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EGYPTIAN AGRICULTURAL MECHANIZATION PROJECT

Contract Number 263-0031-HHC-01

ACTIVITY REPORT NUMBER 5

1 April 1982 - 30 June 1982

Submitted by

LOUIS BERGER INTERNATIONAL, INC

100 Halsted Street
East Orange, New Jersey

Dr Watshi

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1.0 SUMMARY

This reporting period was notable in that USAID and the Ministry of Agriculture have amended the Grant Agreement to reflect the full US$40 million commitment from the United States Government. Also, this amendment formally extends the Project for a full five years life. But most significant to Project implementation is that full funding will now be available for all of the line items in the Grant Agreement. Some of the line items still require subobligation, but without this first step additional subobligations would not be possible.

Now that USAID has moved these funds into the pipeline, responsibility rests with the Project to see that these funds are expended in an expedient and prudent manner.

In this regard, on the US dollar side, 41.2% of the Grant Agreement is in the pipeline or expended: 31.4% in the pipeline and 9.8% expended (see Table 3.1). On the local currency side, 19.5% of the Grant Agreement is in the pipeline or expended: 17.7% in the pipeline and 2.4% expended. However, only 68% of the local currency has been subobligated, so on this basis, 28.7% of the local currency is in the pipeline and 3.6% expended (see Table 3.2).

In summary, of the 31.8 million of the Grant Agreement funds that are available, approximately 11.7 million, or 36.7% is in the pipeline or expended. Although the local currency funds in the pipeline or expended category is not large, what is significant at this stage is that most of these line items have been activated.

The final report of the Area Mechanization Study was presented during this period. Its significance is threefold: 1) it provides a factual basis

of mechanization data rather than one of opinions; 2) it provides useful attitudinal insights for Project implementation, and 3) it provides a data resource that will be useful for additional analyses. With regard to the latter point, future papers to be derived from this study will include: 1) rôle of agricultural cooperatives in the redistribution of machinery services in Project villages; 2) relationships between increasing mechanization and the need for hired agricultural labor; 3) farmers' preferences and requirements in agricultural machinery; 4) an evaluation of machinery workshop services, and 5) irrigation and drainage concerns of farmers.

Because the Ministry is moving towards a sectoral approach to agriculture, the effect of mechanization on hired labor and employment is most significant, since the agricultural sector is Egypt's largest employer. The area study provided a most important insight in this regard: mechanization is associated with an increase in hired labor. This applies only to the existing level of mechanization and will require further study to relate mechanization to overall rural employment.

Two workplans have been presented and approved: the Local Manufacturing Advisor's Workplan (Annex D) and the Machinery Development Advisor's Workplan (Annex G).

The core of the Project's implementation and key to the Project's success rests with the village activities under the direction of the Extension/Training Subproject. The first Extension Specialists have completed their training at the Sakha Training Center and are assigned to Beheira and Gharbia governorates; they will be developing village-level workplans.

In addition to the above, the major activities of the subprojects were, briefly:

1. Planning and Evaluation: A financial and economic evaluation of animal-powered sakias and pumps was prepared and is presented as the Project's working paper no. 2, "Analysis of Waterlifting Costs in Lower Egypt." The study indicated the following costs in LE/feddan/year to be:

Buffalo-powered sakia	LE 53.90
Cattle-powered sakia	43.29
Pump (economic costs)	22.68
Pump (financial costs)	13.83

The farm management study continued its field investigation on schedule. The Evaluation Subunit held a two-week training seminar for the Village Studies researchers with practical sessions related to data analysis in three related studies--landless laborers, farmers, and emigrants in the Project villages. Through the Village Studies program, data collection is in progress on the labor and wage structures in the Project villages. In addition, this Subunit conducted a literature review of MOA mechanization research.

2. Research and Development: This Subproject focused upon self-propelled, imported wheat harvesting/binding machines. Two Italian machines were studied with regard to wheat, a Camon F11 and Olympia. Further modifications are underway for testing in the fall rice crop.

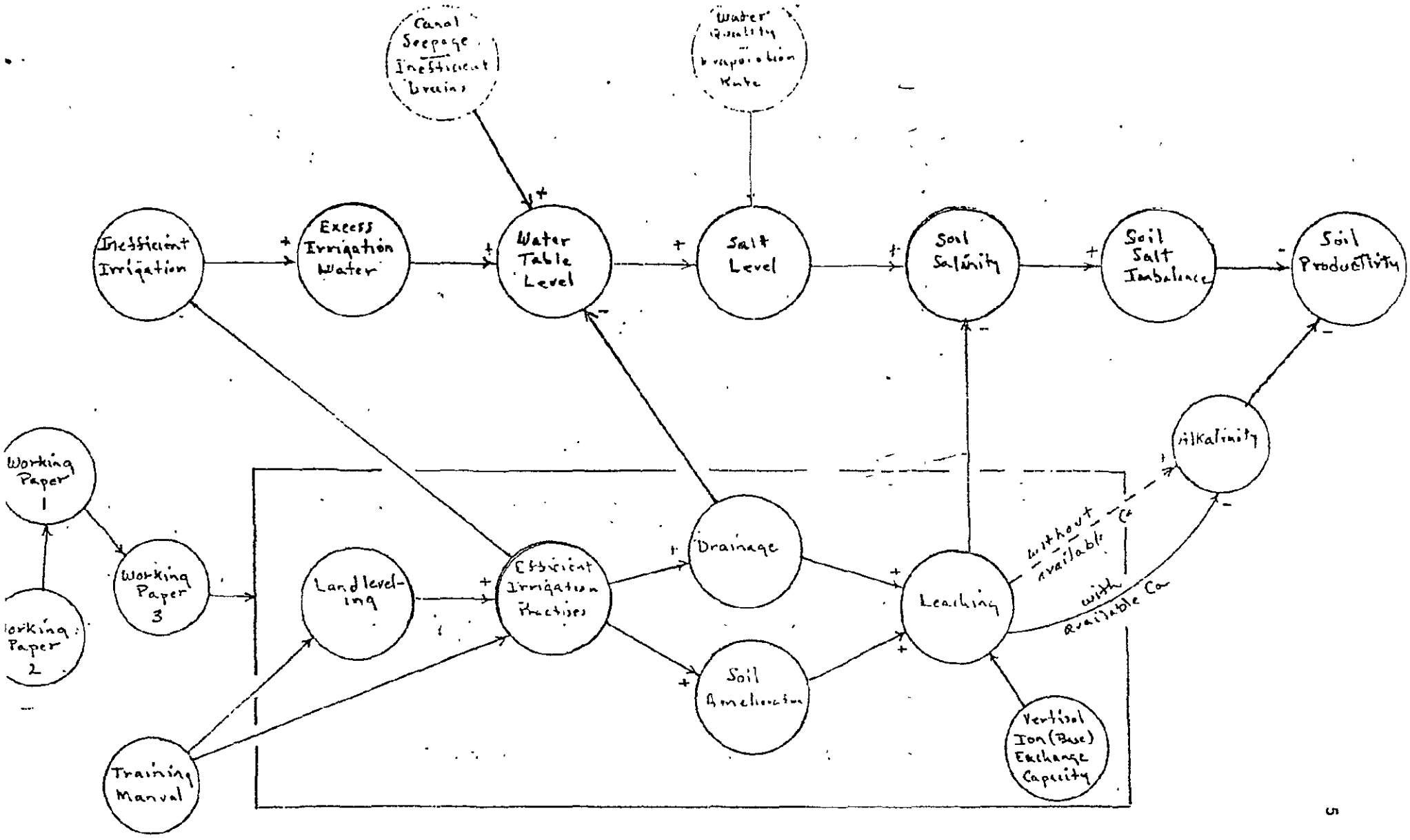
3. Extension/Training: The two remaining conditions precedent were completed and approved: machinery introduction program and local manufacturing program. A Participant Training Guide was developed and is being reviewed by USAID. A training amendment for local manufacturing was approved and resulted in LE 65,498 being added to the training plan. A waterlifting extension program was developed for use in conjunction with the Waterlifting Fund. Project training courses were continued (see Table 4.1): 228 people participated in 18 training courses, 72 participants in 8 courses at training centers and 156 participants in 10 courses at field sites.

4. Local Manufacturing Program: The local manufacturing program is initially based on the concept of on-site training through the manufacture of an improved prototype machine, and the initial emphasis has been upon developing a thresher for wheat and rice that incorporates an axial flow separation design and cleaning system. This has been a machinery development program, as well as a manufacturing exercise, and has been an opportunity to introduce improved manufacturing techniques.

5. Soil Improvement: A simplified view of the Soil Improvement Workplan is outlined in Figure 1. The upper sequence of variables, line (a), describes the existing situation; the boxed variables, (b), discribe amelioration activities needed to correct (a). The working papers and training manual are Project activities that implement ameliorative action. Part I of the Workplan develops the problem and corrective action, Part II identifies research needs. Working Paper 1 deals with land improvement activities in Minia governorate as a prelude to starting with a demonstration basin. Working Paper 2 supports Working Paper 1 in that an operational analysis is made of the laser controlled landleveling system of Delta Sugar in Baltim. Working Paper 3 proposes a plan of action that will demonstrate the basin improvement methodology in the governorates of Assiut, Minia, Beni Suef and Fayoum. Training is an essential part of the program and a manual is being developed for both SAO personnel and extension use.

6. Service Center/Village Workshop Program: Emphasis this period has been upon developing two service center proposals at Beni Mazar and Mahmoudia. Beni Mazar is ready for bank submission and Mahmoudia has been submitted to the bank. Also, three village workshop loans have been submitted for bank approval. See Section 4.1.5 for a more complete development of the active service center participants.

FIGURE 1.0. Soil Improvement Problem Identification.



Two indicators describe the Project's level of effort: technical assistance man-months and financial expenditures. As of June 30, 1982, 186 man-months have been contributed as compared to 196 man-months anticipated in the Inception Report. The 10 man-months differential are recoverable during the life of the Project. The financial level of effort has been previously discussed.

The reader is referred to Section 4.0 for details of the implementation schedule. Briefly, the subprojects can be summarized: 1) Planning and Evaluation, on schedule; 2) Research and Development, modification of imported harvesting prototypes on schedule, Applied Research contracts and in-house field prototype testing behind schedule; 3) Extension/Training on schedule; 4) Soil Improvement behind schedule; 5) Local Manufacturing on schedule; 6) Service Center/Village Workshops behind schedule.

During this period several previous implementation issues were solved: USAID approval for additional transportation; USAID approval of demonstration/training equipment; and USAID approval for the machinery introduction fund. However, several implementation issues are outstanding: approval of a Senior Accounting Advisor; amendments to the letter of understanding to ease constraints on the Service Center Fund; acquisition of Group I research prototype equipment; shop management at the Research Center, and lack of training facilities for in-country training.

2.0 MAJOR PROJECT ACCOMPLISHMENTS

2.1 OVERALL PROJECT ACCOMPLISHMENTS

1. The first amendment to the Grant Agreement was completed. Its purpose was to obligate the full 21.6 million of local currency and to distribute the inflation and contingency monies to the line items of the Grant Agreement as shown in Table 2.1.

Table 2.1 Summary Financial Plan for USAID Funds of Project Grant Agreement No. 263-0031, after PIL No. 17 Amendment, in in US$ and US$ Equivalent for Local Currency (000's)

Line Item	US	LC	Total
1. Technical Assistance	6,424	2,302	8,726
2. Commodities	9,133	2,000	11,133
3. Training	2,023	1,000	3,023
4. Operating Expense	–	100	100
5. Facilities	–	70	70
6. Credit	–	13,000	13,000
7. Research Support	1,005	2,000	3,005
8. Special Studies and Evaluation	215	728	943
TOTAL	18,800	21,200	40,000

2. An additional 11 vehicles were approved for purchase by USAID.

3. A draft of the Soil Improvement Workplan was completed.

4. The Machinery Development Advisor's overall workplan was presented and approved.

5. The Local Manufacturing Workplan was approved.

6. First quarterly local currency cash need statements for the Research and Development and Extension/Training subprojects were submitted to USAID.

2.2 PLANNING AND EVALUATION SUBPROJECT

2.2.1 Economic and Financial Planning Subunit

1. Water Lifting Credit Fund: The US$ local currency equivalent (LE 415,840) has been deposited at the PBDAC following a request to USAID for advance funding for pilot waterlifting activities in Itay El Baroud and Mahmoudia markazes.

2. Sakkia cost survey data was collected, collated and analyzyed during this reporting period. Preliminary analysis indicates comparative waterlifting costs in LE/feddan/year to be:

Buffalo powered sakkia:	LE 53.90
Cattle powered sakkia:	43.29
Pump (economic costs):	22.68
Pump (financial costs):	13.85

A detailed analysis is submitted with this reort as Working Paper No. 2, "Analysis of Comparative Waterlifting Costs in Lower Egypt."

3. An analysis of tractor costs associated with government-operated tractor rental stations is in the data collection phase.

4. HP-85 software has been developed for: a) economic optimization of farm tractor power; b) financial optimization of farm tractor power; c) financial and economic costs for farm implements.

5. Members of this Subunit have been actively participating in the development of the Ministry of Agriculture's Five-Year Mechanization Plan.

6. Farm Management Survey: a) Most all winter crop work was finished in June and information on winter crops activities will be available when data collection is completed. b) Summer crop operations are now in progress.

2.2.2 Evaluation Subunit

1. The Area Mechanization Survey has been completed and covers the following topics: a) social and economic context of farm mechanization; b) present means of land preparation, cultivation, harvesting and transportation; c) the social organization of the use of agricultural equipment; d) agricultural equipment in and out of use and access to repair services; e) availability of credit facilities, and f) the role of extension services.

2. A two-week training program for the Village Studies researchers was held to meet the following objectives: a) discuss theory and practical work in data collection, tabulation, analysis, and report writing; b) acquaint members of the Village Studies Program with the state of agricultural mechanization in Egypt and with project components; c) review critical issues in Egyptian agriculture and development. Practical sessions relating to data analysis focused on three related studies: landless laborers, farmers, and emigrants in project villages. A report of the training session will be prepared in Arabic.

3. A study of sakkia and pump preferences is underway in Qaliubia. This will complement the economic analysis of the Planning and Financial Subunit.

4. A review of agricultural mechanization research undertaken by the Ministry of Agriculture was prepared and is presented in Annex C.

5. Data collection on labor and wage structures are in progress.

6. In Sharqia, the village study team is involved in an examination of tractor use and owner-renter relationships.

7. The Project Village profile is still in progress.

8. The Extension/Training program at Sakha Training Center was evaluated. Its conclusions: a) the extension orientation program

should follow the Sakha program; b) outside lecturers repeated materials already given, and often did not appear.

2.3 RESEARCH AND DEVELOPMENT SUBPROJECT

1. A milestone workplan was presented and accepted by the Machinery Development Advisor.
2. An Olympia self-propelled mower-binder was tested in wheat and it was found that the tall (125-140 cm) Egyptian wheat would not clear the machine's structural frame, nor did the binding mechanism satisfactorily handle the crop. The frame was raised 20 cm, providing greater clearance, but the net effectiveness was not improved. The machine was not effective under lodged conditions. Because the binding mechanism caused plugging problems, it was decided to work with this machine as a windrower only and to remove the knotter assembly.
3. A fall priority was established to develop a machine to cut and windrow standing and lodged rice and to test several prototypes for cotton stalk cutting.
4. Specifications were written and bids obtained for soil testing equipment.
5. Special English courses began with 20 employees enrolled from the station.
6. The Subproject's first quarterly local currency cash need statement was submitted to USAID.

2.4 MACHINERY MANAGEMENT EXTENSION/TRAINING SUBPROJECT

1. The first quarterly statement for local currency cash needs was submitted to USAID and received (LE 74,900).
2. The final two CP's for the extension unit were submitted and approved by USAID for machine introduction and local manufacturing workplans.

2.4.1 Training Subunit

1. A Guide for processing participant training candidates has been developed and is being reviewed by USAID.
2. An amendment to increase the training budget by LE 65,498 for the Local Manufacturing training program has been submitted to USAID for approval.
3. During the reporting period, 228 people participated in 18 training courses: a) at training centers, 72 participants in 8 courses; b) at locational sites, 156 participants in 10 courses.
4. The first group of Mechanization Specialists finished their training program at Sakha Training Center, 15 March-17 June.
5. Specifications were prepared for training/demonstration equipment.
6. The Technical Training Specialist demonstrated a rear delivery mower-binder in wheat in several Sharqia villages.
7. New courses introduced during the reporting period included: a) Mower-binder Operation and Maintenance for Wheat; b) Evaluation Methodology with Machinery Basics.

2.4.2 Extension Subunit

1. The newly trained Mechanization Specialists for the ten project villages in Beheira and Gharbia governorates are now in the field developing extension workplans for each village.
2. An extension/training program for implementing the Water Lift Credit Fund was completed.
3. The first extension leaflet, dealing with long-furrow irrigation, was designed and prepared. Under preparation are leaflets on: a) irrigation costs using animal and mechanical power for pumping; b) maintenance of tractors.
4. Cotton planting trials were monitored. Tirals with acid-treated cotton seed planted on the level with a grain drill did not show satisfactory emergence.

5. Selection of mechanization specialists for project villages in Minia, Qaliubia and Sharqia, for training at Sakha Training Center, is in progress; the training will begin next quarter.

2.5 LOCAL FARM EQUIPMENT MANUFACTURING PROGRAM

1. The focus of this program to date has been twofold: a) the development and approval of a workplan (see Annex D), and b) development of an improved thresher for wheat and rice incorporating an axial flow separation design and a cleaning system, as the present common thresher only removes the grain from the head and a separate winnowing operation is required to clean the grain (see Annex D).
2. The development of an improved thresher will serve as an initial training mechanism for upgrading local manufacturing capabilities.

2.6 SOIL IMPROVEMENT SUBPROJECT

1. An irrigation course dealing with water application methods was presented to the mechanization specialists at Sakha.
2. Parts I and II of the Workplan were completed: a) Part I describes the Egyptian situation and defines problems; b) Part II identifies the areas and types of research needed.
3. The Minia basin survey data analysis was completed.
4. The Beni Suef basin survey is in progress.
5. Working Papers Nos. 1, 2 and 3 were completed, dealing with methods of implementing land improvement activities in selected basins in Minia, Assiut, Beni Suef and Fayoum.
6. A training manual is being prepared, including: field surveying; landleveling procedures; maintenance and rehabilitation of canals; irrigation methods; design layout; surface drainage.
7. Two papers have been prepared: Simulation Modeling for Irrigation, and Landleveling (see Annex B).

8. Waterlifting activities have been reassigned from this Subproject to the Extension program.

2.7 SERVICE CENTER AND VILLAGE WORKSHOP SUBPROJECT

1. The emphasis this reporting period has been upon developing two service center proposals in Mahmoudia and Minia: a) the Mahmoudia Motor Co. proposal was presented to the Damanhur PBDAC June 20, 1982; b) the proposal of Mr. Azmi for a workshop at Beni Mazar in Minia should be ready to present to the bank in July or August.
2. Progress continues with other active candidates, as discussed in Section 4 of this report under "Implementation."
3. The Village Workshop program continues in Beheira and was extended to Gharbia and Sharqia during the reporting period: a) three loan requests have been sent to the banks in Beheira and Sharqia; b) the work effort was directed towards the Project villages, with those in Beheira surveyed during the period.
4. Training activities: a) Eng. Anwar Nada completed a special training course at Beheira and will join the Subproject; b) three trainees completed Level I Mechanics training at Maamura; c) twelve trainees have been identified for the Mechanics training program.
5. Development of a machinery spare parts catalog has begun.

3.0 FINANCIAL AND TECHNICAL LEVEL OF EFFORT

3.1 FINANCIAL LEVEL OF EFFORT: USAID FUNDS

This reporting period has seen a major change in Project funding in that the contingency and inflation factor has been apportioned to the Grant Agreement line items. Consequently, the format of this section is changed to conform to these line items. Funds will be distributed in the following categories:

1. Grant Agreement: USAID finding established by the Grant Agreement and Amendment 1 as per PIL No. 17, effective May 3, 1982.
2. USAID Subobligation: Funds that have moved from an obligated basis in the Grant Agreement to a subobligated category. These funds are available to the Project following appropriate administrative procedures.
3. Funds Requested, In-process: Funds requested from USAID or in the USAID or MOA processing system.
4. Funds-available: Funds directly available to the Project.
5. Funds Expended: Monies physically expended.
6. Pipeline funds: Monies requested, in-process, and directly available to the Project.

Because of the new categorization, direct comparison with past Activity Reports may not be appropriate; the above categorization more conservatively defines "pipeline" funds. For example, in the last Activity Report the subobligated $2 million for the Water Lifting Fund was defined as being in the pipeline, but now, only that amount actually requested for deposit into the Project bank account is so considered.

Table 3.1 summarizes the dollar component of the Grant: 41% of this component is in the Project pipeline or expended, due largely to the Technical Assistance contract. As summarized in Table 3.2, only 19.5% of the local currency funds are in the pipeline or expended. This points to the need in the next quarter to place more concentrated effort on the movement of these funds.

Table 3.1 Financial Level of Effort: USAID Dollar Currency Component, 15 September 1980 through 30 June 1982

	Grant Agreement (1)	USAID Obligation (2)	Funds In-Process, Requested (3)	Funds Available (4)	Funds Expended (5)	Pipeline & Expended Funds (3+4+5) (6)
1. Technical Assistance	6,424,000	5,738,843	[illegible]	4,237,442	1,501,401	5,738,843
2. Commodities	9,133,000	9,133,000	1,500,000	174,000	211,336	1,885,336
3. Training	2,023,000	2,023,000	-	-	-	-
4. Research Support	1,005,000	1,005,000	-	-	127,329	127,329
5. Special Studies & Evaluation	215,000	215,000	-	-	-	-
6. Total	18,800,000	18,114,843	1,500,000	4,411,442	1,840,066	7,751,508
7. Percent in Pipeline & Expended (of Col. 1)			8.0%	23.4%	9.8%	41.2%

Table 3.2 Financial Level of Effort: USAID Local Currency Component, 15 September 1980 through 30 June 1982 (US$ Equivalent)

	Grant Agreement (1)	USAID Obligation (2)	Funds In-Process, Requested (3)	Funds Available (4)	Funds Expended (5)	Pipeline & Expended Funds (3+4+5) (6)
1. Technical Assistance	2,302,000	1,631,483	-	1,182,476	449,007	1,631,483
2. Commodities	2,000,000	2,000,000	160,000	-	-	160,000
3. Training	1,000,000	188,360	-	73,839	16,220	90,059
4. Vehicle Expenses	100,000	100,000	20,290	-	-	20,290
5. Facilities	70,000	70,000	-	-	-	-
6. Credit Funds:						
a) Service Centers	5,000,000	5,000,000	-	1,500,000	-	1,500,000
b) Waterlifting	4,000,000	2,000,000	-	478,357	21,643	500,000
c) Machine Introd.	4,000,000	-	-	-	-	-
d) Total	13,000,000	7,000,000				
7. Research Support	2,000,000	2,000,000	36,432	-	-	36,432
8. Special Studies & Evaluation	728,000	728,000	-	-	-	-
9. Total	21,200,000	13,717,843	216,722	3,234,672	486,870	3,938,264
10. Percent in Pipeline & Expended (of Col.1)			(1.1%)	(16.0%)	(2.4%)	(19.5%)
11. Percent in Pipeline & Expended (of Col.2)			(1.6%)	(23.5%)	(3.6%)	(28.7%)

Table 3.3 Level of Effort: Technical Staff, from 15 September 1980 through 30 June 1982, in Man-months

Position	Starting Date	Actual Effort	Anticipated Efort
1. Team Leader	4/10/80	20.9	21.0
2. Planning/Evaluation Advisor	15/9/80	21.5	21.5
3. Research Director	3/11/80	19.9	20.0
4. Evaluation Advisor	7/12/80	18.8	19.0
5. Extension Advisor	12/1/81	16.6	17.0
6. Farm Management Advisor	15/4/81	14.5	14.0
7. Service Center Director	9/4/81	14.7	14.0
8. Equipment Repair Advisor	3/6/81	13.8	14.0
9. Soil Improvement Director	13/7/81	11.6	12.0
10. Training Advisor	9/9/81	9.7	11.0
11. Machinery Development Advisor		5.8	6.0
12. Local Manufacturing Advisor	3/2/82	4.9	6.0
13. Irrigation Engineer		3.0	10.0
14. Short Term Technical Assistant		10.3	10.0
Total Man-months		186.0	196.0

Although the dollar amounts are not necessarily large, it is of significance that activity has started in all major line items. Also, 68% of the local currency portion of the Grant Agreement is available to the Project. Of these local currency funds, 28% are in the pipeline and expended category rather than just the 18% stated earlier. An overall summary of Tables 3.1 and 3.2 shows:

1. Of the total $40 million grant, 29% of the funds are in the pipeline and expended;
2. Of the total in the subobligated category ($31.8 million), 36.7% of the monies are in the pipeline and expended category.

3.2 TECHNICAL LEVEL OF EFFORT

During this period, the last position was filled: Soil Improvement Irrigation Engineer. The actual level of effort (186 man-months) and the anticipated level of effort (196 man-months) in the Inception Report are compared in Table 3.2. The difference between the two is recoverable during the life of the Project.

4.0 IMPLEMENTATION

4.1 WORKPLAN IMPLEMENTATION SCHEDULE

4.1.1 Planning and Evaluation Subproject

With the completion of the Area Mechanization Study in May, the Evaluation Subunit is on schedule. The Village Studies Program is proceding as anticipated, but the village profile of the Project's random villages is behind schedule. This is important, as selection of control villages is dependent upon this information. The Farm Management Survey's field collection is on schedule, but the data collation is behind. This has been partly due to the turnover of data collation personnel.

4.1.2 Research and Development Subproject

In-house research is on schedule relative to wheat harvesting prototypes, but behind schedule as regards tillage experiments. The delay has been due to the inability to secure research prototype equipment that has been ordered. The Machinery Development Advisor's Workplan is on schedule having been approved during this quarter. The Applied Research Fund is behind schedule due to monetary delays and agreement upon a contract between the researcher and the Project.

4.1.3 Machinery Management Extension and Training Subproject

Basic to the full development of this program is the training of machinery extension specialists, which is proceeding as scheduled and is presented in the last progress report. The training program is reviewed in Table 4.1. Analysis of Table 4.1 shows:

1. 52 courses were scheduled for in-country training, including six observational tours.
2. None of the observational tours were implemented due to a lack of candidates.
3. The rescheduled courses from the last activity report were not undertaken, as facilities were not available.
4. 8 courses were not given because of a lack of equipment.
5. 9 courses were not undertaken because manpower was diverted and these courses had been previously undertaken.
6. Only 19 courses were actually undertaken.

TABLE 4.1 Training Courses Scheduled for April-June 1982 as per training Plan and Rescheduled Courses from the January- March 1982

COURSE NO	COURSE	APR.	MAY	JUN.	STATUS
1. Extension					
2EX1	Tractor operators	x			x
2EX15	Obs.Tour:village heads	x			o
2EX16	Mech.Ext.village adv.	x			RS-Jul
2EX17	Workshop.Mach.Mangt Ext	x			o
2EX18	Mechanic.Level I	x			RS-Jul
2EX19	Land Leveling	x			x
2EX20	Implement Adjustments	x			o
2EX21	Obs.Tour:Dist.advs.		x		o
2EX22	Mech.Planting Rice		x		RS-82**
2EX23	Mech.Planting Rice		x		RS-82**
2EX24	Prev.Maintenance		x		o
2EX25	Mech.Ext.Dist. level		x	x	x
2EX26	Planting Maize		x		o-**
2EX27	Harvesting Wheat		x		o-**
2EX28	Mechanical Weed control		x		o-**
2EX29	Landlevelling		x		o
2EX30	Irrigation			x	o
2EX31	Cultivation:Corn			x	o-**
2EX32	Cultivation:Cotton			x	o-**
2EX33	Fertilization			x	o-**
2EX34	Insect Control			x	o
2EX35	Landlevelling			x	o
2EX36,37,38	Farm Tractor Driving			x	x
2EX39	Farm Tractor Driving			x	o
2EX81	Mower/Binder oper./Maint.		x	x	x
2EX7	Plowing	x			x
2PH2	Peanut harvesting	x			x
2 Soil Improvement					
2Si1	Mechanic : level 1	x	x		x
2Si9	Mechanic level 3		x		NA-RSFeb. 83
3. Service Center					
2SC6	Obs.Tour:Shop owners	x			o
2SC7	Mechanic level 2		x	x	RS-Oct
2SC3	Mechanic level 1	x	x		x
4. Training					
2T3	Teaching Methods	x			o
2T5	Obs.Tour.Mech.Agri.			x	RS-August
2Cp2	Basic Computer Operationx				x
5. Planning and Evaluation					
2PE1	Evaluation Methodology			x	x
2PE2	Machinery basics			x	x
2PE3	Observation Tour	x			o

TABLE 4.1 Continued

COURSE NO	COURSE	APR.	MAY	JUNE	STATUS
6. Research &Development					
2RD1	Obs.Tour:Instr.	x	x	x	o
1RD1 b,d	Intensive English	x		x	x
1RD1c	Regular English	x			x
7. Local Manufacturing					
2LM1	Industrial Technology			x	IP
8. Rescheduled Courses:					
a. Soil Improvement					
2Si2	Machinists		x		o***
2Si3	Welding		x		o***
2Si4	Shop Administration		x		o***
2Si5	Parts Administration		x		o***
2Si6	Lubrication		x		o***
2Si7	Tractor Operation			x	IP
b. Service Centers					
2SC1	Welding		x		o***
2SC2	Machinist		x		o***
2SC4	Shop Administration		x		o***
2SC5	Parts Administration		x		o***

* IP In-Progress
O Not undertaken
X Completed
RS Rescheduled
NA Not available in Egypt--needs course development and design.

**Not undertaken or rescheduled because of training equipment

*** West Nubaria Training Center facilities under renovation--will not be rescheduled until October-November

4.1.4 Soil Improvement Subproject

Currently, there are four areas of implementation evaluation: workplan development, initial data collection, implementation of working papers, and equipment procurement. It is through these activities that field implementation will begin. The Workplan is completed and will be the subject of the next quarterly report. The initial data collection in Minia has been finalized and the final report will be presented in the next quarter. Working Papers 1 and 3 are completed and Paper 2 is scheduled for completion during the next quarterly period. The initial equipment procurement is in the hands of the MOA and is now proceeding satisfactorily.

4.1.5 Service Center and Village Workshop Subproject

It is difficult to place this program into a predictable time frame because of the many variables beyond the control of the Project that can and do cause delays. Instead, Figure 4.1 describes the steps taken in the development of a typical service center. With reference to this guideline, Table 4.2 indicates the current status of each active service center participant: one loan is at the bank, one is with the Project loan committee, and three are in preparation for presentation to the Project loan committee.

4.1.6 Local Manufacturing Program

A planning precedence network, Figure 4.2, has not yet been placed in a time sequence, but program activities (1,5) and (5,10) are in progress. The full implementation of this sequence (1,5,10...35) depends upon development of a prototype machine to manufacture. This is currently in progress with the development of al all-crop thresher including a separation and cleaning unit, which is an advance over the current locally manufactured thresher that merely threshes.

