AID/NE-C-1570
PN-AAL-101

EGYPTIAN MAJOR CEREALS IMPROVEMENT PROJECT

Technical Report

Prepared by

CID Project Design Team

January 17 - March 2, 1979

2/28/79

Acknowledgments

The CID Project Design Team wishes to express their thanks and appreciation for the excellent cooperation and assistance provided by their Egyptian counterparts, specifically:

Dr. A. H. Shehata
Dr. M. F. Abdel-Rahim
Mr. Ahmad Awad
Dr. B. S. Zikri
Dr. A. S. Gomaz
Dr. M. F. Sharaf
Dr. R. A. A. E. Abdo
Dr. T. A. Hak

Thanks also go to the numerous persons over all of Egypt for their help and patience.
A special thanks is also extended to R. Jerry Edwards, John Rogers. Gene Miller, and Bob Morrow of USAID for the guidance and superb support they have provided during our sojourn in Egypt.
We feel that future success of the project will greatly depend on the continuance of this cooperation among all parties throughout the entire duration of the project.

CID Project Design Team

Ralph Finkner, Team Leader, New Mexico State University
John Arledge, New Mexico State University
Irving Dow, Washington State University
Allen Halderman, University of Arizona
Greg Hinze, Colorado State University
Harold Matteson, New Mexico State University
Neil Patrick, New Mexico State University

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Summary and Recommendations

Egypt faces a serious problem in her attempts to feed an increasing population. The major cereals constitute over 45% of the Egyptian diet and furnish approximately 70% of the caloric intake. Egypt imported about 45% of its cereal grains in 1977. Relatively constant yields of cereals compared with a 2.5% annual population increase give cause for concern for the future.

Three major problem areas have been identified: 1) the lack of a properly funded, professionally oriented research organization; 2) the lack of a properly staffed extension system, integrated with the research organization, and 3) serious problems with quality, quantity, and distribution of high quality seeds.

Egypt cannot, for reasons of national security and balance of trade, continue to depend upon imports for its increasing demand for cereal grains. Action must be taken to hold cereal grain imports at present levels or reduce them if possible. The Project Design Team recommends the formation of the Egyptian Major Cereals Improvement Project as a concentrated, intensive effort to increase yields of wheat, maize, sorghum, and barley in Egypt.

The Egyptian Major Cereals Improvement Project is designed to develop new technical information concerning

cereal production, develop new cultivars with increased yield capabilities, establish an integrated research-extension system, test and adapt mechanization for Egyptian conditions, and provide technical and degree training for personnel involved in the project.

To accomplish these goals a multi-disciplinary team of Egyptian scientists assisted and advised by a team of expatriate American scientists will be established with headquarters at Giza. A Director General will be appointed by the Minister of Agriculture to direct the project. An Executive Committee will be established consisting of representatives of several organizations and agencies involved in cereal production. They will establish policies and provide direction for the operation of the project.

Four existing research stations will be upgraded in facilities and personnel such that research and extension functions can be conducted more efficiently and effectively. A pilot program will be established and studied in four districts, providing village extension agents for each village, to examine the benefits of an intensive extension effort.

An extensive training program will be instituted both in-country and outside of Egypt. Its purpose is to develop expertise not now available in Egypt and to increase the professional capabilities of existing scientists.

The seed producing and processing industry of Egypt will receive assistance to improve their capabilities of meeting the needs of the farmers for increased supplies of high quality seeds.

It is not presumed that a five year program, no matter how extensive, can solve all the problems related to cereal grains production in Egypt. The problem is a dynamic one that requires constant effort over time. It is hoped that procedures and organizational structures developed over the term of this project will be continued by the Government of Egypt after its conclusion.

An evaluation procedure is recommended for the project utilizing an internal review every six months and an external review during the third year and again at the conclusion of the project. These review documents will serve as a basis for determining the structure of future national programs related to cereal grain production.

Egyptian Major Cereals Improvement Project

General Agricultural Situation

Agriculture continues to be the largest sector in the Egyptian economy, contributing just under 30% of the GNP. This is about the same proportion as 25 years ago, indicating growth has kept pace with that of the rest of the economy. Agriculture employs about 45% of the labor force and directly or indirectly is responsible for over three quarters of the country's annual export earnings. Although total production of cereal grains has increased about 4% per year since 1970 the per feddan yield has remained relatively constant.

The failure of yields to exhibit any substantial growth over the past decade gives cause for concern, since experimental evidence indicates that considerable increases are still possible. A major reason for the underlying slow growth in productivity throughout the agriculture sector is the problem of rising water tables, combined with increasing soil salinity in many areas. These problems have increased substantially since completion of the Aswan High Dam and the conversion to perennial irrigation throughout the country. Five million feddans of land under cultivation will eventually need to have underground drainage installed.

Importance of Cereals

Cereal crops in Egypt constitute the most important group of field crops in cash value, contributing approximately 40% to the value of all crop production. The group includes wheat, barley, maize, rice, and sorghum.

This project will concentrate on four of these cereals; wheat, maize, sorghum and barley, two of which are for summer cultivation (maize and sorghum) and two for winter growing (wheat and barley).

The relative importance of these cereals is shown by a study[1] which found that the first three cereals (wheat, maize and sorghum) supply approximately 45% of the total daily consumption of food. By commodity, the percentages in 1978 were: wheat 25%, maize 17% and sorghum 4%. In the supply of total daily calories they become even more significant, supplying approximately 70%, with the following shares in 1978: wheat 37%, maize 27%, and sorghum 7%.

Wheat

Wheat is the staple food of the urban area and is widely used for blending with maize flour in rural areas. In cash value it outranks rice. The wheat area has ranged from about 1.3 to 1.6 million feddans (Table 1) during 1950 to 1978, or 21-25% of Egypt's total cultivated area. Yields in the 1970's have been substantially greater than those achieved in the 1960's, but potential for yield increase has not been fully exploited.

In 1977 roughly 1.7 million tons of wheat were produced. Imports totaled 4.3 million tons, thus there was an apparent consumption of 6.0 million tons. Tables 2 and 3 compare yields of local and improved varieties, and illustrates yield increases possible from variety improvement. Using a 2.5% birthrate and assuming present

[1] Dr. Farouk Shalaby, A Report on Wheat Consumption in Egypt, USAID, Cairo, Egypt, December, 1978

Table 1 Wheat: Average area, production and yield during the 1950-78 period.

Period	Area 1000 fed	Production 1000 tons	Yield tons/fed	Index
1950-54*	1,571	1,318	0.83	100
1955-59*	1,501	1,464	0.97	116
1960-64*	1,387	1,504	1.08	129
1965-69*	1,268	1,362	1.07	128
1970-74*	1,302	1,716	1.31	157
1973-74**	1,370	1,883	1.38	166
1974-75**	1,394	2,033	1.46	176
1975-76**	1,396	1,960	1.40	169
1976-77**	1,208	1,699	1.41	170
1977-78**	1,381	1,933	1.40	169

* Data obtained from "Contemporary Egyptian Agriculture" Second Edition, 1976, by H.A. El-Tobgy.

** Data obtained from the Statistical Department of the Egyptian Ministry of Agriculture.

Table 2 Wheat acreage and yields of local varieties and semi-dwarf varieties.

Season	Variety	Area		Production (tons)	Yield Tons/feddan
		Feddans	% of Total		
1974-75	Local	1,207	86.59	1,715	1.42
	Semi-dwarf	187	13.41	319	1.70
	Total	1,394	100.00	2,033	1.46
1975-76	Local	1,219	87.32	1,660	1.36
	Semi-dwarf	177	12.68	300	1.70
	Total	1,396	100.00	1,960	1.40
1976-77	Local	908	75.23	1,232	1.36
	Semi-dwarf	299	24.77	467	1.56
	Total	1,207	100.00	1,699	1.41
1977-78	Local	1,093	79.15	1,467	1.34
	Semi-dwarf	288	20.85	466	1.62
	Total	1,381	100.00	1.933	1.40

Table 3 Mean wheat yields (kg/feddan) from trials conducted by the Wheat Research Section during the 1977-78 season (i.e. "D" trials).

Entry Name	REGION							
	Delta[1]		Middle Egypt[2]		Upper Egypt[3]		Egypt[4]	
	kg/fed	Local	kg/fed	Local	kg/fed	Local	kg/fed	Local
Chenab 70	2161	107	2510	126	1066	106	1919	115
Giza 157	2335	116	2374	120	1107	110	1939	116
Giza 158	2061	102	2568	129	1003	99	1878	112
Sakha 8	2336	116	2490	125	901	89	1909	114
Line 3590-2653	2229	111	2543	128	943	94	1905	114
Line 1628-2973	2221	110	2581	130	1165	116	1991	119
Line 1628-2981	2311	115	2526	127	922	91	1920	115
L.R. 64-Son.	2105	104	2147	108	919	91	1721	103
Sakha 60	2239	111	2672	135	928	92	1946	117
Sakha 61	2303	114	2689	136	1101	109	2031	122
Sakha 62	2281	113	2169	109	1000	99	1817	109
Giza 155	2016	100			1018	100		
Giza 156			1984	100			1669	100

1 - Mean of 16 locations
2 - Mean of 7 locations
3 - Mean of 2 locations
4 - Mean of 25 locations
5 - Local variety in the Delta and Upper Egypt is Giza-155 and in Middle Egypt is Giza-156

per capita wheat consumption, Egypt will require 7.1 million tons of wheat in 1985.

Maize

Maize is the main cereal for bread making in the rural areas. It is also being used increasingly as livestock feed, especially for poultry. Maize can be grown throughout the country, but the bulk of the growing area is in the Delta (75%) and Middle Egypt (20%). The entire maize crop is consumed within Egypt and additional quantities are imported to make up deficits. Maize outranks all other cereals in cultivated area and cash value. It occupies about one third of Egypt's total cultivated area. A major increase in maize yields occurred in the 1965-1969 period when yields increased to 1.5 tons/feddans, due to the availability of irrigation water following the completion of the High Dam at Aswan, which allowed earlier planting dates. Since 1965, however, maize yields have plateaued (Table 4). Maize production in 1978 was about 3.2 million tons. An additional 0.6 million tons were imported, showing an apparent consumption in 1978 of 3.8 million tons. It is estimated that 1985 consumption for maize will be about 4.5 million tons.

In Table 5, data from the Statistical Department of the Ministry of Agriculture show that the nation's maize yields can be increased about 15% simply by utilizing improved germplasm.

As shown in Table 6, results of "on-farm" trials indicate that maize germplasm exists for the North Delta and for Middle Egypt which is capable of yielding con-

Table 4 Maize: Average Area, production and yield during the 1950-78 period.

Period	Area 1,000 fed	Production 1,000 ton	Yield tons/fed	Index
1950-54*	1,746	1,568	0.90	100
1955-59*	1,850	1,624	0.88	98
1960-64	1,727	1,823	1.06	118
1965-69*	1,510	2,269	1.50	167
1970-74*	1,593	2,460	1.54	172
1974**	1,755	2,640	1.50	167
1975**	1,830	2,782	1.52	169
1976**	1,891	3.047	1.61	179
1977**	1,765	2,724	1.54	171
1978**	1,910	3.197	1.67	186

* Data obtained from "Contemporary Egyptian Agriculture" Second Edition- 1976, by H.A. El-Tobgy.

** Data obtained from the Statistical Department of the Egyptian Ministry of Agriculture.

Table 5 Maize Acreage and Yields of Local varieties, Composites and Hybrids during 1975 and 1976*.

YEAR	Germplasm	Area		Production (tons)	Yield tons/feddan
		Feddans	% of Total		
1975	Local Varieties	1,497,148	81,82	2,214,486.0	1.48
	American Early	166,577	9.10	262,503.9	1.58
	Shedwan-3	13,417	0.73	23,854.2	1.78
	Hybrids	152,621	8.34	279,675.0	1.83
	Total	1,829,754	100.0	2,780.520.1	1.52
1976	Local Varieties	1,533,770	81.23	2,413,197.6	1.57
	American Early	202,730	10.74	336,382.2	1.66
	Shedwan-3	26,126	1.38	30,462.4	1.93
	Hybrids	125,466	6.65	242,007.8	1.93
	Total	1,888,092	100.0	3,042,050.0	1.61

* Data obtained from the Statistical Department of the Egyptian Ministry of Agriculture.

Table 6 Mean grain yield (Kg/feddan) for Maize in North Delta, Middle Delta, and Middle Egypt, from trial 3-1 (1978 season).

Entry Name	REGION							
	(1) North Delta		(2) South Delta		(3) Middle Egypt		(4) Egypt	
	Kg/fed	% of Local	Kg/fed	% of Local	Kg/fed	% of Local	Kg/fed	% of Local
D.C. 19	2297	95	2573	94	1885	95	2257	94
D.C. 186	2726	113	2807	102	2004	101	2489	103
D.C. 405	2430	101	2818	102	2273	114	2533	105
V.C. 80	2172	90	2599	94	2190	110	2356	98
Giza - 1	2510	104	2699	98	2146	108	2452	102
Gemeiza-2 Ev-1	2285	95	2567	93	2088	105	2329	97
Sids - 1 Ev-1	2351	98	2718	99	2188	110	2443	101
Sids 7444	2496	104	2679	97	2184	110	2455	102
MED IMP.	2385	99	2568	93	2339	118	2444	102
Giza - 2	2255	94	2599	94	2079	105	2332	97
Province 530	2529	105	2424	88	1919	97	2257	94
Local	2476		2751		1986		2407	
Regional Means	2409		2650		2107		2396	

1- Mean of a total of 5 Locations (i.e. 3 in Behera, 1 in Damietta and 1 in Dakahleya)

2- Mean of a total of 10 Locations (i.e. 3 in Sharkeya, 2 in Garbeya, 2 in Menifia and 3 in Kalyobeya)

3- Mean of a total of 9 Locations (i.e. 1 in Fayoum, 2 in Beni Suef, 3 in Menia and 3 in Assuit)

4- Mean of all 24 Locations in Egypt

siderably more than the "local" varieties. In the South Delta this was not the case, but in several trials on the South Delta the "local" variety may have been germplasm under release by the Ministry. The average national yield in these trials across varieties was about 2.7 tons per feddan or 70% above the national average which comes from a combination of additional nitrogen (i.e., 90 kg N/feddan), higher plant density, improved germplasm and the absence of leaf stripping.

