carrying out these activities. Initially the unit will be expected to plan and arrange for the conduct of any necessary baseline studies for individual project components as well as for overall mechanization in Egypt. In the latter case this will consist primarily of establishing in general terms where agricultural mechanization efforts are at the time of project start-up, while for the former specific data on each project component will be required. As the project is implemented the unit will establish the data required to monitor project implementation and impact on rural residents and will develop plans for collection of necessary information and supervise collections and analyses. Depending on the component, activities may include on-farm surveys, implementation staff or organization reports, or tabulation of information that is already routinely collected. As data are collected they will be analyzed and compiled in a format useful to project management and staff, MOA officials and AID. Through these internal project evaluation activities information to support further stages of project implementation and related nonproject activities will be generated.

Annual USAID evaluations to be conducted with the assistance of the AID project manager will supplement the in-house evaluations utilizing the information generated within the project. These evaluations will focus on project progress, output attainment, input provision and operating problems, to ensure that AID is fully informed of project accomplishments, and to help identify particular problems or concerns as they arise.

Finally it is proposed that two external evaluations be performed with the input of 3 - 5 outside experts in the field of agricultural mechanization. These teams will work with ARE, contractor and USAID staff to provide a greater degree of objectivity than AID on project evaluation. The first evaluation, scheduled for year three of the project, will examine the implementation status of each component, identifying issues and problems as necessary, and the overall effect of the project. It will be a responsibility of the evaluation team to recommend any changes necessary for the project to meet objectives within the given time frame. The second evaluation will be conducted in year 5 and serve to assess what project effects have been and what they indicate for the future.

To summarize, the key events in the proposed time frame are as follows:

6/80 Arrival of Planning/Evaluation Officer
8/80 Baseline data collection begins
1/81 First Annual Evaluation
3 - 5/82 External and Annual Evaluation
3/83 Third Annual Evaluation

3 - 5/84 Fourth Annual Evaluation
1/84 Fifth Annual Evaluation
4 - 6/84 Sixth Annual and External Evaluation

Agenda for Evaluation

As indicated above, topics of concern will be addressed on three levels: the present status, the effect of project components, and the effect of the total GOE program in mechanization. The following list suggests the wide range of topics that must be handled by the Planning and Evaluation Unit in cooperation with other participants in evaluation:

A. Agronomic and environmental variables

1. Yields (effect of subsoiling, planting dates tillage, tillage, etc.)
2. Use of and production from draft animals
3. Long-term effects of mechanization (compaction, etc.)
4. Changes in water use
5. Levels of energy use

B. Economic variables

1. Rate of return to farmers
2. Rate of return to entrepreneurs
3. Effects on land tenure
4. Rate of growth of demand for services
5. Growth of mechanization outside of project (imports, production, sales, etc.)
6. Relation between mechanization and prices (inputs, mechanization services, animal feed and products, other inputs)

C. Social variables

1. Equity of access to resources
2. Labor force size and composition
3. Migration from rural areas
4. Employment
5. Effects on women

D. Program variables

1. Improvement in administration of GOE programs
2. Transfer of functions to the private sector

VIII. Conditions, Covenants and Negotiating Status

A. Conditions Precedent

Because of the range of activities and organizations involved, three sets of conditions precedent will be required: a) a minimal set for initial disbursement, b) a set governing disbursement for certain types of expenditures, and c) special conditions for each component.

1. Conditions Precedent to Initial Disbursement

Initial disbursement will be made following: a) receipt of evidence that the Agricultural Mechanization Group, containing a Planning and Evaluation Unit, has been established within the Undersecretariat for Engineering Affairs, with appropriate authority to administer the Project, b) naming of the Project Director, and c) receipt of specimen signatures.

2. General Conditions for Disbursement

Except for short-term assistance in commodity procurement disbursement for technical services will require evidence of a contract acceptable to AID and designation of counterpart staff for all units and divisions of the Agricultural Mechanization Group. For the commodity procurement assistance evidence of an acceptable contract to AID and the identification of Ministry procurement staff will be required. Any disbursement for commodities will require evidence of an invitation for bid or other procedures suitable to AID for the procurement. Disbursements for training will require submission of an annual training plan for each year.

3. Conditions Precedent for Specific Components Governing Disbursements other than for Technical Assistance, Training and Commodities.

a. Service-Center Development: Disbursement for this purpose will require AID approval of procedures for selection of borrowers, including lending criteria, and management of the Loan Fund, including terms and conditions.

b. Local Manufacture Feasibility Study: Disbursement for the study will be made following receipt of a detailed scope of work for the study prepared by the Mechanization Group and evidence that a feasibility study team acceptable to AID has been selected.

c. Research and Development Center: Disbursement for the Research and Development Center will require a) evidence of firm availability of the site of the Tractor Testing Station at Alexandria, b) establishment of the Center with broad responsibilities for stimulating and coordinating

applied farm mechanization research and machinery development throughout Egypt and c) a detailed implementation plan for Center activities including: (1) operation of an Egyptian-American collaborative research exchange program; and (2) operating procedures for the Agricultural Research Fund including criteria for selection of research topics, the grant approval process and the mechanism for monitoring project-funded research.

d. Machinery Management Extension: Disbursement for this component will require AID approval of an operational plan developed jointly by the Technical Services contractor and the Management Extension Unit of the Agricultural Mechanization group for a) working with the Extension Service to establish effective support for farmers, cooperatives and private custom operators, b) conducting an agricultural implement introduction program, and c) developing an advisory program for small local manufacturers of agricultural implements. Disbursement for credit funds for water-lifting will be made following AID approval of procedures including criteria for the selection of borrowers, management of the fund, and terms and conditions for the loans.

e. Soil Improvement: Prior to any disbursement for this component, the GOE will submit a plan developed by the technical services contractor for subsoiling and land leveling activities, and evidence that the Soil Amelioration Organization has committed adequate resources to Project activities.

B. Covenants

Standard provisions in the Grant Agreement will specify AID's right to conduct evaluations and approve all contracts in advance and will require the GOE to provide local currency and in-kind support as agreed upon on a timely basis.

A covenant will require that repayments of principal and interest or payments for goods and services under the Project be used for purposes furthering project objectives, and will require the GOE to discuss with AID the plans for doing so.

A covenant will require that cooperatives be permitted to utilize private sector facilities in the repair and maintenance of their equipment regardless of the availability of public sector facilities.

C. Negotiating Status

The Project as outlined in this paper has been thoroughly discussed with the GOE and specifically with the Undersecretariat for Mechanization, the Soil Amelioration Organization and other agencies involved in project implementation. The Minister of Agriculture has reviewed the draft and is in full agreement with the proposed design. The Mission expects to proceed to signature of the Grant Agreement immediately following authorization.

ANNEX I

LOGICAL FRAMEWORK

Goal:

Increased Agricultural Production and Higher Farm Incomes.

Indicators:

1. Gross Production Data
2. Value of Agricultural Production
3. Average Farm Incomes

Means of Verification:

1. ARE Statistics
2. Sample Surveys

Assumptions:

1. GOE policies encourage agricultural production
2. Higher production translates into higher farm incomes

Subgoal:

Provide Egyptian farmers with adequate power to carry out needed agricultural operations in a timely, effective and economic manner.

Indicators:

1. More primary tillage, threshing and water lifting performed by mechanical power.
2. Greater percentages of crops planted within two weeks of optimum planting dates.
3. Increased cropping intensity.

Means of Verification:

1. Farm Surveys
2. ARE Statistics

Assumptions:

1. Relative prices of labor and equipment do not discourage farm mechanization.

Purpose:

Build Egyptian capabilities to plan, support and carry out appropriate mechanization efforts.

Indicators:

1. Steady flow of management/planning information reaching senior decision-makers.
2. Information being extended to farmers on opportunities, costs and benefits of mechanization.
3. Research information on which to base farm mechanization decisions and plans.
4. Availability of equipment especially adapted to Egyptian conditions, produced locally.
5. Reduced equipment down-time.
6. Wider range of equipment in use for more operations and for more hours per year.
7. A wider range of farm equipment, produced locally.
8. Additional land areas made more productive.
9. Private sector provision of land improvement services.
10. Adequate numbers of trained manpower to support a range of mechanization activities.
11. Routine conduct of evaluation activities.

Means of Verification:

Observation	Project Records	GOE Statistics
Expert judgement	Project Evaluation	

Assumptions:

1. GOE provision of necessary resources
2. GOE is serious in commitment to turn over certain responsibilities to private sector

Outputs:

1. Agricultural Mechanization Planning and Evaluation Capability in MOA

2. Machinery Management Extension Program

3. Service and Repair Network

4. Farm Mechanization Research and Development Program

5. Local Manufacture Capability and Feasibility Study

6. Land Improvement and Extension Program in Middle Egypt

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Indicators:

1. a. Planning and Evaluation Staff in MOA.

1. b. Planning documents, analyses and evaluations.

2. Active program in MinAg underway with various elements.

3. a. 20 major service-centers, or complexes of small shops and 50 satellite centers established.

3. b. System of spare parts provision in place.

4. Physical facility completed and staffed and managing wide-ranging program, producing 2 items and 4 studies per year.

5. Three or more local equipment manufacturers with expanded capacity.

6. 55,000 feddans levelled and/or subsoiled annually in Middle Egypt.

7. 1,500 mechanics trained, 6,000 tractor drivers trained and 500 ARE staff trained.

Means of Verification

Evaluations

Project Records

GOE Statistics

Inputs:

1. Technical Assistance

2. Loan Funds

3. Research Funds

4. Commodities

5. Training and Funds for Training

6. Other Costs

7. GOE Personnel

8. GOE Operating Costs

9. Land and Facilities

Indicators: (Excluding Inflation and Contingency Values)

1. 713 Staff months

2. $ 7.0 million

3. $ 1.2 million

4. $ 7.6 million

5. 100 individuals receive academic and short-term observation training. Roughly 1200 courses conducted for extension staff, tractor drivers and service personnel.

6. $ 610,000

7. 1700 person years

8. $ 3.2 million

9. $ 2.5 million

Means of Verification:

Project Records

Evaluations

Assumptions:

1. Availability of AID/GOE resources

2. Contracting and commodity procurement proceed according to implementation plans

Annex II.

5C(2) - PROJECT CHECKLIST

.isted below are statutory criteria applicable generally to projects 'ith FAA funds and project criteria applicable to individual fund .ources: Development Assistance (with a subcategory for criteria :pplicable only to loans); and Economic Support Fund.

:ROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE?
HAS STANDARD ITEM CHECKLIST BEEN REVIEWED FOR THIS PROJECT?

\. GENERAL CRITERIA FOR PROJECT

1. FY 79 App. Act Unnumbered; FAA Sec. 653(b); Sec. 634A. (a) Describe how Committees on Appropriations of Senate and House have been or will be notified concerning the project; (b) is assistance within (Operational Year Budget) country or international organization allocation reported to Congress (or not more than $1 million over that figure)?	(a) Congressional notification will be submitted following AID/W approval, if needed. (b) Yes.
2. FAA Sec. 611(a) (1). Prior to obligation in excess of $100,000, will there be (a) engineering, financial, and other plans necessary to carry out the assistance and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?	(a) Yes, firm financial plans have been developed as a part of the project paper. (b) Yes.
3. FAA Sec. 611(a) (2). If further legislative action is required within recipient country, what is basis for reasonable expectation that such action will be completed in time to permit orderly accomplishment of purpose of the assistance?	None required.
4. FAA Sec. 711(b); FY 79 App. Act Sec. 101. If for water or water-related land resource construction, has project met the standards and criteria as per the Principles and Standards for Planning Water and Related Land Resources dated October 25, 1973?	Not applicable

5. FAA Sec. 611(e). If project is capital assistance (e.g., construction), and all U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability effectively to maintain and utilize the project?	Yes. See Annex XIV.
6. FAA Sec. 209. Is project susceptible of execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.	The project is not susceptible to execution as a regional or multilateral project and is not expected to provide measurable encouragement to regional programs.
7. FAA Sec. 601(a). Information and conclusions whether project will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture and commerce; and (f) strengthen free labor unions.	The project will (a) increase trade by promoting agricultural production and use of modern technologies, (b) foster private initiative in delivering services to farmers & machinery owners, (c) None, (d) discourage monopolistic control of machinery services, (e) increase the technical efficiency of agriculture and related local industries, and (f) None.
8. FAA Sec. 601(b). Information and conclusion on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).	A large portion of services and commodoties will have their source and origin in the U.S. and will be provided by U.S. private enterprise.
9. FAA Sec. 612(b); Sec. 636(h). Describe steps taken to assure that, to the maximum extent possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized to meet the cost of contractual and other services.	The Grant Agreement will so provide.

10. FAA Sec. 612(d). Does the U.S. own excess foreign currency of the country and, if so, what arrangements have been made for its release? — No.

11. FAA Sec. 601(e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise? — Yes.

12. FY 79 App. Act Sec. 608. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar or competing commodity? — No.

FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FAA Sec. 102(b); 111; 113; 281a. Extent to which activity will (a) effectively involve the poor in development, by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, spreading investment out from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using the appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing — Not applicable.

countries and the improvement of women's status; and (e) utilize and encourage regional cooperation by developing countries?

b. FAA Sec. 103, 103A, 104, 105, 106, 107. Is assistance being made available. (include only applicable paragraph which corresponds to source of funds used. If more than one fund source is used for project, include relevant paragraph for each fund source).

(1) (103) for agriculture, rural development or nutrition; if so, extent to which activity is specifically designed to increase productivity and income of rural poor; (103A) if for agricultural research, is full account taken of needs of small farmers;

(2) (104) for population planning under sec. 104(b) or health under sec. 104(c); if so, extent to which activity emphasizes low-cost; integrated delivery systems for health, nutrition and family planning for the poorest people, with particular attention to the needs of mothers and young children, using paramedical and auxiliary medical personnel, clinics and health posts, commercial distribution systems and other modes of community research.

(3) (105) for education, public administration, or human resources development; if so, extent to which activity strengthens nonformal education, makes formal education more relevant, especially for rural families and urban poor, or strengthens management capability of institutions enabling the poor to participate in development;

(4) (106) for technical assistance, energy, research, reconstruction, and selected development problems; if so, extent activity is:

(i) technical cooperation and development, especially with U.S. private and voluntary, or regional and international development, organizations;

(ii) to help alleviate energy problems;

(iii) research into, and evaluation of, economic development processes and techniques;

(iv) reconstruction after natural or manmade disaster;

(v) for special development problem, and to enable proper utilization of earlier U.S. infrastructure, etc., assistance;

(vi) for programs of urban development, especially small labor-intensive enterprises, marketing systems, and financial or other institutions to help urban poor participate in economic and social development.

c. (107) is appropriate effort placed on use of appropriate technology?

d. FAA Sec. 110(a). Will the recipient country provide at least 25% of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or has the latter cost-sharing requirement been waived for a "relatively least-developed" country)?

e. FAA Sec. 110(b). Will grant capital assistance be disbursed for project over more than 3 years? If so, has justification satisfactory to Congress been made, and efforts for other financing, or is the recipient country "relatively least developed"?

f. FAA Sec. 281(b). Describe extent to which program recognizes

capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental and political processes essential to self-government.

g. FAA Sec. 122(b). Does the activity give reasonable promise of contributing to the development of economic resources, or to the increase of productive capacities and self-sustaining economic growth?

2. Development Assistance Project Criteria (Loans Only)

a. FAA Sec. 122(b). Information and conclusion on capacity of the country to repay the loan, including reasonableness of repayment prospects. — Not applicable.

b. FAA Sec. 620(d). If assistance is for any productive enterprise which will compete in the U.S. with U.S. enterprise, is there an agreement by the recipient country to prevent export to the U.S. of more than 20% of the enterprise's annual production during the life of the loan?

3. Project Criteria Solely for Economic Support Fund

a. FAA Sec. 531(a). Will this assistance support and promote economic or political stability? To the extent possible, does it reflect the policy directions of section 102? — This assistance will support economic stability by assisting farmers to increase efficiency and production.

Yes.

b. FAA Sec. 533. Will assistance under this chapter be used for military, or paramilitary activities? — No.

5C(3) - STANDARD ITEM CHECKLIST

Listed below are statutory items which normally will be covered routinely in those provisions of an assistance agreement dealing with its implementation, or covered in the agreement by imposing limits on certain uses of funds.

These items are arranged under the general headings of (A) Procurement, (B) Construction, and (C) Other Restrictions.

A. Procurement

1. FAA Sec. 602. Are there arrangements to permit U.S. small business to participate equitably in the furnishing of goods and services financed?	Goods and services will be procured to the greatest extent possible through competitive procedures which will encourage participation of U.S. small businesses.
2. FAA Sec. 604(a). Will all commodity procurement financed be from the U.S. except as otherwise determined by the President or under delegation from him?	Yes.
3. FAA Sec. 604(d). If the cooperating country discriminates against U.S. marine insurance companies, will agreement require that marine insurance be placed in the U.S. on commodities financed?	Egypt does not so discriminate.
4. FAA Sec. 604(e). If offshore procurement of agricultural commodity or product is to be financed, is there provision against such procurement when the domestic price of such commodity is less than parity?	No such procurement is planned.
5. FAA Sec. 608(a). Will U.S. Government excess personal property be utilized wherever practicable in lieu of the procurement of new items?	Yes.
6. FAA Sec. 603. (a) Compliance with requirement in section 901(b) of the Merchant Marine Act of 1936, as amended, that at least 50 per centum of the gross tonnage of	Transport of goods will be in accordance with the regulation.

commodities (computed separately for dry bulk carriers, dry cargo liners, and tankers) financed shall be transported on privately owned U.S.-flag commercial vessels to the extent that such vessels are available at fair and reasonable rates.

7. FAA Sec. 621. If technical assistance is financed, will such assistance be furnished to the fullest extent practicable as goods and professional and other services from private enterprise on a contract basis? If the facilities of other Federal agencies will be utilized, are they particularly suitable, not competitive with private enterprise, and made available without undue interference with domestic programs? — Yes.

8. International Air Transport. Fair Competitive Practices Act, 1974. If air transportation of persons or property is financed on grant basis, will provision be made that U.S.-flag carriers will be utilized to the extent such service is available? — Yes.

9. FY 79 App. Act Sec. 105. Does the contract for procurement contain a provision authorizing the termination of such contract for the convenience of the United States? — It will so provide.

Construction

1. FAA Sec. 601(d). If a capital (e.g., construction) project, are engineering and professional services of U.S. firms and their affiliates to be used to the maximum extent consistent with the national interest? — Yes.

2. FAA Sec. 611(c). If contracts for construction are to be financed, will they be let on a competitive basis to maximum extent practicable? — Yes.

3. FAA Sec. 620(k). If for construction of productive enterprise, will aggregate value of assistance to be furnished by the U.S. not exceed $100 million?	Aggregate will not exceed $100 million.

C. Other Restrictions

1. FAA Sec. 122(e). If development loan, is interest rate at least 2% per annum during grace period and at least 3% per annum thereafter?	Not applicable.
2. FAA Sec. 301(d). If fund is established solely by U.S. contributions and administered by an international organization, does Comptroller General have audit rights?	Not applicable.
3. FAA Sec. 620(h). Do arrangements preclude promoting or assisting the foreign aid projects or activities of Communist-bloc countries, contrary to the best interests of the U.S.?	Yes.
4. FAA Sec. 636(i). Is financing not permitted to be used, without waiver, for purchase, long-term lease, or exchange of motor vehicle manufactured outside the U.S., or guaranty of such transaction?	Yes.
5. Will arrangements preclude use of financing:	
a. FAA Sec. 104(f). To pay for performance of abortions or to motivate or coerce persons to practice abortions, to pay for performance of involuntary sterilization, or to coerce or provide financial incentive to any person to undergo sterilization?	Yes.
b. FAA Sec. 620(g). To compensate owners for expropriated nationalized property?	Yes.

c. FAA Sec. 660. To finance police training or other law enforcement assistance, except for narcotics programs?	Yes.
d. FAA Sec. 662. For CIA activities?	Yes.
e. FY 79 App. Act Sec. 104. To pay pensions, etc., for military personnel?	Yes.
f. FY 79 App. Act Sec. 106. To pay U.N. assessments?	Yes.
g. FY 79 App. Act Sec. 107. To carry out provisions of FAA sections 209(d) and 251(h)? (Transfer of FAA funds to multilateral organizations for lending.)	Yes.
h. FY 79 App. Act Sec. 112. To finance the export of nuclear equipment, fuel, or technology or to train foreign nations in nuclear fields?	Yes.
i. FY 79 App. Act Sec. 601. To be used for publicity or propaganda purposes within U.S. not authorized by Congress?	Yes.

ANNEX III PID APPROVAL CABLE

(31)

Department of State TELEGRAM

AMEMBASSY CAIRO

UNCLASSIFIED

P 112150Z AUG 77
FM SECSTATE WASHDC
TO AMEMBASSY CAIRO PRIORITY 4282
BT
UNCLAS STATE 190463

AIDAC

E.O. 11652: N/A

TAGS:

ACTION TO TR INFO FRM
ACTION TAKEN 13784 DATE 8/16
NAN 13784 INITIALS

PRIORITY

AMERICAN EMBASSY
12 AUG 77 05 35Z
CAIRO, EGYPT

SUBJECT: AGRICULTURAL MECHANIZATION 263-6031

1. THE NE ADVISORY COMMITTEE REVIEWED AND APPROVED PID ON JULY 29. MISSION MAY PROCEED WITH DEVELOPMENT OF PP TAKING ACCOUNT OF THE FOLLOWING COMMITTEE RECOMMENDATIONS.

2. REGARDING PROPOSED SERIES OF STUDIES. COMMITTEE RECOMMENDS THESE BE CONSIDERED AS ONE MASTER FEASIBILITY CUM PROJECT DESIGN STUDY.

3. THE DRAFT SCOPES OF WORK INDICATE PRIMARILY CONCERN FOR CHANGING THE ENERGY BASE WHEREAS THE COMMITTEE BELIEVES MORE CONCERN SHOULD BE DEVOTED TO UNDERLYING OBJECTIVE OF INCREASING AND/OR MAINTAINING BOTH LAND AND LABOR PRODUCTIVITY. CONSIDERABLE ATTENTION WILL NEED TO BE PAID TO DETERMINE THE RELATIVE NEED FOR MECHANIZATION WITH RESPECT TO CARRYING OUT SPECIFIC AGRICULTURAL FUNCTIONS. BY TYPE OR CROP. (PRIMARY TILLAGE, SEED BED PREPARATION, SEEDING. WEED CONTROL. HARVESTING. CROP RESIDUE MANAGEMENT, ETC.) AND WHETHER SPECIFIC KINDS OF MECHANIZATION CAN BE DEVELOPED TO COMPREHENSIVELY SUPPLANT ANIMAL POWER.

4. THE FEASIBILITY STUDIES WILL NEED TO DEVOTE CONSIDERABLE ATTENTION TO SOCIAL COSTS AND BENEFITS AS WELL AS TO THE ECONOMIC AND TECHNICAL CHANGES GENERATED BY PROJECT RELATED TO AGRICULTURAL MECHANIZATION.

5. COMMITTEE SUGGESTS MISSION CONSIDER AS ONE POSSIBLE APPROACH TO CARRYING OUT PROPOSED FEASIBILITY STUDIES U. OF CALIFORNIA UNDER AGRICULTURAL DEVELOPMENT SYSTEMS PROJECT INTERIM CONTRACT. MISSION VIEWS ON THIS AND OTHER POSSIBLE CONTRACTORS REQUESTED.

6. BELIEVE THERE SHOULD BE JOINT AID/W MISSION REVIEW OF COMPLETED FEASIBILITY STUDY PRIOR TO PREPARATION OF PP.
CHRISTOPHER

UNCLASSIFIED
Classification

Annex IV.

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT IDENTIFICATION DOCUMENT FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE: C (A = ADD, C = CHANGE, D = DELETE)

PID

2. DOCUMENT CODE: 1

3. COUNTRY/ENTITY: Egypt

4. DOCUMENT REVISION NUMBER: 2

5. PROJECT NUMBER (7 DIGITS): 263-0031

6. BUREAU/OFFICE: A. SYMBOL: NE; B. CODE: 03

7. PROJECT TITLE (MAXIMUM 40 CHARACTERS): Agricultural Mechanization

8. PROPOSED NEXT DOCUMENT: A. 3 (2 = PRP, 3 = PP); B. DATE MM YY: 07 79

9. ESTIMATED FY OF AUTHORIZATION/OBLIGATION: a. INITIAL FY 79; b. FINAL FY 82

10. ESTIMATED COSTS ($000 OR EQUIVALENT, $1 =)

FUNDING SOURCE	BUDGET
a. AID APPROPRIATED	40,000
b. OTHER U.S. 1.	
b. OTHER U.S. 2.	
c. HOST COUNTRY	15,156
d. OTHER DONOR(S)	
TOTAL	55,156

11. PROPOSED BUDGET AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	PRIMARY TECH. CODE C. GRANT	PRIMARY TECH. CODE D. LOAN	E. FIRST FY 79 F. GRANT	E. FIRST FY 79 G. LOAN	LIFE OF PROJECT H. GRANT	LIFE OF PROJECT I. LOAN
(1) SA	140	010		7809		33000	
(2)							
(3)							
(4)							
			TOTAL				

12. SECONDARY TECHNICAL CODES (maximum six codes of three positions each): 023, 032, 044, 053, 066

13. SPECIAL CONCERNS CODES (MAXIMUM SIX CODES OF FOUR POSITIONS EACH): BF, R/AG, TECH, TNG

14. SECONDARY PURPOSE CODE: 753

15. PROJECT GOAL (MAXIMUM 240 CHARACTERS)

Increase agricultural production and farm incomes by providing farmers with adequate power to carry out needed agricultural operations in a timely, effective and economic manner.

16. PROJECT PURPOSE (MAXIMUM 480 CHARACTERS)

Build Egyptian capabilities to plan, support and carry out appropriate mechanization efforts.

17. PLANNING RESOURCE REQUIREMENTS (staff/funds)

NA

18. ORIGINATING OFFICE CLEARANCE

Signature

Title

Date Signed MM DD YY

19. DATE DOCUMENT RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION MM DD YY

ANNEX V

Draft Project Description for Grant Agreement

Over a six-year period this Project will support Egyptian efforts to implement selected mechanization activities and to create a sound planning, implementation and support base for future mechanization programs. The strategy is to increase the effectiveness of current programs that merit support, and to develop capabilities required for the design and pursuit of alternative mechanization options without committing Egypt (ARE) at this point to a particular mechanization path.

Tactics are to relieve constraints to the more productive conduct of certain on-going mechanization activities where Egyptian Government interest and returns are high, to finance experimentation with certain types of mechanized activities that currently seem appropriate and to assist in the development of elements that are currently missing but needed and wanted by the ARE for the planning and support of future activities. The substantive measure of successful project achievement will be well-formulated and effectively-implemented farm equipment projects, programs and support services contributing to increasing production and farmers' incomes.

The Project will be carried out through an Agricultural Mechanization Group, to be established in the Ministry of Agriculture, reporting to the Undersecretary for Engineering Affairs and Agricultural Mechanization. The Group will consist of Co-Directors, units for Planning and Evaluation and Training Support and four program divisions: 1) Soil Improvement; 2) Machinery Management Extension; 3) Service-Center Development; and 4) Research and Development.