Table 4.2 Summary of the Active Service Center Applicants and Their Progress Related to the Service Center Planning Network

Applicant	Governorate	Location	Current Activity	Completed Activity
1. Abdu Hkir All & Co.	Beheira	Mahmudia	(17,33) (35,40)	35
2. Abdel Mohsen Azmy	Minia	Beni Mazar	(30,35)	30,33
3. Egyptrac Co. (El Aguizy)	Qaliubia	Qaliub	(20,21) (20,22) (20,25) (33,40)	20,33
4. Hammamy Family	Beheira	Abu Homos	(17,33) (20,21) (20,25) (20,22)	20
5. Samtrade Co.	Gharbia	Shubra El Namla	(20,21) (20,25) (20,22)	20,33
6. Salah Gaber	Beheira	S.Tahrir	(10,15)	12

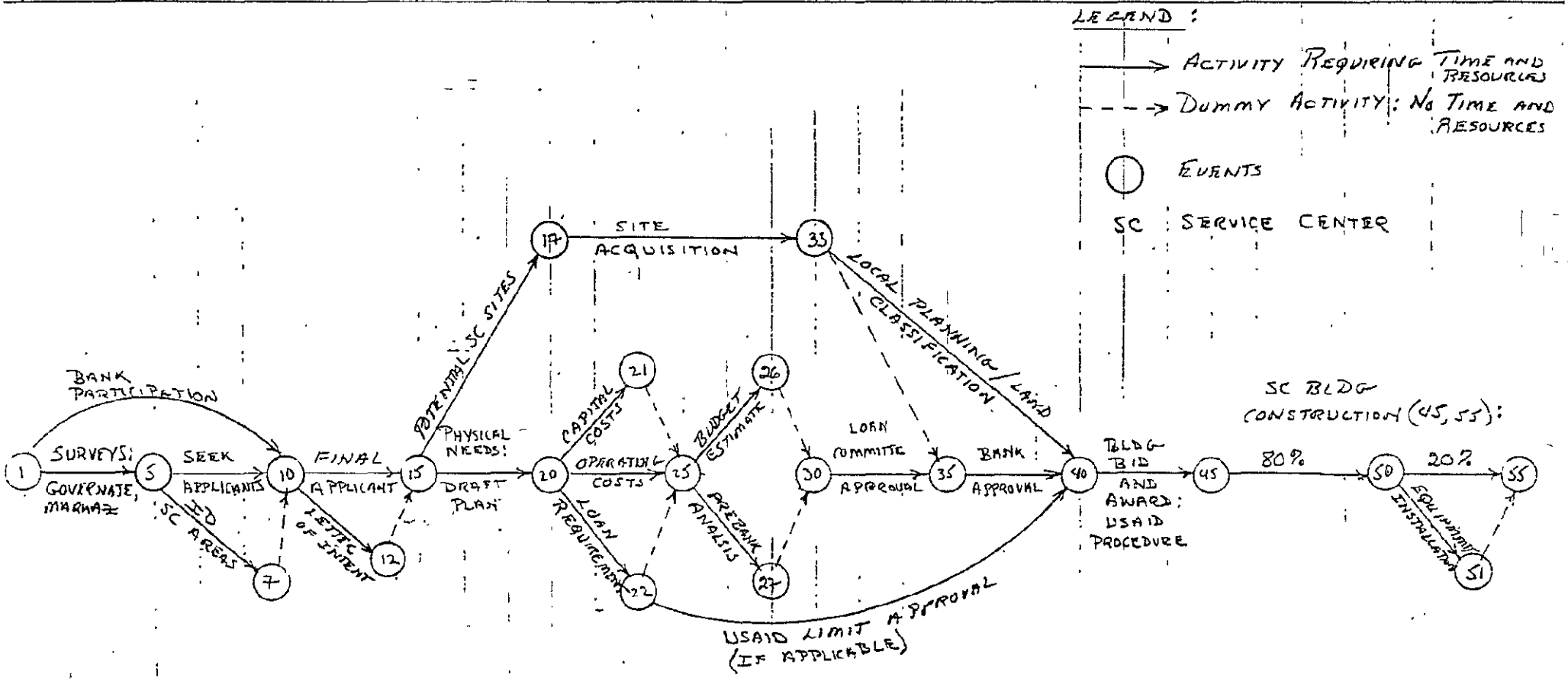
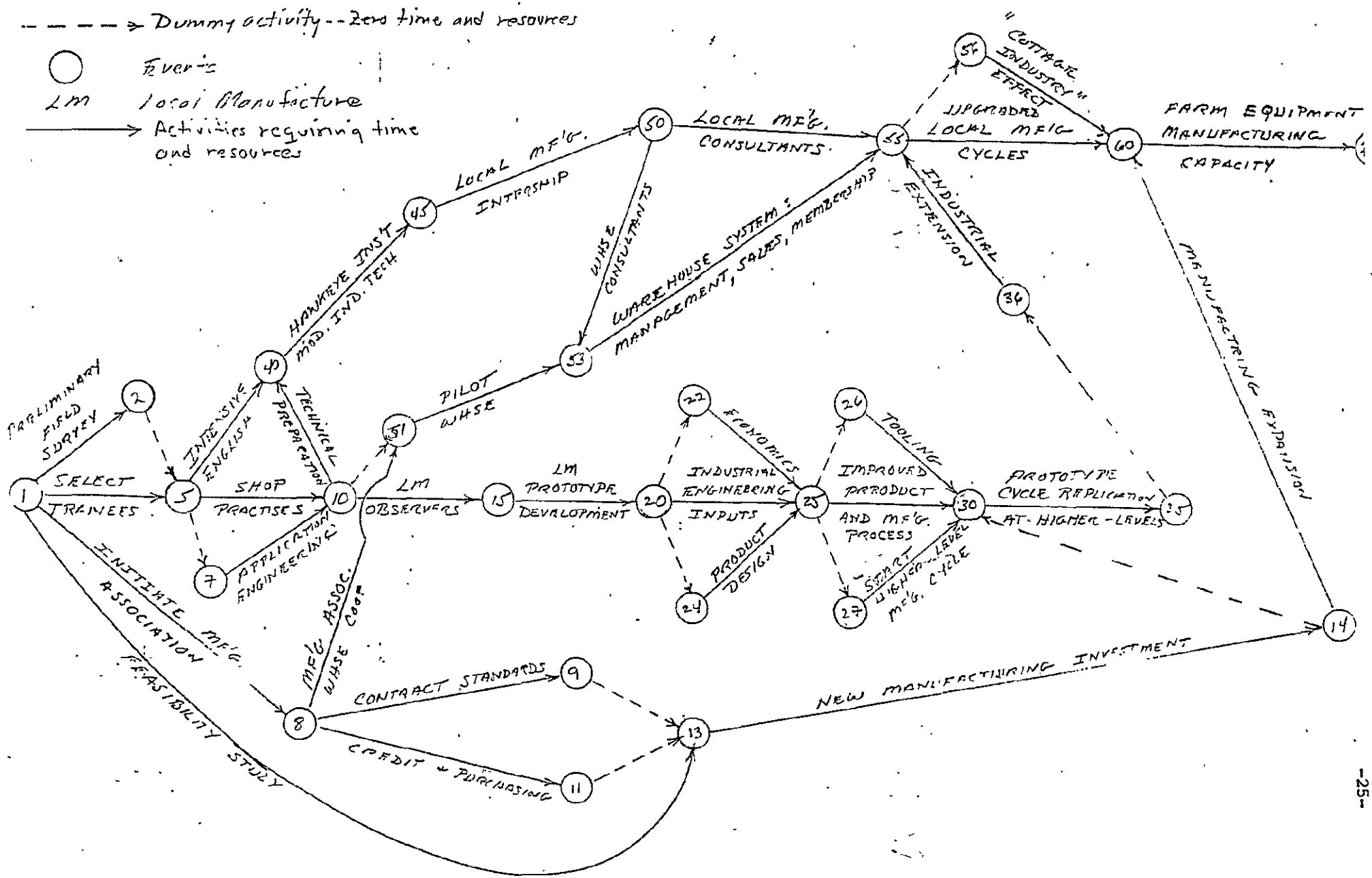


Figure 4.1. Service Center Development Planning Network.

Figure 4.2 . Precedence Network for Local Manufacturing Technical Assistance and Training Program



4.2 IMPLEMENTATION ISSUES

1. With the activation of the credit funds, the need for establishing a Senior Accounting Advisor to oversee the correct operations of these funds is critical.

Remedial Action: USAID approval of the proposed Senior Accounting Advisor's position.

2. Disbursement of Service Center Funds has been nil because of the slowness of the banks to process applications and the need to relax several village workshop requirements, e.g., changing the 6-month grace period to one year, and waiving the down payment requirements for these small operations.

Remedial Action: Amendments to the letter of understanding that more clearly specify to the bank financable items and that meet the other concerns of the small village workshops.

3. The lack of research prototype equipment has made it impossible to implement the in-house tillage research program envisaged in Section 4.1.

Remedial Action: It is beyond the ability of the Project to procure the Group I prototype equipment. The Project can purchase additional equipment from other sources even though these may be inferior to the Group I prototypes.

4. Shop management at the Alexandria Research and Testing Center has delayed the machinery prototype development program.

Remedial Action: Instituting a shop management system.

5. The lack of training facilities has caused delays and rescheduling of in-country technical training programs.

Remedial Action: Direct Project support to assist in developing additional training capacity.

During this reporting period, steps have been taken to address several previously reported implementation issues:

1. Transportation needs have been met through USAID's approval of local vehicle procurement.

2. USAID approval of demonstration/training equipment should ensure that field training programs can proceed on schedule.

3. USAID approval of the machinery introduction fund will keep this program moving forward.

5.0 MAJOR OBJECTIVES

5.1 OVERALL PROJECT OBJECTIVES

1. Concentrate upon initial movement of local currency funding from bank accounts into the expended category.

2. Approval and finalization of the Senior Accountant position.

3. Machinery introduction fund operation.

4. Demonstration/Training equipment procurement to be activated during the next reporting period.

5. Acquisition of Group I research prototype equipment.

5.2 PLANNING AND EVALUATION SUBPROJECT

1. Development of two papers that pertain to project implementation:

   a. Waterlifting Costs of Irrigation Water: a Societal and On-farm Comparison in the Arab Republic of Egypt

   b. Economic Optimization of Tractor Power in Selected Land Improvement Operations.

2. Amend the Service Center Loan Fund's letter of understanding to meet the implementation problems described in Section 4.2.

3. Continue pretesting the Waterlifting Credit Fund.

4. Submit workplan for Evaluation Subunit for next twelve months.

5. Evaluation of Sharqia training program.

6. Examination of sakkia pump use and preferences in Qaliubia.

7. Study of tractor time use in Sharqia.

5.3 RESEARCH AND DEVELOPMENT SUBPROJECT

1. Development of a rice harvester with pickup reel for testing in this fall's rice crop.

2. Acquisition of research prototype equipment.

3. Development of a cotton stalk cutter for the fall cotton crop.

4. Begin awarding Applied Research Contracts.

5.4 MACHINERY MANAGEMENT EXTENSION/TRAINING SUBPROJECT

1. Development of audiovisual materials, TV programs, extension pamphlets and posters.

2. First revision of the Project's Participant Training Guide.

3. Development of village workplan for the recently trained mechanization specialists in Beheira and Gharbia governorates.

4. Begin training of the second group of mechanization specialists for Sharqia, Qaliubia and Minia governorates at the Sakha Training Center.

5. Acquisition of initial demonstration/training equipment for project village use.

6. Continued program development in accordance with the training plan at training centers and in the field.

5.5 LOCAL FARM EQUIPMENT MANUFACTURING PROGRAM

1. Completion of testing program for the new thresher.

2. Available prototype testing in the rice crop.

3. Initiate training activities.

5.6 SOIL IMPROVEMENT SUBPROJECT

1. Selection of initial basins in Minia.

2. Organize equipment needed for initial basin implementation.

3. Review with EWUP the potential for cooperation in Minia.

4. Implement working paper number 2 at Baltim.

5. Finalize workplan.

5.7 SERVICE CENTER/VILLAGE WORKSHOP SUBPROJECT

1. The main effort will focus upon bank approval of at least one service center facility and three village workshops.

2. Amend the letter of understanding with the PBDAC to facilitate service center and village workshop loan approvals.

ANNEX A

MONTHLY REPORTS

A.1 PLANNING AND EVALUATION SUBPROJECT

A.1.1 ECONOMIC AND FINANCIAL PLANNING SUBUNIT

Activity Report
April 1982

Submitted by: Steven Shepley
Zaki Helmy
Mohammed Shoukry

I. Summary

With approval of the Water Lifting Credit Fund Letter of Understanding, the Economic and Financial Planning Subunit has formally requested USAID for an initial advance of funds for use in program evaluation in several pre-test areas prior to program activation in the 23 Random Villages.

The tractor cost algorithm previously developed has been expanded to include a routine for quantifying optimum land area utilization for tractors. The results of this analysis have been incorporated into an expanded working paper which evaluates societal and financial costs of agricultural cooperative tractors in Beheira and Gharbia Governorates.

A statistical evaluation of farm management survey data enumerated in Beheira and Gharbia Gov ernorates was conducted.

Traditional method water lifting costs survey data previously collected has been statistically evaluated for inclusion in a subsequent working paper on sakkia irrigation costs that will be published in the near future.

A follow-on tractor cost survey to be conducted among randomly selected custom operators was designed to be used in a survey effort that will be completed during the next reporting period.

Additional software for the Subunit's computer library was developed and tested.

II. Credit Funds

The Service Center Credit Fund has become fully operational and is ready for activity financing of approved credit applications.

The Water Lifting Credit Fund Letter of Understanding has been formally approved by USAID. During the reporting period, the Subunit drafted and submitted a request for advance funding of LE equivalent $US 500,000 for financing of pilot water lifting credit activities in selected pretest areas prior to activity startup in the 23 random villages. During the next reporting period, Subunit personnel will visit pilot test areas in Itay El Barud and Mahmoudia Markaz in Beheira Governorate to make the final selection of the pretest villages. In conjunction with this effort, the Subunit will work closely with the Training and Extension Subproject to finalize details of the extension program which should complement the credit extension facilities. According to the Letter of Understanding, the Mechanization Project is responsible for providing guidance to farmers on optimum water lifting devices, the venue of their purchase and instruction in proper operating and maintenance procedures.

III. Evaluative Work in Tractor Use Optimization

The tractor operating cost analysis described in last month's report has been expanded to include an evaluation of tractor cost efficiencies at various plot sizes. In the revised report, published as Working Paper 1, "Agricultural Cooperative Tractor Costs Survey in Beheira and Gharbia Governorates," it was found that current practices of tractor use throughout the two governorates surveyed are highly uneconomical.

The prevailing diseconomy of tractor use results from the practice of moving tractors about between isolated plots of two feddans or less. As these plots are small and located at considerable distances from each other, sometimes as much as seven kilometers, considerable effort and expense is incurred in traveling. This expense can be substantially reduced through greater operational consolidation. Societal and entreprenurial cost savings that would be gained through operational consolidation at the sakkia unit level are presented in the talbe below which was taken from the Report:

Financial and Economic Cost Comparison of Tractor Use on Small Disbursed Plots Vs. Consolidated Use on Larger Plots

LE 1982 Per Feddan for 65 HP Tractors

Cost Category	1 Feddan Plot	15 Feddan Plot	Cost Savings in %
Economic	7.31	5.25	39.0
Financial	3.43	2.47	39.0

At present, farmers throughout the agricultural areas of Lower Egypt traditionally share the costs of irrigation, and carry out this activity on a cooperative basis through the sakkia units where there is joint ownership and shared use of animal powered irrigation equipment. It would seem feasible to assume that farmers might be willing to follow this traditional practice for other farming operations in addition to irrigation. If this hypothesis is correct, it should be feasible to promulgate the use of tractor operations based upon the land area of the sakkia unit, which would result in substantial savings in economic and financial costs while also fitting in with common social practice.

IV. Evaluation of Farm Management Data Collected by FINTECS in Sharkia Governorate

As part of a continuing effort to assess the quality of the Project's farm management data collection effort, the Economic and Financial Subunit has performed a statistical analysis using regression models of FINTECS data collected in Sharkia. The regressions plotted from randomly selected farms include fertilizer application, land area and costs and seed application, land area and costs for long term berseem. Evaluations of tractor operation time, land area size and associated costs were also performed. The correlations were found to be better than expected, with multiple correlation coefficients ranging from 0.78 to 1.00.

V. Analysis of Water Lifting Cost Data

The sakkia cost survey data collected for 170 observations in Beheira, Gharbia and Qaliubia were collated and analyzed during the reporting period.

Statistical operations were performedon each of the variables to include calculations of the means, standard deviations, standard errors, coefficients of variation, skewness and kuutosis, confidence intervals at the 95% level plus histograms and frequency distributions. These data and analytical output are on file at the Subunit office and shall be used in the preparation of the next working paper on sakkia opportunity costs during subsequent reporting periods.

VI. Design of a Follow-on Tractor Cost Survey

There presently exist 13 goverment-operated custom operating facilities for tractorized farm operations in Lower Egypt. These are located in Sharkia, Gharbia, Menufia, Qaliubia, Giza and Ismailia. The Subunit has visited a number of these installations and find their operating cost records to be generally complete. It is planned to conduct a second cost survey among these installations which will be developed into a second working paper for the purpose of comparing operating costs of variable tractor makes and sizes. The format of this survey was developed and disseminated and data for each of the cost components shall be tabulated and analyzed. The information that is being collected is shown in the attached matrix.

VI. Computer Software Development

During the month, HP-85 software was prepared for the following operations:

- Economic use optimization of farm tractor power
- Financial use optimization of tractor power
- Random number generating routine
- Financial and economic costs of farm implement use

These routines are on tape and disc files in the Project computer center.

TRACTOR COST OPERATING COST SURVEY FORM
FOR CUSTOM OPERATORS

From (Date) _____ to (Date) _____

Tractor License Number _____

Tractor Make _____

Tractor Horsepower _____

Date of Purchase _____

Purchase Price _____

Operating Hours	Fuel Consumption in Liters	Fuel Cost in £E	Lubricant Consumption in liters	Lubricant Cost in £E	Maintenance Cost in £E (Labor)

Maintenance Cost in £E (Spare Parts)	Operating Labor Costs in £E

Activity Report
May-June 1982

Submitted by: Zaki Helmy
Steven Shepley
Mohammed Shoukry

The following activities were undertaken during the reporting period:

1. Water Lifting Credit Fund

On June 10, 1982, a check for LE 415,840 was deposited into account number 1682 at the Principal Bank for Development and Agricultural Credit (PBDAC). These funds have been reserved for the pretest phase of the credit program which is now being initiated in the following villages:

Village	Markaz	Governorate
Sheikh Ahmad	Itay El Barud	Beheira
Nakhla El Enab	Itay El Barud	Beheira
El Atf	Mahmoudiya	Beheira
Kasr El Moustaga	Mahmoudiya	Beheira

Several visits to the Beheira Agricultural Development Bank have been made to explain the purpose of the pretest and to answer any questions concerning the loan terms and conditions established in the Letter of Understanding. which was executed between the Agricultural Mechanization Project and the PBDAC on November 23, 1982.

To promote farmer acceptance of mechanized water lifting devices in place of animal and human powered water wheels and archimedian "tambours," the water lifting credit fund is being implemented in tandem with a comprehensive extension program designed to acquaint farmers with the comparative economics of alternative water lifting methods. The extension effort also includes dissemination of technical information concerning suitability of various technological water lifting alternatives available on the local market and provides instructions for proper operating and maintenance of equipment. Guidance is being given with respect to completing required loan application forms together with information on prices and locations of various dealerships throughout the pretest area.

One distinguishing feature of the Mechanization Project program is that credit terms have been weighted in favor of the smallest landholders and tenants, allowing up to a seven year payback period for owners and cultivators working less than three feddans. The intent of this policy is to encourage farmer acceptance of improved water lifting methods among the smallest holders, who, although comprising over 50% of the farm holding population, have not been major participants in previous credit programs which were biased in favor of larger holders.

During and following the pretest period, continuous follow-up and evaluation of the effort will be undertaken to permit final adjustment of program procedures prior to full implementation of the program in the 23 randomly selected project villages.

2. Analysis of Comparative Water Lifting Costs

It has always been assumed that replacement of animal and human powered water lifting devices would result in greater operational efficiency and

on-farm cost savings. These assumptions have been supported by various attempts to quantify the magnitude of alternative method water lifting costs. The existing literature concerning the subject of water lifting costs is extensive. In most instances, the previous estimates were developed from standard engineering formulae for fuel consumption, maintenance and repair costs, etc., derived from years of empirical data, usually collected outside Egypt.

The most difficult aspect of comparing water lifting costs is not in the cost comparison of mechanically powered alternatives, as the validity of standard empirical formulae for various cost and consumption coefficients has been proven. The most difficult aspect of water lift costing is the cost of animal power. In most of the previous literature, these costs have been assumed rather than empirically quantified, raising questions about the accuracy of the analyses.

In an effort to develop more realistic estimates of animal power costs, the Planning and Financial Subunit has conducted a random survey of 130 operating water wheels (sakkia) in 14 villages of Beheira, Gharbia and Qaliubia governorates. The information which was collected and statistically analyzed included:

1) Average number of cattle and buffalo working days/month in winter and summer;
2) Average length of cattle and buffalo working days in winter and summer;
3) Birth time intervals for working and non-working buffalo and cattle;
4) Market prices of 40-day old female and male buffalo and cattle calves;
5) Wint er and summer daily milk production of working and non-working cattle and buffalo;
6) Summer and winter market prices of buffalo and cattle milk;
7) Market live weights of adult working and non-working buffalo and cattle;
8) Buffalo and cattle draft rental prices;
9) Sakkia capital costs and useful life periods;
10) Costs of sakkia installations, including cement works, land preparation and excavation.

From analysis of the data, it was found that lactating animals used for sakkia power generate opportunity costs in foregone milk, meat and calf production which represent net income losses to farmers and the national economy which could be recovered by substitution of mechanical for animal power for irrigation devices.

As there are internal subsidies prevailing in official markets for fuel, foreign exchange and credit, an analysis was performed to compare the income effects from replacement of animal powered irrigation methods by diesel powered irrigation devices with and without the subsidies. The results of this investigation are attached as an appendix to this report.

In summary, it was found that replacement of animal powered sakkia by diesel powered pumps would result in water lifting cost savings from 100 to over 300%. The comparative annual costs/feddan from the report are summarized below:

Comparative Water Lifting Cost Means (LE/Feddan/Year)

Buffalo powered sakia	LE 53.90
Cattle powered sakia	43.29
Pump (economic costs)	22.68
Pump (financial costs)	13.85

An additional output of the water lifting cost investigation included the preparation of comparative waterlifting cost tables showing irrigation costs for each of the major crops using alternative methods. These tables have been provided to the Extension Subproject for use in the water lifting extension program described in section (1) above.

Future activities in water lifting costing will include another report and further investigation to refine existing estimates and to expand the comparative analysis to include motorized sakia and electrified pumping options.

3. Liaison with USAID

Approximately half of the Subunit's time during the reporting period was spent in providing liaison with USAID concerning completion of remaining conditions precedent for funds disbursement and in arranging for disbursements and managing the project's financial accounting system.

4. Gebel Asfar Feasibility Study

At the request of the Project Director, the Subunit has provided technical assistance to the Farm Management group in cost estimating and benefit pricing of the Gebel Asfar Mechanized Farm Study. The internal financial and economic rates of return were calculated. The financial IRR was found to be 19.85% and the economic IRR was 13.5%.

5. Participating in the Ministry of Agriculture's Five Year Mechanization Plan

The Plan evaluated the current state of mechanization in Egypt and established targets for mechanization over the next five years for all crops and some specialized crops such as sugarcane, onions, groundnuts and horticultural crops.

Status Report Concerning the Water Lifting Credit Fund

June 15, 1982

To: Dr. Ahmed F. El Sahrigi, Project Director

From: Steven C. Shepley, Sr. Economist & Financial Planning Advisor

Pursuant to your request for information concerning the Water Lifting Credit Fund, the following action has been recently taken:

a) On June 10, 1982, a check in the amount of LE 415,840 was deposited to account no. 1682 in the Principal Bank for Development and Agricultural Credit, established for receipt and disbursement of Water Lifting Credit Funds.

b) The following cooperative areas in Beheira Governorate have been designated for participation in the Water Lifting Credit pretest prior to program activation in the 23 random villages next fall:

   (1) Sheikh Ahmed (Itay El Barud)
   (2) Nakhla El Enab (Itay El Barud)
   (3) El Atf (Mahmoudiya)
   (4) El Kasr El Moustagad (Mahmoudiya)

c) The Agricultural Development Bank in Beheira was visited on June 14, 1982 to explain the program and to request that the Bank publicize the activity through the four village banks. The Governorate Bank has given its commitment to inform the Markaz banks by the end of this week and to follow up to insure that all four of the village banks are fully briefed by the end of next week. We shall follow up to insure that this action has taken place as indicated.

In conjunction with the pretest, the Project should undertake an extension effort in the four cooperative areas to provide farmers with this information:

a) Proper care and maintenance of pump sets;
b) Sepcifications concerning the makes, types and performance characteristics of avialable pump sets on the local market;
c) Names and locations of dealers selling this equipment.

I have discussed this matter with Fred Schantz and he is putting together the material for the extension program. As Erroll Coles' group is no longer involved with the water lifting extension effort, a mechanical engineer counterpart should be assigned to work with Mr. Schantz, who will serve as coordinator and expeditor of the water lifting extension effort in the four pretest areas.

cc: Dr. Haddad
Dr. Gaiser
File

A.1 PLANNING AND EVALUATION SUBPROJECT

A.1.2 FARM MANAGEMENT SUBUNIT

Activity Report
April, 1982

Submitted by: Maher Faltas
Mohamed Ismail
Fuad H. Metry
Samir El-Dessouki
Yousef A. Naiem
Magda Marzouk
Layla El Banby
Jim McClung
G.B. Stringer

Farm Management Survey

Data collection has continued in all three governorates. The winter crops are being completed and summer operations are well underway.

Data transfer to English, by the office staff, is progressing properly with the first 3 month period (Oct., Nov., Dec.) completed. The staff is now working on the data for the January to March period. Due to the fact that the transfer process is standardized the work is now progressing faster than during the earlier quarter. The second quarter data for Qaliubia will be completed by the second week in May. After this, Gharbia and Beheira data will be processed. There have been some questions regarding some of the data in Arabic from Beheira but these have been clarified. Some data has been processed in the computer and it appears that the data being gathered in reasonably accurate. Mr. Faltas, Mr. Ismail and Mr. Helmy went to Sharkia to collect cost data on fertilization, plowing, and seeds for Mr. Shepley.

A visit was made to the farm of Mr. Bahgat Kassem to look into the feasibility of advising him regarding the installation of a drip system in his citrus. It was agreed that due to the flowering and June drop that nothing should be done at this time. We promised to put Mr. Kassem in touch with both Reed and NIMOS. We will also keep in touch with him as the season progresses.

Farm Management Survey: Status in Beheira Governorate

J. McClung
Youssef Abdel-Naiem

Since January 14, 1982, we have held direct responsibility for supervision of survey work in Beheira Governorate. The following are our experiences, issues and questions.

On Jan. 14 Mr. McClung accompanied Mr. Zaki Helmy to Beheira to meet the supervisor and enumerators and to become familiar with the survey area. Following this visit, and accompanied by Mr. Shepley and Mr. Helmy, we made a second two-day familizarization tour. Since this visit, supervision of the survey in Beheira Governorate has been completely in the hands of Mr. McClung and Mr. Abdul Naiem. There are no outstanding developments to report that are in variance with the Monthly Report presented by the integrated survey group.

On March 2 and 3 we again visited Beheira to discuss arrangements with the Agricultural Director for replacing Mr. Rashidy by Mr. Abd El Sattar, one of our enumerators, and assigning and training a new enumerator. These arrangements were suitable to the Director and he will nominate a candidate to replace our enumerator. As of now, Mr. Rashidy continues to serve as supervisor.

Payment of salaries to the enumerators has continued without problems in January and February. No salary increases were given in February in accordance with Mr. Stringer's instructions. The salaries of the enumerators in El Gurn Gamaya will be rediced by LE 5 in March, due to failure to appear on two occasions.

Collection of Forms 4 to 8 through December 31 has been undertaken. As we were requested to delay this process until mid-February when files would be available in Cairo, this process was not completed until March 3. This delay also resulted in much data for January and February being included in the December 31 group of data. The new forms however follow the next consecutive date and no redundancies in the data will result. The March 31 set of data forms will, however, in fact end on March 31. Although this may seem complex, it will save a good deal of scribing activity on the part of the enumerators.

The survey group seems to be at odds on the method for compiling data on intercropped cotton and onions. Some believe this should be treated as one production unit, while others wish to treat it as two separate production units. As the latter method relies on an arbitrary percentage split of production costs it would appear best that the splits be carried out by computer methods following completion of the survey. This will avoid computational errors on the part of the enumerators, as they will only be required to complete one form and few if any calculations. The very fact that the percentages used are arbitrary indicates that this is in the realm of data manipulation and not true data collection. In any event, a set method should be discussed and agreed upon by the survey team and project staff who will be involved in analysis of the data.

Activity Report
May, 1982

Farm Management Survey

1. Data collection is continuing in all three governorates. Summer crop operations are in full swing. It appears at this time that we are again seeing wage increases in the wheat harvest due to the shortage of labor. Such cost increases make mechanization mandatory. As an example, it is less expensive to harvest cotton with a two-row picker than it now is by hand in this part of Egypt.

2. Mr. Jim McClung is now working full time with the Soil Improvement group. Supervision in Beheira Governorate is now being carried out by Youssef Abdul Naiem with backup from Maher Iskander Faltas, Mohamed Ismail, and Gordon Stringer. The supervisor in Beheira Mr. Said El Rashidy has been replaced by Mr. Abdel Sattar El Leithy, a former enumerator. The changeover has been very smooth, and Mr. El Leithy's post has been filled by Mr. Osama Ahmed Hamuda who is expected to begin his work in early June.

3. Data transfer to English by the office staff is progressing in good order. The second 3-month period (Jan.-March) data for Qaliubia and Gharbia has been completed. Work is now progressing on the data from Beheira. This data will be completed by the time new data comes in from the third 3-month period.

4. On 9 May the Farm Management Group visited the Gianaclis Training Center to assess its potential value to this project. A report on the trip was delivered to Mr. Fred Schantz. The Gianaclis Training Center has good potential to assist in carrying out many of the goals set forth in the Project Paper.

5. Mrs. Magda Marzouk has been transferred from data transfer back to the FAO building where she is working on the computer full time.

6. On May 16 Mr. Faltas delivered a talk about the activities of the Farm Management Survey to the participants in the training course in Alexandria put on by the Evaluation group.

Activity Report
June 1982

1. Data collection is progressing properly in all three governorates. Most all the winter crop work was completed in the month of June. Thus, is will now be possible, after collecting the third quarter data (April, May, June) to complete cost and return data for the winter crops. Summer crop operations are presently being carried out. The most visible activity is the inspection of cotton plants by crews of small children looking for cotton worm egg masses. Cotton spraying has started this month in some localities according to this visual checking.

2. As reported last month, Mr. Osama Hamouda began his work as the new enumerator in Beheira in mid-June. So far, it appears that he will be able to do the job properly.

3. Data transliteration by the office staff progresses well. The data for the second quarter (Jan.-March) will be completed during the first week of July. The third quarter data (April-June) will be collected from the governorates during the second week of July.

4. On June 12, as requested, Mr. Faltas, Mr. Ismail and Mr. Stringer visited the Sabahia Research Station which consists of about 180 feddans near Alexandria. This visit was carried out in conjunction with a trip to inspect the enumerators' work in Beheira. A report of this inspection has been delivered to the Minister's office and to Dr. El Sahrigi.

A.1 PLANNING AND EVALUATION SUBPROJECT

A.1.3 EVALUATION SUBUNIT

Activity Report
April 1982

Submitted by: Dr. Peter Reiss

Mechanized Farming Survey

A. During the period: The coding and analysis of data from the survey of ten randomly chosen villages in four governorates has continued. The first two chapters of the final report were written by the research team and reviewed by the Evaluation Advisor. With respect to the analysis of the survey data, four composite variables were selected against which most of the information concerning mechanized farming will be correlated: landholding, degree of mechanization, commitment to mechanize, and employment pattern. The first draft of the section on workshops has been completed and is being reviewed.

B. Follow-up: The first draft of the report is expected to be completed by the end of May or early June. The report, which is being written in English, will then be translated into Arabic for wider distribution. Dr. Bahgat Abdel Maksoud has accepted responsibility for translating the early chapters of the report and will read the later chapters, making the necessary adjustments after they have been translated by Ministry personnel.

Village Studies Program

A. During the period: Work continued on the project village profile. Incomplete or inaccurate forms were returned to the monitors. The information is being coded and tabulated. It will form the basis of a report about the 23 project sites to be used by project members including local extension agents. Cross-tabulations of information from village leaders is being completed and will be part of the same report.

The Evaluation Advisory Committee has met twice during the period to review the work to date and plan for the two week workshop to be held in late May. The workshop will have the following plan of four distinct areas to be considered: 1) data collection and analysis; 2) issues in mechanization and development; 3) discussion of the Agricultural Mechanization Project; 4) and machinery basics. We have been considering the International Research Center at Mariout as a possible location. The Cooperative Institute in Sidi Bishr, Alexandria, has also been mentioned.

Before the training period begins, the village monitors will collect information which will serve as the basis for discussions about data analysis at the meeting. Three members of the Advisory Committee have worked on a study of agricultural wage structure and labor availability in the project villages. Three different populations have been isolated: emigrants, landless laborers, and farmers. In each village, twenty of each will be interviewed. The analyzed data will be used to write a report on the labor situation in the project villages, serving as an overview.

During the period, the three professors, Drs. Ahmed El Adly (Extension), Abdel Tawab El Yamani (Economics), and Abdel Bassett El Sayyad (Rural Sociology), met to write the questionnaires. Team leaders and committee members were delib erately selected from different disciplines in order to share their various perspectives. The cooperative writing of a research plan ought to strengthen the design.

B. Follow-up: The final schedule of the workshop is to be approved by the Advisory Committee as will be the exact participation of each of the members. Outside lecturers are to be invited and the final arrangements for the center will be made almost immediately.

Training Overseas

During the period the Evaluation Advisor visited the office of AMIDEAST in Garden City, Cairo. AMIDEAST has a considerable amount of money to send qualified Egyptians to the USA for MA and PhD degrees. I visited with Wagdy Zeid, a graduate student at the University of Alexandria in the Department of Agricultural Extension. Wagdy served as my temporary counterpart last summer. He has done excellent research on agricultural mechanization in Markaz Abu Hommos in Beheira. At AMIDEAST we found that money is, indeed, avialable. An important criterion for receipt of a grant is ability to speak and use English. Other qualifications include high university grades, acceptable scores in the Graduate Records Examination, and a study plan that will benefit Egypt's development. Wagdy Zeid will take the appropriate langauge exams and try for admission to an American university next spring.

Field Trip to El Arish

The Evaluation Advisor made a short trip to Sinai to review an irrigation project sponsored by the Mennonite Central Committee and the Ministry of Irrigation. Of primary concern was how successful an effort was being made to convert the project from an outside organized and run activity to a farmer managed effort. The Mennonite Committee has been asked to disengage itself from all non-religious activities, and the Ministry has taken over full control. Interesting observations of the transfer of authority include the inability of most irrigation units to handle the distribution of the water themselves and the resorting of one group to hiring an outsider to manage their affairs. Problems in the management of small cooperative units have implications for the Mechanization Project since it is suggested that groups of farmers might be encouraged to manage some activities themselves, such as water lifting devices.

Information Request

During the last staff meeting, the Evaluation Unit was asked to supply names of candidates for the position of vilage mechanization extension experts. The names are now being collected.

The El Arish Irrigation Project

April 17, 1982

Dr. Peter Reiss

The El Arish Irrigation Project is a joint effort of the Ministry of Reconstruction and Housing and the Mennonite Central Committee, the development branch of the American-based church. The project began in 1979, following the Israeli withdrawal from the area.

Prior to the Israeli occupation, the Egyptian government had installed an open trench, gravity flow irrigation system in El Arish. Olive trees were planted, and land was distributed among farmers from El Arish city. A series of wells were drilled which provided the irrigation water. In all, the project covered nearly 500 feddans.

In 1967, the Israeli army determined that the farming zone was dangerously close to the El Arish airport and restricted access to the adjacent farmed area. During the period of occupation, civilian Israelis slowly displaced many of the El Arish farmers. Still, only fifty Israelis lived on the farmed area, and they never succeeded in working the entire zone. With their presence, a new cropping and irrigation system was introduced. The Israeli settlers uprooted the olive trees and installed a drip irrigation system for vegetable growing. The removal of the trees caused a good deal of bitterness among the El Arish farmers. This area was, incidentally, the only Israeli agricultural settlement in the part of Sinai now returned to Egypt.

With the return of this area to Egypt in 1979, the Israelis plugged the wells and dismantled the drip irrigation system, carrying away what they could and destroying the rest. At this point, the Ministry and the Mennonites intervened to restore the system. Six wells were redrilled an a seventh started. A drip irrigation system (Reed Irrigation Systems, Australia) was reintroduced. The original irrigation plan using elevated irrigation channels was abandoned.

