

The Maize Economy of Latin America

MAIZE GROWING ENVIRONMENTS

Maize is the dominant cereal in Latin America, grown in a wide range of production environments, at altitudes ranging from sea level to over 3,000 m elevation, under temperatures ranging from extremely cool to very hot, under moisture regimes ranging from extremely wet to semi-arid, on terrain ranging from completely flat to precipitously steep, in many different types of soil, and using a wide range of production technologies.

No universally recognized system exists for classifying maize production environments. The closest thing to a standardized classification system has been developed by CIMMYT, which holds the global mandate for maize germplasm improvement in developing countries. CIMMYT recognizes four major maize production environments, known as *mega-environments*: (1) lowland tropics, (2) subtropics/mid-altitude zones, (3) tropical highlands, and (4) temperate zones. These mega-environments, which are defined primarily in terms of climatic factors (e.g., mean temperature during the maize growing season, elevation above sea level, daylength), theoretically are characterized by their relative within-class uniformity. Since the growth habits of maize plants are influenced by complex interactions among many different climatic

factors, however, it is not always clear exactly where one mega-environment ends and the next begins.

In considering the relative importance of the four mega-environments, it is important to note that approximately 85% of the maize produced in Latin America is grown in non-temperate production environments; only about 15% is grown in temperate environments, mainly in southern Brazil, Argentina, and Chile (Table 2). The marked difference between non-temperate and temperate maize-growing environments has important implications for the flow of improved germplasm. Maize varieties and hybrids that perform well in temperate regions generally cannot be introduced directly into non-temperate regions without undergoing extensive additional adaptation breeding. For this reason, most of the improved OPVs and hybrids developed for use in industrialized countries (including the vast majority of the commercial hybrids developed by private seed companies) are of little direct use for most of the farmers in Latin America.

PRODUCTION TRENDS

Maize production statistics for Latin America are summarized in Table 3. The aggregate country-level data conceal considerable variation in production and consumption methods.

Throughout most of Mexico, Central America, and the Caribbean, as well as parts of the Andean countries, maize is an important food staple grown by a large part of the rural population for home use. Except for a small commercial farming sector, most maize production systems in these countries are characterized by their small scale, their complexity, and their heavy reliance on animal traction and especially human labor. Maize is often grown in association with beans, squash, peppers, cassava, and other food crops destined for home consumption, and many farmers use little or no chemical fertilizer or pesticides. Use of improved varieties is frequently limited, either because farmers lack access to reliable sources of affordable seed or because they

prefer to grow traditional maize varieties developed to meet specific food and feed requirements.

Further to the south, the picture is different. In southern Brazil, Argentina, and Chile, maize is primarily a cash crop grown by large-scale commercial producers using extensive mechanization and (where profitable) high levels of purchased inputs. Use of improved varieties and especially hybrids is extensive. Many of the maize production environments found in this latter group of countries feature a temperate climate, so growers have directly adopted commercial hybrids and improved management practices imported from North America and Europe.

Table 2. Estimated distribution of maize production by ecological zone, Latin America, late 1990s (000 ha)

	Lowland tropical	Subtropical/ mid-altitude	Highland	Temperate	Total
Central America	1,555.4	49.7	36.5	0.0	1,641.6
Costa Rica	14.5	0.0	0.0	0.0	14.5
El Salvador	293.3	0.0	0.0	0.0	293.3
Guatemala	492.8	36.5	36.5	0.0	565.8
Honduras	403.9	13.2	0.0	0.0	417.1
Nicaragua	277.8	0.0	0.0	0.0	277.8
Panama	73.1	0.0	0.0	0.0	73.1
Caribbean	365.8	0.0	0.0	0.0	365.8
Cuba	74.0	0.0	0.0	0.0	74.0
Dominican Republic	41.5	0.0	0.0	0.0	41.5
Haiti	250.3	0.0	0.0	0.0	250.3
Mexico	3,000.0	1,553.6	3,042.9	0.0	7,596.5
Central America, Caribbean, and Mexico	4,921.2	1,603.4	3,079.4	0.0	9,603.9
Andean Zone	1,363.2	414.9	539.3	0.0	2,317.4
Bolivia	106.0	41.6	145.5	0.0	293.0
Colombia	331.9	262.9	47.1	0.0	642.0
Ecuador	258.6	110.4	181.3	0.0	550.4
Peru	223.3	0.0	165.3	0.0	388.7
Venezuela	443.3	0.0	0.0	0.0	443.3
Southern Cone	9,903.5	4,325.5	0.0	2,728.5	16,957.4
Argentina	214.5	0.0	0.0	2,574.2	2,788.7
Brazil	9,333.8	4,325.5	0.0	0.0	13,659.3
Chile	0.0	0.0	0.0	103.1	103.1
Paraguay	355.2	0.0	0.0	0.0	355.2
Uruguay	0.0	0.0	0.0	51.2	51.2
South America	11,266.7	4,740.4	539.3	2,728.5	19,274.8
Latin America	19,187.9	6,343.7	3,618.6	2,728.5	28,878.7

Source: Estimated by the authors based on CIMMYT Maize Program (1988) and FAO (1998).