Planned outputs and the general assistance strategy for each project component are as follows:

1. Planning and Evaluation

To remedy a lack of needed systematic planning and evaluation in the mechanization area a mechanization planning and evaluation unit will be established in the Ministry of Agriculture. This unit will improve the short- and long-term analysis and planning underlying policy and program decisions in the mechanization area, collect, analyze and transmit information useful to senior-level decision-makers and provide meaningful evaluations of mechanization programs and projects in both implementation and effect terms. The project will establish the unit including, an information gathering and dissemination system and will conduct necessary baseline and other surveys and other data collection activities required for evaluation. This will involve staff

training, development of effective operating procedures and on-the-job assistance by three U.S.-funded contract personnel.

2. Soil Improvement

Under the Project a new division in the Executive Authority for Land Improvement Projects will be established to provide subsoiling, drainage and land leveling services in the governorates of Assiut, Fayoum, Giza, Minia and Beni Suef. Necessary equipment and personnel to carry out subsoiling operations in Middle Egypt on approximately 216,000 feddans and to perform land leveling on approximately 12,000 feddans will be provided. In both activities close collaboration with the Machinery Management Extension Group will be maintained to improve water-lifting and water utilization along with soil improvement and to lengthen the time period that yield increases are maintained from soil improvement activities. In addition, particularly for land leveling, a major emphasis will be on encouraging the private sector to assume this responsibility. It is hoped that land leveling and, to a lesser extent, subsoiling will be established as private sector activities by the Project's end. The U.S. will fund the majority of the equipment and a two-person technical assistance team while the ARE will provide land, facilities, personnel and operating budget.

3. Machinery Service

To provide necessary equipment repair services, a network of 20 area service-centers or small shop complexes located throughout Egypt and 50 or more satellite centers will be established by strengthening existing private shops, or, where necessary, establishing new ones. A credit fund will be created to assist in these activities and financial planning assistance will be provided to workshop operators. In addition a program to put currently inoperable tractors, including those owned by cooperatives, back into operation will be planned and implemented. Training of local mechanics and short courses in workshop operations will be important components of this project element. To carry out these activities a small working team will be established composed of Egyptian and two American contract personnel. The ARE will also provide spare parts inventories and operating capital for the sub-activity while the credit fund will be established with U.S.-provided resources.

4. Research and Development Center

To coordinate and conduct research on technical, economic and social aspects of mechanization, the Project will fund the establishment of a Farm Mechanization Research and Development Center and capitalize a fund to be used in

making research grants to other Egyptian institutions, such as universities and manufacturers. The Center will be located near Alexandria, on the site of the ARE tractor-testing facility, and will conduct some research but will act primarily as a funding and coordinating body. Through these inputs, a focal point for farm equipment research and a source of information for continuing changes in and evaluation of farm equipment use in Egypt will be created. Capabilities in planning and conducting research and in developing appropriate equipment will be strengthened. The ultimate result will be more rational and realistic planning of future farm mechanization programs based on equipment suited to Egyptian conditions. The ARE will provide the necessary facilities, personnel and operating funds for the Center while the U.S. will equip the Center, capitalize a research fund, provide funds for the importation of items to be tested and finance two contract technical assistance staff.

5. Machinery Management Extension

Through the Project, it is proposed that a meaningful farm machinery extension program be established in the Ministry of Agriculture. Emphasis will be on tillage and seedbed preparation, farm operation, maintenance and repair of equipment, water-lifting machinery and implement selection, assistance to small manufacturers, and cost and return evaluation. Particularly close coordination will be maintained with the soil improvement and service-center activities. In addition the program will introduce modest numbers of selected new equipment items that appear to offer substantial returns in production and benefit/cost terms. Threshers, disc harrows and row planters are a few of these items. The introduction of water-lifting equipment will be facilitated by technical assistance aimed at developing techniques for user group establishment and by a credit fund established in the Agricultural Bank specifically for water-lifting equipment. Technical assistance in the areas of agricultural engineering, farm management, extension, and small equipment manufacture will be provided. Finally, training programs for extension staff, farmer owners and operators of equipment, service-center staff and small manufacturers will be developed. Through these activities Ministry capabilities in several areas will be expanded, on-farm equipment use will be improved and additions to the pool of trained manpower will be made, supporting the overall goal of increases in the production and productivity of individual farmers.

8

6. Training

Under this Project a training support group will be established to plan both in-country and external training in mechanization. In-country training programs will be conducted for mechanization and extension staff, mechanics, tractor drivers, service personnel, farm equipment manufacturers and shop operators. Approximately 1200 courses will be conducted. Technical assistance personnel may also supply additional training support. Out-of-country training will be provided on a long-term academic basis and on a short-term observation or short course basis in areas related to agricultural mechanization. Approximately 100 individuals will benefit from the overseas training--25 academic and 75 short-term. All overseas, and a portion of the in-country training will be funded by AID. The training support group and necessary operating budget will be provided by the ARE.

DETAILED PROJECT COMPONENT DESCRIPTION[1/]

PLANNING AND EVALUATION

I. Introduction

At present planning and evaluation activities in the agricultural mechanization area are limited. Most GOE planning efforts are ad hoc, specific to particular projects or programs and short-term in scope. Longer term planning is primarily related to developing budget requirements and generally based on equipment needs to cover a particular land area in the target period. Little attention to coordinated planning of equipment provision, service requirements and economic costs and benefits is evident.

Many of the shortcomings relate to a lack of information. There is no staff unit that specializes in gathering, analyzing and transmitting data for program planning and evaluation. Research data are very limited, hard to identify, and often out of date. There are few analyses of the probable effect of proposed activities. Evaluations tend to be in terms of physical provision of equipment or area covered rather than results achieved. Thus the data are useful for physical planning but provide little guidance for policy decisions or in determining the effectiveness of the program. What information there is flows largely through informal and unstructured channels in an irregular manner. The total effect is that senior MOA staff must rely on judgement based on fragmentary information to make decisions and plan for the future.

In spite of the handicaps, senior mechanization leadership has done a commendable job of guiding the program. But the program is becoming ever more complex and without some system of generating needed information and analyses and transmitting the information, effective program management, and sound senior-level decision-making can hardly be expected.

II. The Proposed Activity

It is proposed that a Planning and Evaluation Unit be established as part of the Mechanization Group for this project. The Contract Team Leader will head a three-person technical assistance team and in addition have three specific responsibilities: 1) act as project co-director; 2) advise the Undersecretary for Engineering Affairs on mechanization and mechanization policy matters and 3) establish an effective management information system. In these efforts s/he will need to rely heavily on and work through other members of the Planning and Evaluation Unit and the Program Divisions of the Project. Effective links with university personnel and other Egyptian personnel will also need to be established.

1/ While not discrete component, Training is discussed separately rather than in each section.

An evaluation officer will work with Egyptian counterparts in collecting necessary baseline data for project activities and mechanization efforts in general. Under the overall guidance of the project director, a system for collecting information necessary to monitor project activities and effects will be developed. Hopefully, a permanent, comprehensive system for collecting relevant information on a time series basis will be established. Economic and social analyses of the effects of mechanization activities will be performed utilizing information collected. These analyses will form the basis for the preparation of policy and planning materials.

A financial and planning section assisted by the third team member will provide assistance and guidance in developing and monitoring project implementation plans, develop procedures for those project elements involving credit provision, and supply necessary financial analyses for project and program planning activities. Initially emphasis will be on developing overall plans and credit procedures with growing attention paid to financial analysis as procedures are implemented and routinized.

The Planning and Evaluation Unit will also handle the Feasibility Study of Small Scale Manufacturing described below.

LOCAL MANUFACTURING FEASIBILITY STUDY

1. Introduction

All types of commonly-used farm implements such as chisel plows and trailers are made domestically, mainly by small shops producing a few units a year. Some larger plants are now manufacturing more modern farm equipment such as irrigation water pumps, a limited number of small diesel engines and a few test models of the IRRI-type thresher-winnower, but most motorized equipment must be imported.

Commonly-used farm implements are generally made to order. Plants typically are little more than bigger workshops; few have any modern equipment. Even the government-owned Behera Company--the largest and best equipped plant--uses an overhead belt-pulley system for powering individual machines and has no production line in the modern sense.

Egypt appears to have little tradition of manufacturers anticipating demand by building a stock of implements for later sale. Nor do manufacturers engage in aggressive market development. Lacking market information, capital, and experience in building a market, individual plants allow the flow of cash-in-hand customers to dictate production. This inevitably delays delivery to the farmers.

The full benefits of mechanized operations can only be obtained by introducing new types of equipment in volume to Egyptian agriculture. While imports are a possible source, this is not an optimal long-range strategy given established Egyptian technical capacity. A more reasonable strategy is to build local manufacturing capacity while re-directing manufacturer and dealer attitudes toward stock-building and market development.

There remain significant uncertainities regarding existing manufacturing capacities and the probable demand for various implements. Assessment is complicated by the broad dispersion of production throughout Egypt. Furthermore, demand for farm implements is a function of overall mechanization efforts and the pace of mechanization, both unknown to some degree.

2. The Proposed Activity

The ERA 2000 Study Team recommended 1) a comprehensive feasibility study on local manufacture of farm implements and 2) modernization of plant capacity to meet domestic requirements for new types of farm equipment, with the emphasis on selecting firms with a commitment to aggressive development of markets, technologies and production.

The Mission has concluded that the proposal to include funding for plant modernization as part of this project seems premature despite the clear long-term need. The study team report does not provide sufficient information on the manufacturing sector on which to base a decision. A great deal of uncertainty remains as to actual capacities and financial needs for modernization. The Project will, therefore, include a study to answer these questions and determine plans and needed financial inputs. Funds for actual plant modernization will not be included in this Project. Some technical assistance to existing firms in the manufacture of farm equipment will be provided under the machinery management component of the project.

The feasibility study will be carried out by a 4-person team over a period of 6 months. The team should provide expertise in economics, demonstration and organization, plant layout/engineering and financial management.

The study will cover the economics of local manufacture, the organization of the industry (particularly the question of private vs. public ownership and concentration vs. dispersion), needs for and source of technical assistance and financial requirements. A detailed scope of work will be developed for the study, to begin in 1981, by the technical assistance team members. Study recommendations for financial and other support to local manufacturing will be considered for funding under a follow-on project or other funding activity and are not included in this Project. The estimated cost of the study is $ 400,000.

MACHINERY SERVICE

I. Introduction

In general, the lack of local repair facilities and spare parts severely reduces the effectiveness of Egypt's current equipment stock. The machinery survey carried out for this Project indicated that 7 percent of all farm tractors were inoperable. In addition, while systematic data are not available on "temporary" down time, farmer reports of 3 - 6 month waits for service are not uncommon. The tractor hours lost each year due to temporary down time or because machines have gone completely out of service represent a significant loss to the economy - reduced crop production due to late planting, lower yeilds due to poor tillage, etc.--and also reduced competition in the custom market, leading to reduced service for small farmers.

With respect to other farm machinery, the repair/spare parts situation is not nearly so critical as it is for tractors. Except for a comparatively few diesel and electric powered pumpsets and some sprayers and threshers, tractors are the only motorized machines currently on Egyptian farms. Sakias, plows, sprayers, and even the water pumps, which use imported engines, are fairly simple in construction and locally manufactured. Additionally, farmers and local repairmen know how to repair these implements themselves; village blacksmiths can make parts or even entire pieces of equipment. Complete replacement of these types of farm machinery should they become totally inoperable, is a relatively small investment.

That service facilities currently fill the self-evident need for service so inadequately is attributable in no small part to lack of initiative on the part of large machinery dealers, many of which are government-owned. Even NASCO, the largest supplier, does not have an effective dealership system in place. Most tractor dealers have only one or two workshops located in the larger cities capable of performing major overhauls. Branches may exist in other cities with more limited capacity but local, self-taught mechanics operating with a minimum of facilities and equipment and limited access to spare parts are the primary sour sources of repair services.

Discouraging as the repair/parts picture is today, there are some bright spots. Plans have been developed in several quarters for coping with the problem, and some remedial action has been started. Thus, the climate is favorable for directed action to bring component repair facilities and an assured supply of spare parts within convenient reach of all farm machinery owners. These plans, though largely paper at present, provide a valuable Egyptian input into the design of a remedial strategy.

Bringing repair, maintenance and dealer services much closer to local communities than they are today is a central focus of

Egyptian planning and action. In this area, the MOA plan, still in the incubation stage, visualizes a network of privately owned and operated service-dealer facilities with Ministry monitoring to assure that farmers get dependable service and can find spare parts when they need them. As a stop-gap, the Ministry also pools procurement of major spare part items on behalf of the cooperatives, private dealers and the two quasi-private corporations that are extensively engaged in the farm machinery business. NASCO has for some time operated a system of small mobile teams to work with their own dealers in providing after-sales service during the tractor warranty period. They also maintain a stock of spare parts for the types of tractors they assemble. These are available through dealers to purchasers of NASCO tractors. Massey-Ferguson has tried the mobile van repair service approach on a limited scale and has evolved a plan much like the Ministry's for area dealer-service centers.

Although differing in detail, all the plans and trial approaches encountered shared two basic objectives: (1) to make competent repair and maintenance services easily accessible to equipment owners and (2) to provide for private ownership and operation of repair facilities. The latter is established government policy in keeping with the Open Door Policy. It also reflects the conviction of MOA leadership that only through private initiative will Egypt develop an efficient network of farm machinery repair and maintenance facilities.

II. The Proposed Activity

Given the preceding considerations, a three part AID-assistance strategy has been developed to support MOA and private sector plans and activities.

A. An Incentive Loan Fund

A loan fund will be established by AID to provide loans to qualified private operators for the development of capability to service farm machinery promptly and reliably and to supply spare parts as needed to customers and small repair shops. Funds will also be made available to these small local shops. It is estimated that up to $ 150,000 will be required per area service-center or service-center complex and up to $ 30,000 per local repair shop. Funds will be used to construct or upgrade facilities, purchase necessary tools and equipment, and to finance a spare parts inventory. While many items will be purchased off-the-shelf, some larger purchases will be non-U.S. source/origin and will require a waiver. See Annex VIII. Applicant eligibility for a loan will depend on annumber of specified criteria including an ability to make a 10 percent contribution in cash or assets. Loans will be relatively long-term (10 - 15 years) and bear commercial interest rates. Precise loan terms, conditions and qualifying criteria will be developed by the technical assistance personnel in

collaboration with Ministry of Agriculture and Administering Agent Officials. The fund will be administered by a local banking institution. Discussions are underway with Bank Misr, but a final decision will not be made until after the arrival of the TA team and the development of a detailed implementation plan, to be approved by AID.

The local target is to establish 20 area centers or workshop complexes and 50 - 70 centers under the Project, thus the proposed input to the loan fund is $ 5,000,000. However, since the establishment of the centers depends on willingness and interest of existing or prospective workshop operators to become involved, it is not possible to determine the precise rate at which funds will be expended. Therefore, funds will be provided in three tranches, with release of the latter two conditional on use of the first tranche. The initial release would be $ 1,500,000 followed by a replenishment of $ 1,500,000 when approved loans totaled $ 1,200,000. The final replenishment of $ 2,000,000 will occur when loans made total $ 2,500,000. If this total is not reached until late in the Project, the final tranches will be reduced to the amount needed to cover further loans expected before Project completion.

B. Technical Assistance

A two-person technical assistance input is proposed to assist in developing a program for putting inoperable tractors back in operation, in developing service-centers, in establishing performance standards for service-centers and in developing MOA capability to carry out a monitoring/counselling program. One technical assistance advisor will be provided for three years to plan and implement a program to rehabilitate tractors. Emphasis will be on the use of private sector facilities with a particular focus on assisting cooperatives in developing viable programs of repair and maintenance using these facilities. This technician will also assist the Agricultural Engineering Division of the MOA's Undersecretariat for Engineering Affairs in developing standards and performance monitoring criteria for repair facilities. The second advisor will be available over a four-year period to focus on the establishment of area and local repair centers. S/He will work with MOA staff and other team members to identify appropriate locations and individuals. In addition, the advisor would be expected to provide in-shop assistance for workshop operators and assistance in arranging and organizing in-country training programs.

This component of the Project is well suited to separate implementation by a U.S. firm experienced in developing and

operating service centers. Major farm equipment manufacturers may be a suitable source of necessary expertise although organizations operating a chain of workshops may also be appropriate. A subcontract for this activity will be allowed in the RFP.

The above TA will be supplemented by a planning/financial specialist provided under the Planning and Evaluation project component who will assist in setting up the incentive loan fund as well as in developing procedures for machinery introduction on credit.

FARM EQUIPMENT

RESEARCH and DEVELOPMENT CENTER

I. Introduction

Little systematic attention has been given in Egypt by either government or universities to the myriad of concerns and considerations involved in agricultural mechanization. The benefits and costs of mechanizing certain practices or employing additional equipment have not been systematically collected and analyzed. Efforts to develop new types of farm equipment or to modify prototype imports to meet Egyptian farm conditions have been limited and primarily the effort of individual researchers operating without the financial resources necessary to see projects through to final production.

The primary barriers to more productive research and development activities are lack of funds and lack of a systematic focus on practical problems. Modest financial resources, judiciously applied, coupled with technical assistance in shaping research and development programs can greatly increase the volume, quality and relevance of research output from the large number of qualified personnel already working in the area.

II. The Proposed Activity

A three-part program is proposed to mobilize Egypt's research and development capacity in support of overall agricultural production and farm income objectives through research on agricultural mechanization.

--Establishing a Farm Mechanization Research and Development Center on the site of the Tractor Testing Station at Alexandria with broad responsibilities for stimulating and coordinating applied farm mechanization research and machinery development throughout Egypt.

--Establishing an Applied Research Fund to encourage and assist problem-oriented research by Egyptian scholars and institutions on important farm mechanization questions, including social and economic as well as engineering aspects.

--Initiating a modest Egyptian-American collaborative research exchange arrangement to give impetus to applied research on Egyptian farm mechanization in both countries.

A. The Research and Development Center

The Research and Development Center will be situated in the present facilities of the Tractor Testing Station at Alexandria, adjacent to Alexandria University and near the Behera Company, which should facilitate cooperative undertakings. The total area is adequate but upgrading will be required to make the facility operational. AID will fund necessary shop and research equipment.

The Center will identify research priorities and carry out field and laboratory investigations to develop new machines, tillage practices, crop processing and storage facilities, etc. Both in-house development of new prototypes and modification of promising imported prototypes will be conducted. Economic and socio-cultural factors will be central considerations in the design and testing program.

The Center will also perform the usual services of a machinery testing station, arrange with equipment manufacturers for production and market development for proven new prototype machines, administer the Applied Research Fund described below, coordinate the Egyptian part of the Egyptian-American graduate research program and disseminate research results through publication and training sessions for extension workers.

Proposed staffing, and staff-member disciplines, are as follows:

	Director (Agricultural Engineering)
	Assistant Director (Social Sciences)
	Fund Administrator
3	Senior Engineers-
	Tillage, Irrigation and Drainage and Harvesting
	Agricultural Economist
	Rural Sociologist/Anthropologist
5	Assistant Engineers
	Instrument Technician
4	Shop Mechanics
	Shop Custodian
	Training Specialist
2	Publications Specialists
12	Support Staff

Two members of the overall Technical Assistance Advisory Group will be assigned fulltime to the Center for a total of 9 work-years. The first will advise the Director on overall research administration with particular emphasis on developing an outreach program and the second will serve as machinery development advisor to support the Center's in-house and outside research activities.1/

B. The Applied Research Fund

Egyptian capacity in problem-oriented research will be mobilized by grants supporting well-designed applied research proposals in predetermined areas. Targeting the Fund to selected subjects will focus research attention on high-priority areas. Priorities may change as mechanization progresses. Some currently identified priority areas are: fertilizer and tillage interactions, relationship between power/labor availability, cropping intensity and farm size, economies of land leveling, effects of draft work on milk and meat production, economics of mechanization by size and type of farm, impact of mechanization on hired worker incomes, and factors affecting tractor use including availability of repair services.

An AID grant of $ 1 million will initially finance the Fund. Drawings upon the Fund should become substantial by the second year of operation. The AID grant will be largely committed by the end of the fourth year. As the value of focused research is demonstrated the GOE is expected to make increasing contributions to the Fund to at least maintain the level of activity generated by the grant. An additional means of supporting the Research Fund to be considered is the channeling of interest on and repayments of loans made for Machinery Introduction into the Fund.

Primary responsibility for administering the Fund and hence for guiding mechanization research will rest with the Fund Administrator, reporting to the Director of the Center. S/He will be assisted in defining mechanization research priorities and evaluating individual proposals by a five-person committee appointed by the project director from the academic community, farm machinery manufacturers, specialists in the social sciences and agricultural engineering, and spokesmen for farm workers and urban consumers. Specific areas to be supported will be identified annually and publicized a year in advance of funding and will include both technical and social science topics.

1/ The functional responsibilities and qualifications required for these respective advisors are covered in the Position Description Annex of this report.

Proposals will be considered from individual researchers and institutions alike, including manufacturers and government. Center staff will counsel prospective researchers in developing their research designs. In the initial stages the counseling load will be quite heavy to produce quality research.

The individual initiative of researchers seeking grants will maintain an adequate flow of acceptable research proposals. When an important area is not covered, however, the Director may solicit proposals from well-qualified sources. This technique will be used only as a last resort to control the potential for real or imagined abuse.

Research proposals requiring more than three years normally would not be considered in order to focus Fund-financed research on pressing practical problems. All Fund-supported projects will be fully funded from the outset on a "reservation" basis with an agreed-upon schedule of payments to recipients.

C. Egyptian-American Collaborative Research

A modest collaborative research activity will be conducted to give impetus to applied farm mechanization research in both Egypt and the United States. This will build a base in both countries to further mechanization's production-increasing potential. Approximately 15 Egyptian graduate students will receive research training in the United States and their professors will participate in greater professional exchanges with their American colleagues.

Participants in this program will be selected by the Center Director. Institutions applying will identify an agricultural engineering or social science faculty member, and one or two graduate students from Egypt and a faculty member and one graduate student from the U.S. Proposals may be extended for one year with the concurrence of the Center Director. U.S. graduate students will spend up to nine months in Egypt for M.S. research and a minimum of twelve months for Doctoral dissertation research. The Table below shows the expected schedule. In the fourth year, one proposal for a two-year, flexible-format research program will be funded.

Schedule for Collaboration Research

Year	New Proposals	Proposals in Progress	Egyptian Faculty	Egyptian Students	U.S. Faculty	U.S. Students
1	2	0	2	4	2	2
2	2	2	4	8	4	4
3	2	2	4	8	4	4
4	1	2	3	6	3	3
5	0	1	2	4	1	1

Full AID funding is proposed for the five-year program to cover the following costs:

a) Local research project operating costs
b) Equipment items required and not available from Research and Development Center
c) Travel, living costs, and research assistant stipends of U.S. and Egyptian graduate students
d) Travel expenses of Egyptian and U.S. faculty

U.S. faculty members will be expected to make two trips to Egypt per year for a total of one month in Egypt. Egyptian faculty will supervise all graduate student activity in Egypt and will make one trip to the U.S. per year to confer on research plans and to serve on the U.S. student's thesis examination committee.

D. Research Priorities

Research undertaken will fall into two categories: that designed to develop and test a specific type of equipment and that designed to answer basic questions about the impact of mechanization. Research of both types will address 6 sets of concerns, as they apply to specific items or to mechanization in general: a) social and financial costs and benefits, b) impact on the labor market, c) effect on the human and physical environment, d) impact on the society, including equity and the role of women, e) degree to which government policies are appropriate and f) the effectiveness of current programs.

While the specific topics addressed will depend on researcher interest and priorities will change over time, the following are recommended by the Study Team as priorities:

1. Interaction of fertilizer or tillage practices on yield.
2. Relation of power and labor ability to cropping intensity on farms over 10 feddans.
3. Economics of land leveling under varying conditions.
4. Alternative means of increasing forage production, including mechanization of berseem harvest.
5. Effects of draft work on animal production and feasibility of raising production by mechanization.
6. Economics of machinery management on New Lands State Farms.
7. Availability and quality of machinery repair in rural areas.
8. Factors affecting availability of tractors and annual usage.
9. Economics of mechanization by sizes& type of farm.
10. Impact of migration on farm production.
11. Impact of mechanization on hired workers' incomes.

MACHINERY MANAGEMENT EXTENSION

I. Introduction

The extension organization recently established a special section for Mechanization and Foreign Projects, the first substantial effort in the area of mechanization. The current staff of 8 engineers in Cairo and 6 in the field is involved in limited activities to date, revolving around the provision of small equipment to Agricultural Councils and support of the World Bank project.

This program suffers from the general problems of extension--unfilled positions; inadequate professional development, particularly for the recently-added village-level officers; poor transportation; a lack of solutions to current farmer problems and an inadequate budget--and is still too limited in scope to supply the unbiased information necessary for optimal machinery use.

The feasibility team estimated that the effective output of tractors and related equipment now on Egyptian farms could be increased 17.5 percent by efficient machinery management. This could be accomplished by replacing tractor power with smaller machines for threshing and water-lifting, where only a small percentage of tractor power is employed. This would free tractors for more timely plowing and seedbed preparation, additional equipment would improve weeding of row crops, now often inadequate due to a lack of labor. A related problem is the lack of maintenance, particularly for co-op tractors, which are used less than half as many hours as privately owned ones.

The Egyptian farmer is not in a position to deal with these problems and opportunities himself. Some facilities, such as those for repair and spare parts, depend on private entrepreneurs and/or government. An economical alternative to the tractor-powered drum thresher is not widely available. Motorized water-lifting equipment is available and highly economical but requires organization of larger irrigation units or a custom market. No companies have the capacity to manufacture in volume the new equipment needed to free tractors for more productive field work.

At present, only a limited range of agricultural operations are mechanized. For mechanization to contribute toward increasing agricultural productivity, improved technology must be progressively applied to additional operations. Certain types of new equipment appear particularly promising, but Egyptian farmers are unfamiliar with them and local manufacturers will not produce them until the market is demonstrated.

The Ministry of Agriculture has supported machinery introduction in the past on a sporadic basis. New and innovative pieces of equipment have been procured for specific projects. However, there has been virtually no effort to provide widespread demonstrations of selected new items. Demand generated by government-sponsored demonstrations has not stimulated local manufacture.

Despite efforts underway, new types of machines cannot be expected from local sources for several years without additional stimulus. In the interim, a program of machinery introductions focused on those aspects of crop production that would be most benefited by more modern equipment is needed to increase farm production and familiarize farmers with the advantage of such equipment.

One area where increased use of mechanized equipment is particularly promising is that of water-lifting. Some 400,000 sakias, the Egyptian water wheels, are currently used to lift water from canals to surrounding fields. A large but unestimated number of man-powered tambours are also used. An estimated 70% of all farms are irrigated by sakias and tambours. In total, sakias use about 80 percent of all draft animals, mostly utilizing female cows and buffaloes for the work, some two-thirds of which comes during the heaviest lactation period and seriously reduces milk production. Extensive use for draft work also lengthens calving intervals, and reduces the calf crop.

Detailed analysis of the costs of lifting water by various means show that mechanizing water lifting can cut irrigation costs in half where the area served is large enough to use a pumpset efficiently. However, the changeover from sakias to motor-driven water-lifting equipment is proceeding slowly. The reason for this appears to lie in a combination of lack of credit for small farmers and others, traditions, poor farmer understanding of comparative costs, and organization difficulties in developing a custom network or an irrigation area big enough to utilize motor-driven units efficiently.