In all, 75 farmers work the five hundred feddans, 30 of whom are among the original El Arish farmers who were displaced by the Israelis, and 45 who are settled Bedouins. Priority was given to returning the land to the pre-occupation holders, but only a portion of them and their descendants have claimed the right. However, prior claims were not fully recognized by the government. All farmers had to purchase the land, whether or not they had been holders prior to 1967, although more favorable terms were given to those with claims. Old farmers were charged 1-2000 Egyptian pounds; settled Bedouins were charged 4000.

Land was divided into four feddan units with roughly ten farmers formed into irrigation groups. Seven groups exist. The Mennoite Central Committee has provided technical assistance and equipment. The Ministry has, among other inputs, paid for the salaries of those who have supervised the irrigation groups. Each group was given a Ministry employee who managed the flow of water to the individual fields. This point ought to be kept in mind, since the Ministry has recently withdrawn the supervisors.

The land is now largely devoted to vegetable growing, tomatoes, cucumbers, okra, and mulukhiya being the most important crops. However, at any one time, generally only half of the land is cultivated. The seven wells provide enough water only for roughly 250 feddans devoted to vegetables. Therefore, except in winter, half the land is left fallow. During the winter, barley is grown unirrigated since precipitation provides enough water. According to government plans, the area eventually is to be used for olive

tree growing. In this case, the seven wells would provide enough water for all 500 feddans to be worked. Already, many farmers have planted olive trees, while intercropping with vegetables.

In order to reduce the use of the land at any one time, the project team installed laterals for only half the land. However, some farmers have paid for laterals themselves.

Water use has presented three problems: qualtiy, supply, cost. Regarding supply, the well water has a high salt content which has increased during the irrigation activities. Last year, a survey indicated that the water had a salt content of 3500 ppm. A recent study showed that this had increased to 4500 ppm. There is growing concern by project staff about this situation, and two valves were installed at the beginning of each line, one to control pressure and the other for volume. The pressure valve was adjusted by the project engineer, and was designed to be left in that position for all users on the line. However, farmers at the front turned full on for themselves, denying an adequate supply to those further on. The engineer has since installed washers in each valve, making it difficult to readjust the pressure. None of the farmers have the appropriate wrench to remove the washers. With regard to cost, no meters were installed on the 40 hp diesel pumps drawing the water 30 meters to the surface. Therefore, farmers were never certain if they were receiving their appropriate amount, and if they were being charged properly. The decision not to add individual meters was a political one made at a high level. Ten to fifteen of the farmers have paid for the installation and purchase of valves for themselves, more to prove that they have not been receiving the correct amount of water than to show that they have been paying incorrectly. Certainly, disputes over water exist, and last winter one farmer was stabbed over such a conflict.

Last month, the Government revoked the right of the Mennonite Central Committee to work in development and ordered its termination of projects. It has already ceased participation in the irrigation project and has given over its responsibilities to the Ministry. One of the first actions of the Ministry was to remove the seven group supervisors from the project. It determined that the farmers ought to be able to organize themselves without government assistance. Since the decision was made, only one month ago, it is difficult to predict what the consequences will be. However, one of the seven groups has already hired an outside individual to take the place of the removed government supervisor. Each farmer contributes to the LE 30 per month salary of the supervisor; previously, they contributed nothing. One wonders why this group differs from the others.

The government's position that each group can organize itself is entirely unsubstantiated and must be dismissed. These groups of farmers and settled Bedouins have no experience in managing modern technical systems, nor are they likely to have aprocedure for resolving conflicts over resources when the disputants are not kinsmen. In fact, each of the seven irrigation groups is comprised of both El Arish farmers and settled Bedouins. It would not be surprising to find conflicts and misunderstandings arising from the differing backgrounds and cultural values. The government, then, is demanding a rather monumental shift in organizational skills and conflict resolution abilities without providing for a meaningful period of transition. It should be recalled that one of the 75 farmers suffered a knifing attack during the period when government employees were still supervising the groups. These civil servants were nominally unbiased participants. Still, charges and countercharges abounded of favoritism among the farmers.

When designing the renewed irrigation system, some thought might have been given to the potentially problematic areas of water supply and cost. If a reliable system for maintaining constant flow had been included at the

beginning, conflicts between those at the head and the tail of the lines might have been avoided. One of the representatives of the Mennonite Central Committee staff remarked that the water supply had been determined only after the land had been earmarked for use. A closer coordination between land to be developed and available resources might have been made more explicit. Any irrigation system is seriously undermined from the beginning if not enough water is available or if some farmers are able to circumvent the established procedures and use more water than is otherwise allowed. Some variation of an automatic shut-off might have been built into the system. Related to this, pressure might have been brought to bear for the initial installation of meters so as to allay the fears of those who would think that they were receiving less than their fair share.

Finally, the question ought to be whether there are lessons to be learned for the Agricultural Mechanization Project. The most important is that the oft heard call for a ground-up organization is to be sought after, but a difficult one to implement. Such a system may be as alien as a formal one imposed from above. In the case of irrigation groups, the removal of the government supervisors left these farmers virtually abandoned. Having no experience in handling a diversified social unit, they cannot be expected to develop the marginal skills called for in deciding when the water is to be disbursed, to whom, and in what order. In our attempts to create decision making groups for implementing soil improvement activities, for example, we ought to call upon those already functioning units, formal and informal, for support. We may want to diversify their interests and broaden their powers so that an existing structure may be integrated with village proejct activities.

Landleveling Management in Minia

Dr. Peter Reiss, Evaluation Advisor

The following report is based on visits made to the Minia Governorate project villages between March 14 and 18, 1982. It represents an initial effort to provide information for the planning of landleveling activities which will be undertaken by the Soil Improvement group.

Project management recognized that if machinery being procured by that group is to be used optimally, farmers in the targeted areas would have to be brought into the planning process. A number of questions were raised which would have to be considered before designing a landleveling schedule: Would farmers permit landleveling activities on their land during usual times of cultivation through either scheduling changes (i.e., late seedbed preparation or early harvesting), or voluntarily set fallow periods? Would such rearrangements require compensation and if so, in what form? Are there particular crops or seasons when such alterations would be last disruptive? What is the appropriate unit for landleveling activities, and how can it be organized for the greatest efficiency of landleveling operations?

Discussions were held with a variety of farmers from the project villages. They were landowners and renters, with holdings varying from less than one, to nine feddans. All of them appeared to understand the importance of landleveling and were able to verbalize how high and low areas within a basin and within a single holding affected water use and production levels. They were cooperative and eager for assistance. However, they also stated that they were bound by certain constraints which would limit landleveling activities to certain periods.

In general, the villages divided into two groups in identifying specific periods during which landleveling could be done with the last disruption of the cultivation schedule. These periods are from 15 December to 15 March and from 15 May to 15 July. It is not yet clear why farmers in particular villages prefer the first period and in other villages prefer the second. This matter will require further investigation. Still, at present, it is possible to identify two free or potentially free periods, one of 90 days and the other of 60 days. However, this leaves 215 days, or more than half of the year, when landleveling activities would not be welcome and presumably could not be done.

These two periods coincide with cultivation dates for particular crops. The first period, 15 December to 15 March, is a time of berseem, broad beans, and wheat growing. In the case of berseem, after about a two month period, harvesting begins, continuing through June through successive cuttings. Farmers indicated a willingness to sacrifice as many as four cuttings to facilitate landleveling activities on their land. In those areas where cotton follows berseem, farmers would still sacrifice two to three cuttings. When asked, farmers will say that land preparation for cotton begins in mid-February. However, in three of the villages, more than half the land designated for cotton growing had still not been prepared. Still, enforced cotton growing is one of the strongest constraints felt by farmers. For this reason, the 15 March cut-off mentioned by farmers is the last date that they would be able to start cotton growing. Farmers also expressed a willingness to harvest broad beans as early as mid-December, thus reducing their harvest. However, the growing season of wheat runs from 1 November through June. In this case, during the winter season, only the land devoted to berseem and beans would be available.

The second period mentioned by some farmers coincides with the corn growing season. Farmers volunteered to delay the land preparation and cultivation of summer corn to as late as mid-July, although they usually begin in early May, two and a half months before. However, they would not consider not growing corn at all. As they indicated, corn is a basic item of household consumption, used for bread. According to them, production levels would not be jeopardized by the two month delay. However, as indicated earlier, farmers do not have such freedom with cotton and cannot begin land preparation later than March. Considering the two periods indicated by the farmers, it is worth noting that no farmers were willing to have landleveling take place on their land during both periods. Although it is at least theoretically possible for a farmer to cut his berseem for the last time in mid-December and delay corn growing until mid-July, thus giving the Project an uninterrupted period of seven months, none was willing to do so. In fact, unless the Project were to undertake some major activities on a single plot, such a long period is unnecessary.

The restriction of landleveling to these two periods has important, though not desirable, consequences. One is the availability of only 150 days a year. The other is that due to the crop rotation schedule, it is unlikely that more than half the feddans of a village could be leveled at any one time. During the winter period, much of the land is still being used for growing wheat, and during the summer, much is devoted to cotton. In the following table, the perecentage of land used for each is given.

Cotton and Wheat Growing in Minia Project Villages

Village	%/Total Cotton	%/Total Wheat	Total (feddans)
Beni Abeid	34	18	3816
Beni Musa	50	10	1225
Birba El Kubra	43	15	1477
El Atlat	28	23	910
Seila Gharbia	45	32	1248
Average:	40%	20%	

Even under optimal conditions, the landleveling activities promise to be slow. Project management has indicated that the machinery doing the leveling will be divided into three groups with seven tractors in each unit. Current estimates are that each group will be able to level about 20 feddans per day. If we compare this figure with the number of feddans in a village we find that the leveling activities will take from 22 to 125 days on the land not cultivated to cotton during the summer. With these estimates, it is unlikely the the Soil Improvement group can accomplsih the work that it has been mandated to do. If it were to level all of the land in only five project villages (a small part of the anticipated area), the work would take nearly 150 days, one full year of working time suggested by the farmers.

In addition to the problem of a restricted working period, one must also note the potential problem of cropping patterns and the need for advanced coordination. Individual basins vary in size from 20 to 125 feddans and are frequently used for more than one crop at one time. While farmers in all the villages stated categorically that cotton is never grown with another crop in one basin, figures from the village cooperatives show otherwise. It frequently is grown with soya beans and corn. Similarly, a variety of winter crops may be grown in a single basin: berseem, broad beans, and wheat. This

mixing of crops in a basin has repercussions for landleveling activities. These different crops have different planting schedules. Furthermore, the presence of cotton and wheat in a basin to be leveled would exclude it from such work, since all of the basin will be leveled at one time. Therefore, using the services of some organizing agent, most likely the village cooperative, wheat and cotton will have to be grown as single crops in a single basin. It will mean that the crop map for the village will have to be prepared well in advance of the landleveling work. Nor can soy beans be mixed with corn. To give the project optimal time, that is through mid-July, corn will have to be cropped singly. Such a redesignation of basin use will require the agreement of farmers as well as cooperative agents.

As for compensation, farmers acknowledge the difficulties involved in establishing an equitable system. None volunteered to leave their land fallow in return for some undefined payment. Nor did attempts to establish a reasonable amount per feddan ease the problem. In one village, the problem was discussed with a small group of farmers who had difficulty agreeing to a rate. When one said that LE 150 would be fair, another said that LE 500 would be more reasonable since he would plant onions and they fetched a good price this year. When they were told about the extent of the landleveling activities, they recognized that it would take tens of millions of pounds to compensate farmers for a missed season. In each village, farmers said that it would be better to volunteer early harvesting or delayed seedbed preparation. Rather than compensating farmers for real or imagined temporary losses, it would be advisable to start an extension program for informing farmers of the gains that come with landleveling. In our work, we ought to encourage the active participation of farmers and not the easier and more expensive method of direct payments.

Certainly the Extension component ought to be brought into the planning and design of the landleveling activities, and this integration between Extension and Soil Improvement can be extended to areas other than information dispersal. Once the land has been leveled by Soil Improvement, Machinery Extension can conduct experimental demonstrations of seedbed preparations for the crop to be planted. For example, once the land has been leveled and the farmer is ready to plant cotton or corn, the Extension component can prepare the land using its innovative approaches. This would bring together two separate parts of the Mechanization Project.

Even under these somewhat ideal conditions, the problem of optimal machinery use continues. If farmers' estimations of 150 free or potentially free days is accepted, then the tractors risk being left idle for more than 200 days.

In discussion and on a field t rip, the Undersecretary of Agriculture for Minia, Mohamed El Gamal, proposed a solution to this dilemma. He suggested that our project conduct all of our landleveling activities in those parts of the governorate where serious drainage and leveling problems exist. No accurate figures exist within the governorate for how many feddans in the Valley are no longer cultivated. However, the areas are to be found in at least six of the nine districts in the governorate. Frequently, they border the new lands projects in the west, but not exclusively. It is the official position that inadequate drainage in the reclaimed areas has caused severe problems in the old lands. However, similar problems exist in central zones unrelated to the reclaimed areas. In any case, it is estimated that at least 10,000 feddans have been taken out of production to date. Figures supplied by the agricultural office of Markaz Samalut indicate eight villages stretching from north to south with serious soil and water problems. In all,

8004 feddans have been mentioned as having reduced or no yields and requiring attention. In one of the eight villages, Kom El Rahib, about one-third of the total 1800 feddans are no longer cultivated. According to the Undersecretary, one-third of the governorate requires assistance while 10,000 feddans require immediate attention. At present, a new drainage system (apparently open) is being installed in much of this area. He suggests cooperation between those doing this drainage work (Ministry of Irrigation with the participation of his office) and landleveling activities undertaken by our project.

I am not in a position to advise the undertaking of landleveling in these damaged lands. Certainly, some investigation will have to be carried out to see the extent of the damage and the cost of reviving them. It is likely that some areas will be good investments while others will be too expensive and time consuming with the promise of little return. However, it is necessary to examine the entire area and select the most promising locations.

It is recommended, then, that landleveling activities be conducted during the two periods isolated by farmers, 150 days a year, and that the rest of the year be spend landleveling in the damaged areas in the governorate. While the Soil Improvement component may not find it advisable to work in the already abandoned areas, it may find it possible to restrict its activities in the marginal zones where production is low but the land is still cultivated.

Activity Report
May 1982

Submitted by: Dr. Peter Reiss

Mechanized Farming Survey

1. During the period: The final report on the area wide survey is nearing its completion. The core of the report, chapters on responses of farmers and machine owners, is being written by the survey senior research staff. It is expected that the final report will be ready for distribution in mid-June. Two hapters have been translated into Arabic by Bahgat Abdel Maksoud. Arrangements will be made to have the remainder translated by Ministry personnel.

2. Follow-up: During the coming month the English version of the report will be distributed to Project members and outside interested parties. The Arabic translation will be prepared and distributed to Ministry personnel in Cairo and in the governorates.

Village Studies Program

1. During the period: Much of the period was spent preparing and holding the training period for the program members. The Cooperative Institute in Sidi Bishr was chosen as the location because of its easy accessibility and reasonable cost. The training period was designed to meet the following objectives: 1) to provide theoretical discussion and practical work in data collection, tabulation, analysis, and report writing; 2) to acquaint the members of the Village Studies Program with the state and future of agricultural mechanization in Egypt through lectures and field trips; 3) to discuss the project components in detail; 4) to provide the members with a background in machinery identification and use and basics in machine maintenance and repair; and 5) to review critical issues in Egyptian agriculture and development.

   Discussions about data collection considered not only survey research, which has already been attempted by members, but also controlled questioning, case studies and observation. The members of the Program displayed an impressive knowledge of the rural situation which would remain untapped with the exclusive use of questionnaired. Dr. Azza Sallem, an American-trained anthropologist now teaching at the University of Minia, discussed alternative methods of data collection, and the participants seemed eager to try them. Tables were distributed to the participants who were asked to begin filling them in. They require the village monitors to systematically look for particular kinds of information: cooperative labor and labor exchange, major household purchases, recent building construction, and women's activities in agriculture. These will be continuing exercises designed to give us farmers' activities over time. These tables are concerned generally with the labor situation in project villages and interest in investment in agriculture and agricultural machines.

   Practical sessions about data analysis focused on the three related studies which were made of landless laborers, farmers and emigrants in the project villages finished prior to the training period. In each

village, twenty of each were interviewed. We were attempting to determine whether or not there is a relationship between the agricultural wage structure in each village and its labor availability. Two sessions centered on the social and economic analysis of these data. In addition, each governorate team presented its information and a livley discussion ensued. Based on the presentations, a number of questions were given to the village monitors for their consideration. They were given two weeks to work through the data and answer the points. The questions are as follows: 1) Using data from the present and from five years ago, what relationship do you find between wages and labor available? What is the commitment of agricultural laborers to remain in their work? What is the working system of landless laborers and what is their commitment to their employers? What commitments do landowners have to their workers? What is the pattern of emigration in your village? At first, we expect the answers to be unsystematic or naive, but this is an initial attempt to bring the monitors into the analysis. The findings will be used for a report on labor in the project villages:

Two full days panel discussions were held on the project components and on mechanization in Egypt. The first invovled Egyptian project experts; the second panel was comprised of experts in mechanization from the Ministry and universities. Attending this second panel were a number of senior officials in the agricultural offices of Minia, Gharbia, and Sharkia. Those from Beheira and Qaliubia were unable to attend.

Field trips included visits to the Water Use and Management Project site in Kafr El Sheikh, the West Nubariyya Mechanized Far, and the Beheira Company. At the Beheira Company, the drum thresher produced by Dick Birky and Abdel Salem El Geshi was inspected.

There were also a number of sessions on issues in mechanization and rural development: economics of mechanization; problems and solutions in Egyptian agriculture; research in mechanization; government intervention in agriculture in Egypt; management problems in establishing an infrastructure for mechanization; agricultural innovation and social change.

2. Follow-up: Notes were taken on all lectures and are being given to lecturers for their approval. They will be assembled in a volume and distributed to participants, lecturers, and project and Ministry personnel. The report will be in Arabic, the working language of the workshop.

   A report will be prepared based on the information about the labor situation in the project villages.

   Plans will be considered for future workshops. On the last day of the period, participants were asked to complete an evaluation form. It is presently anticipated that a six-day workshop for the Village Studies Program participants will be held every three months. Later training periods will be largely devoted to discussions about data collection by the program members. A paper for distribution will be prepared after each meeting.

Sakia Mechanization

Dr. Abdel Basset El Sayyad of al-Azhar and Qaliubia team supervisor has agreed to work with the Evaluation Unit on a study of sakia and pump use and preference in project villages. Dr. Zakaria El Haddad presented an interesting problem which needs to be investigated. It is rumored that many farmers are choosing to install or renovate an electrified sakia, are selling most of their animals, and are building houses of a new design that

does not have a place for the draft animals. What is presented is a complex system of animal and machine use, cropping preferences, house construction, and animal production. Certain kinds of people will be interviewed in the villages. However, for this study, questionnaires will not be used. Instead, a list of questions will be given to each monitor, whom we believe after the training program are more able to handle the data collection themselves. While still controlling the data collection, we would like to give the monitors somewhat more latitude in the process.

Data Requests

Erroll Coles, Director of the Soil Improvement component, has requested that the Evaluation Unit be responsible for choosing one basin in each of the four governorates in Middle Egypt (Fayoum, Beni Suef, Minia, Asyut). These basins will be demonstration areas for the project's landleveling and irrigation activities. There appear to be only two criteria: basins between 60 and 80 feddans, and no permanent crops. We have already collected information about the basins in the five villages in Minia: number, number of feddans, number of landholders, crops grown during two consecutive seasons, and the number of feddans of each. Based on this information and a visit to Minia during the following month a basin will be chosen. Following the selection, a sociological study of the basin will be undertaken with the participation of the village monitor. Mr. Coles has said that he does not want to begin his implementation activities until the survey is at least underway.

Through Dr. El Sahrigi, the Evaluation Unit has been requested to prepare a report for the Minister, Dr. Youssef Wali, on research undertaken by the Ministry. There is concern that research is frequently repetitious, or unnecessary and uncoordinated. It will be our task to review research conducted and cite the overlappings and suggest where future research might most profitably be conducted. To date, we have visited the Agricultural Development Systems Project ("California Project") and the Water Use and Management Project in the Ministry of Irrigation. We have decided that such an effort might be more useful if it includes related activities funded by other sources: Ministry of Irrigation, Ford Foundation, etc. Peter Reiss, Nour El Din Nasr (newly appointed Evaluation Counterpart) and Zakaria El Haddad will be responsible for this activity.

Evaluation Subunit

FIRST WORKSHOP FOR PROJECT EVALUATION, 15-31 May 1982

As part of the evaluation activities of the Agricultural Mechanization Project, a two-week workshop will be held at the International Development Center in Mariout.

The participants in the workshop will include members of the Village Studies Program who are collecting information in each of the 24 project villages (including the pretest area, Sheikh Ahmed), give govenorate counterparts supplied by the sampling offices of the Agricultural Economics Research Institute, five agricultural office liaisons, five professors who supervise the evaluation teams, Center staff, and guest lecturers.

The workshop is designed to meet the following objectives: 1) provide theoretical discussions and practical work in data collection, tabulation, analysis, and report writing; 2) acquaint the members of the Village Studies Program with the state and future of agricultural mechanization in Egypt;. 3) discuss the project components in detail; 4) provide them with a background in machine maintenance and repair; 5) and review critical issues in Egyptian agriculture and development.

The training program at the Mariout Center is planned to develop the analytical skills of the village monitors in keeping the objectives and spirit of the Project Paper, namely the improvement of the data collection and analysis capacity of the Ministry of Agriculture in the area of mechanization. In the short run, it will serve to integrate the five governorate teams and allow for the comparison of project sites.

Prior to the training period, village monitors conducted a study of labor and wage structure in the project villages. In each village, a number of farmers, landless laborers and emigrants (or their household members) were interviewed. The study is to serve as an overview of the labor situation in the 24 sites. The information collected is expected to serve a second purpose: it will form the basis of several discussions of research methods and be used in the practical sessions on data analysis. The training program has four distinct areas: 1) data collection and analysis; 2) issues in mechanization and development;. 3) machinery basics; 4) project component disucssion.

In the sessions on data collection and analysis, a variety of research methods will be examined: questionnaires and sample surveys; interviewing; case studies; key informant studies; and observations of defined activities. To date, the monitors have conducted surveys of village leaders, machine owners, and potential and actual agricultural laborers. Discussions of different research techniques will be concerned with the problem of selection for a particular objective and how the various methods complement each other in the investigation of a given topic. Practical sessions on research will concentrate on the data collected prior to the training period, and monitors will be taught a number of analytical and statistical techniques in manuipulating the survey results. The study will also serve as an example of data use for evaluation activities and policy decision-making in introductory discussions of those subjects.

Issues in mechanization and development are selected for their relationship to monitoring and evaluation activities in the project villages. These topics include the state and future of agricultural mechanization in Egypt,

the economics of mechanization, management issues and problems in the development of an infrastructure for mechanization, agricultural innovation and socioeconomic change, government intervention in Egyptian agriculture, and agricultural problems and solutions in contemporary Egypt. Each of these topics will be the basis of a session.

Machinery basics will be taught in the form of lectures, demonstrations, and visits to mechanization centers. Because the village monitors are expected to spend a good deal of their time with farmers, machine operators, and workshop owners, the data they collect will be of a higher quality if the monitors are sufficiently familiar with machinery and machinery problems. Sessions concerning machinery basics are designed to provide such a background. They will be shown a wide variety of machines which are or will be in use in Egypt and will become acquainted with recommended machine care and frequent repair problems.

A discussion of the various components of the Agricultural Mechanization Project will require the cooperation and participation of the Egyptian members of the team. In order for the members of the Village Studies Program to take part in an evaluation of the project activities, they will require an accurate and comprehensive understanding of the project's objectives and actions to date.

Course listing:

I. Data collection and analysis

A. Collecting data for project implementation
B. Models for data analysis
C. Practical session: data analysis
D. Evaluation theory and activities
E. Report writing for policy decision making

II. Issues in mechanization and development

A. State and future of agricultural mechanization in Egypt (panel)

1. Dr. Abou Saba: History of mechanization in Egypt
2. Dr. Ali El Hossery: Policy and mechanization
3. Dr. Ahmed El Sahriga: Mechanization and development
4. Dr. Ali Youssri Koreym: State of mechanization today
5. Dr. George Bassili: Future of mechanization

B. Economics of mechanization: Dr. Nabil Habashi, Dr. Abdel Tawab El Yamani
C. Government activities in agriculture: Dr. Salah El Abd, Mr. Ahmed Awat, Dr. Shahat Mohamed Zaki
D. Management and mechanization: Dr. Ali El Kheshin
E. Agricultural innovation and social change: Dr. Ahmed El Adly, Dr. Bahgat Abdel Maksoud
F. Egyptian agriculture, problems and solutions: Dr. Nabil Habashi, Dr. Adel Orabi, Dr. Abdel Basset El Sayyad

III. Machinery basics

A. Machine identification and use: field trips to West Nubariya, Gianaclis, Beheira Company
B. Machine maintenance and repair: Habib Iskandar; training films and slide shows

IV. Agricultural Mechanization Project: discussion of project components

Activity Report
June 1982

Submitted by: Peter Reiss
Aiman El Tunsi
Raafat Lutfi
Nour El Din Nasr

Mechanized Farm Survey

1. During the period: The final report on the area wide survey has been completed and is being copied and assembled. It should be available for distribution during the first week of July. The report makes a forceful statement for focusing on the small landholders in any mechanization effort. It also makes the point that any plan for mechanization must take into consideration the regional differences within Egypt. Two particularly intersting points arise from the survey results. Machine owners overwhelmingly expressed satisfaction with the present repair services offered them by local mechanics. They single out the difficulty of obtaining spare parts as the major impediment to the continued use of their machinery. A second surprising point concerned the relationship between mechanization and hired labor. Survey results indicate that as farmers increasingly mechanize their agricultural operations, they hire greater numbers of laborers. This finding runs counter to generally accepted ideas and will have to be examined closely.

2. Follow-up: Copies of the report will be given to every project member, part-time associates, interested parties in related development projects, university professors involved in mechanization activities, Ministry employees working in related areas, and officials at the governorate level.

Village Studies Program

1. During the period: Village researchers and governorate level counterparts from the sampling offices were busy completing the questions on labor and wage structure that were given them at the training session in Sidi Bishr. Their work is now being reviewed by Aiman El Tunsi, a member of the Evaluation Unit. They are also involved in gathering data about the use of household resources for construction and other major projects (including the purchase of agricultural machinery). Researchers have been asked to keep a daily record of their activities which will be read and commented on by their supervisors. One of the points emerging from the Sidi Bishr period was the amount of information known by the village workers which would remain untapped if they were to be restricted to the role of survey enumerators. Each week they have been requested to mark those passages from the previous week which they believe to be most relevant to the project activities. This self-assessment is designed to demonstrate the need for restricted and focused note taking.

   It is expected that, on occasion, the governorate teams will diverge in their responsibilities and activities. Such a divergence is now taking effect. With the Soil Improvement's plan to begin landleveling activities in Minia, a study of selected basins in that governorate will begin shortly. According to the present plan, one basin in each of four governorates in Middle Egypt will be leveled with the accompaying modifications made to irrigation and drainage canals. Once one loop has

been completed, a second will take place. These basins are to become demonstration areas for the project. Therefore, one basin in Matai District and one in Abu Qurqas will be investigated. The two basins will be chosen on the basis of information which was collected at the beginning of the year for the paper that was presented at the conference on soil degradation at the University of Minia in February. On the basis of an initial review of the data, it is likely that basins in El Atlat and Beni Abeid (both project villages) will be chosen since unleveled land is particularly serious in Beni Abeid and poor irrigation and drainage conditions are marked in El Atlat. Researchers in the other three villages will be placed in these two locations for a concentrated data collection effort.

The Evaluation Unit has had a number of meetings with Dr. Abdel Basset El Sayyad and Ibrahim El Akhwas, Qaliubia team supervisors, concerned with the design of an examination of sakia and pump preferences and uses. At issue is whether or not farmers are actively switching back from pumps to sakia use when the latter is powered with other than draft animals. What was finally designed with the supervisors was a complex study of sakia producers, sakia owners, pump owners and renters, and recent housebuilders. At set of questions was agreed to which could be informally asked of these individuals. After the experiences of the village monitors with questionnaires, it was decided that they could be allowed more freedom in collecting the necessary information. Along with the questions, tables have been supplied which allow the monitors to record the information immediately in a standardized form. The study will eventually be enlarged to all project areas, but for the present, Qaliubia will serve as the pretest site. The monitors were given two weeks to interview a predetermined number of people in each category. A team meeting will be held on 15 July to discuss the tenative findings and decide if the questions are to be modified.

In Sharkia, the team under the supervision of Dr. Shahat from Zagazig University is presently working on an examination of tractor use and owner-renter relationships in the three project villages. Through informal conversations and frequent observations, the monitors are asked to determine the pattern of tractor use during two full weeks. This is a particularly propitious time to begin such work, since the village tractors are busy now threshing wheat and preparing the land for late summer crops. Again, if the work is successful, it will be used in the other four governorates.

The teams in Gharbia and Beheira, which were the last to begin, are presently completing the questionnaire of machine owners. The Gharbia team will then begin an evaluation of the work of the Soil Amelioration Organization for the Central Delta.

The Evaluation Unit presented findings about the ten project villages in Beheira and Gharbia to eleven district level mechanization experts who were trained by the Project at the Sakha Training Center. The information about the villages was presented at the request of the Training component, so that they might have some familiarity with the areas before beginning work there.

2. Follow-up: The progress of the work in Qaliubia and Sharkia will be monitored closely since they serve as pretest efforts. The study of Minia soil and water problems will be further analyzed along with

additional information about the state of the basins in the project villages. On these bases, the two basins will be chosen and the research effort will begin.

The analysis of the 24 project sites in continuing, and Raafat Lutfi is involved in a reworking of the questions we have asked about workshops in project villages. Only four of the 24 have workshops which repair tractors and only three which can repair a pump set. Clearly, most of the repair and maintenance activities of village machinery take place in other locations: neighboring villages or district centers. Aiman El Tunsi and Nour El Din Nasr are continuing their work with the village information.

Evaluation of Sakha Training Program

Peter Reiss and Nour El Din Nasr evaluated the training program for district level mechanization experts which was held for three months at Sakha. Preceeding the period, the trainees were given a month of visits to mechanization stations throughout Egypt. Of the eleven trainees, only one claimed to have had any previous training or experience in agricultural mechanization. An evaluation was particularly timely since a similar program has been planned for the district level experts from Minia, Sharkia, and Qaliubia. We found the introductory month tour to be ill-timed. Trainees, unfamiliar with mechanization, obtained less than they might have if the visits had been interspersed during the course of the Sakha program. Lectures and field visits would then have been complementary. It appears also that mechanization at the center too often took the form of tractorization, and participants complained about the unbalanced approach. Still, an examination which we gave the participants about machine use indicated that they had learned a considerable amount during the period, when one reflects that they joined the program with little or no knowledge. An efficient use of the training time would surely be advisable. An area of serious dissatisfaction among the trainees was the use of outside lecturers. They often did not appear or repeated the lectures that others had given. Less reliance on such lecturers might improve the training sessions since one could then better plan course content and delivery.

Field Trip to Fayoum Governorate

Peter Reiss and Nour El Din Nasr accompanied the members of the Soil Improvement component to Fayoum to review the soil and water conditions there. As part of our effort to select and examine a basin for soil improvement activities in the governorate we were interested in learning about the range of agricultural conditions. Soil conditions and bad water management are the most serious problems. The Director General of Agriculture, Yassin Osman, believes that no Class I land is left in Fayoum. The rising water table of Lake Qaroun is threatening cultivated land and it was estimated that the water reaching Fayoum may be 1.5 times as saline as the water south of Asyut since many farmers in Minia and Beni Suef use the Bahr Youssef for drainage. Visits to fields confirmed serious saline and alkaline soil conditions with a large number of feddans (still undetermined) which are out of production. The Director General concluded his talk with an offer of complete support for the project activities and a promise to assist in any way he can.

A.1.3

Review of Report and Data Collection Efforts on Mechanization

At the request of the Project Director and the Minister of Agriculture, the Evaluation Advisor prepared a review of all reports which are concerned with mechanization activities. A report was submitted which discussed the areas of past research (machinery costs, irrigation and soil improvement, multiple cropping intensity, livestock management, labor situation, new lands development, general reviews of mechanization, case studies of specific machines or geographic areas, and farm management surveys). It continued with recommendations for future research efforts. These included the determination of a mechanization "package" to be tested on farmers' fields, livestock use, efforts to mobilize farmers into voluntary associations for development efforts, an examination of the complex labor situation, and a study of alternative energy sources. A lengthy report will be submitted shortly which discusses these points in greater detail.

Executive Summary

The State of Agricultural Mechanization in Egypt: Results of a Survey, 1982

A survey on the state of agricultural mechanization in Egypt was carried out on behalf of the Ministry of Agriculture/USAID Agricultural Mechanization Project. The data are drawn from ten villages in four governorates (Beheira, Gharbia, Qaliubia and El Minia). Altogether, 1000 farmers, 170 machine owners and 27 workshop people were interviewed. All the information in this report reflects what our interviewers were told by these people. The constraints of time prevented using direct observation as a supplement. Our concern was with the experiences and attitudes of our respondents, and thus our report stresses the social aspect of farm mechanization.

Chapter 1 describes the background to the study, and Chapter 2 the sample and the methodology. Chapter 3 presents the data on the farmers, and Chapter 4 the data on the machine owners, and Chapter 5 the data on workshops. Chapter 6 is the summary and recommendations. Many tables are presented in Appendices A through D.

We found that certain operations are almost always mechanized (plowing, threshing), others are never mechanized (planting, weeding, harvesting), and still others are sometimes mechanized (irrigation, transport from field to village). Variation in use of mechanization from village to village is sharper than between large and small farmers, or from crop to crop. Mechanized operations are those that a tractor or an irrigation pump can do. Other machines are lacking almost entirely.

Hired labor appears very common in rural Egypt. This reflects a changing division of labor, concomitant with mechanization, and not necessarily the creation of more jobs as a consequence of mechanization.

