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Sugar and Corn Sweetener

Changing Demand and Trade in Mexico, Canada, and the United States

Peter Buzzanell
Ron Lord

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The trade flows in sugar and high-fructose corn sweetener (HFCS) among Mexico, Canada, and the United States consist mainly of U.S. exports of refined sugar to Mexico, U.S.-Canadian two-way trade in sugar and HFCS, and recent growth in U.S. HFCS exports to Mexico. The North American Free Trade Agreement (NAFTA) could increase these trade flows by reducing tariffs and allowing competitive advantage (for example, the United States in HFCS) to satisfy regional consumption habits.

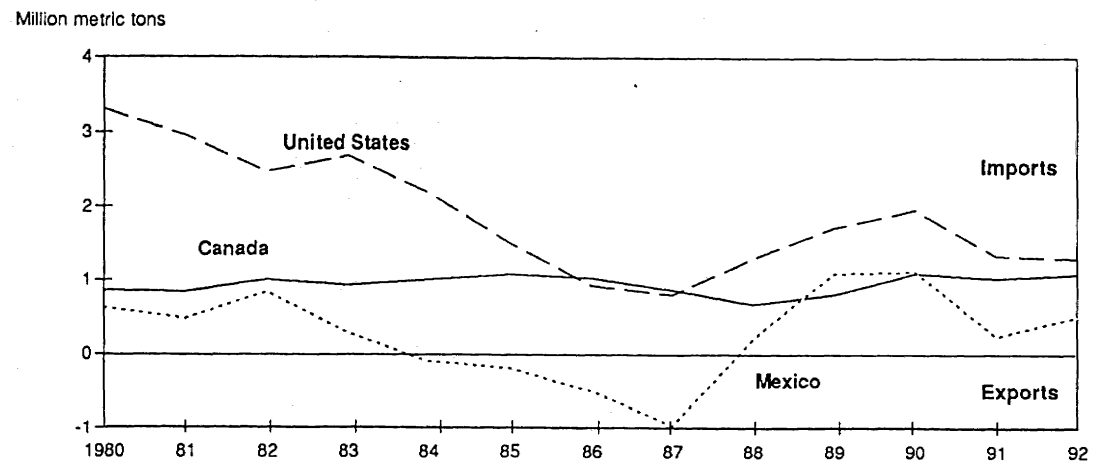
The United States and Mexico produce a significant share of their sugar needs, whereas Canada imports most of its sugar. Canadian sugar consumption is almost 1 million tons (all references are to metric tons; see conversion chart, p. 11), and imports account for over 80 percent of that amount. Canadian sugar consumption declined in the late 1980's due to competition from HFCS, but it is rising once again. Mexican sugar consumption has grown at about 4 percent per year since 1974 to 4.5 million tons in 1992/93, which exceeds Mexico's current production level by about 750,000 tons.

Sugar trade is affected by a country's natural resources, milling/refining capacity, production programs/subsidies, and trade agreements. The U.S. HFCS industry, for example, has expanded because of relatively low-priced corn, efficient transportation and storage, and technological enhancements to production capacity. HFCS largely replaced sugar in the beverage market and led to a contraction in U.S. sugar demand. The United States entirely shielded domestic sugar producers from this decline in market share to HFCS by imposing a quota on sugar imports. Consequently, imports fell from about 5 million tons in the 1970's to 1-2 million tons in the last few years.

Mexico, the United States, and Canada remain large net importers of sugar (fig. 1). Trade among these three countries and the rest of the world differs due to alternative border treatment (see box, "NAFTA--Provisions for Sugar," p. 12). This report describes the changes to consumer demand in all three countries over the last decade, the countries' varied capacities to produce refined sugar, and the support governments provide for corn (HFCS) and sugar growers.

Figure 1
Net sugar trade of Canada, United States, and Mexico, 1980-92

While Canadian sugar imports held steady in the 1980's, U.S. imports fell, and Mexico alternated between being a net exporter and a net importer.



Sweetener Market Changes

The shift from sugar to HFCS is complete in the United States, oscillates in Canada, and has not yet begun in Mexico.

Market share between HFCS and sugar varies among countries due to consumer preference, competitive pricing, and industrial capacity. The U.S. soft-drink industry has switched from sugar to HFCS as a cheaper and more readily available ingredient. Canadian consumption of HFCS is inversely related to the world price of sugar, rising when sugar's price is uneconomic. Mexico's soft-drink manufacturers have bought sugar mills from the Government, ensuring the use of sugar, not HFCS, in their formulas for at least the near term.

While corn syrup and dextrose have been available for decades, they are limited in their ability to substitute for sugar. HFCS is especially suited to soft drinks and other sweetened beverages, but is also used in canning and, to a lesser extent, bakery and dairy products. The production of HFCS is capital-intensive, and a typical modern, low-cost wet-milling factory can grind 13,000 tons of corn per day. Few countries possess the abundant supplies of corn or the cheap and reliable storage and transportation systems upon which the U.S. corn wet-milling industry depends. The Canadian HFCS industry benefits from having ready access to inexpensive U.S. corn.

Canada

Canadian liquid sweetener users have alternated between sugar and HFCS in recent years. Until about 1988, almost all Canadian-produced HFCS was sold in the United States, since U.S. prices were much higher and more stable than Canadian prices. But when the Canadian sugar price rose in 1988-90 due to a rising world sugar price, HFCS, a sugar substitute, could be sold in Canada at prices as remunerative as in the United States. When Canadian soft-drink manufacturers decided to allow HFCS in their formulas, market share shifted further to HFCS. Canada consumed about 180,000 tons of HFCS, along with 1.1 million tons of sugar, in 1990. Canadian HFCS was unable to compete with falling sugar prices in 1991 and 1992, and so again was mostly exported to the higher priced U.S. HFCS market.

