

Adoption of Maize MVs

Information presented in the preceding sections of this report describes how CIMMYT-related germplasm has found its way into maize varieties and hybrids developed by public breeding programs and private seed companies throughout Latin America, but it does not indicate the extent to which farmers use these varieties and hybrids. To assess the impacts of maize breeding research, it is important to determine the extent to which commercial materials have been taken up by farmers. This section of the report presents evidence on the adoption of improved varieties and hybrids in Latin America.

Before presenting evidence on adoption, a caveat is necessary. In Latin America as elsewhere, formulating precise estimates of the area planted to improved germplasm is complicated by at least four factors. First, the physical environments and cropping systems in which maize is grown are extremely diverse, so that the uptake of improved cultivars often varies widely even within individual countries; this greatly increases the difficulty of formulating accurate country-level adoption estimates. Second, a lot of maize in Latin America is grown by subsistence-oriented farmers who do not regularly purchase commercial seed; information on how these farmers manage their maize varieties tends to be limited. Third, much of the commercial maize seed sold in Latin America now moves through the private sector; since many private companies

consider seed sales information to be confidential, it is generally difficult to get seed sales data for use in gauging adoption trends. Fourth, many farmers in Latin America save seed from their own harvest to plant in the following season (a practice known as “seed recycling”); this makes it difficult to identify improved germplasm in the field, especially since maize is a cross-pollinating crop and the genetic makeup of cultivars can quickly change in the presence of seed recycling (see Morris, Risopoulos, and Beck 1999).

Because of the difficulties inherent in estimating the adoption of improved germplasm, we have chosen to present two quite different types of data that relate to the uptake and use of improved maize varieties and hybrids. First, we present information about commercial maize seed sales collected from the public seed production agencies and private seed companies that participated in the CIMMYT survey. Although commercial seed sales data do not provide a direct measure of the total area under improved cultivars (since a considerable portion of the total area is planted using recycled seed), commercial seed sales data nevertheless provide important insights into the strength of demand for improved cultivars. After reviewing the evidence on commercial seed sales, we turn to direct estimates of the area planted to improved maize varieties and hybrids.

COMMERCIAL MAIZE SEED SALES

Production and distribution of maize seed is big business in Latin America. In 1996, public agencies and private companies produced nearly 300,000 t of commercial maize seed for distribution within the region (Table 28).⁷

Commercial seed production was concentrated in the Southern Cone of South America, with two countries, Brazil and Argentina, accounting for slightly over 78% of all the commercial maize seed produced in Latin America. Commercial seed production was relatively modest in Mexico,

Central America, and the Andean Zone of South America, suggesting that use of improved seed in these regions is still quite limited.

As in many other parts of the developing world, in Latin America the maize seed industry is dominated by private companies; public agencies and non-governmental organizations (NGOs) together accounted for less than 3% of the total volume of maize seed produced in 1996. Within the private sector, multinational seed companies have assumed a leading role; in 1996, multinationals accounted for nearly three-quarters of all private sector seed sales throughout the region (Table 28).

Table 28. Sales of commercial maize seed, Latin America, 1996 (t)

	Public seed agencies	Private companies (domestic)	Private companies (multinational)	NGOs ^a	Total
Central America	56	3,329	1,328	704	5,397
Costa Rica	3	110	0	0	113
El Salvador	17	1,718	0	321	2,055
Guatemala	36	201	1,306	0	1,543
Honduras	0	806	22	134	963
Nicaragua	0	223	0	249	452
Panama	0	271	0	0	271
Caribbean	2,051	150	0	198	2,399
Cuba	1,606	0	0	0	1,606
Dominican Republic	445	50	0	37	532
Haiti	0	100	0	161	261
Mexico	4,042	5,599	22,785	218	32,645
Central America, Caribbean, and Mexico	6,149	9,078	24,113	1,120	40,441
Andean Zone	820	16,730	3,468	102	21,120
Bolivia	21	2,363	121	102	2,607
Colombia	50	2,355	830	0	3,235
Ecuador	548	2,263	0	0	2,811
Peru	201	1,395	0	0	1,596
Venezuela	0	8,354	2,517	0	10,871
Southern Cone	126	49,220	182,029	1,129	232,504
Argentina	0	15,272	61,597	1,129	77,998
Brazil	0	31,709	120,052	0	151,761
Chile	—	—	—	—	—
Paraguay	126	2,239	380	0	2,745
Uruguay	—	—	—	—	—
South America	946	65,950	185,497	1,231	253,624
Latin America	7,095	75,028	209,610	2,351	294,084

Source: CIMMYT maize impacts survey.

a Some seed produced by non-governmental organizations (NGOs) was distributed free of charge.

