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Challenges in the Liberalization of Seed Production and Marketing in Egypt:

The Case of Hybrid Maize Seed

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ACRONYMNS

APRP	Agricultural Policy Reform Program
ARC	Agricultural Research Center
CAS	Central Administration for Seed
CASC	Central Agency for Seed Certification
CASP	Central Agency for Seed Production
CIMMYT	International Maize and Wheat Improvement Center
DC	double cross
EGA Seed	Egyptian Agricultural Company for Seed Production
ESAS	Egyptian Seed Association
FCRI	Field Crops Research Institute
GOE	Government of Egypt
GTZ	German Technical Assistance Program (Deutsche Gesellschaft Fur Technische Zusammenarbeit)
HSU	Horticultural Services Unit
MALR	Ministry of Agriculture and Land Reclamation
MRP	Maize Research Program
PBDAC	Principal Bank for Development and Agricultural Credit
RDI	Reform Design and Implementation Unit of APRP
SC	single cross
3WC	three-way cross

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Findings and Recommendations

In 1980, due to technical difficulties associated with maize seed production, particularly hybrids, the Government of Egypt (GOE) decided that maize seed production would be assigned to the private sector. Since that time, the production of certified, hybrid maize seed has made significant advances. By 1985, production exceeded 10,000 MT, which was more than three times what had previously been achieved, and it exceeded 23,000 MT by 1991. Currently, more than half of Egypt's maize area is seeded with certified hybrids, which is high compared to other developing countries, and which helps to explain why the national average maize yield – 7.6 MT per hectare – is also high by world standards.

While most of the seed produced has been based on parent varieties developed in Egypt by the Agricultural Research Center (ARC), imported seed and breeding materials have also made important contributions. Due to concerns about the quality of some of the privately produced seed, the government resumed certified maize seed production in limited quantities at the Seed Unit of the ARC in 1986-87. Nevertheless, the private sector has produced most of the seed since that time, and private companies have shown that they have the ability to produce more than enough hybrid seed to meet farmers' requirements.

The study team's review found that a large number of new firms have entered the industry in the past few years and that the share of maize seed produced by large producers has declined. The considerable expansion in maize seed production, together with information on pricing patterns and on the costs of production, shows that there has been no monopolistic behavior or excessive pricing by the private sector. Furthermore, maize seed prices in Egypt are low in comparison to other countries.

The production and marketing of certified seed by the ARC and the Agrarian Reform Organization, and more recently by the Central Agency for Seed Production (CASP), has contributed to an over-supply of seed, and has been detrimental to the private sector. Production by government organizations not only reduces sales and hurts the financial performance of the private seed companies, but it contributes to the uncertainty in which the seed sector operates.

CASP has engaged in practices unfair to the private sector and detrimental to overall maize production. Together with its supervisory agency, the Horticultural Services Unit (HSU), CASP refuses to allow private seed companies to multiply the single cross (SC) hybrids developed by the ARC, and limits the supply of foundation seed for ARC's three-way crosses (3WC). Using its authority in this way represents a conflict of interest, since CASP's own production is in direct competition with the private sector. These actions are a roadblock to spreading the benefits of the ARC maize breeding program to farmers.

Furthermore, the price that CASP is currently charging for its certified SC seed is evidently lower than the full cost of production. Not only is this unfair to the private sector, but it means that the government in effect has been subsidizing the excess production of maize seed.

- It is recommended that the GOE stop production of certified maize seed by CASP and other government entities after the current (1999) production year. The sale of the resulting seed would then be completed during the following year (2000).
- If CASP is privatized, the GOE should treat it like any other private company and should not give it any preferential treatment or any control over other private companies.
- It is recommended that the GOE require that varieties developed by ARC be released in a competitive and transparent fashion, rather than allowing CASP and the HSU to control their use. This is particularly important for the single cross hybrids.
- It is recommended that the Egyptian Seed Association (ESAS) work with its members in promoting these reforms.

The review conducted by the study team found that there is need to improve the marketing practices of the private companies. While some companies have developed extensive dealer networks, set up demonstration plots, and held field days, others have not done so. There has been a tendency for many companies to work through traders, agricultural cooperatives, and the Principal Bank for Development and Agricultural Credit (PBDAC), rather than to develop systems of reaching the farmers more directly and provide them with good technical support.

The fact that almost half of Egyptian farmers still do not use hybrid maize seed represents both a challenge and an opportunity. The challenge is to gain a better understanding of why they are not using hybrid maize seed. The opportunity is the considerable potential to increase the sales of the seed companies.

- It is recommended that, rather than trying to produce more seeds, the GOE focus on ways to help the private sector expand the demand for hybrid seed.
- It is recommended that both the GOE and the private sector continue to support the National Maize Campaigns which are conducted each year, and that the farmer surveys conducted in conjunction with these campaigns be redesigned so that they lead to a better understanding of the constraints in demand for hybrids.
- It is recommended that ESAS and the government work together to identify constraints to increased farmer demand for hybrid seed, and that they support the seed companies in improvement of their marketing and promotion.

Questions have been raised about the capacity of the private sector to conduct research. While it is clear that the ARC continues to play a strong role in research on breeding and problems related to maize production, private sector companies have begun to develop substantial capabilities of their own. Seven companies have active

research programs and breeders and research farms. Four companies have managed to register a total of 15 hybrid maize varieties, although three of these companies still use ARC varieties.

The private sector has also established considerable seed processing capacity of its own. Eight companies now have seed processing plants, of which three include drying equipment.

The typical pattern for new companies is to get started with varieties developed by ARC and to utilize government seed processing facilities, for which they pay a toll. Once they are established, many companies go on to develop their own breeding program and facilities.

There are concerns about seed quality in the government and within the seed industry itself, and there is a general feeling that “unqualified producers” have been allowed to enter the business. Generally, freedom for new businesses to enter an industry is desirable, since it increases competition. Furthermore, competing private firms normally strive for good quality in order to protect the reputation of their products in the eyes of the consumer.

The Central Agency for Seed Certification (CASC) is the government’s regulatory body in charge of certifying seed and thus is responsible for controlling seed quality. Recent efforts to improve the procedures and operations of CASC are to be commended and are believed to have already raised quality standards. To this end, CASC has implemented new testing and labeling requirements based on the recommendation of the National Seed Council.

- It is recommended that CASC continue to strengthen its certification procedures to ensure quality, and that it improve the enforcement of established qualifications for company registration.
- It is recommended that ESAS work to convey to CASC its members’ concerns about the certification process.
- It is further recommended that ESAS work with its members to improve their own internal quality control systems.

Available statistics on the seed sector are inadequate. As a result, it is difficult for companies to do a good job of planning their production and marketing programs. Much of the information that is needed by producers is collected by CASC, but the agency is often reluctant to release the data which it collects, and its statistical bulletins are very slow to appear.

- It is recommended that CASC improve its procedures for collecting and reporting statistics and other information about the seed sector. It is further recommended that ESAS and the National Seed Council cooperate and support CASC in this effort.

In support of the reforms and other actions outlined above, it is recommended that APRP and donors:

- Use the policy dialogue and benchmark process to promote GOE withdrawal from hybrid maize seed production.
- Use the same process to promote GOE adoption of improved variety release procedures.
- Work with the GOE, the Seed Association, and other donors to identify constraints to expanded adoption of hybrid maize seeds, to help ensure that they are adopted by the 49 percent of maize growers who still do not use them.
- Work with the Seed Association in building its members' capacities in marketing and promotion, and in improving their internal quality control procedures.

Chapter I: Introduction

Maize is one of Egypt's principal summer crops and is important to the national economy, both as a source of human food and as feed for livestock and poultry. There has been significant progress in maize production over the past two decades, during which maize production per hectare has increased from 3.6 to 7.6 metric tons per hectare (Figure 1).

While there are many reasons for the country's success with maize production, the cornerstone of this achievement has been the introduction and widespread use of hybrid maize seed. This has evolved from a successful breeding and variety development program in the Agricultural Research Center, in combination with the emergence of an expanding number of private sector maize seed production and marketing companies.

Recent changes in GOE policy – in particular, the decision to let a government organization, CASP, produce hybrid maize seed, and the decision to restrict the release of new maize hybrids developed by the ARC – have caused alarm and uncertainty in the seed industry. However, the government has its own concerns for the industry. Obviously, it wishes to see continued success in maize production, which almost certainly will require that an expanding supply of high quality seed be available to farmers. It also wishes to ensure that farmers are not charged excessive prices for the seed.

Purpose and Procedures for the Study

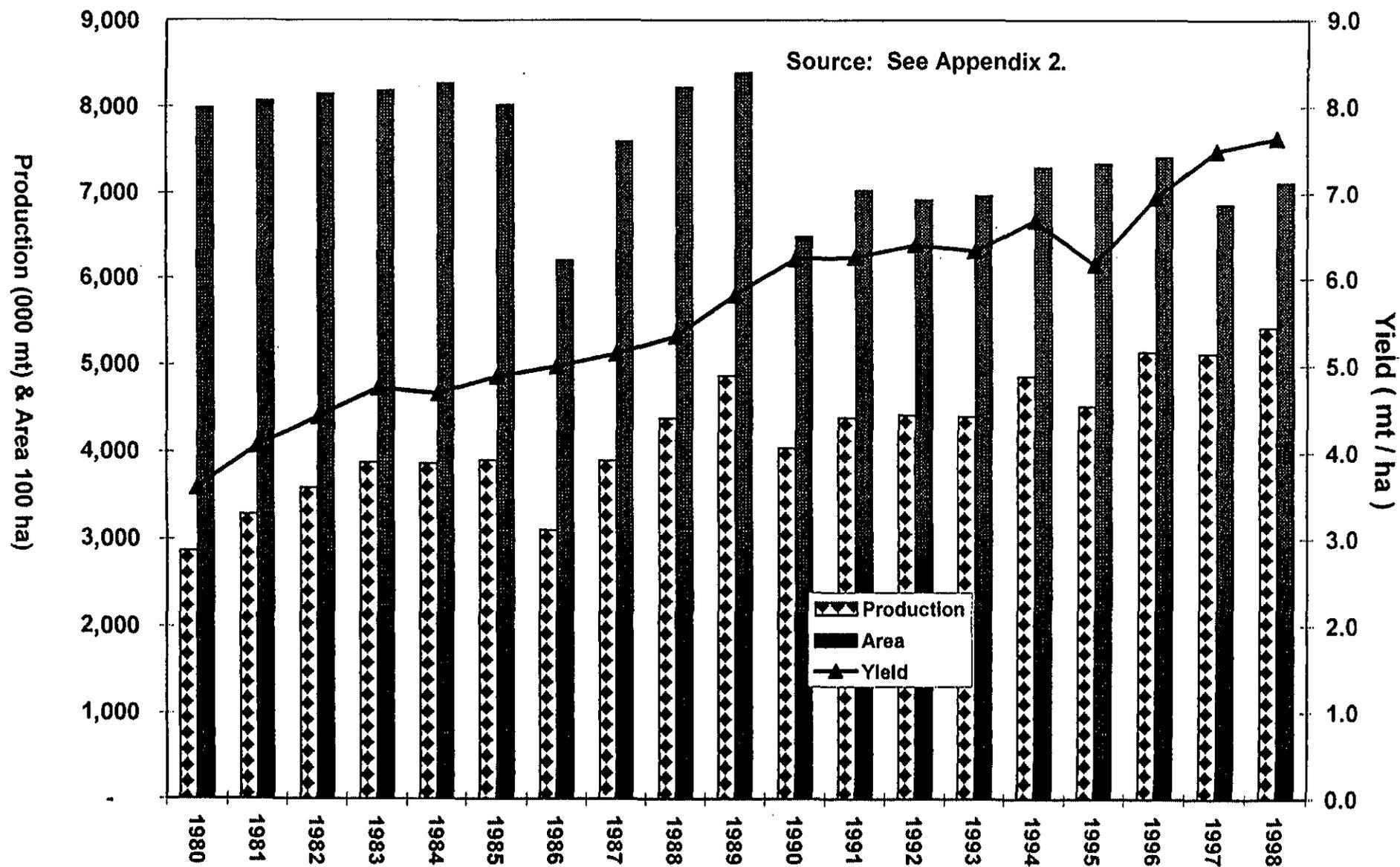
The purpose of this report is to analyze the recent performance of the maize seed industry and to consider whether recent policy changes are likely to foster or hinder continued improvements in the industry.

