

Summary and Conclusions

In 1997, CIMMYT launched a major study designed to document the impacts of international maize breeding research in developing countries. The study was intended to update and extend the findings of CIMMYT's first global research impacts study, which had been published three years earlier in a report entitled *Impacts of International Maize Breeding Research in the Developing World, 1966-90* (López-Pereira and Morris 1994). Due to the enormity of the data collection task, the follow-up study was divided into three regional impacts studies. This report has presented the results of the regional impacts study carried out for eastern and southern Africa.

The results presented in this report are based on information collected during 1998 and 1999 through a comprehensive survey of public and private maize breeding organizations and seed production agencies in 12 countries of eastern and southern Africa. The survey generated information on many aspects of maize research, seed production, and seed distribution (e.g., maize breeding activities, products of breeding programs, maize seed production and sales operations, seed industry regulations and policies). The countries covered by the survey accounted for more than 95% of all maize produced in the region. The organizations contacted as part of the survey currently control about 97% of the total maize seed market in the 12 countries.

Major findings of the study are summarized below.

Policy reforms have led to increased private-sector participation in many national maize seed industries

During the past decade, national maize seed industries in eastern and southern Africa have undergone major structural changes. In most countries, policy reforms introduced in an effort to

scale back the role of the state have paved the way for increased private sector participation in seed research, seed production, and seed distribution activities. These policy reforms have induced marked changes in the organization and performance of national maize seed industries.

The most obvious change has been the emergence of a flourishing private maize seed sector. Private maize seed companies currently operate in every country in the region. This represents a major difference compared to earlier years, when maize research and maize seed production were largely restricted to monopolistic government agencies and parastatals. Major reforms that were instrumental in bringing about this change included the lifting of prohibitions on private seed companies, removal of restrictions on importation of commercial maize seed, and elimination of direct seed price controls.

Despite the recent liberalization measures, however, in many countries the participation of private seed companies continues to be constrained by implicit restrictions in the form of cumbersome seed certification requirements and lengthy varietal registration procedures. Moreover, a number of governments are still trying to influence maize seed prices indirectly, for example by subsidizing maize seed production. This practice is especially prevalent in countries in which public agencies continue to operate and control large shares in the seed market.

Interestingly, the rise of the private seed industry appears to have happened in the absence of well-defined intellectual property regimes. In most countries of eastern and southern Africa, little progress has been achieved in establishing intellectual property rights and implementing plant varietal protection legislation. Private seed companies apparently are relying mainly on trade secrets approaches to keep their most valuable germplasm out of the hands of potential competitors, thereby protecting the investments they have made in maize breeding research.

Rapid growth in private-sector investment in maize breeding research has been accompanied by changes in varietal release patterns

The recent policy reforms have had a pronounced effect on research investment patterns. Although data on research investment are difficult to come by, private investment in maize breeding research clearly has increased as a share of total research investment in many countries. In eastern Africa, public-sector maize breeders still outnumber private-sector breeders, but in southern Africa the number of breeders is now roughly the same. Numbers of scientists provide an imperfect measure of total research investment, however, since they reveal very little about the cost of supporting each researcher. In eastern and southern Africa, as elsewhere in the developing and developed world, the cost of supporting a senior scientist (salary and benefits plus operating funds) tends to be considerably higher in the private sector. Adjusting for the difference in support costs, total research investment by the private sector probably exceeds total research investment by the public sector, certainly in southern Africa and probably for both regions.

The productivity of investments in breeding research can be judged by examining the rate at which breeding programs release new varieties. In both eastern and southern Africa, maize breeders employed by private seed companies have on average released more varieties than maize breeders working in public research organizations. This difference in varietal release rates can be attributed to differences in the quantity and quality of investment, as well as to the commercial orientation of private seed companies compared to public breeding programs, which focus more on non-commercial breeding objectives.

The composition of varietal releases reflects steady growth in the role of the private sector. By the late 1990s, all maize varieties released in eastern and southern Africa were originating from private

companies. The recent decline in public-sector varietal releases no doubt also reflects reductions in public funding for agricultural research that have occurred in many countries in the region.

