

## Mexican Tomatoes—Fruit of New Technology

by  
Daniel J. Plunkett 1/

**Abstract:** Mexico's tomato export sector, which is concentrated in the states of Sinaloa and Baja California, has improved its production technology in the last few years. In particular, successful adoption of extended shelf-life tomatoes is distinguishing the Mexican vine-ripe from the Florida mature green. Mexico's old comparative advantages (climate, labor, land) are now augmented with improved quality, producer organization, and a lengthened harvest. The peso crisis in 1995 added incentive for Mexico to increase exports to the United States.

**Keywords:** Mexico, tomatoes, technology, NAFTA.

### *Mexico's Exporters on the Cutting Edge*

The tomato originated in Mexico, in pre-Hispanic times, and is now Mexico's most important horticultural export item. Mexico began its export orientation during the 1960s, after the U.S. ban on imports from Cuba and termination of the U.S. *bracero* (Mexican guest-worker) program. Cuba had been the main winter supplier of tomatoes and other winter fresh vegetables to the United States. Mexico's investment in export capacity led to strong growth in yields and output during the 1970s and 1980s.

Two principal exporting regions emerged in Mexico, both favored by proximity to the U.S. market, proper soil/weather conditions, and complementarity of seasons. The Mexican states of Sinaloa and Baja California Norte ship to U.S. markets and to domestic markets within Mexico. Usually more than half of Sinaloa's tomato production goes to the United States, and an even larger share of Baja's output is exported. These states typically account for 75 to 90 percent of Mexican tomato exports. Sinaloa harvests chiefly in the winter and spring, while Baja harvests in the summer and fall. Both regions, which have significantly higher yields than the rest of the country, have been boosting yields and decreasing area planted in the last few years.

Tomato production in Sinaloa and Baja differs technologically from the rest of the country. Most of Mexico's export producers use drip irrigation, fertigation, plastic mulch, planed stakes, and—perhaps most important—extended shelf-life (ESL) varieties (see glossary). Florida has used essentially the same technology package for the last 20 years, except ESL varieties grow well in Mexico and not in Florida.

Mexican ESL tomatoes, which are vine ripened, are increasingly perceived by U.S. wholesalers and retailers as qualitatively different from Florida's mature green tomatoes. With these new varieties, Mexico has increased market

share of sales in U.S. supermarkets. Florida tomatoes are preferred for slicing in many foodservice operations.

The adoption of new technology was underway before the North American Free Trade Agreement (NAFTA) started in 1994. Baja turned to drip irrigation in the late 1980s, due to water scarcity. Sinaloa adopted drip irrigation and plastic mulch technology in the last 3 or 4 years to complement the ESL varieties. Mexican export growers are now in their second or third season with the full technology package in place, so there is still room to improve management skill in using the new technology efficiently.

For Mexico, labor has traditionally been viewed as one of its comparative advantages. Labor is needed to sow transplants, tie the vines to stakes, and harvest, grade, pack, and ship tomatoes. Mexican wages are much lower than U.S. wages. But lower productivity of the average worker means more workers in production and marketing. Living conditions are very poor for the unskilled laborer, who must contend with unsafe drinking water and unsanitary conditions. In Baja, workers are often transported into the scarcely populated region. All of these factors hinder labor's productivity.