II. The Proposed Activity

A. Overall Program

As an interim means of meeting the need to improve machinery management and introduce new equipment, the technical assistance team will work with the Extension Service and the Agricultural Bank to increase farmer understanding of and access to mechanical equipment.

The Machinery Management Extension Unit of the Agricultural Mechanization Group will:

1. Work with the Extension Service to establish effective support for farmers, cooperatives and private custom operators.
2. Conduct an agricultural implement introduction program.
3. Develop an advisory program for small local manufacturers of agricultural implements.

Primary audiences for the program will be: farmer-owners of machinery; farmer-users of custom services; private custom operators; and the 4000 co-ops that are major owners and operators of custom equipment, including small items such as sprayers as well as tractors.

At the outset, the unit will develop comprehensive plans, taking into account farmers needs and preferences. Priorities may change with experience, but areas that currently appear to warrant attention include:

1. Tillage and seedbed preparation: Promote better seedbed preparation techniques, which have the potential to improve yields of some crops 10 - 25 percent and reduce production costs. Demonstrations on the 10 feddan demonstration farms newly established by the Extension Service could be an important segment of this program.

2. Cost and return evaluation: Information on net returns on which to base the adoption of new equipment is not available to farmers. A program of group meetings and individual consultation on farm record keeping, evaluating custom-service charges and individual ownership, cost and returns of group ownership of field machines or irrigation pumps, etc., will help ensure that growth of agricultural mechanization is on a sound financial basis.

3. Operation, maintenance and repair of equipment: Tractor owners, drivers, cooperative managers, and others need a source of information on use and care of their tractors and other implements. Machinery operation and daily care workshops conducted in the villages would be components of this program.

4. Machinery and implement selection: The proposed Research and Development Center will generate information on both tractors and implements. A program will be developed jointly by Extension and the research stations to encourage dissemination of this information. Extension-sponsored demonstrations will introduce new implements to farmers and provide unbiased information on machine specifications and optimum size.

5. Assistance to small manufacturers: In addition to the farm-based activities, this component will also extend technical assistance to small manufacturers of farm equipment.

Five long-term advisors will be provided, as follows:

a. Agricultural engineer; concentrating on field machinery - 4 years.
b. Water-lifting specialist: concentrating on methods of organizing small farmers to use mechanical water-lifting equipment - 3 years.
c. Farm management specialist: combining expertise in farm cost-and-returns analysis and credit - 4 years.
d. Extension specialist: to bring machinery management information effectively to farmers and others concerned - 5 years.
e. Small manufacturing specialist: with expertise in farm machinery manufacture and management of small enterprises - 3 years.

B. Machinery Introduction:

In addition to water pumps, discussed below, four types of equipment have been identified as offering particularly promising opportunities in cost and benefit terms. These are: (a) a tractor-mounted disc and spike-tooth harrow combination to improve the quality of seedbed preparation and reduce tractor time requirements (b) tractor-mounted row planters to provide better seed placement and germination and to facilitate cultivation of row crops; (c) self-propelled mower binder to permit more timely harvest of small grains and earlier planting of following crops, and (d) thresher-winnowers to reduce grain losses and help relieve the peak-season power and labor constraints on other cropping operations. The project will provide the items shown on following page to introduce farmers to this equipment.

Procurement of the high capacity thresher-winnower will be delayed for three years to allow farmers to become familiar with this type of equipment via the locally-produced IRRI-type machine which involves a substantially smaller initial investment and requires fewer customers for an operator to break even. Only if the IRRI-type thresher-winnower is accepted will the high capacity thresher-winnowers be introduced. Although the disc/spike-tooth harrow complex involves two separate implements, they should be introduced as a combination unit to gain the full benefits of improved seedbeds and time savings.

Units	Type	Cost per Unit	Estimated Total Cost	Proposed Financing AID	GOE
500	Disc/spike-tooth harrow combination	$ 750	$ 375,000	$ 375,000	
100	High capacity thresher-winnowers	6,500	650,000	650,000	
100	Mower-binders	3,300	330,000	1/	$330,000
200	IRRI-type thresher-winnowers	2,500	500,000	500,000	2/
100	Tractor-mounted row-crop planters	3,300	330,000	330,000	
	Total		$ 2,185,000	$1,855,000	$330,000

This initial introduction of farm machinery represents only the beginning of a sustained machinery introduction program. The porgram will be continued by the proposed Research and Development Center in cooperation with the Extension Service. Prototypes of promising types of equipment will be imported for field testing and adaptation and others will be developed by the Center itself. Whether based on imports or the Center's activities, all new equipment "released" by the Center will require an effective introduction effort. This component will develop a workable approach to meet this need.

The following Table summarizes the benefits expected per feddan from the indicated machinery items.

1/ The preferred model is manufactured only in Italy. MOA imported 50 of these machines in 1978 for field testing on state farms. The project will import the indicated number utilizing MOA funds.

2/ A model of this thresher adapted to Egyptian conditions was produced in limited numbers during 1977-78 for field testing using imported Deutz, Hartz, or Indian 10 hp engines. A waiver to allow AID financing will be requested (see Annex VIII). Some cooperative efforts with the Catholic Relief Services in thresher placement will be supported from these funds.

Operation	Benefits of Mechanical Equipment Over traditional Methods	
	Cost saving	Yield Increases
Seedbed Preparation	L.E. 2.9 per feddan	15%
Mower-Binder	L.E. 2.7 per feddan	8%
Thresher-winnower (IRRI type)	L.E. 1 - 1.2 per feddan	7%
Thresher-winnower (High Capacity)	L.E. 3.1 - 4.6 per feddan	7%
Planters	L.E. 1 - 2.2 per feddan	10%

Obviously, strategic placement of the demonstration units is crucial to maximizing this impact upon potential users. It is necessary that a sufficient number of the respective introductory items be put in use to gain the intended demonstration effect. Choice of initial clients and geographic areas will be an important element of implementation.

On the surface, state farms and/or cooperatives may appear ideal channels for this program, avoiding many of the financing and persuasion difficulties inevitable in introducing new machines via private operators. The size and isolated locations of state farms would not establish a particular piece of equipment's performance on small farms. Equally important, state farms do not function as custom operators and their record of machinery management is not such as to inspire confidence.

These same objections can be applied to cooperatives, notwithstanding their notable contribution to establishing custom tractor services in Egypt. Now that private custom operations have become established, it would be a step backward from the free enterprise spirit of the Open Door policy to return to the use of Co-ops as instruments of intervention.

The strategy, therfore, will be to place the introduced machines in the hands of private custom operators. Because initial buyers will face higher than usual risks of customer acceptance as well as the costs of demonstrating the innovation to develop a profitable market, a risk- and cost-sharing arrangement will be worked out for each type of machine and set of circumstances (geographic locations, crop price, etc.).

While specific details remain to be finalized and the Project will experiment with several approaches, the current plans are to provide the machines on credit to custom operators with a minimal downpayment. Repayments will be geared to demand for services and income generated and the operator will have the option of returning the machine. All repayments will flow into the Research and Development Center account as described above. Criteria for selection of recipients will be established by project staff.

Making machines available through introductory imports or local manufacture and deciding where and how their use can be demonstrated most advantageously cannot be effective without an aggressive extension effort at the village level. The corps of village-level extension workers established in 1976 will be responsible for this activity with the assistance of the technical assistance team. The Agricultural Extension Department has agreed to make machinery introduction a high priority item in its program agenda. Extension personnel directly involved in this activity will receive needed short course training in extension demonstration techniques with particular reference to the new types of farm equipment being introduced. Since training is normally a part of any extension program, it does not place additional requirements of the extension organization.

C. Water-Lifting

Improved water-lifting equipment is judged to be so critical to rationalizing farm operations that this component has been set up separately. Additionally, the fairly widespread use of pumps creates a somewhat different set of problems from introduction of a wholly new piece of equipment. A two part strategy is proposed to help Egypt overcome the financial, informational and organizational problems currently constraining the broader use of better water-lifting methods by providing: (a) financing to enable farmers to purchase water-lifting equipment; and (b) technical assistance to help new custom operators become established and to assist farmers to organize efficient-size user groups for joint ownership.

1. Loan Fund

Existing loan funds do not provide sufficient credit for pumpsets or motorization of sakias. Loan terms and conditions militate against small farmer access to available funds. To remedy this situation, a special "improved water-lifting loan fund" is proposed, to be capitalized in the amount of $ 2,000,000. The fund would be available to groups of 5 or more farmers each owning less than 5 feddans and to landless laborers who had expressions from farmers indicating a willingness to rent water-lifting services. The funds would be loaned

for 5 - 7 years, cover up to 100 percent of the cost of small pumpsets or motors for sakias. Loan funds would be administered by the Agricultural Credit Bank and normal bank interest rates would be charged. The funds and repayments would be segregated for 10 years, as a revolving fund to finance water-lifting activities.

2. Technical Assistance

One American technician will be provided for three years (one of 5 long-term advisors previously mentioned). His/Her main function will be to: (1) organize efforts to inform farmers of the advantages of collective action to replace sakias with motor-driven units serving economic-sized areas; (2) assist farmer groups to organize water-user associations and groups or individual custom operators to obtain loans, if needed, from the Water-Lifting Loan Fund; and (3) train local-level extension personnel to work effectively with farmer groups and others to carry out these objectives. A substantial start must be made on the training objective before any significant progress could be made on the information/organization front since a small, Cairo-based group cannot work directly with farmer groups on a daily basis.

SOIL IMPROVEMENT

I. Introduction

Despite its inherent high fertility Egypt's cropland has been severely damaged by waterlogging and salinity. The detailed soil survey completed in 1973 found that only six percent of the presently-cultivated cropland could be classified as excellent, 45 percent as good, the remaining 49 percent as either medium or poor. The shift to perennial irrigation without adequate drainage has led to a higher water table, increasing soil salinity and alkalinity, subsoil compaction and hardpan formation. For severely waterlogged soils, drainage is the only solution. With World Bank assistance, and USAID cooperation in manufacturing pipes, tile drainage is now being extended to cover the 950,000 feddans in the Delta and 300,000 in Upper Egypt in most serious need. Similar treatment of another 300,000 feddans in Upper Egypt is under discussion.

Installation of a permanent drainage system, however, is both costly and time-consuming. Large areas can be temporarily restored to nearly their original productivity by a simple, inexpensive and rapid process. Called "subsoiling" (actually a type of drainage) this process has been found to increase yields by 20 - 150 percent,

although the effects last only 4 - 5 years and then the process must be repeated. When gypsum is used in combination with subsoiling, yield increases are even more impressive. Research indicates that yields on most of Egypt's three million feddans of fair and poor lands would benefit substantially from periodic subsoiling. One million feddans, where cotton yields have dropped to half the national average, are seriously in need of such treatment.

A related water use problem severely affects another one million feddans of Egypt's prime cropland, mainly in Middle and Upper Egypt. It results from farmers not having leveled their fields adequately following the shift to perennial irrigation after completion of the High Dam. Improperly leveled fields cause irrigation water to collect in low points. This condition not only drowns out growing crops but progressively deteriorates the soil itself. Conversely, high spots tend to be underwatered, with resulting poor seed germination and salt accumulation. It is estimated that crop yields on the one million feddans most seriously affected by uneven terrain could be increased 10 - 15 percent by precision leveling. Unlike subsoiling, land leveling is required only once.

Overall responsibility for all types of land improvement in Egypt rests with the MOA Soil Amelioration Organization (SAO) recently renamed the Executive Authority for Land Improvement Projects headed by a Vice Minister reporting directly to the Minister of Agriculture. The SAO has a professional staff of some 1,000 engineers and others. Field-level workers (machine operators, mechanics, etc.) number several hundred and total staff number 2,300. The Research Department has 10 laboratories which test soil samples to determine the treatment needed. Soil analyses are completed before any amelioration is begun.

The SAO currently conducts subsoiling, clearing of drainage canals and gypsum treatments. The area treated in the Delta has increased rapidly over the past 10 years. A total of 287,000 feddans were subsoiled in the 1969-77 period, while 1,227,000 were treated with gypsum and canals were improved on 425,000.

Expanding the SAO's staff and reassigning current personnel to take fuller advantage of opportunities for increasing agricultural production via subsoiling and land-leveling should not pose a serious problem. Currently SAO leadership is energetic and well-qualified to direct the technical aspects of land improvement. The SAO investment budget, currently L.E. 6.5 million annually, is expected to be increased by as much as 60% this year due to increasing GOE emphasis on soil amelioration.

On the equipment front the picture is far different. The SAO has only a fraction of the machinery required to provide adequate subsoiling coverage nationwide. For land leveling the SAO has only a few scrapers not really suitable for the work required.

II. The Proposed Activity

A. Summary

Soil improvement activities currently are concentrated in the Delta with only a testing program underway in Upper Egypt. Utilizing the assistance proposed herein, the program will be expanded to Middle Egypt with much greater attention focused on precision land leveling.

B. Equipment Division

The current pool of SAO equipment has the capacity to subsoil roughly 100 - 150,000 feddans per year. SAO work plans for the Delta alone will fully utilize this capacity (see Table VI-5-a). To allow the program to meet the subsoiling targets for Middle Egypt as well and to inaugurate a land leveling demonstration activity in the same area the equipment shown in Table VI-5-b will be procured.

C. Technical Assistance

To assist the SAO in implementing land improvement activities in Middle Egypt, a technical assistance team of two agricultural engineers will be provided. They will work with SAO staff in planning and carrying out subsoiling activities to meet indicated targets. This work will include assistance in setting up necessary facilities as well as organizing actual field work and helping to train staff.

The SAO currently charges a subsidized price that covers their capital and operating costs but excludes salaries and is only 60% of the estimated true economic cost of the activity, pricing inputs at world prices. This practice tends to discourage private operators from offering the service as farmers demand increases, even though the SAO cannot cover the full area needing treatment. The economic analysis shows that farmers could easily pay the full price if credit were available. The SAO is currently reevaluating their rates, and some increase is expected. The TA team will work with the SAO to encourage a rate structure reflecting full costs as well as the benefit to Egypt of maintaining its soil resources and will also explore means of encouraging private sector operators to provide subsoiling services.

In addition to the above, a major portion of their effort will be to introduce precision land leveling. Initially, it is proposed that the techniques be demonstrated to farmers by the SAO. However, the intent over the longer run is that the private sector should perform this function, because of

Table VI-5-a

SAO 5 year Plan (Subsoiling)

1979 - 1983

Governorate	1979	1980	1981	1982	1983
Delta					
Sharkia	25000	18000	19000	30000	30000
Dakahlia	20000	20000	20000	30000	30000
Kafr El Sheikh	25000	20000	20000	30000	30000
Beheira	25000	20000	20000	30000	30000
Damietta	5000	5000	5000	5000	5000
Ismailia	20000	20000	20000	--	--
Total	120000	103000	103000	125000	125000
Middle Egypt					
Giza	--	--	--	--	--
Fayoum	20000	20000	20000	20000	20000
Beni Suef	--	17000	17000	--	--
Minya	17000	17000	17000	17000	17000
Total	37000	54000	54000	37000	37000
Reclaimed Land	35000	40000	45000	45000	50000
Total	192000	197000	202000	207000	212000

Table VI-5-b

Soil Amelioration Equipment

Item	Number needed for 60,000 feddans	$ Cost
Farm Equipment		
Subsoiling		
130 Hp tractors	40	1,080,000
65 Hp tractors	40	600,000
70 Hp Digger Loaders	32	1,120,000
Subsoilers, 2 tine mounted 1/	50	27,750
Subsoilers, 1 tine trailed 1/	20	11,100
Land leveling		
65 Hp tractors	40	600,000
1 M^3 Scrapers	40	40,000
Land Planes 14 ft. length	20	80,000
Other farm equipment		10,000
Subtotal		3,568,850
Spares		356,000
Total		3,924,850
Other Equipment		
Laboratory Equipment & Supplies		100,000
Trailer (5-ton)	20	40,000
Track-type tractor with dozer (100 Hp)	2	168,000
Spares for tractor		18,000
Other equipment		50,000
		376,000
Total Capital		4,300,850

1/ Locally manufactured

(1) small field size, (2) simplicity and low cost of the equipment required, and (3) the inability of SAO alone to fill the need, with 1 million feddans needing treatment in Upper Egypt alone, each requiring up to two days of work. Pakistan and Turkey, among others, have been quite successful with introducing private land leveling after the government started the ball rolling. The same is expected to occur in Egypt, where shared use of capital items is traditional and purchase of custom services is well-established. Egypt has the added advantage of a well-developed custom system, bringing tractor services within reach of small farmers, and facilitating private sector provision of this new service. International experiences indicate that private custom operators will rapidly move into provision of this service once its benefit has been demonstrated sufficiently to generate demand. However, the project evaluation unit will need to monitor private sector response carefully to determine if further assistance is needed.

D. Training

Training for SAO personnel and custom operators in subsoiling and land leveling techniques will be provided. 15 - 20 individuals will receive overseas training, but most training will be conducted in-coutnry with the assistance of the TA team.

TRAINING

I. Introduction

While Egypt has a large number of college-trained individuals and a pool of skilled labor, manpower development remains a requirement for an agricultural equipment and mechanization effort. Shortages of skilled workers able to repair and make spare parts for tractors and other farm implements exist. Discussions with farm equipment repair shop operators indicate that job opportunities in urban areas and outside the country have resulted in a loss of mechanics and other service personnel. To retain employees it has been necessary to substantially raise wages. At the same time the technical schools are not producing fully prepared replacements and a period of on-the-job training is required.

Knowledgeable and experienced equipment operators are also in short supply. Equipment operators do not understand the capabilities of the equipment being operated nor routine maintenance. The resultis a failure to achieve potential production increases and unnecessary down-time. No systematic or organized program of training farm equipment operators is currently offered With increasing equipment quantities, the situation will probably worsen slightly if training of relevant types is not provided.

At the college level the basic problem is a lack of relevant experience and knowledge in agricultural equipment areas. Training tends to be theoretical and insufficient to overcome a basic unfamiliarity with farm equipment. As change agents planning and implementing equipment programs these individuals need a considerable degree of expertise, to be knowledgeable about mechanization possibilities, to understand the limits and benefits of mechanization and to be able to effectively extend appropriate mechanization programs. The shortage of people with these skills is reflected in the limited scope and effectiveness of agricultural equipment programs currently underway.

II. The Proposed Activity

Because there are two distinct needs, two types of training efforts are proposed, as follows.

A. In-Country

1. Mechanics and Drivers

To upgrade basic skills of existing equipment repair personnel and equipment operators a number of specialized training programs will be funded. These will be carried out in governorate locations by Ministry and outside staff. Normally fairly narrow training programs (e.g. hydraulics, lubrication, proper plowing, equipment adjustment, etc.) for short time periods (1 - 3 days) will be provided in order that workshop operators, drivers, mechanics and maintenance personnel can attend without seriously disrupting work schedules. In certain instances longer programs (1 - 2 weeks) utilizing existing Ministry of Agriculture training facilities will be provided (machine scheduling, business management). Courses and course materials will be developed by MOA and project training staff assisted by technical assistance team members. The courses will be conducted by Egyptian staff members. To encourage participation participants will be provided meals and travel expenses. A detailed annual schedule of training will be prepared and submitted for AID approval, prior to the release of funds for training.

Current estimates of courses and costs are as follows:

	1980	1981	1982	1983	1984	1985
Courses	20	200	200	220	220	220
Cost $	10,000	100,000	100,000	110,000	110,000	110,000

2. Further in-country training will be provided to extension and other GOE staff involved in mechanization. These training courses will seek to familiarize participants with equipment potentials and the proper role of equipment in farm operation, and equip them with enough skill to work with farmers on equipment use or operate the specialized training course identified above, as needed. Topics will cover technical, economic and social aspects of mechanization. Courses will be conducted utilizing Ministry facilities and will range from 1 day to 1 month in length. Each year a training plan will be submitted by the Training Support Unit to AID for approval. The tentative scheduling of courses is as follows:

	1980	1981	1982	1983	1984	1985
Courses	10	40	40	30	30	30
Cost $	10,000	40,000	40,000	30,000	30,000	30,000

B. Participant Training

Two types of participant training are proposed each with its own purpose, clientele and operating procedures.

Short-term observation training in several developing countries with situations similar to Egypt will be provided in a number of areas to a range of GOE employees and private sector individuals. Training would be provided in machinery management to district and governorate agricultural officers (18 persons), village co-op managers and local custom operators (15 persons), and middle and senior level MOA officials (3). Training in mechanization extension methods will be provided to project counterpart members (15) and governorate/district extension specialists (9). Study tours covering service-center installation and operation will be provided to 6 MOA staff members and private entrepreneurs. Finally, 6 individuals connected with mechanization research will visit the U.S. to observe applied research projects in action. Funding for this training is as follows:

	1980	1981	1982	1983	1984
Cost $	204,000	163,000	110,000	56,000	30,000

Long-term training to develop leadership potential will be provided to a total of 25 individuals. Ten individuals would be trained to the Masters level in variuus mechanization-related areas. Five individuals would be sent on three year programs to earn Ph.D.'s. Ten participants would be sent for one year post doctoral study. Estimated costs of this program are as follows:

	1980	1981	1982	1983	1984
Cost $	-	159,000	240,000	214,000	167,000

0035

ARAB REPUBLIC OF EGYPT

MINISTRY OF AGRICULTURE

MINISTER'S OFFICE

Annex VII: Application For Assistance

July 6, 1979

Mr. Donald S. Brown
Director
USAID/CAIRO

Dear Mr. Brown:

As you are well aware this Ministry has had a strong interest in promoting appropriate mechanization in Egyptian agriculture for some time. In order to determine the real need for mechanization in Egypt and the role the Ministry should play in implementing such a program, we requested AID assistance with a feasibility study on agricultural mechanization. That study which was recently concluded by a U.S. contract team working closely with my staff indicated that numerous activities in support of mechanization are currently needed. An agricultural mechanization project with a number of components was recommended.

We are now requesting AID assistance in support of a project to carry out many of the recommended activities. In this regard, we have reviewed the draft materials prepared by your staff for a possible program of assistance and are in agreement with the activities proposed. We believe USAID assistance in planning and evaluation, machinery service, research and development, machinery management extension and soil improvement will provide a solid and needed footing on which appropriate mechanization efforts can proceed.

We look forward to your favorable response to this request and the benefits a joint program in mechanization can achieve.

Sincerely yours,

Mahmoud M. Dawood

Mahmoud Mohamed Dawood
Minister of Agriculture

ANNEX VIII

WAIVER JUSTIFICATIONS

a. Recommendation for Dollar Funding of Local Costs

The local currency cost of the proposed project is $ 35.3 million, or 64% of total project costs. Part of this cost, roughly $ 10.7 million, represents personnel and other in-kind contributions, which will be provided by the GOE. The remaining $ 24.6 million, represents credit support for the TA team, commodities, and operating expenses. The GOE will contribute $ 3.4 million of this cost (including inflation), and will provide $ 1 million or 5% of the foreign exchange costs. Their share in total project costs is thus 27.5%. Given the current tight restrictions on expansion of the GOE budget, it would be unrealistic to require the GOE to provide a greater share of the total project cost. To do so would inevitably introduce delays and would endanger project success. Furthermore, it would greatly reduce the project's net contribution to development capital. The Mission, therefore, proposes to fund $ 21.2 million of the project's local costs (60%).

The source of AID-provided local currency will be dollar purchases. At present, the projected availability of excess-currency pounds is fully programmed for other activities. Due to the high level of AID activity in Egypt, excess currency cannot cover the needs for project costs and other purposes. If additional excess currency becomes available for this project, it will be used in preference to dollar-funded purchase.

It is therefore, recommended that $ 21.2 million be allocated for dollar purchase of Egyptian pounds to help meet the local currency costs of the project.

b. Request for Waiver of Source and Origin Requirements for Procurement of Commodities

It is recommended that a waiver of source and origin requirements be granted to permit procurement of commodities from Code 935 countries as well as from the U.S. and Egypt up to an amount of $ 1 million. This waiver will permit the purchase of shop and laboratory equipment and prototype farm machinery for testing for the Farm Mechanization Research and Development Center. This waiver is needed for successful project implementation for the following reasons:

1) The Research Center needs to obtain for testing a wide range of machinery, including small-scale and/or highly specialized equipment not manufactured in the U.S. Models currently in wide use in Egypt that are of non-U.S. origin are also needed to develop improved management practices that can be applied with Egypt's current machinery stock.

2) Selection of the laboratory and shop equipment for the Center should reflect the availability of service in Egypt as well as permitting the center to duplicate current practices in Egyptian workshops. Since much of the equipment currently available is not of U.S. source or origin, meeting the requirements will require a waiver for procurement of this equipment.

In light of the above it is requested that waivers be granted to Chapter 5 of Handbook 1, Supplement B to allow 935 procurement of equipment and farm machinery. Signature of the project authorization containing the above waivers will constitute certification that exclusion of procurement from Free World countries other than the cooperating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program.

c. Request for Waiver of Shelf Limits for Procurement of Commodities

It is recommended that a waiver of limits on amount of individual purchase and total amount purchase to permit procurement of shelf items of Geographic Code 935 origin up to an amount of $ 4.6 million.

This waiver will be necessary to successful project implementation for the following purposes:

1) Machinery introduction activities will introduce pumps and threshers powered by a small 6 - 10 Hp engine available locally only from European and Indian sources. Particularly in the case of the pumps, when purchase will be by individual small farmers, procurement from the U.S. would be impractical (estimated local cost: $ 1,431,000).

2) The service-center loan funds will finance purchase of repair equipment by individual small businessmen operating service centers. Equipment needs and timing will vary from shop to shop so that pooled international procurement is inappropriate and would impede project success. Certain items may exceed the individual purchase limit (estimated local cost: $ 1,400,000).

Including an allowance for inflation and contingencies, off-the-shelf procurement needs thus total approximately, $ 4.6 million. It is therefore, recommended that a waiver of the unitary transaction and maximum amount of shelf item limitations in Handbook 1, Supplement B, Section 18.A.4(b) be granted. Signature of the project authorization containing the above waivers will constitute certification that exclusion of procurement from Free World countries other than the co-operating country and countries included in Code 941 would seriously impede attainment of U.S. foreign policy objectives and objectives of the foreign assistance program

d. Request for a Waiver of U.S. Source for Technical Services

It is recommended that a waiver be granted to allow the prime contractor for technical services, which shall be a U.S. firm, to subcontract or form a joint venture with firms or individuals from AID Geographic Code 941 for up to 30% of the technical services. This waiver is necessary to successful project implementation because:

1) Expertise in research in and for developing countries will be critical to the success of the Research and Development Center. Much of the best work in this area is being carried out in developing countries and participation from such organizations would be highly desirable.

2) Project evaluation will require an individual with fluent Arabic and experience in the Middle East. In the event that a U.S. citizen meeting these requirements is not available, it will be necessary to utilize the services of a third-country national.

In light of the above it is requested that a waiver be granted to the nationality rules in Handbook 5 to allow 941 procurement of up to 30% of the technical services.