Sorghum

Sorghum is the fourth most important cereal crop of Egypt, in both area and value, after maize, wheat, and rice. The distribution of sorghum is localized with 80% being grown in Upper Egypt and 20% in Middle Egypt. In those regions, sorghum replaces maize as the main bread cereal for the rural population. Sorghum yields are shown in Table 7 and 8. The greatest yield increase occurred during the 5 year period, 1965-1969 due to the use of an improved variety.

Barley

Barley is of less importance among the major cereals of Egypt. The bulk of the crop is 6-rowed barley grown for animal feed and malting. Less than 10% of the barley area is planted to 2-rowed barley, produced specifically for malting. In addition to the irrigated barley in cultivated lands, rainfed barley is grown in large areas in the western coastal desert region, south and west of Alexandria. This rainfall area may reach 400,000 feddans in some years. In this area barley is used as a food and feed crop by the Bedouins. Produc-

Table 7 Sorghum: Average Area, Production and Yield During the 1950 - 1978 period

Period	Area 1000 fed	Production 1000 ton	Yield tons/fed	Index
1950 - 54	438	519	1184	100
1955 - 59	451	574	1274	108
1960 - 64	469	672	1434	121
1965 - 69	507	853	1683	142
1970 - 74	493	847	1719	145
1975	489	775	1585	134
1976	474	800	1688	143
1977	409	648	1584	134
1978*	413	656	1588	134

*Preliminary

Source: Ministry of Agriculture, Cairo, Egypt

Table 8 Mean Sorghum Yield (Kg/feddan) from trials conducted by the Sorghum Research Section during the 1978 Season

Variety	Giza	Faiyum	Faiyum	Assiut	Sohag	Sohag	Mean
Loc 29	790	1554	2429	2838	1260	3038	1985
Loc 129	1145	1904	1987	2738	1145	2884	1967
Giza 15	1074	1708	2566	2995	981	2310	1939
Giza 54	967	1988	2608	2853	991	2170	1929
Giza 114	1078	1642	2442	2664	840	2884	1925
Giza 123	1026	1456	2359	2554	1485	2422	1884
Giza 3	928	1176	1764	2295	1471	1652	1546
Location Mean	1001	1633	2308	2705	1168	2480	1882

tion data is presented on Tables 9 and 10.

Quantities of maize and wheat imports continue to rise rapidly (Table 11). Imports of maize during 1977 amounted to 600,000 tons with a cash value of approximately $42 million, while wheat imports stood at about 3,000,000 tons with a value of approximately $249.2 million.

Research

The agricultural research system in Egypt is well established and the staff is ample, in fact most Research Stations are over staffed. Nevertheless, there is evidence of a number of problems which have severely reduced its effectiveness in recent years. It has been less successful in recent years than in the fifties and sixties in generating a stream of profitable innovations for increasing the productivity of the farming system. Linkages between research and extension, and between research and farmers, are totally inadequate.

Research Funds

The most pervasive problem is the totally inadequate funding levels for research. The bulk of allocated funds goes merely to pay salaries. Low budget allocations are reflected in acute shortage of farm machinery and of funds for experimental work, transport vehicles, laboratory equipment and library facilities, and low levels of repair and maintenance. There is also an almost total absence of foreign exchange in the research budget, despite the fact that most of the laboratory equipment, chemicals, and field equipment for research must be imported. A highly centralized management and ad-

Table 9 Barley: Average area, production and yield during 1950-78 *.

Period	Area 1000 fed	Production 1000 ton	Yield tons/ fed	Index
1950-54	122	105	0.86	100
1955-59	135	133	0.98	113
1960-64	128	142	1.11	128
1965-69	110	111	1.01	117
1970-74	81	95	1.11	128
1974	77	89	1.15	133
1975	100	118	1.19	137
1976	104	123	1.19	137
1977	95	111	1.17	135
1978	114	132	1.16	134

This table does not include area under rainfed in the coastal areas, which is about (350,000 feddans), with an average of 300-500 kg/fed with no N application.

Table 10 Mean Barley yield (kg/feddan) from trials conducted by the Barley Research Section during the 1976/78 season (i.e. "D" Trials).

Entry Name	REGION							
	Delta[1]		Middle Egypt[2]		Upper Egypt[3]		Egypt[4]	
	Kg/fed	% of Local	Kg/fed	% of Local	Kg/fed	% of Local	Kg/fed	% of Local
Giza 119 (Local)	1451	100	1499	100	862	100	1271	100
Giza 121	1468	101	1489	99	826	96	1261	99
C.C. 89	1545	107	1721	115	844	98	1370	108
C.C. 163	1406	97	1560	104	1123	130	1365	107
C.C. 243	1462	101	1401	93	976	113	1279	101
Cr 251/14/2	1547	107	1341	90	795	104	1261	99
Cr 257/370	1542	106	1434	96	781	91	1252	99
Dr 264/8/4	1442	99	1594	106	712	83	1249	98
Mean of Region	1483		1505		877		1288	

1 - Mean of 4 locations
2 - Mean of 3 locations
3 - Mean of 1 locations
4 - Mean of all locations

Note:
1. Giza 119 is an improved variety released 1973, not a local farmers variety under irrigation.
2. National average is about 1158 kg/fed, using about 30 kg/N only.
3. Under rain fed areas (about 350,000 feddans) yield average, about 300-500 kg/acre, with no application.

Table 11 Selected Grain Imports (1000 tons) for Egypt over a 7 year period.

Commodity	PERIOD						
	1970/71	71/72	72/73	73/74	74/75	75/76	76/77*
Coarse Grains*	76	48	130	450	460	500	600
Wheat & Flour	2527	2670	3040	3180	3490	3800	4300

(Source) Foreign Agriculture Circular, EG-6-77 May 2, 1977, p. 24,26.

* Essentially Maize

** Preliminary.

ministrative structure, combined with lack of mobility, inhibits response to local needs. Concentration of effort on development of hardware alone, without dealing with management problems, is unlikely to be adequate. Several separate projects proposed for financing by USAID contain components of support for the research system, but not all have yet been approved. Each is concerned with a distinct part of the research effort and none address the overall system. Because of the competition of the various crops for land in Egypt, it would seem desirable to develop a comprehensive plan of operation.

Varietal Development

Better varieties are being developed and there is great opportunity for continuous germplasm improvement. Dramatic yield increases will come from improving on-farm soil and water management. Although improved germplasm will always offer opportunities for continued yield increases, it is believed that the larger share of immediate yield increases will come from improved crop management (better soil and water management, increased plant density, higher level of fertilizer, reduced leaf stripping and better weed control).

Extension

Although there are some rather serious constraints in Egypt's research programs, the main problem of how to increase cereal production does not appear to be a lack of research information, but of the transfer of technology to the farm. Research and Extension are two completely separate institutions within the Egyptian

Ministry of Agriculture. Research data is forwarded to the ARC at Giza where it is analyzed and written into research report form. The Extension Department receives copies of these reports and from them prepares Extension Circulars of various forms. This is a time consuming process. Attempts have been made to short-cut this process by holding meetings, usually at Giza, where the researchers can share information with extension personnel prior to the publication of research reports.

The Village Agent

Egypt has over 4500 villages with only about 2000 manned by a village extension agent. These agents have a B.S. in Agriculture but with very little training in extension philosophy and methodology. They have no offices, in most cases, and few have a reliable means of transportation. They are by necessity linked to the local cooperatives and become involved with government regulations and incentives regarding use of fertilizers, seed and crop allotments. Since most farmers are suspicious of "government agents" they have low levels of rapport with farmers. They are conscripted almost annually, for periods up to 5-6 months, by local government agencies to spray cotton for insects and other non-extension activities.

Information and Support

Extension information is usually too late getting to the village agent to be of use to him in advising farmers. There is no established system of informational backstopping for him to rely upon. The illiteracy rate

for rural people is high, over 60%, making written communications with farmers ineffective.

In summary the village agent is charged to do an educational job with too little and too late information, low levels of respect and rapport from farmers, and significant demands on his time to do other things.

Seed Production

High quality seeds of superior cultivars are essential for all crops under production. The present governmental system of production, processing and distribution of seeds has many limitations. It is believed that the present plan to cover a large percentage (i.e. 1/3 of the area) of the acreage each year is far too ambitious in relation to capabilities at this time. It is suggested that a realistic goal would be to produce sufficient certified seed to plant 10-15% of the area each year.

Seed Quality

At this time seed quality is often not good, hence the reputation of new varieties, being released into the system, has been damaged. At the cooperative (Gamaeya) which serves to distribute fertilizer and seed, there is no special incentive to distribute the available seed, thus the farmer often prefers to use his own seed rather than suffer from the Gamaeya routine. The distribution of seed is different from that of fertilizer, since the farmer has an alternative source of seed, his own or a neighbors but he must acquire fertilizer from the Gamaeya.

Seed Distribution

In spite of direct government subsidies for certified cereal crop seeds, much of the seed is not distributed. It may be sold as commercial grain at the end of the season or fed to livestock.

Egypt has seven major seed cleaning and processing plants. The cleaning and processing equipment and technology used in most of the plants is antiquated or nonfunctioning. Packaging seeds in burlap bags of 100 kg per bag is too cumbersome, too heavy, and often may be more seed than a grower requires.

In order to produce and supply high quality seed to the farmers, the development of a private sector or a joint sector "seed industry" should be encouraged by the government. Such a sector would seem to be a necessity if hybrid maize and sorghum cultivars are to be produced.

Constraints

Constraints to increased cereal yields and production are identified and summarized as follows:

A. Biological and Technical Constraints

1. Soil salinity associated with poor water management, excess irrigation and poor drainage.
2. Shortage of nitrogen fertilizer as well as a possible need for other major and minor elements, especially at high N levels. In addition, hand fertilization appears to result in poor distribution.
3. Plant densities which are too low or uneven to produce high yields and make efficient use of

high nitrogen levels. Poor stands may often be associated with seeding by hand and the consequent poor distribution and seed cover.

4. Farmer preference for "local" varieties instead of improved cultivars, especially in maize.
5. Poor weed control, a major problem especially in wheat and barley.
6. Use of maize and sorghum as a summer forage crop. The practice of defoliation damages the plant, thereby reducing yield.
7. Poor management practices, such as:
   a. Poor tillage, especially at primary tillage and planting.
   b. Late planting. This again relates to tillage as well as to timely removal of the previous crop.
   c. Late harvesting of cereals, resulting in grain lost to shattering and transport.
8. Insect damage to all cereals.
9. Disease damage due to late wilt and leaf blight in maize, and leaf and strip rust in wheat.
10. Shortcomings in the improved varieties themselves.
11. Lack of modern seed cleaning equipment to produce high quality seed.

B. Institutional and Policy Constraints

1. Segmentation of the various research and production efforts on the same crop into various institutes and sections.
2. A complex of an excess number of staff short working hours, and poor salaries. Poor salaries often force employees into second job.
3. A bureaucratic (routine) system which prevents the efficient and timely execution of tasks.

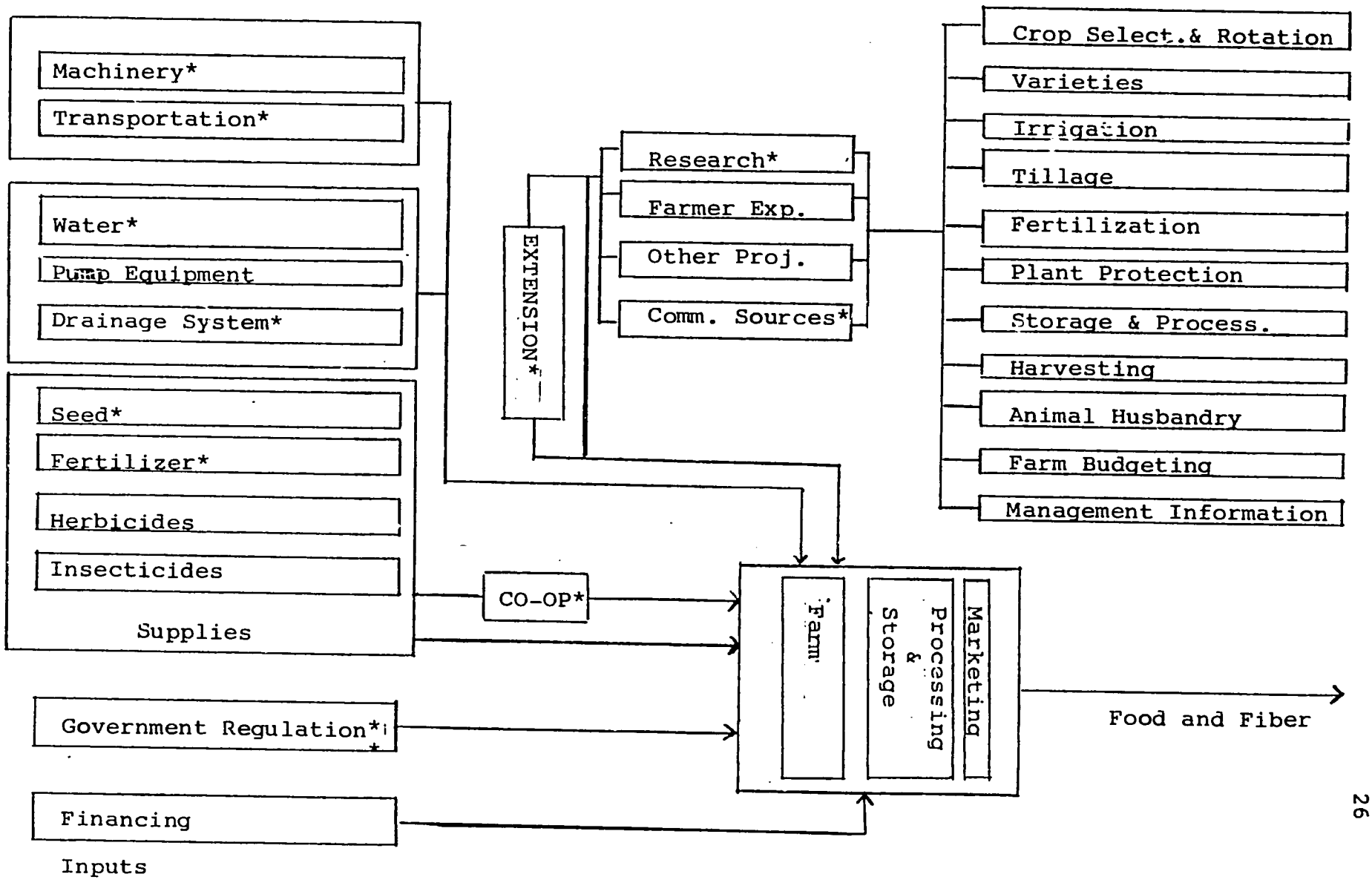
4. The system of staff advancement and promotion based largely on journal publications and on seniority.
5. Inadequate program equipment and funds to support an effective research and extension effort.
6. Confounding of the Experiment Station system and the State Farm system. The objectives of the two are very different.
7. Limited incentives to the farmer caused by low, regulated prices for produce and designated management production control.
8. Necessary quantities of quality inputs not readily available to the farmer (largely seed and fertilizer).
9. Research information is not being made readily available to the farmer.
10. Apparent lack of a dynamic, aggressive and well-funded extension system.
11. Lack of cooperation and communication between departments within the Ministry of Agriculture as well as between Ministries.