United States

The U.S. soft-drink industry, the world's largest, converted from sugar to HFCS in the mid-1980's. U.S.

soft-drink consumption, at 47 gallons per capita in 1990, accounts for a major share of sweetener use. Thus, total consumption of caloric sweeteners (mostly sugar and HFCS) rose even as U.S. sugar consumption fell from 1980 to 1990. While U.S. per capita sugar consumption (29 kilograms per year, 1989-91) is lower than Mexico's 44 kilograms, U.S. per capita consumption of both sugar and HFCS combined is higher, at 49 kilograms per year, than Mexico's per capita consumption at 48 kilograms (fig. 2).

About 30 percent of the U.S. soft-drink industry is diet soft drinks, which primarily use aspartame, and the diet segment is growing more rapidly than the caloric segment. HFCS use in the United States will not grow much if consumer preference continues to swing from caloric soft drinks to soft drinks sweetened with high-intensity (low-calorie) sweeteners. The price of aspartame is expected to fall as its U.S. patent expired at the end of 1992, and there is considerable debate about whether its lower cost or its low-calorie image will contribute more to its use.

Mexico

Mexico's sugar use jumped by 66 percent in the 1970's and 28 percent in the 1980's, partly due to an increase in population of 16 million in the 1970's and 10 million in the 1980's. Other factors include higher incomes, attractive retail pricing, and lack of alternative sweeteners. HFCS and aspartame have not been significant factors in Mexico's soft-drink market. Some U.S. HFCS (20,000 tons in 1992) has been imported into northern Mexico for the baking industry, but its use in soft drinks is not yet reported.

Low Government-controlled sugar prices have stimulated Mexican soft-drink consumption. A 12-ounce bottle of regular cola in Mexico City currently costs the equivalent of 16 cents. Soft drinks partially compensate for Mexico's widespread lack of potable water and serve as a source of calories. The Government has sought to keep the price of soft drinks affordable to low-income people for these reasons. Diet soft drinks are increasing in popularity among the urban middle- and upper-income groups. The prices of caloric and diet soft drinks are currently the same in Mexico.

Only about half the sugar sold in Mexico is refined sugar. About three-fourths of the refined sugar in Mexico is used by industrial users, mainly the soft-drink sector. In 1991, for example, the Mexican soft-drink industry accounted for an estimated 1.3 million tons of sugar or about 55 percent of industrial use (30.8 percent of total use). Other major users are the bakery and confectionery industries, each with about 7.2 percent of total use. It is cheaper for Mexican mills to produce "standard" or low-

quality refined sugar, which is not as highly refined as high-quality refined sugar. Households consume about 90 percent of the standard sugar.

Virtually all sugar consumed in the United States and Canada is refined sugar. About 60 percent of the sugar consumed is in products produced in the industrial sector (fig. 3). This reflects a decrease in home baking, and an increase in eating outside the home.

Figure 2
Per capita consumption of refined sugar and HFCS, 1979-81 and 1989-91
Mexicans consume the most sugar, Americans the most combined sweeteners.

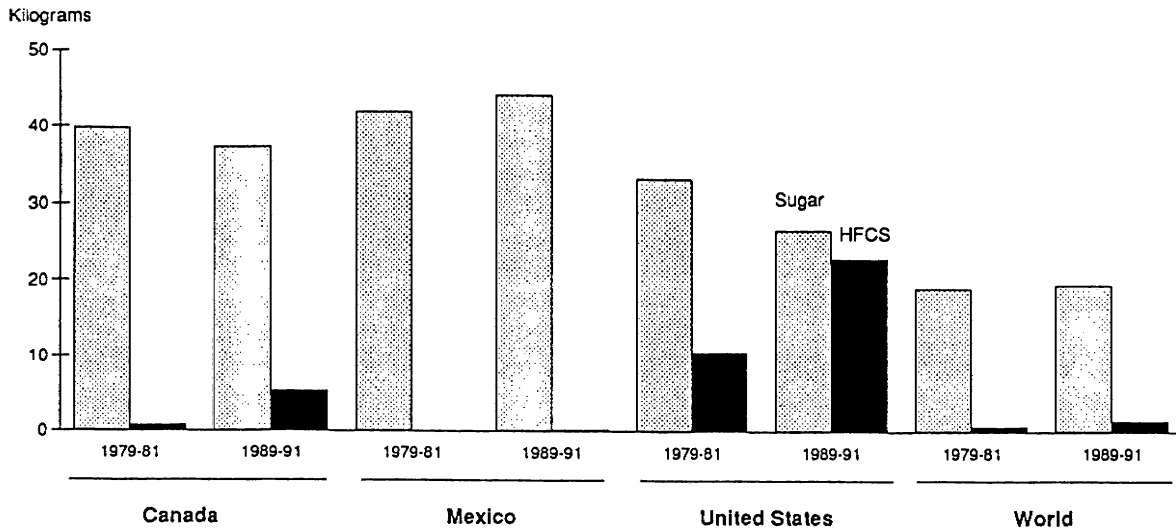
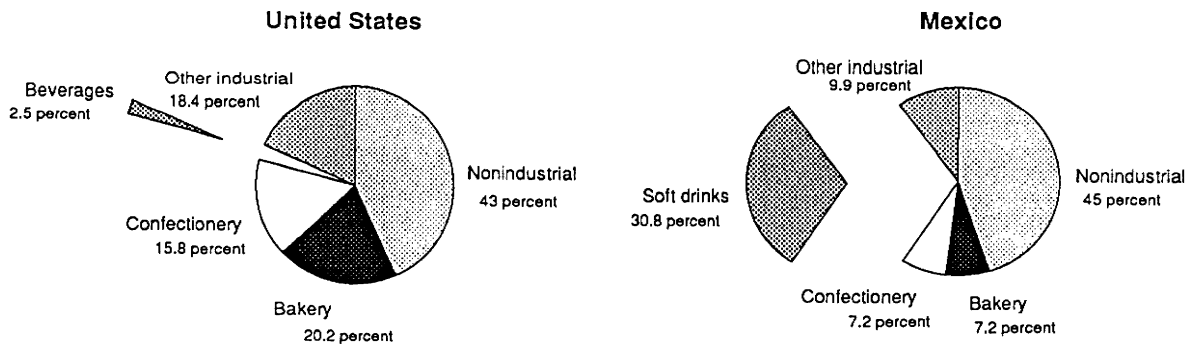


Figure 3
Mexican and U.S. sugar deliveries by type of use, 1991
Soft drinks are the largest category of Mexican use. U.S. beverages (including soft drinks) have mostly switched to HFCS.