Most farmers interviewed are small farmers growing traditional crops; in many cases their households are too small to allow them to supply all labor needs from within the household. They are also too small to be independent owners of machines, given the present inventory of available machines. The traditional field crops lend themselves better to tractorization than some of the proposed new crops such as vegetables.

Farmers say they prefer to mechanize their operations in order to save time and effort. They envision machines as being large, powerful, and able to work much faster than people alone can. They hope that machines will relieve them from the need to hire labor, although so far they have the opposite effect.

Machine owners are overwhelmingly large farmers. They rent out their machines to their less fortunate neighbors. This is probably more advantageous to the machine owner than to the farmer. The relationship between machine owner and farmer is the critical one for the agricultural mechanization of Egypt. Not everyone is fully at ease with this relationship, for farmers often say they prefer to rent from cooperatives and machine owners often say they do not rent at all.

Machine owners are concerned about the life of their machines, and so sometimes use them sparingly. They are relatively happy with the

quality of the mechanics they deal with, but are apprehensive about the availability and the cost of spare parts. Neither they nor the workshop people were much interested in training.

Machine owners would like machines to harvest wheat, pick cotton, or dig potatoes. Some mentioned the rototiller. Seed drills, rice transplanters, weeders, and other machines were not mentioned. Farmers' priorities were the same, with the addition of irrigation.

Most workshops are small, and are located in the major towns. However, the mechanics are willing to travel to an unmovable machine. They have many ideas on how to improve their shops, and also complain of difficulties with spare parts. They do not like to be interviewed.

Recommendations

1. Equity should continue to be a goal in encouraging the further mechanization of Egyptian agriculture. The present trend works in the opposite direction. Equity can be furthered by a judicious use of the existing cooperatives both to introduce new machines and to provide custom services at a reasonable cost to the small farmer.

2. Assuning that irrigation and transport will progressively be mechanized, certain agricultural operations are obvious targets for further mechanization. These include planting, harvesting, and weeding. However, more thought must be given to finding appropriate machines for Egypt: suitable for small farmers (most of whom will not own the machines) and that fit the vision that all farmers have of machines. We further recommend a coordinated switch to more intensive crops and to the machines useful for these crops.

3. Mechanization changes the nature of work and modifies the division of labor. Development of new machines should also keep in mind the laborer who will work with the machines. It should be policy to humanize work and provide the laborer with a decent living. Equity is also an issue between farmers and laborers.

4. Policy must take into account the tremendous differences in mechanized farming practices between villages and regions. In our study the contrast between the Delta and Minia was very sharp.

5. Project villages should be the site of experimentation with various combinations of cropping pattern, mechanization, labor use and labor relations, marketing, controlled loans and prices. Once there is a better understanding of the functional relationships involved, then the new package can be extended to other villages/areas. Agricultural extension is a weak link in the system at present and must be improved.

6. The problem of spare parts must be addressed. We recommend encouraging local manufacture of these parts. Workshops should be upgraded, and carefully designed training programs should be cautiously offered.

7. A fundamental policy choice is whether agriculture should be given the role of absorbing all the "surplus" population, so that labor intensive techniques are preferred, or whether the long-term goal should be to streamline agriculture and so reduce the number of people involved--but then the consequences (families pushed out of agriculture) must be foreseen.

Nicholas S. Hopkins, Survey Director
Sohair Mehanna
Bahgat Abdel Maksoud

June 30, 1982

A.2 RESEARCH AND DEVELOPMENT SUBPROJECT

Activity Report
April 1982

Submitted by: Carl A. Reaves
Samir Younis

During the period

1. Seven Executive Committee meetings were attended. The Committee has modified the responsibilities of Beebe and Reaves to some extent. Beebe, Naggar, Karayam and Khalil will be responsible for the Tractor Test Station physical facilities plus machinery development. Younis, Matouk, and Reaves will be responsible for in-house research plus contract research. Korayem will be responsible for committee administration and liaison with other subprojects.

2. Considerable progress was made toward getting proposed projects for the contract research fund finalized. One committee meeting was devoted to each of seven projects to discuss details and make suggested modifications. Approved projects to date include one each on drying of fruits and vegetables, harvesting equipment, tillage equipment, solar drying of field crops, cotton mechanization in the Delta, trickle, surface and sprinkle irrigation systems, and mechanized harvesting for small holders. It was agreed that the Principal Investigator of each approved project will present to the Executive Committee a detailed report of procedures and plans before they obligate much money.

3. Very little progress was made towards getting the machine shop operating. The milling machine was assembled and a machinist was employed late in the month. Some more equipment was delivered. Badly needed work benches and bins for nuts, bolts, small tools, etc., were not constructed.

4. Plans for the first few months of in-house research were developed for the Executive Committee. Emphasis was given to primary and secondary tillage. It was learned that land reserved for R&D at Sakha included some 18-19 feddans and that it would be available only about two weeks (between crops) for tests. This is not enough area nor enough time for tests so a new area will have to be located.

5. A machinery demonstration by Ragab Company on the Alexandria University Farm was attended. RAU tillage equipment plus 60 hp and 72 hp Ford tractors were demonstrated. Most of the RAU equipment appeared to be rather light weight for heavy soils. This RAU equipment is supposed to be brought to the Tractor Test Station for performance evaluation in Egypt about May 1, 1982.

6. As Dr. Samir Younis, counterpart to Reaves, is located at Alexandria University a considerable part of the working time, it is very difficult to communicate. The telephone at the Tractor Test Station has worked only 4 days in the last 18 months.

7. Hopefully, all requirements of USAID for Nazek to seek an MSc degree in agricultural engineering at Davis, California have been met. Nazek is scheduled to take the TOEFL test next month, and it is planned that she will commence studies at Davis in September 1982.

Activity Report
May 1982

Submitted by: Carl A. Reaves
Samir Younis

During the period

1. The R&D Executive Committee held four meetings during the month. At least three subprojects were discussed at each meeting. Some of the projects were discussed for the first time; major revisions were suggested for some, and final approval was given to some. At the present, four projects have received final approval, one each on soil tillage, threshers, crop processing, and solar drying. It is anticipated that the first project will be financed in June 1982. A rough draft was completed for the contract agreement for each project between Dr. Sahrigi and the respective institute, and also for steps required to take before funds will be available. These rough drafts will be finalized by the Executive Committee in its meeting 10 June 1982.

2. The machinery development group spent considerable time with mower-binders in the wheat fields. Two days were spent in Faronia with a 3-point hitch Agostini and one self propelled Olympia mower-binder. The R&D subproject purchased one Olympia binder. The wheat was 140 cm tall but it was cut and bundled almost satisfactorily with the Agostini. The only thing that was not satisfactory was that the bundles required some assistance for separation from the knotting mechanism. One important characteristic of this machine is that it operates on one side of the tractor and contains a powered conveyor that moves the bundled crop out of the succeeding tractor path. Since the crop is cut and bundled off to one side of the tractor, there is no restriction to tall crops passing through the machine. On the other hand, the self propelled Olympia cuts the crop directly in front of the machine, bundles the crop, and then the bundle has to pass under and through the machine. Clearances under this binder are not adequate for wheat 140 cm tall to pass.

3. The Olympia mower-binder was brought to Alexandria for tests and modifications. Wheat on the Alexandria University farm was 110-120 cm tall. Without modifications this binder would not harvest this wheat satisfactorily. Mr. Beebe raised the machine approximately 20 cm and also made other small modifications to increase open space available for the wheat to pass through the machine. Further trials proved that 110 cm wheat could be harvested satisfactorily, except that occasionally the bundles had to be assisted to separate after passing through the knotter unit. A field of wheat that was 130 cm high was located for further trials. The machine could not manage this size of wheat without assistance to separate bundles at the knotter.

4. The machine shop became better organized. Fifty percent of machining on the soil sampler was completed, some new components of a hydraulic dynamometer were fabricated, small modifications were made on the binder, and several odd jobs were completed. It was planned to construct work benches and storage cabinets with present personnel of the Tractor Test Station, but with other work pressing it was deemed that this should be contracted out to local industry.

5. Arrangements were made with the American Cultural Center in Alexandria and approval was received from the MOA and U.S. Project Director to offer two sections of an English course to personnel of the Tractor Test Station. Students will be given a test in order to assign them to one of the sections. One section will hold classes three days per week and the other will hold two classes per week. Classes will be held from 9 am to 2 pm each day, and the session will be 6 weeks. Classes will begin on 7 June 1982.

6. Dr. Gaiser spent two days in Alexandria and discussed in detail the present status of R&D progress plus objectives for the next few months. We attended the Project Staff Meeting in Cairo and discussed details of the funds disbursements after they become available. Resistant strain gauges were borrowed from Alexandria University to build one extended ring 3-point hitch dynamometer.

7. Dr. Samir Younis left for a 3-month visit to the US. The Arabic version of this report will be completed upon his return.

Activities for June: Complete soil sampler and sampling tubes; design and construct one version of a cotton stalk cutter; obtain a shop supply of nuts, bolts, steel, etc., and provide adequate storage areas; assist with tests and modifications for and get bids on machinery for potato production; hopefully, appropriate funds to initiate at least one contract subproject.

Activity Report
June 1982

Submitted by: Carl A. Reaves
Samir Younis

During the period

1. The R&D Executive Committee held two meetings in June. As the chairman and vice chairman were out of the country, little was accomplished, though some progress was made on the contract form for individual projects and the requirements to be met before funds are available. Two proposals were reviewed and returned for revisions.

2. Research requirements to enhance mechanization were drafted and research priorities were discussed in detail with Dr. Zakaria. He listed the first two priorities as rice harvest and cutting cotton stalks after harvesting. It was agreed that R&D would make available by September a machine that will cut lodged rice and windrow it, plus several different machines that will cut cotton stalks.

3. Dr. Sahriga discussed the need for research on sugar cane harvesting and suggested developing a cooperative project with Dr. Gad El Kaeim in Kom Ombo. One of the greatest needs, due to shortage of labor and the drudgery involved, is to develop a mechanical device for loading cane in the field and at the transport train. Dr. Sahrigi pointed out that Tanta Motors has developed a machine that should be tested.

4. Three bids on soil testing equipment were reviewed and returned to Cairo with recommendations. Hopefully this equipment can be purchased as soon as money is available. About 20 employees of the Tractor Testing Station are enrolled and started in the English courses.

5. The designs for work benches for the shop were completed and it was agreed that Tractor Test Station employees will furnish materials and build three benches plus a tool board for LE 750. This work is to be done after normal work hours and to be completed in one month. Little progress was made on fabrication of the soil sampler this month. I made a list of steel for a stock supply and designed a steel rack to be built by the shop; the steel will be bought after receiving three bids on it.

6. Two days were spent in the Cairo office discussing accounting procedures, training, etc. MOA is graciously lending R&D money until the USAID budget is available and this makes it possible to buy some essential equipment and items to get a few research projects underway.

Activities for July: Complete the cotton stalk cutter and soil sampler; buy another type of binder for wheat and rice harvest; locate some locally available agricultural equipment; write specifications and get competitive bids so this can be purchased as soon as money is available; develop some definite cooperative work with the Mechanized Farm on cotton; get some of the Applied Research Projects underway.

Activity Report
April 1982

Submitted by: R.A. Beebe
Mohamed El Naggar

During the period

1. Attended seven meetings of the R&D Executive Committee at the Alexandria R&D Station and Agricultural Engineering Department of the University of Alexandria. Eng. Mohammed El Naggar was designated my counterpart as of April 1982. Inspected R&D test acreages at Sakha and visited Tanta Motors Co. at Tanta to see locally available implements.

2. Visited test/demonstration plots prepared in March at Itay El Barud to inspect germination and emergence of cotton. Unfortunately, the plots were under pre-planting irrigation and the crop was not planted. Attended field demonstration of Ford 4600 and 6600 tractors with RAU primary and secondary tillage and post-plant cultivation implements on the University of Alexandria farm near the R&D station.

3. Inspected a French-manufactured small combine near Itay El Barud. This machine was reported to have had severe crop in-feed problems during the 1981 harvest season. The cause of the problem evidently is a relatively long, steep, smooth rubber-faced belt to convey harvested material to the combine cylinder. Reports are that the manufacturer plans to provide corrective modifications for the 1982 season. We plan to observe this machine's operation in May or June 1982.

4. Drew up a list of urgent tasks and details, which could be completed with relatively little expense and labor, to improve the appearance of the R&D station; and pressented the list to Mr. Naggar for his consideration and action. Drew up a list of short and medium term actions to permit effective and efficient operation of the R&D workshop and presented these also to Mr. Naggar.

5. Wrote a preliminary Work Plan, outlining my proposed actions and priorities during my tensure in this position. Presented the plan to Drs. Gaiser, Sahriga, Zakaria and Abu Saba for their review and comments. I am now rewriting the plan to reflect their recommendations.

6. Visited the Menufia Governorate mechanization depot at Shebin El Kom with Mr. Naggar to inspect several Italian-origin self-propelled mowers and and Italian-manufactured tractor-mounted grain binder to consider them as possible candidates for modification/redesign to adapt to local conditions and manufacture. Discussed the results and conclusions of this visit with Drs. Sahriga and Kareem at Cairo and Dr. Reaves at the R&D Station.

Activities for May: Assist and advise in the assembly, adjustment and preliminary evaluation of the Israeli-sourced "prototype" implements; continue work on the renovation, supply, completion and activation of the R&D station offices, labs and workshop; continue search for wheels, axles and brakes for machinery transport trailer; observe local field operation of wheat harvesting machines, including mowers, binders and small combines; visit Mechanized Farm at West Nubariya to discuss cereal grain harvesting problems with Farm Manager Eng. Essam Khalil; visit portions of eastern Egypt and Sinai peninsula to observe agricultural conditions and practices.

Visit to Shebin El Kom

R.A. Beebe, Farm Machinery Advisor

On April 25, 1982, Mohamed El Naggar and I visited the Menufia Governorate's Agricultural Mechanization depot at Shebin El Kom to inspect cereal grain harvesting machines used in their program.

They have two types of harvesting machines in their inventory, some 4-5 self-propelled mowers and at least one tractor-mounted binder. Both types are made in Italy--the mowers displayed the name "Feragi" but no name was readily visible on the binding machine. All machines were designed to cut an estimated 1.2 meter swath using conventional reciprocating sickles and guards.

During a brief discussion with a gentleman who appeared to be the manager of machine operations, we were told that all these machines had been operated for varying numbers of hours during at least the 1981 wheat harvest season. I understand the machines are hired out to local farmers, with a basic charge of LE 12/feddan of crop harvest. In addition, farmers who hire the binder must also pay for the twine used.

The binder had had problems in tying when using locally-produced twine due to non-uniform tensile strength and twine diameter. It was reported to do an acceptable job of tying when using an imported plastic twine of more uniform characteristics. The manage said approximately 1.25 balls of twine were required per feddan, costing LE 7 per ball.

The manager stated that most farmers think the cost of binding would be offset by the ease of handling the bundles as opposed to the loose winrows produced by the mowers. He also stated that the binder damaged a lot of the crop, or required hand harvesting to provide a path for the tractor on the initial round of a field, whereas the self-propelled mowers required no manual cutting. This advantage of the mowers becomes even more significant in fields which are severely lodged. The self-propelled mowers can be easily manouvered to cut against the direction of the lodging while the tractor-mounted binder required extensive hand harvesting on lodged fields to permit cutting against the direction of the lodging without prohibitive losses due to running over unharvested grain with the tractor.

He stated that studies conducted by that organization showed a cost of LE 32 per feddan to cut manually, as compared to their charge of LE 12 for mower hire, and approximately LE 22 (12 plus cost of twine) for binder hire. He quoted no figures as to cost differences of subsequent handling/transport, nor any comparison of grain loss resulting from the three methods of cutting.

The self-propelled mowers were essentially the same as the one we saw at the Cairo Industrial Fair some weeks ago, and seemed to be in good condition.

The binder seemed also to be in good repair. It is designed to mount on the tractor's three-point hitch and is PTO driven. The design is such that the binder swings to the rear, parallel to the tractor's crank shaft axis, for field-to-field transport, and extends to the left for harvesting. The binding mechanism is located centrally off and just to the rear of the cutting sickle. The binder packer fingers also gather the crop and move it inot position for bundling. The bundles are tied with crop stems oriented vertically. After tying the bundles are ejected out the rear of the binding chamber and conveyed to the tractor's center line where they are dropped.

Both machines were equipped with conventional reciprocating knife assemblies and guards. Neither had been used to harvest rice to date.

I recommend that each one, SP mower and tractor-mounted binder, be obtained by the R&D station as soon as possible for further testing in the 1982 wheat harvest. If the binder's tying mechanism proves reliable, and grain loss due to cutting and moving the crop into the bundle chamber is not excessive, it appears mechanically feasible to modify the binder so as to mount and drive its cutting and bundling systems on the SP mower chassis, thus providing a self-propelled binder for study and evaluation. If this assumption proves correct we would have a head start on the development program outlined in the proposed Work Plan submitted to the Cairo office April 20.

Probable obstacles to be encountered in successful performance are: a) The ability of the currently used sickle to cut rice is questioned and will require significant redesign; 2) knotter reliability using sisal twine must be improved if the comments of the Shebin El Kom manager are correct; 3) some type of reel or lifter guard will probably be required to cope with lodged wheat and lodged wet rice crops; 4) weight of the cutting/binding head may require a redesign of the carrier vehicle to provide sufficient strength and tire capacity; 5) the SP mover's engine may not provide the power required to operate the binder, particularly in wet rice fields.

In spite of the above possible problems, the proposal seems to have a reasonable chance of success, and I strongly recommend that we pursue it.

Activity Report
May 1982

Submitted by: R.A. Beebe
Mohamed El Naggar

During the period

1. Considerable effort was expended towards renovation of the R&D station and completion and activation of the workshop. The lathe, radial drill and power saws are now operable and our newly hired machinist is making detail parts for the soil sampling equipment.

2. Participated in seven meetings of the R&D Executive Commitee at Alexandria University and the R&D station.

3. Continued a fruitless search for wheels, axles and brakes for use on the gooseneck machinery trailer. I am of the opinion that the plan for local manufacture of this unit should be canceled and a suitable trailer be purchased outside and imported.

4. Visited the Ismailia, Suez and Sinai Peninsula areas to observe local cultural practices and conditions.

5. Conducted preliminary field evaluation of an Italian manufactured self-propelled mower and binder, and a tractor operated three-point-hitch mounted binder at El Faronia on May 17, returning on May 23 to conduct further evaluation and demonstration for Dr. Zakaria El Haddad.

6. The performance of the tractor-mounted binder was marginally acceptable, but neither of the two self-propelled units could cope with the 140 cm tall wheat. Insufficient clearance under the units' frame structures prevented smooth flow-through of the cut crop. Constant plugging prevented any realistic evaluation of the binder's cutting and binding functions.

7. The self-propelled binder was taken to the R&D station, and subsequently operated in 110-120 cm wheat at the Alexandria University farm. The binder's performance was not acceptable as regards crop feed-through.

8. The machine was then taken to the Beheira Co. workshop where it was modified to increase the frame-to-ground clearance approximately 20 cm. An evaluation of the modified machine in tall wheat has not been completed at this time.

Italian Self-propelled Binder

R.A. Beebe, Machinery Development Advisor

The machine performed unacceptably in 140 cm wheat at El Faronia due to constant plugging of the tied bundles in the machine's frame structure. In wheat approximately 110 cm tall at the Alexandria University farm it performed somewhat better, but did occasionally plug.

The binder was taken to the Beheira Co. workshop and the frame raised approximately 20 cm by the addition of supplemental axle mounting brackets. At the same time the tension member bracing the left end of the cutter bar to the main frame was moved appoximately 4 cm to the left. After these modifications, feed-through was considerably improved.

In general the machine is rather difficult to operate due to poor steering characteristics and our testing has suffered from lack of experience of the operator. The modified version, with raised frame, is somewhat more difficult to steer and control than the original configuration.

To date the cutting mechanism has performed with no problem. No mechanical problems have been met with regarding the engine or drive train. One or two weld failures were experienced in the collecting/transferring arm mechanism. The packer fingers and knotter needle have not shown any failures to date. The knotter mechanism has caused a few problems, but it is not yet clear whether this is the result of poor quality twine, wrong adjustment of the knotter's bill-hook tension, or excessive wear of knotter components.

Activity Report
June 1982

Submitted by: R.A. Beebe
Mohamed El Naggar

During the period

1. The first week - 10 days of June was spent continuing efforts to improve the performance of the Olympia self-propelled binder in wheat harvesting. The machine (Italian) was evidently designed for shorter crops than the Egyptian wheat whose plants range from 120 to 140, sometimes 150 cm.

2. It was determined after modification that the axis of the bundle chamber was tilted too far forward, the tied bundles were ejected with a positive vertical velocity component in addition to the normal rearward velocity. The bundles thus struck the ground 15-20 cm rearward of the "normal" position, thus decreasing the time (space) for the bundle to tip over and allow the machine to pass over.

3. Tests also indicated that the binder could not cope with lodged wheat. When operating in the direction of lodging the crop was cut objectionably high, and the gathering mechanism failed to move the cut wheat into the bundle chamber. When operating against the direction of lodging, the cut material tended to enter the bundle chamber horizontally and the resultant plugging and congestion in the bundle chamber applied constant pressure to the knotter tip arm, thus operating the tying mechanism almost constantly and producing bundles of only a few plants. These small, horizontally oriented bundles consistently refused to be ejected from the bundle chamber, meaning a stop overy 5-10 meters to clean out the entire bundling mechanism by hand, each "clean-out" requiring 2-5 minutes.

4. We were contemplating a modification of the machine to tilt the cutter bar and bundle chamber back to or beyond its original position. In a discussion between Dr. Reaves, Dr. Hadded, Eng. Naggar and Mr. Beebe, it was pointed out that the binding mechanism was evidently responsible for a large percent of the plugging in erect, tall wheat and did not function acceptably in lodged wheat. It was also pointed out that the gathering fingers, which move the cut crop from the cutter bar into the bundle chamber, would prevent the installation of a pick-up reel, required for operation in severely lodged crops. At the conclusion, Dr. Haddad said that in light of all the negative factors of the binding mechanism we should remove it from the machine and continue our development work towards a mower which will winrow the cut material and permit operation with a pick-up reel for severely lodged conditions.

5. Since this discussion, the design of a pick-up reel has been 90% completed and drawings of the detail parts approximately 65% completed. Some material has been acquired in the workshop for use in the reel.

6. We have also designed a sweep attachment for a chisel plow, to be tested as a cotton stalk cutter/lifter later in the year.

7. Considerable time has been spent in informal instruction of the young Egyptian engineers assigned to this work in the techniques of engineering drawing.

8. In spite of repeated requests to my counterpart, very little progress has been made towards readying the shop for the work required to build the pick-up reel prototype. Specifically, the band saw and drill press saw are not wired to a power source, nor are the metal shear, press brake or

power hack saw completely assembled. We have no adequate work benches at this time, nor are the hand tools separated and readily available for selection and use.

A.3 EXTENSION/TRAINING SUBPROJECT

Activity Report
April 1982

Submitted by: Fred Schantz, Training and Extension Coordinator
Ibrahim Hassan, Counterpart
Samir Shawky, Training Director
Edward Constien, Extension Director
Ahmed Behery, Co-Extension Director

Summary

Training and Extension activities included:

1. Revising the project's Village Programs Workplan 1982-85
2. Weekly extension and extension training operations planning sessions (Thursdays)
3. Submission of the first Machinery Management Extension Subunit's quarterly cash need statement to the Financial Planning Subproject
4. Attending the monthly Extension/Training Committee meeting April 12, during which an outline for the machinery introduction program was presented for review
5. Appointment of a Training and Extension Coordinator Counterpart

During the period

1. The first draft of the Village Programs Workplan 1982-85 was revised during the month and is now being finalized for presentation to the Extension and Training Committee. It has the verbal approval of the MOA Extension Dept. which will allow the project activities to tie in with institutionalized extension activities. The draft was presented to mechanization extension trainees now at the Sakha Training Center who also were receptive to the workplan. When the workplan is finalized and approved it will be charted on the wall in the Training/Extension office where ongoing operations, planning and implementation data will be kept.
2. The weekly extension and extension training operations planning sessions continued throughout the month but with limited progress. This was primarily due to the absence of the Extension Subunit's personnel who missed most of the meetings. Forms are being developed to allow each person to list his scheduled activities for the upcoming weeks which should help this situation. An ongoing emphasis is being placed on the importance of combining the extension and training planning and implementation efforts, as in two months there will be a large number of villages to deal with which will require close and continuous coordination.
3. Now that both quarterly cash need statements have been submitted, USAID funds for the upcoming extension and training activities should soon be available. This will allow the implementation effort to be intensified and more effective. The major problem now being faced is to streamline procurement and spending procedures which are difficult and time consuming.
4. The appointment of Mr. Ibrahim Hassan El Ghatas as the Counterpart to the Training/Extension Coordinator has greatly improved the success of this effort. With his administrative abilities, agricultural and coopera-

tive background and training experience, the coordination effort can now begin to be fully realized.

5. Detailed reports of the Training (Appendix C) and Extension (Appendix B) subunits are attached as well as a financial report (Appendix B) of the Training Subunit.

Problems

1. Improved secretarial assistance is critically needed if administrative requirements are to be fully met.

2. Additional vehicles are required for the regional extension coordinators who will begin their field activities next month. A request for 10 additional Chevrolet Suburbans was submitted to the Project on April 14 and is now being revised for submission to USAID next month.

Activities for May: Continue weekly extension and extension training operations meetings; chart the Village Programs Workplan 1982-85; formalize training and extension fund procurement procedures; formalize the structure, function and objectives of the newly formed Machinery Management Extension/Training Subproject.

Extension

Activity Report
April 1982

Submitted by: Ahmed El Behery
E. Constien

During the period

1. We met with members of the Faculty of Agricultural Engineering three times to discuss the writing of extension type publications on mechanization. The first publication planned will be on tractors.

2. The machinery situation in Minia was checked and plans made for the mechanization education program in Minia governorate. In a meeting attended by Farouk Afifi, Chairman of the Extension-Training Advisory Committee at El Roda, agricultural problems and possible ways the Mechanization Project can assist in developing a mechanization education program for that area were discussed. The meeting was attended by the Undersecretary of Agriculture for Minia, Mr. Mohamed El Gamal, the Director General for Land Reform Mr. Hassan Mahmoud, other local Ministry of Agriculture officials, local cooperative personnel, and twelve key farmers. The meeting provided considerable information that will be useful in development of an effective program for the area. Mr. Afifi requested and was given a report upon our return to Cairo.

3. We also visited the Agricultural Research Station at Mallawi and went to Naway village where FAO is conducting a mechanization demonstration, and dicussed mechanization practices with personnel at these stations. The information being developed at Mallawi and Naway will be valuable in developing an information base for the extension education program in Minia governorate.

4. At the Horticultural Research Station at Kaha, we participated in the demonstration of a leveling blade manufactured by Tanta Motors from a design developed by USAID personnel. It appears to have good potential for Egypt and worked well in the demonstration. Dr. Hosni Khalifa of the Research Station and Eng. Samy Abdel Moneim of the Horticultural Research Institute expressed a desire to make the station available for future mechanization related extension activities of the Mechanization Project program and the needs of the vegetable growers in that region. Vegetables are major crops in Qaliubia, offering an opportunity to develop a program oriented towards vegetable growers.

5. At a meeting with the Extension Specialist for Mechanization (attending the training session at Sakha Training Center) we discussed the Project goals and individual programs and discussed with the trainees some of the possible activities they may want to include in their programs.

6. We went with members of the Training Subunit, Mr. Salah and Mr. Shawky, to El Sheikh Ahmed to see the demonstration trials in Sheikh Ahmed, El Dilingat and other nearby villages. Trials with acid treated cotton seed planted on level rather than bedded land with a grain drill did not emerge to a satisfactory stand. It appears that in heavy clay soils, bed planting in hills on previously leveled land is desirable.

7. Following meetings with farmers in El Sheikh Ahmed regarding future activities in water lifting, a list of farmers who have expressed an interest in a program on water lifting has been prepared. This list can now be used for invitations to training sessions, demonstrations, meetings, etc. The list has been given to Mr. Coles.

Activities for May: Continue to monitor the demonstration in El Sheikh Ahmed and surrounding villages; cooperate with the Research and Development Subproject members in putting in seedbed preparation for maize trials in an area near Sheikh Ahmed; conduct a wheat harvest demonstration; continue to work with the Extension Department in developing the mechanization education plan for the 24 project target villages.

A.3

Training

Activity Report
April 1982

Submitted by: Samir Shawky
Fred Schantz

Summary

1. Ten courses for 135 trainees were in various stages during the month (see Appendix A). They included 90 trainees attending locational training courses and 45 in training center courses.

2. A draft of the project Participant Training Guide was completed and participant training candidate processing continued throughout the month.

3. The Local Manufacturing Training Program amendment was completed, signed and sent to USAID for approval.

4. Eleven meetings were attended and four field trips were taken.

During the period

1. As demonstrated in Appendix A, the number of courses and trainees increased this month. As the project grows, the number of trainees will continue to increase accordingly. This will be most notable when the 11 district mechanization specialists return to their areas and begin selecting local trainees. Already, over 100 names have been given to the training unit by other project field staff who constantly have people asking for increased training sessions. These numerous requests and activities in progress are being charted in order to deal effectively with the information.

2. The participant training effort was improved this month with the production of a Guide for processing participant training candidates. Mr. Dale Debutts, the short term training consultant who has produced the Guide with the project Training Director Mr. Samir Shawky has obtained approval from USAID as well as the Project's technical staff for this Guide. The 26 steps required to successfully process a participant candidate are clearly outlined along with observation tour processing information and other pertinent facts concerning the Project's participant training programs. The Guide is now being finalized and will be distributed next month to all concerned.

3. The local manufacturing training program amendment was signed by Dr. Sahrigi on April 22 and sent to USAID for approval this month. When approved, it will provide the local manufacturing component a training program and the funds with which to initiate an intense effort in this area.

4. Of the numerous meetings and field trips duirng the month, the following are highlighted:

   a) The monthly meeting of the Extension and Training Committee allowed bylaws of the training unit to be reviewed and a proposed draft was completed.

A.3

b) A meeting was attended on April 20 with the Soil Improvement committee during which their subproject's training activities and plans were discussed in detail. They presently have trainees in one training center and are actively assisting the training sub-unit in selecting and processing participant training candidates.

c) On April 20 a meeting was held with Dr. Sahrigi, Dr. Zakaria Haddad, Dr. Gaiser and Dr. Abu Saba concerning the selection of participant training candidates. It was decided to draft a letter of request to the MOA for candidates from which potential participants would be selected. These trainees would be given second priority to our project's staff and would be selected to fill remaining program openings.

d) A peanut harvesting seminar held on April 22 was extremely useful in that training personnel present agreed to send our project training aids on peanut harvesting equipment. The Extension Department is heavily involved in this activity, in which we are also participating.

e) A considerable amount of time, energy and effort during the month was spent with members of the MOA General Dept. of Training in developing a program for the Nubariya Training Center at Gianaclis. A draft of the program is almost finished (Arabic), which will allow more of our time to be spent on project training activities which are increasing daily.

f) A tour was taken with the Sharkia Extension Director who is very interested in the Project's involvment in his areas, especially in peanut harvesting. We visited a farm machinery station at Sardina which appears to be an excellent location to begin training activities in the area.

5. Forms have been completed and contacts made concerning English language training for the project staff on weekends. Final arrangements should be completed so the course can begin next month.

6. The fiscal report for the month is found in Appendix B.

7. Secretarial assistnace, primarily the clerk/translator called for in the 1982 training plan, continues to be important to the success of the training effort.

<u>Activities for May</u>: Continue planned training activities; finalize and distribute the project Participant Training Guide; procure budgeted training aids as planned.

A.4 SERVICE CENTER AND VILLAGE WORKSHOP SUBPROJECT

A.4.1 SERVICE CENTER SUBUNIT

Activity Report
April 1982

Submitted by: Graham G. Sparrow
Youssef F. Stefanos

During the period

1. This month there has been a steady flow of inquiries coming in from various people and companies wishing to partake in the Service Center Development Subproject. All new inquiries have been explored and it would appear that there may be at least three if not four possibilities of developing new Service Centers.

2. Of concern has been the fact that in Minia there are no large agricultural companies operating--those existing are Delta based, with not even a branch office in this governorate. However, we have had an application from an influential gentleman from Beni Mazar who has the necessary experience and knowledge to establish a service center. One of the most important factors in developing a service center is owning a suitable piece of land with access to water and electricity, all which conditions are met in this case. We have visited the location and held long and detailed discussions and have reviewed his draft proposal.

3. In Gharbia we are very close to final discussions and are awaiting a copy of the draft from a company which has formed a new company to establish a service center about 10 km north of Tanta. Again, this is an ideal location, on the highway and away from any immediate or future rural development. Three other proposals have come in from the new lands area. One is at 33 Km on the desert road (governorate of Alexandria). Another is at Km 76 in Beheira governorate, which we personally favor for a number of reasons, and the third is at South Tahrir (Beheira), on which we have some reservations.

4. Other people we are dealing with are progressing steadily. We have received the first fully detailed draft for the service center at Mahmoudiya, which requires some further minor details before it is finalized and then presented to the Bank.

5. The service center for Abu Hommos has got bogged down due to the purchase of land, but this should be resolved shortly, and in the meantime they are researching the cost of building tools and equipment so that as soon as the land deal is concluded they can present a draft proposal.

6. We feel that at this time we must concentrate on the applications in hand and hold all new ones for review at a later date. This will allow us to spend more time with the developing service centers which is necessary to continue a steady rate of progress and not be spread too thinly.

7. Next month we hope to have two applications at the Bank for their approval, and will continue our discussions with the others who are already at various stages of development.

A.4.1

Activity Report
May 1982

Submitted by: Graham G. Sparrow
Youssef F. Stefanos

During the period

1. This month has been extremely busy and we have made good progress in some areas at the expense of others, mainly in our office paperwork, but this will be caught up next month.

2. We have had a total of 17 meetings with 12 companies with regards to service center development. Some of them were new applications which had to be investigated while others were with people already involved in one way or another and at different stages of development.

3. While we are endeavoring to push ahead with existing clients, we do have to investigate all new applications so as not to allow them to feel that we are not interested in them.