To conduct the study the authors met with cognizant industry leaders, researchers, and government officials over a two-week period. This included visits with executives in nine of the 22 organizations that are currently producing certified maize seed (see Annex A). Relevant literature and statistics were reviewed.

Guiding Concepts for the Study

Strong seed industries are essential to modern crop improvement programs. Seed industries are comprised of several linked components, including research, production, processing, quality control, and marketing. In initial stages of development, these components are often quite weak or even non-existent. Farmers make their own variety improvement decisions by selecting seed from one year's crop to be used for the next. A few farms or private companies may specialize in seed production, but the advantages of such specialization are often limited due to the absence of significant improvements in varieties.

Fig. 1. Maize Production, Area and Yield in Egypt, 1980-98



In the course of modern agricultural development, research on production problems and in plant breeding often becomes the assignment of a government agency. Based on the resulting improved varieties, government may then undertake to produce and process seed and to control quality through seed certification programs. To encourage farmers to use new varieties, governments often begin by distributing their seed at low, subsidized prices. As development proceeds and the use of improved seeds expands, however, the costs of such systems become a serious drain on limited government resources.

As improved, high-yielding varieties are developed, private seed production becomes more attractive. The production and marketing of hybrid maize seed is normally one of the first segments of the industry to attract private entrepreneurs. This is because of certain characteristics of hybrids:

- ♦ they are technically difficult to produce, meaning that it is not possible for most farmers to produce hybrid for themselves;
- ♦ the yield advantage of the hybrid, which is often substantial, does not continue in the resulting grain which the farmer might otherwise save as seed for his next crop; thus
- ♦ the farmer finds it advantageous to purchase new hybrid seeds each year.

These characteristics add up to the potential for private companies to operate at a profit, which is more difficult in the production of seed for self-pollinated crops such as wheat and rice, where the farmer can select and save grain for a number of successive generations once he has obtained an initial supply of improved seed.

There are a number of advantages to private seed industries, as compared to the government seed sector:

- ♦ private companies are typically more efficient at seed production, processing and marketing, which means that they are able to produce at lower cost;
- ♦ competition among private companies can serve as the incentive to develop and introduce more varieties than might result from a government program alone;
- ♦ competition among private companies to preserve the reputation of their company name and brands often proves to be a more effective safeguard and assurance of quality control than is possible to obtain in a seed industry which is run by a single government agency.

Of course, the profit motive is the incentive for the private sector to pursue the seed business. There are often concerns that, in the pursuit of profit, private companies might charge prices that are too high and could reap monopolistic profits. Indeed, this could occur if there were only one or a few seed companies selling a limited number of improved varieties. However, certain conditions, if they exist, will limit the potential for monopolistic pricing:

- ♦ government breeding programs can make the varieties they develop available to a number of companies, or they can make exclusive releases of similar varieties to various companies;
- ♦ private companies can develop their own breeding programs, thus increasing the number of new varieties which are available; and
- ♦ the entry of or affiliations with international seed companies can serve to expand both the number of companies and the number of varieties available, thus increasing competition.

As the private sector develops and expands, the government must naturally reduce the scope of its activities in the seed industry. Continued government involvement in the production, processing and marketing of seeds will normally be seen as unfair competition to private companies, particularly since such activities will likely be subsidized from the government budget. Thus, it is important that the government cease to be a producer and marketer.

In other areas, however, there is need for government activity to continue. This is often the case in seed certification, which is one important aspect of quality control and which may be seen as one of the government's regulatory responsibilities. There is also justification for the government to continue breeding research, at least until the private sector is able to develop strong breeding programs of its own.

Chapter II: Certified Maize Seed Production in Egypt

Maize Breeding Research

Maize was introduced in Egypt at the end of the 16th Century. By the early part of the current century the area devoted to the crop had reached 588,000 hectares, with yields averaging about two tons per hectare. Research to improve maize productivity was initiated in the 1920s and resulted in several improved varieties, some of them based on crossing local varieties with germplasm introduced from Italy and the United States.

While the practice of hybridization was first used in Egypt in the 1930s, the first hybrids to be developed did not gain widespread use and had little impact on national production. A series of double cross (DC) hybrids developed in the 1950s and early 1960s gained wider acceptance, but the success of these efforts was cut short by the emergence of a disease, *Cephalosporium maydis*, commonly known as "late wilt."

The real breakthrough in variety development came from collaboration between the Maize Research Program (MRP) of the Agricultural Research Center (ARC) and the International Maize and Wheat Improvement Center (CIMMYT), begun in 1966. This effort provided Egypt with a wide selection of germplasm, particularly from Mexico, some of which proved to be resistant to late wilt. However, the initial variety crosses and composites that were released from this program in the early 1970s did not gain widespread acceptance, due to their tall plants, late maturity and high fertilizer requirements.

Eventually, MRP's variety development program began to pay off. A new composite known as Giza-2 was released in 1980, and production expanded so rapidly that it covered about 50 percent of the maize area within four years. Work on hybrids never ceased, however, since it was recognized that they held the promise of far greater yield increases than composites. In 1981, the DC Giza-202 was released, followed by two more double crosses, Giza-204 and Giza-215, three years later. The year 1988 marked the release of the first three way cross, Giza-310, which has been in cultivation since that time and is currently being produced by about 20 seed companies and organizations.

A year after the release of Giza-310, another three-way cross, Giza-320, was released, together with three single-cross hybrids, Giza-9, Giza-10, and Giza-103. Until this time, all of the new releases were of white endosperm. The intensive work of the ARC maize research staff yielded 17 new hybrids that were registered and released for commercial production during the period 1993-1997. Of these, eleven were single cross hybrids, seven with yellow and four with white endosperm, and six were three-way crosses (four white and two yellow).

Certified Maize Seed Production

Until very recently, most maize farmers in Egypt have depended on saving their own seed because improved seed of suitable varieties, particularly hybrids, were not widely available, and farmers had a limited understanding of the need for improved seed.

In the 1940s, maize seed production was limited to local, open-pollinated varieties and was carried out jointly by the Maize Research Program and the General Directorate for Seed Multiplication. The Maize Section was responsible for breeder, foundation and registered seed production, while the Directorate was in charge of certified seed production. The volume of certified seed produced at this time was small and was focused mainly on two varieties: Giza Baladi and American Early. Toward the end of the 1950's, greater attention was given to the production of American Early, and the area planted to this variety increased to 230,000 feddans by 1963. Since the variety was open-pollinated, the seed did not have to be replaced every year, as is necessary with hybrids. After the emergence of late wilt, which affected the hybrids, American Early went on to occupy about a half million feddans by the end of the 1960s.

Maize hybrid seed production began in 1954 on about 1,500 feddans in the state farms at Sakha and Serw. Certified seed production was undertaken by the Maize Research Program while seed processing and testing were handled by the Directorate of Seed Multiplication. The following year, a group of large farmers formed a sort of company or informal cooperative to produce hybrid maize seed, under the guidance of the Maize Section. The hybrids being produced at this time were all double crosses. The area under cultivation with hybrids expanded gradually and reached about 300,000 feddans by 1963. However, the use of hybrids declined dramatically with the emergence of late wilt, and the company terminated its seed production in 1964.

Since hybrid seed production represented a lot of additional work for the Maize Research Program, it was decided in 1966 that the responsibility for production of all hybrids would be given to the Directorate of Seed Multiplication. Maize Section personnel were transferred to the Directorate for a period of years to train their staff in hybrid production. The Directorate continued to produce double cross hybrids, together with open-pollinated seed, until 1979. During this era, the responsibility for distributing seeds was carried out by the government's Agricultural Credit Bank, which was later to become the Principal Bank for Agricultural Development and Credit (PBDAC). The credit bank worked through the agricultural cooperatives, which were heavily influenced by the government at that time.

Private Sector Production Begins in 1980

By the late 1970s it was found that the variety cross hybrids being produced by the Directorate of Seed Multiplication had no yield advantage over their parent lines. This suggested that production procedures were inadequate. To ensure that the potential of the new varieties about to be released by the MRP would not be lost, the Ministry of Agriculture decided to allow private and quasi-private companies to be organized to undertake maize seed production. Consequently, three new seed companies were soon formed: Misr Pioneer Seed Company was organized in 1980¹, while the Egyptian Agricultural Company for Seed Production (EGA Seed) and the National Seed Company were formed in 1981. All three were joint ventures between

¹ Pioneer actually started importing seed and selling it to farmers in 1978, two years before the Misr Pioneer joint venture company was organized. By 1983, the company was selling seed that it had produced in Egypt.

government entities and the various private sector interests, including majority international ownership in the case of Pioneer.²

While Misr Pioneer obtained breeding materials for hybrids from Pioneer International and embarked immediately on its own local breeding research, National Seed and EGA Seed started by producing the Giza-2 composite and soon followed with production of the double cross hybrids Giza-202, 204 and 215. The ARC had developed all of these varieties, and the Maize Section provided the two companies with the necessary foundation seed.

In 1989, two additional companies were organized: the Misr-Danton Company and the Nile Seed Company, both privately held by Egyptian owners. Then, in 1993, the Misr Hytech Seed International company was formed, with majority ownership by a group of international seed companies, including AgrEvo of Germany, and minority ownership by private Egyptian investors. In the following years, a number of other private seed producers began operations. Several contract seed growers formed new seed companies, such as the El Fouad Seed Company, when the seed companies they had been growing for quit buying their seed after 1992. During this time the Nile Storage Company obtained an exclusive marketing agreement with DeKalb International.

By the 1997 production year, seed was being produced by 21 different organizations. These were mainly private sector companies³, but a number of cooperatives (now considered to be non-governmental organizations) and the Agrarian Reform Organization (government) had started producing certified seed.