Sugar Trade

The United States has significant two-way trade in both sugar and HFCS with Canada, but trade with Mexico is mostly confined to U.S. re-exports of refined sugar.

The United States, Canada, and Mexico were all net importers of sugar in 1988-92, but for different reasons. The U.S. refining industry continues to import raw sugar, adding value and exporting refined sugar at a profit. U.S.-Canadian sweetener trade is promoted by a preferential trade agreement. Mexico recently allowed the private sector to import sugar in an effort to satisfy national demand, which is growing at 4 percent per year.

Under the Refined Sugar Re-export Program (RSRP), U.S. refiners can buy sugar at the world price if they certify that an equivalent amount of refined sugar will be re-exported (at the world price for refined sugar) within a certain period of time. The price of refined sugar in the prospective export market must, of course, be remunerative in order for U.S. refiners to do business. U.S. refineries in New York and New Orleans, that is, those relatively close to the Canadian and Mexican borders, are particularly well situated to take advantage of market opportunities in North America.

There is a two-way trade in sugar between the United States and Canada (fig. 4). U.S. exports to Canada are generally under the RSRP, and U.S. refiners compete for the Canadian market against Canadian and world refiners. The Canadian tariff on U.S. refined sugar is less than 1 cent per pound, and is scheduled to be phased out by 1998 under the U.S.-Canadian Free Trade Agreement. As this tariff declines, it will give U.S. refined sugar a slight advantage over other countries that do not receive preferential Canadian tariffs.

Canadian sugar exports to the United States were constrained by the U.S. quota program until October 1990, when the United States dropped its absolute import quota and replaced it with a tariff-rate quota. With the

tariff-rate quota, imports from quota-holding countries are allowed in, up to a certain level, with few or no duties, but any imports above those levels would bear a prohibitive duty of 16 cents per pound, raw value. But the U.S.-Canadian Free Trade Agreement prevents the United States from applying this higher rate of duty to Canadian sugar. Canadian sugar exported to the United States pays a very low duty, which will decline to zero by 1998. In 1991, Canadian sugar exports to the United States were about 30,000 tons. Mexico has a share of the U.S. quota, currently 7,258 tons, which Mexico fills with raw sugar.

HFCS is traded both ways between the United States and Canada since HFCS going to Canada from the United States may not be identical to the Canadian product (see box, "The HFCS Industry"). The United States imported about 100,000 tons of HFCS from Canada in 1991, and exported about 70,000 tons to Canada.

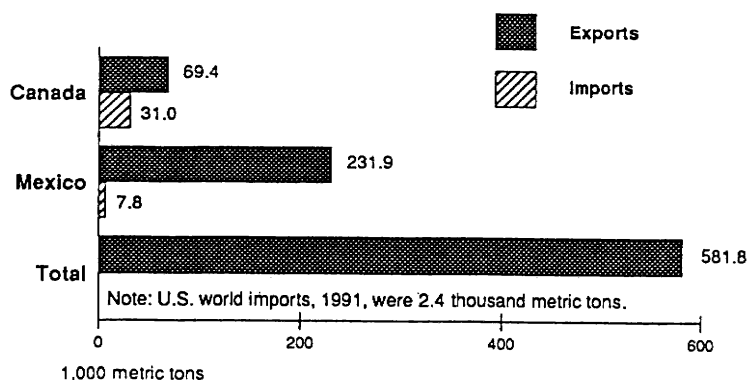
In 1990/91, the Mexican private sector for the first time was allowed to import several hundred thousand tons of sugar, while the state sugar agency, Azucar, S.A., imported over a million tons, for a record total of 1.4 million tons. Mexican imports were largely refined sugar (86 percent of total) destined for industrial users, and flowed from sources such as the United States, the European Community, and Brazil.

Sugar imports in 1991/92 dropped to about 275,000 tons as the Government of Mexico raised tariffs to stem the flow of imports and draw down high stock levels. With stocks down sharply, forecasts for 1992/93 imports are 500,000 tons. About 60 percent of these projected imports are refined sugar, much of that facilitated by the U.S. RSRP.

Figure 4

U.S. sugar trade with Canada, Mexico, and the world, 1991

The United States has a positive sugar trade balance with both Canada and Mexico.



The HFCS Industry

The U.S. high-fructose corn syrup industry flourishes because of many resource advantages: the world's largest and cheapest corn market, cheap storage and transportation of corn, a Government-guaranteed minimum price for sugar, and rapid technological development. There are 22 HFCS facilities in the United States, most near the Corn Belt.

Canada has three HFCS facilities in Ontario, Canada's primary corn-producing Province. Ontario produces enough corn to supply the Canadian industry most years, but U.S. corn is sometimes needed. Under the U.S.-Canadian Free Trade Agreement, the duty on U.S. corn imported into Canada is very low; a countervailing duty of US\$0.40 per bushel was added in 1987, but was then removed in 1992. The average Canadian HFCS facility produces about 75,000 tons of corn syrup a year, about a fourth of the 260,000 tons produced in the average U.S. plant.

Corn is basic to Mexico's cultural history and remains a vital food grain. About 10 million people in Mexico depend on corn farming for their livelihood. Despite its importance in the national food supply, Mexico is not self-sufficient in corn, importing 1-1.5 million tons in 1991 and 1992. All of these imports came from the United States, with a portion destined for the Mexican corn wet-milling industry.

Five companies in Mexico operate 7 wet mills, with an estimated total grind of 110,000 bushels per day, producing traditional products such as corn starch, glucose syrup, dextrose, and corn oil. None of the mills can produce HFCS; however, several companies are considering building onto existing facilities or at new sites. The Mexican Government largely limits corn imports from the United States to direct food purposes, in order to maintain producer support prices and a viable Mexican corn industry. Therefore, investment in HFCS production facilities dependent on corn imports would appear risky given corn import restrictions.