Not surprisingly, multinationals have concentrated on major commercial markets. In the four largest seed markets in Latin America (Brazil, Argentina, Mexico, and Venezuela), the top three industry leaders are all multinationals (Table 29). Interestingly, the multinational seed companies have yet to penetrate some of the smaller regional markets. For example, in Central America most commercial maize seed is still produced by small domestic seed companies or medium-sized regional companies with a restricted geographical focus. In the Caribbean countries, the public sector remains an important player, in large part because of the Cuban maize seed industry, which remains firmly in the hands of the state.

Reflecting the prominent role played by the private sector, most of the commercial seed sold in Latin America is

⁷ The data on commercial maize seed sales discussed in this section were provided by the 36 public seed agencies and 172 private seed companies interviewed as part of the CIMMYT survey. In 1996 these organizations accounted for approximately 97% of all commercial maize seed sold in Latin America, so the data provide an accurate picture of the entire market.

hybrid seed (Table 30). Although public seed agencies continue to sell nearly as much varietal seed as hybrid seed (Figure 7), which is consistent with their commitment to serve small-scale producers who do not regularly purchase commercial seed, public agencies account for such a small share of the overall market that the total volume sold of varietal seed is negligible.

Table 29. Leading maize seed producers, Latin America, 1996

	#1 seed producer	#2 seed producer	#3 seed producer	Combined market share (%)
Central America				
Costa Rica	Piscis ^b	Desarrollos del Futuro Nima	Agrocosta ^b	90
El Salvador	Semillas Cristiani	Prosel	Lombardia	85
Guatemala	Cadelga	Hondugenet	ICTA	78
Honduras	SAGSA	Agrosemillas	Segovia	68
Nicaragua	Melo	Semillas Superiores	Gurdian	70
Panama			Margarita	95
Caribbean				
Cuba	Ministry of Agriculture ^a	—	—	100
Dominican Republic	Ministry of Agriculture ^a	Productores de Semillas Dominicana	National University ^a	97
Haiti	ORE	Agrotechnique	—	100
Mexico				
	Pioneer ^b	Asgrow ^b	Dekalb ^b	68
Andean Zone				
Bolivia	Agrocere ^b	Cargill ^b	Pioneer ^b	68
Colombia	Valle	Pioneer ^b	Cargill ^b	68
Ecuador	Agripac	Senaca	Emsemillas	84
Peru	Cargill ^b	Semillas Peruanas	La Molina	70
Venezuela	Seminaca	Sehiveca	Maize Program ^a	62
Southern Cone				
Argentina	Dekalb ^b	Cargill ^b	Pioneer ^b	62
Brazil	Agrocere ^b	Cargill ^b	Pioneer ^b	70
Chile	—	—	—	—
Paraguay	Cargill ^b	Agrocere ^b	Pioneer ^b	76
Uruguay	—	—	—	—

Source: CIMMYT maize impacts survey.

^a Public organization.

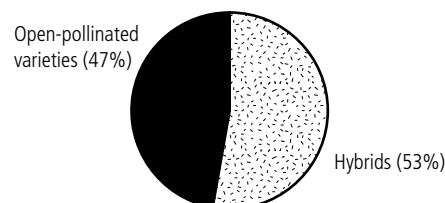
^b Multinational company.

Table 30. Composition of maize seed sales, Latin America, 1996 (000 t)

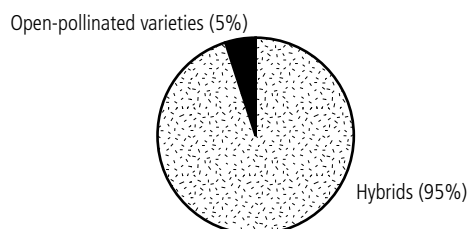
	Public seed agencies			Private seed companies ^a		
	Varieties	Hybrids	Total	Varieties	Hybrids	Total
Central America	33	23	56	962	4,382	5,344
Costa Rica	3	0	3	0	110	110
El Salvador	15	2	17	10	2,010	2,020
Guatemala	15	21	36	145	1,363	1,508
Honduras	0	0	0	389	574	963
Nicaragua	0	0	0	377	95	472
Panama	0	0	0	41	230	271
Caribbean	1,057	194	1,251	311	0	311
Cuba	612	194	1,606	0	0	0
Dominican Republic	445	0	445	50	0	50
Haiti	0	0	0	261	0	261
Mexico	1,728	2,314	4,042	427	28,125	28,552
Central America, Caribbean, and Mexico	2,818	2,531	5,349	1,700	32,507	34,207
Andean Zone	391	402	793	3,202	16,577	19,779
Bolivia	21	0	21	1,081	1,088	2,169
Colombia	50	0	50	716	2,469	3,185
Ecuador	181	367	548	276	1,988	2,264
Peru	139	35	174	528	762	1,290
Venezuela	0	0	0	601	10,270	10,871
Southern Cone	126	0	126	8,655	223,723	232,378
Argentina	0	0	0	1,236	76,762	77,998
Brazil	0	0	0	7,391	144,370	151,761
Chile	—	—	—	—	—	—
Paraguay	126	0	126	28	2,591	2,619
Uruguay	—	—	—	—	—	—
South America	517	402	919	11,857	240,300	252,157
Latin America	3,335	2,933	7,068	13,557	272,807	286,364

Source: CIMMYT maize impacts survey.