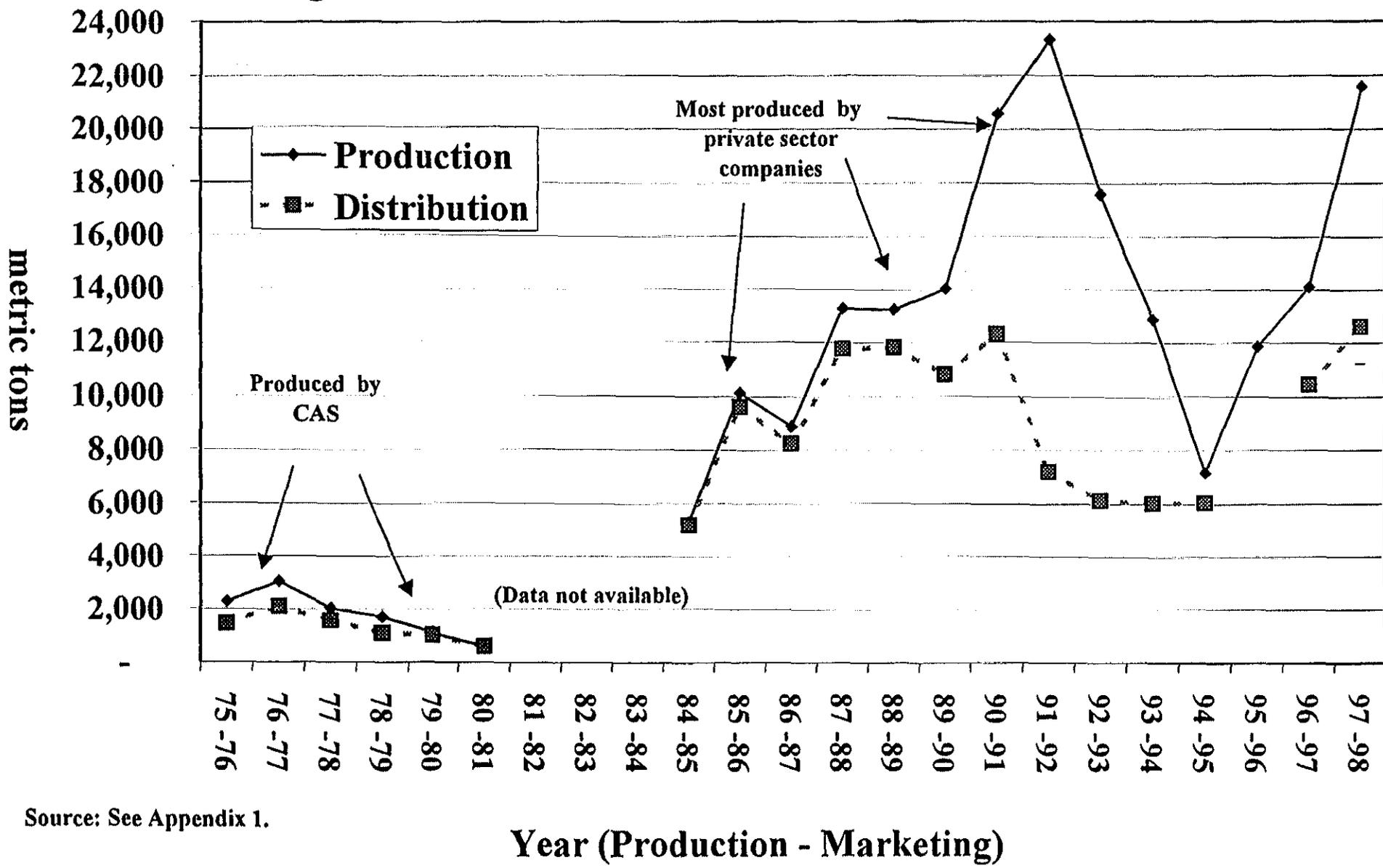
The amount of certified maize seed produced and available to Egyptian farmers has increased dramatically since the government decided to allow and encourage the private sector to enter this business in 1980. As shown in Figure 2, total production exceeded 10,000 MT by 1985, which was more than three times greater than the highest level, reached by the Directorate of Seed Multiplication in 1976. By 1991, total production rose to 23,325 MT.

As Figure 2 indicates, not all of the seed produced has been distributed. Data from CASC and ARC indicate that over 12,333 MT was sold in 1991 and that 12,625 MT was distributed in 1998. Marketing and distribution is discussed below.

² Misr Pioneer was initially owned by Pioneer Hi-Bred International (51%), by the Agrarian Reform Organization (government), and by local private investors. Pioneer International has since increased its capital contribution and now owns 80 percent, while the Agrarian Reform Organization's share has been greatly reduced and is currently in the process of being divested. National Seed's initial ownership consisted of various government banks, an insurance company, and private individuals, although many of the banks have since been privatized. EGA Seed continues to be owned by several organizations that, if not government, have close government affiliations, and by individual private investors.

³ By this time, the government had begun to divest its interests in the three original joint venture companies that had been formed in 1980 and 1981.

Fig. 2. Certified Maize Seed Production & Distribution



Source: See Appendix 1.

Year (Production - Marketing)

According to available statistics from the CASC, 98.9 percent of the certified maize seed produced in 1997/98 was hybrid seed. Of this, some 80 percent was produced by the private sector (including the various cooperatives). Most was three-way crosses (73%), and almost all was white maize (96%).

Table 1. Categorization of Hybrid Seed Produced in 1997.	
by Type of Producer	
Private Companies	76%
Agricultural Research Center	16%
Cooperatives	4%
Agrarian Reform Agency	4%
by Type of Hybrid	
3-Way Cross	73%
Single Cross	20%
Double Cross	7%
by Color of Endosperm	
White	96%
Yellow	4%

Source: See Appendix Table 4.

Based on the amount of hybrids distributed, and assuming seeding rates of 12 kg per feddan for single crosses and 15 kg per feddan for three-way and double crosses, it is estimated that about 874,000 feddans were seeded with certified hybrids in 1998. This represents 51.5 percent of the total area seeded to maize in 1998. This is a significant achievement. It compares to hybrid seed adoption rates of just 20 percent for Africa and West Asia as a whole, or 43 percent for all developing countries. While Egypt's achievement is commendable, it should be noted that all production in Egypt is irrigated, which is not true for much of Africa and many parts of West Asia. It should also be noted that the rate of adoption of hybrids has reached 99 percent in industrialized countries, which suggests that Egypt still has further gains to expect from hybrid adoption⁴.

Government Resumes Production of Certified Seed

By 1985, the Seed Production Unit had been established in the Field Crops Research Institute (FCRI) of ARC, and it undertook the responsibility of producing breeder and foundation seed of the ARC maize hybrids. The Unit was set up as a separate economic activity that did not receive direct budgetary support from the government. Seed companies were required to pay a price for the foundation seed that they obtained, plus a small royalty fee. In 1986-87, the Seed Unit undertook the production of certified hybrid maize seed, due to concerns about the quality of the seed that was being produced by the private companies at the time.

⁴ Statistics on maize adoption are from Morris, Michael L., "Overview of the World Maize Economy," in Morris, M.L., ed., *Maize Seed Industries in Developing Countries*, Bolder, CO, USA: Lynne Reinner Publications, Inc., in association with the International Maize and Wheat Improvement Center (CIMMYT), 1998.

The Seed Unit at first produced the same double crosses and the three-way crosses that were being produced by the private companies. It then began to produce the new single cross Giza-10 when it was released in 1989. The ARC was criticized for competing with the private sector, particularly after large quantities of seed could not be sold and had to be carried over after the 1992 and 1993 marketing years.

Consequently, it decided to limit its production to single crosses [especially Giza-10], and leave the three-way crosses to the private companies. It decided not to release the single crosses to the private sector, partly due to concern that, since Egypt does not have plant breeder's rights legislation, there would be no way to control the parent lines.

In February 1998, a new element emerged. The Minister of Agriculture and Land Reclamation decided to transfer the certified seed production activities of ARC to the CASP, an agency which had been formed to take up the seed production activities of the Central Administration for Seed (CAS)⁵. As a result, CASP began distributing and marketing the 3,443 MT of seed which the ARC had produced in 1997, and it set about producing seed on its own account in 1998, to be sold in 1999. Moreover, CASP and its supervisory agency, the Horticultural Services Unit (HSU), were given the authority to determine if and when the single cross maize varieties developed by ARC will be released to the private sector. They have also acted to limit the quantities of foundation seed sold for the three-way crosses.

While the decision to transfer ARC's production and marketing responsibilities to CASP was apparently well intentioned – the Minister cited the need to prevent monopoly and to encourage the establishment of research capability within the private sector – the decision has raised fear and concern about unfair competition within the private sector, as will be discussed in Chapter 4.

Processing

Initially, most of the new companies that were established to produce certified seed relied heavily on government sector facilities. In particular, EGA Seed and the National Seed Company both processed their seed in plants owned by the Central Administration for Seed,⁶ for which they were required to pay a service charge.

Eventually, however, both of these companies acquired their own seed processing plants. By 1998, five of the private sector companies had acquired seed processing plants, and EGA Seed had made arrangements to have its processing capacity doubled.

The remaining 16 private sector organizations⁷, many of which started seed production in 1993 or later, were apparently all utilizing the seed processing facilities

⁵ CAS was the successor agency to the former Directorate of Seed Multiplication. It carried out both seed certification and production. In the mid-1990's, at the urging of GTZ and others, CAS was divided into two independent agencies, the Central Administration for Seed Certification (CASC), and the production entity, CASP. The purpose of this separation was to avoid conflicts of interest between the *certification* and *productive* functions of the agency.

⁶ Formerly known as the Directorate for Seed Multiplication.

⁷ In this count, the Agrarian Reform Sector's seed operations are included with the private sector, which may not be quite accurate.

of CASP. However, most of these companies are still relatively small in comparison to the older, larger companies that have their own processing facilities. The 16 companies accounted for only 37 percent of private sector production in 1997/98. Thus, 63 percent of private sector production was processed in private facilities.

In at least one regard, the private sector's seed processing facilities are superior to those of CASP. The plants belonging to Misr Pioneer, Nile Seed Company and Misr Hytech all have drying equipment, whereas none of the CASP plants have it. Mechanical drying produces more uniform drying and achieves a lower moisture content than natural air drying, and this in turn leads to less seed loss in storage and longer seed life.

Seed Certification

Seed certification, which is an important dimension of quality control, is conducted by the Central Administration for Seed Certification (CASC). The private companies pay CASC a fee for certification, which entails both inspection of field production and sampling and testing of the seeds after they are harvested. The performance and reliability of CASC have reportedly improved in the past few years, since it and CASP were reorganized from the old CAS and required to operate independently of each other.

The Ministry of Agriculture and Land Reclamation (MALR), with the support of the German Technical Assistance Program (GTZ), aims to make CASC operate on a self-supporting basis, so that the fees it collects cover its operating costs. According to the director of CASC, the fees currently charged cover only 38 percent of operating costs. Consequently, CASC has announced a significant increase in its fees, which is a cause for concern to the private sector. CASC has recently required that all maize seed be packaged in paper bags, rather than the plastic bags that most companies previously used. This reportedly has resulted in a 100-150 percent increase in packaging costs.