ANNEX IX

Detailed Project Budgets and Cost Factors

I. U.S. Overall (U.S. $'000)

A. Technical Assistance	1980	1981	1982	1983	1984	1985	Project Total
1. Team Leader (Co-Director)	44	130	130	130	130	88	652
2. Planning/Financial	33	130	130	130	130	99	652
3. Evaluation Officer	33	130	130	130	130	99	652
4. Research Administration	22	130	130	130	130	110	652
5. Machine Development Advisor	-	66	130	130	130	66	522
6. Service Center Advisor	22	130	130	130	110	-	522
7. Equipment Repair Advisor	-	131	131	131	-	-	393
8. Water-Lifting Specialist	22	130	130	111	-	-	393
9. Agri. Engineer-Soil Improvement	11	130	130	130	121	-	522
10. Agri. Engineer-Soil Improvement	-	33	130	130	130	99	522
11. Agri. Engineer-Extension	22	130	130	130	111	-	523
12. Farm Management (Extension)	11	130	130	130	121	-	522
13. Extension Education Advisor	22	130	130	130	130	110	652
14. Small Manufacturer Advisor	22	130	130	111	-	-	393
15. Short-Term	71	20	20	20	20	21	172
Subtotal	335	1680	1841	1803	1393	692	7744

B. Commodities	1980	1981	1982	1983	1984	1985	Project Total
1. Vehicles							
Pickups	160			100			260
Vans	13						13
Sedans	27			27			54
2. Office Equipment	27						27
3. Training and Extension Items	14						14
4. Shop Equipment	40						40
5. Research Equipment and Supplies	655						655
6. Library Materials	5						5
7. Tractors							
65 hp	1320						1320
130 hp	1188						1188
crawler	185						185
8. Digger Loaders	1232						1232
9. Disc/Harrows	413						413
10. Row Planters	363						363
11. Thresher/Winnowers	500	300		350			1150
12. Miscellaneous	614	20		20			654
Subtotal	6756	320		497			7573
C. Training							
1. Participant	204	322	350	270	197	-	1343
2. Driver/Mechanics	20	140	140	140	140	140	720
Subtotal	224	462	490	410	337	140	2063
D. Other Costs							
1. Credit Funds - Water Lifting			500	1000	500		2000
2. Credit Funds - Service Centers		1500		1500	2000		5000
3. Research Fund		100	200	400	200	100	1000
4. Collaborative Research	10	40	40	40	40	35	205
5. Feasibility Study			400				400
6. Building Renovation		70					70
7. Vehicle Operating Costs		19	19	19	16	7	80
8. Evaluations		-	30			30	60
Subtotal	10	1729	1189	2959	2756	172	8815
Overall Subtotal	7325	4191	3520	5669	4486	1004	26195
Contingency (10%)	733	419	351	567	449	100	2619
Inflation	706	1370	1378	3446	3489	797	11186
TOTAL	8764	5980	5249	9682	8424	1901	40000

II. U.S. By Component (U.S. $'000)

Planning and Evaluation	1980	1981	1982	1983	1984	1985	
Staff							
1. Team Leader	44	130	130	130	130	88	
2. Planning/Financial	33	130	130	130	130	99	
3. Evaluation Officer	33	130	130	130	130	99	
4. Short-term	71	20	20	20	20	21	
Subtotal	181	410	410	410	410	307	2128
Commodities							
1. Sedans (9,000)	9			9			
2. Pickups (10,000)	20			20			
3. Office Equipment	9						
Subtotal	38			29			67
Training							
1. Participant	50	76	74	65	65		330
2. In-Country							
Subtotal	50	76	74	65	65		330
Other Costs							
1. Vehicle Operating Costs	-	3	3	3	3	2	
2. Evaluation	-	-	30	-	-	30	
3. Feasibility Study	-	400	-	-	-	-	
Subtotal	-	403	33	3	3	32	474
Component Total	269	889	517	507	478	339	2999

Service Center Development

Staff	1980	1981	1982	1983	1984	1985	
1. Service Center Development	22	130	130	130	110		
2. Equipment Repair	-	131	131	131			
Subtotal	22	261	261	261	110		915
Commodities							
1. Sedan	9						
2. Pickups	20			9			
Subtotal	29			9			38
Other Costs							
1. Vehicle Operating Costs		3	3	3	2		
2. Credit Funds		1500	-	1500	2000		
Subtotal	-	1503	3	1503	2002		5011
Component Total	51	1764	264	1773	2112		5964

Soil Improvement

Staff							
1. Agricultural Eng.	11	130	130	130	121		
2. Agricultural Eng.	-	33	130	130	130	99	
Subtotal	11	163	260	260	251	99	1044
Commodities							
1. Pickups (2)	20			10			
2. Tractors 65 Hp (80)	1320*						
130 Hp (40)	1188*						
Crawler (2)	185*						
3. Digger Loaders (32)	1232*						
4. Miscellaneous	376*						
Subtotal	4321			10			4331
Training							
1. Participant	45	48	46	41	13		193
2. In-Country							
Subtotal	45	48	46	41	13		193
Other Costs							
1. Vehicle Operation	-	2	2	2	2	1	9
Component Total	4387	213	308	313	266	100	5577

*10% Spares included in these items.

Research and Development Center

Staff	1980	1981	1982	1983	1984	1985	
1. Research Administration	22	130	130	130	130	110	
2. Machine Development Advisor	-	66	130	130	130	66	
Subtotal	22	196	260	260	260	176	1174
Commodities							
1. Sedans	9			9			
2. Pickups	20			20			
3. Van	13						
4. Shop Equipment	40						
5. Research Equipment	155						
6. Prototypes for Testing	500						
7. Reproduction Equipment and Supplies and Misc.	214						
8. Gooseneck Trailers	13						
Subtotal	964			29			993
Training							
1. Participant	8	91	123	116	82		420
2. In-Country							
Subtotal	8	91	123	116	82		420
Other Costs							
1. Research Fund	-	100	200	400	200	100	
2. Collaborative Research	10	40	40	40	40	35	
3. Building Renovations	-	70					
4. Vehicle Operating Costs	-	3	3	3	3	2	
Subtotal	10	213	243	443	243	137	1289
Component Total	1004	500	626	848	585	313	3876

Machinery Management Extension

	1980	1981	1982	1983	1984	1985	
Staff							
1. Agr. Engineer	22	130	130	130	111	-	
2. Farm Management	11	130	130	130	121	-	
3. Agr. Extension	22	130	130	130	130	110	
4. Agr. Engineer (Water Lifting)	22	130	130	111	-	-	
5. Small Manufacturer Advisor	22	130	130	111	-	-	
Subtotal	99	650	650	612	362	110	2483
Commodities							
1. Pickups	80			50			
2. Office Equipment	9						
3. Disc/Harrows (10% Spares)	413						
4. Row Planters (10% Spares)	363						
5. Thresher-Winnowers	500	300		350			
6. Training & Extension	14						
7. Miscellaneous	25	20		20			
Subtotal	1404	320	-	420	-	-	2144
Training							
1. Participant	101	107	107	48	37	-	400
2. In-Country	20	140	140	140	140	140	720
Subtotal	121	247	247	188	177	140	1120
Other Costs							
1. Vehicle Operations	-	8	8	8	6	2	
2. Credit Funds	-	500	1000	500	-	-	
Subtotal	-	508	1008	508	6	2	2032
Component Total	1624	1725	1905	1728	545	252	7779

Complete Project Total	$ 26,195
Contingency	2,619
Inflation	11,186
Grand Total	$ 40,000

III. GOE by Component (LE)

Planning & Evaluation	Annual	Project Total
A. Staff		
1. Co-Director/5 years	6,000	30,000
2. Planner/Economist/5 years	5,400	27,000
3. Sociologist/4 years	4,200	16,800
4. Financial Officer/5 years	4,200	21,000
5. Administrative Officer/ 5 years	4,200	21,000
6. 3 Secretaries/5 years	7,200	36,000
7. 3 Drivers/4 years	5,400	21,600
8. Training Affairs Officer/4 years	4,200	16,800
Subtotal		190,200
B. Office Space and Facility	48,000	240,000
C. Operating Costs	30,000	150,000
Total LE		580,200

Research and Development Center		
A. Staff		
1. Director/5 years	6,000	30,000
2. Asst. Director/4 years	5,400	21,600
3. 3 Senior Engineers/4 years	12,600	50,400
4. Economist/4 years	4,200	16,800
5. Sociologist/4 years	4,200	16,800
6. 5 Asst. Engineers/4 years	18,000	72,000
7. 2 Senior Staff/4 years	6,000	24,000
8. 4 Mechanics/4 years	9,600	38,400
9. 2 Publications Specialists/ 3 years	6,000	18,000
10. 5 Secretaries/4 years	9,000	36,000
11. 4 Drivers/4 years	7,200	28,800
12. 5 Misc./5 years	6,000	30,000
Subtotal		382,800
B. Land and Facilities		500,000
C. Operating Costs	50,000	250,000
Total LE		1,132,800

	Annual	Project Total
Soil Improvement		
A. Staff		
1. Agr. Engineer/5 years	4,200	21,000
2. Agr. Engineer/4 years	4,200	16,800
3. 10 Technicians/4years	14,000	56,000
4. 150 Tractor Drivers/4 years	108,000	432,000
5. 30 Other Equipment Operators/4 years	21,600	86,400
6. 15 Mechanics/4 years	18,000	72,000
7. 10 Other Staff/4 years	14,000	56,000
Subtotal		740,200
B. Land and Facilities		350,000
C. Operating Costs	150,000	600,000
Total LE		1,690,000

Machinery Management Extension		
1. Overall		
A. Staff		
1. Agr. Engineer/5 years	4,200	21,000
2. Farm Mgmt./4 years	4,200	16,800
3. Agronomist/5 years	4,200	21,000
4. Small Scale Industry/4 years	4,200	16,800
5. Agr. Extension/5 years	4,200	21,000
6. 3 Secretaries/4 years	5,400	21,600
7. 5 Drivers/4 years	9,000	36,000
8. 2 Support Staff/5 years	2,800	14,000
9. 100 Local Level Staff/ 4 years	120,000	480,000
Subtotal		648,200
B. Office Space and Facilities	24,000	120,000
C. Operating Funds	30,000	150,000
Total LE		918,200

	Annual	Project Total
2. Water Lifting		
A. Staff		
1. 4 Extension Staff/4 years	16,400	65,600
2. 20 Local Extension/4 years	24,000	96,000
3. 10 Bank Staff/4 years	12,000	48,000
4. 2 Drivers/4 years	3,600	14,400
Subtotal		224,000
B. Facilities		
Extension	2,400	9,600
Agricultural Bank	2,400	9,600
Subtotal		19,200
C. Operating Costs		
Extension	10,000	40,000
Bank	2,000	8,000
Subtotal		48,000
Total LE		291,200
3. Machinery Introduction		
A. Staff		
1. 3 Extension Personnel/5 years	12,600	63,000
B. Equipment		330,000
Total LE		393,000
4. Training		
A. Staff		
1. Director/4 years	4,200	16,800
2. 5 Training Staff/4 years	18,000	72,000
Subtotal		88,800
B. Facilities	10,000	40,000
C. Operating Costs	40,000	160,000
Total LE		288,800

Grand Total Machinery
Machinery Extension LE 1,891,200

	Annual	Project Total
Service Center Development		
A. Staff		
1. 2 Agricultural Engineers/5 years	8,400	42,000
2. 1 Development Officer/ 5 years	4,200	21,000
3. 5 Other Professional Staff/4 years	18,000	72,000
4. 4 Mechanics/3 years	9,600	28,800
Subtotal		163,800
B. Service Facilities		500,000
C. Spare Parts		250,000
D. Operating Costs	5,000	25,000
Total LE		937,800

Complete Project Total	6,232,000	($8,903,000)
Contingency	623,000	($ 891,000)
Inflation	3,754,000	($5,362,000)
Total LE	10,609,000	($15,156,000)

IV. Cost Factors

A. Technical Assistance

Person-Year = $ 130,000
Person-Month = 10,000

Breakdown of $ 130,000 assuming 2 year tour of duty and family with two children.

Base Salary	$ 36,000
Fringe Benefits (including Workmans Compensation)	12,000
Post Differential	3,600
Allowances	
-Shipment of personal and household effects (one way)	7,000
-Shipment of automobile (one way)	3,000
Education at $ 4,000 per child	8,000
Housing	20,000
Rest and Recuperation Travel	1,000
International Travel	4,000
Domestic Travel	1,000
Miscellaneous	2,000
Contractor Overhead	30,000
	$ 127,600

Rounded to $ 130,000

B. Commodities

Pickups	$ 10,000
Sedans	9,000
Vans	13,000
65 Hp Tractor	15,000
130 Hp Tractor	27,000
Crawler Tractor	84,000
Digger Loader	35,000
Disc Harrows	750
Row Planters	3,300
Thresher Winnowers	2,500

C. Training

Long-Term Academic	17,500/year
Short-Term Observation	1,500 - 2,500/month

D. GOE Salari s

Director Level	LE 6,000/year
Assistant Director or Senior Professional staff	5,400/year
Professional staff	4,200/year
Junior Professional staff	3,600/year
Specialists	3,000/year
Secretaries	2,400/year
Drivers	1,800/year
Mechanics	1,200 - LE 2,400/year
Local and Miscellaneous staff	1,200/year
Tractor Drivers	720/year

ANNEX X

Current Status of Machinery Use

As shown in Table X-1 Egypt has roughly 30,000 farm tractors of which 5300 are on State Farms developing the new Lands. Thus, there are about 25,000 units to serve nearly 6 million feddans of cultivated land or 1 tractor per 240 feddans. If all these tractors were in operating condition and utilized at their rated capacities there would be available at most .30 Hp per feddan. When discounted for age, condition and substandard operating practice this figure drops to around .23 Hp per feddan.

As the table also indicates, for most other modern equipment items availability and use are even lower, the exception being manual and back-carried sprayers, a major portion of which are owned by the government. Overall it appears that Egyptian agriculture, is not heavily capitalized with modern equipment.

Looking at other features of the equipment picture the consequences of inadequate repair facilities are apparent from the condition of farm tractors. As indicated in Table X-2, nearly one-fourth of all cooperative-owned tractors were inoperative at the time of the survey, as were 3 percent of the generally newer, privately owned machines. On State Farms the situation was even worse; 45 percent of their tractors reportedly were not in operating condition. With the low level of imports for several years prior to 1974, age is, of course, a significant factor. Some 70 percent of all inoperable units were more than 10 years old. However, under Egyptian capital-short conditions this does not mean that with proper repair these tractors could not have several more years of economic life.

More discouraging is the number of fairly new tractors reported to be inoperable and the high percentage of both co-op and privately owned machines that were in only "fair" condition. As there is no information on how long individual units had been inoperable, many may only have been awaiting spare parts. However, reports from various quarters indicate that 3 to 6 month delays in obtaining spare parts are by no means uncommon.

Nevertheless tractor power appears to be very important for Egyptian farmers. Table X-3 shows the percentages of farmers employing different tractor-powered custom services. Interestingly the percentage variation between small and larger farms, for plowing and threshing, is quite small.

Turning to hours of use, Table X-4 indicates that private owners use their machines twice as many hours per year for custom work as they do on their own lands. Private machines were also operated significantly more hours than were cooperative machines.

Table X-1

Farm Machinery Inventory, By Type, 1978*

Item	Estimated Total No.	Percent owned privately
	No.	Present
Tractors	24,680	83
Tractor Plows	24,680	86
Subsoiler/ditcher excavator	125	88
Harrows	8,820	86
Planters	6,430	95
Irrigation pumps		
Electric powered	2,160	98
Diesel or gasoline powered	24,830	98
All motor-driven pumpsets	26,990	98
Threshers and winnowers**	3,580	89
Dusters		
Manual	2,580	98
Motor Operated	960	8
Sprayers		
Motor Operated	160	38
Other	2,640	20
Spraying equipment		
Motor operated & car carried	4,730	10
Motor operated & back carried	1,940	55
Manual and back carried	50,600	23

* Based on 2-part farm machinery survey, 1978 with cross-check reference to Ministry of Agriculture data supplied by respective governorates. . In addition to above numbers of implements MOA 1978 indicate the following are on the state farms reclaiming new lands: Chisel plows 2270; trailers 1704; drum threshers 631; mobile irrigation pumps with motors 1696; stationary irrigation pumps with motors 2588; snapsack sprayers 600; and tractors 5336.

** Drum threshers and hand winnowers.

Table X-2

AGE OF FARM TRACTORS BY CONDITION AND OWNERSHIP
FARM MACHINERY SURVEY 1978

Privately Owned

Age	Condition			All Conditions	
	Good	Fair	Inoperable	Percent	Number Reported
Years	Percent of total reported				
1	24.9	1.5	6.1	15.2	692
2	19.9	3.0	2.0	12.7	578
3	12.2	4.1	3.3	8.8	400
4	6.7	4.0	1.4	5.5	251
5	7.8	6.5	2.7	7.1	325
6	3.3	4.2	1.4	3.6	165
7	2.5	3.9	1.4	3.0	139
8	3.4	5.1	3.4	4.1	186
9	.9	1.9	1.4	1.3	60
10	4.3	12.6	6.1	7.6	347
Over 10 1/	14.1	53.1	70.8	31.1	1423
All ages	100.0	100.0	100.0	100.0	-
Total number Reported	2637	1781	148	100.0	4566

Co-op Owned

1	16.4	1.0	1.5	5.6	68
2	21.2	1.9	.4	7.2	87
3	5.9	1.7	.7	2.7	33
4	5.1	1.0	1.8	2.4	29
5	10.5	6.0	4.0	6.9	83
6	4.2	2.6	3.7	3.3	40
7	3.6	2.4	3.9	2.9	35
8	5.4	2.0	3.7	3.6	43
9	.8	1.5	1.5	1.3	16
10	4.0	8.7	9.2	6.6	90
Over 10 1/	22.9	70.8	70.6	57.3	691
All ages	100.0	100.0	100.0	100.0	-
Total number Reported	354	588	273	-	1215

1/ Of all privately owned tractors in this age group 66 percent were reported to be 10-15 years of age; 22 percent 15-20 years and 12 percent 20 or more years. Comparable data for cooperative-owned tractors are: 89 percent 10-15 years, 8 percent 15-20 years and 3 percent 20 or more years.

Table X-3

FARMERS USING CUSTOM-HIRE TRACTORS
FOR SPECIFIED OPERATIONS

Farm Machinery Survey, 1978

Farm Size* (cultivated area)	Users as Percent of Total Number in Size Group			Percent of All Users		
	Plowing	Threshing	Transp.	Plowing	Threshing	Transp.
feddans						
Less than 1	62.3	49.9	5.3	38.6	38.5	24.9
1 - 3	66.7	53.6	8.9	37.4	37.4	38.1
3 - 5	68.4	56.9	10.5	13.8	14.3	16.0
5 - 10	67.7	52.6	14.7	6.5	6.2	10.6
10 - 15	58.4	45.4	18.1	2.3	2.2	5.4
15 and over	65.1	50.3	30.6	1.4	1.4	5.0
All Sizes	65.0	52.2	8.6	100.0	100.0	100.0

* Wording of questionnaire unfortunately prompted some respondents to interpret farm size as area owned, instead of total area cultivated as was intended. This resulted in some downward skewing in the farm size distribution. Indications are, however, that this skewedness does not seriously affect the general conclusions regarding custom tractor usage. The Farm Management Survey which did reflect operating units found an even higher percentage of very small farms using tractors for plowing—a difference well within the range of sampling error.

Table X-4

HOURS OF TRACTOR USE, BY TYPE AND OWNERSHIP

Farm Machinery Survey, 1978

Ownership	Type of Use					
	Plowing	Irrigation	Threshing	Transportation	Other	All uses
		Hours per tractor*				
Co-operative	291	8	162	96	-	557
Private						
Own farm	85	37	58	46	9	235
Custom work	271	28	260	100	14	673
Total Private	356	65	318	146	23	908
All tractors	345	56	291	137	19	848
		Percent of all uses				
Co-operative	52	2	29	17	-	100
Private						
Own farm	36	16	25	19	4	100
Custom work	40	4	39	15	2	100
Total private	39	7	36	16	2	100
All tractors	41	7	34	16	2	100
		Percent of total hours				
Co-operative	16	3	10	13	-	12
Private						
Own farm	20	55	16	27	38	23
Custom work	64	42	74	60	62	65
Total private	84	97	90	87	100	88
All tractors	100	100	100	100	100	100

* Inoperable tractors are excluded from base numbers.

Roughly 40 percent of the total annual usage of privately owned tractors reportedly went for plowing, 25 percent for threshing, 15 percent for farm and non-farm transportation and the remaining 10 percent for irrigation and other farming operations. Co-op tractors were used somewhat more for plowing and less for the other operations than were privately owned machines.

DRAFT PROJECT AUTHORIZATION and REQUEST for ALLOTMENT of FUNDS

PART II

Name of Country: Arab Republic of Egypt

Name of Project: Agricultural Mechanization

Project No: 263-0031

Pursuant to Part II, Chapter 4, Section 531 of the Foreign Assistance Act of 1961, as amended (Economic Support Fund), I hereby authorize a Grant to the Arab Republic of Egypt ("Cooperating Country") of not to exceed Forty Million United States Dollars ($40,000,000) to assist in financing the foreign exchange and local currency costs of goods and services required for the Project as described in the following paragraph:

The Agricultural Mechanization Project will assist Egypt to meet the goal of increasing agricultural production and increasing farm incomes. In pursuance of this goal this project will help build Egyptian capabilities to plan, support and carry out appropriate mechanization efforts. The project strategy is to increase the effectiveness of selected current programs and to develop capabilities required for the design and pursuit of alternative mechanization options, without committing Egypt at this time to particular mechanization path. Areas of assistance that will be undertaken under the Project include (a) Planning and Evaluation; (b) Land Improvement; (c) Service-Center Development; (d) Research and Development; and (e) Machinery Management Extension. Assistance will be in the form of technical assistance, capital for loan funds, research funds, training, commodities and equipment and costs related to the above designated areas of assistance.

I hereby approve the total level of A.I.D. appropriated funding planned for this project of not to exceed Forty Million United States Dollars ($40,000,000) of which $ 21,000,000 is authorized during the period of Fiscal Year 1979. I approve further increments during Fiscal Years 1980 through 1983, subject to availability of funds and in accordance with A.I.D. allotment procedures.

Based upon the justification set forth in Annex VIII of the Project Paper, I hereby determine, in accordance with Section 612(b) of the Act, that the expenditure of United States Dollars for the procurement of goods and services in Egypt is required to fulfill the purposes of this Project; the purposes of this Project cannot be met effectively through the expenditure of U.S.-owned local currencies for such procurement; and the administrative official approving local cost voucher may use this determination as the basis for his certification as required by Section 612(b) of the Act.

I hereby authorize the initiation of negotiation and execution of the Project Agreement by the officer to whom such authority has been delegated in accordance with A.I.D. regulations and Delegations of Authority subject to the following terms, together with such other terms and conditions as A.I.D. may deem appropriate:

a. Source and Origin of Goods and Services

(1) Except as A.I.D. may otherwise agree in writing, or as provided in paragraphs (2) and (3) below, goods and services financed by A.I.D. under the Project shall have their source and origin in the United States or in the Arab Republic of Egypt.

(2) Shop and laboratory equipment and prototype farm machinery will have their source and origin in countries included in A.I.D. Geographic Code 935 provided that such procurement shall not exceed One Million United States dollars ($ 1,000,000).

(3) Up to 30 percent of the total technical services by value will have its source and origin in countries included in A.I.D. Geographic Code 941, and the remaining technical services will be of U.S. or Egyptian source and origin.

(4) In accordance with Handbook 1, Supplement B, paragraph 18D, with respect to shelf items financed with Egyptian Pounds purchased with U.S. Dollars, (A) such items shall be of Egyptian source only provided that their origin is a country included in A.I.D. Geographic Code 935; and (B) the individual unit limitation of 2,500 dollars and the total limitation of 10,000 dollars or 10 percent of the authorized local currency for the project on the amount of shelf items authorized to be procured are hereby waived.

b. Conditions Precedent to Initial Disbursement

Prior to any disbursement, or the issuance of any commitment documents under the Project Agreement, the Grantee shall, except as A.I.D. may otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(1) A statement of the person or persons acting as the Grantee's representive, and a specimen signature of each person;

(2) Evidence that an Agricultural Mechanization Group containing a Planning and Evaluation Unit has been established within the Undersecretariat for Engineering Affairs of the Ministry of Agriculture, and that such Group has been granted appropriate authority to administer the Project; and

(3) Evidence that the Ministry of Agriculture has appointed a Project Director along with a statement of his functions.

c. Conditions Precedent to Subsequent Disbursements

Prior to any subsequent disbursement, or the issuance of any commitment documents under the Project Agreement for each of the types of disbursements listed below, the Grantee shall, except as A.I.D. may otherwise agree in writing, furnish in form and substance satisfactory to A.I.D.:

(1) For subsequent disbursement for up to six months of technical assistance of a procurement specialist: (a) an executed contract for such consultant services; and (b) a statement of the personnel of the Ministry of Agriculture responsible for procurements for this Project;

(2) For subsequent disbursement for other technical services: (a) an executed contract with a firm or institution acceptable to A.I.D., and (b) evidence of assignment of staff to all units and divisions of the Agricultural Mechanization Group;

(3) For subsequent disbursement for commodities: (a) evidence of completion of a procurement plan;

(4) For subsequent disbursement for each year of training to be financed under the Project: (a) submission of a training plan covering the training to be financed in that year;

(5) For subsequent disbursements for Service-Center Development, except for technical services, commodities or training: (a) procedures for management of the Loan Fund, including terms and conditions, procedures for selection of borrowers, and lending criteria;

(6) For subsequent disbursement for the Local Manufacturing Feasibility Study: (a) a detailed scope of work for the study prepared by the Mechanization Group and; (b) evidence of a contract with a feasibility study team;

(7) For subsequent disbursement for the Research and Development Center, except for technical services, commodities and training: (a) evidence of firm availability of the site of the Tractor Testing Station at Alexandria; (b) evidence of establishment of the Center with broad responsibilities for stimulating and coordinating applied farm mechanization research and machinery development throughout Egypt; and (c) a detailed implementation plan for Center activities including (1) operation of an Egyptian-American collaborative research exchange program, and (2) operating procedures for the Agricultural Research Fund including criteria for selection of research topics, the grant approval process and the mechanism for monitoring project-funded research;

(8) For subsequent disbursment for Machinery Management Extension, except for technical services, commodities and training: (a) an operational plan developed jointly by the Technical Services contractor and the Management Extension Unit of

the Agricultural Mechanization Group for (1) working with the Extension Service to establish effective support for farmers, cooperatives and private custom operators; (2) conducting an agricultural implement introduction program, and (3) developing an advisory program for small local manufacturers of agricultural implements. Disbursement for credit funds for water-lifting will be made following A.I.D. approval of procedures including criteria for the selection of borrowers, management of the fund, and terms and conditions for the loans.

(9) For subsequent disbursement for Soil Improvement except for technical services, commodities and training: (a) a plan developed jointly with the technical services contractor for subsoiling and land leveling activities, and (b) evidence that the General Authority for Land Improvement Activities has committed adequate resources to project activities.

d. Covenants

The Grantee shall agree to all of the standard covenants in A.I.D. Handbook 3 and in addition shall agree to the following covenants:

(1) The Grantee shall utilize the repayments of principal and interest and payments by farmers for goods and services provided under Machinery Management Extension activities and by the General Authority for Land Improvement Activities in areas to which its services have been extended under the terms of the Project, for purposes furthering project objectives and shall consult with A.I.D. on a regular basis with regards to the use of such funds.

(2) The Grantee shall permit the agricultural cooperatives to utilize private sector facilities in the repair and maintenance of their equipment regardless of the availability of public sector facilities.