4. We have also attended two project meetings in Cairo, held two Executive meetings in Alexandria related to our subproject, had a meeting with the Chairman of the Land Reform Department in Damanhur, and attended the workshop at Sidi Bishr for one day during the presentation by Dr. Reiss.

5. This month we had two engineers, Messrs Shoukri and Adel, from the Testing Station assigned to us for training. Eng. Adel has been on a 6-week intensive English training course at the American Cultural Center in Alexandria. He has now completed this programme and attained a very high mark. We are very pleased with the result; he will be starting another English course, for only two days a week, to allow more time for field training. Eng. Shoukry has spent time doing research work in Cairo and Alexandria, which is very important to the subproject as well as attending some meetings with us with various clients. Both engineers have now started to compile some of the data they have collected.

6. We are presently compiling a financial forecoast to present to the Executive Committee for the Service Center project located in Mahmoudiya. This part of our operation is probably the most important part, as this will indicate to the client and the bank how much the project is going to cost and more important, how the client will generate sufficient income to meet his financial commitments. We must remember that because of the soft loans we are able to offer, local businessmen immediately request many thousands of pounds for machinery and equipment without much thought as to how they are going to make repayments; it is our responsibility so ensure that their undertaking is within their capability. If this procedure is not adopted, we risk the possibility of the new business failing because it was stretched beyond its financial limits.

7. Next week we must complete a second forecast for the Service Center in Minia. This particular project will take some time, as in its present draft form it is estimated to cost LE 520,000 and will therefore require USAID approval as it is over the maximum guideline figure. The service center for Abu Hommos is in nearly the same position, but the problem that might hold it up is the purchase of suitable land. The client has failed to secure five different pieces of land. It appears that when

the price has been agreed, the owner then fails to meet the lawyer on the set day and later our client is infomred that the owner has raised the price again; this continues until the price is unreasonable. We have had many meetings with the MOA and the Land Reform Dept. to see if they can help the client, but unfortunately they do not have any land that might be used for the service center. They have been helpful in supplying the names of landowners who are wishing to sell their land.

Small and Village Workshop Unit

1. R. Snyder and his team have visited the random villages in Beheira to see if it would be possible to develop a small workshop in any of them. It appears from his report that these villages do not have the number of machines that would warrant the development of a small center, and what machinery is there belongs to the cooperatives which at the present time we cannot assist. He had a meeting with Mr. Ahmed Zayed, head of the Mechanization Co-op group in Damanhur, who was apparently very interested in our project's program and asked if we could assist them with loans. This point was taken up later in Cairo with Dr. Gaiser. Mr. Zayed was also interested in our training program and asked if he would call again in about two weeks when he would have candidates for training.

2. Eng. Anwar Abd El Hamid Nada is still at Beheira Co. for training that will be completed at the end of June. Abd El Hamid has been collecting data from dealers, parts shops, workshops, etc. and at the same time assisting in showing some small workshop owners where to find certain types of machines and tools. He has also assisted Mr. Naggar to carry out various types of tests on some tractors at the station.

3. Mr. Snyder is close to presenting about three loan applications to the Executive Committee for their approval after which they will be presented to the PBDAC in Damanhur.

4. At the end of June, we feel confident that at least two service centers and about four village workshop applications will be presented to the bank.

A.4.1

Activity Report
June 1982

Submitted by: Graham G. Sparrow
Youssef F. Stefanos

During the period

1. We must state for the record that there are many people we meet or who are sent to us who feel that once they have asked us to help them establish a service center, we should write out a check for whatever amount they wish, wave goodbye and let them do their own thing. There are, as we know, many facets which must be explored, too numerous to go into in this report. This is a very time consuming operation but must be done to protect the individuals, the loan fund, and the Mechanization Project itself. Failure on our part to complete this function would be completely against all business ethics, and would leave the Ministry and ourselves open to criticism.

2. The first Service Center proposal which has been finalized is located in Mahmoudiya and was passed by the Executive Committee on 17 June and presented to the bank in Damanhur on 20 June. The center will be owned and operated by Mahmoudiya Motors Co. and located on some 2000 m^2 of land which is being purchased from the Land Reform Authority. The total value of the loan is LE 200,000 which includes the building, machinery and equipment.

3. Many meetings have been held with Mr. Azmi who plans to open a service center 5 km west of Beni Mazar in Minia; he already owns the land and can meet all the necessary guarantees. The financial feasibility and projection has been completed in rough draft for a loan of LE 490,000, and it will be presented to the Executive Committee for approval and to the bank hopefully next month.

4. In the past two or three months we have received no further response from Egyptrac (Saad Aguizy) and we felt that he might drop out, but in the first week of this month we received a letter from requesting a meeting to discuss his proposals; this was followed by meetings during the month. His first proposal is for 2885m^2 of land on the main agricultural road at Qaliub, which he owns (3 km north of Qaliub). The type and design of building and types of machinery and equipment were discussed. Mr. Aguizy hoped that the final design and size of the service center would be completed and the total cost given to us before Ramadan, or immediately after the feast so as to submit it to the Executive Committee before the end of July and to the bank the first week of August.

5. We have had several meetings with the Hammami family to follow up their progress on the purchase of a piece of land. In the meantime the list of machinery, tools and equipment has been completed, but the design and size of the building will depend on the size and shape of the land that will be purchased.

6. Eng. Samir Fahmy of Samtrade has purchased land on the agricultural road 8 km north of Tanta and his engineer has submitted a list of equipment required. Unfortunately, Mr. Fahmy was admitted to hospital with a slight heart attack, so everything has stopped until Mr. Fahmy returns to work.

A.4.1

7. We have had three meetings with Mr. Salah Gaber from South Tahrir during which he promised more information in writing as to his requirements, but as yet we have no more information than that after our second meeting; he also has to be able to purchase land in the area before we can continue further.

8. Mr. Mohamed Herhesh wants a service center on the road between South Tahrir and Kom Hamada and we have agreed to visit his location after Ramadan and discuss his plans. We feel that great care should be taken with this application and the one from South Tahrir, as these two would be very close to each other.

9. With regard to Aiman Korra, located on the desert road 76 km from Alexandria, we have visited him many times and he promises to send us a letter of intent; however, nothing is forthcoming.

10. Two Executive meetings were held this month, on the 6th and 8th June, when two small workshop applications were approved, and on the 17th of June when one small workshop application was approved and also the application of Mahmoudia Motors Co. for a service center. All of these have been given to the bank for their approval.

11. We may encounter a problem with the banks, as we have been asked for an incentive for them to do the work necessary to obtain the loan approvals. They are also trying to change some of the terms and conditions, and we have had clients return to us saying the bank wants many more guarantees. If this situation is not resolved soon it will create a bottleneck.

A.4.1
Appendix A

SUMMARY OF THE ACTIVE SERVICE CENTER APPLICANTS AND THEIR PROGRESS RELATED TO THE SERVICE CENTER PLANNING NETWORK

Date: 1/7/1982

Applicant	Governorate	Location	Current Activity	Completed Activity
1. Abdu Khir Alla & Co.	Behera	Mahmoudia	(17,33)(35,40)	35.
2. Abdel Mohsen Azmy	Minia	Beni Mazar	(30,35)(22,40)	30
3. Egyptrac Co. (S. El Aguizy)	Qualubia	Qualub	(20,21)(20,22) (20,25)(33,40)	20,33
4. Hammamy Family	Behera	Abu Hommos	(17,33)(20,21) (20,25)(20,22)	20
5. Samtrade Co.	Gharbia	Shobra El Namla	(20,21)(20,25) (20,22)	20,33
6. Salah Gaber	Behera	S. Tahrir	(10,15)	12

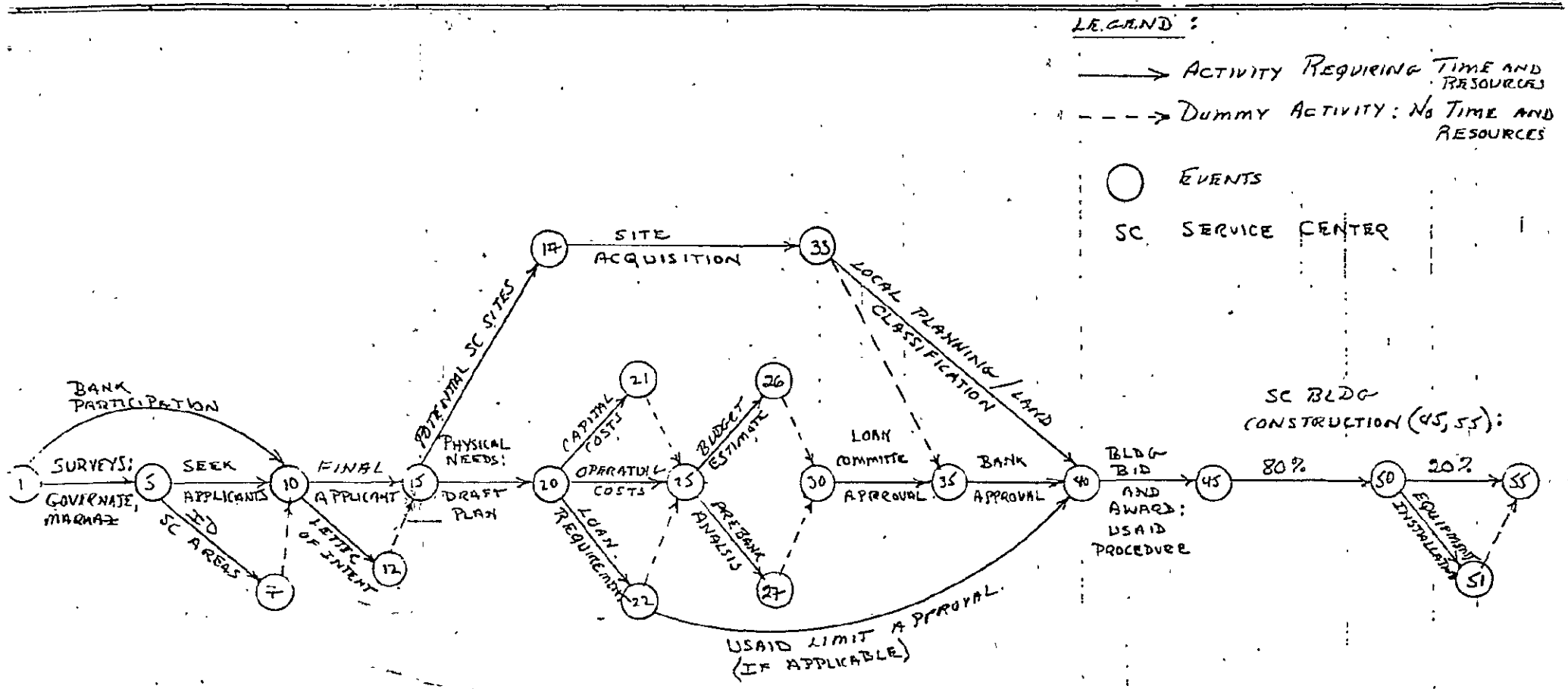


Figure 1. Service Center Development Planning Network.

DATE: 11/5/82

A.4 SERVICE CENTER AND VILLAGE WORKSHOP SUBPROJECT

A.4.2 VILLAGE WORKSHOP SUBUNIT

Activity Report
April 1982

Submitted by: R. Snyder
Wagdy Metry

During the period

1. Our primary effort this month has been visiting small workshops to survey their capabilities and suggest how they may improve their operation through help from our project. Interest in this sector has picked up considerably, and we now have several shop owners requesting loans for facility improvements, tools, machinery and even new shops.

2. One of the major setbacks with small shops is their inability to meet collateral requirements. Almost none can produce cash. Very often they claim to have land, but there seem always to be many many reasons why they don't have clear title to any land.

3. We have begun making some visits to shops in Gharbia and Sharkia, but do not want to get too far afield until a few are established in Beheira.

4. Dr. Gaiser and Dr. Zakaria have instructed us to discontinue our visits to small village shops, at least for the time being, and to concentrate our efforts on the 23 preselected random villages. We have seen only a few of these villages, so naturally cannot make predictions about them.

5. Two whole days were spent this month setting up our office files. We have begun to build up our staff. Eng. Anwar Nada came on about the middle of April and is now in special training at Beheira Co.

6. Abd El Hamid is still collecting data for a machinery/spare parts catalog. It would be helpful if we could get someone with English typing ability to assist on this project. Hamid has also been helping potential borrowers to locate machinery and tools.

7. We still have three trainees at Maamoura Training Center in Mechanics (Level 1) class.

A.4.2

Activity Report
May 1982

Submitted by: R. Snyder
Eng. Wagdy Metry

During the period

1. This month we have continued our visits to small workshops. Most were previous contacts for whom we are attempting to finalize loans but some new contacts were made.
2. We have completed the survey of random villages and co-ops in Beheira governorate. The two near Mahmoudia merit further investigation. There are people in this area who are interested in developing small workshops. We will need a survey on their tractor and machinery populations before deciding to proceed or drop the effort.
3. We met Mr. Ahmed Zayed, Chairman of the Mechanization Coops in Beheira, who said they were allotted funds to purchase machinery and wished to develop small workshops in or near the Markaz towns where their co-ops are located. We discussed this with Dr. Gaiser who will inquire if we can make loans to co-ops.
4. It was decided by our executive committee to reduce our meetings to two per month, as the meetings often interfered with field work.
5. Eng. Anwar Abd El Hamid's training at Beheira Co. is expected to be completed in June, when he will begin training in the field with Eng. Wagdy and Mr. Snyder.
6. Abd El Hamid has been collecting data on dealers and parts shops, has been guiding shop owners in finding tools and equipment, and has helped Mr. Naggar test some tractors for a few days.

A.4.2

Survey of Random Villages & Coops for Possible Small Shop Development

Submitted by: R. Snyder
Wagdy Metry

In May 1982 we visited the group of Random Villages in Beheira Governorate and made the following observations:

11 May 1982 : We visited the Coop office at Deseya village and discussed the maintenance capabilities in the immediate vicinity with the project enumerators. Our observations:

1. There are no workshops in the village or surrounding area.
2. There are no maintenance persons in the area who do any kind of machinery maintenance except that done on their own machinery.
3. The Coop does not own any machinery and has no plans to develop maintenance facilities.
4. Nearly everybody in this area uses the repair shops in Mahmoudia and Desuk for their maintenance needs. Most prefer Desuk where they claim they get better and more reliable service. Mahmoudia is 5 km away and Desuk 10 km.
5. Graham Sparrow and Youssef Stefanos are negotiating with some people in anticipation of development a service center within a few kms of this area, near Mahmoudia.
6. Mr. Mahmoud Hab Allah works for the Coop and as an enumerator on the Project. He owns land directly across the road from the Coop and expressed interest in starting a small shop. He has no experience in this type of business, but says he could hire a mechanic to run it for him. It would require a loan for a building, tooks, parts and probably operating expenses.
7. We did not say "no" to Mr. Hab Allah, but in view of the maintenance facilities available in Mahmoudia and Desuk, plus the probability of a service center being developed by the project, we do not consider it advisable to make an investment in this area; it is doubted that it would ever be a profitable business.
8. We plan to investigate the tractor and machinery population in this and nearby villages before we take a firm decision on whether or not to try developing here.

11 May 1982: We visited the Coop at Enab Besentow village for the same purpose. Our observations:

1. There are no workshops in the village or surrounding area.
2. The only maintenance person in the area repairs flat tires occasionally in a 20 m^2 mud hut near the road; I believe it is a squatter hut on Governorate land.
3. The Coop has only one tractor, one plow and one trailer but has no plans to develop maintenance facilities.
4. Most people in this area use the repair shops in Mahmoudia (7 km) and Damanhur (11 km) for their maintenance needs.
5. This village is also in the vicinity (a few kms) of where the project is planning to develop a service center.
6. Mr. Aly Ahmed El Said Hillal who works in the village bank has expressed interest in starting a small shop. He has land which was given to him

by the Agrarian Reform group and is not sure they would allow him to develop a shop.

7. The same situation prevails here as in Deseya village. Considering the individuals' lack of experience and the repair shops available in Mahmoudia, Desuk and Damanhur, it is unlikely that a profitable business could be developed here.

8. We plan to investigate the tractor and machinery population in the area before making a final decision.

12 May 1982: We visited the following:

El Gurn Cooperative (agricultural road, .5 km north of the intersection of the access road into Abu Hommos)

1. The coop has no machinery. There is however quite a dense population of tractors and machinery in the Abu Hommos area.

2. Abu Hommos has about 8 tractor and machinery workshops. It has two sort of machine shops, each with an old lathe and a drill press.

3. Graham Sparrow and Youssef Stefanos are negotiating with some businessmen who plan to establish a major service center in the immediate vicinity.

4. Considering the maintenance facilities already available in Abu Hommos and those planned for the near future, we feel there is no need to develop additional shops in this area.

El Dahawab Coop (in the town of Abu Hommos)

1. The coop has no machinery. As previously stated, the area surrounding Abu Hommos has quite a dense population of tractors and machinery.

2. Since this coop/village is located in the town where facilities are available, there is no need for additional shops.

Desnus Coop (3 km north of Abu Hommos on west bank of Mahmoudia Canal)

1. The coop has no machinery. This area, however, has a dense population.

2. Since the coop is located so near Abu Hommos, it is not necessary to develop more shops in the area.

In conclusion: We have decided to do more research on machinery populations in the areas around Deseya and Ezab Besentow. If the machinery population is sufficinelty dense, we shall persue the possibility of developing a small shop in one or both areas. Those coop/villages in the immediate vicinity of Abu Hommos have no need for additional maintenance facilities and we do not plan to develop any. During each visit we mentioned the possibility of training a few maintenance persons from each coop. It was well received and we shall return in ten days to get the necessary data on the trainees.

A.4.2

Activity Report
June 1982

Submitted by: R. Snyder
Wagdy Metry

During the period

1. This month we delivered requests for loans for three individuals to the banks in Beheira and Sharkia. At the risk of being overly optimistic, we have had at least verbal approval from the bank officials on all three.

   One loan is for Mr. Sabry Ibrahim Eid El Said of Ibrahimiya, Sharkia governorate. The loan is for a building (LE 34,000), and tools, equipment and spare parts (LE 24,500).

   One is for Mr. Mohamed Kohla of Delengat, Beheira, for building improvements (LE 2400) and machinery and tools (LE 8500).

   One is for Mr. Ibrahim Ateya Ibrahim of Delengat, Beheira, for building improvements (LE 1500), and machinery and tools (LE 12,000).

   The next step is to present the bank with the necessary documents and a letter requesting they finalize the loans.

2. It seems the bank officials had not done their homework as well as we had hoped. Every visit to date has been like starting all over again. There also seems to be some doubt as to the extent of the bank's responsibility and authority. This should be clarified immediately.

3. Another problem is that we have not been able to convince the bankers at Damanhur that a person's land, although not directly related to his business, could in fact be used as collateral for the client's required 10% down payment. In order to alleviate a few very troublesome problems we recommend the following amendments to the letter of understanding:

   a) We should eliminate the requirement for a 10% down payment for small shops. Too often, acquiring this down payment or collateral to satisfy it involves a long process of getting the client's or a relative's land registered, a very time consuming process.

   b) We recommend that we be officially allowed to grant a one year grace period for machinery purchases that exceed LE 10,000.

   c) We feel we should not require a guaranteee in the form of cash or assets for hand tools and spare parts purchases if the total of the two does not exceed LE 2000. The hand tool and spare parts situation is very seriously deficient in small shops at this time. Since most of these operations have no cash or assets to speak of, this would improve the situation.

4. Since English language training began in June, each of our staff has lost two working days per week. Due to this, Ramadan and the urgency to finalize some loans, we were not able to visit any random villages this month. Also, we have not had any feedback from those in Beheira we visited on two occasions.

5. Eng. Anwar Nada completed his special training course at Beheira Co. this month. His training included familiarization and some practice in the company's machine shop, engine overhaul shop, injection pump shop and welding/fabricating shop. He is now training with R. Snyder and Eng. Metry in the field.

6. Abd El Hamid continues to collect data on agricultural machinery dealers, their workshops and spare parts situation. He has more recently begun trying to collect an assortment of spare parts and service catalogs for the various farm tractors and machinery sold in Egypt. If the dealers are cooperative and we acquire a reasonable quantity of these catalogs, we will make them available to various shops we feel could benefit from them.

7. We have the names of 12 trainees who are ready to begin their courses as soon after Ramadan as possible. Some of these will be from the Mechanization Center Coop in Damanhur, who have given us the names of 8 persons.

8. Not having a telephone at the office is a severe handicap; we often have to drive for hours to discuss some item of a loan that we could handle in a few minutes on the phone. Lack of transportation is also a problem; our staff could use another vehicle full time.

A.5 SOIL IMPROVEMENT SUBPROJECT

Activity Report
April 1982

Submitted by: Erroll Coles
Adel Orabi

1. Minia Survey: The data for the section of the basins is being extracted and tabulated prior to being analyzed. A standard program for the HP85 computer is being modified for storing and statistical analysis of the relevant data.

2. Pump Survey: A survey of small pumps available on the local market was concluded and the summary of the survey was given to the financial advisor for incorporation into a comparative study of sakias.

3. Extension Personnel Training Course, Sakha: Preparation of lecture materials for the E.P. training course.

4. Project Papers: Work continued on the Workplan and various working papers in order to focus on the specific role of the subproject. These papers, in draft, will be presented in May—Workplan parts I and II, and Working Papers 1, 2 and 3.

5. Personnel Activities:

   Dr. Abdel Orabi: familiarization with subproject activities, coordinating research activities with SAO research section

   Dr. Ahmed El-Arabi: data collection and research

   Eng. Ahmed El-Fayoumi: pump survey

   Eng. Amr Marei: Minia basin survey

   Eng. Hassan El-Banna: lecture preparation and translations

   James McClung: analysis of Minia survey data

   Erroll D. Coles: preparation of workplan, working papers and rates

A.5.

Activity Report
May 1982

Submitted by: Erroll Coles
Adel Orabi

1. Land Improvement Symposium, 2-6 May 1982: This symposium was sponsored by various organizations concerned with land improvement activities in Egypt. A panel composed of both Egyptian and overseas specialists presented a series of papers on diverse subjects and activities going on in Egypt. A paper on the role of water management in land improvement was contributed by the subproject. This symposium was most interesting and informative.

2. Extension Personnel Training at Sakha: A number of lecture notes were presented at this session: a) The advantages of mechanical pumps over sakias; b) the cost of operating pumps compared to sakias; c) credit facilities for sakia replacement; d) soils of the Nile Valley; e) salinity and salt balance; f) improved irrigation methods (three papers. All of these papers have been translated into Arabic and returned to the Training section and to the Sakha Training Center.

3. Minia Survey: Work proceeded on analysis of the Minia survey data and most of the tabulation was completed.

4. Subproject Reorganization: The subproject Advisor was requested and agreed to cede responsibility to the extension subproject for waterlifting activities, and will concentrate on land improvement activities only (per Memo of 17 May 1982).

5. Personnel Activities:

Dr. Adel Orabi: Subproject familiarization and coordination of research activities

Dr. Ahmed El Arabi: Collection of data and information relevant to the research activities; obtaining maps and air photos relevant to Middle Egypt areas

Eng. Hassan El Banna: Preparation of lecture materials and translation of lecture notes; presentation of lectures at Sakha.

Eng. Amr Marei: Collating and tabulation of Minia Survey data

Eng. Ahmed El Fayoumi: Preparation of lecture materials on pumps and translations; presentation of lectures at Sakha

Mr. James McClung: Analysis of Minia survey; presentation of lectures at Sakha; compilation of a computer program for HP85 for Minia data analysis

E.D. Coles: Preparation of lecture materials, working papers and Minia Survey data analysis; presentation of lectures

A.5 LAND IMPROVEMENT SUBPROJECT*

Activity Report
June 1982

Submitted by: E.D. Coles

A. Fayoum Governorate (9-10 June)

El Fayoum Governorate consists of about 320,000 feddans irrigated by the Bahr Youssef Canal discharging from 70 to 80 cumecs. The "water duty" is 4000 feddans per cumec, or 0.25 liters per second per feddan. Crops range from permanent tree crops (citrus, apricots, apples, grapes and pears, olives, dates) to field crops of cotton, berseem, wheat and mixed vegetables. The soils vary from light textured calcarious entisols along the high ground, and heavier swelling clay vertisols further down the slopes.

The irrigation and drainage system, as well as the farm layouts, place demands on the landforms. The whole system differs markedly from the Delta and Nile Valley and a different approach to the various field problems will be required.

The southeast and central area is fairly flat, sloping steeply toward Lake Qarun. The lands are terraced, the terrace heights and width varying with the slope of the land. The area to the west is similar, but slopes off toward a secondary depression (Wadi El Ruayyan). Two large ravines dissect the area, serving as drains and conveying water to the lower lying lands along Lake Qarun.

From the brief two day visit, a superficial assessment of the situation indicates that these problems are apparent: water management, drainage manangement and improvement, soil management improvement:

1. Water Management: The water supply seems to be based on a "free flow" system, water flowing from the top farms to the bottom farms, allocated to each farm in turn on a fixed rotation. However, this system lends itself to the traditional "head-ender/tail-ender" conflict. Farms at the top take water at liberty while the end farms receive a very diminished flow. The diminished flow also results from losses along the aged canal system, and not only from pilfering. Water is metered to the command area or large groups of farms by means of a proportional division structure known as the Fayoum Weir. The width of the weir has a constant head over the weir being proportional to area supplied. The irrigation water requirement (IWR) appears to be consistent for the whole area and of course equal to the peak crop requirements. The basis on which crop water requirements have been estimated for the present crop rotations is not known.

   Water shortages are claimed but there is evidence of waterlogging. However, maldistribution and inefficient irrigatino practices may account for waterlogging, causing salinity, and in some low lying areas severe alkalinity; these maladies seem to occur on both the lighter and heavier textured soils.

*Note subproject reorganization noted in May Activity Report.

A.5

The solution to the maldistribution of water does not lie in land-leveling, alghough land smoothing is needed along some of the terraces, but in providing improved water regulation along the steep canals. This could be accompanied by using check-drop structures and pipe turnouts, the water being diverted onto the farm through the pipe when the check is closed by a gate. An alternative would be to use a low pressure pipe system to distribute water throughout the area. The two systems could be complementary--i.e., used together. The use of overhead irrigation or trickle system would have to be justified on a cost basis, though trickle may be used for permanent tree crops, and there the costs may be justifiable.

None of these systems will work successfully or for long without the full cooperation of the farmers. The organization of farm water users' associations is an essential pre-condition to improved water distribution and management. These aspects are beyond the terms of reference of the Project. There would be little point in attempting to correct one set of problems without correcting the other attendant problems causing maldistribution of water and water-logging. While waterlogging is prevented by intensive drainage, it may be less costly to improve the distribution of water and use less intensive drainage.

2. Drainage Management and Improvement: Drainage on the sloping lands should be adequate even though soils are heavy and restrictive. Even in areas with 2000mm or more of main fall, citrus is planted on freely drained soils while on sloping lands, benching is a common practice. But the translocation of saline water to the crest of the benches may damage the trees and open drains may also have to be used.

   The claim of water shortage may be accounted for by the fact that crops grown on saline soils usually display signs of moisture stress and more water is added, creating surpluses to be drained. This situation needs to be studied in careful field investigations and water balance studies.

3. Soil Management: The lighter textured soils have a high carbonate content. Desalinization of such soils requires different techniques than in heavy swelling clays and gypsum cannot be used to "release" or react with the soil calcium. Such soils are prone to "hardpan" formation by continuous movement of tractors and implements over or in the soil.

   The small-basin method of irrigation seems to be widely used for applying water to field crops. This method is generally used on uneven land, but may be the general traditionally preferred method. In the absence of a topographic survey, it appears that land smoothing or grading the terraces toward open drains may be required to improve irrigation and remove surplus irrigation water.

   Tillage practices on the soils (vertisols) would follow those improved practices advocated for the Nile Valley soils and Delta, namely

deeper non-inversion type tillage, deeper incorporation of ameliorants if required, subsoiling, etc.

One salient feature remains in question: experience elsewhere has shown that vertisols are more productive if they are allowed to dry out and crack deeply. This phenomenon has been observed in Egypt and under pre-High Dam conditions, occurred regularly. Under present economic conditions, a fallow period long enough to allow the soils to dry and crack is not acceptable to farmers. Consideration should be given to fallowing land.

B. El Fayoum Research Unit

The Research Section of the EALIR has selected a 100-feddan area in the area of Salhia, west Fayoum. The area is located on the higher slopes of the depression and the soils are typical vertisols, dark gray swelling clays deeply cracked, and a few "slick" spots or alkaline areas with characteristic "fluffy" soil surfaces occurring. The soils are no doubt saline. The area of the 100 feddans is contiguous and the location easily accessible and provided with a reliable irrigation water supply and complementary drainage.

A simple, straightforward experimental layout is advocated based on determining the optimum land improvement parameters required to maintain productivity of the soils. Additional areas should be considered to demonstrate and test procedures for reclaiming the severe alkaline areas in the Fayoum. Such reclamation procedures should be considered for the lighter texture carbonate soils that are saline and where gypsum cannot be used, and acid-based ameliorants such as slag, iron sulphates (products of steel mills) and in extreme cases, sulphuric acid, could be used in the reclamation process. These areas may be located in the Nazla area on the heavy soils and to the south on lighter soils.

C. Minia, Beni Suef (9-10 June)

The data gathering part of the basin survey was in progress for Beni Suef governorate. For Minia, the progress of the water management project was explained to the project personnel.

D. Landleveling Seminar (7 June)

Three short papers were presented covering various aspects of land leveling and the personnel of E.E.C. (local representatives for spectra-physics and manufacturers of the laser plane equipment) explained the operation of this equipment. Copies of these papers will be available soon, presented as Project Occasional Papers No. 1.

E. Work Completed and In Progress

1. Working Paper No. 2, "Operational Analysis of Laser Plane Land Leveling, Delta Sugar Company," has been completed and will be presented when typed.

2. Working Paper No. 3, "Land Improvement Demonstration Basin," is completed.

3. The Minia Basin Survey preliminary data collection is completed and will be presented during July, as Technical Paper No. 3.

4. Working Paper No. 8a, "Land Improvement Training Program: Irrigation Methods Demonstrations" (A. El Fayoumi and Hassan El Banna) is in the process of compilation. This working paper proposes the demonstration of long furrow and long basins using syphons and alternatively, spiral pipes.

5. Technical Paper No. 1, "Operating Costs of the Four Tractor Power Ranges for Land Improvement Operations," is in preparation. The costs will be based on standard tractor test reports and local tractor and implement prices. Tractor test reports have been ordered.

6. Technical Paper No. 2, "Design Parameters for Basin and Furrow Irrigation Methods" (A. El Fayoumi) is a review of the most recent design procedures for the determination of discharge, furrow and basin length, application depth and soil intake rates based on regression curves, the use of siphon pipes and spile pipes, and the capacity of them as related to the required discharge.

7. The data on pumps and engines and all subsequent analyses have been given to the Planning and Evaluation Advisor.

F. Field Tours

1. Fayoum Governorate, 9-10 June: Dr. A. Orabi, Dr. A. Araby, Dr. Peter Reiss, Mr. J. McClung, Eng. A. El Fayoumi, Eng. Hassan El Banna, and E.D. Coles were accompanied by Dr. Maher Waly and a discussion was held with the Undersecretary of Agriculture of Fayoum.

2. Delta Sugar Co. (18-19 June): Dr. A. Orabi and Dr. A. Arabi had discussions with Dr. Mustafa of D.S.C. regarding the field investigation to be carried out after Ramadan.

3. Beni Suef/Minia, 18-19 June: Eng. A. El Fayoumi, Eng. Hassan Al Banna, Mr. J. McClung, E.D. Coles.

A.6 LOCAL FARM EQUIPMENT MANUFACTURING PROGRAM

Activity Report
April 1982

Submitted by: Richard Berky
Manufacturing Advisor

1. The first two weeks were devoted to drafting and discussing second drafts of the Manufacturing Advisor's workplan and training program. A final draft of the training program was signed and submitted to USAID which had previously been given approval for inclusion in the 1982 training budget.

2. The workplan underwent major changes in emphasis and though a third revision is ready, it is being held up temporarily pending review of the Beheira Training Center by the partially formed advisory committee.

3. Work is progressing and assembly has started on the 3/4 ton per hour threshing machine with separation. It is expected to be in the field about 15 May.

4. Engineering information has been obtained on the old Allis-Chalmers Model 66 all-crop harvester, through the courtesy of Robert H. Tweedy, Manager of Strategic Business Planning for Allis Chalmers. Design work is under way on a 3/4 scale version of adapting the separator unit to the widely copied Beheira threshing/chopping machine. Prototype testing is anticipated this summer with tests in rice scheduled for winter.

5. The major problem areas are recruitment of trainees and finalizing the training program. The Advisor is extremely disappointed at this and has drafted a workplan using the training component as the immediate source of funds. Means of inducing immediate budget funds to allow ordering of long lead time program equipment and supplies were examined. Drafts of a workplan were submitted, and a training program, to the joint operating committee and this was approved for the training program, subject to USAID review. The second draft has been completed and awaits review.

(See Annex D for May and June reports.)

ANNEX B: SOIL IMPROVEMENT PAPERS

B.1 Simulation Modelling for Irrigation, Erroll D. Coles, P.E.

B.2 Landlevelling, Erroll D. Coles, P.E.

B.1: SIMULATION MODELLING FOR IRRIGATION

Erroll D. Coles (P.E.)
Senior Irrigation Engineer
Louis Berger Int. Inc.
Cairo, Egypt
June 1982

Introduction

An attempt will be made here to present an outline of what simulation modelling is all about and to define the various kinds of modelling procedures and programming techniques used in describing and simulating various processes. The problem is nobody actually understands, at a detailed level, how complex natural processes really work, let alone man-made systems and processes, man-made industrial plants and processes prove almost impossible to emulate. It is possible to model parts of a process under controlled conditions in a laboratory but the number of variables involved in such plants preclude complete models being constructed. The number of variables involved in the plants, some of them indeterminable or unmeasurable, make it impossible, let alone, link, all the complex feedback loops.

Examples of these models concerned with crop production under irrigation are briefly discussed. The first two models are deterministic models providing decision analysis while the third model is based on a linear programming model defining the cropping patterns and system capacity for set, static situations, for conditions under risk and for stachostic hydrological conditions, such as streamflow, rainfall and alternative water supplies drawn from the ground water sources.