Examination of the diagram shown in Figure 1 facilitates identification of constraints to higher yields as previously mentioned.

High yields of cereal grain and forage require inputs into a production system as illustrated in Figure 1. The production system is composed of the farm units, processing and storage facilities, and a marketing mechanism. Productive capacity is determined by physical inputs such as seed, water, and machinery; financing; government regulations, and management information.

Management information, under Egyptian conditions,

Figure 1 Egypt's Agricultural Production System



*Identified Constraints

is obtained from the experience of other farmers and from research programs. Potentials exist for the expansion of information from other projects and from commercial sources. Information from all these sources can flow directly to the farmer or through an organization with an extension capability.

Some of these constraints such as government regulations, are clearly outside the domain of the cereal grains project. Others, such as water delivery and drainage systems, are under study by Colorado State University and P.L. 480 projects on drainage and crop water requirements.

Project Description

Objectives and Constraints

The objective of the Egyptian Major Cereals Improvement Project, hereafter called the Project, will be:

> to improve research and extension capabilities related to modern production of wheat, maize, sorghum and barley and to devise and implement a program to increase production of these cereals while taking into account the problems and opportunities characteristic of Egypt's general economy and its small scale peasant farmers.

The constraints to the attainment of this objective have been listed and discussed in the background section of this paper. Several of these constraints will not receive direct consideration within the purview of this project since: 1) there are other projects directly concerned with the problem (i.e., soil salinity and water management), 2) assurance has been obtained that the solution to the problem is close at hand (i.e., shortages of nitrogen fertilizer), and 3) the identified constraint is primarily a political question currently under study by the Government of Egypt (i.e., regulated prices for most grains). All constraints which can not be categorized in the above three groups will be considered by the project.

Project Package

The Project proposes to:

1. Establish four Research-Extension Centers at Sakha, Gemmeiza, Sids, and Mallawi with an integrated research/extension program for major cereal grains.
2. Provide extensive training in research methods,

extension techniques, administration and support activities for personnel employed by the Project.

3. Provide land, facilities, and equipment necessary to conduct, in an effective and efficient manner, the research and extension activities required by the Project.
4. Conduct adaptive research in mechanization useful for crop research and on small farms.
5. Provide equipment and training necessary to produce, test, and process seeds of high quality for research and demonstration purposes.

To accomplish these goals certain operational innovations will be instituted. They are:

1. Research and extension will be established as an integrated program capable of reacting to the needs of farmers with minimal delay.
2. From the central level of the project to the village level the problem of increasing cereal grain production will be viewed with a multidisciplinary, problem solving approach.
3. Cooperation and coordination will be established with existing Institutes within Egypt, International Research Centers, and any and all organizations useful to the accomplishment of the objectives of the Project.
4. Pay scales will be increased and working hours lengthened to encourage professionalism of effort at all levels of the Project.
5. Four districts will be selected as pilot study areas which will be staffed by an entire system of extension personnel under the employ of the Project.

Project Activities for Alleviating and/or Reducing Cereal Production Constraints

Constraints which currently impede maximum production of the major cereals in Egypt were identified in the previous section of this document. Following are the constraints which fall within the purview of this project and a tentative list of activities which should alleviate and/or reduce each constraint.

Constraint No. 1

Soil salinity associated with poor water management, excess irrigation and poor drainage.

Suggested project activities;

1. Cooperate with the CSU project regarding water use management,
2. Conduct research pertaining to irrigation and water use of cereals,
3. Breed cereals resistant to saline conditions,
4. Conduct on-farm water management trials,
5. Develop a package-program of information on proper irrigation techniques to be disseminated to farmers.

Possible gain in production: 10 - 15%.

Constraint No. 2

Shortage of nitrogen fertilizer as well as a possible need for other major and minor elements, especially at high N levels. In addition, hand fertilization appears to result in poor distribution.

Suggested project activities;

1. Encourage the GOE to increase nitrogen fertilizer production,
2. Breed cereals which are able to respond to less than optimum amounts of fertilizer,

3. Conduct fertility trials to determine the amounts of fertilizer needed for each cereal and genotypes with each cereal,
4. Analyze soils for macro and micro elements and determine critical levels,
5. Mechanize the application of fertilizers for better distribution,
6. Conduct on-farm trials and demonstrations,
7. Extend fertilizer information to the farmer.

Possible gain in production: 5 - 10%.

Constraint No. 3

Plant densities which are too low or uneven to produce high yields and make efficient use of high nitrogen levels. Poor stands may often be associated with seeding by hand and the consequent poor distribution and seed cover.

Suggested project activities;

1. Encourage the production of high quality commercial seed,
2. Determine proper plant densities through research,
3. Develop mechanical planters for uniform seed distribution and uniform planting depth,
4. Disseminate research information about seed cultivars, seed quality, and date and rate of seeding to farmers.

Possible gain to production: 5 - 10%.

Constraint No. 4

Farmer preferences for "local" varieties instead of improved cultivars, especially in maize.

Suggested project activities;

1. Breed cultivars which are sociologically and

economically acceptable to the local farmer,

2. Educate farmers to the value of new cultivars by on-farm trials and demonstrations.

Possible gain to production: 10 - 15%.

Constraint No. 5

Poor weed control, a major problem especially in wheat and barley.

Suggested project activities;

1. Develop a weed control research project using chemicals, mechanization, cultural practices and/or a combination of different methods. Determine proper herbicide rates and study residue carry over,
2. Conduct on-farm trials and demonstrations,
3. Disseminate weed control information to the farmers,
4. Keep current on the development of new herbicides through journals, contacts with chemical companies and meetings.

Possible gain in production: 5 - 10%.

Constraint No. 6

Use of maize and sorghum as a summer forage crop. The practice of defoliation damages the plant, thereby reducing yield.

Suggested project activities;

1. Advise the GOE that their low price setting for cereal grains is counter productive. Farmers will grow and use their crops to make the most money,
2. Breed plants with more leaves,
3. Encourage farmers, through extension, to plant a forage crop, such as forage corn, forage sor-

ghum or sudan grass,

4. Educate farmers as to the losses incurred because of leaf stripping.

Possible gain in production: 5 - 10%.

Constraint No. 7

Poor management practices, such as: 1) Poor tillage practices, especially at primary tillage and planting; 2) Late planting. This again relates to tillage as well as to timely romoval of the previous crop; 3) Late harvesting of cereals, resulting in grain lost to shattering and transport.

Suggested project activities;

1. Through research develop a package-of-cultural practices and test them in farmers fields,
2. Develop machinery for primary tillage through harvesting. Timeliness is a major factor and machinery should increase efficiency over the entire production process,
3. Cooperate with other commodity groups, such as cotton, for mechanizing their harvest such that there will be no delay in wheat or barley seeding,
4. Breed cultivars resistant to shattering,
5. Educate the farmer to the benefits of good cultural practices from seed-bed preparation to harvest. Use on-farm trials and demonstration tests to show the farmer the benefits that are possible.

Possible gains in production: 10 - 15%.

Constraint No. 8

Insect damage to all cereals.

Suggested project activities;

1. Breed cereals resistant to insects
   a. Evaluate foreign and native genotypes for insect resistance,
   b. In maize and sorghum develop broad germplasm pools of resistant materials,
   c. Develop artificial insect infestation so germ plasm can be evlauated,
2. Evaluate new insecticides by conducting rates and time of application experiments, etc.,
3. Evaluate cultural practices that help reduce insect populations,
4. Evaluate biological control methods,
5. Develop an integrated pest management control program using combinations of all factors listed above,
6. Develop a program of early detection of insect infestation so control measures can be considered before economic losses occur.
7. Through extension, develop a program of education for the farmer to aid him in insect identification and control methods.

Possible gains in production: 15 - 20%.

Constraint No. 9

<u>Disease damage due to maize wilt and leaf blight in maize, and leaf and stripe rust in wheat</u>.

Suggested project activities;

1. Breed cereals resistant to diseases
   a. Evaluate foreign and native genotypes for disease resistance,
   b. Develop broad germplasm pools of resistant material,
   c. Develop disease nurseries such that germplasm can be evaluated,

2. Evaluate new fungicides
   a. Conduct rates and time of application experiments, etc.,
3. Evaluate cultural practices that help reduce fungi population,
4. Evaluate biological control methods,
5. Develop an integrated disease control management program using combinations of all factors listed above,
6. Develop a program of early disease detection such that control measures can be considered before economic losses occur,
7. Extend information to the farmer on disease identification and the control methods available.

Possible gain in production: 15 - 20%.

Constraint No. 10

Shortcomings in the improved varieties themselves.

Suggested project activities;

1. Develop a dynamic breeding program for each cereal. All cultivars have shortcomings for there is no "perfect" cultivar. Continuous plant improvement programs will be vigorously employed to meet the farmers needs,
2. Testing imported cultivars
   a. A continuous effort should be made to test the best cereal cultivars in the world,
      (1) the best hybrid maize and sorghum cultivars in the United States should be sent to Egypt for testing each year. This should be coordinated by CID Project Director,
      (2) Pest resistant U.S. material should be

sent to Egypt for evaluation.
Example: Greenbug resistant sorghum and wheat.

b. Cooperate in planting International Cultivar Nurseries,

3. Keep current on the developments of new cultivars, genotypes and breeding procedures, through journals, meetings, additional training, etc.

Possible gains in production: 15 - 20%.

Constraint No. 11

Lack of modern seed cleaning equipment to produce high quality seed.

Suggested project activity;

1. Establish seed production units at each Research-Extension Center to produce quality seed,
2. Provide technical assistance to Seed Department of the Ministry of Agriculture for the production, processing, and distribution of quality certified seed,
3. To extent appropriate, assist in development of independent seed industry,
4. Assist USAID in examining the feasibility of a specially funded agri-business project in seed cleaning and processing.

Possible gain in production: 5%.

Constraint No. 12

Segmentation of the various research production efforts on the same crop into various institutes and sections.

Suggested project activity;

1. Establish research teams composed of various, appropriate disciplines (e.g., plant breeding, plant pest control, soils, etc.) as required for problem solving,

2. Provide for linkages between research and extension to disseminate cereals research results to the farmers.

Constraint No. 13

Inadequate program equipment and funds to support an effective research and extension effort.

Suggested project activity;

1. Provide funds for construction of new, or remodeling of existing facilities,
2. Acquire needed machinery and laboratory equipment,
3. Provide vehicles for transportation of staff and materials,
4. Provide funds for repairs, maintenance and operating costs.

Constraint No. 14

Due to an apparent lack of emphasis on the extension function and the apparent absence of linkages between extension and research, adequate information regarding cereal production is not reaching the farmers.

Suggested project activities;

1. This project provides both administrative and functional linkages between research scientists and extension personnel,
2. The administrative structure of this project allows the extensionists to obtain research information immediately after its generated for use in rural areas,
3. Research programs will focus more on adaptive rather than basic research. Thus research results will be more readily sueful to farmers,
4. The administrative structure of the project

allows a two way flow of information among researchers, extensionists and farmers.

Constraint No. 15

Lack of cooperation and communication between departments within the Ministry of Agriculture as well as between Ministries.

Suggested project activities;

1. The Executive Board is composed of members from various Ministries and representation from within the Ministry of Agriculture,
2. The Board of Program Leaders should provide for cooperative effort between the six components of the Project.

If all the proper technology were applied, cereal grain yields should be increased by over 50%. However, in nearly all systems a certain amount of slippage occurs. If improved cultivars are developed, pests controlled, a package of cultural practices readied for delivery, sufficient fertilizer and all of this transferred to the farmer, a yield gain of 25% should be reached in five years, but only if the farmer has the proper incentives.