ANNEX XII

Brief Position Descriptions for Technical Assistance Personnel

A. Team Leader/Co-Director

The Team Leader will be responsible for coordinating the activities of technical assistance group members to ensure effective interrelation of their efforts and for overall Team direction and supervision. S/He will also be responsible for advising the Undersecretary for Engineering Affairs on policy issues and planning questions and for helping develop a management information system adequate to meet decision-making requirements of top level Ministry of Agriculture staff. The Team Leader will also be responsible for meeting AID reporting requirements. The incumbent must have a strong background in agricultural program planning and administration and extensive first-hand experience in senior-level decision-making. Formal training in management principles is highly desirable; solid grounding in management information systems, principles and operations is mandatory. The person must have previous overseas experience, preferably in the Middle East, and have demonstrated capability for working effectively with senior host-country officials. Prior service as the Team Leader of a large technical assistance group is desirable.

B. Planning/Financial Advisor

The Planning/Financial Advisor will have three principal responsibilities: 1) working with the Team Leader, the Evaluation Officer and Ministry staff, s/he will develop or coordinate the development of necessary implementation plans for Project and other Ministry mechanization activities; 2) working with the Service-Center personnel, the Machinery Management Extension staff and concerned Bank staff, the officer will assist in developing lending criteria, loan rates, etc., for the loan funds for service-center development and improved water-lifting; 3) the officer will be responsible for overseeing management of all Project financial matters. The incumbent should have a minimum of an M.S. in Agricultural Planning or Agricultural Economics with a Ph.D. preferred. Some experience in Agricultural Credit is also desirable. Experience as an agricultural planner is required with a strong preference for an individual with developing nation experience. A capability to deal effectively with senior level personnel is important.

C. Evaluation Officer

The evaluation officer will be responsible for assisting Egyptian staff in planning and implementing necessary surveys and other data collection activities to measure the effect of both Project and other mechanization programs in Egypt. Data on both the macro and micro levels will be required with particular attention given to socio-cultural as well as economic and physical effects. S/He will also work with other technical assistance and Ministry personnel in planning programs to ensure that they are effective and socio-culturally feasible. The incumbent should have experience in collecting socio-economic data, in data analysis and in preparation of policy useful documents, preferably in an LDC environment. A minimum of an M.S. in Anthropology or Rural Sociology with some economics training is required with a Ph.D. desirable. Arabic language capability is also highly desirable. The incumbent should have previous overseas experience, preferably in the Middle East, and a willingness to engage in extensive travel.

D. Research Administration Advisor

Chief among this Advisor's responsibilities will be assisting the Director of the Research and Development Center in planning and guiding the establishment of the research center and the implementation of a broad-based program of mechanization-related research. As the bulk of the research will be carried out by or in universities utilizing grants from the Center the Advisor should have had extensive exposure to research administration at the college level. Experience with farm mechanization research is essential, but an agricultural engineering background is not. High capability in planning and directing applied research, a good grounding in modern research methodology and a broad perspective regarding farm mechanization are required. A Ph.D. is essential and prior overseas experience is highly desirable.

E. Machinery Development Advisor

The Advisor on machinery development to the Director of the M[illegible] Research and Devleopment Center will be intimately involved in identifying types of new or improved farm equipment that could contribute meaningfully to increasing Egypt's agricultural production. S/He also would be concerned with testing selected imported machinery items potentially suited to Egyptian farm conditions; modifying prototype equipment to meet local needs; designing and developing new pieces of equipment where circumstances warrant; and assisting the Director in encouraging local manufacturers to produce proven models.

The candidate must be a professionally qualified agricultural engineer with at least an M.S. degree and extensive experience with development/modification of equipment to meet particular farm needs, preferably in or for less-developed countries. Industrial experience in farm equipment research and development would be highly advantageous. Beyond academic training and relevant experience, the demonstrated ability to adapt relatively unsophisticated machinery items to the needs of particular farming situations is required.

F. Service-Center Development Advisor

The Service-Center Development Advisor will be responsible for assisting in the design and execution of a program to establish 20 major and 50 - 70 local farm service-centers. This will involve working with Ministry and technical assistance staff in identifying appropriate locations and private entrepreneurs, working with Bank and Ministry staff to develop credit procedures, loan terms and applicant eligibility and providing, with Ministry and technical assistance staff, service-center operators with assistance in staff training, financial management, spare parts procurement and control and other areas necessary to place the centers on a sound management and financial footing. Experience as a service manager or equivalent at the distributor level or operator of a moderately sized farm equipment repair center is required. A college degree in agriculture and previous overseas experience is desirable. Experience in the use or extension of credit is also highly desirable. Extensive travel will be required.

G. Repair Service Advisor

The Advisor will assist in developing performance standards for farm machinery service-centers, in establishing a spare parts catalogue and availability information service, in facilitating the flow of imported or locally fabricated spare parts to repair shops and in training Ministry personnel and mechanics/farmers in machinery maintenance and repair. The Advisor will also have primary responsibility for working in the cooperatives to develop and carry out financial and other plans for maintaining their equipment using private service facilities. A college degree and previous overseas experience is desirable but a strong working familiarity with farm machinery and experience as a "service technician" is more important. Extensive field travel will be required.

H. Agricultural Engineering Specialist

As a member of the Machinery Management Extension staff the general Agricultural Engineering Specialist will assist and advise on those elements of the extension program dealing particularly with farm, irrigation and drainage equipment.

S/He will work directly with farmers and Ministry personnel in demonstrating equipment use, maintenance and repair. S/He will assist in developing technical and farmer training materials and in planning appropriate extension programs. The incumbent must have a B.S. in Agricultural Engineering or Agricultural Mechanization and experience with farm machinery, irrigation, land leveling and drainage equipment. Experience in extension and private custom operations is desirable. Prior experience in a developing country will be an advantage. A willingness and ability to undertake extensive field travel in Egypt is required.

I. Water-Lifting Specialist

Working with other members of the Machinery Management Extension Team, this individual will be responsible for developing a program that will encourage and assist farmer groups to utilize more efficient water-lifting methods. The incumbent's primary role will be to determine appropriate motivational techniques and to train Ministry staff in how to utilize these techniques in convincing farmers and groups of farmers to replace animal and hand-powered water-lifting devices with mechanical devices. S/He will also need to work closely with the Agricultural Bank in developing lending criteria and loan terms for water-lifting loans to be made from a special credit fund established partially for this purpose. The incumbent must have a B.S. degree in Agriculture, have sufficient maturity to gain easy acceptance by Egyptian colleagues and farmers and be willing and able to travel extensively. Prior experience in a developing country is desirable.

J. Extension Education Specialist

As a key member of the Machinery Management Extension Team the Extension Education Specialist will advise and assist Ministry staff in developing and implementing farmer extension education programs. This will involve developing materials, training aids, and appropriate extension methods and training Ministry staff in how to use them. The incumbent must have at least a B.S. in Extension Education or equivalent and extensive experience in working with farmers. S/He must have prior experience in developing areas of the world and be willing and able to undertake extensive field travel. S/He should also have a demonstrated ability to improvise to meet new situations.

K. Farm Management Advisor

The Farm Management Advisor will operate as part of the Machinery Management Extension Team. S/He will be responsible for providing the farm management component in the extension programs conducted. This will include analyzing the operations of individual farms, developing accurate projections of farm machinery costs and returns, determining credit needs and formulating economic and cash-flow porjections for single farms or

groups of farms. The individual must have a minimum of a B.S. in Agricultural Economics with a major in Farm Management. An M.S. is preferred. S/He must have experience in farm management extension or supervised credit. Previous overseas experience is desirable. A willingness to engage in considerable travel is also necessary.

L. Small Manufacturer Advisor

The Small Manufacturer Advisor will advise and assist Ministry staff in working with local manufacturers of farm equipment to expand the range of items produced and to increase their production efficiency. S/He will also be expected to provide a major input into the development of a Scope of Work for a Small Manufacturing Study Feasibility Team and to monitor Team progress while the study is underway. The individual should have a B.S. in Agricultural Engineering, Industrial Engineering, or an equivalent field. S/He must have a broad knowledge of manufacturing techniques, raw materials procurement, product sales and service and dealer development. Experience working with a small manufacturing plant and in the extension of farm machinery would also be useful. Prior overseas experience would be useful. A willingness to engage in extensive travel is required.

M. Agricultural Engineers--Drainage, Subsoiling, Land Leveling

Attached to the Soil Amelioration Organization the two Advisors will assist the organization in inaugurating a program in Middle Egypt. One advisor will focus on operations currently performed by the SAO--subsoiling, drainage and gypsum application--and the other on planning and implementing a program in precision land leveling. A joint effort will be required to establish necessary equipment maintenance and repair facilities and in developing necessary administrative management and capabilities in the new office. Both will work closely with Machinery Management Extension personnel in implementing on-farm programs. A minimum of a B.S. degree in Agricultural Engineering is required for both advisors. Experience in drainage and irrigation methods and land leveling is also desirable. One advisor should have some experience in maintenance/repair shop operations. Both should be willing and able to travel and be prepared to reside outside of Cairo.

N. Short-Term Advisors

Approximately 17 work-months of short-term assistance will be provided. The mix of skills and specific responsibilities will be determined by the Project Co-Director in cooperation with AID. It is anticipated that the most important use will be for evaluation. Five months of assistances are included in FY 80 for a logistics specialist to assist in procurement of commodities.

THRESHOLD DECISION BASED ON INITIAL ENVIRONMENTAL EXAMINATION

Project Location : Egypt

Project Title : Agricultural Mechanization (0031)

Funding by Fiscal Year : FY 79: $ 21 Million
FY 80: 15.5 Million
FY 81: 1.5 Million
FY 82: 2.0 Million

Life of Project : $ 40 million

IEE Prepared by : Jennifer Bremer Date: July 10, 1979

Environmental Action Recommended : Negative Determination

Mission Decision : APPROVED: _____

DISAPPROVED: _____

DATE: 7/26/79

Near East Bureau Decision: APPROVED: _____

DISAPPROVED: _____

DATE: _____

Clearances:

Acting/Environmental Coordinator: _____ Date: 7/16/79

Legal: _____ Date: 7/18/79

Ag: _____ Date: 7/16/79

DD: _____ Date: 7/19/79

INITIAL ENVIRONMENTAL EXAMINATION
NARRATIVE DISCUSSION

Date: July 10, 1979

1. Project Location: Egypt

2. Project Title : Agricultural Mechanization (0031)

3. Funding:

FY 79 :	$ 21 Million	FY 81 :	$ 1.5 Million
FY 80 :	15.5 Million	FY 82 :	2.0 Million

4. IEE Prepared by : Jennifer Bremer

5. Environmental Action Recommended: Negative Determination

6. Discussion:

The Project will address the needs of the Egyptian farmer for improved access to power for agricultural work by increasing the effectiveness of GOE programs in the area of farm mechanization. Specifically it will a) improve GOE planning and evaluation capacity, b) establish a network of service and repair facilities, c) create an institutional capacity to develop and test agricultural machinery, d) expand activities in land leveling and soil improvement, and e) strengthen provision of information to farmers and machinery operators through extension activities, machinery introduction, and training.

Project impact on the environment is expected to be primarily positive, although minor negative consequences are also foreseen. The Project will affect the environment by: a) changing tillage practices, b) increasing the use of internal combustion engines, c) expanding local machinery servicing activities, d) indirectly reducing the livestock population, e) subsoiling and encouraging gypsum applications, and f) changing the means of lifting water. This is expected to result in a minor increase in air and general environmental pollutants in the fields and, to a lesser extent, in the villages. The levels involved will not have a discernible impact in the rural environment. Changes in tillage will be primarily beneficial, although care will be required to prevent an increase in erosion. The reduction in livestock is expected to be minor and in any case constitutes an improvement in the rural health environment. Appropriate technical assistance will be provided to ensure that mechanized pumping does not lead to over-watering. The subsoiling and gypsum application will improve drainage and soil salinity. The subsoiling poses no threat to archeological or cultural sites. Activities are concentrated in Old Lands areas, and do not involve disturbing strata more than 70 cm. below the surface. Information on this concern will be provided to Egyptian authorities.

The direct environmental effects of the Project are thus expected to be minor. In general, the Project will not introduce new technologies with the potential for environmental damage. The improved soil and water management made possible by mechanization will have important environmental benefits. The potentially negative impact of increased use of existing technologies will require close monitoring of project activities. Plans for this monitoring are fully detailed in the project paper. Extensive further analysis prior to project implementation would not be fruitful, however, because the possible impacts are well known from experience in Egypt and elsewhere. Environmental analysis during implementation will concentrate on the following issues as well as others identified in progress:

a. Impact on soil quality, erosion, and water table.

b. Increase in noise and air pollution.

c. Impact of expected reduction in animal numbers.

d. Impact of local farm machinery manufacturing and service industries.

As the development of firm plans progresses during project implementation, the environmental consequences of each component will be further evaluated. The project paper presents the preliminary results of evaluation to date and specifies the needs for continuing information gathering and analysis throughout the life of the Project. This ongoing environmental evaluation will monitor environmental impact to permit project managers to forestall negative environmental consequences of project activities.

IMPACT IDENTIFICATION AND EVALUATION FORM

Impact Areas and Sub-areas[1]	Impact Identification and Evaluation[2]
A. LAND USE	
1. Changing the character of the land through:	
a. Increasing the population	N
b. Extracting natural resources	N
c. Land clearing	L
d. Changing soil character	M
2. Altering natural defenses	L
3. Foreclosing important uses	N
4. Jeopardizing man or his works	N
5. Other factors	
B. WATER QUALITY	
1. Physical state of water	L
2. Chemical and biological states	N
3. Ecological balance	N
4. Other factors	
Improved water management	M

1/ See Explanatory Notes for this form.

2/ Use the following symbols:
N - No environmental impact
L - Little environmental impact
M - Moderate environmental impact
H - High environmental impact
U - Unknown environmental impact

IMPACT IDENTIFICATION AND EVALUATION FORM 2

C. ATMOSPHERIC

1. Air additives	N
2. Air pollution	L
3. Noise pollution	L
4. Other factors	

D. NATURAL RESOURCES

1. Diversion, altered use of water	L
2. Irreversible, inefficient commitments	L
3. Other factors	
Improved land-use practices	M

E. CULTURAL

1. Altering physical symbols	N
2. Dilution of cultural traditions	L
3. Other factors	
Reduced use of child labor	L

F. SOCIOECONOMIC

1. Changes in economic/employment patterns	L
2. Changes in population	N
3. Changes in cultural patterns	L
4. Other factors	

IMPACT IDENTIFICATION AND EVALUATION FORM

G. HEALTH

1. Changing a natural environment — N
2. Eliminating an ecosystem element — N
3. Other factors
   - Reduced health hazards in work environment — L
   - Reduced exposure of children to health hazards — L

H. GENERAL

1. International impacts — N
2. Controversial impacts — L
3. Larger program impacts — M
4. Other factors
   - _____ _____
   - _____ _____

I. OTHER POSSIBLE IMPACTS (not listed above)

_____ _____

_____ _____

_____ _____

611(e) Certification

The proposed project does not fund construction of physical facilities, with the exception of upgrading private service-centers. Substantial capital equipment and loan funds are provided, however, to establish new programs in support of agricultural mechanization.

A substantial portion of these resources will be channeled to the private sector, including funding establishment or improvement of privately-owned service-centers and provision of pumps and other equipment to small farmers. Private sector ability to utilize and maintain resources provided is adequate, particularly in view of the amounts involved. Other activities, however, will focus on public sector provision of goods and services. The three components that involve significant new activities for the GOE are 1) the Research and Development Center, 2) Soil Improvement, and 3) Planning and Evaluation.

1) Research and Development. The Center, to be located in a renovated facility currently operated by the Ministry, will receive substantial technical assistance to ensure that staff can maintain equipment. The Undersecretariat attaches a high importance to this activity and, from the beginning of the Project, will be required to provide operating expenses. Replenishment of research grant inputs is somewhat more problematical, but it is believed that, once the benefit of university and private research is demonstrated, additional funds will be made available. Sale of equipment under the machinery introduction activity may also be used to maintain the grant program.

2) Soil Improvement. The equipment provided will be used to provide a service to farmers for which they will pay a large share of the cost. The Executive Authority for Land Improvement Projects (SAO), however, does not receive farmer payments and is dependent on a budget allocation. Due to high level concern with the rapid deterioration of Egypt's critically important soil resources, the Authority has been increasingly effective in its bids for adequate fiscal support. This situation is expected to continue. Technical ability to utilize equipment provided is ensured by the SAO's past experience with similar equipment and the substantial technical assistance provided.

3) Planning and Evaluation. Establishment of the Planning and Evaluation Unit is part of a joint GOE-donor effort to increase planning in the agricultural sector, to which the GOE, AID and other donors are firmly committed. The Unit will be staffed by current GOE personnel and operating expenses will be met wholly by the GOE. Thus, continued support for the Unit will be well-institutionalized by Project completion.

In view of the above, I hereby certify that the GOE has the capacity effectively to utilize and maintain the Project.

Donald S. Brown
Director

ANNEX XV

Brief Description of Implementing Organizations

I. Department for Agricultural Mechanization and Engineering Affairs - Ministry of Agriculture

This Department is headed by an Undersecretary and is one of the major divisions in the Ministry of Agriculture. The Undersecretary reports directly to the Minister. In general terms the Department is responsible for overseeing and implementing agricultural mechanization projects of the Ministry, for providing agricultural and civil engineering expertise throughout the Ministry, for construction, maintenance and repair of Ministry buildings, for the maintenance and repair of all Ministry vehicles, for handling external procurements of equipment and spare parts for various Ministry organizations and for operating the Tractor and Agricultural Equipment Testing Station. In addition the Undersecretary serves as Chairman of the Supreme Council on Mechanization, the overall mechanization policy group.

As shown in the attached Chart 1 the Department is divided into two major divisions. The Division for Agricultural Engineering handles all engineering services related to agricultural mechanization, monitors agricultural mechanization projects, performs all electrical and mechanical works for the Ministry, operates workshops for repair and maintenance of vehicles and equipment, provides support and administrative services, oversees the manufacture of certain equipment items in Ministry facilities and procures, from local and foreign sources, spare parts, vehicles, equipment, etc.

The Division for Civil Engineering is concerned with planning and implementing all Ministry activities which involve civil engineering. This includes building design, procurement of construction materials, preparation of cost estimates and tenders, overseeing or carrying out construction works, and maintaining links with engineering groups in other Ministries.

Also directly under the supervision of the Undersecretary is the Agricultural Equipment Research and Testing Station. The station is responsible for conducting performance and suitability tests of farm equipment, conducting research on ways of improving and adapting equipment to Egyptian conditions and designing new equipment for Egyptian agriculture.

In addition to the routine or normal responsibilities indicated above the Department oversees several projects. These are as follows:

	Period of Execution	Financial Value
- Agricultural Mechanization Development Project in Sohag and Menufia Governorates (IBRD)	4 years	32,000,000
- Project for Transplanting Rice Mechanically (Japan)	5 years	5,000,000
- Project of USAID FOR Small Scale Agricultural Activities	5 years	1,700,000
- National Planning Project for Agricultural Mechanization with USAID	5 years	40,000,000 (this project
- Project for Renewal and Replacement of Workshop and Scientific Equipment on Experiment stations	yearly	700,000
- Project for Establishing Equipment Service Stations in ten Governorates	--	--

To meet the indicated responsibilities the Department has the following staff:

Personnel	Division of Agricultural Engineering (number)	Division of Civil Engineering (number)
Professional Engineers	77	31
Agricultural Specialists	27	--
Engineering Technical Staff	77	40
Agricultural Technical Staff	5	--
Clerical & Administrative Staff	141	28
Skilled Workers	743	7
Support Staff	96	14

The 1979 budget of the Department is as follows:

	Agricultural Engineering	Civil Engineering
Salaries and Wages	LE 600,000	LE 200,000
Incentives and Per Diems	30,000	20,000
Maintenance	60,000	70,000
Repairs & Renewals (Vehicles)	300,000	--
Machines (or equipment) and Preparation	150,000	--

Not reflected in the above figures are the annual workshop volume of roughly L.E. 275,000 and the overseeing by the Department of 1979 expenditures of L.E. 352,000 for electrical works and L.E. 1,029,000 for civil works. The Department is also engaged in the following procurements:

1.	Tractor spare parts, rubber tires, and miscellaneous equipment for private sector and cooperative societies		LE 1,430,000
2.	Equipment and tools, sprinklers, spare parts and hoses		1,152,225
3.	Agricultural tractors for cooperative and Egyptian Agricultural organizations	800	1,858,157
		200	393,447
		500	1,172,493
4.	Miscellaneous agricultural equipment		900,000
5.	200 units of movable irrigation equipment for the Agricultural Bank		50,000
6.	Canal construction and cleaning equipment for the General Authority for Land Improvement Activities		219,000
7.	Equipment for collecting and squeezing grapes and equipment for fertilizer application (El-Kroom Co.)		228,000
8.	Iron machines and equipment		485,000
9.	Pickup vehicles (American CID Loan)		1,235,000

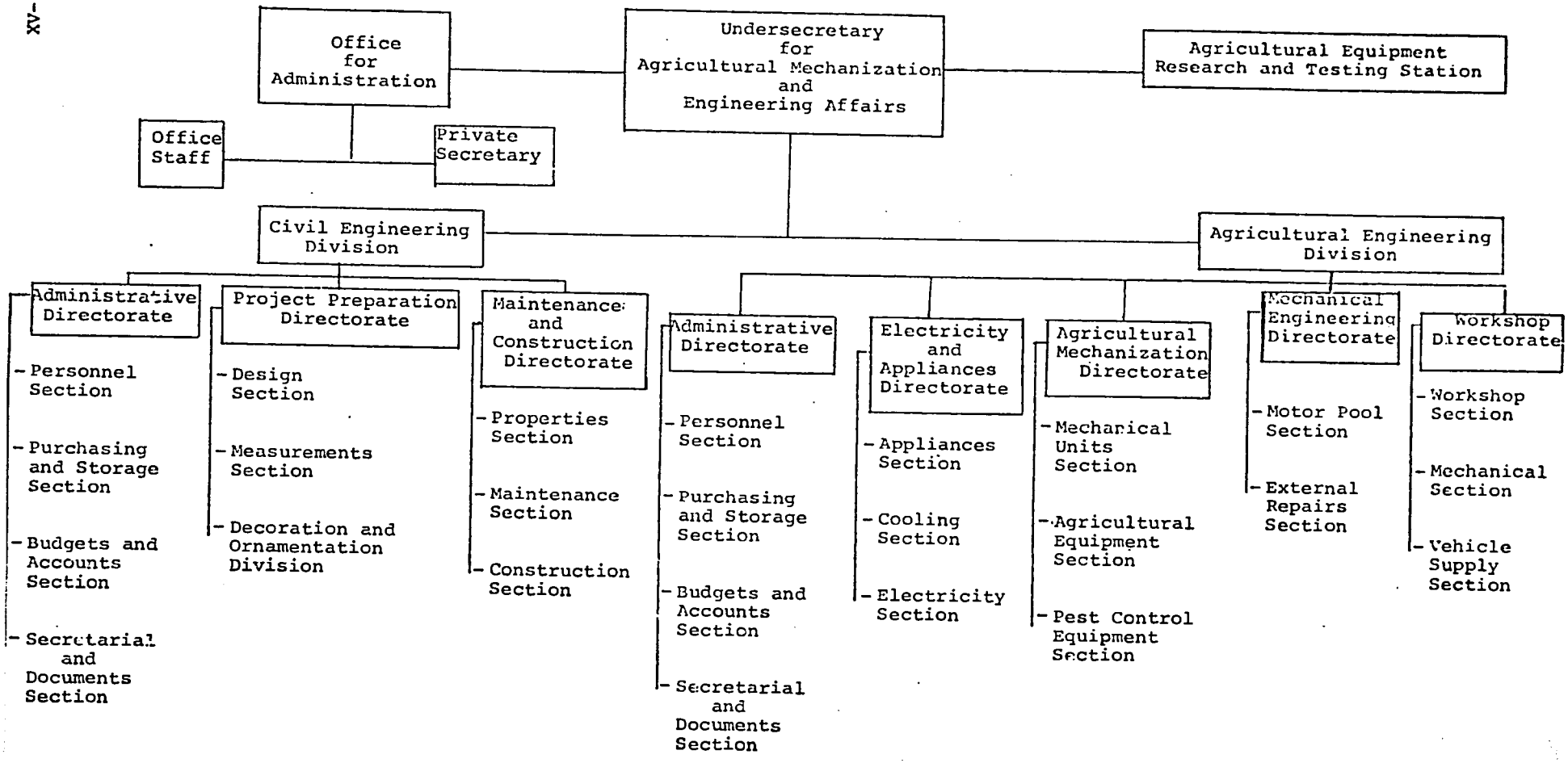
It is expected that the Project will work most closely with the Directorate for Agricultural Mechanization under the Division for Agricultural Engineering. This Directorate: a) Provides maintenance and repair service for agricultural equipment and tractors of the Ministry and monitors the repair and administration of agricultural equipment, including tractors, owned by the agricultural cooperative societies; b) provides maintenance and repairs for Ministry cars, (trucks) and motorcycles in all agricultural districts; c) provides maintenance and operation training for agricultural equipment and tractors; and d) procures spare parts and tires from abroad for agricultural mechanization equipment, vehicles and tractors (as shown above).

Comment

The current orientation of the Agricultural Mechanization and Engineering Department is directed heavily toward repair, maintenance and service functions. Only through equipment procurement and the projects has the Department exercised much leadership in determining the pace and type of farm mechanization. Partially this stems from the recent past when the Department was largely an executing or support body for programs planned elsewhere. Another factor in the concentration of decision-making authority at the highest level and the lack of a real planning and analysis section within the organization. Clearly the Department must expand its horizons and capabilities if it is to perform the roles which seem appropriate for the organization with chief responsibility for agricultural mechanization in Egypt. The proposed AID inputs seek to support what is viewed as expansion in the proper direction. Without assistance at the top via the Planning and Evaluation Group it is unlikely the Department could effectively implement the complex project proposed.

Chart 1

DEPARTMENT OF AGRICULTURAL MECHANIZATION AND ENGINEERING AFFAIRS



II. Executive Authority For Land Improvement Projects[1/]

A. History:

In the 1960's the Soils Department of the Ministry of Agriculture was the only organization responsible and contributing to soil improvement. Individual complaints from farmers concerning the deterioration of their soils were received. Investigators visited the farmer, examined the soils and then tested soil samples in the laboratory to determine the treatements needed. Based the subsequent report necessary soil amelioration activities were carried out by the farmers themselves.

In 1967 based on three pilot studies a program of open field drains, subsoiling and gypsum application for the improvement of low productivity soils in the Lower Delta was started under the direction of Soils Department Authorities. The program was expanded to a large scale pilot effort on 15,000 feddans in 1969, then to 23,000 in 1970 and finally to 35,000 feddans in 1971. Encouraged by farmer reception and success of these programs the government issued a Decree establishing a general organization named the Executive Authority for Land Improvement Projects. The Authority is now directed by M.Azmi Abou Hussen, a dynamic, energetic and qualified individual who reports directly to the Ministry of Agriculture and has Deputy Minister rank.

B. Description:

The Authority consists of four main Departments as shown in the attached chart. The first is the Research and Planning Department which does overall activity planning and includes ten laboratories for analyzing soil samples collected in areas where activities are to take place. The second is the Agriculture and Soils Department which is responsible for performing the amelioration processes recommended by the study department, i.e. open field drains, clearing of main drains, subsoiling, deep ploughing, molling or gypsum application. The other two Departments are Engineering with responsibility for field engineering and maintenance of equipment and Administration.