What is a Model?

Amongst many definitions a model may be considered a simple mathematical explanation of a complex natural phenomena, such as water flowing in a channel, commonly explained by Manning's equation or the flow of water through porous media where Darley's law explains this flow. Many such models are used by engineers every day.

In the agricultural field Crowther and Yate's* crop yield prediction model,

$$Y = Y_o + m\,(1-10^{-kx})$$

was used to predict the yield (Y) of a crop for different levels of fertilizer applications (x) assuming the yield without fertilized (Yo) and the response limits (m).

Models can be divided into four basic kinds.

a. Conceptual models are a logical, ordered thought process. Such models are not solved by mathematical means and the flow diagram or charts that preceed the formulation of a model are basically a conceptual model.

b. Iconic models, which are similar to real systems in that the relevant properties are represented by those properties with only a transformation in scale; plot trials in agronomic crop experiments and scaled-down engineering models are examples of iconic models.

c. Analogue models are based on the use of one property to represent another, using electric current to represent the flow of water or the flow of heat in a solid body to represent water flow in porous media.

d. Symbolic models represent properties represented by symbols; symbolic models are mostly abstract and easiest to manipulate, systems analysis is primarily concerned with models where symbols represent quantities such as quantitative mathematical models or simulation models.

A distinction must be drawn between "simulation" and "system"**; simulation infers setting up a model of a real situation - or system - and then performing experiments on the model. It should be realized that models merely describe the behaviour of systems under a given set of assumptions and by experimenting, that is by using different variables or by changing the parameters, approximate solutions can be obtained.

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* Crowther and Yates (1941). Fertilizer Policy in Wartime. The Fertilizer Requirements of Arable Crops. Empire Jul. of Experimental Agric. Vol. 9.

**Brockington, N.R. 1979. Computers in Agriculture. Oxford University Press.

The procedure for developing a model usually starts by adequately specifying the problem (conceptualizing), the type of system and the analytical method to be used. This procedure is used because there is really no formal framework for developing simulation models. The problem has to be specified in detail if the model is to fulfil its purposes.

Once the model has been developed, the model must be "verified", that is to establish the correctness or the truth, whether the model does represent reality or not. At this stage the model is tested to see if it does follow the hypothesis that the system is true, or at least correct. If the verification is in error then the model may be altered or the degree of error noted and later the outputs are adjusted accordingly.

The next step is the experimentation phase of the simulation. In biological systems great variability exists which can not normally be taken into account and statistical methods are used to account for this variability; while in engineering systems variation can normally be accounted for by using some safety factor or probability analysis for more elaborate systems.

The objectives of experimentation with simulation models are, for example:*

i. to compare alternative courses of action.

ii. to estimate responses of the system to changes in the level of a single input.

iii. to explore the response surface, generate for different combinations of input levels, and

iv. to estimate the input combination required for an optimal or near optimal level of input.

If models are not quite sufficiently realistic they still provide suitable estimates of the performance of a system that provides a clear insight into its workings of the system.

Model States

The form a model can take will depend on the system being studied, though three states are recognized:

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* Wright, A. 1971. Farming Systems. Models and Simulation. In Systems Analysis in Agricultural Management: J.B. Dent and J.R. Anderson (ed). John Wilmet Jones. London.

i. Static state models, such as simple mathematical equations, used for many engineering calculations.

ii. Dynamic state models are time based and many of the operational analysis procedures used in business for inventory control; G.P.M. analysis may be considered dynamic models.

iii. Stochastic state models are based on statistical outcome of events and are generally used for modelling hydrological events, as well as for decision-making in business.

Various analytical operational procedures, called programming, may be used in the process of solving the kinds of models mentioned above.

a. Linear programming; this procedure is not time-based, that is not "dynamic", for the most part linear programming falls short of prescribed rules that translate a recommended plan or model into an operational procedure for time spans shorter or longer than the period in the model. Another limitation of linear programming analysis relates to uncertainty about the future. Imprecise forecasts or outcomes exist in all model studies, reflect lack of knowledge about only a <u>few</u> parameters used in a model or even uncertain data. However, sensitivity analysis is assumed to take care of uncertainty. But little is known beyond the standard sensitivity analytical techniques which are too clumsy and computationally burdensome for analysing the impact of uncertainty.

b. Dynamic programming can be used to analyze multi-period models containing uncertainty and can be used to determine optimal solutions. Compared to linear programming dynamic models, in reality, can only deal with simplified systems provided that the system contains only a few main variables otherwise the computational task of solving such a model becomes impossible.

c. Stochastic Programming: Deterministic models assume that data used is known exactly but in real life all the values are not known with precision, however, this does not preclude the use of deterministic models by this element of doubt, or certainty, must be introduced, that is the "when". Then, the questions to be considered are,

i. what uncertainties must be considered and how do they influence the selection of the optimal output,

ii. whether the given model takes these uncertainties into account.

To deal with these aspects of uncertainty probability analysis is introduced into the programming methodology optimizing the outputs. However, such programs will only be more complicated deterministic models but more complex programmes using Markovian processes may be used for solving models. The third example demonstrates this method of modelling.

Developing a Simulation Model

Simulation models are usually "constructed" or developed with certain objectives in mind.

a. To describe an existing system either to assess constraints or faults or to improve and enlarge the scope of the system,

b. To develop and experiment with a hypothetical system, determining the dimensions of a system or the effectiveness of the system.

Such models would be constructed following the steps shown in Figure 2. However, the number of steps may be reduced to four.

Step 1. Specify the problem, formulate the model

Step 2. Collect the data

Step 3. Design the experiment, considering what statistical tools to be used and the analytical methods that may be appropriate.

Step 4. Develop the computer program to run the model.

Modelling Irrigation Systems

The production of crops under irrigation needs a complete understanding of the natural water cycle. Besides this, the characteristics of the crops and soils, the water application system and component costs, the market value of the crops and the sources of the water, either from surface sources or from the groundwater, have all to be quantified before a model can be conceptualized.

Before proceeding with the running of a model for an irrigation system a complete array of data will have to be processed, including:

a. Complete climatic data for not less than five years, rainfall, temperature, wind speeds, humidity and actual sunshine periods. This data will have to be statistically analysed.

b. Streamflow records and groundwater extraction rates.

c. Soil survey data, soil classification including profile depths, soil moisture retention, chemical and physical properties (i.e. salinity and alkalinity).

d. The agronomic data pertaining to traditional crops and possibly new crops, besides economic data for these crops. (i.e.production costs and market values).

e. Additionally, the farming system will have to be assessed and includes management factors.

Depending on the sophistication of the model, these data may have to be augmented by many other inputs to obtain a clear understanding of the system under consideration.

The Water Cycle

A complete description of the flow system of the water cycle defining each component will be the central task for specifying the problems and objectives of the model. The principle flow components and storage elements comprising the water cycle are shown in Figure 3.

Before contemplating the construction of a model simulating the water cycle, environmental aberrations and modifications must be carefully studied. Disturbance of the natural water cycle by irrigation or drainage will cause significant changes within other components of the system. Such models are wholely dynamic and certainly stochastic by nature of the variability of the climate.

The water cycle of the Nile Valley has been stable for many millennia being in equilibrium with the rise and fall of the river cycle. Recently, this cycle had been interrupted and is unlikely to return to the original cycle. Furthermore, the whole river system is being tampered with along the middle reaches in Sudan and Uganda, for example. Further tampering is likely to occur elsewhere along the river in the future. Therefore,

there is little likelihood of a stable system developing[121] in the future. In order to study the situation occuring in the Nile Valley at present, where groundwater is rapidly rising, salinity is increasing and the irrigation regime will require radical changes, a model representing the pre-high dam regime or even the pre-barrage conditions should be constructed. Simulation of subsequent changes that have taken place may be attempted. Of course a model of the whole valley would present a formidable task but a small sample section across the valley could provide vital information on how the present cycle developed and how it could progress in the future. It could also provide information on remedial procedures besides exploiting groundwater resources. A model of the delta would be infinitely more complex because of the possible ingress of saline water.

Irrigation Simulation Models

The modelling of water use (within the water cycle) for irrigation has been developed in the United States since 1960. Models of this kind have been studied in detail elsewhere too, notably in the Netherlands. Many of these models can be adapted to the situation prevailing in any part of the world, including small farmer situations.

With the advent of small, less costly, high capacity mini and microcomputers many excellent programs are available to run these models. This point should be emphasized that at present the potential user shops around for a program to suite the application then purchase a computer to run the program and finally a computer programmer to modify and adapt the program to suite local conditions. Creating new models - or even new programs - from the ground up is costly and very time consuming.

The kind of data available is an important factor in adapting or constructing a new model. Many countries have been collecting data of various kinds, hydrological records, agricultural indices and similar statistics, for many years. Much of it may be completely reliable but the chances are that much of the data may be of very doubtful value and could not be used. Model outputs based on such data will be spurious and misleading. But models can be programmed to compare sets of data to verify reliability. For example, comparing rainfall data from three or more observation points for the same time period. This method can be rapidly conducted on a computer and has produced useful, usable data with a high degree of confidence when used for simulation studies.

Models concerned with irrigation water apportionment or crop water allocations consist of four main points:

i. Crop factors; including yield response to water.

ii. Water cycle factors, including soils, water quality climate and water sources.

iii. Irrigation system factors; distribution system, layout design and irrigation methods.

iv. Economic factors; includes production functions, benefit functions.

The first examples demonstrate models that simulate the use of water for irrigation for a number of farm units, different crop sequences and water allocation methods, The model has been used to evaluate and test alternative water distribution and allocation methods among farms. Furthermore, the model can be used to evaluate the economic (or financial) benefits of alternative cropping patterns and yield response to reduced water supplies. These models could be adapted to conditions in the Nile Valley, particularly for studying conditions within a basin and amongst competing basins. Besides, it could provide both a valuable training aid and a basis for a more complex model. However, it does not take into account irrigation losses from seepage; contributions to the groundwater system nor abstraction from the groundwater sources.

The third example, was developed for conditions in Bangladesh, a very complex model, and it takes into account groundwater use and return flow. The model consists of a linear objective function and linear constraints and the solution is obtained by means of a linear programming algorithm. Although this model may be termed a static deterministic linear program, the system provides for introducing stochastic variables to deal with water supply, variable crop water requirements and the role of risk in ordering decision rules. The model includes seven components and 39 variables in consequence a large capacity computer is needed to run this complex program.

The First Example

A "family" of programs written in Fortran iv were constructed for determining the feasibility of alternative irrigation options and the net returns from these alternatives. Besides the two programs briefly described here a more comprehensive model* has been constructed for small farm situations found in developing countries.

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* Reuss, J.O. (1980). Matching Cropping Systems to Water Supply Using an Integrative Model. Water Management Tech. Report No. 62. Colorado State Univ., U.S.A.

i. The first model* described here was constructed to provide an analysis of a multi-crop, multi-soil, farm irrigation system. The model assumes that the water supply, the source of which is not defined, is the most important variable which regulates plant growth and uses a production function which is based on the stress day** concept.

The model has been subdivided into a number of discrete units which are then analysed by means of a two-level optimization. At the first optimization level dynamic programming is used to determine the optimum irrigation program, on a unit area basis, the maximum net returns, the expected irrigation labour required and the crop water requirements for each crop-soil combination and each level of irrigation development. For the next level of optimization linear programming is used to determine the irrigation system, the level of irrigation and the cropping patterns that maximize the anticipated profits from irrigation on the farm; without impinging on the farm limitations.

The flow diagram in Figure 4 for the model program shows the various steps from initial inputs through to the solution. The principles involved in the solution of the model are based on dynamic programming techniques using the optimization principle that not only the current decision of a multi-stage process should be optimized but also the remaining decisions from a given state resulting from the previous decision.

The basic concept of the dynamic programming deals with a system whose state at a given time may be defined by a set of physical quantities known as state variables. In the case of an irrigation system the state variables are represented by vectors which indicate the soil moisture levels in the various crop root zones at a given time. At certain times, or stages, the state of the system may be altered by the farm operator. The decision, may be whether or not to irrigate specific crops. The decision variable may then be regarded as a control variable which depends on the prevailing state of the system.

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* Winnor, J.S. and Ven Te Chow (1970). A Programming Model for Farm Irrigation Systems. Hydraulic Eng. Series No. 23, Univ. of Illinois, U.S.A.

** Hiler, E.A. and R.M. Clark (1971). Stress day index to characterise effects of water stress. Trans. of the A.S.A.E. 14 (4): 757 - 761.

The day to day basis of the system undergoes a transition from one soil moisture state to another. The stochastic process of each decision and resulting transition will have a probability and an associated net profit. The objective of the model is to establish the sequence of irrigation decisions for each state and storage of the system which will optimize the expected profits subject to given constraints, the optimal policy is that policy which yields the greatest expected profit.

A linear programming analysis routine is included in the program where the input of the initial crop-soil activitiy has been completed by the dynamic programming routine and the linear program selects the irrigation system and level or irrigation intensity that optimizes farm profits subjected to the set of resources constraints existing on the farm.

Tables 1 to 7 show the output from the model for two kinds of overhead irrigations methods; a circular, rotating self-propelled system and a tow-line system. The tables are self-explanatory.

ii. The other example of a simulation model provides information for decision making at different levels of activity in an irrigation system for the regulation of the supply of water under restricted availability, down to the farm level using limited water supplies. The model takes into account crop response to limited water availability. The different decision making activities are assigned to ten main phases or sub-routines in the program which are equated to the actual distribution and use of the water within the irrigation system throughout the cropping season.

The sub-routine, PLAN, in Figure 5, shows the respective steps of the flow chart of the planning function that determines the optimum cropping pattern in response to a predicted water supply. A recursive sub-routine recalculates the cropping pattern and water allocations if supplies are restricted.

The model can be used for most field crops grown in the arid or semi-arid regions. Crop water yield functions are also available for these crops in most countries. Crop water requirements based on evapotranspiration can be calculated by means of the three most commonly used or recommended methods.*

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* Doornbos and Pruitt, Crop Water Requirements. Irrig. and Drainage Paper No. 24, F.A.O. Rome.

The water distribution procedures are based on i) a fixed percentage basis, meaning each farm unit receives a proportion of the total water supply, (ii) on a priority basis, where water supplies vary from time to time during the season, depending on crop priority or location priority; (iii) demand system where each farm unit is allocated a fixed quantity for the irrigation season.

The model determines the crop response to null or limited water applications, nominally at a soil depletion of 25,50 and 75 percent of the available water. Water allocations are based on the multiple time period decisions in the course of running the program.

The effects on crops of varying evapotranspiration rates and yield reductions resulting from soil moisture stress can also be examined by this model. Consequently, the benefits of irrigation can be tested. The decision making element is based on providing water for the highest valued crop or providing water for the crop that would lose the most from not being irrigated at the moment.

Benefits are computed as follows, (i) benefits from meeting output targets, (ii) benefits from exceeding output targets, and (iii) losses sustained from failing to achieve outputs.

The output from the simulation model program, which was written in Fortran iv, is shown in Tables 8 to 13. The tables are self-explanatory.

The Second Example

The conceptual flow diagram of the model shown in Figure 5 for the water balance of an irrigation project, of course, this diagram differs a little from the diagram in Figure 3, though directly relating to a specific situation where well water is used to supplement surface water supplies. Furthermore, not only is water being drawn from the groundwater system for supplementing irrigation but to control the groundwater levels from rising up into the crop plant root zone.

The model was developed to obtain optimum economic relationships for land allocated to alternative crops with varying climatic conditions for different crops and planting dates. The output from the program solutions is shown in the accompanying tables, 14 to 17.

The basic linear programming model has been used to solve multipurpose water utilization problems. The model includes multiple soil types, socio-economic aspects, hydrological regimes and land use. Stochastic parameters are included in the model to improve reality and meaningful interpretation of variability.

The model was constructed to study irrigation development in East Pakistan*(now Bangladesh) to determine the strategic nature of investment planning decisions and operating policy of such irrigation systems using alternative sources of water for irrigating multiple cropping patterns.

The objectives of this model are to maximize the effective contributions to system continuity, capacity, agronomic and land constraints. The irrigation system to be modelled is composed of the following components.

a. Surface water sources,
b. Groundwater supply sources,
c. The conveyance canal system,
d. The surface drainage system,
e. The well system, either existing or to be installed,
f. The distribution canal system of tertiary canals delivering water to the fields,
g. The irrigated lands planted to various cropping patterns.

The linear programming model of the irrigation system is constructed to select these capacity variables, notably:

a. The area of land to be irrigated initially or according to the volume of water available.

b. The total delivery capacity of the wells, either to be installed or from existing wells.

c. The total delivery capacity of the conveyance and distribution canals, supplying water to the fields.

d. The total capacity of the surface drainage works to remove surplus surface runoff - from rainfall and irrigation surplus.

There are four operating variables, consisting of the area sown to crops each season; the volume of well water pumped each season and the volume of surface water pumped or diverted to the system. In order to define the system with precision there are 21 exogenous parameters and variables that are assumed to be known and that the data are available. Finally, there are twelve economic parameters, including farm prices and costs. Capital costs are expressed as equivalent uniform annual costs.

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* Smith, D. 1970. Stochastic Irrigation Planning Model. Harvard University, Cambridge, Mass.

The example of the output of the linear program for an optimal cropping pattern is shown in Table 14 using two climatic conditions for rainfall. The program also generates information for water diverted into the conveyance and distribution canals and to the fields for each month, crop and source shown in Table 15. Table 16 shows the output for water used by the crops for each month, while in Table 17, the water balance is given and the monthly groundwater recharge rates.

However, other features of this program include provision for sensitivity analysis and for estimating risk under various stochastic situations such as ongoing rainfall and river flows.

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1. Dent J.B. and J.R. Anderson (1971). Systems Analysis in Agricultural Management. John Wiley & Sons (Australia) Pty Ltd. Sidney, Australia.

2. Maass, A. M.M. Hufschmidt, R. Dorfman, etc. (1972). Design of Water Resource Systems. Harvard Univ. Press. Cambridge, Mass. U.S.A.

3. Hufschmidt, M.M. and M.B. Fiering (1966). Simulation Techniques for Design of Water Resource Systems. Harvard Univ. Press. Cambridge, Mass., U.S.A.

(These three references provide the best basic material on simulation modelling, many articles and technical bulletins are available on the subject and many provide the actual program that can be entered into a computer and run.)

EGYPTIAN AGRICULTURAL

MECHANIZATION PROJECT

LAND IMPROVEMENT SUB-PROJECT

B.2: OCCASIONAL PAPER NO. 1
LAND LEVELLING

June 1982

Land Levelling*

Introduction

Some doubts or misconceptions exist about the whole business of land levelling, how it is done and the role of the laser control device in levelling and comparing it to other control methods.

This short seminar is being presented to inform project personnel and other interested persons about land levelling in general and the laser equipment in particular.

The Need for Land Levelling

The need to improve the distribution of irrigation water improving irrigation efficiency and to improve surface drainage, rapidly removing surplus water originating from irrigation and rainfall, has long been recognised. A comprehensive technology to deal with land levelling activities has been developed.

Land levelling applied to small farm situations has been developed for conditions in Pakistan. The Egyptian Water Use Project (EWUP) has demonstrated that land levelling has improved irrigation efficiency considerably, for example, 38% up to 62%, attributed to levelling and improved irrigation system layout and operation. This value is indicative though not conclusive.

Some land levelling costs and cut and fill ratios have been obtained for conditions in the Delta area. On the very flat areas, using a trailing wheel scraper, the average cost is about L.E. 20 per feddan and the volume of cut range from 165 and 66 cubic metres per feddan, the cut-to-fill ratios average 1.4 to 1.5 while the mean cost is L.E. 0.175/m^3, with a maximum of L.E. 0.44/m^3 and a minimum of L.E. 0.027/m^3. Again, these figures are not conclusive.

What is the Extent of the Need for Land Levelling in Egypt?

There are no certain figures for the total area to be levelled. The project paper gives a value of 12,000 feddan for upper Egypt without defining the degree of levelling required or the distribution of lands to be levelled. This value seems to have been derived from the total area of the four governorates, taken at about 250,000 feddan each, or a total of about 1,000,000 feddan and taking 1.0 - 1.2% of that amount.

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* Prepared by E.D. Coles.

However, the consensus of opinion would indicate that land levelling would be required for a greater area than 1%. To determine both the extent, the location and some order of the priority, a sample survey is being undertaken. (see Working Paper No. 1).

This survey is also needed for estimating equipment requirement and drawing up a schedule of work, let alone for long-term planning purposes.

Basin or Farm?

The next hypothesis that arises is whether levelling operations (together with other ameliorative practices should they be required) be carried out on a farm-by-farm basis or basin-to-basin basis.

Working on a farm-to-farm basis will present a formidable organizational and management problem, bearing in mind that 95% of all the farms in Egypt are 5 feddan or less. Most of the farms are long and narrow, this shape is not suitable to efficient levelling operations because it may be necessary to place fill in adjacent farm lands, otherwise uneven farm surfaces will occur causing water from "high" farms to swamp "low" farms. This would only aggrevate the situation. Not improve it.

The basin-to-basin proposition would provide a "package" of improvements for the whole basin, besides being more "economically" efficient, organization and management would be easier. The use of machinery moving earth, on a volume basis, would be less costly and provide a more efficient farming system, with benefits of improved irrigation methods, mechanization, access and water availability.

The Time Factor

The results from the preliminary survey of the Minia governorate provide some interesting information.

The distribution of the basins in the Magaga markaz are shown in Figure 2 and this basin distribution is similar to the other markaz distributions. The total area of the 432 basins is 29980 feddan, or 5700 farms, 5 feddans or less(assuming 95% of all farms are 5 feddan or less.)

In order to estimate the time that will be required to complete the basin rehabilitation work, a factor is used, the machine unit day (M.U.D.). That is the area one machine unit will complete in one day; for example, fewer or smaller machines would be used for low volumes of earthworks per unit area and conversely, more smaller machines or fewer longer machines for greater volumes of earthworks. The capacity of a single machine unit, consisting of tractor and scraper, is not known

with any degree of certainty nor how many units can do a unit area of work in one day - of 10, 18 or 24 hours, some very approximate values have been obtained but require verification. (See Working Paper No. 2).

However, the M.U.D. is very much a "black box" unit of measurement at present but it is a useful concept for looking at the values given in Table 1. Assuming, 100% of the basins will be rehabilitated, a single M.U.D. completing 3 feddan per day, workings for 90 days per season will complete the whole markaz in 110 seasons (or years), with 12 feddan per M.U.D., 28 seasons will be required; more operational days per season reduces the time span. Of course, reducing the number of basins to be rehabilitated will reduce the total time too.

Until some definite measurements concerning the M.U.D.'s can be obtained, that is the amount of earth moved per unit area by a specific machine configuration e.g. power output, speed, turning time, etc. on the soil (together with moisture content and bulk density amongst other soil factors) where the levelling work is going to be done, any other values obtained by simplistic methods will be pure conjecture.

It is crucially important to obtain <u>real</u> measured values for the M.U.D., both the type, size and kind of machinery and equipment in order to determine the cost of these operations.

<u>The Role of the Laser Control</u>

The control of the depth of cut by a scraper unit will determine,

a. the number of passes of the scraper.

b. the relative accuracy of the depth of cut.

c. the power required to cut and capacity to carry the earth.

There are three methods of doing this levelling,

a. Stake method, where stakes are driven into the ground and the cut-or-fill at that point marked on the stake. This method is normally used for primary levelling.

b. Optical controls where the raising and lowering of the scraper blade is observed through an optical level onto a target mounted on the blade and the operator is instructed to lift or lower the blade by means of a radio link, various refinements of this method are used, by direct control of the

Table 2

Magnitude of Land Levelling

Markaz Magagah - Minya Governorate

MUD = Machinery Unit Day

Dia*	90				120				150			
M.U.D.	100	75	50	25	100	75	50	25	100	75	50	25
3	110	86	59	34	83	65	44	25	66	52	35	20
6	55	43	30	17	41	32	22	13	33	26	18	10
9	31	29	20	11	28	22	15	8	22	17	12	7
12	28	22	15	8	21	16	11	6	17	13	9	5

* Days Per Annum.

hydraulic actuation by the observor. This method can be used for secondary levelling.

c. Light emitting apparatus, simple high intensity hologen-quartz lamps and photo-sensitive receivers mounted on the tractor preceded the highly refined laser levelling device. The operation of this apparatus will be described in the course of the seminar.

The use of the laser apparatus is two-fold. First; less costly, more compact scrapers can be used on the smaller land units, replacing the ungainly land plane, whilst it is anticipated that very little secondary levelling will be done, no primary levelling, most of the levelling will be tertiary levelling, the smaller through method scraper fitted with laser actuated controls will be ideally suited to the prevailing conditions in the Nile Valley and the Delta. Up to 25% greater output can be obtained using laser control.

Secondly, greater overall accuracy can be obtained using laser controlled equipment. The landscape of the Nile Valley and Delta is "flat" and accurate control, whether for "zero" levelled or sloped areas, will be required to maintain output. Accuracies of 0.025 to 0.030 m are obtainable using laser control.

ANNEX C:

AN INITIAL REVIEW OF THE REPORTS AND DATA-COLLECTION EFFORTS ON AGRICULTURAL MECHANIZATION IN EGYPT

Peter Reiss, Evaluation Advisor
Agricultural Mechanization Project
29 June 1982

Introduction

This paper is an initial review of the available literature and data-collection efforts dealing with agricultural mechanization in Egypt. A cut-off point of five years was set at the beginning of the investigation on the grounds that earlier efforts could not address themselves to the rapidly changing conditions of Egyptian agriculture.

Some of the reports and activities dealt with in this evaluation of research in mechanization may touch upon the subject only tangentially, but to the extent that they shed light upon some aspect of mechanization they have been included.

In all, forty-three reports or research efforts were collected for examination. Some arrived too late to be considered in this report and will be discussed in the final evaluation to be submitted shortly. Still, they will be included here for statistical purposes to indicate the general areas of research in agricultural mechanization.

Funding Sources

The wide variety of institutions that have supported research on mechanization attests to the interest it has evoked and the importance placed upon it by the development community. However, a careful examination of the original funding agencies indicates that largely American sources have underwritten the research. Of the forty-three reports and efforts, fully thirty of them have been financed by the Agency for International Development through eight projects, companies, or agencies (i.e. Egyptian Water Use and Management Project, Agricultural Development Systems Project, Agricultural Mechanization Project, Louis Berger International Inc., Pacific Consultants, Winrock International, ERA 2000,and Catholic Relief Services). The second largest contributor of funding is the Ford Foundation with nine studies attributed to it. The American Research Center in Egypt funded one study. Another report, an overview of agricultural mechanization in Egypt, was French-funded, although the report does not indicate the exact source. The two final studies are M.A. theses from Egyptian universities.

Admittedly, there may be some bias to the selection of reports in this study: only two are written in Arabic. A number of other reports in Arabic have not been included because of the difficulty in obtaining them. They are largely papers given at local conferences and appear to be based on secondary information. A third M.A. thesis was produced under the auspices of the American University in Cairo. However, from an examination of bibliographies of the included pieces and from conversations with a host of experts in mechanization it appears that the forty-three reports and efforts under review here include most of the existing literature.

Major Areas of Research

The studies under review cover a variety of subjects related to the issue of mechanization. They may be grouped into nine general categories: machinery costs, irrigation and soil improvement, multiple cropping intensity, livestock management, labor situation, new lands development, general reviews of mechanization, case studies of specific machines or geographical areas, and farm management studies.

Not surprisingly, one of the areas of greatest interest in research and report-writing has been in determining the financial and economic costs of machinery. Six of the papers focus directly on tractor or pump operating costs. Most of the research, having been undertaken by the Water Use and Management Project deals with the costs of saqia versus pump. The Project has already established a program which will give the costs of any machine for each operation. A study conducted by Wahby, Quenemoen, and Helal is likely the most controversial of the lot. Taking issue with a Menoufia University study of the costs of various water-lift devices, it recommends the continued use of the saqia rather than the encouragement of electrically-powered water-lift systems. If the report by Wahby et al. is to be accepted, it would have profound implications for development efforts in irrigation improvement.

While such studies of machine costs are undeniably useful starting points for considering mechanization, they appear to be terminal points, as well. Surely, the most serious criticism that can be levelled against the present studies of machine costs is that they make no effort to carry their findings to the obvious next stage: the determination of a mechanization "package" for particular crops or soil and water conditions. Studies and research in machinery costs appear to have a scattergun approach rather than the systemic one which is required.

In addition, and particularly with regard to water-lift devices, the studies of costs have taken a narrowly-defined view of what ought to be considered, that is, expenditures under the present conditions. It might be advisable for them to consider also the costs of such machines under improved conditions: under better maintenance and management. Certainly, the saqia ought to be evaluated under the present conditions of use as well as under optimal conditions of use as well as under optimal conditions when all improvements have been made.

The affect of mechanization on cropping intensity has been given serious attention in five reports and occasional mention in others. While tractorization of land preparation is often cited as a key factor in raising cropping intensity, the work of Fitch and Abdel Aziz indicates that this is not the case. They find little, if any affect produced. Interestingly, they attribute a decrease in cropping intensity to increased use of pump-sets for water-lifting. However, it appears that the main factor here is farm size. Smaller

holdings are more likely to be irrigated with a saqia, and, in general, have higher cropping intensities than larger holdings. While the delineation of relationships between cropping intensity and mechanization are interesting and raise doubts about widely held ideas, the papers on multiple cropping intensity do not go beyond the statement of those relationships. They are unable to explain why they exist or suggest how mechanization might play some role in the process of raising cropping intensity. If tractorization has little affect, will the mechanization of other operations increase the ratio of cropped area to farmed area? Such a question arises when mechanization is taken for land preparation and water-lift alone.

More than tangentially related to mechanization is the issue of livestock management. Most discussions of mechanization in Egypt refer to a need to decrease the population of draft animals, especially those involved in saqia operation. Draft animals are singled out for two main reasons: their reduced milk and meat production and the sizeable amount of land devoted to growing fodder to feed them. Therefore, it has frequently been suggested that tractorization be expanded and, more importantly, that cattle and buffaloes be taken out of saqia operation, to be replaced by any number of alternative water-lift possibilities. ERA 2000, often regarded as a seminal study of mechanization in Egypt, actively encourages this option with a recommendation that the saqia be replaced with a low-lift pump.

Four more recent studies of animal use (Winrock International 1980, Hopkins 1980, Dyer 1981, Fitch and Soliman 1981) argue convincingly against the generally accepted view. They make the point that even with the use of an alternative water-lift device, farmers are likely to be unwilling to reduce the number of animals they own. Fitch and Soliman argue from their findings in the Ministry of Agriculture Farm Management Survey that farmers may actually increase the size of their herds instead. Furthermore, Winrock International found that roughly 90% of the milk and milk products were consumed within the household, never reaching the market. As a major source of food for the family, the cow or buffalo must be retained. Some doubt has also been thrown on United Nations figures that animals taken out of agricultural production will give more milk. The current estimate is that milk production will double. However, there are apparently no figures for the Egyptian situation, ones which would go to the core of the issue.

The crucial areas of irrigation and soil improvement appear to have received less attention than one would have expected. The Water Use and Management Project has produced a number of reports on pump costs, as has been mentioned. In addition, there are two reports produced by Louis Berger International for the Ministry of Irrigation on the feasibility of electrifying tertiary pumping means and on the profitability of manufacturing low-lift pumps

in Egypt. However, in areas of soil improvement, including landlevelling, subsoiling and gypsum application, little substantive work has been accomplished. An effort has been made by Shepley and Haddad (1982) to quantify the costs of landlevelling using scapers and lasers. However, such an obvious starting point as the time required to level a feddan given particular volumes of soil to be moved and methods has never been attempted. Given this lapse, basic planning for soil improvement activities cannot be made in a realistic fashion. Nor have studies been made about how much land ought to be treated in Egypt. Mechanization as related to soil and water improvement continues to be a largely unexplored area.

The requirements of reclaimed land for mechanization also remains an under-investigated area as suggested by the reports under review. Four studies pertaining to the new lands are included. One (Richardson and Koelzer 1980) is a disappointing statement about various irrigation methods for desert land. The Pacific Consultants reports on new land productivity find that "average" investments in the reclaimed areas would probably be economically unprofitable. They focus on various irrigation techniques in comparing costs. A final piece (Moussa n.d.) is a M.A. thesis evaluating the economic impact of farm mechanization in North Tahrir and West Nubariyya. It compares costs on fully and partially mechanized farms, finding a greater net income on the former. However, the terms are ill-defined. Still, it is the most serviceable piece to date and ought to be used as a starting point for more useful work. The confinement of research to irrigation techniques is clearly in error. Since holdings in the new lands tend to be, on average, larger than those in the old lands, it is arguably a more productive area for major mechanization efforts. Again, given the holdings sizes and soil and water conditions, it is advisable to encourage the determination of a mechanization "package" to be tested.

Reports on the rural labor situation in Egypt are a continuing disappointment. It is fair to say that we still do not have a good idea of the dynamics of the rural labor market, including the condition of landless laborers and the processes of off-farm employment. No clear picture exists of who emigrates, where he goes, and what is done with the remittances from his labor. Seven years after Amr Mohie El Din's paper on under-employment in Egyptian agriculture, the issue is still very much being argued. It appears that what is needed is a micro-level analysis of the choices of and constraints on agricultural households to arrive at a particular level of labor input (Seifelnasr 1981). The dynamics of the labor market at the village level is yet to emerge.

Case studies of mechanization at the village level are therefore required. Few such studies are apparent. Hopkins (1981) did undertake a study of a village in Assiout, focusing on mechanization. In addition, Zeid (1980) has produced an M.A. thesis in agricultural extension based on research in Markaz Abou Humus, Beheira. A Village Studies Program has been established under the Agricultural Mechanization Project which will monitor and evaluate project activities in twenty-three villages in five governorates. It offers the opportunity of investigating such crucial issues as the impact of mechanization on the labor market during an extended period.