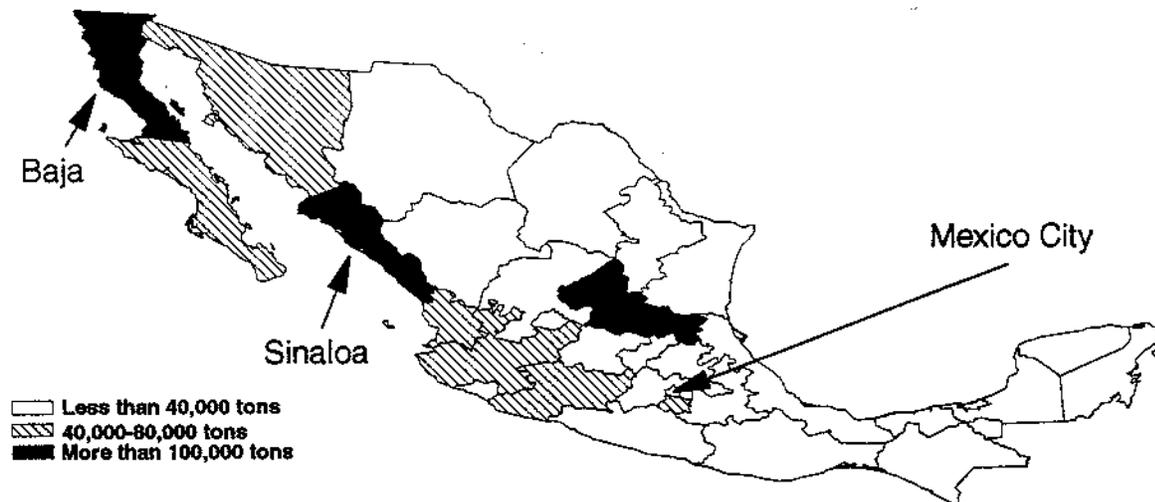
### *Mexico's Strong Organization*

The main voice for Mexican tomato growers is CAADES (Confederation of Agricultural Associations of the State of Sinaloa), an umbrella group for Sinaloa groups. CAADES conducts residue testing, farm extension, scientific experiments, quality inspection, and weather forecasting. CAADES also works with the Volcani Institute of Israel to develop new hybrid seeds. Because of limited Mexican government involvement in research and support, CAADES fulfills many of the functions that government agencies, marketing boards, or land grant universities perform in the United States. About 90 percent of the tomatoes produced in Sinaloa are grown by CAADES members.

Two recent voluntary measures taken by CAADES growers illustrate their organizational power. They agreed to raise quality standards, so that tomatoes shipped to the United States would be 90 percent or more of the U.S. No. 1

<sup>1</sup> Agricultural economist with the Commercial Agriculture Division of the Economic Research Service, USDA. Tel: (202) 219-0670.

## Mexican Tomato Production 1993



grade. Also, Sinaloa growers reportedly halted shipments to the United States for 2 days (March 2 and 3, 1996), and Florida prices increased.

The Mexican tomato industry, where it's geared for export, uses a "dual market optimization strategy." The strategy compares prices at the U.S. port of entry with prices prevailing in domestic Mexican markets—Mexico City, Guadalajara, and Monterrey. By regulating the quantity shipped to each market, whether domestic or export, the strategy hopes to mitigate large price swings and optimize earnings in both markets.

Furthermore, Mexican companies are active in the continent-wide trend toward developing a year-round supply of tomatoes (often as a "branded" product, with a small sticker on each tomato). There is increasing integration across borders, with a handful of Florida producers investing in Sinaloa. Many California companies operate in Baja, and a few Sinaloa tomato growers are active in Florida, California, and Baja. With operations in different regions, companies can ensure an adequate supply even when bad weather affects production in one region. And they are poised to benefit from high prices at those times. The year-round supply strategy in Sinaloa and Baja extends their harvest seasons at both ends by planting some fields earlier and some later than before.

### ***How the Peso Devaluation Affected Mexico's Tomato Sector***

The December 1994 peso devaluation led to an economic crisis in Mexico that cost consumers about half of their purchasing power in a span of 4 months. During 1995, per capita income fell about 9 percent, and unemployment more than doubled. With the peso weakening from 3.4 pesos per U.S. dollar before the devaluation to 7.7 pesos at

the end of 1995, Mexican producers could get twice as many pesos per dollar—doubling the peso value of Mexican tomatoes and other fresh vegetables for export to the United States.

The Mexican peso's devaluation lowered labor costs, reduced domestic demand, and made business much more attractive in dollars than in pesos within Mexico. Mexican producers faced a severe liquidity problem and uncertainty about receiving payment for fresh tomatoes if they sold in the domestic market.

Although the crisis caused Mexican costs of production to soar in peso terms, in dollar terms those costs actually fell because the price of labor and other domestic inputs lagged behind the rate of devaluation. For example, due to a depressed labor market, the costs of field preparation and harvesting were down by about half in dollar terms. For imported inputs, such as planting and transplanting material, dollar costs went up 23 percent.

The "dollarization" of Mexico's tomato export industry insulated growers from the full effects of peso devaluation. Irrigation equipment, tomato seeds, fertilizers, and most other inputs are typically purchased in dollars. Tomatoes shipped to the United States are priced in dollars and paid for in dollars. However, the main factors lowering the dollar price of Mexican tomatoes at the border are reduced labor costs and the price-depressing effect of lower domestic demand for tomatoes.