Mexico may become a regular importer of U.S. HFCS, especially for the soft-drink industry in northern Mexico, which is far from sugar-producing areas. The United States exported 300 tons of HFCS to Mexico in 1989, over 8,000 tons in 1990, 11,000 tons in 1991, and 20,000 tons in 1992. U.S. HFCS exports to Mexico are assessed a 15-percent ad valorem duty. The NAFTA could increase Mexican HFCS imports by lowering HFCS tariff rates over a 10-year period. Alternatively, U.S. investors might provide the infrastructure needed to produce HFCS in Mexico. The primary potential user, the soft-drink industry, has invested recently in sugar mills, and would have to be willing to shift away from sugar as its primary sweetener. Any significant switch to HFCS in Mexico would tend to slightly lower the world sugar price by lowering overall sugar demand.

Sugar Demand

Sugar demand in Mexico is driven by population and income growth. In the United States and Canada, alternative sweeteners and changing diets are more important.

Mexico's fast-growing population, along with a lack of alternative calorie sources, fuels Mexico's 4-percent rise in sugar consumption per year (fig. 5). Though Americans and Canadians, per capita, still consume twice the world average in sugar, they have tended more toward high-intensity sweeteners to reduce calorie intake.

U.S. per capita sugar consumption has been growing since 1986, and in 1991 stood at 29 kilograms (64.8 pounds) per year, still lower than Canadian or Mexican per capita consumption. When HFCS is added to sugar, though, Americans annually consume 49 kilograms per capita, more than the sugar/HFCS total for Mexicans (48 kilograms) or Canadians (42 kilograms).

Canadian sugar consumption fell between 1986 and 1989, as a rising world sugar price allowed HFCS to replace liquid sugar in some uses. But with the world sugar prices falling since 1990, Canadian sugar consumption has started to recover. Americans and Canadians have an increasingly positive image of sugar as a natural food. The public perception is that fat intake is now a more serious dietary concern.

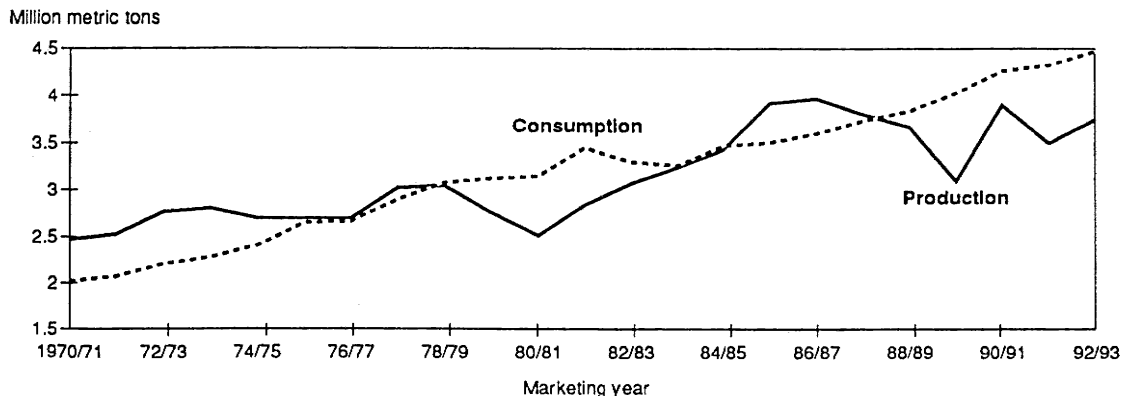
Mexico's population is about 90 million, roughly three times that of Canada and a third of the U.S. population. Mexico's population is growing 2 percent per year, about double Canada's rate of 1.1 percent, and three times the U.S. rate of 0.7 percent per year. To remain at the 1991 per capita level, total sugar consumption would need to rise by about 10,000 tons per year in Canada, 50,000 tons per year in the United States, and 100,000 tons per year in Mexico.

Mexico's per capita consumption of sugar has risen in the last 5 years from 41 to 45 kilograms. Much of the increase is likely due to rising per capita income. Imports of HFCS from the United States are growing, but remain a small fraction of total sugar consumption. Use of high-intensity sweeteners in Mexico, as in most less-developed countries, is at very low levels, but will likely continue to rise with increases in per capita income. In the United States and Canada, the calories absent in "diet" products are easily made up for from other foods, but in Mexico sugar-containing products are often nutritionally important as a cheap source of calories.

Figure 5

Mexico's sugar production and consumption, 1971-93

Consumption growth depends on substitute sweeteners, population, and income growth. Production depends upon government support policies (which determine price), investment, and technical progress.



Sugar Supply

Sugar crops are more significant in U.S. and Mexican agriculture than in Canadian agriculture.

Sugar is one of Mexico's largest field crops, but yield increases have been handicapped by the fragmentation of sugarcane farms (fig. 6). The United States devotes more acreage and more acreage per farm to sugar production, allowing economies of scale. Canadian sugar production (in sugarbeets) is slight due to climate.

Sugarcane production in Mexico dates from the early 1500's. Despite its wide distribution, three-quarters of the area devoted to sugarcane is concentrated in six States: Sinaloa, Jalisco, San Luis Potosi, Tamaulipas, Oaxaca, and Veracruz. Veracruz alone accounts for nearly 40 percent of national production, although its dominance has declined in recent years.

Mexico has about 130,000 sugarcane farms, which grow as much sugar as the approximately 1,000 U.S. sugarcane farms. Mexican farms are small chiefly because of past Government restrictions on farm size. Much of the land currently in sugarcane is owned by the Government of Mexico. It is apportioned under the Land Reform Law to citizens of a given area to hold in perpetuity. About 60 percent of Mexico's area in sugarcane is located on these communal lands or "ejidos" and is farmed by approximately 80,000 individuals. Holdings average about 3.5 hectares (8.6 acres) per person.