Other case studies in mechanization have focused on the use and costs of a particular machine rather than on a geographical area. Three studies financed by the Ford Foundation (Voll 1979, Fitch and Immam 1980, and Mehanna and Hopkins 1981) have evaluated a self-powered thresher distributed through Catholic Relief Services. Voll found it to be superior to the non-mechanized threshing methods as well as to the common drum thresher. Fitch found that it was generally successful for sorghum and might be expanded to other crops. The study by Mehanna and Hopkins added an interesting and useful viewpoint to the discussion of the self-powered thresher for it focused on the nature of the owners, the affect of the machine on the household and its organization of labor, the identification of those factors related to the acceptance of the machine by users, and the possibility of the further expansion of small-scale machinery. Unlike most other reports, this series of papers on the thresher forms an insightful unit from a variety of perspectives. The economic and sociological perspectives combine to form a coherent whole.

A large category of reports concerns general overviews of agricultural mechanization, usually examining a number of aspects. The seven reports in this group are based on both secondary data and original research. The single French study (D'Ornano 1980) is a review of agricultural mechanization in Egypt from the perspective of a developing nation. More significant are the studies by ERA 2000 (1979) and by Hopkins, Mehenna, and Abdel Maksoud (1982). The former included a modified farm management survey, a survey of farm machinery, and a survey of farmers' attitudes towards mechanization. The result was a call for a massive importation of machinery as well as the building of an infrastructure for mechanization at the national and village levels. The second study was an in-house survey conducted by the Agricultural Mechanization Project for the dual purposes of establishing a baseline for mechanization and the collection of information for the implementation activities of the diverse components of the Project.

A final category of reports and data-collection efforts focus on the numerous farm management surveys conducted by a host of projects. In all, five separate studies of farm production and consumption levels have been undertaken. The earliest was conducted by the Ford Foundation and the Ministry of Agriculture in 1976-77. To date, three reports have appeared via the Micro-Economic Study of the Egyptian Farm System Project written by Hindi and Goueli 1979, Fitch and Abdel Aziz 1980, and Habashy, Fitch and Rehiwi 1981. Including machine use as one of the variables, they make occasional references to mechanization. A second survey was conducted by the Egyptian Water Use and Management Project but nothing appeared using the data. ERA 2000 initiated a restricted farm management survey, and Michigan State University is presently conducting an examination of off-farm income tied to a survey of farm production. Finally, the Agricultural Mechanization Project is conducting a farm management survey in four Delta governorates. Conducted over a one year period through daily inspections, it may well be the most successful of the efforts. Again, none of these activities bears directly on mechanization as such. Information about farm levels of production and consumption may, however, be utilized to ascertain the affect of particular mechanized interventions at the household level, the unit of the surveys. Furthermore, for all of the interest that such surveys have generated, it ought to be recalled that they have limited usefulness in assessing the impact of mechanization. They cannot yield information at the village level about such issues as timeliness or the completion of agricultural activities; for such evaluations cross-sectional village studies must be undertaken.

In reviewing the forty-three reports and efforts, an interesting point which emerges is that the majority of them are based on original research. Twenty-three are based on survey or case study research. Eleven rely upon secondary data, and only nine the musings of the author.

Suggestions for Future Research Efforts

The following points arise from the review of the research conducted on mechanization to date. Some have already been mentioned in the above text. Others may be either general areas for research or specific points about which questions have emerged and, as yet, have not been adequately examined.

1. In the treatment of machine costs there has been no attempt displayed in the literature which suggests a movement to the next stage of the investigation, that is, the delineation of a mechanization package which would be advisable for particular crops and for particular soil and water conditions. Such studies have tended to take a confined view, isolating individual machines rather than employing a more advisable systemic approach.

2. While many authorities have advised the widespread reduction of the draft animal population for increased milk and meat production, there appear to be no convincing figures on the matter. I offer the suggestion of Dr. Wahby of the Water Use and Management Project that milk production of cows and buffaloes in gravity flow areas be compared with those in neighbouring water-lift areas to see the degree to which the supposition is correct. Limited differences might well discourage the current push to reduce the number of animals.

3. A study of farmers' attitudes and behavior with regard to animal management might be advisable. Do farmers who have taken their animals out of agricultural labor, in fact, reduce the size of their herds and thereby reduce the amount of land devoted to bersim-growing?

4. A related problem arises with the decrease of bersim-growing. Since it is a nitrogen-fixing crop which also facilitates drainage, is a decreased cropping area desirable given the likely need for additional artificial fertilizer? What will be the affect upon the soil in cotton-growing areas?

5. Farmers have been reluctant to accept wheat harvesters which cut the stalk too far from the ground. Yet, experts decry the loss of organic matter to the soil for the next growing season. Is there, in fact, a balance between the loss in yield the following season and the increased income earned from the sale of the chaff or the benefits gained by feeding it to one's animals? What is suggested is a complex system of return of organic matter to the soil, fodder, household income, and animal use that must be sorted out and investigated.

6. We continue to have an incomplete picture of the rural labor market and its various components: household and hired labor, landless laborers, and emigration. As stated above, a detailed examination at the village level is required.

7. Frequent mention is made of the need to mobilize farmers into voluntary associations for development efforts. Yet, the dynamics and organization of an already existing and successful unit of farmer cooperation are still not understood: the

saqia group, that unit of farmers which owns the water-lifting device and regulates the distribution of the irrigation water. How might an understanding of the organization of the saqia group be used in furthering development aims?

8. The in-house survey for the Agricultural Mechanization Project suggests that mechanization may increase the reliance on and need for hired labor. To what extent is this the case, given that it runs counter to accepted thinking that mechanization displaces laborers?

9. Studies to date in the new lands have focused on pumping systems. Research on land preparation and intensified mechanization efforts ought to be stressed, particularly with regard to suggestions about mechanization packages to be tried there.

10. There appears to be little research undertaken comparing various mechanization options using different power sources. Studies of diesel fuel versus electricity occur in the literature, but such a possibility as solar energy rarely, if ever, is found. Furthermore, the costs of different forms of energy must be examined in any calculations: costs not only at Egyptian market levels but also at international market levels. The present structure of price subsidies may be curtailed in the future.

POSTSCRIPT

Again, this report is an initial review of the literature on mechanization in Egypt. Its purpose is to indicate the various areas of interest and suggest points for possible future investigation. A fuller report will follow shortly which will examine these areas in detail.

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ANNEX D: LOCAL MANUFACTURING

D.1 Local Manufacturing Workplan

D.2 Progress Report in Testing and Development of the Semi-mounted Axial Flow Thresher

D.1: AGRICULTURAL MECHANIZATION PROJECT
LOCAL FARM EQUIPMENT MANUFACTURING WORKPLAN

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FIGURE 1: Precedent Network for Local Farm Equipment Manufacturing Technical Assistance/Training Program.

WORKPLAN: LOCAL FARM EQUIPMENT MANUFACTURING

SUMMARY

The Project Paper identifies two areas of intervention: (1) Technical assistance, and (2) a local farm equipment manufacturing feasibility study; the details of a technical assistance program are lacking. The only guidance is to assist local manufacturers. Consequently, the workplan is primarily directed towards a technical assistance program that will develop a local farm equipment consulting base with trained personnel to carry on the activities of the Project after the project itself has ceased. In this process, existing manufacturing facilities will be upgraded and will form an initial base for Egypt's farm equipment manufacturing sector.

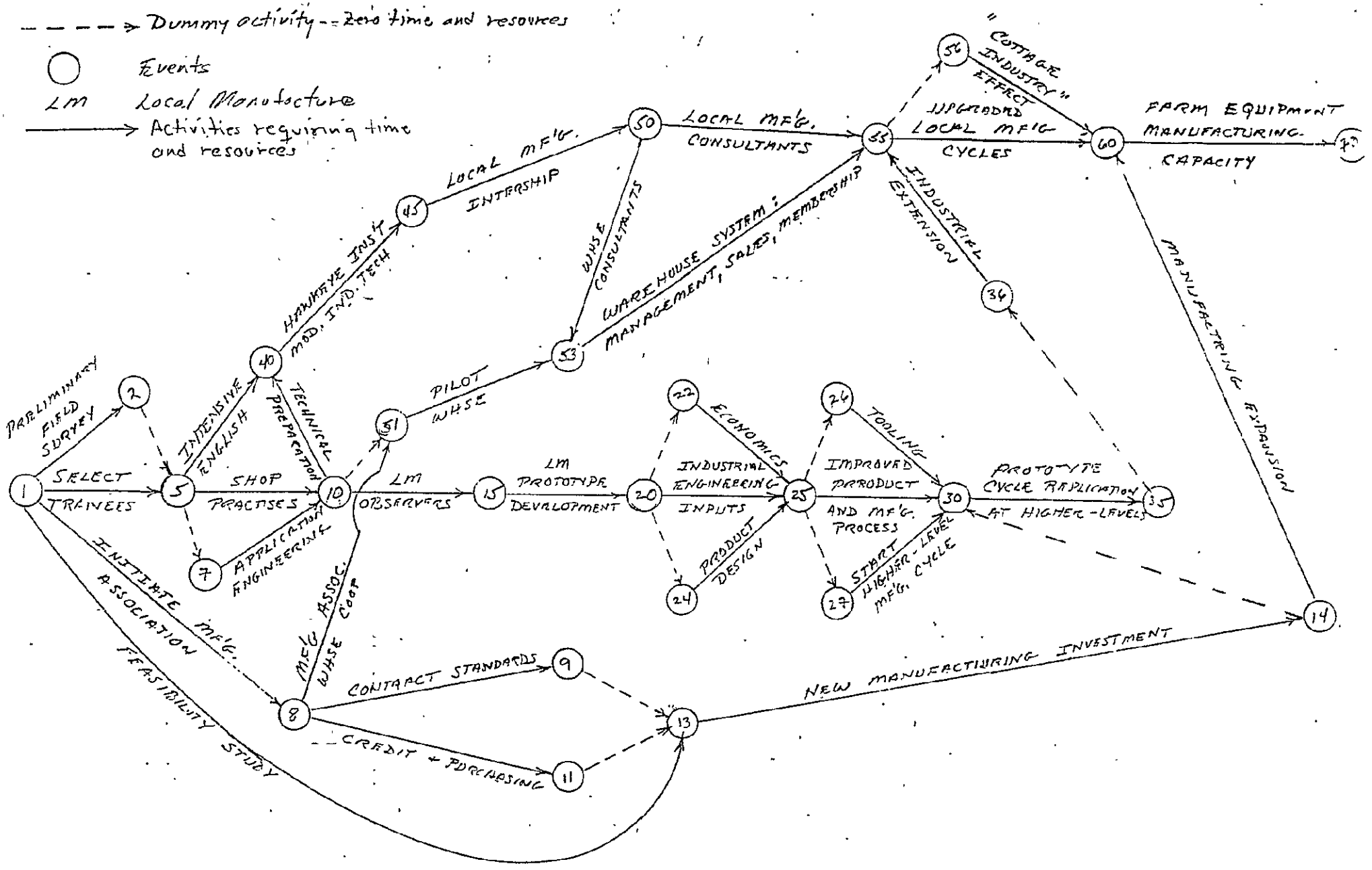
Although this workplan does not consider the feasibility study in detail, it does recognize the existing uncertainties as to plant capacities and financial needs for modernization which suggests such a study. This study will deal with: (1) the economics of local manufacturing, (2) the organization of the industry, (3) needs for technical assistance, and (4) financial requirements of the industry. At this time, it is anticipated that the feasibility study will be undertaken towards the middle of this program.

The ensuing workplan consists of a preliminary survey, which has been completed, and a list of disequilibrium producers a 'la Schultz (1964). In this proposal, training is the principle means of introducing these technologies disequilibriants. Training is also the means for extending: (1) the results of a new prototype program, (2) new manufacturing processes research and development program, (3) import substitution and (4) a local manufacturing technical and managerial skills program.

The proposed program might be more readily understood through a network precedence diagram (figure 1). There are three main thrusts: (1) training within existing manufacturing facilities, i.e, upgrading local manufacturing capacibilities (events 1 thru 35), (2) development of a core of manufacturing consultants (events 5 to 55) and (3) a feasibility study leading to new manufacturing expansion to increase the local farm equipment manufacturing capacity (events 1,13,14,60). Supporting these three major thrusts would be the development of the manufacturer's association and a warehouse system to support the industry's growth. This becomes especially important as one realizes the small-lot manufacturing characteristics of this industry in Egypt. Each avenue leads to upgrading the local manufacturing cycles (activity 55,60) and thus increasing Egypt's farm equipment manufacturing capacity (activity 60,70).

Thus, through this training process infrastructural support is developed in the process of upgrading existing facilities and training manufacturing consultants. Throughout this program "hands-on" training is the central theme.

Figure . Precedence Network for Local Manufacturing Technical Assistance and Training Program



A. INTRODUCTION

1. PROBLEM

At the time the Project Paper was written, the inputs from the local manufacturing advisor were not clear. Consequently it was deliberately left open in both this report and the Inception Report pending a preliminary field survey. This survey is now complete.

The survey shows that most of the activities listed under operations and policy formulation in the Project Paper must be treated discretely in the work plan. The survey further shows that the availability of raw materials and hardware, on schedule and at affordable prices, to be an additional activity not occuring in the other subprojects.

The bulk of the Agricultural Mechanization subproject activities are directed towards improvements in the agricultural production sector. In the short-run the convenient solutions favored by farmers and bureaucrats include too great a reliance upon the importation of goods and technology.

Specialization and lack of understanding of the problems peculiar to the small manufacturer lead to biased thinking by the farmer and the governorate alike.

The small manufacture is keenly aware of this and reluctant to take advice from self-styled experts. Therefore, it was decided that the natural coordination point was within the training program. This has been accomplished by creating a coordinating function for the training officer.

2. SCOPE

The program activities divided into three groups namely:

a. Advisory program for small manufacturing of agricultural equipment.

b. Advisory program for potential suppliers of raw materials and subcomponents.

c. Local manufacturing feasibility study.

3. JUSTIFICATION

The local manufacturing subcomponent is charged in the Project Paper as follows:

a. Technical assistance to local manufacturers and,

b. Local manufacturing feasibility study involving

1) economics of local manufacturing

2) organization concepts of small plants in the Egyptian manufacturing industry

3) needs for, and source of, technical assistance

4) needed financial inputs

4. PURPOSE

To increase the capacity and the quality of output from the agricultural equipment manufacturing sector through the introduction of technical disequilibriants into the system and assisting in the forced adjustments to higher production levels.

The general purposes of this program are:

a. To develop an awareness and use of new factors of production appropriate to rational, small-lot manufacturing.

b. To develop more subcontracting between small manufacturers and the government manufacturing sector.

c. To demonstrate economies of scale obtainable through "cottage industry" manufacture. As used here it is the subcontracting of machine components by small workshops of the public sector.

d. To increase the percent of locally manufactured components in agricultural machinery to be introduced into Egypt.

e. To establish a training program that will provide the technical manpower for rapid growth of local manufacturing and the institutionalization of a continuing training program to meet projected manpower requirements within this sector.

5. OBJECTIVE

To develop a balanced supporting infrastructure in time to allow economical local manufacture of new and improved agricultural equipment that will be introduced in Egypt through the Agricultural Mechanization Project and the Ministry of Agriculture.

6. OVERVIEW

Because of the late activation of the Manufacturing Advisor Program and the broad scope of these activities, certain key products have been selected for case studies and use for training purposes. This program postpones the feasibility study until the middle of the project subcomponent when results of the case studies are available. Yet this still allows time to apply recommendations of the study to the agricultural manufacturing sector. During the interim period between inauguration of the training program and the beginning of feedback from other programs, the Manufacturing Advisor and counterparts, in conjunction with Behera Co., will institute a small "cottage industry" demonstration workshop and related facilities. Concurrently, unused raw materials, representing under employed industrial capacity, will be identified and substituted into existing implement designs to create cheaper and more easily manufactured prototypes. These designs will be released to the local manufacturers. According to demand, materials will be stocked to encourage manufacture of items, which are supportive of mechanization and will be profitable and instructive to manufacturers without Government subsidies.

B. INDUSTRIAL TECHNOLOGY TRAINING PROGRAM

Training is the principal means of introducing the technological disequilibrants described by Schultz and the means for extending:

(1) the results of the prototype program, (2) new process research and development program, (3) an import substitution program, and (4) a local manufacturing management skills program. Training involves two components as follows:

1. Local Training (consisting of):

   a. An accelerated program in technical English communications,

   b. A "hands-on" program, which involves performing each step in the manufacture of at least one new product of significance to Egypt's mechanization aims. Part of this training will be conducted in the field and part in a small workshop.

   c. Introduction to methods of small-lot manufacturing.

2. United States Training (consisting of):

   a. A modified two year industrial technology program compressed into ten months to reflect the engineering courses previously completed by trainees in Egypt. The students on their return to Egypt will be expected to serve as industrial internee for two years.

b. A continuation study of small-lot manufacturing methods.

c. The internship is devoted to:

1) Consulting to local manufacturers

2) Prototype development

3) Procurement and scheduling consulting to industry, including importers and banks.

4) Administration in MOA and manufacturers association

5) Local training programs

6) Warehouse consulting

d. Product engineering

The portions of the project initiated during the local training program will be continued as training themes in US. They will be refined and returned to Egypt for new manufacturing programs.

e. Participation training

From time to time representatives of local manufactures will join formal training classes as working observers. This will occur both locally and in US, as is appropriate.

f. "Will fit" parts manufacture training because of its level of sophistication, training in the manufacture of spare parts has been linked to the expatriate training component.
The MOA is not prepared to assign a high priority to this program at this time. However, seen from the manufacturers standpoint rather than that of the mechanization program's, it provides a steady guaranteed and predictable market and income, with modest requirements for capital investments. In addition, it leads to valuable interindustry contacts locally and abroad. It requires low investments in sales and services and short manufacturing lead times. The expertise developed by this exercise allows quick movement into new fields of macroeconomic significance to Egypt.

g. Cottage industry training

The cottage industry manufacturing system was widely used during the industrial revolution and is again becoming popular in Italy. It should be very useful in Egypt because it allows manufacturing economies of scale without a requirement for new investment. At the same time it minimizes and spreads risk while increasing manufacturing flexibility. Cottage industry training is included in the training program because it automatically trains and encourages

manufacturing entrepreneurs with a minimum investment requirement. Manufacturing exercises which are suitable in terms of enhancing human capital development can be machined from locally produced castings using modernized equipment with "home made" fixtures and attachments.

C. INDUSTRIAL EXTENSION

The important activity will be accomplished by direct industry involvement in prototype development, industrial consulting, and as a spin-off from three specific programs:

1. A manufacturer's cooperative association. Its functions are:

   a. Setting industrial standards.

   b. Policy research, advice and coordination.

   c. Industry new letter publication.

   d. Warehouse policy formulation and stock list Publication.

   e. Trainee recruitment.

2. Mobile demonstration workshops of two types:

   a. Machining center with functions of:

      1. Demonstrating small size machines equipped with optimum auxillary tooling.

      2. Production heat-treating facilities.

      3. Mensuration and quality control facilities.

   b. Operating mobile unit:

      One or more units will be operated on a regular schedule serving members of the manufacturers association. It will deliver raw materials, collect accounts receivable for the warehouse and provide certain advisory and training functions that are justified by economies of scale. It will also encourage applied research and inter-industry subcontracting. It will be manned by special consultants, interns and local machine operators as a continuous hands-on training and manufacturing exercise.

3. Foundry service workshop

One demonstration unit will be regularly scheduled to serve small foundries engaged in the production of grey iron castings. It will provide all the necessary functions in conjunction with existing cupolas for the pouring and heat treating of high grade modular iron castings. Equipment will include an induction holding furnace, in process sampling and testing equipment, induction heat treating furnaces, cold set core making equipment for making match plates from loose pattens, a shell core machine, a portable sand conditioning, etc.

Its scheduling will be according to accumulated demand and its operation conducted in the same general manner as the mobile machining center. As economies of scale permit, foundries will invest in their own stationary equipment and employ trained metallurgists.

D. IMPLEMENTATION SCHEDULE

Most of the program is expected to be in place and self-sustaining within two years. This one year for program adjustment and expansion within the project's maximum time frame.

1. The planning phase for all the sub-components is underway. Sponsors have been found for the Industrial Technology training components, the warehouse sub-component, the manufacturers association, the cottage industry component and the "will fit" parts component.

2. In order to avail itself of formal training programs, both local and abroad, the training must be in place immediately. Therefore, it will start under the approved 1980-1982 training budget. An amendment (A) for this program was submitted to USAID in May 1982.

E. BUDGET

The financial support for this program will initially come through the training program (Amendment A) of the project's 1982 training workplan. In addition, it is anticipated that a L.E. 50,000 research request will be developed through the Applied Research Fund to support the development of improved prototypes of harvesting machinery , threshing equipment, tillage implements , etc. This is over and above the US$ 400,000 for the feasibility study.

D.2: PROGRESS REPORT ON TESTING AND DEVELOPMENT OF SEMI-MOUNTED AXIAL FLOW THRESHER

June 28 1982

PROGRESS REPORT ON TESTING AND DEVELOPMENT OF SEMI-MOUNTED AXIAL FLOW THRESHER

BACKGROUND:

About three months ago a project was initiated to design a new threshing machine capable of local manufacture. The design targets were to replace the existing 1960 model thresher with a machine of higher capacity and capability of threshing and separating the grain from the straw while still permitting the option of cutting the straw.

A modern Axial flow system was selected to demonstrate new manufacturing methods and use of more modern materials. A primary objective was to reduce the labor requirements associated with the current threshing system and if possible maintain about the same dollar first cost per ton per hour of productivity. Since the current threshing system involves much labor for inprocess transport of materials and repeated setup's of machinery, it was decided to make the machine semi-mounted upon popular tractors.

The first prototype was tested on May 15th. Certain deficiencies were noted which would make further development difficult. These were corrected and a straw cutter was added. The results were disappointing as the axial flow of material was impaired by the cutter. It was decided that further remodelling was required so that separate development of threshing, separation and straw cutting could be carried out conveniently. The remodeled machine was tested on June 26 and met our objectives. We now have a flexible test machine with three interchangable straw cutting heads, seven interchangable threshing cylinders, and provisions for testing various screen and chaffer designs.

PURPOSE:

The purpose of this report is to outline the procedures to be followed in the testing and development of this machine in preparation for a November 1982 production of at least 10 machines for experimental sale.

TARGET SPECIFICATIONS	ECONOMIC SPEC.
1. Manufactured costs	1200 L.E.
2. Capacity in average conditions	One ton/hour
3. Equal capacity in rice or wheat	" " "
4. All crop threshing capability with use of special attachments	" " "
5. Rapid transport from one work site to the next	15 MPH
6. Quick attachment to Egyptian made tractors	10 man minutes

TEST RESULTS TO DATE:

1. Semi mounting and transport system: Rough terrain tests have been conducted with highly satisfactory results. It is believed that the basic system is adequate and future testing will be confined to service, durability, safety, cost reduction and reduction of set up and mounting time. Specifically a ASAE quick-tach system will be tested.

2. Threshing System:

A standard IRRI type spike tooth cylinder was operated for a short time in wheat. The capacity was far below the target capacity and increased cylinder speeds caused problems in the separation system. A second cylinder of helical bar arrangement was tested in wheat. The results were encouraging. It appears hopeful that this type cylinder can meet the design capacity targets. Threshing is complete at a lower cylinder speed and must less trash reaches the separator. This allows reduction of speed of the shoe crank, lowered vibration and noise levels.

The use of spike tooth type cylinder was largely abandoned in the U.S.A. about 40 years ago for many reasons, a major one being the difficulty of adjusting for variations in crop conditions. It has largely been replaced by some form of rasp bar design.

We are now preparing to test various combinations of helix angle, rasp bars, spiketeeth, rubber etc. When we determine the optimum combination for capacity in wheat we will test for capacity in rice and make suitable compromises.

3. Cutting System:

A counter rotating flial type cutter, attached to the discharge end of the cylinder, was built and tested. It was unsuccessful in expelling the straw from the machine. We have prepared three cutter heads with drives for testing various systems of cutting and blowing. Since there are many widely used cutter systems for the proposed function, the development will be one of matching and cost reduction and straight forward engineering will be sufficient for successful cutter development.

4. Material Handling System:

Four covers have been prepared for test. Two are equipped with turret type spouts for straw discharge thru 360°. To date no comparisons can be made among cover designs.

A bagging elevator was tested with mixed results. The main problem is kernal breakage. It is believed that much of this breakage can be eliminated by redesign and selection of a more suitable universal joint. The present design is adequate for the testing program, consequently a separate auger, bagger test is being built to develop the auger conveyor system and an alternate bucket elevator system. Selection will be based on total cost/benefit ratio.

5. Separation System:

From our preliminary observations, we believe the present system will be adequate to complete our cylinder development program. Since the Separator design is sensitive to changes in the threshing system, development of the cleaning system will be defered until the threshing system development is sufficiently advanced.

Observations to date indicate the following items of note:

a. A special barley screen will be required.

b. Addition of a tailings return auger will be required.

c. Additional cleaning capacity could easily be obtained by extending the shoe and/or straw rack laterally to either side of machine.

Testing/Developing Program

Discussion:

The unthreshed wheat and barley from 5 feddans has been stockpiled at the MOA Research Center. This is to be used to test various components and changes in preparation for pilot manufacture starting in November of 1982. This is less than 10 hours of actual operation, therefore testing must be well organized and directed towards specific goals. To this end 1/2 of the barley and 1/6 of the wheat must be saved for testing the final version thresher.

The testing procedure outline is to prepare the machine as a test stand so that any component can be easily taken out and replaced by an alternate component and thus can be tested while simultaneously modifying the first component.

The first order of testing is to increase threshing capacity with as little damage to straw as possible. This will be accomplished by fitting the cylinder with various modern type threshing bars and checking capacity, threshing quality, power requirements and crop condition sensativity. This will be followed by combining the best features in fitting two test cylinders.

The second order of testing will be to develop several adjustable test concaves incorporating modern practice to find the best combination of cylinder and concave for wheat. Concurrently a tailings (rethreshing) elevator will be added and tested concurrently with one and two.

The third order of testing will be the testing of recutters. Again as in one, the cutter heads will be alternately fitted with modern cutting systems and power and material flow characteristics measured.

In order to facilitate the above programs a convenient drive line torque meter and a dynamic balancing machine will be built locally. These will be based on use of a storbe light and at later time the use will be extended to high speed photography.

The fourth order of testing will be that of matching the separation capacity to the threshing capacity by means of interchangeable screens, extensions, etc.

The fifth order of testing will be qualitative trials in various minor crops and rice.

The sixth order of testing will be durability testing run concurrently with service convenience and material substitution (Cost reduction).

SUMMARY & CONCLUSIONS:

This report is submitted at the completion of the threshing machine local manufacture program phase 1, which was the building of a test fixture using locally available technology and material. It is the writers opinion that the machine is satisfactory for its intended purpose. It is also his opinion that the rate of progress if slow and must be increased if manufacturing release in November is intended.

Respectfully Submitted,

Manufacturing Advisor

Richard K. Berky

ANNEX E: END OF TOUR REPORT

JANUARY 1981 - JUNE 1982

Edward J. Constien
Technical Director, Extension Subproject
Egyptian Agricultural Mechanization
Project
Contract No. 263-0031
Ministry of Agriculture and
United States Agency for International
Development

END OF TOUR REPORT

INTRODUCTION

The primary goal of the Extension Subproject was to develop a mechanization education program within the Ministry of Agriculture Extension Service. The Project Paper states;

> "...A meaningful farm machinery management extension program be established in the Ministry of Agriculture."
>
> "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 problem seems to reflect low budget, low motivation, and insufficient staff development rather then administrative difficulties. The Project will directly address the above problem in the Machinery Management area while the heavy input of technical assistance and training will upgrade both personnel and organization/administrative management."

The Inception Report states that Extension Objectives are:

> "Work with the Extension Department in establishing and institutionalizing a machinery education program."
>
> "Assist the Ministry of Agriculture in selecting and training a core of competent Extension Machinery Specialists to work in both educational and advisory roles."

The Extension Service did not have the resources or a sufficient number of personnel with the needed educational background and experience to plan and implement a nationwide educational program in mechanization.

The need for an extension program on mechanization was recognized by the Ministry of Agriculture and was stressed in the ERA 2000 Report, The World Bank Study on Extension in 1981 and the USAID Study on Extension in 1981.

PROGRAM DEVELOPMENT

An extension program can be successful only if it is based on real needs as seen by the clientele. It must also be understood and supported by those professionals who are directly or indirectly involved in program implementation. Successful programs are developed by following recognized principals of extension.

The Extension Service did have highly competent personnel knowledgeable in extension techniques. Our input was oriented toward assisting in planning and implementing a program on mechanization education.

The following guidelines were used in developing the program:

The program should be developed around the concept of Extension Specialist for Mechanization working at the village, at the district and at the governorate level who would carry out the educational program.

The role of the Extension Specialist for Mechanization would be educational. He would have no regulatory responsibilities.

The Extension Service would assume responsibility only for education. The Office of the Undersecretary for Engineering Affairs would retain all present responsibilities.

The extension program would be based on information gained from research and from controlled farm trials.

A program would be developed whereby persons selected by the Extension Service to be mechanization specialist would receive additional training in mechanization and in extension techniques specifically oriented toward mechanization extension program.

The newly trained mechanization specialist would be given one-on-one assistance in planning and in the early stages of implementation of their individual programs.

There would be built into the system a provision for a flow of information from researchers and other mechanization experts to the mechanization specialist and through them, to the farmers.

Provision would be made for farmers problems, and ideas for improvement, to flow through the specialist, to researchers and others in a position to make changes for improvement.

An overall approach to the program was developed early. At the Central Level of the Extension Service efforts would be made to develop a structure for an extension mechanization program following the guidelines set out for the program.

At the same time, actual extension mechanization program would be developed in three or more villages. Extension mechanization programs at the village level would:

Make it possible to develop extension techniques appropriate for mechanization and suitable for local conditions.

Develop crop production techniques appropriate for mechanization.

Serve as a model for mechanization specialist to use in training programs.

Be used as a "showcase" for farmers from other villages and for Ministry of Agriculture officials demonstrating the effects of an extension mechanization program.

Provide an opportunity to test machines in actual field conditions for possible inclusion in the machinery introduction program.

Develop a viable extension mechanization program for the benefit of the farmers in the area.

Originally three villages were selected with expansion to other villages as trained personnel and other resources became available. This was changed to limit the program to one village until the farm management study in the Mechanization Project's target villages was completed in October, 1982.

A village in Behera Governorate, Sheikh Ahmed, was selected. It proved to be an excellent choice. The farmers in the area were mechanization oriented and were willing to allow the extension team to try new machines and new farming practices on their land. Perhaps, most important, they actively participated in program planning, in implementation and in evaluation. Since this is a Land Reform area, we were able to work with large blocks of land and still interact with a large number of farmers rather then one or two large land holders.

The information base on which an extension mechanization program could be developed was and still is limited. The original project plan to use research results obtained by or through the research and development subproject as the primary information base proved unworkable. The research information on agricultural mechanization in Egypt, although helpful, is inadequate. Some information is available and a great deal of information is available from highly knowledgeable mechanization experts. With this as an information base it was decided to start an extension mechanization program. Also, the program has provisions, through the specialist inservice training program to provide the specialist with current information as it becomes available. As mechanization further develops and more information becomes available, the information base can be broadened.

The Undersecretary for Engineering Affairs was responsible for mechanization programs. The Land Reform organization had responsibilities that include education on mechanization in their assigned areas. Other organizations and individuals had legitimate interests in mechanization education and in machinery introduction. The extension mechanization program had to provide for this situation not only in program planning but also in program implementation.

To assure that these organizations and individuals were involved in the program a request was made to name an Extension Advisory Committee that would represent all those concerned. After numerous delays the committee was named and the executive subcommittee first met in October, 1981.

At that subcommittee meeting the extension plan was reviewed and given tentative approval, pending approval, by the full committee. The committee met in November and voted to approve the plan and submit it to USAID for approval or suggestions for revision.

The committee was short lived but was valuable in gaining a consensus of groups and individuals involved in mechanization on the kind of program needed and how it should be implemented.

Other Ministry of Agriculture personnel, farmers, machinery dealers, manufacturers, and other persons with farm machinery interests were also helpful in program development.

While program details were being further developed and formation of the committee was delayed the initial stages of the program was being implemented.

A village was selected where the extension village program was developed.

The village program was started with a seedbed preparation demonstration in March, 1981.

Demonstrations, field days, tours, meetings and other extension activities were started with constant evaluation and change as the program evolved.

Following approval of the village plan, L.E. 110,000 was made available to purchase and operate a set of equipment.

Machinery introduction programs were started with demonstrations and evaluations of machines identified for inclusion in the program.

The mechanization specialists were selected from the Mechanization Project's target villages.

The plan for the further training of the specialist was developed.

The extension educational program and the machinery introduction programs were being developed to the point that similar programs could be started in other areas.

An extension plan aimed at institutionalizing a mechanization program within the Extension Service has been developed and is being implemented.

A program for the selection and further education of persons who are designated to be extension mechanization specialist was developed. Thirty extension workers from the Mechanization Project's target governorates have been named to be mechanization specialists. Eleven of these have completed the major part of their training and are scheduled to return to their assigned areas and begin extension mechanization programs in these areas.

The program to provide these extension workers with additional knowledge of mechanization and techniques for teaching mechanization to farmers has three stages -- orientation, technical, and in-service training.

The orientation session for the first group lasted six weeks. It consisted of lecture sessions with mechanization experts, visits to mechanization farms, research farms, dealers, repair shops, and spare parts stores. Sessions were also conducted at Sheikh Ahmed where the specialists were shown the results of an extension mechanization program.

Members of the Egyptian Water and Management Project in the Ministry of Irrigation conducted an excellent one day seminar for the specialist on land leveling and irrigation practices.

A syllbus was prepared and a suggested list of potential instructors was prepared for the technical training session. This session was arranged by the Training Sub-project.

After completion of the two formal components of the program the specialists will return to their assigned areas to develop individual programs. The Central Level Extension staff and members of the Mechanization Project are scheduled to assist the specialists in planning and implementing their individual program.

The in-service component of the program is scheduled to start soon after the specialists begin their individual programs. Twelve days or more each year will be scheduled for planned training sessions, seminars, or other activities to allow specialists to remain current on mechanization and to learn of new research findings.

The intent of the program at Sheikh Ahmed was to develop extension techniques, provide a model for the extension mechanization specialist to study and copy, and provide a viable extension mechanization program for the farmers in the area.