^a Including non-governmental organizations (NGOs).



(a) Composition of 1996 maize seed sales (public agencies)



(b) Composition of 1996 maize seed sales (private companies)

Figure 7. Composition of maize seed sales, Latin America, 1996.

Commercial maize seed sales in Latin America have increased rapidly. During 1990-97, sales reported by the public and private seed organizations that participated in the CIMMYT survey grew at an average annual rate of just under 9.0 % (Table 31). The pattern of growth has not been smooth, however, as sales within individual countries or regions have sometimes fluctuated considerably around the long-term trend in response to climatic variability and/or policy shocks that have temporarily affected the area planted to improved seed. For example, commercial maize seed sales in Mexico fell sharply in 1995 after the government introduced policy reforms that significantly reduced the profitability of maize production.

Since 1990, virtually all of the growth in commercial maize seed production has occurred in the private sector; seed production reported by public agencies has barely increased (Figure 8). Because most of the growth in seed production has been concentrated in the private sector, hybrids have assumed an increasingly important role in the overall seed market (Figure 9).

How competitive are Latin America's maize seed industries? By some measures, national maize seed industries in many countries are very concentrated. Based on data provided by the companies that participated in the CIMMYT survey, in 1996 the combined market share of the three leading seed companies varied from a low of around 62% in Argentina and Venezuela to a high

of 95% or more in Panama, Haiti, and Cuba (Table 29). These levels of industrial concentration are high by global standards, exceeding even the level found in the United States, where the three largest maize seed

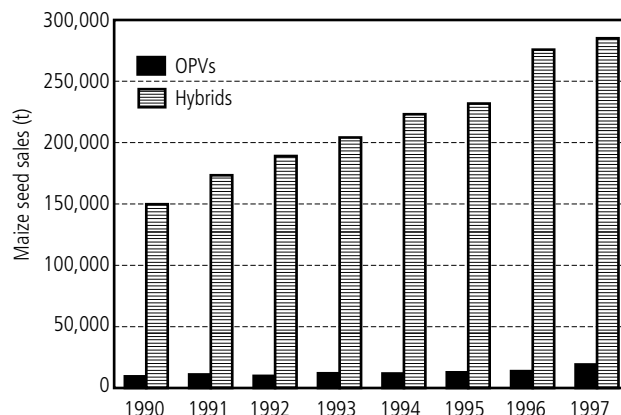


Figure 8. Evolution of commercial maize seed sales, OPVs versus hybrids, Latin America, 1990-97.

Source: CIMMYT maize impacts survey.

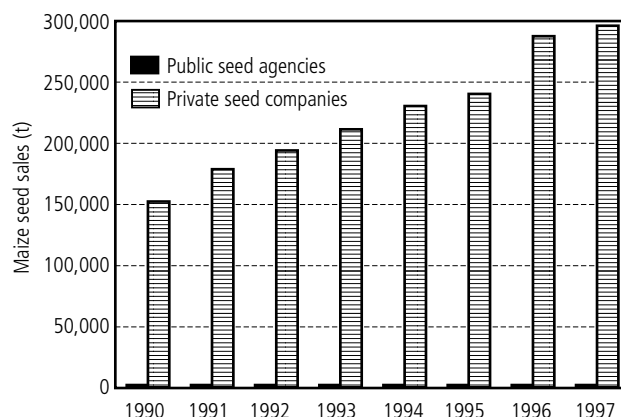


Figure 9. Evolution of commercial maize seed sales, by type of seed organization, Latin America, 1990-97.

Source: CIMMYT maize impacts survey.

Table 31. Evolution of commercial maize seed sales (t), Latin America, 1990-97

	1990	1991	1992	1993	1994	1995	1996	1997
Central America	3,085	3,001	3,019	3,661	3,744	4,222	5,365	5,822
Caribbean	40	40	40	316	368	292	261	305
Mexico	15,982	18,762	25,071	33,749	35,350	32,230	32,363	41,249
Central America, Caribbean, and Mexico	19,107	21,803	28,130	37,726	39,462	36,744	37,989	47,376
Andean Zone	16,389	18,741	21,838	22,693	16,189	16,274	20,814	26,828
Southern Cone	123,483	143,660	148,799	155,680	178,948	191,367	232,503	230,030
South America	139,872	162,401	170,637	178,373	195,137	207,641	253,317	256,858
Latin America	158,980	184,204	198,767	216,099	234,599	244,385	291,305	304,225

Source: CIMMYT maize impacts survey.