The fragmentation of sugarcane farms makes it difficult to introduce improved technologies and to coordinate harvest schedules. The supply of fresh cane to mills is irregular. The time lapse from when the cane is cut

to when it is ground at the mill is more than double the lapse for more efficient cane-producing countries such as Australia, South Africa, and the United States. These delays result in considerable deterioration of the crop.

Legal restrictions on selling and renting land have prevented efficient farmers from competing with less efficient farmers for land resources. Recent constitutional and agricultural reforms aim to make the land tenure system more flexible to foster increased capitalization. Farms can now be grouped together to achieve economies of scale, which is particularly important for a cane sugar industry that requires capital-intensive inputs. However, change will be slow due to problems with land titles and the general conservatism of the small *ejido* grower.

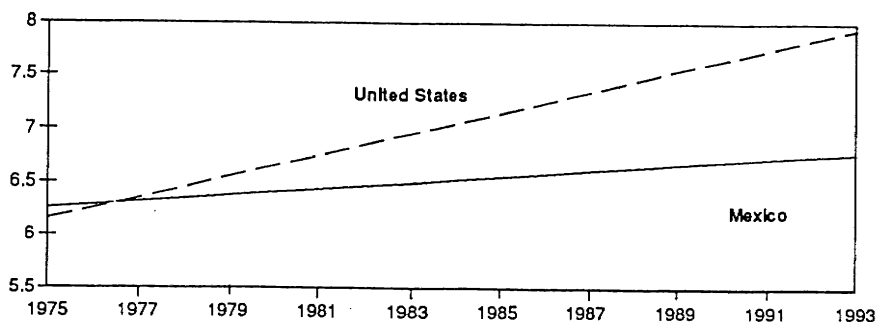
U.S. sugarcane is grown in four States: Hawaii, Texas, Louisiana, and Florida. In Louisiana and Texas, sugarcane farms average between 100 and 150 hectares, with most growers sharing in cooperative-owned mills. In Hawaii and Florida, sugarcane is grown mostly by integrated grower/processor companies, which average 11,000 hectares in sugarcane.

About 851,000 hectares of sugar crops (557,000 in sugarbeets and 294,000 in sugarcane) were harvested in the United States in 1991. This was about 0.2 percent of total U.S. cropland (331 million hectares). Mexico harvested 530,000 hectares of sugarcane in 1991, or 1 percent of total cropland. Canada harvested only 24,000 hectares of sugarbeets in 1991, 0.2 percent of Canada's cropland.

Figure 6

Mexican and U.S. yields of sugar per hectare from sugarcane, 1975-93
While U.S. yields have risen, Mexican yields have stagnated.

Metric tons per hectare



Note: U.S. is mainland only, excluding Hawaii. Trend line is based on crop years 1975-92.

Milling and Refining Sugar

Mexico's sugar milling industry was recently privatized, with hopes of improving efficiency.

Mexico's sugar mills generally suffer from obsolete equipment, excess labor, and irregular supplies of cane. Mexico was capable of producing 4-5 million tons of sugar per year in the late 1980's. With production estimated at 3.75 million tons for 1992/93, the industry is operating at about two-thirds capacity. To reverse industry stagnation in the late 1980's, the Government decided to reprivatize the mills and to decontrol domestic sugar marketing.

Mexican mills vary widely in size and efficiency. Of Mexico's 64 sugar mills, nearly 60 percent (37) produced less than 50,000 tons of sugar per year in 1987-92. About half have a daily grinding capacity of 4,500 tons or less; only four mills can grind more than 10,000 tons a day. The national average is small (5,100 tons) compared with 7,280 tons in the mainland United States, reducing opportunities for economies of scale. Most mills are more than 50 years old with obsolete equipment that causes frequent breakdowns, high sucrose loss, and inefficient energy consumption. Milling costs vary from less than 12 cents to more than 18 cents per pound of sugar, depending on the degree of modernization.

Mexico's milling sector produces four types of sugar: refined, standard or plantation white, brown, and raw. Standard and raw sugar comprise about half of Mexico's annual mill production, refined sugar accounts for about a third, and "mascabado" or brown sugar accounts for the remainder. Mexico's milling sector, with over 40,000 millworkers, is overmanned, as much as 40 percent more than required to run the mills. The workers' union has resisted automation and defended low sugar output per worker. While labor is a more abundant factor of production than capital in Mexico, excess labor has been counterproductive. The new owners of sugar mills are negotiating the removal of excess labor and a reduction of worker subsidies for nonessential activities.

Ownership of Mexico's milling sector has changed dramatically in the last 20 years, reflecting shifts in government intervention. In the early 1970's, the private sector owned three-fourths of all mills. By the early 1980's, however, the bulk had been shifted to government ownership. Mexico held down the consumer price for sugar, while production costs rose, and many mills became insolvent. Since many private mills had borrowed from the Government, when mills went

bankrupt the Government took them over. In 1987, the Government owned and managed 75 percent of the mills.

In October 1988, the administration of Mexico's Miguel de la Madrid began auctioning off packages containing both good and deteriorated mills. The Government also began to allow privately owned mills to market their own sugar without paying a heavy sales tax. All mills are now in private hands, many bought by soft-drink companies that hope to control ingredient costs and ensure quality supplies.