The farmers in the area were an integral part of the program since its inception. They were involved in the decision making process that led to the selection of that village. They were involved in program planning for demonstrations, machinery selection, and field days. They discussed production restraints that are related to mechanization. They were involved in the planning, in the implementation and in the evaluation of the program. The success of the program is directly related to the participation of the farmers in the area.

Demonstrations, field days, field meetings and informal meetings in the field and in the cooperative headquarters proved effective teaching methods.

The program was carried out with and through the Sheikh Ahmed Cooperative. It was their program.

The support of dealers and manufacturers made it possible to conduct these activities when no project operating funds were available.

Farmers and others were also generous with their support, making their fields available for demonstrations and field days, and contributing freely with their time and efforts. Without these kinds of support, the extension program would not have been possible.

The Ministry of Agriculture made L.E. 110,000 available for the purchase and operation of a set of machinery for use in the extension village area. This made it possible for the program to move forward and be more effective.

By utilizing the abilities and resources of local machinery dealers, we were able to develop the list of appropriate machines, write specifications, release the tenders, open and accept bids, purchase the machinery and have most of it delivered for the beginning of the 1981-1982 crop year.

Demonstrations were a key component of the program and were used extensively. The first demonstration with a new machine or a new practice normally was less than fully successful. Since no isolated area where machines could be tried and adjusted was available and people were aware of any new project, the first trial was always a "demonstration". Machines were not adjusted, operator manuals were not available, wrenches for adjusting the machine were not available, and operators were not familiar with the machines.

Farmers soon understood the situation, however, and assisted us in our efforts to make the necessary adjustments.

Field days were used to create an awareness of selected machines and mechanization practices as well as to draw support and attention to the program. At the first major field day, fifteen hundred people attended. The Governor of Behera Governorate, Dr. Zamazam, attended, also included in his party were Eng. Osman Ahmed Osman, Dr. Dawood, Minister of Agriculture, Undersecretary of Engineering Affairs, and other Government officials.

The farmers in the area sent the Minister of Agriculture a telegram thanking him for the benefits they were receiving from the program.

Land leveling has been identified as a key component of the extension program. The Inception Report states, "The main technical constraint to a complete machinery introduction program is the small irrigation basin used within a field to control irrigation water. To alleviate this problem a land leveling trial for the corn crop will be conducted at Eti Al-Baroud in Behera Governorate."

The trials and demonstrations that started with the 1981 maize crop were continued with each succeeding period between crops. A leveling blade manufactured by Behera Plant was used for the highly successful demonstrations. Much of the land in the extension area have been leveled in demonstrations. Other land in the area has been leveled by custom operators who purchased blades as a result of demonstrations in the area. There has been a strong demand to extend the demonstrations outside of the extension area. Demonstrations were conducted in nearby villages and one demonstration was conducted at a Horticultural Research farm near Benha.

Private manufacturers are now manufacturing a leveling blade similar to the one manufactured at the Behera Plant. Improvements in the privately manufactured blade will broaden its scope of use.

The leveling also works effectively as a secondary tillage tool, breaking up large clods, smoothing and firming the soil as it creates an acceptable seed or root bed.

Activities at Sheikh Ahmed were conducted at a rate somewhat faster than the normal extension program, in order to make the information gained available for program expansion into other areas. During the first year activities in the area included:

Tillage demonstrations for seedbed preparation for each major crop. Numerous demonstrations were conducted covering a total of seventy five feddans.

Seventy five feddans of rice fields were used for land leveling demonstrations.

Land leveling demonstrations and mechanized rice sowing with a grain drill on sixty feddans.

Grain drill demonstrations on 250 feddans of wheat.

Land leveling demonstrations on a horticulture research farm.

Land leveling demonstrations preceeding mechanical rice transplanting, wheat harvesting and combining demonstrations.

Ditch cleaning demonstrations with a backhoe. Cleaning farm drainage ditches and irrigation canals on a total of six kilometers.

A research/demonstration trial in cooperation with the Research and Development Subproject evaluating four secondary tillage tools in heavy clay soils.

The program at Sheikh has strong support from farmers, Ministry of Agriculture and other government officials in the area.

The Extension team has had frequent requests to expand the program into other areas. Some demonstrations were conducted in nearby villages however the primary efforts have been restricted to the Sheikh Ahmed Cooperative area. The program has however, reached the point that the same or a similar program could be conducted in the other target villages or other areas.

Two groups of fifty farmers from other target villages were brought to Sheikh Ahmed to see the results of an extension mechanization program. They expressed approval of what they saw and a desire to start a similar program in their villages.

COMMENTS AND SUGGESTIONS

The Extension Service has not been operating with subject matter specialists. The transition to the widespread use of subject matter specialist in the program should prove to upgrade the service and provide better programs for their clientele. Some problems in implementation could result however. A short term consultant with experience in this area could be helpful.

Management and economics are badly needed in the mechanization program. Farm management specialist with training in machinery management working at the district level supported by specialist at higher levels would be extremely helpful to the farmers as they make the transition to a higher level of mechanization.

Mechanization is essentially limited to tillage, threshing, water lifting, and transport. There are few indications that mechanization is expanding beyond these operations. Without an active program to remove or reduce certain restraints the future growth of mechanization may stall. Some of these restraints include: Short rows or small irrigation basins, the strong demand for straw for summer animal feed, and the lack of implements designed specifically for local conditions.

Visual aids are needed. They should be locally produced and identified with local conditions. Foreign visuals can be used on a limited basis but cannot provide the educational value that is needed.

Machinery for demonstrations and field days may be a problem if specialists utilize these techniques in their individual program. A good budget will be needed plus a good working relationship with other Departments within the Ministry of Agriculture.

The specialist should be allowed to attend seminars, field days, machinery exhibits, etc., to maintain a current knowledge of mechanization.

The specialists are going to need information to build up their files. Some effort should be made to accumulate copies of research reports, manufacturers literature, etc., for each of the specialists.

A machinery handbook would be helpful.

Consideration should be given to recruiting some Agricultural Engineering graduates for future positions as Extension Specialist for Mechanization.

Extension specialists should be assigned to work with researchers working in mechanization or fields directly related to mechanization. These specialists would then be the link between the specialist working in the field, the researcher, providing a source of information both ways.

A formal connection with the Ministry of Irrigation would help to assure a flow of information between the Irrigation Ministry and the Extension Specialist.

PROGRESS TOWARD ACCOMPLISHMENTS OF GOALS

Development of a mechanization education program within the Extension Service.

The framework for this is in place and implementation has begun. The plan was developed by and with extension administrators and planners. There was never a question of its acceptance. It is an extension plan.

The plan is compatible with recommendations made by the USAID sponsored study on extension in November, 1981 by Dr. Mohamed Abbas, Dr. Said Dessouki, Dr. E. T. York and other scientists.

Significant indicators of progress include:

An Extension Mechanization Director has been named.

Six persons from each of the mechanization project's target governorates have been named as Extension Specialist for Mechanization.

A three stage training program, orientation, technical and in-service training has been developed to provide the newly named mechanization specialist with additional knowledge and skills on mechanization and how to apply extension teaching skills to a mechanization program.

The specialist program is in the process of implementation. Specialists from Behera and Gharbia Governorates have completed a six-week orientation course and are enrolled in a three-month technical course.

An extension mechanization program has been developed in one village. Extension mechanization techniques have been developed and specialists have had an opportunity to observe an on-going program in operation.

The village program has developed to the point that programs can be implemented in other areas.

APPENDAGE TO THE END OF TOUR REPORT

MACHINERY INTRODUCTION

BY

EDWARD J. CONSTIEN

A program to identify and introduce selected machines that have the potential to remove or reduce agriculture production restraints in Egypt.

The primary goal of this component of the extension program was to identify and introduce selected machines that have the potential to remove or replace agriculture production restraints.

The Project Paper states:

> "...the project 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."

The Inception Report states as an objective of the project:

> "Introduce selected machines through demonstration/education programs."

Machines make it possible for a farmer to increase yields at less cost, with less drudgery type labor. Machines make it possible, but do not insure, that all or any of these things will happen. Only careful selection and proper use of the machine can assure its positive contribution to Egyptian agriculture.

The Ministry of Agriculture has a policy of encouraging further mechanization. A number of machines have been introduced and some have gained widespread use.

Limited research and field experience is available. Machines have been imported or manufactured from locally or imported designs and tried under local conditions to evaluate their ability to function properly and gain farmer acceptance.

New or imported designs rarely gain immediate acceptance. Machinery introduction is a complex problem with many interrelated factors. New machines require different practices.

Egyptian farmers have developed farming systems that meet their needs considering available resources. They are ready to move to higher levels of mechanization but only after they are convinced that it is to their advantage to do so. As machines have become available that meet their needs, these machines were gradually adopted and necessary changes made in individual farming methods. Only a limited number have gained acceptance and adoption. Some machines that have been introduced that appear to meet a known need are not now in widespread use. The small self-propelled mower-binder introduced in 1977 is an example of this. Wheat and rice harvest are major problems and the use of this machine would appear to at least partially solve these problems. These machines are being used and are in demand in some villages where they are located; however, they have not been widely adopted.

Some of the factors involved in successful machinery introduction are:

The machine must be able to successfully do the job for which it was intended.

The machine must be readily available to the farmer at a price he considers reasonable.

The capacity must be sufficient to allow completion of the intended job within acceptable limits.

It must be convenient to operate, adjust and repair.

It must either readily fit into the present farming system or necessary changes must be made that are acceptable to the farmer.

STRATEGY

Evaluate major agricultural production restraints that could be reduced or eliminated by widespread use of appropriate machines.

From potential machines identified, select machines to be introduced into this program.

A sufficient number of an individual machine will be located in selected areas to gain the intended demonstration effect and resulting adoption.

Machines will be sold through local dealers and/or manufacturers who have demonstrated the desire and ability to sell and service the machines on a long term basis.

Import selected machines or make arrangements with local manufacturers to supply selected numbers of machines.

Because initial buyers will face higher than usual risks and dealers will face problems of customer acceptance as well as extra costs of demonstrating the newly introduced machine to gain farmer acceptance, a risk- and cost-sharing agreement will be developed for each machine type.

To meet the planned future demand for the machines, local plants will be given assistance in manufacturing, distributing and servicing the implements.

Recommended Machines, Category 1

Leveling blade

Grain drill

Backhoe

Disk harrow

Rotary tiller

Ridger

These machines are recommended for immediate introduction following the extension program recommended for each individual machine type. Machines are to be distributed through approved dealers and sold to private farmers to cooperatives. Individual sale or repayment plans to be offered will provide incentives for prospective owners.

Disk harrows have been used in Egypt since tractors were introduced. They have not been widely adopted. They are standard secondary tillage tools and should gain in use if they are readily available, especially if farmers gain increased knowledge of good seedbed preparation practices. Deeper tillage with improved chisel plow designs and tilling the soil at optimum soil moisture content will increase the need for and adoption of disk harrows. The tool can also be used as a primary tillage tool for seedbed preparation of small grains and berseem.

Rotary tillers are recommended for secondary tillage operations in heavy clay soils and rice growing areas. It is also a good tool for preparing seedbeds for vegetable crops and for use in orchards. It has the disadvantages of requiring more power and fuel than other tillage operations and soil structure damage can result if the soil is overtilled.

Ridgers are presently used only to a limited extent. Many ridges on which rowcrops are planted are still formed by hand labor. Also, proper use and adjustment will improve their effectiveness and increase their adoption rate. They are presently being manufactured here, though some designs could be improved and changes in manufacturing practices could improve their quality.

The leveling blade is an effective secondary tillage tool. It breaks down large clods, leveling and slightly compacting loose soil. It has a high capacity, giving it a cost advantage when compared to some other techniques. It is manufactured here and a demonstration program plus a purchase incentive program should make rapid adoption possible.

The grain drill has the potential to increase yields and save time. It will also result in more effective use of the tractor by utilizing it more hours per year. Farmer reaction to demonstrations have been good. The relatively high original cost of these machines may retard their adoption rate. The limited number of days the machines would

be used will cause high per-feddan fixed costs. The incentive program for grain drills should reflect the high cost of imported machines so that a sufficient market can be developed to interest potential local manufacturers. Grain drills introduced should have hoe, knife, or runner type openers.

Backhoes were identified as machines that should be included in the program after problems related to drainage and irrigation ditch cleaning were given a high priority by farmers and other persons knowledgeable of farm practices.

Two farm-sized backhoes were considered, one mounted and one pull type. Demonstrations indicated that the pull type model had the greatest appeal to farmers, although the mounted model is also satisfactory.

A backhoe was included in the group of machines purchased for use in the extension area. Demonstrations with the machine produced immediate, positive results. Farmer groups in other areas requested demonstrations. The dealer who imported the machine ordered six machines; when these were sold, he ordered 12 more, and subsequently, 40 more.

The machine can be used at the farm level to load cotton sacks, load sugarcane stalks, and load soil or manure.

Recommended Machines, Category 2

Chisel plow (improved design)

Row planter

Interrow cultivator

Mower-binder

The machines listed above have been identified as having the potential to meet farmer needs but widespread introduction is not recommended. Demonstration machines should be made available for use by Extension Specialists for Mechanization in their education program. Demonstration and use in selected demonstration areas will create an awareness of these machines by farmers and local manufactures. In some instances, major changes in production practices are needed before widespread adoption will take place.

Chiesel plows are in widespread use and are being manufactured in many local shops. Importing a limited number of chisel plows for use in demonstrations would give extension specialists a quality tool with which to carry out demonstrations, would place a well designed plow in the area which local manufactures could copy to improve their present designs, and it would create an awareness by farmers of well designed plows and how they operate.

Row planters . The adoption and use of this machine would make mechanical planting of row crops and weed control possible. They have been used on a limited basis by some cooperatives and on some research farms. Widespread adoption in the Old Lands is dependent on:

Land leveling and long rows;

An extension program aimed at teaching farmers those production practices needed to make row planters work effectively in Egypt;

Selection of design options on the planters that would make them work effectively under Egyptian conditions.

Planters introduced for use in the Old Lands should have knife or runner openers, hill drop metering devices, bed forming attachments, and the ability to plant non-delinted cottonseed.

Inter-row cultivators. These machines are directly linked to the use of row planters. Their adoption would eliminate or reduce hand weeding and cultivation. The same factors that affect the adoption of planters apply to cultivators.

Mower-binders. Mowers and mower-binders have been included in the Ministry of Agriculture machinery introduction program. The machines introduced in the past appear to be the type of machine appropriate for Egypt. The machines are being used but design features and perhaps other factors have restricted their widespread adoption. The most appropriate machine selected from those that have been tested and those being tested in the 1982 wheat crop should be made available for demonstrations.

Recommended Machines, Category 3

Sugar cane planters

Groundnut planters

Potatoe planters

Potatoe diggers

Groundnut diggers

Other similar machines that have potential in limited areas for specialized crops.

The machines listed above have potential for adoption in limited areas. Individual situations should be evaluated and machines introduced for demonstration and/or limited distribution as localized extension program evolve.

Machines not recommended, Category 4

Cotton pickers

Combines

Threshers

Rice transplanters

Each of these machines has been studied for their potential to assist farmers in solving major problems. These machines have not been recommended because they are not within the guidelines adopted for this program, or are machines that fit into farming practices in the Old Lands that have not been identified.

Cotton pickers: Harvesting cotton is a major problem. The Ministry of Agriculture has imported mechanical cotton pickers that are being used at the Nubaria Mechanized Farm. Their potential for use in the Old Lands is questionable. No machines have been identified that would be appropriate for cotton picking in the Old Lands.

Wheat Threshing and Harvesting: Farmers do not consider wheat threshing a major problem when considered with other production problems. Wheat harvesting, however, is a major problem. At present, wheat is cut by hand, allowed to dry in the field, moved, often by camel or donkey, to the threshing floor and stored until threshed.

Threshing is done with locally manufactured drum-type threshers powered by farm tractors. Separating and cleaning is done in a separate operation, normally with a hand powered winnower. In the threshing operation, the straw is chopped, making it a more desirable animal feed. The straw has a high value and is transported to the living area to be stored for use during the summer for animal feed. Incomplete separation of the grain and straw is not a problem since grain is typically added to the straw when it is used as feed. Storage of the straw around the living area, however, is a fire hazard.

Threshers have a relatively high capacity, making threshing time for an individual farmer and his family relatively short. The labor requirement during this time is high, however, and the labor is "drudgery" type labor for those involved.

Small threshers manufactured in Egypt based on an original IRRI design have been introduced but have had limited acceptance as a wheat thresher.

A limited number of combines are being used in Egypt. Most of these are in the New Lands.

Through the years, large stationary threshers have been imported and many are still in use.

A combine could be used in the Old Lands. A small unit could be acceptable in the smaller fields, especially if a land leveling program results in the reduction of irrigation boundaries. The cost would be attractive to custom operators if:

A forage program could be developed that would reduce the

need for chopped straw for summer animal feed;

A short straw variety with good lodging resistant characteristics was adopted.

The combine could be used in wheat and rice. Interest in finding better threshers is high and some new designs are now being tried. Threshers are being tested on the 1982 wheat crop. If one of these machines tests out well, it should be included with the Category 2 machines.

Rice transplanters: This machine and production practices related to it were not included in the machines under consideration by the project. It has gained the attention of the extension team because of the impact rice transplanting has on other farming practices and machinery. It is an example of the complexity of machinery introduction and the many factors that affect the growth or lack of growth of mechanization.

Transplanting rice requires soil "puddling." Puddling creates a good seedbed or rootbed for rice seedlings. It also tends to form a seal that restricts downward water movement. These factors are favorable to the growth of rice and, if rice were the only crop being produced on that land on a continuous basis, no problem would arise. In Egypt, rice is included in a rotation that includes maize, soybeans, and cotton. Puddling tends to destroy soil structure. This creates problems in seedbed or rootbed preparation. It also causes additional soil crusting, creating plant emergence problems.

Substitute planting techniques that eliminate puddling would make soil working conditions easier and less expensive and reduce planting problems. Rice can be planted without soil puddling if:

Weeds can be controlled;

Planting could be performed a week or more earlier;

Adequate irrigation water is available when needed;

The fields are precision land leveled.

The availability of irrigation is the responsibility of the Ministry of Irrigation. The other factors could be influenced and probably solved with changes in production practices and additional inputs of machinery and herbicides:

The crops preceding rice are usually wheat or berseem. If a suitable mower-binder could be found, wheat could be harvested earlier.

Berseem could be harvested earlier with one cutting rather than the present practice of harvesting some every day over a period of time then harvesting the last cutting. If the

hay could be baled or otherwise properly stored, the loss in crop growth for part of the crop would be compensated for by reduced losses in quantity and quality.

Herbicides are available that will control weeds if proper application techniques are used.

These types of change would not be excessive in cost but would require an ongoing extension program to assure success of the interrelated changes. Transplanters used in a well managed rice production system could also play an important role in rice production in Egypt. Well designed transplanters must continue to be tested and considered for introduction in Category 2.

SUMMARY

Activities in machinery introduction began with the extension program in March, 1981. The actual purchase of imported machines was to be delayed until after a plan was developed on the basis of research conducted by the Research and Development Subproject.

Machines that were identified in the Project Paper and other machines identified by the extension team as having potential for removing or reducing production restraints related to mechanization were used in demonstrations and field days. The extension team and other mechanization experts evaluated the technical aspects of the machines as well as farmer reaction to their use.

Some machines used in the demonstrations were identified early as appropriate for Egypt. After observing several demonstrations and farmers' reactions to the demonstrations, one farmer in an adjoining village purchased a similar machine from Beheira plant at Alexandria. He later reported he had been using the machine to do custom work for other farmers in the area and had been able to pay for the machine in three months.

The Beheira Company was cooperative and very helpful in providing machines for demonstrations. Private dealers were also helpful in making machines available for demonstrations.

One machine, the small backhoe used for cleaning farm ditches, proved an immediate success. Following demonstrations, the Beheira Governorate Agricultural Department purchased twelve backhoes and private farmers purchased machines for use in customs operations. A leveling blade similar to the one manufactured at the Beheira Company is now being manufactured in the private sector.

The program has been submitted to the Extension Advisory Committee. A framework has been developed, machines identified for introduction, and the program is ready to be put into effect following USAID approval and release of funds.

ANNEX F: WATER LIFTING CREDIT FUND
EXTENSION AND EXTENSION TRAINING PROGRAM

BEST AVAILABLE

WATER LIFTING CREDIT FUND

I. INTRODUCTION.

In order to fulfill the Project Paper's strategy (annex VI, 18-19) to not only make financing available to enable farmers to purchase water lifting equipment (mainly water pump sets) but also technical assistance which will enable them to procure, select, operate and maintain their equipment, the following extension and extension training program is presented. As outlined in the Water Lifting Credit Fund letter of understanding to USAID (November 23, 1981) and further described in the Water Lifting Status Report Letter of June 15, 1982, the Extension/Training Program will cover four specific activities: (A) Informing farmers concerning the requirements and procedures of the Water Lifting Credit Fund, (B) Providing farmers with the descriptions, specifications, prices and justifications concerning pump sets available on the local market, (C) Training Farmers with the use of practical demonstrations and visual aids on the proper operation and maintenance of their pump sets, and (D) As information is made available from research sources, providing farmers with information necessary concerning crop water requirements and optimum irrigation frequencies and times which will serve to improve crop yields. In order to carry out these extension and extension training tasks, the following activities, staff, funds and other resources are required.

II. EXTENSION AND EXTENSION TRAINING ACTIVITIES

Although there has been preliminary work done on some of the four activities listed above which encompass the water lifting credit extension and extension training program, each activity will require additional intensive attention in order for the extension/training effort to accelerate.

A. Water Lifting Credit Fund Information: It is critical that the farming populations in the target areas are fully informed of the procedures through which credit for water lifting equipment (water pump sets) can be obtained as well as economic advantages in changing from sakia powered to engine or motor powered water pumps. This should be done through both personal contacts as well as with educational aids at the actual locations. As the project's Financial and Planning subunit has already contacted the Behera Governorate Agricultural Development Bank on June 14, 1982 and provided them with credit fund information, a follow up check in the field by a project Water Lift Extension Specialist is now required. This will ensure that the information has been sufficiently and correctly received in the pretest villages (Sheik Ahmed and Nikla El Enab villages in the Itay El Baroud district and El Atf and El Kasr El Moustagad villages in the Mahmoudia district). Appendix A is a copy of the

information which has been made available and can be distributed as necessary.

B. Technical Information on Water Pump Sets: In order for farmers, farmer cooperatives and other loan recipients to be able to select a water pump set for their requirements, a detailed listing of technical information on water pump sets from local water pump sets' dealers/ manufacturers must be made available to them. Appendix B contains a comprehensive listing of this information which will be charted and presented to potential loan fund recipients. From this information and with practical advise from the water lift extension specialist the best pump for a particular condition in a specific area can be decided upon.

C. Operation and Maintenance Training: For the water pump sets to be properly operated and maintained a water pump set operation and maintenance training program is required. This program (Appendix C) which will be supervised by the Water Lift Extension Specialist with technical assistance from other sources as conditions demand, is critical to the life of the pump sets and success of the entire water lift credit fund program. When the pump sets are purchased the extension specialist will insist that the dealer supply both the warranty guarantee and sufficient operator's and maintenance manuals needed to properly care for whatever pump set is purchased. If manuals are not available, the specialist will see that they are prepared as soon as possible. The specialist will also assist farmers in developing their operation and maintenance (o/m) programs by initially monitoring their o/m records and advising on technical or administrative needs concerning the programs.

D. Crop Water Requirements Information: An ongoing responsibility of the Water Lift Extension Specialist will be to acquire updated information on crop water requirements for the various soils and to transfer this information on to the farming populations. This data will be obtained from various research sources including the projects' surveys, research institute stations, universities, etc. With this information farmers will be able to make more accurate decisions concerning water pump set needs in particular soil conditions.

III. WATER LIFT EXTENSION STAFF

A Water Lift Extension Specialist, under the direction of the Machinery Management Extension Director, will be the primary staff member who will carry out the initial water lift extension program detailed in the above four activities. In addition, irrigation experts and technical advisors will serve as secondary support staff who will assist as conditions require. They will monitor the effectiveness of the extension activities and make appropriate recommendations based on the results observed.

As the program expands into more than the initial four pretest villages additional water lift extension specialists will be needed. They can be oriented and even supervised by the initial specialist who will be responsible for setting up, implementing and eventually evaluating the first programs in the Itay El Baroud and Mahmoudia districts of the Behera governorate.

IV. REQUIRED FUNDS AND OTHER RESOURCES

In order to begin the water lifting credit fund extension and extension training programs in the four pretest villages, the following funds and other resources will be needed for 1982.

A. Funds

	L.E.
1. Extension information preparation and duplication	4000
2. Field Days	1000
3. Training aids/materials etc.	8000
4. Incidental Living Expenses	6000
5. Miscellaneous expenses	1000
TOTAL	20000

Project training funds can be used for items 3 through 5 while funds for items 1 and 2 will need to come from another source.

B. Other Resources

The following resources will also be needed to carry out the program.

1. Chevrolet Suburban for the extension specialist

2. Administration support to:

a) Type leaflets/reports etc.

b) Translate materials

c) Prepare charts

d) Xerox materials

e) Print leaflets

f) Prepare extension/training aids and materials

g) Perform other miscellaneous administrative duties.

V. CONCLUSION

In conclusion the success of this program depends on not only how effective the Water Lift Extension Specialist is in the field, but also on the willingness of the farming populations in the pretest villages to invest in pump sets and then to follow the advice of the Specialist. Of utmost importance is the technical backup supplied by the project to the field which will, in a short time, convince the farmer using new equipment that he can depend on what advice the specialist gives him and on the reliability of the mechanization system to grow his crops.

APPENDIX G

WATER LIFTING CREDIT FUND

WATER PUMP SET OPERATION AND MAINTENANCE TRAINING PROGRAM

AGRICULTURE MECHANIZATION PROJECT

WATER PUMP SET

OPERATION AND MAINTENANCE

TRAINING PROGRAM

CONTENTS

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WATER PUMP SET OPERATION AND MAINTENANCE TRAINING PROGRAM

1.0 INTRODUCTION

The following Water Pump Operation and Maintenance Training Program has been prepared for the Water-Lifting Credit Fund Extension Program. As this Program is beginning with four pretest villages in the Behera Governorate, the training program presented is designed accordingly. When the water-lift activities (which will include the need for water pump operation and training sessions) move into project villages this initial program can also follow. It will need to be revised and expanded according to area needs and specific pump demands.

2.0 PURPOSE

The purpose of the Water Pump Operation and Maintenance training program is to provide farming populations who are buying and will own water pump sets with the information necessary to properly operate and maintain these machines. This will result in a longer use life from the pump sets and an increased use efficiency.

3.0 OBJECTIVES

The objectives of the program are as follows:

1. To train farmers to operate and maintain water pump sets according to manufacturer's recommendations.
2. To ensure that the pump sets are properly used to increase critical time availability.
3. To establish among the pump owning population a set of effective and efficient water pump operation and maintenance standards which will be ongoing and available to surrounding farming communities.

4.0 SCHEDULED TRAINING ACTIVITIES

The following is a list of scheduled training activities for the water pump operation and maintenance program. These activities will have to be modified according to pump sets and conditions but will apply in most cases.

DATE	COURSE NO.	COURSE TITLE	NO.OF TRAINEES	LOCATION
July-* Dec. 1982	2EX73a	Water Pump Operation & Maintenance	12 (maximum)	on-site
"	2EX40a	Water Pump set instructor	12	Training Center

* The actual dates for the courses will be established when pump sets are purchased from local dealers. This will require that at least four courses to be conducted in the four pretest villages. Course numbers will be used in sequence as the courses are conducted as shown: (course 2EX73a, 2EX73b, 2EX73c, etc.)

DURATION

The duration of each course will be three hours at an on-site location. This allows the limited number of farmers to start and stop the engine and to participate in preventive maintenance activities.

5.0 PROGRAM COSTS

The cost breakdown for the program is as follows:

	ITEM	L.E.
1.	Training aids	1000
2.	Training materials	3000
3.	Incidental living expenses	6500
4.	Administrative expenses	1000
5.	Instructor's fees	1000
6.	Petroleum, oils, lubricants	500
7.	Transportation	500
8.	Training Center Fees	1500
	TOTAL - L.E.	15000

6.0 CONCLUSIONS

In conclusion the immediate need is to identify potential pump set owners and where they live. Then training sessions can be scheduled and carried out accordingly by the Water Lift Extension Specialist in conjunction with the project's Training Subunit. Once the training activities are underway in the field, addition of specialized short courses will be conducted at selected training centers for potential instructors of water pump sets. These individuals, from the action villages can then be used to train subsequent pump set owners.

MAINTENANCE PROGRAM

Water Pumps

The majority of the water pumps found in Egypt are the centrifugal type driven by one and two cylinder diesel engines.

Pump:

The pump just described requires very little maintenance. It is essential however to make certain that the mounting bolts are tight so that the pump cannot move on its mounting and become misaligned from the engine.

Some of these pumps have sealed lifetime bearing on the pump drive shaft. Others require lubrication. Those that require lubrication should be lubricated with a good quality chassis grease once during each operation of 6 to 10 hours. It is important that the bearings not be over lubricated. Too much lubricant will cause the seals to rupture or in some cases even blow out the drive shaft packing glands.

The coupling between the pump and engine should be inspected periodically. There are several types available, but basically they perform the same function. The most common coupler is a fabric reinforced rubber pad that has a driving plate on the engine side and driven plate on the pump side. If the fabric becomes worn or frayed it should immediately be replaced. In emergency situations these couplings can be cut out of the side of a truck or tractor tire. If the pump or engine has to be removed for this repair it is important that they be realigned upon reassembly.

The packing gland should only be tightened if there is excessive water leaking between the packing and the shaft. It should only be tightened until the leak stops. If the gland is tightened until it bottoms and the leak has not stopped, the packing should then be replaced with new material.

Engine:

Most of these engines are one and two cylinder diesel unit of up to 25 H.P.

These engines are of rather heavy construction, have a relatively slow RPM and will give good service for a long time if properly maintained. There are several items to consider in the maintenance of the engine:

ANNEX H

MACHINERY DEVELOPMENT ADVISOR'S WORKPLAN

ANNEX B

Machinery Development Advisor's Workplan

A. Delineation of Activity Priorities

1. Primary Activity: Harvesting Machine

The principal thrust of this activity will be the development of a small harvesting machine for wheat, rice and other cereal grains. The design of this harvester will, to the maximum extent possible, be geared to the current level of technology of the Egyptian manufacturing community. Locally produced components and materials will be used wherever possible and compatible with proper machine function. The ultimate goal of this activity will be Egyptian manufacture of at least one model of a small harvesting machine for local retail. Of equal importance will be the enhancement of the design expertise of the Egyptian engineering personnel associated with its development.

2. Secondary Activity: Tillage Machines

The second level of priority will be assigned to the development of more efficient tillage implements for use on Egyptian soils. These machines will also be designed for manufacture in Egyptian factories, using locally available materials whever practicable. An important spinoff of this activity will be the training of Egyptian engineers in the design, test and production process and procedures required to successfully develop and launch the manufacture of similar agricultural machinery.

3. Tertiary Activity: Ancillary work

Assisting the Research Advisor in the development/equipping of the Research and Development Center and conduct of in-house research work; serving on the R&D Extension Committee and similar activities--low

priority activities not to interfere significantly with the Primary and Secondary activities.

B. Timing and Implementation Plans

1. Primary Activity: Harvesting Machine

I plan, in company with my counterpart, to observe harvesting operations over as wide an area as is practical during the May-June 1982 season, to familiarize ourselves with field conditions and grain harvesting problems prevalent in Egypt. We shall attempt to locate and observe field operation of tractor mounted mowers, small self-propelled cutting implements (both with and without binding capabilities), small self-propelled combines and small pull-type combines to evaluate their performance and identify functional problems. Farmers and operators will be queried as to their experiences, likes and dislikes of the different types of harvesters. The information from these observations will be used in drawing up a proposed design specification to be presented to the R&D Executive Committee for their consideration and approval.

Preliminary design work on a prototype harvester, probably based on one or more selected imported machines, will be started 15 July 1982. The imported machine(s) will be modified in the R&D workshop to reflect the proposed design. Preliminary field testing of the prototype will be conducted in November and December 1982, harvesting rice. Design changes as dictated by preliminary field test results will be incorporated into the prototype prior to May 1983 to prepare for extensive field testing during the 1983 wheat harvest.

A third prototype, reflecting all test-dictated design modifications and incorporating locally-made components will be constructed in the

R&D workshop during the June-October 1983 period and extensively field tested in harvesting rice in November-December 1983 and wheat in May-June 1984. A third "pre-production" prototype, built to the final design configuration will be obtained from a selected local manufacturer prior to October 1984 for exhaustive testing and evaluation during the 1984 rice and 1985 wheat harvests.

This activity will culminate in the arrangement for on-going production of the harvesting machine by one or more local manufacturers with initial production slated for approximatley 1 August 1985.

Counterpart personnel will have had sufficient training and experience by that time to enable them to monitor production and maintain/modify the basic design to adapt to changing conditions, materials availability, and to develop additional models/sizes as required to conform to market requirements.

2. Seconary Activity: Tillage machines

The timing and extent of work expended on this activity will be dictated to a large extent by the availability of machines to be evaluated, results of the test work on each machine and availability of personnel, due to the overriding priority of the harvesting machine development work.

Present indications are that the Israel-sourced "prototype" implements will not arrive at the R&D station in time to complete their preliminary evaluation prior to the 1982 wheat harvest. This will necessitate the division of our time between the testing of these Israeli implements and the observation of wheat harvesting machines. Thus, the major part of the assembly and preliminary evaluation of the Israeli machines will be carried out under the supervision of the R&D station

management with a minimum of advice and assistance from Dr. Reaves and myself. Upon completion of the harvesting operations time will be available to review the implement test results and consider changes and modifications required to adapt to Egyptian farm conditions and manufacturing capabilities.

Modifications to these tillage machines can be designed, executed in the R&D workshop, and tested/evaluated on an ongoing, relatively unscheduled basis since land will be readily available throughout the year, as opposed to the two short periods of crop availability for testing grain harvesting equipment.

3. Tertiary Activity: Ancillary work

Cooperation in the development and equipping of the R&D station, setting up test and reporting systems and procedures as well as R&D Executive Committee responsibilities and duties are an ongoing function of the Machinery Development Advisor position and will be carried out on a continual basis as priorities and other commitments permit.