1/ Also called the Soil Amelioration Organization (SAO) in the Project Paper.

In carrying out the indicated activities the Authority has the following staff and equipment fleet:

STAFF

Specialization	Regular	Seconded Staff	Total
Agricultural Engineers	189	811	1,000
Civil & Mechanical Engineers	57	93	150
Engineering Technical Staff	83	267	350
Administrative Personnel	286	114	400
Skilled Personnel	193	207	400
	808	1472	2300

EQUIPMENT

Item	Number
130 hp. tractors	
Eicher (new)	24
Fiat (2 years old)	50
65 hp. tractors	
UTS (4-10 years old)	120
Miscellaneous (old)	50
70 hp. digger-loaders	
JCB	25
Allis Chalmer	3
Land Planes - 14 ft.	3
Doudi Ditchers	52
Subsoilers, 2 time mounted	92
Subsoilers, 1 time mounted	100
Trailers	25
Gypsum Spreaders	18
Track type tractors	
MF (100 hp.)	2
MF (160 hp.)	1

In 1978 the Authority expended LE 4,762,000 (see below). The 1979 budget is LE 6,500,000 with an expectation it will be raised to LE 10 million in 1980.

Operating Expenditures (1978)

Salaries	LE 428,000
Operating Costs	220,800
Total	LE 628,800

Investment Expenditures (1978)

Construction	LE 1,839,000
Equipment	1,394,000
Transportation	56,000
Inputs	675,000
Salaries	150,000
Total	LE 4,114,000

C. Operating Plans and Methods:

Amelioration processes are carried out at the request of individual farmers living within the geographic areas selected for work by the Authority.

The costs of the soil amelioration work are repaid by the farmers over 10 years. Repayment starts one year after completion of the work with payments collected by the Agricultural Bank and going back to general government revenues. Interest of loans is borne by Government.

The present charge for subsoiling is LE 3. The farmer pays the actual cost of gypsum, 81 piasters per ton while the cost of hauling is absorbed by the government. Usually gypsum is prescribed at a rate of 3-6 tons per feddan for alkaline soils. Ditching costs about LE 15.00 per feddan. Subsoiling is done 120 days per year and ditching is done over a 3 month period, 6 days per week.

On the basis of experimental data it appears that subsoiling has an effect for about two years. Gypsum application have little effect immediately but at the end of two years are important. The gypsum treatment may last four to five years and perhaps longer providing the drainage continues to function effectively. Drainage will last 15 to 40 years.

Through 1978 all the efforts of the Authority were concentrated in the Delta with about 610,000 feddans ameliorated. In 1979 plans call for the amelioration of 225,000 feddans, of which about sixty percent will be subsoiled. The Authority for the first time also proposes to expand activities to the Middle Egypt governorates of Beni-Suef and Minia. In addition to work in cultivate areas the Authority is engaged in reclaiming and preparing 30,000 feddans in the Lower Delta for sugar best production. Finally, it is planned to study reclamation of a desert area in Minia governorate.

D. Comment

The Authority has the advantages of dynamic leadership, some enthusiastic staff and a growing concern in Egypt with the types of drainage and salinity problems which the amelioration activities address. Consequently the Authority is an expanding body. However, the organization seems to have equipment management and repair difficulties in addition to suffering from certain equipment shortages. Also the fact that all work, except that performed on contract for private companies, is done on credit with repayments going via the Agricultural Bank to the treasury does not provide much direct incentive to

maxamize areas covered. In land leveling the Authority has little real experience. Their activities do not qualify as precision leveling of the type necessary to really improve water use.

Expanding into Middle Egypt and adding a land-leveling element will obviously tax authority capability. The basic technical competence of the personnel and their eagerness to get on with the job should enable the proposed assistance to be used effectively.

Chart 2

Executive Authority For Land Improvement Projects

Chairman

- Public Affairs
- Administration and Management
- Legal Affairs
- Follow-up & Supervision
- General Supervision
- Technical Office

Financial, Administration Dept.

1. General Division for Financial Affairs
2. General Division for Administrative Affairs

Engineering Affairs Dept.

1. General Division for Field Drainage And Civil Engineering
2. General Division for Mechanical Engineering

Agricultural Soils Department

1. General Division for East Delta Agriculture and Soil Department
   a. Soils Section
   b. Civil Engineering Section
   c. Mechanical Eng. Section
   d. Administration, Financial Section
2. General Division for Middle Delta (as above)
3. General Division for West Delta (as above)
4. General Division for Middle Egypt (to be established)
5. General Division for Upper Egypt (to be established)

Research, Planning Evaluation Departmen

1. General Division for Applied Rese
2. General Division for Evaluation a Planning.

III. The Principal Bank for Development and Agricultural Credit:

A. History:

The Agricultural Credit Bank of Egypt was established in 1931, marking the start of institutional credit in rural Egypt. The Bank was incorporated with a share-capital of one million pounds divided between the Government (51%) and a number of commercial banks, land banks and individuals (49%).

In 1948, the Bank was transformed into a cooperative and renamed the Agricultural Credit and Cooperative Bank. With the growth of the Cooperative movement, a source of credit suitable to finance cooperative operation was needed. The Bank's capital was increased to LE 1,500,000 and half of the increase was subscribed to by the cooperatives while the other half went to the Government.

In 1964, the Bank was converted into a Public Organization bearing the name of the Egyptian General Organization for Agricultural Cooperative Credit and the Governorate Branches were made autonomous Agricultural and Cooperative Credit Banks with Branches at each District.

The Bank was reorganized as the Principal Bank for Development and Agricultural Credit (PBDAC) by the passage of Law No. 117 in 1976.

B. Description:

The principal components of the PBDAC are:

1. The Principal Bank for Development and Agricultural Credit, situated in Cairo, is a holding bank which takes the form of a public authority whose share-capital is 100% State owned. Its functions are: (a) to undertake the central planning of agricultural credit and rural development financing in accordance with the State's policy and in coordination with the concerned Government Authorities; (b) to follow up and supervise the implementation of such plans; (c) to provide funds required for financing the credit and development programs; and (d) to make available all farming inputs (seeds, fertilizers, pesticides, pest control, equipment, jute bags, feeds).

2. The Development and Agricultural Credit Banks have their head offices in the capital towns of the various Governorates. The 17 BDAC's have a network of 150 Branches, approximately 740 Village Banks and over 4,200 Agencies. The share-capital of each Governorate Bank is wholly owned by the Principal Bank. The tasks of the Governorate Banks are: (a) to lend to farmers; (b) to give loans to cooperative societies for all their activities; (c) to promote rural development by issuing credit and providing banking services; and (d) to create or participate in companies, firms and projects with an objective to develop agricultural production and allied economic activities.

3. The Village Banks and their Agencies are the base of the rural development and agricultural credit system, with a network covering the whole country. Their objective is to finance the rural economy and to provide the banking services required for its promotion.

The task of financing encompasses: (a) issuing credit - in cash and in kind - to farmers so that they may conduct their usual farming operations; and (b) providing funds required for development.

Additional banking se[illegible]es provided include: (a) the full range of standard banking operations such as current accounts, cheques, bills of exchange, letters of credit, etc.; and (b) capital mobilization through savings and deposits accounts for subsequent use in development plans.

The system followed in providing short-term Agricultural Credit is as follows:
The Village Bank establishes well before the beginning of each farming season (Winter, Summer, or Nili) the input allotments per acre in collaboration with the technical staff of the Ministry of Agriculture and according to the needs of the soil and the crops.

The only formality the farmer has to perform is the submission at the start of the farming year (October) of an application showing his holdings and cropping plan. These details are checked against the Village Bank records and then approved or corrected.

The loans given for crop production are short-term loans not exceeding 14 months. The borrower must hold cultivated land either as an owner or a tenant. This condition ensures that the loans are used in production since the crops guarantee the loans. The borrower must adhere to the presented cropping pattern and should have a good repayment record. The major part of the crop production loans is given in kind (seeds, fertilizers,

pesticides, jute bags) while only a small part is given in cash. Repayment of loans is timed to coincide with the sale of crops. The farmer repays in cash to the Village Bank or his debt may be deducted from the proceeds of the crops when marketed through the government. Defaulters without plausible cause are charged a penalty interest and denied credit for the following season. The Village Bank can also attach and seize the crops. If the default results from crop failure, the debt can be rescheduled.

The Village Banks help the farmers to modernize farming by giving them loans for the following purposes:

a. Mechanization of Farming:

The Village Banks give farmers loans to acquire tractors and related implements, and to purchase pump sets, and transportation equipment. Such loans are medium-term, recoverable over a period of up to 5 years. This type of credit is available to individual farmers, groups of farmers and cooperative societies provided that the holdings are big enough to ensure economical operation of the machines.

b. Soil Amelioration:

Loans are given to farmers in order to better the irrigation and drainage of the land as well as treating the soil to improve its fertility.

c. Other:

Several projects in livestock and poultry have also been financed by the Village Banks. Future plans include setting up integrated projects for agro-industry.

The development of rural communities requires that new projects be set up in order to create new jobs for farmers to dissuade them from leaving the villages for cities. On the other hand, farming is increasingly taking the form of commercial enterprise. Both trends require expanded banking services in the villages such as current accounts, bank cheques, letters of guarantee, etc.

The Village Banks also make it a point to encourage capital mobilization. Various means are used to achieve this goal.

1. Savings Accounts, which have simple procedures and offer up to 5.5% interest.

2. Notice Deposits, offering a higher rate of interest, but requiring one month's notice for fund withdrawal.

3. Time Deposits, of three months or more.

The savings accounts and the deposit accounts with the Village Banks enjoy the following privileges: (a) interest on these accounts is tax exempt and (b) funds cannot be seized or attached for any reason, including debt to the Bank.

Summary information on bank activities is provided in the following table.

C. Comment:

The PBDAC has made impressive progress in establishing an agricultural credit system, yet problems remain in the areas of loan funds, lending procedures, management and facilities. Partial or full solutions to some of these problems will come from the AID supported Small Farmer Production Project, others from a World Bank project to assist the Bank. This assistance and the size of the current lending program, in excess of $140 million annually, lead the Mission to believe that the Bank will be able to handle effectively and with little difficulty the additional funds proposed. The Bank is eager to handle the funds and no problems are foreseen in establishing lending criteria and terms - which may in fact follow normal Bank practices. The Water-lifting Specialist and the Planning/Financial Officer will also be available to assist the Bank in carrying out its identified responsibilities.

Table XV-1

Summary Data on Bank Activities

(LE '000 unless indicated otherwise)

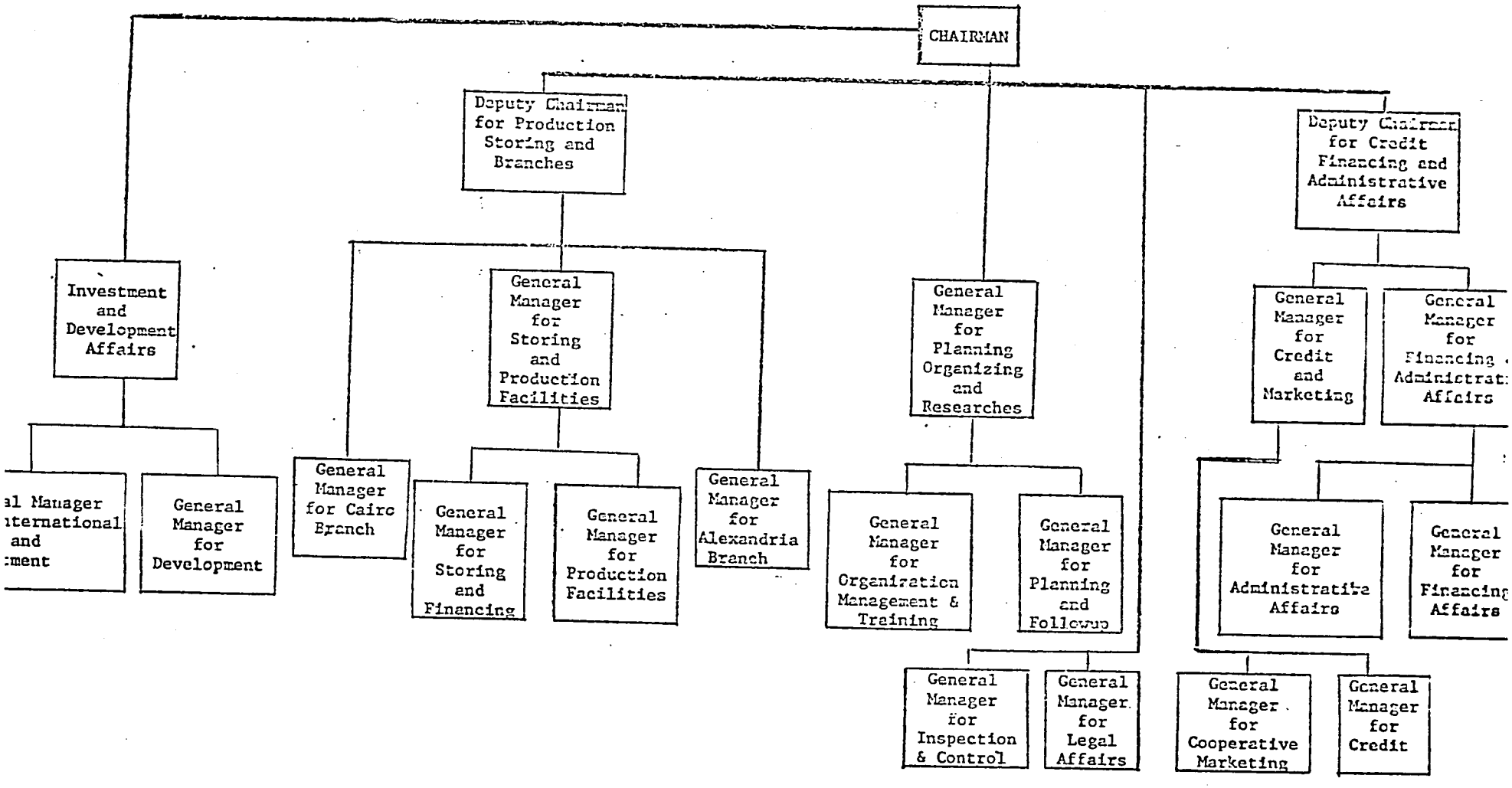
Activity	1975	1976	1977 3/	% increase (75-77)
Short-term Loans				
In-kind	49,243	51,947	59,699	21.2
Cash	29,252	39,191	40,966	40.0
Total	78,495	88,133 1/	100,665	28.2
Development Loans				
Short-term	2,823	10,427	14,400	410.1
Medium-term	709	2,224	3,364	374.5
Total	3,532	12,651	17,764	402.9
Deposits and Savings	0	0	31,707	-
Loan recovery rate (%)	74	79	81	9.5
Bank Profitability				
Revenues	NA	31,540	52,145	65.3 2/
Expenditure	NA	31,208	40,489	29.7 2/
Surplus	NA	331	11,656	3421. 2/
Input Distribution				
Fertilizers ('000 tons)	NA	NA	1,816	
Seed and oil cake ('000 tons)	NA	NA	835	
Sacks ('000 pieces)	NA	NA	34,700	

Source: PBDAC, Report on the Balance Sheet of the Principal Bank

1/ Error in source
2/ Increase (76-77) only
3/ As of Dec. 19, 1977

ANNEX 13

PRINCIPAL BANK FOR DEVELOPMENT AND AGRICULTURAL CREDIT



IV. Bank Misr 1/

Bank Misr was established in 1920. It is the largest bank in Egypt with approximately 200 branches encompassing 25 governorates. In 1965, the Bank became a joint stock company with all of its shares held by the Central Bank of Egypt. It is managed by a nine-member board, all of whom are its employees. The Chairman, Vice Chairman and three other directors (senior officials of the bank) are appointed by the President on recommendation of the Governor of the Central Bank of Egypt. Although 100% government-owned, the bank is operated as a private, commercial bank without interference. Bank Misr is in excellent financial condition, its resources deriving almost entirely from deposits, capital, reserves and provisions. It is reportedly in a position to finance any sound project presented to it for study. Its lending policies are conservative and according to reliable sources of information, its loans are based on sound appraisal and review processes.

Recently, an agricultural department was organized, primarily for the purpose of administering a World Bank Loan of about LE 34 million. This department makes loans to large speciality operations such as those for fruit, vegetables and sugar cane. These loans cover machinery, equipment and capital items, but are bulk loans rather than for individually specified items.

Substantial loans are made for imports, to processors, merchants, marketing organizations and equipment dealers. Such loans are made on a short-term basis (up to one year) but are renewable from year-to-year as warranted. Interest rates are from 11-13%. Officials indicated that if USAID or other foreign government proposed a special fund for upgrading dealerships and service centers, the bank would like to handle such funds. If they were for agricultural purposes, they would likely be serviced by the new agricultural department. The bank prefers to serve agriculture through indirect loans, and appears to have no interest in small farmer loans.

1/ Bank Misr may handle the service center loan fund. However, the final decision will not be made until after the arrival of the technical assistance team.

Annex XVI

Study Team Methodology, Recommendations and Mission Modifications

This Annex describes the feasibility study examining the question of mechanization in Egypt conducted by the ERA 2000 Study Team. The 16-person team was in the field for approximately 6 months beginning in June 78 and completed their work in March 1979. They recommended an 11-point program with a total cost of $78.7 million. The project proposed in this paper is based on those recommendations but, for reasons discussed below, the Mission advocates a more modest approach to mechanization at this time.

A. Team Methodology

The analytical methodology employed by the feasibility team consisted of four, largely sequential phases. The first was essentially data collection and analysis consisting of: (1) farm level surveys to ascertain the current pool of tractor-powered equipment, attitudes regarding mechanization and use of mechanical power in current farming practices, and the identification of where additional mechanization could contribute to farm income and national production goals, (2) a review of secondary data on mechanization in Egypt, (3) a technological review of the potential functional contributions of tractors and other equipment, (4) estimation of program research, developmental and service requirements, (5) identification of, and estimation of scope of, new program elements, and (6) estimating demand requirements for equipment.

The second phase consisted of formulating a potential project including various components suggested by the first phase of work. The third phase consisted of the economic, financial and social soundness analysis of those identified components that were suitable to such analysis. The final phase was the presentation of project recommendations.

B. Recommendations

The project components and funding levels recommended in

"Further Mechanization of Egyptian Agriculture" are as follows:

1.	Tractor Provision	$ 30,000,000
2.	Land Improvement Equipment Provision	4,681,000
3.	Loan Fund and Related TA/Support Costs to Replace Animal-Powered Water Wheels	16,065,000
4.	Machinery Management Extension (TA/Support)	5,705,000
5.	Loan Fund and Related TA/Support Costs for Service Center Development	5,329,000
6.	Research and Development Center Establishment and Funding	3,830,000
7.	Loan Fund and Related TA for Modernization of Local Farm Equipment Manufacturing Plants	8,000,000
8.	Introductory Imports of New Types of Farm Machinery	1,000,000
9.	Apprenticeship Training Program	1,599,000
10.	Short and Long Term Participant Training	1,403,000
11.	Planning and Evaluation	---------
12.	Technical Assistance Group 1/	1,134,000
	Total Program	78,746,000
	Less MOA contribution to shared local costs	226,000
	Recommended AID Assistance	$ 78,520,000

1/ Only team leader and support costs. Does not include TA funded in other components.

Each element recommended may be briefly described as follows:

1. Financing for the importation of the equivalent of 6,000 65-hp farm tractors during 1980-81

Team's analysis indicated that, based on current tractor inventories and a projected demand for tractors to meet a target of one-half of the long-run level of mechanization identified as optimal, the specified volume of imports would be required. Beyond 1981 requirements would be met by a local manufacturing plant.

2. Financing the importation of equipment for the Soil Amelioration Organization

Water logging and salinity are cutting yields over large areas. Research results indicate that subsoiling, the addition of gypsum and land leveling offer opportunities to affect yields quickly and dramatically. The Soil Amelioration Organization provides these services at cost to farmers, but with present equipment can only cover a small portion of the area that would benefit from such operations. The Team suggested that the capacity of the organization be doubled so that 300-400,000 feddans per year could be treated.

3. Establishment of a credit fund for the replacement of animal-powered water wheels with pumpsets and related technical assistance/local cost support

The study team found that sakias are an expensive means of lifting water in terms of losses of potential milk and meat production. Diesel or electric pumpsets are more economical, but inadequate credit supplies and organizational problems prevent small farmers from acquiring this capital asset. Placement of roughly 10,000 pumpsets would be a reasonable target. The TA/local cost support would assist in mounting a motivational/informational campaign to encourage farmers to organize themselves into efficient-sized user groups.

4. Machinery management extension programs (TA and support costs)

The existing pool of tractors and related equipment is poorly managed and inefficiently used. Crop production could be increased while production costs could be reduced by better machinery management. A six-unit joint task force

made up of U.S. and Egyptian experts in the areas of agricultural engineering (machinery), agricultural engineering (land and water use), agronomy, farm management, and extension methods was recommended to improve machinery management.

5. Establishment of a credit fund for the development of service centers and related technical assistance

Lack of local repair facilities and a chronic shortage of spare parts mean that equipment is often inoperable for excessive time periods. The credit fund would be used for loans on a concessional basis for 20 area centers, private or semi-private, and 50 local repair shops to meet initial operating expenses.

6. Establishment of a research and development center for agricultural mechanization including technical assistance and an applied research fund

Research in Egypt in the agricultural mechanization area is extremely limited and of almost no practical value. Using the existing facilities of the Tractor Testing Station at Alexandria, the Team proposed the development of a viable mechanization research center with responsibility for stimulating and coordinating applied farm mechanization research and for machinery development. An applied research fund would be capitalized to encourage and assist problem-oriented research, TA would be provided to help set up the center and commodities would be supplied to equip the center.

7. Establishment of a credit fund for the modernization of Egyptian farm equipment manufacturing firms and related feasibility studies and technical assistance

Optimum mechanization requires the utilization of a range of equipment. While Egyptian companies produce many of the equipment items required, they currently lack the capacity and the equipment development capability to meet a growing demand for a wider range of adapted items. The Team proposed relieving these constraints through a feasibility study to identify the exact manufacturers and requirements, a credit fund to finance plant expansions and technical assistance.

8. Machinery introduction

The range of agricultural machinery currently being utilized in Egypt is limited. Prior to eventual local manufacture it would be useful to introduce in strategic locations sizeable quantities of selected machines for demonstration and market development purposes.

9. Funding of an appreticeship training program for mechanics

There is a current shortage of skilled workers able to repair and make spare parts for tractors and other farm implements. As mechanization increases the shortage will likely worsen, unless additional personnel are trained, with negative effects on equipment utilization and agricultural production. One immediate market for trained mechanics is the machinery service centers in this project. The Arab Federation of Agriculture Workers is prepared to start a program of apprenticeship training. The proposed project component would support programs in 20 governorates with 20 trainees each year, in each receiving 11 months of training.

10. Participant training

To support the efforts in the various areas and to expose key individuals to the opportunities and world-wide experience in mechanization, a substantial training program was proposed over the 5-year period. Both U.S. and third-country training would be provided in machinery management, mechanization extension, service center operation, applied research, agricultural engineering and related fields. A total of 25 degree participants and roughly 200 non-degree participants would be trained.

11. Technical assistance advisory group (Team Leader plus general support)

To coordinate the diverse project activities and the joint task forces charged with implementing the activities, a central headquarters office was proposed. The Team Leader in addition to the above duties would also seek to establish an effective management information system through the establishment of a Planning and Evaluation Staff unit within the Undersecretariat for Engineering and Farm Mechanization.

C. Modifications of initial recommendation

The project proposed in this paper starts from the indicated components and funding levels. In the course of project development over a six month period by USAID, ARE and AID/W staff, however, numerous modifications have been made to reflect: (a) ARE priorities, and plans; (b) additional information supporting or failing to support study team conclusions; (c) absorptive capacity of implementing bodies; (d) feasible implementation scheduling; (e) USAID judgements and specific concerns; and (f) administrative constraints and arrangements.

The most significant modification is a decision not to fund tractor imports under the project. Although highly desired by the ARE, the high cost of U.S. tractors, probable allocation and procurement difficulties and remaining uncertainties over the incidence of costs and benefits have led the Mission to exclude this component. Second, effective tractor use will be conditioned on the establishment of certain other project components (service centers, machinery extension, etc.). Finally, current inventories will meet needs in the near term while over the longer term AID judgement is that the private sector should assume responsibility for tractor provision (import and/or manufacture) under market demand conditions. If in the future the private sector proves unable to perform this function and other issues are resolved, AID will be prepared to re-examine the question of import financing under project or CIP financing. Mission proposals regarding the other components, or alternative means of providing the required inputs or services, including proposed funding levels, are specified and discussed in the detailed project description and related Annexes.

The principal changes are as follows:

1. Consolidating related components and scaling them down to provide a more manageable package. Specifically, machinery introduction, training of machinery operators, and sakia replacement have been combined with machinery management. Sakia replacement has been pared down to a more modest level. Training for tractor drivers has been added to training for mechanics but the concept of an apprenticeship program through the Arab Federation did not prove feasible and has been dropped.

2. Planning and evaluation has been made a specific component, while the TAAG has been redefined as an input. Structurally, this involves placing the project more directly under the Undersecretary for Mechanization.

3. Upgrading of local manufacturing has been postponed pending results of the study, which will be undertaken as part of the planning and evaluation activity.

ANNEX XVII

Study Team Data Gathering Activities

The Feasibility Study Team conducted three surveys to determine the use of farm machinery, current machinery inventories and farmer attitudes towards mechanization.

Farm Management A survey was conducted through the University of Alexandria Agricultural Economics Department to determine the current farm management situation with regard to mechanization and related practices. Four hundred and six farmers in seven "cropping belts" were interviewed as to their ownership of machinery, use of labor, timing of operations, cropping mix, etc. This survey sheds light on several areas where data is otherwise extremely sketchy, but due to inadequacies in the methodology, the results obtained are not completely reliable. Wherever possible other sources have been used to supplement this data in developing the proposed project design.

Farm Machinery Inventory Roughly 4000 cooperative managers were asked to supply a wide range of data on farm machinery ownership and use in the villages to which they are assigned, including both privately-owned equipment and that belonging to the cooperative. Two thousand five hundred of the cooperative managers, who are MinAg employees, responded, half providing information on tractors and half responding to a different set of questions on other equipment. Data from these two surveys is included in the discussion of the current situation in Annex X.

Farmer Attitudes The principal activity under the rubric of social soundness analysis was a survey of 158 farm families in 9 villages distributed over Egypt. The survey gathered data on farmers' perceptions of the benefits of mechanization, their problems, and their knowledge and ownership of a variety of equipment. Not surprisingly the survey found that Egyptian farmers strongly favor mechanization and that larger farmers have greater interest in and knowledge of farm equipment use. The survey showed that farmers are particularly interested in pumps and tractors and believe that this equipment will increase their income as well as reducing drudgery, increasing leisure and education opportunities, and providing other benefits Farmers cited credit problems (inability to make down-payment, lack of credit, and high interest rates) as the principal barrier to their purchase of machinery and also registered a number of complaints about cooperative and custom providers of machinery service.