Table 3. Maize production and net imports, Latin America, 1995-97

	Area (million ha)	Yield (t/ha)	Production (million t)	Net imports ^a (million t)
Central America	1.64	1.76	2.90	0.78
Costa Rica	0.02	1.74	0.03	0.31
El Salvador	0.29	2.20	0.64	0.14
Guatemala	0.57	1.96	1.11	0.14
Honduras	0.42	1.63	0.68	0.04
Nicaragua	0.28	1.16	0.32	0.02
Panama	0.07	1.50	0.11	0.13
Caribbean	0.37	0.90	0.33	0.82
Cuba	0.07	1.17	0.09	0.13
Dominican Republic	0.04	1.04	0.04	0.67
Haiti	0.25	0.80	0.20	0.02
Mexico	7.60	2.30	17.49	1.83
Central America, Caribbean, and Mexico	9.60	2.19	21.04	3.43
Andean Zone	2.32	1.80	4.16	2.73
Bolivia	0.29	2.07	0.61	0.00
Colombia	0.64	1.61	1.03	0.92
Ecuador	0.55	1.10	0.60	-0.02
Peru	0.39	2.04	0.79	0.82
Venezuela	0.44	2.53	1.12	1.01
Southern Cone	16.96	2.88	48.77	-3.27
Argentina	2.79	4.35	12.13	-5.01
Brazil	13.66	2.55	34.80	1.34
Chile	0.10	8.49	0.88	0.41
Paraguay	0.36	2.38	0.85	-0.09
Uruguay	0.05	2.26	0.12	0.08
South America	19.27	2.75	52.92	-0.54
Latin America	28.88	2.56	73.97	2.89

Source: FAO (1998).
a 1993-95.

Compared to other regions of the world, the performance of the Latin American maize economy has been mixed (Table 4). During the 1960s, 1970s, and 1980s, maize yields in Latin America grew more slowly than maize yields in developing countries generally; yield growth in Latin America consistently trailed yield growth in Asia but for the most part outpaced yield growth in Sub-Saharan Africa. During the 1990s, the rankings reversed themselves; up through 1997, maize yields grew faster in Sub-Saharan Africa than in all other developing regions, and Asia lagged behind. The relatively favorable performance of the Latin American maize sector during the 1990s can be attributed to extremely rapid productivity growth achieved in the Southern Cone as growers reacted to sharp increases in global maize prices; productivity growth in Mexico, Central America, and the Andean Zone has been much more modest.

Table 4. Growth in maize yields, by region, 1961-97 (% average annual growth)

	1961-70	1971-80	1981-90	1991-97
Latin America	1.98	2.12	0.30	3.10
Mexico and				
Central America	2.23	3.35	0.30	1.46
Andean Zone	1.36	1.84	0.68	1.61
Southern Cone	1.66	1.45	0.33	3.92
Sub-Saharan Africa	1.09	1.16	0.93	3.57
South, East, and Southeast Asia	4.19	3.87	2.93	1.69
Developing countries	2.91	3.11	1.66	2.27
Industrialized countries	3.11	1.77	1.14	1.73

Source: Calculated by the authors using data from FAO (1998).

CONSUMPTION TRENDS

Unlike other leading cereals that are mainly consumed as human food, such as wheat and rice, maize is a multipurpose crop that is eaten by humans, fed to animals, or used as a raw input into industry. Maize consumption statistics for Latin America reflect marked differences between countries in the relative importance of each of these end uses (Table 5). Maize is the leading food staple in Mexico, Central America, and parts of the Andean Zone, but most maize produced in the Southern Cone countries is used as animal feed or for industrial purposes.

Table 5. Maize consumption, Latin America, 1992-94

	Consumption (million t)	Consumption per capita (kg)	Percent used for:		
			Food	Feed	Other
Central America	3.57	117.1	68	25	7
Costa Rica	0.27	81.7	22	71	7
El Salvador	0.70	130.1	66	28	6
Guatemala	1.47	146.5	75	18	7
Honduras	0.61	115.1	79	12	9
Nicaragua	0.28	71.9	82	7	11
Panama	0.24	92.9	36	61	3
Caribbean	1.09	43.0	16	79	5
Cuba	0.20	18.3	0	94	6
Dominican Republic	0.67	88.7	8	88	4
Haiti	0.22	31.8	52	40	8
Mexico	18.46	209.8	60	25	15
Central America, Caribbean, and Mexico	23.11	178.8	59	28	14
Andean Zone	5.95	61.8	53	32	15
Bolivia	0.37	51.7	56	38	6
Colombia	1.83	53.1	68	29	3
Ecuador	0.55	50.5	16	5	79
Peru	1.40	61.5	20	72	8
Venezuela	1.80	86.1	74	13	13
Southern Cone	39.79	189.4	10	79	11
Argentina	5.61	165.7	3	85	12
Brazil	32.28	208.6	10	78	12
Chile	1.28	93.0	7	89	4
Paraguay	0.43	92.8	44	36	20
Uruguay	0.20	61.8	32	53	15
South America	45.74	149.3	15	73	12
Latin America	68.86	158.1	30	58	12

Source: FAO (1998).