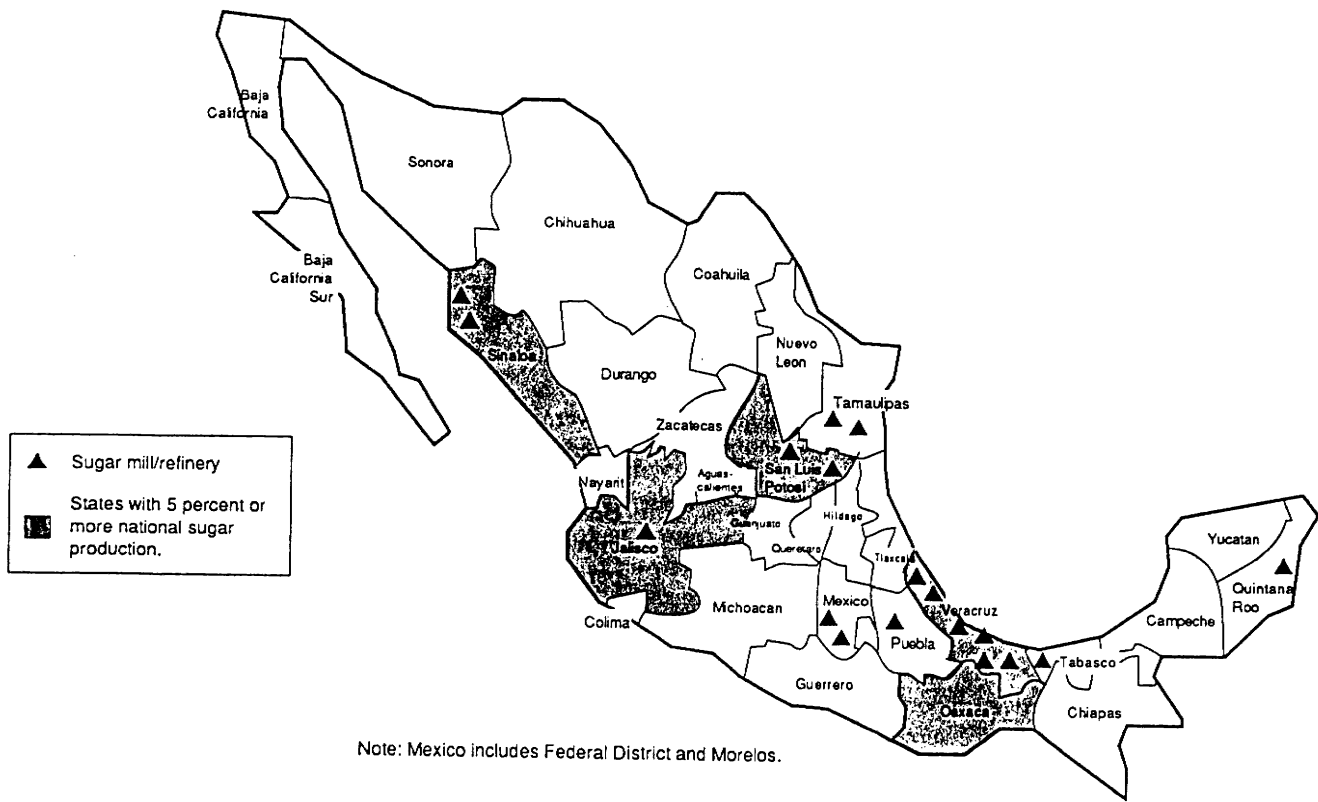
Mexico is also a sizable producer of byproducts from sugarcane, including molasses, alcohol, and bagasse. About a third of 500,000 tons of molasses produced per year is exported, mostly to the United States, with the rest used for animal feed and nonfuel alcohol. In 1991, the United States imported 1.26 million tons of molasses, nearly 20 percent of which came from Mexico. The volume of alcohol produced from uncrystallized molasses is estimated at 80 million liters per year. While most bagasse produced from sugarcane is used as an energy source, about a quarter is used as pulp for paper.

There are no stand-alone sugar refineries in Mexico: all refined sugar production takes place in integrated milling and refining facilities. Of Mexico's 64 sugarcane processing mills, 18 can produce refined sugar either directly from the sugarcane or by refining purchased raw sugar (fig. 7). Mexico's annual capacity to produce commercial-grade refined sugar is about 1.5 million tons. Mexico has supplemented domestic supplies with refined sugar imports, much of it from the United States.

The United States has 12 sugar refineries, only one of which is attached to a sugarcane-processing mill. Most refineries are near ocean ports to accept imported raw sugar (fig. 8). In recent years, 25-33 percent of refined cane sugar sold in the United States has been made from imported raw cane sugar. Canada has four cane sugar refineries, which import all their raw sugar.

The average capacity of U.S. refineries is about 1,800 tons per day, about twice the capacity of Canadian refineries. There are economies of scale in this industry, and U.S. refiners have lower unit costs of production. Costs of refining in Mexico are likely high due to the costs of transporting the raw sugar from a port to the inland mills, and then to the population centers.

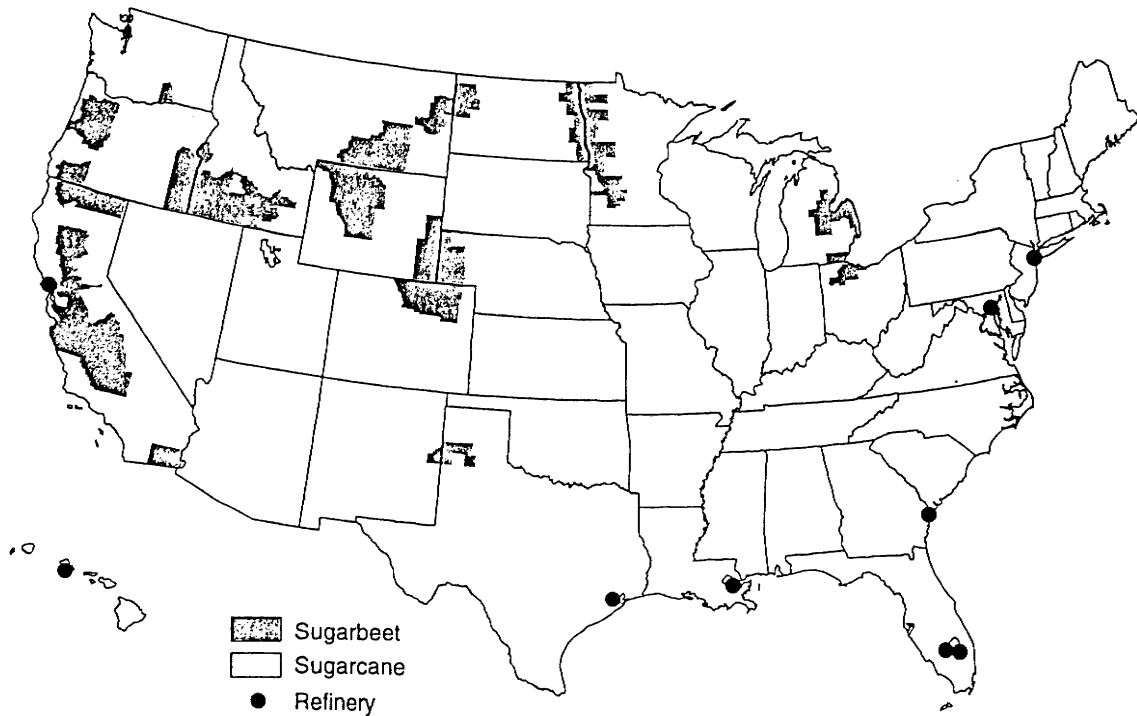
Figure 7
Mexico's sugarcane growing areas and mills/refineries
Mills that can produce refined sugar (18 of Mexico's 64 mills) are often far from an ocean port.