CASC requires that seeds that are carried over from one year to the next be re-tested and re-certified. Recently the agency has adopted the practice of testing carry-over seeds for vigor, in addition to the normal test for germination. In the face of the large carry-over of seeds from last year, CASC has also decided to require that the companies label each bag to indicate the year of production. The companies feel that this is unfair, since they hold the government responsible for the large carry-over, and they feel that the germination and vigor tests should be adequate to assure quality. They further point out that seed companies in some major producing countries such as the United States are not required to show the year of production on their labels.

Distribution and Marketing

The current system of marketing for certified seed really began to develop in 1992. Until that time the PBDAC took responsibility for distributing most of the seed produced by the seed companies, and the companies operated more like regulated public monopolies than independent private producers. Officials of the bank, the MALR, and the maize program would meet each year to work out a distribution plan. The Bank would distribute the seed through its input distribution centers (*shonas*) and the agricultural cooperative.

Under the distribution system with PBDAC, little marketing or promotion was required of the companies. If there was more seed than farmers might otherwise have purchased, the bank would encourage them to take the maize seed anyhow, or risk losing their right to buy fertilizers and chemicals at the subsidized prices that the bank offered. The bank distributed the seed at the prices set by the companies, although it attempted to bargain them down on price in some cases. Since most companies were producing the same seeds (ARC releases), various districts in each governorate were assigned exclusively to a specific company. That way, if there was any question about quality, the producer could be readily identified.

As Figure 2 indicates, while the seed companies expanded their production significantly from 1987 to 1991, distribution remained fairly constant at 11,000 to 12,000 MT. Thus, the amount of seed not sold expanded significantly, from just 639 MT (11% of production) for the 1987 marketing year, to 8,247 MT (40% of production) by the 1991 marketing year.

Withdrawal of PBDAC a shock to the industry

In early 1992, the government decided to drop most remaining subsidies on inputs and to withdraw the PBDAC from the input distribution business. PBDAC has continued to distribute some fertilizers, and it also distributes some seed for private sector companies. However, the bank no longer offers fertilizer subsidies, which were a big attraction to farmers in the past, and the amount of seed it distributes has dropped significantly. This change occurred at a time when maize seed production had already been outstripping distribution, and it caused turmoil in the seed business. In 1992, 16,123 MT of seed went unsold, amounting to 69 percent of the available production (Figure 3).

Improvements in industry marketing and distribution

As Figures 2 and 3 show, the industry recovered slowly from the shock of not being able to rely on PBDAC to distribute its seed. Although some companies had been active in marketing even when the bank was in the distribution business, now all of them were forced to become more active marketers in order to survive. The challenge was made greater by the significant number of new companies entering the business during this period⁸.

The maize seed companies improved their marketing practices in several ways. They hired more people for their marketing staffs. They worked to establish new distribution arrangements with the cooperatives at the national and governorate levels. They worked out new distribution arrangements with dealers and traders. Furthermore, more competition developed on the "discounts" which they offered to

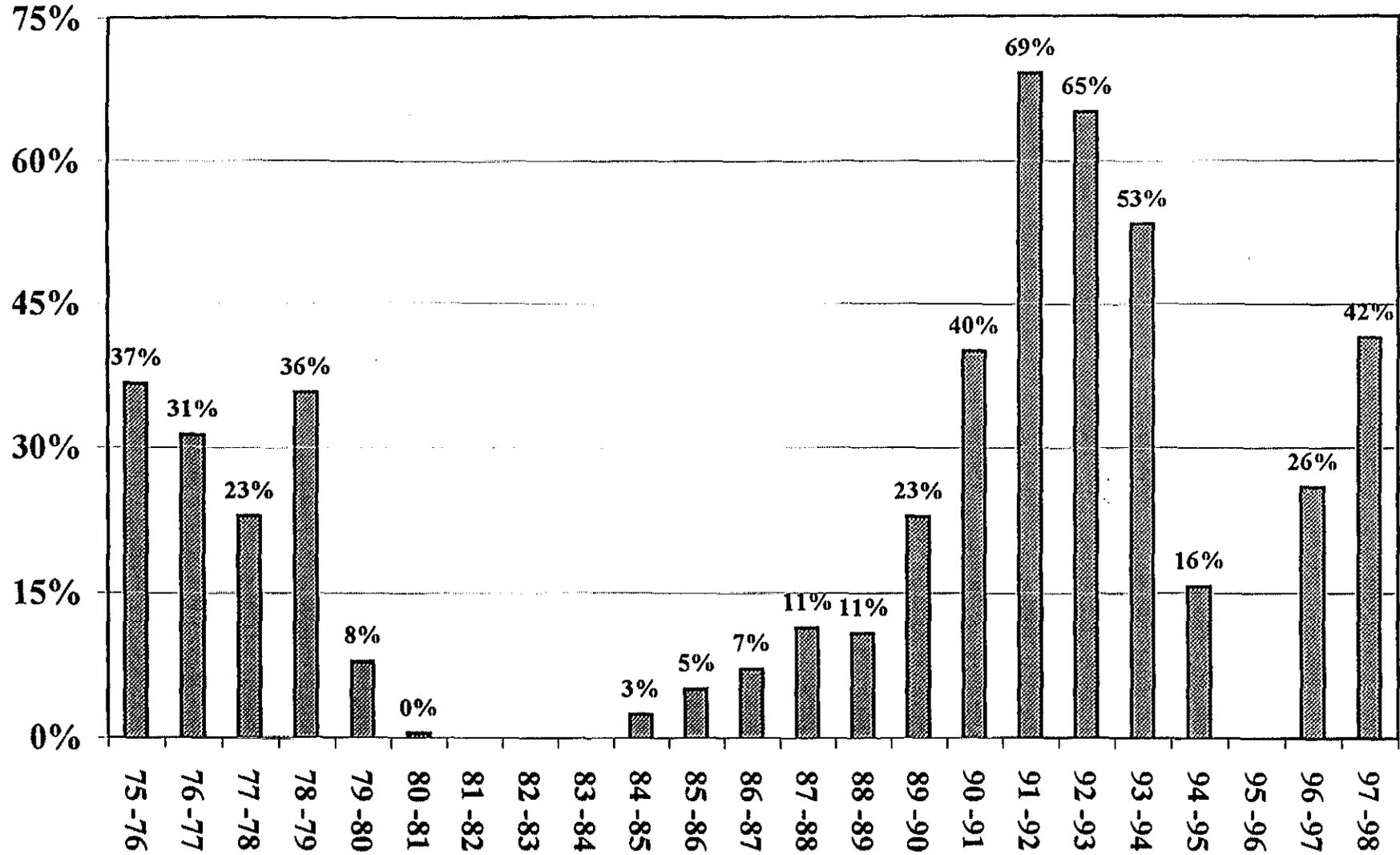
⁸ There seem to have been two main reasons for the new entries: several of them were farmers who had been contract seed growers and were left with production which the established seed companies refused to purchase after the bank withdrew. Furthermore, a number of new private seed companies had recently entered vegetable seed production and saw the production of maize seed as something they could use to increase their business and to help achieve more efficient use of facilities.

the dealers and cooperatives that handled their seeds. Whereas the discount charged by the bank had originally been 2 percent and finally reached 15 percent before the bank withdrew, some companies now offered even larger discounts, particularly for dealers and outlets that would handle a larger volume.

To make their marketing more effective, the seed companies also paid more attention to setting up demonstration plots and holding field days. They began to package their seed in smaller bags, to make it affordable to small farmers. Currently, some companies have bags as small as two kilograms, and several have bags in the 5-10 kg size range.

The private sector also marketed its seed by using extension agents as distributors. At least two types of arrangements were made for this purpose. In some cases the extension councils for a governorate would undertake to represent one or more seed companies. The agents served as distributors, and the council retained the sales discounts. In other cases, companies made arrangements directly with individual agents, and the agents themselves retained the sales commission. The MALR found this practice to be inappropriate, and an order was issued prohibiting it. However, there are reports that the practice still persists in some cases.

**Fig. 3. Proportion of Maize Seed Production Not Sold
(Carry-Over)**



Source: See Appendix 1.

Year (Production - Marketing)

Indications are that the private sector's marketing efforts have worked to some extent. As seen in Figures 2 and 3, production dropped steadily from 1992 to 1994. In 1995, however, only 16 percent of the seed produced in 1994 was not sold. In 1995, production increased for the first time since 1991, although no data are available on what was sold in 1996.

The seed not sold in 1997 represented 26 percent of the crop. It is normal to end up with some carry-over, and seed producers indicate that this level of carry-over is within acceptable limits for good business⁹. Most producers stock more than one variety, and they can never be totally sure what the farmers will demand. They have consignment arrangements with many dealers and cooperatives, and some seed is invariably returned.

New Problems Emerge

In 1997 there was a near-record production, causing a large carry-over in the 1998 marketing season. Almost 9,000 MT, or 42 percent of the seed, went unsold (Figure 3). In 1997, most companies had increased their production somewhat over the previous year. However, ARC's production increased by more than 150 percent to 3,400 MT, up from the 1,350 MT it had produced in 1996. This increase added greatly to the over-supply in 1998.

One of the reasons why ARC produced so much in 1997 was that it had been short of seed the preceding spring. Its single cross Giza 10 had been rapidly gaining recognition, due both to farmers' experience in growing the variety and because of the reputation that it had earned in the large number of demonstration fields of the National Maize Campaign. Being a government agency, ARC did not develop the expanded marketing channels that the private sector had developed after PBDAC withdrew. Rather, it dealt directly with farmers and traders from its national office in Giza and from four regional offices. These buyers would often come to the office in Giza to obtain the seed directly. Demand became so brisk in the spring of 1997 that the available supply had to be rationed. A small black market developed in which some traders charged farmers significantly higher than ARC's announced price of LE 10/kg. Competition became so fierce that in at least one case a fight broke out and police had to be called. The ARC did not want this to happen again.

The large carry-over after 1998 caused serious damage to the seed industry. While the average was 42 percent, four companies did not sell 60-66 percent of their seed, and one new entry to the industry did not sell 77 percent. One company reported selling about 2,000 MT as common grain, at a loss of thousands of Egyptian Pounds per MT, when compared to its seed value. The private sector has greatly resented the carry-over situation. Much of this resentment is focused on CASP, which had been given the responsibility to sell what ARC had produced.

Although the high production by government entities obviously exacerbated the problem with seed not sold in 1998, there is still no avoiding the obvious: *a large amount of seed was available but went unsold while almost half of the maize farmers still did not use hybrids.* Why was the seed not getting to them?

⁹ One seed producer indicated that a carry-over of about 30 percent would be considered normal.

There are two important factors here: (1) not enough is known about the constraints to farmer demand for seed, and (2) the seed companies are still not strong enough in marketing. Surprisingly, some companies interviewed by the study team still think that the answer to their problem is for the government to sell the seed for them, as the bank used to do. Many companies still need an effective means of reaching the farmer directly, rather than relying on the village cooperative or extension agent. Many do not have a well-established and trained dealer network. And many do not have the means of providing the technical support that is required by farmers to help them realize the full productive potential of the hybrids.