Rationale for the Selection of Four Research-Extension Centers

Four Research-Extension Centers have been selected for inclusion in this project. These four are: Sakha, Gemmeiza, Sids, and Mallawi. Some additional work will be done at Shandaweel but will be directed from the Mallawi Center. Each center will carry out on-farm trials and Extension activities in two governorates. These governorates are: Gharbia, Menufia, Kafr-El-Sheikh,

Dakalia, Beni-Suef, Fayum, Minia, and Assiut.

Maize, wheat, barley and sorghum can be produced throughout Egypt. However, in 1978, two-thirds of Egypt's total production of the four cereals was in the eight governorates proposed for this project.

This project is a commodity oriented program which requires that researchers and extension personnel work closely together as a team to eliminate constraints in cereal production. The mission of this multi-disciplinary team is to reach the farmers with improved seed and cultural practices as quickly as possible. Having a cadre of specialists located in the governorates where the greatest quantities of cereals are produced should have a greater impact on production than a centralized effort.

Each Research-Extension Center will provide a certain amount of replication to the project, however, each station also differs in its specific mission. For example the majority of the maize produced in the Sakha area is planted after rice. The rotation with rice seems to lessen the severity of maize wilt. This disease is prevalent at Gemmeiza and Sids. However, there appears to be a location-genotype interaction between the latter two Centers. This could be an indication of different races of this disease organism. The disease complex on wheat, maize, and barley differs from area to area indicating some small but distinct environmental differences.

Research results obtained at Sakha will apply more to the North Delta area, while results obtained at Gemmeiza represent the Middle and South Delta. The

Center at Sids is representative of middle and southern Egypt with a differnt climate and environment than the Delta. Maize wilt is more severe in this area. The environment of this area also is better suited for making sorghum crosses.

The Center at Mallawi has two distinct functions differing from the other Centers, improvement of durum wheat and grain sorghum. Research on these two cereals will be emphasized at this station.

Egypt now has a network of 11 agricultural research stations, all established during the 1960's. Wheat research is carried out on all stations, maize and barley on six or seven stations and sorghum at two. This project includes only four Centers most relevant to major cereal producing areas.

Project Administration

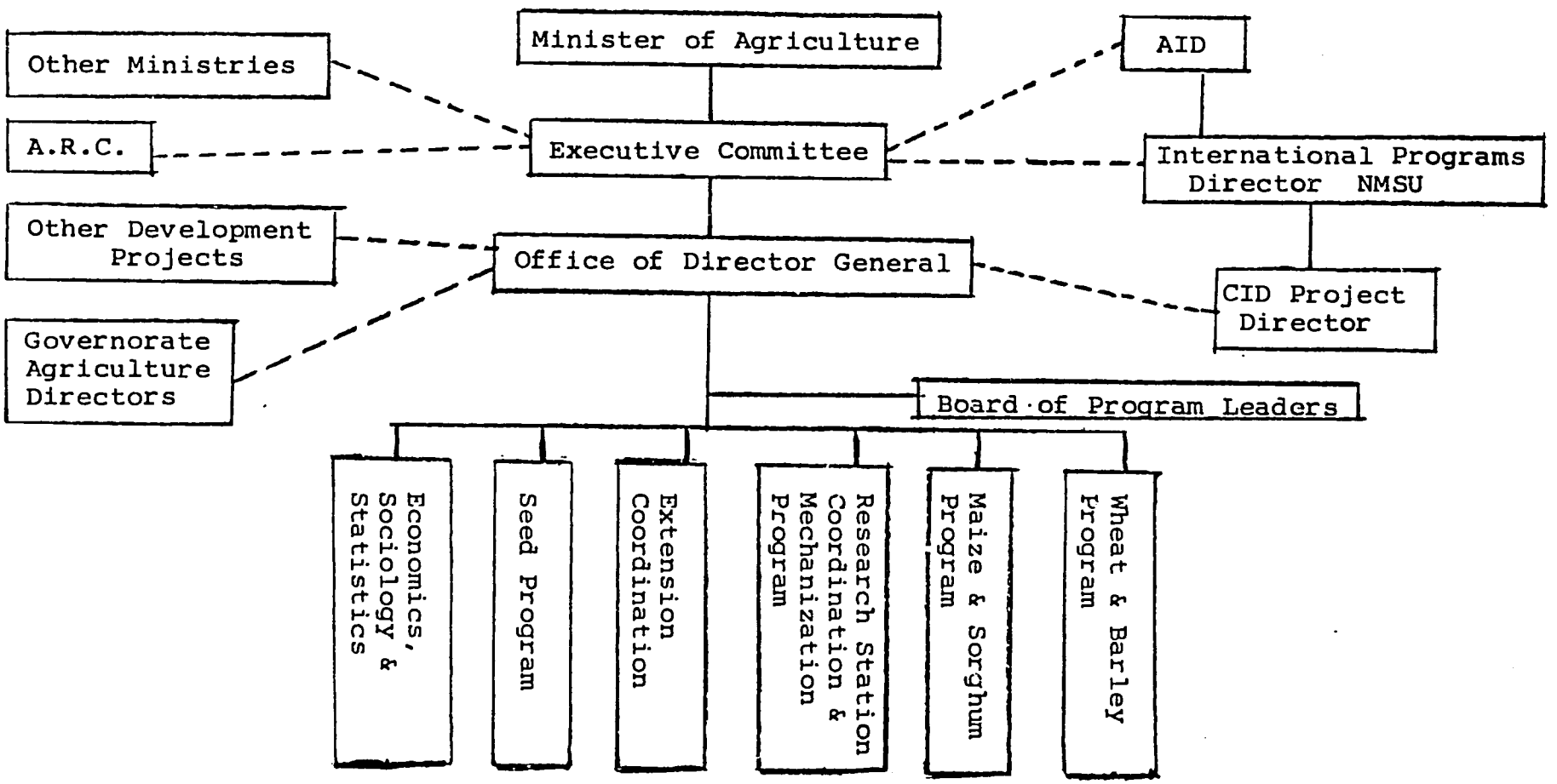
The Central Level administrative structure of the Egyptian Major Cereals Improvement Project is diagrammed on Figure 2. The purpose of this entity is primarily administration and coordination of the work of the project which will take place at the four research stations, at the district level, and at the village level in the pilot study areas.

Minister of Agriculture

The project will be under the administrative control of the Minister of Agriculture. He shall appoint the chairman of the Executive Committee and the Project Director General.

Figure 2 EGYPTIAN MAJOR CEREAL IMPROVEMENT PROJECT

Central Level Organizational Chart



———Lines of Authority

-------Lines of Cooperation

Executive Committee

The Executive Committee shall perform general direction and advisory functions within the framework of this project design paper. Matters on which established policies are not in existance will be taken up by the Committee to develop such policies as are deemed necessary. The Executive Committee shall consist of the highest ranking official (or his designated representative) from each of the following:

- Agricultural Research Center
- Agricultural Extension Department
- Under Secretary for Agricultural Production
- Bank of Development and Agricultural Credit
- Ministry of Irrigation

Ex-officio non-voting, members will be:

- Project Director General
- Project Expatriate Team Leader
- U.S. Agency for International Development (USAID-Egypt Mission)
- Representative of Consortium for International Development (CID)

The Chairman of the Executive Committee shall be appointed by the Minister of Agriculture from among the voting members as listed above.

Office of Director General

The Director General's office shall consist of the Director General (appointed by the Minister of Agriculture), Deputy Director General, the Expatriate Team Leader (who will act as Project Co-Director), and the necessary support staff. The responsibilities of this office are those dealing with the operation and implementation of the project within the policies est-

ablished by the project paper and the Executive Committee. All functions related to staffing, budget, logistics, and attainment of the objectives of the Project are the responsibilities of this office.

Board of Program Leaders

This Board is composed of the Program Leaders of each of the six program areas listed below, the Expatriate Team Leader, the Deputy Director General and the Project Director General as chairman. The purpose is to coordinate the work of the project through regularly scheduled meetings and interpersonnel contacts.

Program Areas

Wheat and Barley Program:

The Wheat and Barley Program area will be staffed at the central level by a Program Leader, Assistant Program Leader, a small group of highly trained scientists[1] and the necessary support staff. The function of this entity is to coordinate the development of new cultivars of wheat and barley, test fertilizer response, determine optimum production strategies and provide such information for use by extension workers.

Maize and Sorghum Program:

The structure and function of this program area is the same as for the wheat and barley program discussed above except as related to maize and sorghum.

Research Station Coordination and Mechanization Program:

This program area will be staffed by a Program Leader, an Assistant Program Leader, a small group of

[1] Specified staff for each program area is provided in the Implementation section, Table 11, of this document.

Agricultural Engineers, and the necessary support staff. The program area will provide coordination between the four research stations and the project at the central level, provide assistance and training in research station administration and management, and have the responsibility of administering the adaptive and development research on mechanization for use by researchers and farmers.

Extension Coordination:

A Program Leader, an Assistant Program Leader, and the necessary support staff will conduct the work of this program area. The responsibilities are to coordinate and administer the work of the project as it relates to the extension of information to farmers. Assistance and training of extension personnel and the administration of the pilot programs will be the responsibility of this program area.

Seed Program:

This program area will be staffed by a Program Leader, an Assistant Program Leader, and adequate support staff. Its purpose is to assist in the upgrading of seed processing plants, seed testing facilities, and seed distribution. It will have responsibility for the handling of new varieties and multiplication of foundation seed.

Economics, Sociology, and Statistics:

This program area will contain a Program Leader, an Assistant Program Leader, a statistician, and sufficient support staff. It will serve as a support group to the entire Project by assisting researchers in designing experiments, providing statistical anal-

yses of results, performing economic and sociological surveys as needed, providing economic interpretations of research results, and assistance in farm management extension

Central Headquarters

The Central Headquarters will be located at Giza in order to take advantage of existing institutes, libraries, and professional relationships. A new building will be constructed as soon as possible after approval of the project by all parties concerned. The building will contain all necessary space and equipment to efficiently carry out the objectives of the project. Cars, vans, and pickup trucks will be provided to the headquarters staff for use on project related activities. No crop breeding work or extensive testing, with the exception of cereal quality testing, will be conducted at the Project Central Headquarters, however, minimal laboratory facilities will be provided for intermittent use by the scientists.

Plans r Spec

The mechanization research will take place at the Sakha Research Station where adequate facilities and equipment will be provided by the project.

All expatriate staff will be officed at the Central Headquarters at Giza. The Expatriate Team Leader will be assigned to the Director General's office and will assist and advise the Director General in his responsibilities. Other Expatriate team[2] members will be assigned similarly to one or more of the program areas.

[2] The expatriate team is discussed in the Implementation section of this document. See Table 12.

The Research-Extension Centers

All actual research and extension activities will be centered at the four research stations at Sakha, Gemmeiza, Sids, and Mallawi. Each Research-Extension Center will be individually inventoried by a team of expatriates working with Egyptian specialists during the first year of the project to ascertain building and equipment needs to carry out the work of the project. Research facilities and equipment, vehicles, housing, and land on which to conduct research will be provided by the project for the priority or exclusive use of the Project.

Figure 3 indicates the organizational structure at the Research-Extension Centers, districts, and villages.

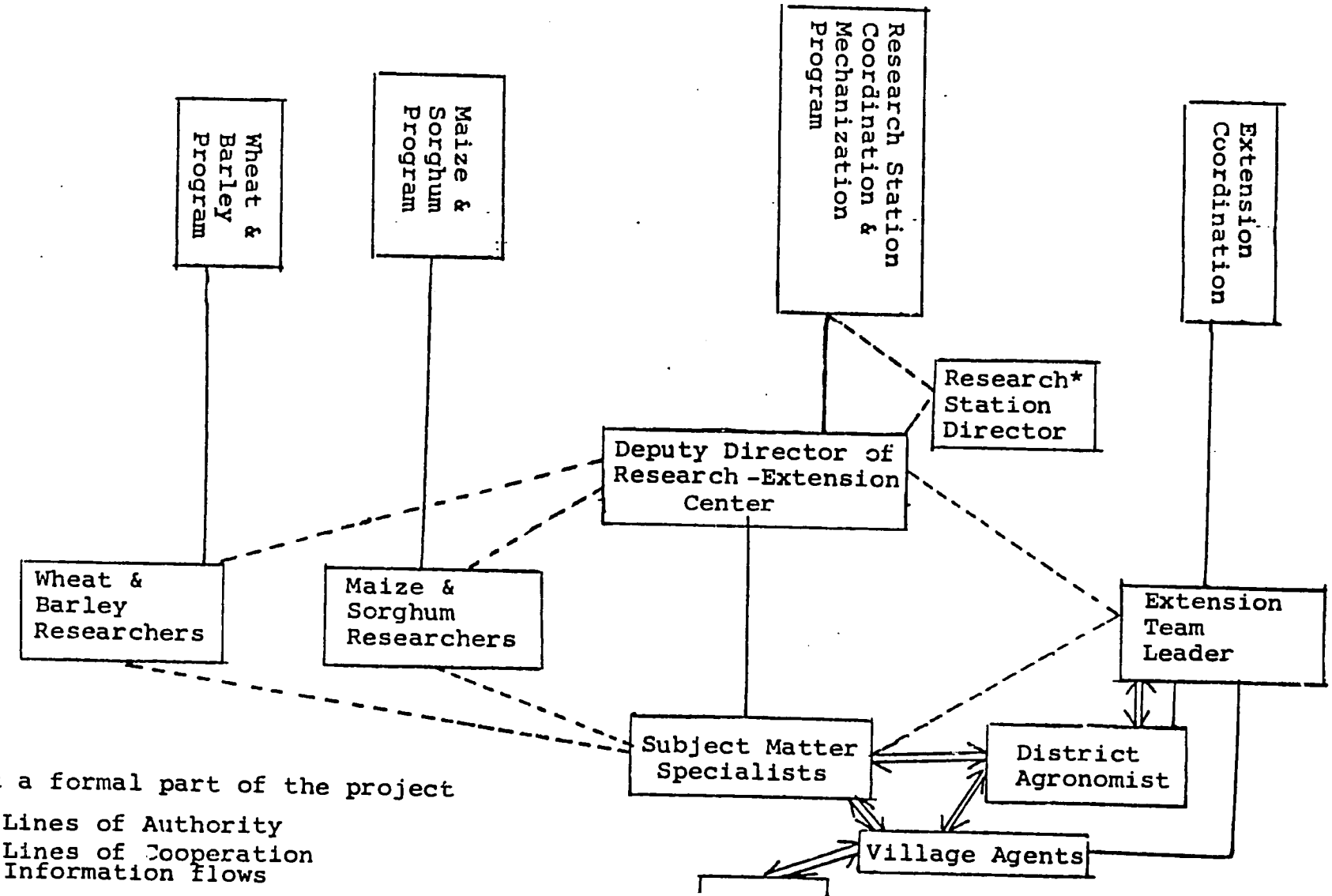
A Deputy Director of Cereal Grain Research will be assigned to each Research-Extension Center. His responsibility is to coordinate the work of the Project with the other work being done at the station under the direction of the Research Station Director. He will have direct administrative control of the Subject-Matter Specialists and will also have the responsibility of managing the activities of the Project at the Station. He will report directly to the Program Leader of the Research Station Coordination and Mechanization Program.