The peso devaluation occurred precisely as the 1995 winter tomato harvest was gaining momentum and exacerbated the normal price drop that comes at peak harvest. Price relationships between the U.S. border and Mexico City wholesale markets changed abruptly in January. The U.S. market

## Glossary

*Drip irrigation* is critical to tomato production in Baja, where irrigation water comes from wells. In Sinaloa, where water comes from mountain reservoirs, drip irrigation has permitted tomato production to remain high. Among local irrigation authorities, tomatoes get first priority in water allocation.

Virtually all tomato area in Sinaloa (about 67,000 acres) and Baja (about 12,500 acres) uses drip irrigation. Drip users consume one-third as much water and get higher yields than growers using movable irrigation rigs. Hoses with regularly-spaced drip holes are laid permanently at the center of the tomato beds, delivering water right at the root base of the plant. Water is not wasted between the rows as with the movable rigs.

*Fertigation* uses the same drip irrigation hoses to efficiently deliver liquid fertilizer to the roots of the tomato plants. A side-benefit of fertigation is reduced water pollution from leaching and run-off of agricultural chemicals. Tomatoes for export are grown according to U.S. tolerance standards for chemical residues.

*Plastic mulch* reduces weeds, promotes growth, and blocks microorganisms moving from the soil to the plant. The result is less need for herbicides, fungicides and other plant protection measures. Plastic raises the soil temperature, reduces water evaporation, and increases total photosynthetic activity of the plant. After the raised and rounded soil beds are formed, long clear plastic sheets are laid over the

entire bed, pierced only where the young transplants are sown. New plastic is used each year.

*Planned stakes* are replacing the traditional bark-covered sticks and branches in Sinaloa and Baja, because planned stakes are stronger and do not bend as much. As the plants grow, they are tied to lines strung between the stakes. Growing plants upright, rather than along the ground, increases disease- and insect-pest control efficiency. About two-thirds of the plants in Sinaloa are "determinate" types, meaning their height is limited and more of the plant's energy goes into bearing fruit.

*Extended shelf-life* seed varieties (ESL) are based on Israeli (and to a lesser extent, Dutch) research that allows the tomato to be left on the vine several days longer, until 90 percent of the fruit is pink and red. Most ESL varieties are products of traditional breeding techniques, but ripening-inhibitor genes have been isolated and may be biotechnologically transferred in future commercial varieties.

After reaching the supermarket or wholesaler within 5 to 7 days, ESL tomatoes last about 2 to 3 weeks on the shelf—a week longer than a *mature green tomato* (picked just before it turns pink). Tomato growers in Sinaloa and Baja have completely converted to ESL varieties, all within the last 2 or 3 years. The primary benefit of the vine-ripened ESL tomatoes is their *appearance*—bright, red, and firm.

remained attractive for several months, similar to what happened during the Mexican debt crisis of the early 1980s.

### **Mexican Tomato Exports Since The Peso Devaluation**

U.S. tomato imports from Mexico hit a record 593,000 metric tons worth \$406 million during calendar 1995, up 58 percent by volume but only 29 percent by value from 1994. Throughout 1995, Mexican exports were the highest in the last 5 years. Before the peso crisis, producers had expected continued robust domestic demand based on Mexico's relatively strong economic performance during the early 1990s. And Mexican growers knew that Florida had been hit by Tropical Storm Gordon.

Mexico increased 1995 tomato exports to the United States about equally from the winter crop and summer crops (through May and June-November, respectively). Summer producers doubled the share of their harvest exported to nearly 25 percent, from 13 percent a year earlier. Winter producers increased their export share of production from 28 percent to about 33 percent.

### **U.S. Tariffs and TRQs**

During 1996, five separate tariff periods are in effect for tomatoes from Mexico, including winter and spring tariff-rate quotas (TRQs). Tariff liberalization under NAFTA has played a minor role in tomato trade, because tariffs were relatively low. U.S. tariffs on Mexican tomatoes averaged only about 4 percent in recent years during the winter period (November 15 to the end of February). Even when the pre-NAFTA "snapback" tariffs are triggered—because TRQ volumes are breached—protection is minimal. Under NAFTA, all tariffs will be gone by 2003.