Chapter III: Current Problems and Concerns in the Maize Seed Industry

The present study was organized by APRP/RDI after the large amount of maize seed went unsold in 1998, and in response to concern that the private sector had registered about the entry of CASP/HSU into the industry. Not only is the entry of CASP viewed by the private sector as unfair competition, but the authority that CASP and HSU have been given over release of single cross maize varieties and over the quantities of foundation seed for three way crosses to be sold to the private sector is seen as further unfair behavior.

But the concerns are broader than these. When CASP was authorized to produce maize seed, the government raised the issue of monopolistic pricing,¹⁰ and of the need for the private sector to become more involved in maize research. There have also been concerns that seed quality may not be up to par in some private sector companies. Both government and private industry representatives fear that unqualified producers have been allowed to take up the production of certified maize seed.

There are also concerns about the coordination of maize seed production. The government naturally wants to ensure that the quantity of seed produced is sufficient to meet farmer demand, and that the use of hybrid seed continues to expand so that national production and food security needs are met. The seed companies feel that government efforts to orchestrate adequate seed production – including seed production in government facilities – have led to years of over-supply which have been very costly to the industry. They also believe that agencies such as CASC could do a better job of releasing available information, so that it would be easier to make decisions related to production and marketing.

Has the Private Sector Engaged in Monopolistic Behavior?

Monopolistic behavior can manifest itself in a number of ways. Monopoly literally means an industry that has just one producer, which is obviously not true of the seed industry in Egypt. In a more general sense, “monopolistic” is often referred to as a situation in which there may be artificial limits on output, or where there are special circumstances which allow producers to charge high prices which lead to “excess profits.” Poorly conceived government policies often lead to monopolistic conditions – either the government itself attempts to monopolize production, or its regulations may either prevent entry of new producers or restrict an industry’s production.

As the preceding discussion has shown, the production of certified maize seed has expanded rapidly in Egypt. In fact, there has been a problem with *over-production*, which is not what would be expected if monopolists had somehow been restricting supply in order to be able to drive up the price. Furthermore, seed prices have been fairly stable. Producers and others contacted by the study team indicated that recent maize pricing has been more or less as shown in Table 2.

¹⁰ See the Ministry of Agriculture Agreement of 12 February 1998.

(Producer's suggested price to end-user, LE per kg)				
	<u>1996</u>	<u>1997</u>	<u>1998</u>	<u>1999</u>
Government producers (ARC & CASP)				
Single crosses, Giza-10 and others	9.00	9.00	10.00	7.50
Various Private sector producers				
3-Way Crosses, Giza #310 – low	4.00	5.00	4.00	4.00
- high			5.00	
3-Way Crosses, proprietary & exclusive – low	5.00	5.00	5.00	5.00
- high		9.00	9.00	9.00
Single crosses, proprietary – low		9.00	9.00	9.00
- high		9.50	9.00	9.00
Single cross yellow, proprietary			14.00	14.00
Double crosses, proprietary	4.50	6.00	7.00	7.00

Note: In 1998, the majority of Giza #310 was sold at LE 5 per kg, whereas most of the proprietary single crosses were sold for LE 6.50.

While this is only partial information, it suggests that prices have been fairly steady. There is a wide variation according to type of seed, which is to be expected since the productive potential of the seeds varies. Furthermore, the single cross is more expensive to produce, and thus its price is expected to be higher. Prices did seem to soften for 3WC #310, since this was the seed which appeared to be in greatest over-supply. Above all, producers reported that they increased the discounts (commissions) paid to their dealers in 1998, in order to give them the incentive to sell more seed. This is the kind of behavior that is expected of a competitive market. Some of the discounts undoubtedly were passed on to growers in the form of lower-than-suggested prices to induce them to buy more seed, but there is no data to verify these reports.

Cost of seed production and processing

To evaluate whether the prices shown above might lead to excessive profits, the study team conducted an evaluation of private costs of production. Three different seed producers provided input to the process. Of course, no two companies are alike, and costs varied somewhat among the three cooperators, for a number of reasons. The figures in Table 3 are considered to be conservative estimates of the costs for companies which are believed to have typical circumstances – they have their own processing facilities with mechanical dryers. Costs to produce two different types of hybrids – a three-way cross (3WC) and a single cross (SC) – are shown, together with relevant production parameters.

Costs might vary from those given in the table for a number of reasons. Some 3WC varieties are known to be less productive than the one shown in the table, which is expected to yield 2.2 MT of ear corn at 18 percent moisture. Extraction rates (proportion remaining after selection, shelling, drying and cleaning) can vary from those shown, depending on the specific variety and field condition, and depending on the efficiency of the processing plant. A storage loss of 5 percent is estimated for the

cleaned seed, but this will be higher in cases where natural rather than mechanical drying is used.

Table 3 indicates typical costs of LE 4,685 per MT for the 3WC and LE 8,665 per MT for the SC. These costs are in the same range as the prices which producers report charging for their seed. While they do not prove that private producers are not earning monopolistic profits, they are about what one would expect given the range of prices which producers are asking for their product.

For 3WCs that provide higher yields or that can be processed more efficiently than the one shown in the table, the cost of production would likely be lower than the LE 4.69 per kg indicated in the table. Thus, it might be possible for seed producers to sell some 3WCs for LE 4 per kg and still make a profit. Similarly, some SC might have lower yields or extraction rates than the one indicated, which would lead to a cost of greater than LE 10 per kg.

In both cases, the costs in the table reflect what ARC charges for its foundation seed and breeder's royalty. Producers who are using imported foundation seed or who have to pay a higher breeding royalty to an international seed company could be expected to have a higher cost structure than what is shown in the table and would consequently have to price at the higher end of the ranges shown in Table 2 in order to cover their costs.

International comparison of prices

Another way to evaluate whether or not Egyptian maize seed prices are too high is to draw international comparisons. A recent analysis of maize seed prices in developing countries found that in the 17 countries ranked highest in terms of grain prices, yields (6.79 MT/ha average for the group), and proportion of crop area planted to hybrids (71% average), the average price charged by the private sector for hybrid seed was 26.7 times the prevailing grain price, and the average price charged for public sector hybrids was 18.6 times the grain price¹¹. In Egypt, the average grain price in 1998 was LE 0.55 per kg. At ten times the grain price, maize seed would have sold at LE 5.50 per kg, which was about where most of the private 3WC was selling. Or at 20 times the grain price, seed would have sold at LE 11 per kg, which was slightly above where most of the private SC varieties were selling. Thus, Egypt's seed prices are slightly lower than the seed prices found in the study, indicating that the prices being received by Egypt's private sector seed companies are not too high.

¹¹ See Table 7.1 in Crull, C.F., J.M. Prescott, and C.W. Crum, "Seed Marketing and Distribution," pp. 225-241 in Morris, M.L., ed., Maize Seed Industries in Developing Countries, Bolder, CO, USA: Lynne Rienner Publications, Inc., in association with the International Maize and Wheat Improvement Center (CIMMYT), 1998.

Table 3. Costs of Hybrid Maize Seed Production in Egypt :

Comparison of Costs for 3-Way (3WC) and Single Cross (SC)

(All monetary values stated in Egyptian Pounds (LE))

Basic production parameters for 3-Way Cross and Single Cross		3WC	SC		
a	Foundation seed requirements: SC, kg per feddan	9			
b	Inbred line, kg per feddan	3	12		
c	Production of ear corn, ardebs field weight (200 kg/ardeb, inc. cobs)	11.00	5.00		
d	Production of ear corn, kg field weight (18% moisture, incl. cobs)	2,200	1,000		
e	Extraction of clean, dry seed (14% moisture), percent of field weight	65%	55%		
f	Production of clean dry seed, kg/feddan	1,430	550		
g	Seed production cost, contract grower, LE per ardeb	160	400		
		Cost per feddan		Cost per ton of finished seed	
		3WC	SC	3WC	SC
		(LE)	(LE)	(LE)	(LE)
On farm production costs:					
h	Seed cost per feddan (LE 15 /kg for SC, LE 25 /kg for Inbred)	210	300	147	545
i	Breeding royalties to ARC (equal cost of seed)	210	300	147	545
j	Seed production cost, contract grower, LE per feddan	1,760	2,000	1,231	3,636
k	Credit - 50% of seed cost charged to grower	(105)	(150)	(73)	(273)
l	Seed certification inspection cost - LE 20/feddan, + share of license	21	21	15	38
m	Transport from field to processing	66	30	46	55
n	Supervision cost, LE per feddan (salaries and incentives)	60	60	42	109
o	Supervision cost, LE per feddan (transport and per diems)	30	30	21	55
p	Sub-total, production costs per feddan & per ton	2,252	2,591	1,575	4,711
Processing and Marketing Costs:					
q	Shelling, mech. drying and cleaning, including depreciation on plant & equipment			450	450
r	Chemical seed dressings, insecticides and fungicides			100	100
s	Seed certification inspection, per finished ton (LE 30 per lot - assumes 15 ton lot size)			50	50
t	Assessment, agricultural syndicate, LE 15 per ton			15	15
u	Bagging (paper) @ LE 1.30 per 10 kg sack			100	100
v	Storage (5 mo's @ LE 7 per ton/month)			35	35
w	Transport cost (1 haul to distributor)			30	30
x	Marketing and technical support to farmers - staff salaries and incentives			125	125
y	Marketing and promotion - educational materials and travel			75	75
z	Storage loss, 5% of the above (would be higher w/ natural drying)			124	281
aa	Overhead - general management and administration costs			664	664
bb	Interest on operating capital - 12% on the above for 6 months			201	398
cc	Cost of carry-over (4% of the above, assuming 25% carry-over)			142	281
dd	Sub-total, processing and marketing costs			2,110	2,604
ee	Sub-total, production, processing and marketing			3,685	7,315
ff	Distribution costs, agent discount (20% of end user price for 3WC, 15% for SC)			1,000	1,350
Total costs, production, processing, marketing, distribution				4,685	8,665

Source: Based on discussions with eight private seed companies and information obtained from the Maize Program of ARC

Market concentration

The trend in the number of producers and market share in the industry in recent years is shown in Table 4. As the table demonstrates, both the production and number of producers has been increasing, while the market share of the largest producers has been declining. This is true whether or not ARC is included in the analysis.

Without counting ARC, the top five producers accounted for 91 percent of the production in 1993. Economists consider this to be a fairly high degree of concentration. By 1997, however, with almost three times as many producers in the industry, the top five producers accounted for only 67 percent of production. Thus, as the industry has been getting more competitive, there is less risk of monopolistic behavior now than in the early 1990s.

Production year:	1993	1994	1995	1996	1997
Including ARC					
Number of producers	9	10	11	17	22
Total production, MT	8,070	7,177	11,829	14,121	21,591
Share of top 5 producers	88%	80%	76%	72%	69%
Share of top 8 producers	99%	96%	92%	87%	80%
Not including ARC					
Number of producers	8	9	10	16	21
Total production, MT	7,069	6,814	10,829	12,771	18,147
Share of top 5 producers	91%	84%	80%	76%	67%
Share of top 8 producers	100%	99%	96%	90%	83%

Restrictions in supply of foundation seed

As noted above, government can at times promote monopolistic tendencies without intending to do so. In 1998, CASP was given the responsibility to market the seed that ARC had produced in 1997. CASP was allowed to begin hybrid maize seed production itself in 1998, and it was given authority over the supply of ARC foundation and breeder seed to private seed producers. The director of HSU has stated that none of ARC's three-way crosses will be released for production by private seed companies.¹² In the spring of 1998, CASP decided to restrict the issue of ARC seed to some private sector producers who had requested it. The reason given was that it was necessary to limit production in 1998 after the large carry-over of unsold seed from 1997. While this may be a logical enough move, it is a form monopolistic behavior. Only the free and unrestricted decisions of private producers can ensure that supply is adequate and lead to the competitive type of behavior that prevents monopolistic pricing.