Researchers

A group of well trained researchers of various disciplines will be stationed at the Research-Extension Centers to conduct the breeding work, fertilizer tests, planting date trials, etc. for each of the two program areas of Wheat and Barley Program and Maize and Sorghum

FIGURE 3 EGYPTIAN MAJOR CEREAL IMPROVEMENT PROJECT

Local Level Organizational Chart



* Not a formal part of the project

—— Lines of Authority

---- Lines of Cooperation

⇄ Information flows

Program. These researchers will be administratively managed by the appropriate Program Leaders. They will be assisted by a group of Subject Matter Specialists (discussed below).

Subject Matter Specialists

A group of scientists whose educational background is in the fields of entomology, soils, water and irrigation, agricultural mechanics, weed control, and production agronomy will be stationed at the Research-Extension Center. Their duties will be twofold; first to assist the researchers in conducting their research activities; and second to provide subject matter backstopping to the district and village level extension personnel.

These specialists will be under the administrative jurisdiction of the Deputy Director of the Research-Extension Center. Vehicles and housing will be provided by the Project.

Extension

A system of well trained extension personnel will be placed at the four Research-Extension Centers, district headquarters of the eight governorates covered by the project, and every village in the four districts of the pilot study area. Vehicles for transportation and training will be provided by the project for each extension worker.

Extension Team Leader

This person is responsible to the Extension Coordination Program Leader and is in charge of developing and carrying out an effective extension educational program in two assigned Governorates. He is stationed at

the Research-Extension Center.

District Agronomists

One district agronomist is assigned to each district and is stationed at that location. They are administratively responsible to the Extension Team Leader and will assist and provide cereal production information for the extension efforts of the village agents of the district. In the pilot program districts they will direct the extension activities of village agents employed by the Project.

Village Agents

In the four districts of the pilot program one village agent will be stationed in each village and is responsible to the District Agronomist. Their function is to carry out the day-to-day extension activities with the farmers of the village. No regulatory or service activities will be assigned so that 100% of their effort can be expended on extension of information dealing with cereal crains.

Pilot Program Districts

In the Governorates of Menufia, Kafr El Sheikh, Dakalia, Beni Suef, Fayum, and Assiut the Project will provide personnel, equipment, and extension information through the District Agronomists as shown in Figure 3. Village Agents will be provided in each village of two districts each in Gharbia and Minia governorates. These four districts will be considered the pilot program area. It is projected that in the third or fourth year of the project four more districts from the other governorates may be selected to expand the pilot program under expanded financing by the Government of Egypt. It is hoped that at the end of the project

the Government of Egypt will see fit to expand this extension concept over all agricultural governorates of the country.

Implementation Plan

I. Inputs

Major inputs into this project will be in the form of personnel, training and commodities. This section will include a brief description of the items included in each of these areas.

A. Personnel

1. Expatriate Staff-Long Term

Table 12 includes the long term expatriate staff needed during the five years of this project. This team will be stationed at the Central Headquarters at Giza to be readily available to all four Research-Extension Centers as well as entities of the Government of Egypt. A brief description of each of these specialists follows:

(a) Expatriate Team Leader - 60 months

This position requires an agricultural scientist with general management and research administration experience. Previous foreign experience would be desirable. He will administer all expatriate team members, be responsible for their staffing, budget, purchases and other logistical needs, and function as follows:

(1) Serve as the principal U.S. technical representative for all activities of the Project during its duration, and act as Project Co-Director.

(2) Provide technical and administrative assistance to GOE authorities responsible for planning and implementation of work programs under the Project.

Table 12

Manpower Requirement for Expatriate Long-Term Personnel

COMPONENT	First Pm	Second Pm	Third Pm	Fourth Pm	Fifth Pm	Total Pm
	Person Months					
1. Expatriate Team Leader	12	12	12	12	12	60
2. Crop Scientist		12	12	12	12	48
3. Soil Scientist	9	12	12	12	3	48
4. Irrigation Specialist	9	12	12	12	3	48
5. Applied Research Agronomist	3	12	12	12	9	48
6. Agricultural Training Specialist	12	12	12	12		48
7. Extension-Education Specialist	12	12	12	12		48
8. Seed Multi-plication SPEcialist		12	12	12	12	48
9. Agricultural Engineer (Mech)	6	12	12	12	6	48
10. Agricultural Economics Statistician		12	12	12	12	48
TOtal Person/Months	63	120	120	120	69	492
Total Person/ YEars	5.25	10	10	10	5.75	41

He will maintain daily coordination with the Project Director General.

(3) Assure that project activities are scheduled and implemented according to the Project Paper and staff work plan.

(4) Establish and maintain coordination with GOE authorities and USAID for timely and efficient implementation of project activities.

(5) Provide evaluation reports to GOE and USAID.

(6) Recommend needed changes or amendments to the Project.

(7) Approve and facilitate requests for the procurement of commodities provided by this Project.

(b) Crop Scientist and/or Plant Breeder

Broad experience in agronomic research on field crops, preferably cereal grains with plant breeding experience desired. Will work with barley, maize, sorghum, and wheat breeders concerning with a variety of problems in Egyptian agriculture.

(c) Soil Scientist

Experienced in soil fertility and management, including physical properties. Will work closely with Irrigation Specialist (and Egyptian Water Use and Management Project) in problems of water use, water logging, and soil salinity.

(d) Irrigation Specialist

Experienced in water management, including

soil moisture relationships, water requirements, and water measurement and scheduling. He will work closely with the Egyptian Water Use and Management Project and the Soil Specialist.

(e) Applied Research Agronomist
Experienced in general crop production with special emphasis on on-farm trials and experimental design.

(f) Agricultural Training Specialist
This individual should have experience in developing and conducting a variety of non-academic short term training programs in the agricultural field. This individual will be responsible for the planning and conduct of all in-country project related in-service and pre-service training of Egyptian staff and arranging for training conducted in the United States or other countries.

(g) Extension Education Specialist
This person will have had broad experience in extension and special training in extension education. His role will be advisory to the total extension program within the project. He will assist with training programs involving extension administration, extension methods, program planning and evaluation, human behavior in the educational process, etc.

(h) Seed Multiplication Specialist
Should have knowledge and training of seed increase programs, including production, processing, and distribution.

(i) Farm Mechanization

Specialist capable of designing, adapting, and evaluating agricultural machinery, especially for small farms and/or research station use.

(j) Agricultural Economist/Statistician

Experienced in evaluating alternate farming systems, credit use, merits of mechanization and farm management. Knowledge of statistics and economic/sociological surveys. Trained to provide economic analysis of research results.

2. Expatriate Staff-Short Term

Short-term specialists (TDY) will be used to support the efforts of the long-term staff in Egypt. Examples: The Agricultural Training Specialist may need the assistance of a research administrator for a training program he plans to conduct. A Plant Breeding Specialist in wheat may require short term assistance in breeding for insect resistance. This project includes an average of three man-months for each man-year of long term expatriates in Egypt.

3. On Campus-Back Stopping

(a) Technical

An average of three man-months of technical backstopping per man-year of expatriate staff has been provided by this project. These persons will be on-campus personnel needed for functions such as: developing and conducting research complimentary to the project, developing

and teaching short term non-degree training programs for Egyptian in the U.S., providing technical information to expatriates in Egypt upon request, etc.

(b) Administration

Given the size of this project a full time CID Project Director serving under the supervision of the Director of the New Mexico State University Center for International Programs, will be needed to administer expatriate support for this program, handle purchase of commodities, arrange for training outside of Egypt, etc. Classified staff support on campus will include an administrative staff assistant and two secretaries. Part time student help will be employed when deemed necessary.

4. Egyptian Staff - Central Office

The central office for this project will be located at Giza. All administrative support for this project and its field components will be located at this site. Table 13 indicates the Egyptian Central Office Staff by program area.

The Central Office Staff is to function as both an administrative and field working team. The idea is to establish a multi-disciplinary research and production system along crop oriented lines that is capable of responding effectively to help reduce and remove existing constraints to production.

Table 13 Egyptian Central Office Staff

Position	Wheat & barley program	Maize & sorghum program	Research station & mech.	Ext. Coord.	Seed program	Economic, soc., & stat.	Project Director
Professional							
Project Director General							1
Deputy Director General							1
Program Leader	1	1	1	1	1	1	
Asst. Prog. Leader	1	1	1	1	1	1	
Plant Breeders	3	3					
Pathologist	1	1					
Entomologist	1----------						
Soil Scientist	1----------						
Irrigation Specialist	1----------						
Agronomist	1	1					
Agric. Mech.			3 (Sakha)				
Editor							1
Statistics						1	
Chemist	3----------						
Sub-totals	13	7	5	2	2	3	3
Support							
Expediter							1
Secretaries	1	1	1	1	1	1	2
Drivers	----------6----------						1
Janitors, gardeners, etc.							10
Sub-totals	2	2	2	2	2	2	14

The system will be run by a capable[1], dedicated staff which will have accepted the responsibilities, been given the necessary authority and received sufficient support. They must travel frequently, often remaining overnight at the centers (i.e. 3-5 days per week, when work requires). It should be remembered that for the actual planning and execution all staff members must work together as a well trained "team". A brief description of the responsibilities of the central office staff are listed below.

(a) Director General

The Director General of the project will be appointed by the Minister of Agriculture. He should be an agriculturalist with successful experience in research and/or extension administration. He should be extremely knowledgeable of Egyptian agriculture and have a general knowledge of international agriculture. He should be capable of working with people and have experience in public relations.

The Director General will work harmonously with the Expatriate Team Leader, serve as Chairman of the Board of Program Leaders, cooperate and interact with other Ministries, development and research projects, international research centers, and government officials at all levels.

[1] All administrative staff members must be bilingual in Arabic and English.

(b) Deputy Director General

The qualifications of the Deputy Director General should be much the same as for the Director General indicated above. He will be in charge, administratively, of the project in the absence of the Director General and assume any specific duties assigned by the Director General.

(c) Program Leaders

There will be six Program Leaders in charge of the six program areas as discussed in the Project Description section of this paper. The Program Leaders will have administrative experience and be knowledgeable in the work of his particular program area. He should be capable of working with people and command the respect of subordinates.

(d) Assistant Program Leaders

Each program area will have assigned an Assistant Program Leader. He should possess the same qualifications as the Program Leader. His professional orientation should compliment the respective Program Leader as related to the tasks of the program area.

(e) Professional Staff

A small staff of scientists[1] will be located at the central office[2] whose duties are to assist and direct the research at

[1] See Table 13 for specific scientific disciplines of this staff.

[2] The Agricultural Mechanics Staff will be located at Sakha.

the centers and to assist in the training of extension personnel. They should be well versed and experienced in their discipline and possess skills of public relations.

5. Egyptian Staff - Research-Extension Centers
The project will include four Research-Extension Centers. These will be located at Sakha, Gemmeiza, Sids, and Mallawi. Table 14 includes both research and extension personnel who will be located at each of these centers. The following is a brief description of the responsibilities of the staff identified in this table.

(a) Deputy Director of the Research-Extension Center
This person will be responsible for the operation of the Research-Extension Centers. His responsibilities will include land preparation, irrigation, labor, cultural practices and maintenance of all cereal project farm equipment. He must work closely with each Team Leader and the present Director of the Research Station. He will coordinate, assist and be administratively responsible for the Subject-Matter Specialists working at his Station. Administratively he will answer to the Research Station Coordination and Mechanization Program Leader.

(b) Team Leaders
One person in the Maize-Sorghum and Wheat-Barley group, at each station will be de-

Table 14 Research and Extension Staffing

Personnel	Total	Sakha		Gemmeiza		Sids		Mallawi	
		Wheat & Barley	Maize & Sorghum	Wheat & Barley	Maize & Sorghum	Wheat & Barley	Maize & Sorghum	Wheat & Barley	Maize & Sorghum
Research Staff									
Research Staff Deputy Director	4	1	----	1	----	1	----	1	----
Team Leader	8	1	1	1	1	1	1	1	1
Plant Breeder	16	2	2	2	2	2	2	2	2
Pathologist	6	1	1	1	1		1		1
Seed Specialist	8	1	1	1	1	1	1	1	1
Production Res. Agronomist	16	2	2	2	2	2	2	2	2
Research/Extension									
Entomologist	8	2		2		2		2	
Soils Specialist	8	2		2		2		2	
Water Specialist	8	2		2		2		2	
Agricultural Mechanic	4	1		1		1		1	
Weed Control Spec.	8	2		2		2		2	
Production Agron.	16	4		4		4		4	

Extension Personnel	Total	Gharbia	Menufia	Kafr el Sheikh	Dakalia	Beni-Suef	Fayum	Minia	Assiut
Extension Team Leader	4	1	----	1	----	1	----	1	----
District Agronomist	66	8	8	8	11	7	5	9	10
Village Agents	160	80						80	

signated as the Team Leader. It will be his responsibility to direct the overall research activities of this specific group. He will coordinate activities such as, obtaining extra labor when needed (both office and field) locating material, supplies, equipment and reapirs. He must work closely with the Research Deputy Director. Administratively he will answer to the Program Leader (Maize-Sorghum or Wheat-Barley) at the Central office.