Note: Mexico includes Federal District and Morelos.

Figure 8
U.S. sugar crops production regions and refinery sites

Most U.S. refineries are near ports; many ship from the Gulf of Mexico.



New Orleans is the site of three refineries; New York, two.

Sugar Price Supports

Support policies for sugar crops differ in the three countries, as do sugar price support levels set by policy.

Retail sugar prices are not controlled in the United States and Canada, but reflect normal marketing margins, given the wholesale price of sugar. The Mexican Government, by contrast, has kept the retail sugar price low for years. In Canada, Government intervention is in the form of payments from a "tripartite fund" generated from three sources: the Federal Government, Provincial governments, and growers. Sugarbeet farmers are supported in any year that the price paid by the beet sugar processor falls below a target level. This target level was about \$30 per ton of sugarbeets in 1991/92 (fig. 9). Sugarbeet growers are taxed to help replenish the fund when the price paid is above the target level. The aim is for the fund to be self-financing.

The 1991/92 U.S. sugarbeet price support level was about \$38 per ton, and the sugarcane price support level about \$28 per ton. The actual price of sugarbeets and sugarcane averaged \$42 and \$32 per ton, respectively, well above the support levels. Market prices are generally above target levels because statutory requirements provide for minimum, but not maximum, support levels.

For more than a decade, the Government of Mexico announced each year a guaranteed minimum price for cane growers. The basis for this price was a 1979 Presidential decree, which mandated that producers receive prices equivalent to the previous year, plus the annual rate of inflation. For example, for the 1988/89 crop, producers were guaranteed 40,676 pesos (US\$17.30, November 1988) per ton of cane delivered to mills.

For 1989/90, cane received a 13.85-percent increase to 46,309 pesos (US\$17.80, November 1989) per ton. Some growers reduced sugarcane acreage and some shifted land into more remunerative crops, such as citrus and vegetables. The Government of Mexico announced a price of 58,766 pesos (US\$20.10) per ton in November 1990 for the 1990/91 crop, up 26.9 percent from the previous year (fig. 10). Growers, discontent with the price increase, formed a nationwide strike that delayed harvest by about a month.

The 1990/91 minimum guaranteed producer price was based on an assumed extraction rate of 83 kilograms of sugar (raw value) per ton of cane, assumed mill processing losses not to exceed 2.64 percent, and was

equivalent to 708.2 pesos per kilogram of sugar or 11.2 cents per pound. However, this did not take into account the actual sugar content of cane produced by individual growers. As a result, growers of high-quality cane tended to subsidize growers of poor-quality cane.

Government and industry leaders understand the need to provide economic incentives for quality improvement and to develop techniques to test for sucrose content in cane. Under a new Government initiative, sugarcane prices to growers are to be determined monthly, based on 54 percent of the monthly wholesale price of standard sugar times KARBE (kilograms of standard quality sugar recovered). KARBE data would include sucrose content, fiber content, juice quality of cane, and efficiency of the mill. KARBE data would be different for each producer and mill. The average KARBE factor for 1991/92 was 93. Using this, the formula would yield an average cane price of 71,912 pesos (US\$22.80) per ton for September 1992.

While the revised system is an improvement, the most direct method to foster incentives for quality cane is an individual payment program, which requires a "core sampler system" for individual sampling. The Mexican industry plans to install such a system, which should improve yield and efficiency in the long run. Meanwhile, since cane from growers is lumped together and prices are determined monthly, growers of high-quality cane still subsidize growers of poor-quality cane.

Until recently, Azucar, S.A., monopolized domestic marketing of sugar in Mexico. The Government facilitated sugar storage and shipping throughout the country and, through a pan-Mexican pricing policy, sought to prevent black marketing. However, costly Government subsidies were needed to sustain the monopoly, especially to maintain a single national price in areas remote from domestic sugar-growing areas and mills.

As part of the privatization process, Azucar, S.A., no longer distributes sugar in Mexico. Private sugar mills now market and distribute their sugar. A recent initiative ended pan-Mexican pricing by adding a small price increase to the officially controlled sugar price in States without sugar mills. This is aimed at encouraging the private sector to market sugar in remote areas.

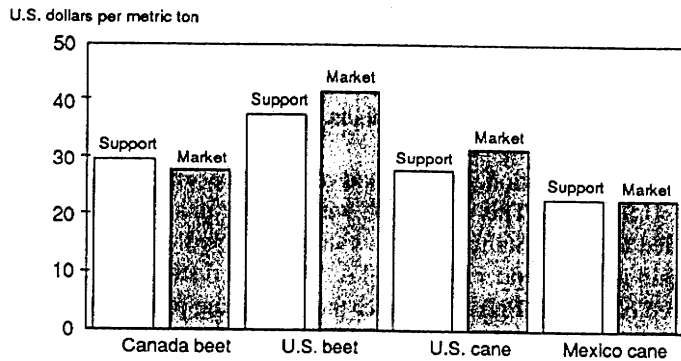
In February 1990, retail sugar prices began to rise monthly in Mexico, according to a complicated pricing formula. As of April 1992, the retail price for refined sugar was 18,672 pesos per kilogram (27.2 cents a

pound). The price spread between the mill price for refined sugar and the urban retail price is 281 pesos per kilogram, or 8 percent.