Impacts of Government Actions on the Private Sector

¹² This statement was made to the study team on March 22nd.

It is clear from the study team's discussions that private sector producers think they have been unfairly treated by the government. To understand why they think this, it is useful to consider how the government's actions have already affected private producers, and how they might affect them in the future.

First, there is the issue of the ARC production, which increased significantly in 1997. As already noted, this contributed to the large amount of seed that remained unsold at the end of the 1998 marketing season. If seed is unsold, a producer has two options. He can either carry it over and attempt to sell it the following year, or if it has not yet been treated with pesticides, he can sell it as common grain. Either way, the result is a loss.

Based on the cost analysis presented in Table 3, it is possible to estimate the financial losses that result to the private sector. If the seed is sold as common grain, the loss will be at least LE 1,000 per MT,¹³ assuming that the decision to sell as grain is made before the seed has been processed. If the decision to sell as grain is made after processing for seed, the loss will be on the order of LE 3,100 per MT.¹⁴ If the seed is carried over for sale in the following year, the loss should be less, but there are certain risks involved – for example, the carried-over seed might not pass the re-certification.

Furthermore, the price at which the government – in this case CASP – sells its seed is an issue. While CASP sold Giza 10 and other single crosses for LE 10 per kg last year, they have announced that they will sell them at LE 7.50 per kg in the coming season. The private producers view this as unfair, given that CASP benefits from government support and therefore does not have to charge as much as the private producers in order to cover its costs. The study team inquired about this at CASP and was told by the manager that the agency does have to pay full costs. Furthermore, it was stated that in selling its seed at LE 7.50 per kg (LE 7 net after reduction of the distribution discount) CASP would be able to operate at a profit. To substantiate this, the manager agreed to provide an itemized statement of its costs of production.

Table 5 compares the CASP cost statement to the private producer's costs of producing single cross seed, as previously elaborated in Table 3. A number of observations can be made about the CASP cost statement, based on Table 5. First, some errors apparently have been made in preparing the CASP statement. The LE 1,510 per ton listed as the cost of the "breeder's right" is almost three times higher than the breeder's royalty that ARC charges for its foundation seed.¹⁵ Secondly, the CASP statement of LE 1,512 for "fungicides" per ton of finished seed must also be far too high. Nevertheless, CASP's overall costs that relate to field production (LE 4,922 per MT) are similar to the LE 4,711 determined for field costs of the private producer. Therefore, it might be concluded that CASP has fully accounted for field production costs in one way or another.

¹³ The on-farm production cost of the 3WC hybrid seed is LE 1575 per MT, whereas the price of common grain averaged LE 550 per MT in 1998.

¹⁴ Seed cost of LE 3,685 per ton, including processing, less the common grain price.

¹⁵ Table 3 should be consulted to see how the breeder's royalty of LE 12 per kg of foundation seed is converted to an equivalent of LE 545 per ton of certified single cross seed.

However, it appears that a number of costs are missing from the CASP accounting in the area of processing and marketing. In particular, there is no indication that the costs of certification or packaging have been included. Furthermore, it does not appear that interest costs, storage losses, or costs of stock carry-over are accounted for. While one might suspect that some of these items could have been included in the category "other items and services," the amount of this item (LE 350 per MT) is simply not sufficient to include them all. Furthermore, the LE 60 per ton indicated for the cost of processing is undoubtedly far too low to represent the full financial or economic cost, including depreciation, of utilizing one of CASP's seed processing plants, even given the fact that CASP plants do not include a drying apparatus.

In view of the preceding, the study team finds that the CASP statement is incomplete and that a higher amount than LE 7.50 per kg would have to be charged in order to cover CASP's full costs of operation. In allowing CASP to sell at this level, the government is effectively subsidizing maize seed production at a time when its policy is to remove input subsidies.

CASP's use of a price that is too low to cover its full economic costs will affect the private sector in two ways. It will place downward pressure on the prices which the private sector is able to obtain for its seed, and it will take sales from the private sector. Both of these factors will reduce private sector revenues and returns to private sector investments in the seed industry.

Private seed producers also believe that CASP is using unfair marketing practices. They report that CASP is using extension agents as distributors of its seed. The study team had no way to verify this allegation, but if true, it would seem to be unfair, since private producers have been prohibited for employing extension agents in this way. There are reports that some private companies still do this, too. To the extent that this practice is being used by either sector, it should be discontinued.

In the course of its visits, the study team saw signs that seed companies are having second thoughts about their involvement in the maize seed industry. Many are fearful that continued or expanded government seed production activities are having a negative effect on investment in the sector. Most indicated that they are unsure about the government's involvement in the sector. Going back to the early 1980's, they thought that there was a government commitment to leave maize seed production to private industry. This policy was first overlooked when ARC was allowed to resume seed production in the mid-1980s. And now it has been violated since CASP has been allowed to produce maize while it is still part of the government. The effect of government actions on future investments in the seed sector is likely to be negative unless the government clarifies its policy toward the sector and reaffirms its commitment to privatize.

Table 5. Costs of Hybrid Maize Seed Production in Egypt :

Comparison of Full Private Sector Costs for Single Cross (SC) to Cost Stated by CASP

(All monetary values stated in Egyptian Pounds (LE))

	Cost per ton of finished SC seed		Remarks - relationship to CASP Statement
	Private Sector (LE)	CASP (LE)	
On farm production costs:			
a Seed cost per feddan (LE 15 /kg for SC, LE 25 /kg for Inbred)	545	3,162	"Raw seed buying cost"
b Breeding royalties to ARC (equal cost of seed)	545	1,510	"Breeder's right"
c Seed production cost, contract grower, LE per feddan	3,636		
d Credit - 50% of seed cost charged to grower	(273)		
e Seed certification inspection cost - LE 20/feddan, + share of license	38		
f Transport from field to processing	55	50	1/2 of "Transportation"
g Supervision cost, LE per feddan (salaries and incentives)	109	200	"Production Cost"
h Supervision cost, LE per feddan (transport and per diems)	55		
i Sub-total, production costs per feddan & per ton	4,711	4,922	(Sub-total, not shown on CASPstatement)
Processing and Marketing Costs:			
j Shelling, mech. drying and cleaning, including depreciation on plant & equipment	450	60	"Processing"
k Chemical seed dressings, insecticides and fungicides	100	1,512	"Fungicides"
l Seed certification inspection, per finished ton (LE 30 per lot - assumes 15 ton lot size)	50		
m Assessment, agricultural syndicate, LE 15 per ton	15		
n Bagging (paper) @ LE 1.30 per 10 kg sack	100		
o Storage (5 mo's @ LE 7 per ton/month)	35		
p Transport cost (1 haul to distributor)	30	50	1/2 of "Transportation"
q Marketing and technical support to farmers - staff salaries and incentives	125		
r Marketing and promotion - educational materials and travel	75	106	"Traveling Allowance"
s Storage loss, 5% of the above (would be higher w/ natural drying)	281		
t Overhead - general management and administration costs	664	350	"Other Items and Services"
u Interest on operating capital - 12% on the above for 6 months	398		
v Cost of carry-over (4% of the above, assuming 25% carry-over)	281		
w Sub-total, processing and marketing costs	2,604	2,078	(Sub-total, not shown on CASPstatement)
x Sub-total, production, processing and marketing	7,315	7,000	(Sub-total, not shown on CASPstatement)
y Distribution costs, agent discount (20% of end user price)	1,350	500	"Distribution Incentives"
z Total costs, production, processing, marketing, distribution	8,665	7,500	"Total Cost Per Ton"

Source: Information provided by CASP (see Annex C) and analysis shown in Table 3.

The Need for Better Market Information and Coordination

Seed producers are understandably concerned about the over-supply which occurred last year. Many appear to hold the government partially responsible for the problem, since they think that the government encouraged them to produce a large amount of seed in order to further its plans for expanded national maize production. Naturally, the fact that seed produced by a government agency contributed to the over-supply compounds their concerns about the government's actions.

The periodic reappearance of over-supply in the seed industry suggests that there is a need for better coordination, or at least for better information about what is happening. The study team found that there is very limited information about what is happening, which makes it difficult for producers to make good production decisions. The information on seed production used in this report was very difficult to obtain.

Most of the available seed information is collected by CASC, but this information is not available on a timely or consistent basis. For example, the total amount of seed produced by the industry in 1998 has apparently still not been reported, although the marketing of seed for the 1999 crop has already begun, and it is time for the seed companies to start making their production plans for the year. CASC indicated that their informational program in conjunction with the National Seed Council calls for them to release a bulletin of current seed statistics every six months. However, the last such bulletin available was for 1997.

Seed producers indicated that it is very difficult to obtain information from CASC. The study team found that while CASC seemed willing to help provide information, the agency's records and system for reporting are not well organized. The information which is reported is not always clear in its meaning: for example, sometimes the production attributed to a given year seems to mean only the new seed which is produced in that year, whereas at other times it includes carry-over stocks from the preceding year.

Poor Quality Seed and Unqualified Producers

Two related issues were often mentioned to the study team. One was seed quality problems and the other was that there seem to be a number of small, "unqualified" seed producers. The implication is that unqualified producers are causing problems with seed quality.

Problems with seed quality were used to justify the re-entry of the ARC Seed Unit into the production of certified maize seed in 1986-87. This may have been justified at that time, given that there were only three companies in production; they operated under assigned markets; they were producing mainly ARC varieties; and PBDAC was doing all of the distribution work. There was not much competition among the companies. Since all were producing the same varieties, it was not always clear which company was responsible for problems of quality.

Over the past decade, however, the industry has expanded and gained considerable experience. Competition has increased dramatically. Establishment and defense of brand names has become more pronounced.

As already noted, the government's certifying agency, CASC, was made independent from the seed production agency, CASP. With guidance from the National Seed Council, CASC has tightened its testing requirements for re-certification of seeds, for which a test of vigor is also required in addition to the standard germination test. Thus, it is less likely that old seeds that cannot germinate sufficiently will reach the market. Bagging standards have been raised, and seed must now be labeled for year of production. Thus, quality standards have been raised overall.

Nevertheless, as many in the industry are quick to point out, while government testing and certification are an important element of quality control, they can never be an absolute assurance of quality. It is also important that the seed companies themselves exercise quality control, both through supervision of seed production in the field, and by adequate supervision of processing and storage. It appears that some companies – especially the smaller and newer ones – may not have adequate staff for this. In some cases, it appears that there may not have been adequate screening to ensure that companies meet the established standards and qualifications.

Capabilities of the Private Sector

When the government transferred authority to produce seed and to control ARC varieties to CASP, it cited concerns about the private sector's research capabilities. The head of the HSU indicates that the ARC's single cross varieties are not being released to the private sector companies in an attempt to encourage them to develop breeding programs.