(c) Research Personnel Assigned to Wheat-Barley; Maize-Sorghum Programs at each Center

Four plant breeders, two each of wheat and barley and maize and sorghum; four Production Research Agronomists, two each for wheat and barley and maize and sorghum; two Plant Pathologists, one each for wheat and barley and maize and sorghum, two Seed Specialist, one each for wheat and barley and maize and sorghum will be assigned to the research section of the wheat-barley and maize-sorghum Programs. Administratively they will answer to the Team Leader in their respectively section.

(d) Plant Breeders

These people will hybridize, select and/or develop superior cultivars in maize, wheat, sorghum and barley. Breeding for pest resistance and other attributes will require the cooperation of colleagues in other disciplines.

(e) Plant Pathologists

These people will study the nature of cereal diseases and develop methods for their control. These methods may include the use of chemicals, plant resistnace, biological control and/or combinations of several methods. Much of the work should be in cooperation with the breeders. They will also serve as adviser to the Extension personnel on problems related to pathology.

(f) Seed Specialists

These people will specialize in growing, roguing and maintaining clean seed increase fields of breeder and elite seed stocks. They will be responsible for cleaning, storing, and packaging of seed. They will conduct both field and laboratory germination tests when necessary. They will assist other disciplines in packaging seed for tests. They will be available for consultation concerning problems in commercial seed production.

(g) Production Research Agronomist

These people will conduct research trials on all type of cultural practices such as date and rate of seedings, fertilizers (amounts, sources, applications, etc.) weed control (mechanical and/or chemical) irrigation (times and amounts), cultivation plowing, clipping and etc. They must work closely with the Subject Matter Specialists.

(h) Subject Matter Specialist

A group of scientists whose educational backgrounds are in the fields of entomology, soils, water, agricultural mechanics, weed control and production agronomy will be stationed at the Research-Extension Center. Their duties will be two-fold; first to assist the researchers in conducting research activities, and secondly to provide subject matter backstopping to the district and village level extension personnel. These specialists will be under the administrative jurisdiction of the Deputy Director of the Research-Extension Center.

(i) Extension Team Leader

The Extension Team Leader is responsible to the Program Leader for Extension Coordination and mechanization. He is responsible for an effective educational program in cereal grain production in two assigned governorates. He has administrative and program direction over district agronomists and is stationed at the Research-Extension Center.

6. Egyptian Staff-District and Village Extension

The district and village extension staff will have the responsibility of diffusing relevant agronomic information to the small farmers. Table 14 indicates the district agronomists and village agents assigned to the eight Governorates included in this project. Since this is a pilot program, village agents from

only four districts are included in this project, while district agronomists will be placed in all eight Governorates. Should this pilot program be successful a dicision may be made to include village agents in four additional districts prior to termination of this project.

(a) District Agronomists

The District Agronomist is responsible to the Extension Team Leader and is charged with conducting an effective extension educational program in cereal grain production for his assigned district. In four selected districts of the pilot study area the District Agronomist has administrative and program direction over the Village Agents.

(b) Village Agents

The Village Agent is responsible to the District Agronomist for an effective extension educational program in cereal grain production for his assigned village. At the beginning of the project villages in only four districts will be manned by village agents.

B. Training

Training activities for this project are grouped under three major categories. These are:

a. In-country training
b. Non-degree training outside Egypt
c. Graduate level training in the U.S.

1. In-country Training

Short term and intensive training will be

provided thru this project for 160 Village Agents, 4 Extension Team Leaders, 66 District Agronomists, and 52 Subject Matter Specialists. This training will be provided at sites appropriate to the training needed. The Agricultural Training Specialist Extension-Education Specialist Egyptian counterparts will have the responsibility of designing and conducting this training. The training for the first year will focus on the Subject Matter Specialists, Extension Team Leader, and District Agronomists. The focus of the second year program will be on the Village Agents. Training activity for subsequent years will be based on a needs analysis and an assessment of the training provided during the first 2 years. This training program will accomodate the needs of those individuals who are competant in the English language.

2. Non-degree Training outside Egypt
   Project related Egyptian personnel whose needs cannot be met by in-country training will be sent to the U.S. or another third world country for non-degree training. Current estimate of the number of participants to be trained and the type and duration of this training is as follows:
   (a) 40 research and extension staff members will receive up to 3 months training during the second to fifth year of the project.
   (b) Ten mechanization staff members will re-

ceive 12 months of training during the second or third year of the project.

(c) Four individuals from the seed processing and production program area will receive six months training in the U.S.

3. Advanced Degree Training in the U.S.
Although Egypt has a number of individuals with advanced degree training there are still some subject matter areas where this type of training will be needed. Although staff in all subject matter areas included in this project will be considered for advanced degree training, the major emphasis will be placed on the Extension, Plant Protection, Irrigation, Plant Breeding and Mechanization fields.

C. Commodities

Commodities to be purchased for this project were organized under six major categories and are included in Tables 15-20. These categories and corresponding tables are:

Category	Table
Installations structures	15
Farm machinery and equipment	16
Vehicles	17
Laboratory equipment	18
Offices equipment & supplies	19
Household appliances	20

Table 15

Building Requirements for Central Office and Research-Extension Centers

LOCATION AND SPACE DESCRIPTION	NO. REQ.	AVG. UNIT SIZE	EST. SQ. FT REQ.	EST. COST SQ. FT.	EST. COST
		- - - - - - sq. ft. - - -			$
GIZA (incl. Cereal Quality Lab)					
Staff Offices	39	150	5850	$40	234,000
Secretarial Offices	12	100	1200	do	48,000
Laboratories	2	550	1100	do	44,000
Storerooms	4	200	800	do	32,000
Kitchen	1	100	100	do	4,000
Emergency Room	1	100	100	do	4,000
Reading/Library	2	500	1000	do	40,000
Lounge	1	500	500	do	20,000
Closets/Cabinets	20	50	1000	do	40,000
			11,650		466,000
Halls, entrances, etc. @ 15%			1,748	do	69,900
			Sub-Total		$ 535,900
SAKHA & MALLAWI					
Staff Offices	20	150	3000	$40	$ 120,000
Secretarial Offices	3	100	300	do	12,000
Laboratory	5	550	2750	do	110,000
Kitchen	1	100	100	do	4,000
Emergency Room	1	100	100	do	4,000
Reading/Library	1	500	500	do	20,000
Conference Room	1	500	500	do	20,000
Storage, Office	2	250	500	do	20,000
Seed Storage	1	250	250	do	10,000
Shops	1	1000	1000	$20	20,000
Equip. Storage	1	12000	12000	5	60,000
Apartments	10 @ $17,500.00				175,000
Halls, entrances, etc.			2200	$40	88,000
Guest House	1	4000	4000	do	160,000
Greenhouse	1	1800	1800	10	18,000
			Sub-Total (Per Center)		$ 841,000

Table 15 (contd)

GEMMEIZA & SIDS	
Renovate existing structures, construct eight addition apartments, & misc. shop facilities, etc. @ $500,000.00 each	$1,000,000
DISTRICT EXTENSION AGRONOMIST OFFICES	
Portable Office Bldg. 66 ea. @ 160 sq. ft. equals 10,560 sq. ft. @ $40.00	424,400
Total (Table 15)	$3,642,300

Table 16

Machinery and Equipment for Research-Extension Centers

	ITEM	UNIT COST	SUB-TOTAL	SPARE PARTS	EST. TOTAL COST	LOCATION
Research-Extension Center Equipment		$		$	$	
2	80 d.b.hp actors	20,000	40,000	8,000	48,000	S , G
2	60 d.b.hp Tractors	18,000	36,000	7,200	43,200	Se, Ma
4	35 d.b.hp Tractors	14,000	56,000	11,200	67,200	S,G,Se,Ma
4	40' Land Planes	3,000	12,000	600	12,600	"
4	Moldboard Plow	1,500	6,000	300	6,300	"
4	Chisel Plow	1,500	6,000	300	6,300	"
4	Lister w/Tool bar	1,500	6,000	300	6,300	"
4	Bed Shaper 2/Tool bar	1,500	6,000	300	6,300	"
4	Adjust. Cultiv.	1,200	4,800	240	5,040	"
4	Flail Chopper	1,700	6,800	340	7,140	"
4	Rotary Chopper	1,200	4,800	240	5,040	"
4	Lilliston Cult.	2,200	8,800	440	9,240	"
4	80" rotovators	3,400	13,600	680	14,280	"
4	Hagi Plot Comb.	10,000	40,000	8,000	48,000	"
4	10' Fert. Spreader	750	3,000	150	3,150	"
4	6' Fert. Spreader	750	3,000	150	3,150	"
4	Ditch openers	500	2,000	100	2,100	"
4	4 row Cone Planter	4,000	16,000	800	16,800	"
4	80" Blade	750	3,000	150	3,150	"
4	10' Grain Drill	3,400	13,600	680	14,280	"
4	Farm Wagons	750	3,000	150	3,150	"
4	Pipe Wagons	750	3,000	150	3,150	"
4	Hilldrop Planter	3,500	14,000	700	14,700	"
4	Port. Pump 4" out	3,000	12,000	2,400	14,400	"
4	Sets gated pipe 4" Irrigation	6,000	24,000	1,200	25,200	"
4	4" in-line Meters	750	3,000	600	3,600	"
4	Sets Shop Equip	15,000	60,000	3,000	63,000	"
4	3 pt. Border Disc.	1,000	4,000	200	4,200	"
4	Vogel Threshers	4,500	18,000	3,600	21,600	"
4	Misc. Small Equip.	20,000	80,000	16,000	96,000	"
4	Seed Cleaning Equip.	25,000	100,000	20,000	120,000	"
	Sub-total		608,400	88,170	696,570	
Extension Function @ Research-Extension Center						
4	25 hp Tractor	8,000	32,000	6,400	38,400	S,G,Se,Ma
4	6' Grain Drill	2,400	9,600	460	10,060	"
4	6' Fert. Spread.	750	3,000	150	3,150	"
4	5 ton-5th wheel trlr.	8,000	32,000	1,600	33,600	"
4	Tract. Mount Sprayer	4,000	16,000	800	16,800	"
	Misc. Small Equip.	10,000	40,000	8,000	48,000	"
	Sub-total		132,600	17,410	150,010	
	Total		$741,000	$105,580	$846,580	

Table 17

PROJECT VEHICLES

LOCATION & PROGRAM	SEDANS	CREW CAB P/U	15-PASSENGER VAN	½-TON PICK UP	¾-TON PICK UP W/5TH WHEEL HITCH	1-TON TRUCK W/5TH WHEEL HITCH	MOTORCYCLES
CAIRO							
Expatriate Team	3	12	2	1			
Project Administration	3	12	1	2			
GEMMEIZA							
Research			1	3			
Res. Sta. Dept. Dir.		1		1	1		
Extension Team			2	4			105
SAKHA							
Mechanization Program				4	1	1	3
Research			1	3			
Res. Sta. Dept. Dir.		1		1	1		
Extension Team			2	4			19
SIDS							
Research			1	3			
Res. Sta. Dept. Dir.		1		1	1		
Extension Team			2	4			13
MALLAWI							
Research			1	3			
Res. Sta. Dept. Dir.		1		1	1		
Extension Team			2	4			108
SHANDAWEEL							
Research			1				

Table 18

Laboratory Equipment for Central Office

and Research/Extension Center

Item	Unit Cost $	Sub Total $	Spare Parts $	Est. Total Cost $	Location[1/]
4 Entomology Lab Equipment	50,000	200,000	40,000	240,000	S, G, Si, Ma
4 Soil Lab	100,000	400,000	80,000	480,000	"
4 Pathology Lab	100,000	400,000	80,000	480,000	"
4 Breeders Workroom Equipment	25,000	100,000	20,000	120,000	"
1 Cereal Quality Lab	150,000	150,000	30,000	180,000	Headquarters
1 Lab Equipment for Giza	50,000	50,000	5,000	55,000	"
		1,300,000	255,000	1,555,000	

1/ S= Sakha, G=Gemmeiza, Si= Sids, Ma= Mallawi

Table 19

Office Equipment and Supplies

	No.	Unit Price $	Total $
Hand Calculators	100	40	4,000
Desk Calculators	10	400	4,000
Ditto Machine	4	400	1,600
Typewriter			
English	25	1,000	25,000
Arabic	5	1,200	6,000
Photocopy -			
Xerox type small	2	7,000	14,000
Xerox type large	1	10,000	10,000
Office furniture	120 sets	1,000	120,000
Supplies (location)	5	12,000	60,000
Training Aids (location)	5	4,000	20,000
Air Conditioners	458	750	343,500
		(F.O.B-USA)	608,100
		Freight 50%	304,050
		Breakage and Loss 10%	60,810
		Total	$ 972,960

Table 20

House Appliances for Expatriate Staff

and Guesthouse

No. Req.	Item	Unit Cost	Total
		$	$
74	Air Conditioner/Heater	750	$ 55,500
15	Refrigerator	1,000	15,000
15	Gas Cook Stoves	600	9,000
		Sub Total	$79,500
		Freight (50%)	39,750
		Breakage and Loss (10%)	7,950
		Total	$127,100

Project Commencement Activities

Director General Responsibilities

Ideally, the Director General should be appointed shortly before contract negotiation with CID begins such that he can participate in this activity. Once the contract is signed he should initiate the following actions:

(a) acquire land for the Project,
(b) arrange for office space for Egyptian and expatriate professional and support staff,
(c) arrange for expeditor, secretaries and other support staff for Egyptian Central Office Staff,
(d) assist CID Project Director in arrangements he will be making in preparation for the arrival of the expatriate team.