Increased private-sector participation in the maize seed industry has been accompanied by greater concentration of the industry

Seed industry liberalization has led to a significant decline in the role of public seed agencies throughout eastern and southern Africa. Seed sales data make clear that the private sector has effectively taken over the maize seed market in many countries. In 1996, the most recent year for which seed sales data are available, more than 90% of total commercial seed sales were made by private companies. It is important to note, however, that in a number of major maize producing countries (e.g., Kenya, Zambia, Zimbabwe), the leading private seed company is simply a transformed version of a previously public or parastatal seed agency that had long monopolized the local seed market. In several instances, these privatized parastatals continue to control more than 80% of the national seed market. At the time of their creation, these companies already had an edge over potential competitors because they inherited well established networks of seed production facilities, conditioning plants, and distribution depots.

With privatization, the maize seed industry is becoming more concentrated as a relatively small number of large multinationals acquire, merge with, or buy large shares in local seed companies. While consolidation could lead to scale economies, reduced competition is a concern to farmers, who worry that they may eventually face restricted choices and have to pay higher prices. The fact that seed prices in many countries have not risen significantly may reflect continued attempts by governments to keep maize seed prices low through the supply of subsidized public maize seed.

Hybrids now dominate varietal releases and seed sales

Since private seed companies have strong commercial incentives to concentrate on hybrids, it is not surprising that the emergence of a flourishing private seed industry has been accompanied by a rising share of hybrids in new varietal releases and seed sales. Because many public breeding programs are now also concentrating on hybrids (because of their superior performance), this has led to a situation in which varietal releases and seed sales are now completely dominated by hybrids.

Some observers have raised questions about the increasing popularity of hybrids, pointing out that hybrid technologies may not be suitable for small-scale, subsistence-oriented farmers, many of whom lack the resources needed to buy fresh seed every season. Little empirical evidence has emerged to indicate that small-scale farmers have been adversely affected by the shift to hybrids, but the matter will require careful attention, because supplying seed to smallholders may not be of interest to profit-motivated private firms.

Adoption of improved maize varieties increased during the 1990s

Commercial maize seed sales data support estimates made by researchers and seed industry insiders that adoption of improved varieties increased during the 1990s in most countries of eastern and southern Africa. However, significant differences in adoption patterns are evident between countries and regions. Total sales of improved maize seed have fluctuated around a modest 20,000 tons per year in eastern Africa, whereas in southern Africa total maize seed sales grew during the early 1990s to peak at just over 100,000 tons in 1992 before declining. Within individual countries, the area planted to modern varieties varies from less than 10% to nearly 100%. The large differences between countries in adoption

rates can be attributed partly to differences in economic, institutional, and policy factors that affect the availability and affordability of improved seed.

Use by researchers of CIMMYT germplasm continues to increase, as does adoption by farmers of CIMMYT-derived varieties

CIMMYT's maize breeding program has had significant impacts in eastern and southern Africa. Of all maize varieties released by public and private breeding programs since 1966 and whose parentage is known, 24% were developed using CIMMYT source materials (35% if South Africa is excluded). Use of CIMMYT germplasm increased steadily over time; of the varieties released since 1990 and whose parentage is known, over 31% were developed using CIMMYT source materials (55% if South Africa is excluded). In 1996, approximately 1.6 million ha in eastern and southern Africa were planted to varieties that had been developed using CIMMYT germplasm, representing nearly 21% of the area planted to all modern varieties. Excluding South Africa, where farmers grow mainly temperate materials not targeted by CIMMYT's breeding program, nearly 37% of the area planted to modern varieties in eastern and southern Africa was planted to varieties containing CIMMYT germplasm. Taken together, the varietal release data and the adoption data indicate growing demand for CIMMYT source materials on the part of public and private breeding programs, as well as growing acceptance by farmers of varieties developed using those materials. The observed growth in demand for and use of CIMMYT germplasm in eastern and southern Africa over recent years validates the decision by the CIMMYT Maize Program to establish regional maize breeding programs in eastern and southern Africa and to allocate increased resources to local adaptive breeding.

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