Annex XVIII

Labor Supply and Demand

Although the direct labor-displacing effects of the proposed project will be minimal, as discussed below and in the main text, the project can be said to encourage a process of mechanization that may have a more extensive impact on the labor market. For this reason, it is important to address this issue as part of the overall project appraisal.

The Overall Situation

As recently as 1973, one could state with confidence that Egypt had a surplus of rural labor. Studies drawing on data from the 1960's and early 1970's generally conclude that there was substantial underemployment. (See, for example, A. Mohie el-Din in Manpower and Employment in Arab Countries, ILO, 1975, or Rural Employment Problems in the UAR, ILO, 1969). Wage rates fell in real terms throughout the 1966-1973 period, while the real wage bill remained approximately stable, despite modest rises in yields and the value of production. This strongly supports the view that a labor surplus existed.

Since 1973, however, evidence has begun to appear that a substantial structural change is taking place in rural labor markets, sparked perhaps by the heavy demand for Egyptian workers overseas but reflecting as well a wide range of social and economic factors. Due to the lack of a reliable agricultural census since 1961 and only fragmentary evidence on wages, participation rates, and land-holdings for the mid-1970's it is not possible to draw a clear picture of the current situation. There is a severe need for a thorough examination of the labor situation. Such evidence as does exist tends to support the view that a condition of labor shortage is developing.

Table XVIII-1 presents a variety of estimates of the agricultural labor force and employment. It can readily be seen that the data are coflicting and will support virtually any argument. It is also clear that there are now somewhere in the neighborhood of 4.2 million agricultural workers, which represents an increase of no more than 5% since the 1930's.

Rural population in the same period increased 105%. Given the substantial increase in area cultivated and cropping intensity during this period, it is clear that technology had not been stable in agriculture and that overall sectoral labor intensity had already begun to decrease before the current decade began.

The total numbers employed do not give the entire picture, however. The amount of employment, wages received, division of labor use between farm-owners and hired labor, seasonality and the role of female and child labor are all important factors in determining the true labor situration. Table XVIII-2 presents data on wages in agriculture during recent years. It is interesting to note that in the 54-month period from January 1974 to June 1978 only four months show a decline in current wages, with no clear year-to-year pattern. This suggests that seasonal changes in wages as indicated by national averages are now reflected only in lesser or greater increases, at least in current terms. In real terms, the picture shows that daily wages and the wage bill declined between 1966 and 1974. See Figure XVIII-1. During this period agricultural wages increasingly lagged behind wages in industry and services. Since 1974, however, current and real wages have increased rapidly, although wage earnings in industry still average roughly three times those in agriculture and the pull away from agriculture remains strong. The turn-around in rural wages also corresponds with the beginning in 1973 of a heavy flow of Egyptian workers to Arab countries, where earnings are several times greater than local agricultural or industrial wages.

Recent data on days worked per year is extremely scarce. Evidence from the 1960's suggests considerable involuntary underemployment at that time, with "lack of work" the most common explanation for inactivity given in the ILO study. More recent figures show slight declines in total days worked in agriculture per year between 1974 and 1976. Man-days declined 4.4% while boy-days declined 1.4%. The average worker was employed 145 days.

We have shown elsewhere that mechanization is increasing rapidly. Does the stability in the labor force and the drop in days per year indicate that mechanization is displacing labor, or does the rising wage suggest that mechanization is a response to reduced labor availability due to other causes? The Data currently available do not allow a definite

answer to this question. A brief examination of the situation in supply and demand may be indicative, however,

Labor Supply

The total rural population may be expected to increase for quite a while, despite heavy out migration. The effect of migration to the cities, drawing off as it does primarily younger males, is much greater on the labor force than on total population. Several other factors, however, are currently influencing the supply of labor. In general, their effect is to reduce the supply, although information is not sufficient to allow a quantitative approach. Important trends include the following:

1. Temporary work overseas. Government labor officials estimate that as many as 785,000 agricultural workers are overseas. This represents over 18% of the agricultural labor force, but the total effect on supply is even greater, since, again the younger workers are involved and there is evidence that the remittances tend to reduce the labor supplied by other family members. Recently-returned workers and those expecting to go overseas may also be less available than previously.

2. Eduction. Better school attendance is reducing the availability of children for critical tasks traditionally performed by children such as tending sakias. Farmers are forced to use adult labor, to mechanize, or to omit the operation entirely. Information available suggests that all three strategies are being pursued.

3. Off-farm employment. While few figures are available, all indications are that rural off-farm employment in construction, services, government, and industry is growing rapidly, further restraining the agricultural labor supply.

4. Role of women. While the integration of women into the economy is generally progressing, in the agricultural sector the picture is somewhat different. Field work for women is viewed as generally degrading to the family and, as incomes increase, fewer women are available to perform this type of work either on their own farm or as laborers. This issue is further discussed below.

5. Changes in work attitudes. Anecdotal evidence indicates

that rural workers increasingly demand conditions similar to those of urban workers. This means that the work day is shortening, more amenities must be offered to supplement the money wage and workers are increasingly refusing the most back-breaking tasks altogether. The greater bargaining power these changes suggest supports the view that the labor market is no longer characterized by oversupply.

6. Health. Overall, rural health and nutrition conditions are improving, which should increase the amount and quality of labor available (though more productive workers may also demand a higher wage). Bilharzia, however, spread rapidly after the High Dam was constructed and is believed to affect as much as 60-80% of the rural population. The net effect on labor supply is unknown.

Labor Demand

There is little doubt that mechanization in the form of simple tractorization displaces adult labor. International experience suggests a rule of thumb of 5 workers displaced per tractor, allowing for increases in repair services, etc., as well as decreases in hand labor. Mechanization of threshing also displaces labor, but affects only a short period (this may nevertheless be significant for workers who depend on higher earnings during this period for a large share of their income). In any case, threshing per se is already highly mechanized at present. In Egypt, where tasks are clearly defined as appropriate for men, women or children, and labor needs are calculated separately for "man-days" and "boy-days", mechanization of water-lifting and some other tasks displaces only family child-labor, and thus, if anything raises the demand for adult labor. Some child operations, such as weeding, are simply not being performed, since child labor is unavailable and adults are not available.

Another factor, which has been seriously ignored in previous estimates, is the impact of fragmentation on total labor demand. Surveys show that smaller farms are more intensive in their labor use. This behavior is in line with theoretical expectations, since small land-holders must maximize the return to their scarce factor, land. Study team estimates suggest that farms of 1-2 feddans have a cropping intensity up to 1.5 times that of farms over 5 feddans. Labor use differs even more strongly: farms of less than 2 feddans use

over three times as many labor hours as those over 5 feddans, according to an ILO study, and farms below 5 feddans empley 1.1 persons per feddan versus only .4 persons for farms of 5-20 feddans and .1 persons for those over 20 (Mohie el-Din).

When the above is placed in the context of increasing fragmentation due to inheritance and land reform, it is clear that demand for labor is rapidly increasing for structural reasons. Thus between 1952 and 1969, changes in ownership, disregarding the increase in cultivated area and cropping intensity, created a demand for 1.3 million additional jobs, raising the potential demand from 3.0 million to 4.3 million, as shown in Table XVIII-3.

These results are supported by recent theoretical work by Rosenzweig, in which he demonstrates that fragmentation can increase wages. His estimates using data from another "labor-surplus" country (India) tend to support these conclusions.

No data are available on changes in the land-holding situation since 1965, but it is widely believed that further fragmentation is the dominant trend, despite some indication of consolidations.

The Labor Balance and Mechanization

With the high degree of uncertainty surrounding both supply and demand, estimates of the labor balance can be produced to support any desired argument, ranging from a condition of surplus even during peak periods to a tight supply year-around. Without further information on the current situation it is fruitless to argue one way or the other. The labor market is clearly undergoing a transition in regard to both supply and demand. Mechanization is part of this process and will contribute to the determination of the new equilibrium. The project Planning and Evaluation Unit will closely monitor the effect of project components on labor use and earnings, as well as attempting to form a clear picture of the overall labor picture.

As argued in the text, the project is not expected to have a significant labor-displacing effect. The Study Team estimate of project impact, based on a much larger level of machinery imports, forecasts increases in cropping intensity and out migration, both of which are encouraged by mechanization but do not depend on it, and concludes that overall labor use

will continue largely unchanged, as it has done for forty years.

The Role of Women

A critical Mission concern is the impact of mechanization on women's role in agriculture. Official figures, which estimate that women over 18 make up only 17 percent of the agricultural labor force or 13% of the permanent labor force, clearly understate the involvement of women. A recent FAO study sheds some additional light on the issue. Although it does not give a full break-down of time use, it shows that a substantial proportion of rural women are involved in agricultural operations. As can be seen from Table XVIII-4, non-field operations generally dominate. With the important exception of harvesting, women do not participate heavily in operations likely to be mechanized. As Tables XVIII-5-7 show, women participate even more heavily in off-field farm activities such as marketing and animal husbandry. Thus increased crop and animal production will increase the importance of their jobs within the family. This, too, will require close monitoring by the project to verify theoretical predictions, however.

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Table XVIII-1

Estimates of Agricultural Labor Force
('000 persons)

	Clatanoff Survey 2/3/	World Bank Total 2/	World Bank "Adult Workers"	World Bank "Permanent Workers"	Study Team 2/ Total	Study Team 2/ 12 and over	Study Team 2/ Adult-1/ Equiv.	ILO 3/	Mohie el Din 3/
1937									4020
1939				3978					
1947		4086							4086
1950				3442					
1960	3690	4406			3245			{4800 {4085	4406
1961				3840	6620	5083	4835		
1962									
1963									
1964									
1965					3751				
1966	3974	4447							
1967									
1968			3867						
1969			3964						
1970			4048		4048				{4298 {4464
1971		4471	4056		4057				
1972			4094		4134				
1973			4163		4164				
1974		{4212 {4198	4153		4212				
1975	4424		4217		4218				
1976	4223	4224	4223		4224				
1977	4103				4291		4400		

1/ Males over 18 plus all others divided by 2.

2/ Employment

3/ See Bibliography

Table XVIII-2

Movements in Wage-Rates

a. Monthly Man-Day Wage Rates (PT., current prices)

	1974	1975	1976	1977	1978	
January	29.0	38.5	54.5	66.5	85.0	
February	30.0	38.0*	56.0	67.5	85.0	
March	30.5	39.5	56.0	70.5	85.0	
April	33.0	42.0	57.0	72.0	87.0	
May	34.0	47.0	60.0	74.0	87.0	
June	36.0	49.0	63.6	76.5	94.4	
July	37.0	49.0	65.5	81.0		
August	38.0	50.0	65.0*	81.0		
September	39.0	51.0	65.0	81.0		
October	39.0	52.0	65.0	81.0		
November	39.0	52.0	66.0	82.0		
December	37.0*	51.0*	66.0	82.0		
Ave.	35.3	46.9	61.6	76.0	88.0	(-Jan-June)

* Indicates months with decrease from previous period
Source: Study Team

b. Annual Man-Day Wage Rates Selected Years 1/

Year	(1) Wage	(2) Annual % increase over last period	(3) Index Real Wage	(4) Average Wage Bill	(5) Deflated Wage Bill
1960	13				
1962	14	4			
1964	19	18			
1966	25.5	17	100		
1968	24	- 2.9	88.2		
1970	25.5	3.1	81.3	53.0	53.0
1971	25.8	1.2	81.5	55.6	54.2
1972	26.5	2.7	79.3	57.3	54.2
1973	28.5	7.5	79.0	60.5	54.5
1974	35.1	23.2	85.5	65.1	50.8
1975	46.5	32.5	101.0	87.0	61.3
1976	61.6	32.4	119.6		
1977	76.0	23.3	134.0		
1978 (Jan.- June)	88.0	17.1	139.0		

1/ Deflated by Rural CPI 1966 = 100

Source: Ministry of Agriculture (Col. 1-2), Study Team (Col. 3), World Bank (Col. 4-5).

Table XVIII-3

Theoretical Change in Labor Demand Due to Fragmentation

Farm Size (feddans)	1952 Area (000 feddan)	1952 Laborers/ feddan	1952 Total Labor (000)	1965 Area	1965 Laborers/ feddan	1965 Total Labor (000)
Less than 5	2118	1.1	2330	3417	1.1	3758
5-20	1167	.4	467	1059	.4	424
More than 20	2698	.1	270	1508	.1	151
TOTAL	5983		3067	5984		4333

Table XVIII-4

Listing of agricultural operations by percentage of women who are participants in each operation.

Agricultural Operation	Total Participants	%	Rank
Reaping	148	57.2	1
Packing crops	147	56.8	2
Thinning plants	143	55.2	3
Transpoting crops	142	54.9	4
Resowing	139	53.7	5
Cultivation	136	52.5	6
Irrigation	136	52.5	6
Spreading fertilizers	130	50.2	7
Drilling	129	49.8	8
Spraying insecticides	128	49.4	9
Hoeing	127	49.0	10
Harrowing	121	46.7	11
Ploughing	93	35.9	12

FAO

/

Table XVIII-5

Distribution and percentage of housewives according to their activity in raising poultry.

Area	Lower Egypt		Upper Egypt		All Sample Cases	
Participation	No.	%	No.	%	No.	%
Participating	132	79.0	75	81.5	207	79.9
Non-participating	35	21.0	17	18.5	52	20.1
Total	167	100.0	92	100.0	259*	100.0

* Includes all sample cases.

FAO

Table XVIII-6

Distribution and percentage of housewives according to their activities in home agricultural manufacturing.

Area	Lower Egypt		Upper Egypt		All Sample Cases	
Activity	No.	%	No.	%	No.	%
Active	107	64.1	50	54.3	157	60.6
Inactive	60	35.9	42	45.7	102	39.4
Total	167	100.0	92	100.0	259	100.0

FAO

Table XVIII-7

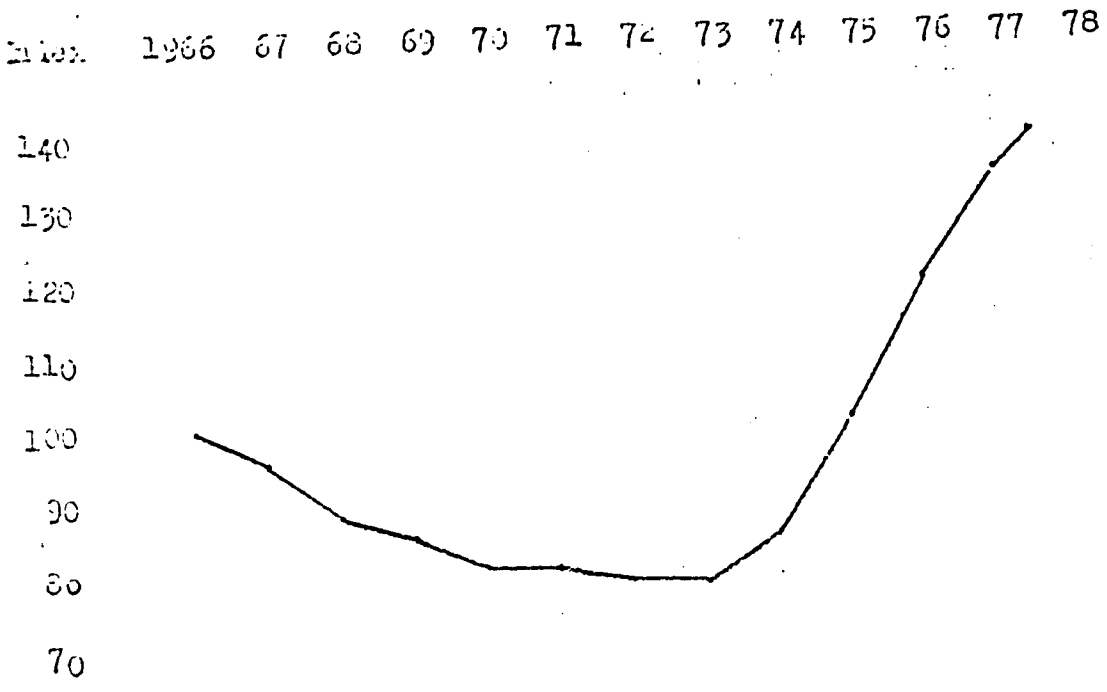
Distribution and percentage of housewives according to their activities in dairy production.

Area	Lower Egypt		Upper Egypt		All Sample Cases	
Activity	No.	%	No.	%	No.	%
Active	115	68.86	42	45.65	157	60.6
Inactive	52	31.14	50	54.35	102	39.4
Total	167	100.00	92	100.00	259	100.00

FAO

Figure XVIII-1

Index of Real Farm Wage Rates, 1966 - 1978



ANNEX XIX

Additional Economic Materials

The Ministry of Agriculture is firmly committed to mechanization and officials believe that mechanization will raise the output of Egyptian agriculture and increase rural incomes. By and large, the Egyptian farmer agrees: 87% stated that mechanization would help them achieve their goals, according to the Study Team survey.

To explore these issues in more depth, the Mission conducted cost/benefit and other economic analyses of the proposed components. These analyses address the concern that individual project components should be profitable for the individual farmer, while at the same time benefiting the Egyptian economy as a whole. The issue of subsidies and shadow prices was of particular concern. Throughout, highly conservative assumptions have been made with regard to prices, hours of machinery use, etc.

Three types of analyses were conducted by the Mission to answer different questions about the desirability of mechanization:

a) Traditional cost-benefit analyses using world prices of inputs as shadow prices and including all project costs to determine the economic profitability of appropriate project components.

b) Farm-level analyses of these components to determine whether farmers would accept the new services at their true costs.

c) Additional farm-level analyses exploring the affect of mechanization on income for four farm sizes and types at current and world market prices.

These analyses draw on and supplement the previous examinations of mechanization in Egypt. These include: a) the Study Team's cost-benefit analyses at current market prices, b) the recent Ford Foundation study of the economics of threshers and pumps, c) Egyptian Water Use and Management Project studies of pump returns, and d) World Bank analyses of components included in their projects. Taking into consideration the wide variety of assumptions used, the results of these seven sets of studies are quite consistant. Although the rates of returns vary substantially, overall the studies strongly support the conclusion that mechanization is profitable in the Egyptian context.

1. Cost-benefit Analyses

The overall strategy of the cost-benefit analysis was to compare a conservative estimate of project benefits for some components with the full cost of the project including technical assistance to arrive at a conservative estimate of project economic return. This strategy

was chosen because several project components, including the Research Center and the Planning and Evaluation Unit, do not permit a responsible estimate of benefits. With regard to the Service-Center component full benefit estimates would depend on assumptions of the benefits obtained by machinery repair, on which no data is available. Other subcomponents, such as threshers, would be expected to have a high rate of return, based on other studies, but are relatively small and have not been included in benefit estimates.

Thus, benefits are estimated for three subcomponents only: subsoiling, land leveling and sakia replacement. Using a 20-year time horizon for these components and including full life-of-project costs for the other components yields an IRR of 12% . Recalculating the IRR under the assumption that the remaining components have individual IRRs of well below 15% would still generate efficient additions to this benefit flow to raise the overall IRR well above 15%, the figure that is widely recognized as a rule of thumb. In reality, these components for which no benefits have been included should have IRR's over 15%. The World Bank study, for example, calculates the financial rate of return for service-centers at 29% (their analysis is reproduced below as Table XIX-4).

The analyses of the three components are shown as Tables XIX-1, XIX-2, and XIX-3. Important assumptions have been indicated in notes. Some assumptions, however, hold for all three. Wages of government employees are included as a cost, although project employees will generally be drawn from offices where their marginal product, if any, is low. Foreign exchange has been converted at the preferential rate ($1 = LE .70), which is believed to represent its approximate scarcity value. Fuel has been priced at pt. 15 per liter, roughly four times its subsidized price, to reflect world market conditions. By contrast, the price of outputs has generally been calculated using the latest price available. This seriously underestimates the value of additional output, which constitutes the main benefit for the soil improvement subcomponents. Savings of farm labor have not been included, nor has additional labor needed to handle output increases.

2. Farm-level analyses of selected components

The costs and benefits generated in the macro-level analysis described above were used to estimate the total economic cost of providing services to the farmers on a per-feddan basis and compared to farmer benefits. These show that, for the three cases considered, farmers would benefit considerably from project participation and should readily accept the technologies proposed. Except for land leveling, which has never been offered on a wide scale, these theoretical results confirm the evidence of high farmer acceptability for these services at present. It should be noted that the costs as computed are extremely conservative, including as they do, the world price for fuel and, in the case of government-provided services, the cost of the U.S. technical assistance. This allows

Table XIX-1

Analysis of Sakia Replacement Component

($'000)

	1980	1981	1982	1983	1984	1985	1986	1987	1988
1. Assumptions									
Pumps in Service		30	130	430	1130	1830			
New		30	100	300	700	700			
Feddans Served									
Initial 30/pumps		900	3000	9000	21000	21000			
Remaining 20/pumps		-	600	2000	6000	14000	14000		
Previous area		-	900	4500	15500	42500	77500		
Total		900	4500	15500	42500	77500	91500 →		
2. Costs									
Investment @ $1093 plus $364 after 10 yrs.		33	109	328	765	765	-		
Operating @ $15.7/f.		14	71	243	667	1217	1437 →		
TA Team and support	57	145	145	124	1				
GOE	20	104	104	104	104	104	104	104	104
Total Costs	77	296	429	799	1537	2086	1541	1541	1541
3. Benefits									
Milk and Meat @ $ 38.6/f + Sakia repairs @ $1.4 =$40.00/f		36	180	620	1700	3100	3660 →		
NB	-77	-260	-249	-179	163	1014	2119	2119	2119

	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
1. Assumptions (cont')												
Pumps in Service												
New												
Feddans Served												
Initial 30/pumps												
Remaining 20/pumps												
Previous area												
Total	91500 →											91500
2. Costs												
Investment @ $1093 Plus $364 after 10 years			11	36	109	255	255					
Operating @ $15.7/f.	1437 →											1437
GOE	-	-	-	-								
Total costs	1437	1437	1998	1473	1546	1692	1692	1437 →				1437
3. Benefits (as shown above)	3660 →											
Net Benefits	2223	2223	2212	2187	2114	1968	1968	2223 →				2223

IRR:65.62

Table XIX-2

Analysis of Subsoiling Component

Unit $1,000

-Benefit	yr.0 1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
s																
inery	3330															
[illegible]	20	68	68	62	68	68	68	68	68	68	68					
[illegible]																
penses 1/	100	327	327	327	327	327	327	327	327	327	327					
.S.	11	163	260	260	251	99										
[illegible] & Op.	20	2	2	12	2	1										
	8	111	111	111	111	111	111	111	111	111	111					
	200	75	75	75	75	75	75	75	30	30	30					
		340	525	525	525	525	525	525	525	525	525					
	[illegible]	1271	1368	1378	1359	1206	1106	1106	1061	1061	1061					
	[illegible]	127	136	137	135	120	110	110	106	106	106					
		1398	1504	1516	1495	1327	1216	1216	1167	1167	1167					
			[illegible]	3473	4940	5983	6613	6777	6777	6777	6777	6777	4520	2644	1400	467
		[illegible]	41	1969	3445	4656	5397	5561	5610	5610	5610	6777	4520	2644	1400	467
					1825	1657	1546	1546	1497	1497	1497					
					[illegible]	2700	2700	2700	2700	2700	2700					
						1043	1154	1154	1203	1203	1203					

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Table XIX-3

Analysis of Land Leveling Subcomponent
($'000)

osts[1]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993 - 20
rchase of Equipment	792													
erating Expenses		80	163									163		
ontingencies	79	8	16									16		
Total Costs	871	88	179									179		
nefits														
ea levelled in previous years[2]			700	3,100	5,500	7,900	10,300	12,700	15,100	17,500	19,900	22,300	24,700	24,7
creased production[3]			32	143	253	363	474	584	695	805	915	1,026	1,136	1,1
t Benefits	-871	-88	-147	-36	79	184	295	405	516	626	736	847	957	9
R: 22.47														

Does not include project costs that are assigned to subsoiling component, including U.S. and GOE staff.
Assumes 2400 feddans/year, 700 in 1981.
See Table XIX-9 for calculation of benefits. Calculated at $ 46/feddan per year.

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Table XIX-4

EGYPT

AGRICULTURAL DEVELOPMENT PROJECT

CASH FLOW PROJECTION OR REPAIR SHOP (Sub-Dealer)
(LE)

	Year :	2	3-8	9	10
Inflow					
Gross income 1/	-	44,600	68,600	68,600	74,800 2/
Long-term loan 3/	21,000	-	-	-	-
Contribution 4/	7,000	-	-	-	-
Short-term loan 5/	-	13,000	18,650	18,650	18,650
Total	28,000	57,600	87,250	87,250	93,450
Outflow					
Investment	28,000	-	-	-	-
Operating costs:					
- wages 6/	-	4,920	4,920	4,920	4,920
- inputs 7/	-	28,990	44,590	44,590	44,590
- vehicles	-	390	600	600	600
- maintenance	-	2,800	2,800	2,800	2,800
- travel	-	150	240	240	240
- others 8/	-	2,800	2,800	2,800	2,800
Total	-	40,500	55,950	55,950	55,950
Net cash before debt service	0	17,550	31,300	31,300	37,500
Debt service:					
Amortization LTL 9/	-	3,255	4,830	-	-
STL	-	13,000	18,650	18,650	18,650
Interest on STL 10/	-	1,300	1,865	1,865	1,865
Total	-	17,555	25,345	20,515	20,515
Net cash after debt service	-	(5)	5,955	10,785	16,985
Gross income	-	44,600	68,600	68,600	74,800
Costs	28,000	41,800	57,815	57,815	57,815
Net cash flow	(28,000)	2,800	10,785	10,785	16,985

F.R.R.: = 29%.

1/ £E 516 per tractor annually, 133 tractors. Second year, 65%.

2/ Including 10% of equipment and residual value of building.

3/ 75% of investment.

4/ 25% of investment.

5/ One third of operating costs.

6/ Manager, £E 1,800 p.a.; 2 mechanics, £E 900 p.a. each; 2 mechanic helpers, £E 480 p.a. each; 1 driver, £E 360 p.a.

7/ 10% of gross income

8/ 10% of investment.

9/ At 10% interest; 1st year interest capitilized and paid in second year together with interest for second year. Repayment starts 3rd year. Six instalments.

10/ 10%.

Table XIX-5

Consolidated Costs and Benefits of Project
($'000)

Costs[1/]	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
U.S. inputs										
R & D	1,207	450	567	805	553	344				
Machinery Management Extension	1,746	1,686								
Service-Centers	56	1,940								
Planning & Evaluation	241	894								
Training	246	508								
GOE										
Staff	18	179	502	502	502	272				
Mechanization Group		111	111	111	111	111				
R & D	714	71	71	71	71	71				
Machinery Management Extension	471	101	101	101	101	77				
Service-Centers	1,071	7	7	7	7	7				
Training	71	71	71	71						
Subtotal	5,841	6,018	4,646	6,603	5,123	1,618				
Contingency	584	602	465	660	512	162				
Total Cost	6,425	6,620	5,111	7,263	5,635	1,780				
Benefits[2/]										
Sakia Replacement	- 77	- 260	- 249	- 179	- 163	1,014	2,119	2,119	2,119	2,223
Land Leveling	- 871	- 88	- 147	- 36	74	184	295	405	516	626
Subsoiling	-4,058	-1,398	- 41	1,969	3,445	4,656	5,397	5,561	5,610	5,610
Total Benefits	-5,006	-1,746	- 457	1,754	3,756	6,154	7,811	8,085	8,245	8,459
Net Benefits	-11,431	-8,366	-5,548	-5,509	2,279	4,074	7,811	8,085	8,245	8,459

Continuation	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Benefits											
Sakia Replacement	2,223	2,212	2,187	2,114	1,968	1,768	2,223	→			2,22
Land Leveling	736	847	957	→							957
Subsoiling	5,610	6,777	4,520	2,644	1,400	467					467
Total Benefits	8,569	9,836	7,664	5,715	4,325	3,592	3,180				3,18
Net Benefits	8,569	9,836	7,664	5,715	4,325	3,392	3,180				3,18
IRR = 12.04%											

1/ Costs do not include sakia replacements land leveling and subsoiling (see note 2). Discrepancies between these tables and financial tables due to later revisions in latter not reflected here.