CID Project Director Responsibilities

Immediately after the contract is signed the CID Project Director should arrive in Egypt to make the following arrangements:

(1) make temporary housing arrangement for the first group of expatriate staff,
(2) arrange for interpretor and expeditor,
(3) arrange transportation and drivers for expatriate team members,
(4) initiate the preparation of a commodity list,
(5) initiate the planning of buildings to be constructed as a part of this project,
(6) arrange procedures for temporarily storing commodities,
(7) take initial steps to identify support staff

for the expatriate team,

(8) assist in the initial adjustment of first group of expatriates as they arrive in Egypt.

Staffing Strategy

The three long-term expatriate staff members most crucial to the initiation of the project are the team leader, agricultural training specialists, and agricultural extension specialists. The reasons for this statement are as follows:

Team Leader

The Team Leader is needed in Egypt as soon as possible after the contract is signed so that he can contribute to the development of organizational and operations policies and procedure which will provide direction for the program developed through this project and provide direction for staff involved in this program. The Team Leader will be responsible for the continuance of activities initiated by the CID Project Director, i.e. building construction and commodities acquisition.

Extension Education Specialist

Since the extension - research linkage involved in this project is a new concept in Egypt, the Extension Education Specialist must develop an education program for all staff involved in this project. Roles and responsibilities and duties of these roles need to be developed and shared with all parties concerned.

Program planning, evaluation and extension methodology must also receive considerable attention during the early stages of this project. Lastly the relation-

ship of the new system to the current extension system and the agents in each will be a problem with which the extension specialist can deal.

Agricultural Training Specialist

Training, both in Egypt and in the United States and third world countries is an important part of this project. Once again since Egyptian research and extension specialists will be working together in a new and different manner and often with different responsibilities, in-country training must begin immediately. Also, those individuals to be trained outside of Egypt must be identified such that they can complete their training and become involved in the project as soon as possible. The training specialist will need to identify initial and long-term training needs and develop a coordinated training plan to meet these needs.

Shortly after the arrival of the above mentioned three staff members, the soil scientists and irrigation specialists should arrive in Egypt. These individuals should have a major role in leveling and preparing land for irrigation and construction of buildings. They should be accompanied by three short-term specialists; an entomologist, plant pathologist and agricultural mechanization specialist . These five specialists will assist in the acquisition of machinery and/or equipment and the construction of appropriate buildings and/or laboratories at the Research-Extension Centers for their respective areas of specialization. Other short-term staff will be used to support this team as deemed appropriate.

The remainder of the long-term staff should be in

Egypt toward the end of the first or beginning of the second year.

Base Evaluation Data

Within the first year of the project a base data study must be completed upon which to evaluate progress. This could probably be done most effectively by an Economist/Sociologist on a short-term assignment with the assistance of the Egyptian staff.

Actions Required of the Government of Egypt to Assure Project Success

There are existing and potential constraints which require response and committment by the GOE to assure success of the Egyptian Major Cereals Improvement Project. Among these actions are:

1) Significantly increase Egyptian Staff salaries using the international pay scale as a guide. The success of this Project is completely dependent on the involvement of highly qualified and dedicated Egyptian scientists. Researchers in the Ministry presently view their salaries as inadequate and far below the international scale for similar education and training. Consequently many acquire a second job in order to recieve what they consider to be an adequate income. The design team seriously questions whether qualified staff, with sufficient amount of time to dedicate to this project, can be obtained if they do not receive considerably more compensation than is currently received.
2) Extend working hours to 40-45 per week. Given the design of this project, it becomes imperative

that the staff have time and resources for travel. This would be extremely difficult under the current situation where the work day is from 9:00 a.m. to 2:00 p.m. We recommend the following working hours for Egyptian and Expatriate Staff for this project.

8:00 a.m. - 5:00 p.m. Saturday-Wednesday
8:00 a.m. - 1:00 p.m. Thursday

3) Adequate land should be allocated for and exclusively under the control of this project. The total land requirement at the four Research-Extension Center is 1,000 feddans distributed in the following manner

Location	Feddans Required
Sakha	400
Gemmeiza	300
Sids	200
Mallawi	100

In addition, approximately 2 feddans will be needed for the central office in Giza.

4) The GOE will have the following responsibility regarding items imported from the U.S. and other countries for this project.
   a) Exempt all commodities from import duties or be responsible for their payment,
   b) Insure and license all vehicles,
   c) Provide phytosanitary certificates for the unrestricted movement of seeds in Egypt,
   d) Provide expatriate staff with all privileges and immenities normally extended to International agencies.

5) Guarantee that all commodities and vehicles purchased for this project will remain under the control of the Director General and the American Co-director of this project, and will be used exclusively for activities directly pertaining to this project.
6) Allow professional staff at the 4 Research-Extension Centers to make decisions regarding which information can or should be used for extension purposes prior to the formal publication of research results.

Financial Analysis and Plan

Table 21 provides a summary of the financial support needed for the implementation of the Egyptian Major Cereal Improvement Project.

All budget items with the exception of the Egyptian professional and support staff salaries have been calculated in dollars rather than pounds, although we realize some of these items will be purchased in pounds.

It is our assumption that the Ministry of Agriculture has agreed or will agree to pay for all base salaries and merit and bonus salaries for their professional and support staff.

Table 21

Summary of Project Cost Estimates

		Dollars
A.	Personnel	
	U.S.	
	Professional Staff and Backstopping (Table 22)	8,139,346
	In Egypt Support Staff Cost (Table 23)	285,400
	Egyptians	
	Professional Staff (Table 24)	6,140,400
	Support Staff (Table 25)	1,667,400
B.	Training (Table 26)	2,391,000
C.	Buildings and Installations (Table 27)	3,642,300
D.	Commodities	
	Machinery & Equipment (Table 28)	1,368,928
	Vehicles (Table 29)	4,899,420
	Laboratories (Table 30)	2,488,000
E.	Other Direct Costs (Table 31)	
	In Egypt	1,465,060
	In U.S.A.	135,000
	Sub-total	32,625,254
	U.S. Contribution	
	Sub-total	24,817,454
	Contingencies (10%)	2,481,745
	Total	27,299,199
	Egyptian Contribution	
	Total	7,807,800
	Total for Project	35,106,999

Table 22

Cost Estimates for U.S.A. Resident Staff and Backstopping Support

Resident in Egypt		
1 Expatriate Team Leader for 5 years @ 131,890	$	659,450
4.25 Staff 1st year @ 120,410		511,743
9 Staff for year 2, 3, 4 @ 120,410		3,251,070
5.75 Staff for 5th year @ 120,410		692,358
Sub-total	$	5,114,621
Backstopping Support		
TDY (Short-term Support)		
2.5 man years for 1st year @ 114,720	$	286,800
2.5 man years for 2nd year @ 114,720		286,800
2.5 man years for 3rd year @ 114,720		286,800
2.5 man years for 4th year @ 114,720		286,800
2.0 man years for 5th year @ 114,720		229,440
Sub-total	$	1,376,640
Departmental Backstopping		
2.5 man years for 1st year @ 64,080	$	160,200
2.5 man years for 2nd year @ 64,080		160,200
2.5 man years for 3rd year @ 64,080		160,200
2.5 man years for 4th year @ 64,080		160,200
2.0 man years for 5th year @ 64,080		128,160
Sub-total	$	768,960
Administrative Support		
1.5 professional staff - 5 years @ 81,550	$	611,625
1 staff assistant - 5 years @ 25,220		126,100
2 secretaries - 5 years @ 11,640		116,400
Part time - 5 years @ 5,000		25,000
Sub-total	$	879,125
TOTAL	$	8,139,346

Table 22a

Illustrative Annual Costs for

Resident U. S. Staff

(Assuming 2 year tour of duty & family with 2 children)

	Expatriate Project Leader	Expatriate Staff
Base Salary	$ 42,000	$ 36,000
Fringe Benefits (30%) (includes workmans compensation)	12,600	10,800
Post Differential	4,000	3,600
Allowances		
shipment of personal & household effects (one way)	6,500	6,500
shipment of automobile (one way)	2,500	2,500
education at $ 4,00 per child	8,000	8,000
housing, including settling in	20,000	20,000
rest and relaxation	500	500
marine insurance, misc.	1,500	1,500
international travel	4,000	4,000
domestic travel	750	750
Institutional overhead (MDCM - 40%)	29,540	26,260
Total	$ 131,890	$ 120,410

Table 22b

Illustrative Costs for TDY Staff

(Assuming average of 2 months assignment)

Base Salary - 2 months @ 3,000/month	$ 6,000
Fringe Benefits	1,800
Per diem 60 days @ $ 70.00/day	4,200
International Travel	2,000
Miscellaneous Expenses	500
Institutional Overhead @ (77%)	4,620
Total	$ 19,120
Annual Equivalent	$114,720

Table 22c

Illustrative Cost for Back-up Staff in USA

Base Salary	$ 32,000.00
Fringe Benefits (@ 17%)	5,440.00
Computer	1,000.00
Miscellaneous	1,000.00
Institutional Overhead	24,640.00
Total	$ 64,080.00

Table 22d

Illustrative Costs for
On-Campus Administrative Support

Project Director	
Base Salary	$ 35,000
Fringe Benefits @ 20%	7,000
Transportation	
International 3 trips/year	4,200
Domestic	1,500
Per diem	
In Egypt - 90 days @ 70.00	6,300
In U.S.A. - 15 day @ 40.00	600
Institutional overhead @ 77%	26,950
Total	$ 81,550
Staff Assistant	
Base Salary	$ 13,000
Fringe Benefits @ 17%	2,210
Institutional overhead @ 77%	10,010
Total	$ 25,220
Secretary	
Base Salary	$ 6,000
Fringe Benefits @ 17%	1,020
Institutional overhead @ 77%	4,620
Total	$ 11,640

Table 23

Estimated Costs for Expatriate Team Support Staff

1	Expeditor/5 years @ $ 4,200	$ 21,000
1	Administration Assistant/5 years @ $ 4,200	21,000
2	Secretaries (Bilingual)/5 years @ $ 3,360	33,600
1	Secretary (English Speaking)/ 5 years @ $ 5,000	25,000
1	Translator/5 years @ $ 4,200	21,000
13	Drivers/5 years @ $ 2,520	163,800
	Total	$ 285,400

Table 24

Estimated Costs for Egyptian Professional Staff

No. Req.:	Title	Annual Salary	5 year Total
		L.E.	L.E.
Central Office			
1	Director-General/5 years	6,000	30,000
1	Deputy Director General/5 years	5,400	27,000
5	Program Leaders/5 years	27,000	135,000
5	Asst. Program Leaders/5 years	24,000	120,000
6	Plant Breeders/5 years	25,200	126,000
2	Pathologists/5 years	8,400	42,000
1	Entomologist/5 years	4,200	21,000
1	Soil Scientist/5 years	4,200	21,000
1	Irrigation Scientist/5 years	4,200	21,000
2	Agronomist/5 years	8,400	42,000
3	Agri. Mechanization/5 years (located at Sakha)	10,800	54,000
1	Statistician/5 years	4,200	21,000
3	Chemists/5years	10,800	54,000
1	Editor/5 years	3,600	18,000
	Sub-total		732,000
Four Research-Extension Centers			
4	Research Station Deputy Dir/5 yrs	19,200	96,000
8	Team Leaders/5 years	33,600	168,000
16	Plant Breeders/5 years	57,600	288,000
6	Pathologists/5 years	21,600	108,000
8	Seed Specialists/5 years	28,800	144,000
16	Prod. Research Agronomist/5 years	57,600	288,000
8	Engomologists/5 years	28,800	144,000
8	Soil Specialists/5 years	28,800	144,000
8	Water Specialists/5 years	28,800	144,000
8.	Weed Control Specialists/5 years	28,800	144,000
4	Agricultural Mechanics/5 years	14,400	72,000
16	Production Agronomists/5 years	57,600	288,000
4	Extension Team Leaders/5 years	14,400	72,000
66	District Agronomists/5 years	118,800	594,000
160	Village Agents/5 years	192,000	960,000
	Sub-total L.E.		3,654,000
	Total L.E.		4,386,000
	$ Equivalent		6,140,400

Table 25

Estimated Costs for Egyptian Support Staff

No. Req.		Annual Salary	5 year Total
Central Office		L.E.	L.E.
1	Expediter/5 years	3,000	15.000
1	Administrative Asst./5 years	3,000	15,000
8	Secretaries/5 years	19,200	96,000
10	Laborers/5 years	6,000	30,000
7	Drivers	12.600	63.000
	Sub-total		219,000
Four Each Research-Extension Centers			
8	Mechanics/5 years	19,200	96,000
8	Mechanics Helpers/5 years	9,600	48,000
8	Tractor Drivers/5 years	14,400	72,000
70	Technicians/5 years	84,000	420,000
40	Laborers/5 years	24,000	120.000
8	Drivers/5 years	14,400	72,000
12	Secretaries/5 years	21,600	108.000
4	Cooks/5 years	7,200	36,000
	Sub-total L.E.		972.000
	Total L.E.		1,191,000
	$ Equivalent		1,667.400