The study team reviewed the private sector's capabilities, including its program for breeding research. Findings are summarized in Annex B. This record demonstrates that many private sector companies have established their own breeding programs and that the older, more established private companies have developed varieties which have been registered and are being distributed. However, almost all companies still rely upon ARC for at least some of their foundation seed, and ARC continues to play a key role in providing germplasm for the private breeding programs.

The pattern for many companies is to first start production by using varieties developed at the ARC. In time, after they have gained experience and developed the financial capacity, they then proceed with establishing their own programs of breeding research.

Annex B shows that most of the older companies have professional seed breeders on staff or under contract as consultants. Seven of the 22 companies producing seed in 1997 had such breeders, and eight¹⁶ had established research farms used for breeding. Four companies have managed to register a total of 15 varieties, which are currently being marketed.

¹⁶ One company had recently lost its breeder and is in the process of looking for a new one.

It is clearly beneficial for some private companies to do their own research and market their own varieties, particularly since this helps to ensure that the government is not the sole source of new varieties. Nevertheless, breeding is expensive, and some small companies which are perfectly capable of producing and marketing good seed may not be able to develop good breeding programs.

Other capabilities may be more important than breeding. Appendix B shows that eight companies have established their own seed processing units, and that three of these include drying equipment. Although drying is very helpful in the production of quality maize seed, none of the 15 seed plants operated by CASP includes a dryer.

ANNEX A. List of Study Team Activities and Persons Visited

<u>Date</u>	<u>Activity - Persons Visited</u>
3/12/99	Meeting, Dr. Curt Delouche, seed consultant.
3/13/99	Meeting, Mr. Lawrence Kent, APRP-RDI
3/13/99	Meeting, Dr. Adel Yaseen, Chairman, Fine Seeds International
3/13/99	Meeting, Dr. Abdel Salaam Gomaa, Consultant to the Minister and Retired Head, ARC
3/14/99	RDI staff meeting and attend meeting of Working Group on Variety Release with Dr. Delouche
3/14/99	Meeting, Dr. Mohamed Zaki Gomaa, Egypt Seed Association
3/14/99	Meeting, Dr. Saad Nassar, General Director, Agricultural Research Center
3/16/99	Meeting, Mr. Mounir Mehesin, Chairman, and Dr. M. Essam El Gressi, Misry Hytech Seed International
3/16/99	Meeting, Dr. Mohamed S. Radwan, President, Egyptian Plant Breeder's Association, at Cairo U.
3/17/99	Meeting, Engr. Roshdy M. Hassib, Head, Central Administration for Seed Production (CASP)
3/17/99	Meeting, Mr. Azmi Iskander, Vice Chairman, and Mr. Shashank Aurora, Controller, Misr Pioneer Co.
3/18/99	Meeting, Dr. Ahuned Salem, Chairman, Idea Group
3/18/99	Meeting, Engr. Ali Attia Ali, Assistant Manager, Danton Seed Company
3/20/99	Meeting, Dr. Mourad Khalil of Zagazig University re IFPRI study of maize production.
3/20/99	Meeting, Dr. Farouk Afifi, Chairman, and Engr. Ibrahim El Badry, Gen Mgr. Tech Affairs, EGA Seed
3/21/99	Attend annual conference on National Maize Campaign at ARC, Giza
3/22/99	Meeting, Engr. Fawzi Shaheen, Head, Central Admin. for Seed Production (CASC) & Mr. Adel Medani
3/22/99	Meeting, Dr. Essam Gheith, Chairman, National Seed Company
3/22/99	Meeting, Dr. Yusef Abdel Rahman Hossni, Undersecretary of Agriculture, and Chairman, HSU
3/23/99	Meeting, Dr. Shawki El Bagouri, Undersecretary of MALR for Agrarian Reform Sector.
3/24/99	Meeting, Dr. Magdy El Guindy on APRP study of animal feed sector.
3/24/99	Meeting, Engr. Mahmoud Nour, APRP Project attend meeting of working group on variety releases.
3/24/99	Meeting, Dr. Mahmoud Mansour, Head, AERI
3/25/99	Meed with Ahmed Ghoneima, AERI on monitoring survey for National Maize Campaign
3/25/99	Attend final debriefing of Dr. Delouche
3/30/99	Fitch and Abdrabboh meet to go over report draft
3/31/99	Prepare for workshop at APRP office
4/1/99	Present study findings to Workshop with 25 participants (industry, government, APRP, USAID)
4/3/99	Fitch and Abdrabboh finalize report.

Annex B. Capabilities of Private Sector Maize Seed Companies

Company Name (in order of date started)	Year founded or started maize seed production?	Total number of employees (where known)	Size of production staff (where known)	Has own seed processing facility?	Has own breeder on staff or contract?	Has research farm?	Has active breeding program?	No. of Maize Varieties Registered to Date?	Produces ARC Maize Varieties?	Has exclusive ARC release variety?
1 Misr Pioneer Seed Co.	1980	60		Y D	Y	Y	Y	7		
2 Egyptian Agri. Co (EGA Seed)	1981	150	50	Y	Y	Y	Y	4	Y	
3 National Seed Co. ^{b/}	1981	43	17	Y		Y	?		Y	
4 Nile Company for Seeds	1989			Y D	Y	Y	Y		Y	#321
5 Danton Egypt Co.	1989								Y	#322
6 Misr Hytech Co.	1993	30+	7	Y D	Y	Y	Y	1	Y	#320
7 Rice Producers' Cooperatives	1993?								Y	
8 The Nile Storage Co.	1993?					Y		3 ^{a/}		
9 El Fouad Co.	1994								Y	
10 Gen. Org. for Agrarian Reform	1994?								Y	
11 Fine Seeds International Co.	1995			Y	Y	Y			Y	#323
12 Agro Seed Co.	1996								Y	
13 El Safa National Co.	1996								Y	
14 Interseeds Co.	1996								Y	
15 The Developed Group Co.	1996								Y	
16 Int'l Investment Co. for Seed	1996								Y	
17 Idea	1996			Y					Y	
18 Delta Seeds Co.	1997					Y	Y		Y	#324
19 Arab Co.	1997								Y	
20 Nobaseeds Co.	1997								Y	
21 Abu Nour El Din Association	1997								Y	
22 Union Co.	1997								Y	
23 Agri-Tech for Ag. Development					P				Y	
24 El Sharkia Company										
25 Commercial Company										
26 Ag Services Company										
27 Pure Seeds Company										

Notes: Y = Yes; D = Includes drying equipment; #nnn = the number of the exclusive 3-Way Cross from ARC

a/ Three of these are Pioneer international varieties, whereas the others are registered in the name of Misr Pioneer.

b/ Varieties registered for Nile Storage are DeKalb Varieties.

ANNEX C

Central Administration for Seed
Production (CASP)

Cost Calculations for Maize – 1999

	Description	LE / Ton	LE / Kg
1	Raw seed buying price	3,162.00	3.162
2	Fungicides	1,512.00	1.512
3	Breeder's right	1510	1.51
4	Production cost	200	0.2
5	Transportation	100.00	0.1
6	Processing	60.00	0.06
7	Travelling Allowance	106.00	0.106
8	Distribution incentives	500.00	0.5
9	Other items & services	350.00	0.35
	<i>Total Cost per Ton</i>	<i>7,500.00</i>	<i>7.5</i>

Selling price equals total cost

*** Selling price of 10 kg bag = LE. 75

Source: Prepared by CASP at the request of the study team.

ANNEX D. Brief History of the National Maize Campaigns

**by Abdrabboh A. Ismail, PhD
Former Head of FCRI, ARC**

The Ministry of Agriculture, along with the Academy of Scientific Research, have adopted the idea of national campaigns to improve production of cereal crops. Through these campaigns, efforts of specialized scientists from government research centers and universities are combined with the activities of agricultural extension agents in farmers' fields for the purpose of increasing crop yields. The end objective is for Egypt to become self-sufficient in the major grains.

The National Campaign for Improving Maize Production was the leading campaign and succeeded in increasing maize yields from 10.77 ardebs per feddan in 1980 to 22.9 ardebs per feddan in 1998. This indicates the effectiveness and importance of such campaigns.

The Maize Campaign started in 1980 by operating in one governorate (Dakahlia) and covering 3,058 feddans of maize. In 1981 it expanded to cover three governorates, all in the Delta, and the total area covered was increased to 7,380 feddans. In 1982, the Sharkia governorate was added. By 1985 all governorates in the Delta area were covered, and 142,000 feddans was reached by activities of the campaign.

Starting in 1981 the National Research Center, collaborating with the Ministry of Agriculture, and funded by the National Academy of Scientific Research and the Rural Development Project, conducted another campaign in southern Egypt. Only Giza Governorate was reached in 1981, but by 1985, all five governorates from Giza to Assyout were included in the southern campaign.

Then, in 1986, the two campaigns for the South and the Delta were merged into one National Maize Campaign. This was financed by the Ministry of Agriculture and the National Academy of Scientific Research, and it combined the efforts of the Agricultural Research Center, the National Research Center, the Colleges of Agriculture, all of Egypt's universities, and the Extension service of the Ministry of Agriculture.

Now the National Maize Campaign is active in 20 governorates, representing all of the cultivated maize area of Egypt, including new desert lands that have recently been brought into production.

To accelerate the production increase target, the campaign undertook to do the following:

- acquaint farmers with high yielding hybrids,
- acquaint farmers with recommended agronomic practices,
- help farmers solve problems limiting their production,
- increase availability of high quality seed by involving seed companies in campaign activities and by including their varieties in demonstration fields,
- help insure the availability of production inputs.