2/ Net benefits from Tables XIX-1, XIX-2, XIX-3. This procedure does not affect overall net benefits.

Table XIX-6

Farm-Level Analyses of Selected Components

(L.E.)

Year	0	1	2	3	4	5	6	7	8	9	10	11	12	13	19	20
Sakia																
Owner-operator																
Cost:																
Loan 1/	351	667									667	584				584
		124									124	41				41
Fuel	137	229														229
Labor	150	250														250
Maintenance, oil and other	64	64														64
Income																
Salvage (10%)	600	1000									1000	1025	100		1000	1109
Services 2/												25				109
	600	1000										1000				1000
Net Income	249	333									333	441	416		416	525
Subsoiling (farmer-customer, per feddan)																
Costs 3/ (Loan repayment)		11.1	11.1	11.1	11.1											
Additional income 4/		29.3	24.3	16.1	12.1	6.0										
Net income		18.2	13.2	5.0	1.0	6.0										
Land Leveling (farmer-custom , per feddan)																
Costs 5/		18.8									18.8					
Additional Income 6/		32.2									32.2					
Net Income		13.4									13.4					

1/ LE 765 at 10% over ten years, replacement motor at year 11, same terms.
2/ Assuming L.E. 1/irri./feddan 20 irrigations performed per year on 50 feddans, with 30 feddans served in 1st year. See also Tables XIX-7-8.
3/ Assuming LE 35 over four years at 10%.
4/ Assuming yield increases for cotton, maize and berseem only. Assuming timing not coordinated with crop rotation (i.e. estimates benefits conservatively). See Table XIX-10.
5/ Assuming loan of LE 115 over 10 years at 10% interest.
6/ Assuming 10% increase in yields at current crop mix and prices. See Table XIX-9.

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Table XIX-7

Calculation of Break-Even Areas for Pump Services

a. Calculation of break-even area for custom operator alone.

1. Costs:

Capital: Loan of LE 765, repaid over ten years at 10%.
Annual payment: LE 124.

Operating cost:

fuel	=.12 x LE.159 x 2 hr. x 6Hp	= .229
oil	= 15% fuel	= .034
maintenance	= 2 hr. at LE .015/hr.	= .030
labor	= .33 days at LE .75/day	= .250
	LE	.543/feddan

2. Income: LE 1/feddan/irrigation.

3. To calculate break-even, set income equal to costs:
124 + .543 f = f, where f = feddans irrigated
f = 271 or, assuming 20 irrigations per year,
area served = 13.6 feddans

b. Calculation of break-even area for farmer-owner (or for farm system).

1. Costs: Same as above, assuming 20 irrigations=LE 10.86/year

Benefits: .5 cows per feddan x LE 53/cow[1/] = LE 27/feddan

Break-even:
124 + 10.86 f = 27 f
f = 7.68

2. Assuming use of own labor and current fuel price of 3 PT/liter:
124 + 2.00 f = 27 f
f = 4.96

1/ LE 42 increased milk production + LE 11 increased meat production, based on estimates of Water Use and Management Project

Table XIX-8

Notes on Calculation of Costs and Benefits For Sakia Replacement

1. Capital Costs

Pump	(20 yr. life):	LE	510	
Motor	(10 yr. life):	LE	255	
		LE	765 =	$ 1093 Total Initial Investment.

Pumps are replaced after 10 years of service.

Loan fund of $ 2 million funds = 1830 pumps with initial capital.

2. Operating Costs

Same as in Table XIX-7 above, assuming 50 feddans irrigated/yr./pump with 20 irrigations/yr. and 2 hr./irrigation or 2000 hours operation/yr. Raised to LE 11/feddan to allow for risk, etc.

3. Benefits

Same as in Table XIX-7. Benefits from increased yields are not included, to allow for risk, etc. Salvage values not included.

Table XIX-9

Notes for Calculation of Costs and Benefits for Land Leveling

a. Value of Production for Fayoum, Beni Suef and Minia

	Area '000 feddans	Price[1] LE/MT	Yield MT/F	Value LE/F	Total Value LE
Wheat	219	70	1.4	98	21462
Beans	111	134	.775	104	11544
Winter vegetables	28	39[2]	2[2]	78	2184
Permanent clover	253	NA	NA	197[3]	49841
Cotton	257	562	.628	354	90978
Sugar	36	10	35	350	12600
Orchards	38	69	5	345	13110
Maize	307	NA	NA	98[3]	30086
Nili maize	170	NA	NA	50[3]	8500
Sorghum	84	55	1.54	85	7140
Rice	21	66	1.89	125	2625
Summer & Nili veg.	91	86[2]	8[2]	688	62608
Catch Clover	172	NA	NA	67[3]	11524
	1787				324202

These crops include 94% of crop area. Total value is thus increased by $\frac{1}{.94}$ = 6.38% to LE 344896. Divided by total farm area, 1,055,000 feddans, this gives estimate of LE 327 or $ 467 per feddan. Land leveling is assumed to raise yields 10%, thus raising output value by $ 46/feddan.

1/ Where possible, price has been altered to reflect world prices.
2/ Estimate based on representative items.
3/ Price and yield unavailable. Value estimated from other sources.

b. Operating Costs

Assuming 40 tractors operating 120 days/year, 8 hours/day, with 65 Hp each.

fuel = Hp - hr/year x .12 x PT 15.9	=	LE 47624
oil = 15% fuel	=	7144
repairs = .767 x tractor hours	=	29452
plus scraper repairs	=	6000
		LE 90220/year = $ 128,886

Plus 40 drivers for 200 days at LE 3/day = LE 24000 = 34,286

Total Operating Cost = $ 163,172

Note: depreciation is not considered an economic cost, but has been included in estimating economic cost per feddan.

Table XIX-10

Notes on Calculation of Costs and Benefits for Subsoiling

Costs (at full operation)

Drivers:
80 tractors. 40 130-Hp, 20 65-Hp for subsoiling
20 65-Hp for gypsum
80 x LE 3 x 120 days[1/] = 28,000/Yr

Ops: Hp.	= 5200 + 2600 = 7800; hrs.	= 960	= 8 x 120
Subs.	= 5200 + 1300 = 6500		
Fuel	= 7800 x .12 x PT 15.9 x 960	= 142,871	
Grease	= 15% of Fuel	= 21,431	
Repairs	= 80 x .767 x 960	= 58,906	
Scraper Repairs	=	6,000	
		229,208/Yr	
Gypsum	= LE 6.81/ton delivered x 54,000 feddans	= 367,740/Yr	

Benefits

a. Value of production for crops benefitted by subsoiling.

Cotton: 1979 price=LE 283.80/ton x .500 MT/f
Maize: 1977 price=LE 10.4/ardab = LE 74.3/MT x 1.32 infl.[2/] = 98.26/MT
x 1 MT/feddan = LE 98.26/f
Berseem: 1977 LE 67[2/]- catch
LE 197 - long

b. Value of production benefitted per feddan.

Cotton	LE 144	x .28[3/]	= 40.32
Maize	98.26	x.42	= 41.27
Berseem:			
long	197	x .27	= 51.22
catch	67	x .18	= 12.06

1/ It is assumed that equipment will be used elsewhere when not used for subsoiling, as is the current practice. Consequently, operating and drivers costs during subsoiling only are shown.
2/ Berseem prices have not been inflated due to high uncertainty of base level. Maize inflated at 15%/year.
3/ Probability of crop appearing on a given feddan in any year based on current Middle Egypt rotation. Sums to more than one because of double-cropping

c. Phasing of benefits following subsoiling in year 0
(Based on Study Team estimates)

	Year 1	2	3	4	5
Cotton	20.16	19.35	16.13	12.10	6.05
Maize	6.19	2.06			
Berseem:					
long	2.36	2.36			
catch	.55	.55			
Total Benefits/feddan (LE)	29.26	24.32	16.13	12.10	6.05
x 35000 feddans (Yr 0) (LE'000)	1024	851	565	524	212
x 54000 feddans (Yr 1 - 9) (LE'000)	1580	1313	871	653	327

d. Total Benefits from project activities

	1	2	3	4	5	6	7	8	9	10
in year 0(1981)	1024	851	565	424	212					
1		1580	1313	871	653	327				
2			1580	1313	871	653	327			
3				1580	1313	871	653	327		
4					1580	1313	871	653	327	
5						1580	1313	871	653	327
6							1580	1313	871	653
7								1580	1313	871
8									1580	1313
9										1580
Total LE	1024	2431	3458	4188	4629	4744	4744	4744	4744	4744
$	1463	3473	4940	5983	6613	6777	6777	6777	6777	6777

	11	12	13	14	15	16	18	19
nt.) year 0								
1								
2								
3								
4								
5								
6	327							
7	653	327						
8	871	653	327					
9	1313	871	653	327				
Total LE	3164	1851	980	327				
$	4520	2644	1400	467				

considerable margin for error in the estimate of benefits. The overall results are presented in Table XIX-5 below.

In general, as might be expected, private providers of services such as irrigation are currently charging an economic price. Economic estimates suggest a price of LE 1/feddan/irrigation, compared to current charges of LE 1.50 - LE 6.00 (the latter is charged in areas not served by sakias). Similarly, government-provided services are sold below cost. The SAO charges farmers LE 22 for a service actually costing roughly LE 35. When serving the government entities the SAO charges a rate approximating this level, showing that they fully understand the true economics of their service. Land-leveling, which is not currently provided, would cost roughly LE 115 for a one-time operation.

Calculations of break-even levels of service show that a pump-operator can meet his costs with an area of 13.6 feddans, if he charges LE 1/irrigation. The pump is economic for the total farm system, considering all benefits to both farmers and custom workers, with only 7.7 feddans. This is in line with World Bank calculations showing a financial rate of return of 33% for a 5 feddan farm operating a pump.

3. Impact of Mechanization on typical farms

The summary results of these analyses are shown in the text. Therefore, the following seeks only to explain how the results in text Tables IV-3 and IV-4 were developed. For Table IV-3 current prices and national average yields of the indicated crops were the starting point for determining production values with mechanization affecting yields as well as cash costs. The yields and prices employed, except for berseem are shown in Table XIX-11. For berseem, where price information is sketchy, Study Team data were used to arrive at a production value of LE 127 per feddan for nonmechanized production and LE 140 and LE 130 for 2 and 8 feddan mechanized operations respectively.

Table XIX-11

Crop	Per Feddan Yield Without Mechanization	Per Feddan Yield With Mechanization		Price
		2 Feddan	8 Feddan	
Cotton	.93 MT	1.02 MT	.976 MT	LE 281/MT
Wheat	1.40 MT	1.54 MT	1.47 MT	LE 63/MT
Rice	2.36 MT	2.60 MT	2.48 MT	LE 65/MT
Maize	1.67 MT	1.84 MT	1.75 MT	LE 77/MT
		(+10%)	(+5%)	

Table XIX-12 Value of Production

Rice Farms - Without Mechanization

	2 Feddans		8 Feddans	
	Area x Yield x Price	= Value	Area x Yield x Price	= Value
Cotton	.70 x .93MT x LE 281	= 182.93	2.9 x .93 x LE 281	= 757.86
Wheat	.70 x 1.40 MT x LE 63	= 61.74	2.7 x 1.40 x LE 63	= 238.14
Rice	.87 x 2.36 MT x LE 65	= 133.46	3.4 x 2.36 x LE 65	= 521.56
Maize	.43 x 1.67 MT x LE 77	= 55.29	1.7 x 1.67 x LE 77	= 218.60
Berseem	1.30 x LE 127	= 165.10	2.9 x LE 127	= 368.30
	Value = LE	598.52	Value = LE	2,104.46

Table XIX-13 Animal Days Required

Rice Farms - Without Mechanization

	2 Feddans		8 Feddans	
	Area x Days		Area x Days	
Cotton	.70 x 51	= 35.7	2.9 x 51	= 147.9
Wheat	.70 x 48	= 33.6	2.7 x 48	= 129.6
Rice	.87 x 101	= 87.9	3.4 x 101	= 343.4
Maize	.43 x 61	= 26.2	1.7 x 61	= 103.7
Berseem	1.30 x 58	= 75.4	2.9 x 58	= 168.2
Animal Days Required		258.8		892.8
Animal Days Available		912.5		1569.5
Net Productive Days		653.7		676.7

Table XIX-14 Value of Production

Rice Farms - With Mechanization

	2 Feddans		8 Feddans	
	Area x Yield x Price	= Value	Area x Yield x Price	= Value
Cotton	.70 x 1.02 MT x LE 281	= 200.63	2.90 x 97.6 MT x 281	= 795.34
Wheat	.70 x 1.54 MT x LE 63	= 67.91	3.80 1.47 MT x LE 63	= 351.92
Rice	.87 x 2.60 MT x LE 65	= 147.03	3.40 2.48 MT x LE 65	= 548.08
Maize	.43 x 1.84 MT x LE 77	= 60.92	1.70 1.75 MT x LE 77	= 229.08
Berseem	1.30 x LE 140	= 182.00	4.20 x LE 133	= 558.60
	Value = LE	658.49	Value = LE	2,483.02

Table XIX-15 Value of Production

Cotton General Farms - Without Mechanization

	2 Feddans							8 Feddans						
	Area	x	Yield	x	Price	=	Value	Area	x	Yield	x	Price	=	Value
Cotton	.65	x	.93 MT	x	LE 281	=	169.86	4.00	x	.93 MT	x	LE 281	=	1,045.32
Wheat	.75	x	1.40 MT	x	LE 63	=	66.15	3.00	x	1.40 MT	x	LE 63	=	264.60
Rice	-						-	-						
Maize	1.35	x	1.67 MT	x	LE 77	=	173.60	3.60	x	1.67 MT	x	LE 77	=	462.92
Berseem	1.25	x			LE 127	=	158.75	3.80	x			LE 127	=	482.60
					Value = LE		568.36					Value = LE		2,255.44

Table XIX-16 Animal Days Required

Cotton General - Without Mechanization

	2 Feddans				8 Feddans			
	Area	x	Days		Area	x	Days	
Cotton	.65	x	51	= 33.15	4.0	x	51	= 204.00
Wheat	.75	x	48	= 36.00	3.0	x	48	= 144.00
Maize	1.35	x	61	= 82.35	3.6	x	61	= 219.60
Berseem	1.25	x	58	= 72.50	3.8	x	58	= 220.40
Animal Days Required				224.00				788.00
Animal Days Available				949.00				1,606.00
Net Productive Days				725.00				818.00

Table XIX-17 Value of Production

Cotton General - With Mechanization

	2 Feddans							8 Feddans						
	Area	x	Yield	x	Price	=	Value	Area	x	Yield	x	Price	=	Value
Cotton	.65	x	1.02 MT	x	LE 281	=	186.30	4.00	x	.976MT	x	LE 281	=	1,097.02
Wheat	.75	x	1.54 MT	x	LE 63	=	72.77	3.20	x	1.47 MT	x	LE 63	=	296.35
Rice	-													
Maize	1.35	x	1.84 MT	x	LE 77	=	191.27	4.00	x	1.75 MT	x	LE 77	=	539.00
Berseem	1.25	x			LE 140	=	175.00	4.80	x			LE 133	=	638.40
					Value = LE		625.34					Value = LE		2,570.77

Table XIX-18 Machine Hire - Mechanized

1.	Land preparation 1 plow + 2 disc/harrow	L.E. 9.50/feddan
2.	Mower Binder	L.E. 3.70/feddan
3.	Thresher	L.E. 8.40/feddan
4.	Irrigation	L.E.19.00/feddan/year

Estimated Actual Costs Per Feddan

Plow	LE 2.188 / feddan
Disc/Harrow	LE 2.550/feddan
Mower Binder	LE 1.854/feddan
Thresher	LE 2.290/feddan
Irrigation	LE 10.63/feddan/year

Table XIX-19 Machine Cost Calculations

	Rice Farms				Cotton General			
	2 feddans				8 feddans			
	fd	total cost	fd	total cost	fd	total cost	fd	total cost
		LE		LE		LE		Le
Land Preparation (LE 9.50 /feddan)	4.00	38.00	16.00	152.00	4.00	38.00	16.00	152.00
Harvest (LE 3.70 /feddan)	1.57	5.80	7.20	26.60	.75	2.80	3.20	11.90
Thresh (LE 8.40 /feddan)	1.57	13.20	7.20	60.50	.75	6.30	3.20	26.90
Irrigate (LE 19.00/feddan)	2.00	38.00	8.00	152.00	2.00	38.00	8.00	152.00
		95.00		391.10		85.10		342.80

Table XIX-20 Value of Production and Costs

	Rice				Cotton General			
	2 Feddans		8 Feddans		2 Feddans		8 Feddans	
	N 1/	M 1/	N	M	N	M	N	M
Value of Production	LE	LE	LE	LE	LE	LE	LE	LE
Crops	598.52	658.49	2,104.46	2,483.02	568.36	625.34	2,255.44	2,570.77
Milk & Meat	256.90	358.61	265.94	616.82	284.93	372.96	321.47	631.16
Grain Saved		15.00		59.00		6.00		25.00
Total	855.42	1,032.10	2,370.40	3,158.84	853.29	1,004.30	2,576.91	3,226.93
Cash Costs								
Machine Hire		95.00		391.10		85.10		342.80
Labor	7.00	8.00	332.00	194.00	7.00	8.00	363.00	253.00
Berseem	69.00		68.00	34.00	157.00	157.00		
Total	76.00	103.00	400.00	619.10	164.00	250.00	363.00	595.80
Net Returns	779.42	929.00	1,970.40	2,539.00	689.20	754.00	2,213.91	2,631.00
Change		+150		+ 568		+ 65		+ 417
% Increase		19%		29%		9%		19%

N = Non-Mechanized, M = Mechanized

On the cost side an estimate of animal days employed per feddan was necessary in order to calculate milk and meat savings. The following animal-day requirements per feddan for the production of the various crops were developed by the feasibility Study Team and are consistent with other studies.

Crop	Animal Days per Feddan
Cotton	51
Wheat	48
Rice	101
Maize	41
Berseem	58

Each animal day was assumed to have value of LE .393 based on milk and meat losses as calculated by the Study Team while the availability of animal days was derived from the average animal units per farm given in text Table IV-2.

Taking the average area under each crop for 2 and 8 feddan rice and cotton-general farms total production values under nonmechanized and mechanized conditions were developed. Tables XIX-12, XIX-13, XIX-14, XIX-15, XIX-16 and XIX-17 show the basic calculations.

Mechanization costs were taken from Table XIX-18, developed by the Study Team, and applied to the two types of farms--Table XIX-19.

The calculations in the previous Tables plus an estimate of 2 - 5 percent in grain savings were combined in Table XIX-20 to provide a total value of production for nonmechanized and mechanized farms. Costs for machine hire were taken from Table XIX-19 while labor costs are Study Team estimates. Berseem costs were also taken from Study Team data. Utilizing only differences the results were then transferred to Table IV-3 of the text.

The procedure for developing Table IV-4 of the text was exactly the same. The only differences were the utilization of approximate world market prices for grain and cotton production and higher custom machine charges to reflect higher fuel and capital costs. The changes amounted to a doubling of the cotton prices, a 10 percent increase in wheat and rice prices and machine hire costs as indicated in Table XIX-21 where custom charges permit roughly the same profit margin as under the current situation. Maize prices were assumed to remain the same, and animal days available and required for each type of farm were kept constant.

Table XIX-21

Machine Hire)(Free Market)

1.	Land Preparation	LE 13.50/feddan
2.	Mower/binder	LE 3.70/feddan
3.	Thresher	LE 8.40/feddan
4.	Irrigation	LE 21.00/feddan 1 year

Estimated Actual Costs per Feddan

Plow	LE 4.728
Disc/Harrow	LE 4.596
Mower/binder	LE 1.991
Thresher	LE 2.290
Irrigation	LE 12.94

The calculations resulting are shown in Tables XIX-22 to XIX-25. Table XIX-26 gives the recalculated machine hire costs and Table XIX-27 summarizes the results which are transferred to the text. The results in all cases indicate a positive return to mechanization.

Table XIX-22 Value of Production (Free Market Prices)

Rice Farms - Without Mechanization

	2 Feddans									8 Feddans								
	Area	x	Yield	x	Price			=	Value	Area	x	Yield	x	Price			=	Value
Cotton	.7	x	.93	MT	x	LE	562	=	365.86	2.9	x	.93	MT	x	LE	562	=	1,515.71
Wheat	.7	x	1.40	MT	x	LE	69	=	67.62	2.7	x	1.40	MT	x	LE	69	=	260.82
Rice	.87	x	2.36	MT	x	LE	71	=	145.78	3.4	x	2.36	MT	x	LE	71	=	569.70
Maize	.43	x	1.67	MT	x	LE	77	=	55.29	1.7	x	1.67	MT	x	LE	77	=	218.60
Berseem	1.30	x				LE	127	=	165.10	2.9	x				LE	127	=	368.30
						Value		= LE	799.65						Value		= LE	2,933.13

Table XIX-23 Value of Production

Rice Farms - With Mechanization

	2 Feddans									8 Feddans								
	Area	x	Yield	x	Price			=	Value	Area	x	Yield	x	Price			=	Value
Cotton	.7	x	1.02	MT	x	LE	562	=	401.27	2.9	x	.976	MT	x	LE	562	=	1,590.68
Wheat	.7	x	1.54	MT	x	LE	69	=	74.38	3.8	x	1.47	MT	x	LE	69	=	385.43
Rice	.87	x	2.60	MT	x	LE	71	=	160.60	3.4	x	2.48	MT	x	LE	71	=	598.67
Maize	.43	x	1.89	MT	x	LE	77	=	60.92	1.7	x	1.75	MT	x	LE	77	=	229.08
Berseem	1.30	x				LE	140	=	182.00	4.2	x				LE	133	=	558.60
						Value		= LE	879.17						Value		= LE	3,362.46

Table XIX-24 Value of Production (Free Market Prices)

Cotton General - Without Mechanization

	2 Feddans							8 Feddans						
	Area	x	Yield	x	Price	=	Value	Area	x	Yield	x	Price	=	Value
Cotton	.65	x	.93 MT	x	LE 562	=	339.73	4.00	x	.93 MT	x	LE 562	=	2,090.64
Wheat	.75	x	1.40 MT	x	LE 69	=	72.45	3.00	x	1.4 MT	x	LE 69	=	289.80
Maize	1.35	x	1.67 MT	x	LE 77	=	173.60	3.60	x	1.67	x	LE 77	=	462.92
Berseem	1.25	x			LE 127	=	158.75	3.80	x			LE 127	=	482.60
					Value	= LE	744.53					Value	= LE	3,325.96

Table XIX-25 Value of Production (Free Market Prices)

Cotton General - With Mechanization

	2 Feddans							8 Feddans						
	Area	x	Yield	x	Price	=	Value	Area	x	Yield	x	Price	=	Value
Cotton	.65	x	1.02 MT	x	LE 562	=	372.61	4.00	x	.976 MT	x	LE 562	=	2,194.05
Wheat	.75	x	1.54 MT	x	LE 69	=	79.70	3.20	x	1.47 MT	x	LE 69	=	324.58
Maize	1.35	x	1.84 MT	x	LE 77	=	191.27	4.00	x	1.75 MT	x	LE 77	=	537.00
Berseem	1.25	x			LE 140	=	175.00	4.80	x			LE 133	=	638.40
					Value	= LE	818.58					Value	= LE	3,694.03

Table XIX-24 Value of Production (Free Market Prices)

Cotton General - Without Mechanization

	2 Feddans							8 Feddans						
	Area	x	Yield	x	Price	=	Value	Area	x	Yield	x	Price	=	Value
Cotton	.65	x	.93 MT	x	LE 562	=	339.73	4.00	x	.93 MT	x	LE 562	=	2,090.64
Wheat	.75	x	1.40 MT	x	LE 69	=	72.45	3.00	x	1.4 MT	x	LE 69	=	289.80
Maize	1.35	x	1.67 MT	x	LE 77	=	173.60	3.60	x	1.67	x	LE 77	=	462.92
Berseem	.25	x			LE 127	=	158.75	3.80	x			LE 127	=	482.60
					Value	=	LE 744.53					Value	=	LE 3,325.96

Table XIX-25 Value of Production (Free Market Prices)

Cotton General - With Mechanization

	2 Feddans							8 Feddans						
	Area	x	Yield	x	Price	=	Value	Area	x	Yield	x	Price	=	Value
Cotton	.65	x	1.02 MT	x	LE 562	=	372.61	4.00	x	.976 MT	x	LE 562	=	2,194.05
Wheat	.75	x	1.54 MT	x	LE 69	=	79.70	3.20	x	1.47 MT	x	LE 69	=	324.58
Maize	1.35	x	1.84 MT	x	LE 77	=	191.27	4.00	x	1.75 MT	x	LE 77	=	537.00
Berseem	1.25	x			LE 140	=	175.00	4.80	x			LE 133	=	638.40
					Value	=	LE 818.58					Value	=	LE 3,694.03

Table XIX-26 Machine Cost Calculations

(Free Market Prices)

	2 Feddans				8 Feddans			
	fd	total cost	fd	total cost	fd	total cost	fd	total cost
Land .eparation	4.00	54.00	16.00	216.00	4.00	54.00	16.00	216.00
Harvest	1.57	5.80	7.20	26.60	.75	2.80	3.20	11.90
Thresh	1.57	13.20	7.20	60.50	.75	6.30	3.20	26.90
Irrigate	2.00	42.00	8.00	168.00	2.00	42.00	18.00	168.00
		115.00		471.10		105.10		422.80

Table XIX-27 Value of Production and Costs

(Free Market Prices)

	Rice				Cotton General			
	2 Feddans		8 Feddans		2 Feddans		8 Feddans	
	N LE	M LE	N LE	M LE	N LE	M LE	N LE	M LE
Value of Production								
Crops	800.00	879.00	2,933.00	3,363.00	745.00	819.00	3,326.00	3,694.00
Milk & Meat	257.00	359.00	266.00	617.00	285.00	373.00	321.00	631.00
Grain Saved	-	16.00	-	65.00	-	7.00	-	27.00
Total	1,057.00	1,254.00	3,199.00	4,044.00	1,030.00	1,199.00	3,647.00	4,352.00
Cash Costs								
Machine Hire		115.00		471.00		105.00		422.00
Labor	7.00	8.00	332.00	+ 94.00	7.00	18.00	363.00	253.00
Berseem	69.00	-	68.00	+ 34.00	157.00	157.00	-	-
Total	76.00	123.00	4.00	599.00	164.00	270.00	363.00	675.00
Net Returns	981.00	1,131.00	2,799.00	3,445.00	866.00	929.00	3,284.00	3,677.00
Change		150.00		545.00		63.00		393.00
% Increase		15%		23%		7%		12%