Table 26

Estimated Costs for Participant Training

Type	Number of Trainees	Man Months of Training/ Trainee	Cost/ Month	Total Cost
In Country training				
Village Agents	160	7	$ 600	$ 672,000
District Agronomists	66	5	600	198,000
Subject Matter Specialists	52	5	600	156,000
Extension & Team Leaders	4	5	600	12,000
Non Degree training Outside Egypt	60	6	1,200	432,000
Advanced Degree training USA				
M.S.	20	24	1,100	528,000
Ph.D.	10	36	1,100	396,000
				$ 2,394.000

Table 27

Estimated Costs of Buildings and Installations

(See Table 15)

Location/function	Total
Giza (Central Office)	$ 535,900
Sakha	841,000
Mallawi	841,000
Gemmieza	500,000
Sids	500,000
District Extension Agronomist Officer	424,400
Total	$ 3,642,300

Table 28

Estimated Costs of Machinery & Equipment for Research & Extension Centers

Purchases (See Table 16)		
Equipment & Machinery		$ 741,000
Spare Parts		105,580
	Sub-total	$ 846,580
Shipping Costs		
Freight (USA to Cairo @ 50%)		$ 423,290
Breakage & Loss @ 10%		84,658
	Sub-total	$ 507,948
Operating Cost (tractors)		
12 Vehicles @ 1,200		$ 14,400
	Total	$1,368,928

Table 29

Estimated Costs of Vehicles

(See Table 17)

Vehicle	No. Req.	Unit Price	Total
Sedan	6	6,000	$ 36,000
Crew Cab/pickups	28	10,000	280,000
Vans	16	11,000	176,000
½ Ton pickup	39	9,000	351,000
¾ Ton pickup w/5th wheel hitch	5	11,000	55,000
1-Ton truck w/5th wheel hitch	1	15,000	15,000
Motorcycles	248	1,000	248,000
		Total	1,161,000

Cost Summary

Total Vehicle Cost F.C.B. USA[1]		2,322,000
Freight (USA to Cairo @ 40%)		928,800
Spare parts (20%)		464,400
Damage & Loss @ 10%		23,220
	Total	4,899,420

1 Since these vehicles will need to be replaced in approximately 2 years this budget estimate will be doubles.

Table 30

Estimated Costs of Laboratory Equipment
(See Table 18)

Scientific equipment (Giza)	$ 55.000
Entomology Laboratories	240,000
Cereal quality laboratory	180.000
Soils laboratories	480 000
Pathology laboratories	480,000
Breeders Workroom Equipment	120,000
F.O.B U.S.	1,555,000
Freight 50%	777.500
Breakage & Loss 10%	155 500
Total	$ 2,488,000

Table 31

Estimate of Other Project Costs

In Egypt		
Office Equipment & Supplies (See Table 19)		$ 972,960
House Appliances for Expatriate Staff and Guesthouse (See Table 20)		127,100
Guest house (1 Expatriate - 1 Egyptian)		50,000
Per Diem in Egypt 900 days/year x $70.00		315,000
	Total	$ 1,465,060

In United States	Per Year	Total
Communications	$ 12,000	$ 60,000
Office & Field Supplies	5,000	25,000
Office Equipment	3,000	15,000
Library Materials	5,000	25,000
Miscellaneous	2,000	10,000
	Total	$ 135,000

Project Analysis

The Consortium for International Development (CID) proposes to enter into agreement with the Government of Egypt through the Ministry of Agriculture with funding from AID to provide technical and professional assistance to the Egyptian Major Cereal Improvement Project as described herein. CID and its member universities (Colorado State University, New Mexico State University, Oregon State University, Texas Tech University, University of California, University of Arizona, University of Idaho, Utah State University, and Washington State University) will work with the Government of Egypt, and in particular the Ministry of Agriculture, to increase the country's capability to produce increased quantities of wheat, maize, sorghum and barley. Such increases in productivity will have beneficial effects upon the nation of Egypt by decreasing its dependence upon cereal production of other countries and improving its balance of trade. Increased cereal production will create increased indigenous economic activity creating more employment, increasing payments to wage earners, and creating increased demand for consumer goods and services.

Since it is believed that increases in cereal productivity can be achieved without proportionate increases in the cost of production (i.e. improved seed quality and improved managerial practices) the net income of farmers will be increased causing additional economic activity in the rural areas of Egypt. These rural communities are in desperate need of increased economic activity to provide the

financial base to upgrade their community services and personal living conditions. With over 4000 villages in Egypt the most effective way to improve living conditions is through activities which result from improved economic conditions.

Economic Analysis

The success of the Project depends to a great deal on activities outside the scope of the project itself. Several constraints have been identified which will not be actively pursued under the auspices of this project. Soil salinity and water logging are definite constraints to increased productivity of cereals. These problems are being considered by a separate AID sponsored development project and are not included here to avoid unnecessary duplication of efforts.

Increased cereal grain production will require increased quantities of nitrogen fertilizer. Available information indicates that new fertilizer plants, currently under construction, will be "on line" in about two years and will have the capacity to produce the needed supplies.

It is believed by the Project Design Team that the Government policy on price controls of certain cereal grains has a depressing effect on productivity. A price which more accurately represents the free market price would encourage greater productivity of cereal grains. Assurance has been given that these policies are under close scrutiny at the present time.

Assuming that these constraints, which are not being considered by the Project, are adequately dealt with over the next five years, an increase in productivity of cereal grains of 25% for each of wheat, maize, sorghum, and barley is possible in the eight governorates covered by the project. In 1978, the

percentage of Egypt's total production of the four cereals produced in the eight governorates was: wheat 75%, maize 66%, sorghum 50%, and barley 33%. Some "spill-over" benefits will be accomplished in the remaining cereal producing areas of the country. Increases in production of 12% for each of the cereal crops should be possible in these areas.

If area planted to cereal crops remains constant at 1978 levels these increases in productivity are as indicated in Table 30. Increases in cereal productivity and associated values at 1977 export prices are shown in Table 31.

Increased value of productivity amounts to 66,539,000 LE. Not all of this increased productivity, however, can be applied to the nation's balance of trade.

If population continues to increase at 2.5% annual rate, the number of persons in Egypt will total 48.1 million by 1985. This increase in population creates increased demand for cereal grains. At current per capita consumption levels the demand for cereals in 1985 will be: wheat 7.1 million tons, maize 4.5 million tons, sorghum 808.1 thousand tons, and barley 158.7 thousand tons. Table 32 shows the import-export situation in 1985 for the four cereal grains under conditions of constant 1978 yields and projected yield increases. The net balance of trade for Egypt would be improved in the amount of 90.7 million LE in the fifth year alone. If it is assumed that the first year of the project produced no increase in cereal grain yield and each of the following four years produced one fourth of the projected increase, the total improvement in balance of trade over the five year project would be 226.7 million LE. Assuming a total cost of

Table 30 Total production of wheat, maize, sorghum, and barley under assumed yield increases.

Eight Governorates	1978 Base yield T/feddan	Estimated yield 1985 T/feddan	Area planted feddans	Total 1985 production 1000 tons
Wheat	1.47	1.84	746,894	1,374.3
Maize	1.70	2.12	1,069,100	2,266.5
Sorghum	1.65	2.06	200,390	412.8
Barley	1.39	1.74	27,132	47.2
Rest of Country				
Wheat	1.40	1.58	633,718	1,001.3
Maize	1.64	1.84	829,003	1,525.4
Sorghum	1.58	1.77	232,176	410.9
Barley	1.16	1.30	86,691	112.7
Total for Country				
Wheat	--	1.72	1,380,612	2,375.6
Maize	--	2.00	1,898,103	3,791.9
Sorghum	--	1.90	432,566	823.7
Barley	--	1.44	110,823	159.9

Table 31 Increases in cereal productivity and values

	Total Productivity 1978	Total Productivity 1985	Value of Production* 1978	Value of Production* 1985
	(1000 tons)		(1000 L.E.)	
Wheat	1,933	2,375.6	102,758	126,287
Maize	3,117	3,791.9	158,312	192,591
Sorghum	681	823.7	34,588	41,836
Barley	132	159.9	7,017	8,500
			LE 302,675	LE369,214

* at 1977 export prices

Table 32 Projected Import-Export situation for Cereal Grains in 1985 under two levels of productivity.

Net Imports - 1985

	1978 Level Productivity Quantity Imported Million tons	1978 Level Productivity Value 1000 LE	Projected Yield Increases Quantity Imported Million tons	Projected Yield Increases Value 1000 LE
Wheat	5.2	276,484	4.7	249,899
Maize	1.4	71,106	.7	35,553
Sorghum	.13	6,603	-*.15	- 7,618
Barley	.27	14,353	- .001	- 53
Total	7.00	368,546	5.43	277,781

* Minus sign indicates an export

the project as $ 30 million, the benefit-cost ratio approaches 10.6:1.

Economic benefits will also be felt by the farmers of Egypt. Increased yields will result from minimal increases in cost per feddan. Due to the relatively high levels of current usage of fertilizer and chemical pesticides these costs are expected to increase only moderately as yields are increased. The major yield increasing effects will result from improved cultural and managerial practices.

It is projected that net income per feddan of the four cereal grains will increase (in real terms[1]) by approximately: 12.86 LE for wheat, 21.23 LE for corn, 23.25 LE for sorghum, and 14.45 LE for barley. A farmer who produces one feddan each of corn and wheat (as part of the typical 3 year cotton rotation on a 3 feddan farm) will find his net income increased by 34.09 LE.[2]

Social Impact Analysis

The social impact of the Project can be analysed as a direct result of the economic impact. An improved balance of trade can only result in improved social conditions for the citizens of Egypt as financial resources are freed from purchase of cereal grains to be used for improving living conditions. Improved roads, communication systems, educational facilities, etc. could be the result of saving 226 million LE over the next five years.

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[1] Adjusting for inflationary factors.

[2] Using most recent reliable farm cost and price information.

Social impacts will also be significant at the village level as farmers incomes are increased. The propensity to consume is extremely high in the rural areas of Egypt, meaning that very high proportions of additional income is used to purchase consumer goods and services. This fact in conjunction with the multiplier effect will have significant effects on the economic activity of the rural communities. This activity will have a positive impact upon living and social conditions.

The project proposes an ambitious training program with individuals at all levels from village extension agents to the Program Leaders, Directors of Research Stations, and other high ranking officials being provided technical, administrative, and practical training. Such training will provide long term social benefits as those who have been trained continue to work and progress upward in the Ministry of Agriculture.

The mechanization program will provide a means of reducing labor requirements to agriculture in Egypt. Labor reductions for cereal grain production will free labor for other employment, such as industrial and commercial. The long-term social impact could be far reaching if the industrial capacity of the country is increased to provide employemnt for workers freed from the farms. A second benefit from increased mechanization will result from the reduced dependence upon animal power, reducing the need for forage crops which presently compete with cereals for land. This reduction in forage demand could have significant impacts on cereal production as more area is converted to cereal grains, more timely planting is allowed, and leaf strip-

ping in corn and sorghum is reduced.

Technical Feasibility

Egypt has a significant number of well trained and educated crop scientists. The presence of a cadre of excellent plant breeders, pathologists, entomologists, and other disciplines assures the feasibility of the Project. The primary constraints currently existing are the lack of a professional attitude toward research and extension and the lack of a properly structured organization which encourages the type of output required by a developing agriculture. Both of these constraints have been dealt with in this project proposal. The training activities and the inclusion of scientists from the United States will have a positive impact on these constraints.

The time is right for instituting the Project. The Government of Egypt is receptive to the institutional changes, financial input, and assignment of personnel necessary to make the project a success. USAID and the Consortium for International Development stand ready to make the necessary commitments in the form of financial and technical assistance.

Productivity of cereal grains in Egypt has seemingly reached a plateau. Further yield increases will come only from a concerted effort resulting from a unique approach to interdisciplinary research and extension efforts.

Evaluation

One of the main objectives of this Project is to improve the social and economic conditions of the Egyptian small farmer. In order to reach this main objective, the Project has designed a multi-disciplinary research, extension and training program. This program will focus on removing and/or alleviating constraints to cereal production in Egypt. As constraints are alleviated, yields, production and income should increase in proportion to production inputs, resulting in a greater net income to the farmer.

Other outputs of this project are to establish a cadre of qualified cereal technical specialists which can conduct on-farm trials and demonstrations in eight major cereal growing governorates.

To insure progress toward these objectives, program reviews will be made by the office of the Director General from reports prepared by program leaders every six months. It is also recommended that two teams of 3 expatriates each should conduct a project review during the third and fifth year of this project. One team will focus on summer crops (maize and sorghum) and the other team will focus on the winter crops (wheat and barley). In order to coordinate the efforts of the review teams it is recommended that one member serve on both teams.

Perhaps the best evaluation would be the measurement of crop yields in the two pilot program areas. Yields in these areas should be carefully and systematically monitored each year and compared with previous years' yields. Similar procedures should be used to

evaluate other districts and governorates to determine the effectiveness of the pilot and the district programs.

Importation of these four cereal grains should be monitored. If yields and production are increased, imports of cereal should be less. Less imports should have a positive effect on the balance of payments in the Egyptian economy.

On-farm and research tests results should be a guide to the yield potential of new cultivars and cultural practices. If the yield spread between farmers yields and research results is small it would indicate that information transfer, improved cultivars and cultural practices are being readily accepted. (It is also an indication that more research effort is needed.) The number of improved cultivars released and how rapidly they are accepted would also be a measure of the effectiveness of this program.

Quality of commercial seed should be monitored each year and compared to foundation seed produced by the research station. Seed purchased by farmers should be sampled and checked for purity, germination and yield potential.

The quantity of training of personnel could be measured by the number of man-hours of training received per month. The quality measurement of training is more difficult to evaluate. However, an assessment of job performance should be made before and after an individual receives training to determine the effectiveness and appropriatemess of his training program.

A sociological survey or study of farmers in the two pilot areas should be made. This study should be designed to determine if there are any changes in the farmers attitudes toward the service they receive from the government, in the area of extension, research, seeds, etc.