In the first 2 months of this year's winter season (December 1995 and January 1996), tomato imports from Mexico were up 49 percent (35 percent in value). The winter TRQ was filled on February 12, 1996, triggering the "snapback" tariff for the rest of that month. Currently, tomato imports are governed by the spring TRQ (March 1 to July 15). During spring 1995, Mexico exported about 250,000 tons of tomatoes to the United States. A similar quantity is expected to enter in 1996, although slightly lower area planted in Sinaloa and very low water levels may dampen the supply.

Figure B-2

**Input Costs Rose in Peso Terms,  
But Fell in Dollar Terms**

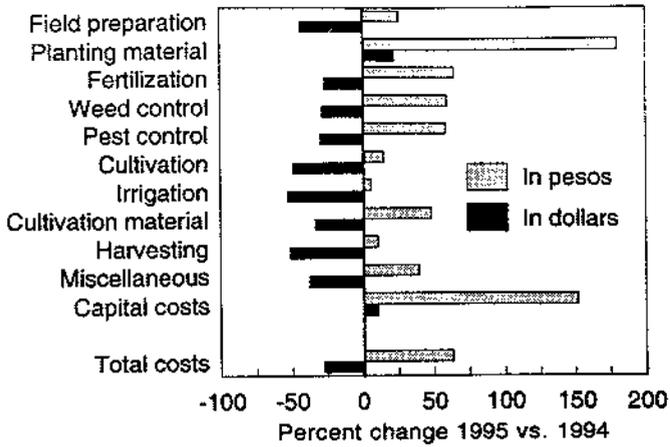
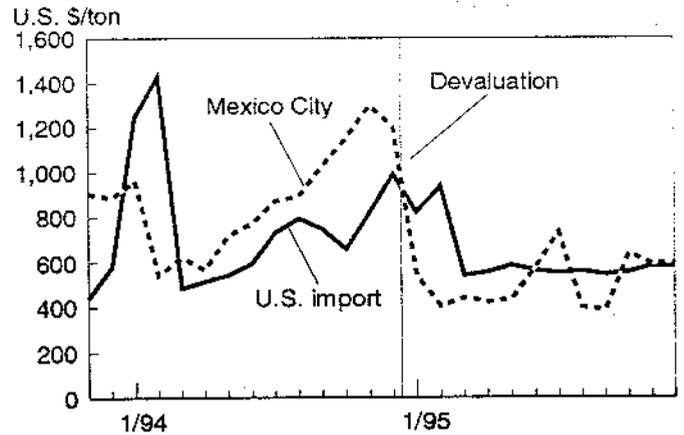


Figure B-4

**Mexican Tomato Prices**



Mexico City price adjusted by monthly exchange rate.  
Source: FAS (Mexico City).

Figure B-3

**Mexico's Currency Exchange Rate**

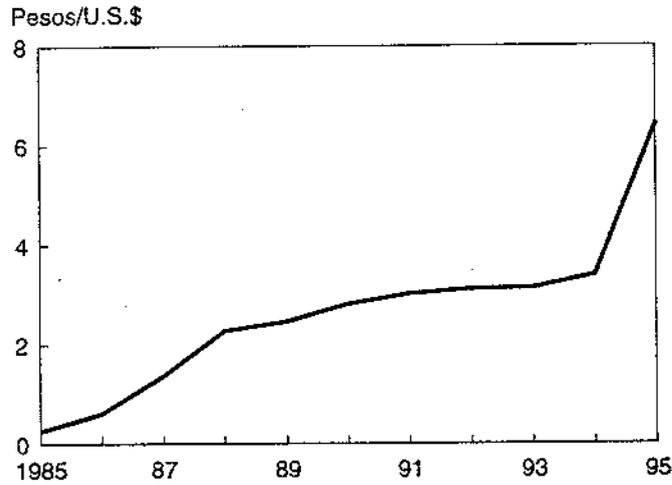
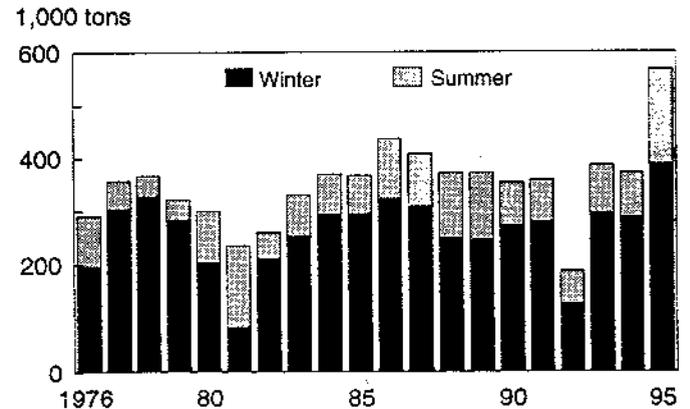


Figure B-5

**Mexico Achieved Record Tomato Exports  
To the U.S. in Summer and Winter 1995**



Winter = December-May.  
Summer = June-November.