Metric conversion chart

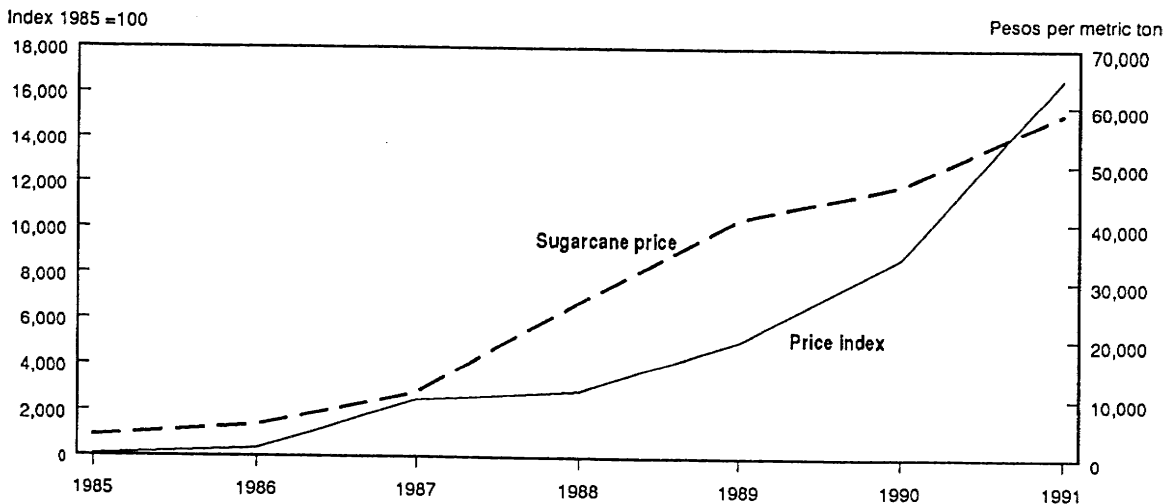
- 1 hectare = 2.471 acres
- 1 kilogram = 2.2 pounds
- 1 metric ton = 1.102 tons (short); 0.984 tons (long)
- 1 liter = 1.057 liquid quarts

Figure 9
1991/92 sugar crop prices and support levels in Canada, the United States, and Mexico
The United States had lower support levels than market prices.



Note: U.S. prices are for Florida.

Figure 10
Mexican sugarcane price support level and Mexican inflation rate, 1985-91
Inflation has risen faster than the price of sugarcane since 1989.



The North American Free Trade Agreement (NAFTA)--Provisions for Sugar

The United States, Canada, and Mexico concluded, in August 1992, 14 months of negotiations on the North American Free Trade Agreement. In December 1992, former President Bush signed the Agreement, which must still be ratified by Congress.

The 1989 U.S.-Canada Free Trade Agreement has already boosted U.S. agricultural exports to Canada. The most significant growth in agricultural trade from NAFTA will be with Mexico, already U.S. agriculture's third largest single-country market. All tariffs, quotas, and licenses that act as barriers to agricultural trade will be eliminated by the end of the NAFTA transition period, resulting in net gains for both the United States and Mexico.

Mexico eliminated the import permit requirement system for sugar in late 1989. There is currently a variable levy system on sugar imports. The Government announces each month a target internal price, which is adjusted to stay at about 18.7 cents a pound (U.S.). The variable levy is adjusted to bridge the gap between the target price and world price. This price support system will work only when Mexico is a net sugar importer, which has been the case in recent years.

Above 7,258 metric tons of raw sugar, the NAFTA limits additional duty-free access to no more than Mexico's projected net production surplus of sugar (domestic production minus total consumption). In addition, for the first 6 years of the agreement, duty-free access may not be more than 25,000 metric tons, raw value. In year 7, the maximum duty-free access quantity becomes 150,000 metric tons, raw value. In each subsequent year of the 15-year transition period, the maximum quantity of Mexican sugar allowed duty-free access will be increased by 10 percent. However, beginning in year 7, the United States shall provide duty-free access to the full extent of Mexico's projected net production surplus for that year if (1) Mexico has been a net surplus producer for any 2 consecutive marketing years (including years 1-6 of the agreement), or if (2) Mexico has been a net surplus producer during the previous year and is projected to be a net surplus producer that year. If Mexico is not ultimately a net surplus producer in that second year, the appropriate quantitative restriction on duty-free access is applied in the subsequent year. Duty-free access to the Mexican market for U.S. products will be granted on the same basis as duty-free access is given to Mexican products in the U.S. market.

The U.S. over-quota tariff will be reduced over the 15-year transition. By the end of year 6, Mexico will align its tariff regime that applies to the rest of the world with the U.S. tariff. This new tariff will then be phased out for the United States between years 7 and 15. Mexico is not obligated to reduce its variable levy until the new tariff regime is in place. The U.S. Refined Sugar Re-export Program will remain in place under the NAFTA, but refined sugar shipped to Mexico under this program will be subject to the Most-Favored Nation (MFN) duty rather than receiving preferential status. The United States will continue using the sugar re-export program to ship refined sugar to Mexico.

Income growth in Mexico will expand its demand for sugar and will also encourage a shift to more highly refined sugar, a share of which is likely to be imported. Lower rail transportation costs due to other provisions of the NAFTA will improve the competitive position of U.S. refiners relative to other suppliers in supplying refined sugar to Mexico.

Canada has either no tariffs or very low tariffs on most sugar imports, whether raw or refined. Canadian tariffs on U.S. sugar are being phased down to zero by 1998. The NAFTA would not change U.S.-Canadian sugar tariffs, but requires that Canadian sugar entering Mexico be given Mexico's Most-Favored Nation over-quota customs duty. The NAFTA allows Canada to apply a duty on Mexican sugar equal to the Mexican duty on Canadian sugar.

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