

# Impacts of Maize Breeding Research in Latin America, 1966-1997

Michael L. Morris and  
Miguel A. López-Pereira

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**Abstract:** This report documents the number and types of maize varieties and hybrids released by public breeding programs between 1966 and 1997, describes the varieties and hybrids marketed by public seed agencies and private companies in Latin America in 1997, analyzes recent trends in commercial maize seed sales, estimates the area planted to improved maize germplasm in 1996, and discusses factors that have influenced adoption. The authors find that the primary locus of maize breeding research has shifted to the private sector, the private sector now dominates commercial maize seed production, and the maize seed industry in Latin America has become increasingly concentrated. Although the area planted to improved maize germplasm continues to increase, adoption has been uneven. The use of CIMMYT materials has been extensive in public as well as private sector breeding programs, and total area sown to CIMMYT-related materials continues to increase.

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# Executive Summary

This report, the latest in an occasional series of maize and wheat impacts studies published by the International Maize and Wheat Improvement Center (CIMMYT), presents an updated picture of the impacts of maize breeding research in Latin America.

It documents the numbers and types of maize varieties and hybrids released by public breeding programs between 1966 and 1996, describes the varieties and hybrids being marketed by public seed agencies and private companies in Latin America in 1997, analyzes recent trends in commercial maize seed sales, estimates the area planted to improved germplasm in 1996, and discusses factors that have influenced adoption.

The data presented in this report were collected through interviews with representatives from public research institutes, government seed agencies, and private seed companies located throughout Latin America. An initial survey was conducted in 1992; findings were published in the report entitled *Impacts of International Maize Breeding Research in the Developing World, 1966-1990* (López-Pereira and Morris 1994). A second, more extensive survey conducted in 1997 involved comprehensive interviews with representatives from 36 public maize seed organizations and 172 private seed companies in 18 countries. Information was collected from virtually every organization in Latin America that

engaged in maize breeding and maize seed production; collectively, the organizations that participated in the survey accounted for approximately 97% of the commercial maize seed sold in Latin America in 1996.

Major findings of this research are summarized in the following paragraphs.

## **THE PRIMARY LOCUS OF MAIZE BREEDING RESEARCH HAS SHIFTED TO THE PRIVATE SECTOR.**

During the past decade, the primary locus of maize breeding research in Latin America has shifted from government research organizations to private seed companies. Private-sector research and development (R&D) expenditures have increased steadily, while support to public maize breeding organizations has declined. The level of private investment now significantly exceeds the level of public investment.

## **COMMERCIAL MAIZE SEED PRODUCTION IS NOW DOMINATED BY PRIVATE COMPANIES.**

The decline in public-sector support for maize research has been accompanied by a gradual disengagement of the state from commercial seed production activities. During the 1980s and 1990s, many money-losing government seed agencies were privatized or shut down, and those

that remain account for an insignificant proportion of the total market for seed. State disengagement from seed production has been accompanied by an equivalent expansion of the private seed industry. Private companies now dominate the market for maize seed in virtually every country in Latin America, except for the countries in the Caribbean region.

#### **THE MAIZE SEED INDUSTRY HAS BECOME INCREASINGLY CONCENTRATED.**

The emergence of a flourishing private maize seed industry in Latin America has been characterized by steady consolidation, as large multinational seed companies have swallowed up many small local seed companies through acquisitions and mergers. The maize seed industry in Latin America is today highly concentrated; in most countries, the three largest seed companies control 75% or more of the total market share.

#### **THE AREA PLANTED TO IMPROVED GERmplasm CONTINUES TO EXPAND.**

The area planted to improved germplasm in Latin America continues to expand. In 1996, nearly 14 million ha were planted to improved varieties and hybrids (equivalent to about 48% of the total area planted to maize). This represents a significant increase from 1990, when just under 10 million ha were planted to improved varieties and hybrids (equivalent to about 43% of the total maize area).

#### **THE PATTERN OF ADOPTION OF IMPROVED GERmplasm HAS BEEN UNEVEN.**

Use of improved germplasm has increased throughout Latin America as a whole, but the pattern of adoption has been uneven. Use of improved germplasm is concentrated in areas where maize is a commercial crop; meanwhile, in regions characterized by subsistence-oriented agriculture, most farmers continue to grow local varieties. The area planted to improved varieties

and hybrids remains particularly modest in some of the poorest countries and regions within Latin America, including Mexico (20.3%), Central America (21.8%), and the Caribbean (31.3%).

#### **USE OF HYBRIDS HAS INCREASED DRAMATICALLY RELATIVE TO USE OF IMPROVED OPEN-POLLINATED VARIETIES (OPVs).**

The rise of the private seed industry has been reflected in a pronounced shift in the types of materials planted in farmers' fields. The area planted to hybrids has increased, while the area planted to improved OPVs has declined. By 1996, the area planted to hybrids already far exceeded the area planted to improved OPVs. Despite warnings that only large-scale commercial producers would adopt hybrid technologies, in many countries small-scale producers have successfully adopted hybrids.

#### **CIMMYT MATERIALS HAVE BEEN USED EXTENSIVELY BY PUBLIC BREEDING PROGRAMS.**

Public maize breeding programs have made extensive use of CIMMYT materials. From 1966 to 1997, approximately 55% of all varieties and hybrids released by public breeding programs contained CIMMYT germplasm. Contrary to expectations, this percentage has increased over time. However, the way in which CIMMYT germplasm is used has changed. Public-sector breeders have increasingly tended to subject CIMMYT materials to additional cycles of selection before using them to form finished cultivars.

#### **CIMMYT MATERIALS HAVE BEEN USED EXTENSIVELY BY PRIVATE-SECTOR BREEDERS.**

Private-sector breeders also have made extensive use of CIMMYT materials. Although detailed information about the genetic background of proprietary hybrids is not always available, we

estimate that 75% of all seed sold by private companies in Latin America in 1996 contained CIMMYT-derived germplasm. The way CIMMYT materials are used tends to vary by type of seed company. Small local seed companies often make direct use of CIMMYT lines in forming hybrids. Large companies with strong breeding programs (including most multinationals) also use CIMMYT lines directly, but more frequently they use CIMMYT materials as source germplasm for developing their own inbred lines.

**THE TOTAL AREA PLANTED TO CIMMYT-DERIVED OPVs AND HYBRIDS CONTINUES TO INCREASE.**

The area planted to improved OPVs and hybrids that contain CIMMYT germplasm in their ancestry continues to increase. In 1996, CIMMYT-derived cultivars were planted on approximately 10.6 million ha, representing over 36% of the total maize area in Latin America and

over 75% of the area planted to improved germplasm. Use of CIMMYT-derived cultivars is concentrated in lowland tropical environments.

**ADOPTION OF IMPROVED GERmplasm DEPENDS ON MANY FACTORS.**

Adoption of improved germplasm is influenced by many factors, only some of which pertain to the characteristics of the germplasm itself. Generally speaking, adoption of improved germplasm is higher in countries where it is profitable for farmers to adopt improved OPVs and hybrids and for companies to produce and sell seed. Policy makers therefore must be realistic about researchers' ability to bring about desired changes in farm-level productivity. Improved germplasm is needed to raise productivity, but improved germplasm in and of itself is not sufficient. Other things are also required, including adequate economic incentives, appropriate institutional structures, and a favorable policy environment.

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