Table B-1--Tomatoes, fresh and processing: Mexico supply and use, 1961-1996

Year	Area	Yield	Supply			Net domestic use		
	harvested		Production	Imports	Exports	Total	Processing	Fresh 1/
	Hectares	Metric tons/ha	-- Metric tons --					
1961	68,921	6.83	470,527	1,325	95,714	376,138	17,800	338,520
1962	67,679	6.67	451,502	22	136,265	315,259	25,000	271,295
1963	67,871	6.80	461,191	23	141,343	319,871	31,100	269,400
1964	68,573	6.77	463,992	37	152,876	311,153	37,500	254,164
1965	52,565	10.92	573,919	28	161,488	412,459	47,700	340,653
1966	53,010	10.86	575,855	1	225,673	350,183	41,687	284,310
1967	53,885	11.99	645,932	0	227,685	418,247	46,071	345,047
1968	60,080	11.66	700,472	1	240,485	459,988	54,480	376,088
1969	63,419	11.79	747,510	464	287,884	460,090	79,412	349,263
1970	71,551	13.32	952,776	0	374,264	578,512	90,571	447,924
1971	69,184	14.51	1,004,044	0	322,720	681,324	63,394	617,930
1972	82,059	15.53	1,274,392	1,521	337,844	938,069	51,905	886,164
1973	80,429	14.56	1,171,131	328	441,143	730,316	53,600	676,716
1974	72,181	16.50	1,190,627	774	318,113	873,288	160,000	713,288
1975	70,111	16.08	1,127,237	234	339,374	788,097	210,000	578,097
1976	58,514	14.82	867,193	2,414	368,875	500,732	170,000	330,732
1977	74,781	14.39	1,075,863	963	458,722	618,104	250,000	368,104
1978	81,004	19.02	1,541,005	3,050	497,417	1,046,638	220,000	826,638
1979	94,427	18.37	1,734,370	1,935	422,298	1,314,007	200,000	1,114,007
1980	88,286	16.77	1,480,425	1,418	386,879	1,094,964	220,000	874,964
1981	75,293	15.97	1,202,175	1,506	480,742	722,939	170,000	552,939
1982	72,573	20.41	1,481,433	202	598,155	883,480	200,000	683,480
1983	52,500	25.33	1,330,000	178	371,238	958,940	190,000	768,940
1984	71,500	23.60	1,687,379	903	490,274	1,198,008	375,000	823,008
1985	69,500	23.74	1,650,000	1,022	511,723	1,139,299	250,000	889,299
1986	69,000	23.91	1,650,000	497	572,385	1,078,112	300,000	778,112
1987	68,000	24.43	1,661,000	575	558,835	1,102,740	271,000	831,740
1988	62,115	24.04	1,493,000	2,368	533,035	962,333	282,400	679,933
1989	78,076	21.33	1,665,000	4,680	467,198	1,202,482	316,800	885,682
1990	75,258	21.84	1,644,000	13,739	484,457	1,173,282	365,000	808,282
1991	78,000	20.83	1,625,000	20,627	489,369	1,156,258	225,000	931,258
1992	68,000	20.62	1,402,000	43,740	208,079	1,237,661	52,000	1,185,661
1993	80,000	21.38	1,710,000	22,038	417,493	1,314,545	340,000	974,545
1994	75,000	20.93	1,570,000	21,896	408,437	1,183,459	350,000	833,459
1995	77,800	22.81	1,775,000	2,150	628,064	1,149,086	275,000	874,086
1996	75,000	22.33	1,675,000	2,150	620,000	1,057,150	275,000	782,150

1/ Post-harvest waste is included in the fresh use category. Wastage can vary considerably from year to year, making fresh use consumption difficult to measure with any degree of certainty.

Source: UN/FAO/Agrostat (1961-1992). USDA Economic Research Service and Foreign Agricultural Service (1993-1996).