ANNEX E. List of Maize Varieties Registered to ARC and Private Companies

(as of 1 February 1998)

<u>Class</u>	<u>Name</u>	<u>Applicant</u>	<u>Date Registered</u>
<u>White Single Cross</u>	Single Cross 10	ARC	1991
	Single Cross 9	ARC	1992
	Single Cross 103	ARC	1992
	Giza 122	ARC	1993
	Giza 123	ARC	1993
	Watania 4	National Seed Co	1994
	Giza 123	ARC	1995
	Giza 129	ARC	1995
	Giza 156	ARC	1995
	Giza 161	ARC	1995
	EGA Seed 13, "Bashayir"	Egyptian Seed Co.	1995
<u>Yellow Single Cross</u>	Giza 151	ARC	1993
	Giza 152	ARC	1993
	Giza 153	ARC	1993
	Giza 154	ARC	1993
	Giza 155	ARC	1993
	Pioneer 3062	Misr Pioneer Seed Co.	1996
<u>White Double Cross</u>	Hybrid 73120 "Fattah"	Misr Pioneer Seed Co.	1988
	Double Hybrid 204	ARC	1989
	Double Hybrid 215	ARC	1989
	Double Hybrid 217	ARC	1992
	Dbl. Hybrid DK 2771 "Gawaher"	Dekalb	1992
	"Taba"	Pioneer Overseas	1991
<u>Yellow Double Cross</u>	"Hediah" DK 2770	Dekalb - EINil Storage	1993
	"Amoun" - Hybrid 73115	Misr Pioneer	1988
<u>White 3-Way Cross</u>	Hybrid 310	ARC	1989
	"Neima" - DK 2147	Dekalb	1992
	Hybrid 320	ARC	1992
	Hybrid 321	ARC	1993
	Hybrid 322	ARC	1993
	Wataniya 1	National Seed Co.	1994
	Pioneer 3057	Pioneer	1995
	"Nefertiti" 3	Egyptian Seed Co.	1996
	Pioneer 3052	Misr Pioneer	1996
	Gizaa 323	ARC	1977
	Giza 324	ARC	1977
"Baraka"	Egyptian Seed Co.	1977	
<u>Yellow 3-Way Cross</u>	Giza 351	ARC	1993
	Giza 352	ARC	1993
	"Sultan"	Agroseed	1994

Source: Crop Variety Registration Committee, Office of Secretariat (CASC)

Appendix 1. Quantities of Certified Maize Seed Produced and Distributed, 1975 until Present

Combinded Data Used in Analysis												
Year	Percent				MALR/CASP				ARC Maize Campaign Reports			
	Production	Distributed	Not Sold	Not Sold	Production	Distributed	Not Sold	% Not Sold	Supply	Distributed	Not Sold	% Not Sold
	mt	mt	mt		mt	mt	mt					
1975/76	2,275	1,441	834	37%	2,275	1,441	834	37%				
1976/77	3,030	2,082	948	31%	3,030	2,082	948	31%				
1977/78	2,013	1,554	459	23%	2,013	1,554	459	23%				
1978/79	1,694	1,089	605	36%	1,694	1,089	605	36%				
1979/80	1,102	1,014	88	8%	1,102	1,014	88	8%				
1980/81	605	602	3	0%	605	602	3	0%				
1981/82												
1982/83												
1983/84												
1984/85	5,311	5,177	133	3%	5,311	5,177	133	3%				
1985/86	10,131	9,612	519	5%	10,131	9,612	519	5%				
1986/87	8,863	8,224	639	7%	8,863	8,224	639	7%				
1987/88	13,266	11,755	1,511	11%	13,266	11,755	1,511	11%				
1988/89	13,231	11,800	1,432	11%	13,231	11,800	1,432	11%				
1989/90	14,029	10,825	3,204	23%	14,029	10,825	3,204	23%				
1990/91	20,580	12,333	8,247	40%	20,580	12,333	8,247	40%				
1991/92	23,325	7,202	16,123	69%	23,325	7,202	16,123	69%				
1992/93	17,585	6,139	11,446	65%	17,585	6,139	11,446	65%				
1993/94	12,883	6,006	6,877	53%	12,883	6,006	6,877	53%	8,070	6,006	2,064	26%
1994/95	7,177	6,050	1,127	16%					7,177	6,050	1,127	16%
1995/96	11,869								11,869			
1996/97	14,121	10,463	3,658	26%	13,645	casc			14,121	10,463	3,658	26%
1997/98	21,591	12,625	8,966	42%	19,775	casc			21,591	12,625	8,966	42%

Note: The MALR/CASP data is taken from Table 78 in MALR/CASP/GTZ Agricultural Seed Sector Statistics, 1975 - 1997, October 1998.

This table indicates that data for the 1981-1984 production years are not available. It indicates that there was a carry-over of 8061 mt of seed for the 1992 marketing year, which would have been 69% of that year's production. The authors chose not to use this data because it seemed to be unbelievably high. Furthermore, the data reported by ARC, which is based mainly on information reported by CASC, were used for the 1993/94 year and beyond. Note that the amount of the production distributed during 1994 and 1995 was much higher, according to CASC.

The data from ARC data series are reported in ARC/MRI, Annual Reports of National Maize Campaign, 1995 through 1998. Most of the production and distribution data in these reports is attributed to CASC.

The quantity of National Seed Company's 1998 distribution was adjusted downward, based on information from that company. This adjustment also affects the total distribution shown for 1998.

Appendix 2. Maize Production and Price Data for Egypt

Year	Area (ha)	Production (mt)	Yield (mt/ha)	World fob Price (\$/mt)	World price at farmgate in Egypt (LE/mt)	Egypt domestic farm price (LE/mt)	Population of Egypt (millions)
1980	798,000	2,864,820	3.590	125.6	142.9	123	42.1
1981	806,400	3,284,467	4.073	130.7	129.1	94	43.1
1982	814,800	3,590,824	4.407	108.3	102.9	125	44.1
1983	819,000	3,876,327	4.733	135.8	129.6	168	45.2
1984	827,400	3,861,476	4.667	135.8	132.9	173	46.2
1985	802,200	3,904,307	4.867	112.2	108.6	194	47.3
1986	621,600	3,101,784	4.990	87.8	117.3	219	48.5
1987	760,200	3,902,107	5.133	75.6	162.2	254	49.6
1988	823,200	4,390,126	5.333	107.1	278.5	324	50.8
1989	840,000	4,886,280	5.817	111.4	346.0	405	52.0
1990	649,740	4,047,880	6.230	109.4	396.8	427	53.2
1991	703,920	4,399,500	6.250	107.5	469.3	437	54.5
1992	692,580	4,432,512	6.400	104.3	455.5	435	55.8
1993	697,620	4,415,935	6.330	102.0	460.1	458	57.1
1994	730,800	4,883,936	6.683	107.9	477.3	479	58.4
1995	735,420	4,535,335	6.167	123.6	554.5	514	59.8
1996	742,560	5,165,990	6.957	194.6	735.6	537	61.2
1997	687,120	5,146,529	7.490	127.0	650.7	552	62.7
1998	712,740	5,440,344	7.633	125.0	642.0	550	

Source: Production data is from Central Administration for Agricultural Economics, Ministry of Agriculture and Land Reclamation.

Price information is from M.El Guidi, I. Saddik, & E. Ariza Nino, "Policy Issues & Options in the Poultry Feed Market in Egypt," APRP/RDI, draft March, 1999.

Appendix 3. Certified Maize Seed Production 1993-98, by Company or Organization

Company	1997/98			% Not Sold	1996/97			% Not Sold
	Production	Distribution	Not Sold		Production	Distribution	Not Sold	
Agricultural Research Centre ^{a/}	3,443.4	2,530.0	913.3	27%	1,350.0	1,350.0	-	0%
Misr Hytech Co.	2,852.8	1,713.5	1,139.3	40%	2,500.0	2,200.0	300.0	12%
Egyptian Agri. Co (EGA Seed)	3,870.9	1,600.9	2,270.0	59%	2,094.6	1,402.0	692.6	33%
National Seed Co. ^{b/}	2,291.2	1,500.0	791.2	35%	1,531.1	904.0	627.1	41%
Misr Pioneer Seed Co.	2,487.2	1,441.1	1,046.1	42%	2,747.2	1,730.0	1,017.2	37%
Gen. Org. for Agrarian Reform	732.6	705.2	27.4	4%	334.8	334.8	-	0%
Nile Company for Seeds	743.4	576.2	167.2	22%	889.5	720.0	169.5	19%
Agro Seed Co.	812.0	520.8	291.2	36%	498.7	388.0	110.7	22%
Danton Egypt Co.	1,264.7	452.6	812.1	64%	705.1	593.0	112.1	16%
Rice Producers' Cooperatives	749.6	435.1	314.6	42%	306.0	218.0	88.0	29%
Fine Seeds International Co.	373.1	231.1	142.0	38%	174.1	151.0	23.1	13%
The Nile Storage Co.	428.7	160.9	267.8	62%	467.7	78.0	389.7	83%
Delta Seeds Co.	256.7	153.7	103.0	40%				
El Safa National Co.	292.4	148.7	143.7	49%	151.8	86.0	65.8	43%
El Fouad Co.	188.7	93.4	95.4	51%	115.4	93.0	22.4	19%
Arab Co.	168.5	88.5	80.0	47%				
Interseeds Co.	172.5	82.0	90.5	52%	67.6	54.0	13.6	20%
Nobaseeds Co.	92.9	57.6	35.3	38%				
The Developed Group Co.	152.0	52.0	100.0	66%	117.2	91.0	26.2	22%
Int'l Investment Co. for Seed	130.7	45.2	85.5	65%	70.0	70.0	-	0%
Abu Nour El Din Association	37.2	24.6	12.6	34%				
Union Co.	49.3	11.3	38.0	77%				
Total	21,590.7	12,624.6	8,966.1	42%	14,120.6	10,462.8	3,657.8	26%

Source: ARC/MRI, Annual Reports of National Maize Campaign, 1995 through 1998.

Most of the production and distribution data in these reports is attributed to CASC.

a/ In 1998, the seed which had been produced by ARC (MRI) was distributed by CASP.

b/ National Seed Company's 1998 distribution adjusted downward, based on information provided by the company.

Appendix 3. Certified Maize Seed Production 1993-98, by Company or Organization

Company	1995/96	1994/95		% Not Sold	1993/94		% Not Sold
	Production	Production	Distribution		Production	Distribution	
Agricultural Research Centre ^a	1,000	363	361	1%	1,001	942	6%
Misr Hytech Co.	1,415	1,529	1,529	0%	353	293	17%
Egyptian Agri. Co (EGA Seed)	2,024	960	915	5%	1,585	1,140	28%
National Seed Co. ^b	1,155	678	614	9%	1,100	635	42%
Misr Pioneer Seed Co.	3,353	1,884	1,524	19%	2,529	2,030	20%
Gen. Org. for Agrarian Reform	492	432	432	0%	-	-	
Nile Company for Seeds	750	658	543	17%	887	538	39%
Agro Seed Co.							
Danton Egypt Co.	591	367	316	14%	361	231	36%
Rice Producers' Cooperatives	325	247	213	14%	138	112	19%
Fine Seeds International Co.							
The Nile Storage Co.	634				116	85	27%
Delta Seeds Co.							
El Safa National Co.							
El Fouad Co.	90	59	59	0%	-	-	
Arab Co.							
Interseeds Co.							
Nobaseeds Co.							
The Developed Group Co.							
Int'l Investment Co. for Seed							
Abu Nour El Din Association							
Union Co.							
Total	11,829.0	7,177.0	6,506.0	9%	8,070.0	6,006.0	26%

Appendix 4. Certified Hybrids Production in 1997/98, by Type of Seed and By Organization

<u>Producer</u>	Hybrids									<u>Inbred Lines</u>	<u>Non-Hybrids</u>	<u>TOTAL</u>
	<u>Single Cross</u>		<u>Double Cross</u>		<u>3-Way Cross</u>		<u>Sub-totals</u>					
	<u>White</u>	<u>Yellow</u>	<u>White</u>	<u>Yellow</u>	<u>White</u>	<u>Yellow</u>	<u>White</u>	<u>Yellow</u>	<u>Both</u>			
ARC	2,993	22			117	27	3,110	49	3,159	112	79	3,350
Private Companies	834	26	714	602	12,733	33	14,281	661	14,942	22		14,964
Cooperatives					720		720	-	720			720
Agrarian Reform Agency					742		742	-	742			742
TOTAL	3,827	48	714	602	14,312	60	18,853	710	19,563	134	79	19,776
Sub-total, by type of cross		3,875		1,316		14,372			19,563			

Source: CASC