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**BABCOCK INSTITUTE DISCUSSION PAPER
NO. 2009-2**

The Dairy Sector of Mexico: A Country Study

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THE DAIRY SECTOR OF MEXICO: A COUNTRY STUDY

William D. Dobson and Edward V. Jesse¹

EXECUTIVE SUMMARY

Mexico is a large and growing market for U.S. dairy exports, taking more than one-quarter of total foreign sales of U.S. dairy products over the five-year period 2004–08. Mexico's proximity to the U.S. allows quick and relatively inexpensive market access by truck and rail, and the elimination of all tariffs on dairy products through the North American Free Trade Agreement (NAFTA) gives a strong competitive edge to U.S. suppliers. The purpose of this report is to evaluate how this important market is likely to evolve over time and identify related opportunities for U.S. exporters to benefit from market growth and other changes.

Mexico has about one-fifth the land and one-third the population of the U.S. GDP per capita is less than one-third that of the U.S. but, until the recent recession, growing at a slightly faster rate. Poverty is widespread, and the Mexican government maintains an extensive feeding program (Liconsa) that has used large quantities of U.S. milk powder. Mexico's economy is tied closely to that of the U.S., most notably through remittances of Mexican citizens working in the U.S., through employment at Maquiladora factories producing U.S. goods, and through trade—the U.S. accounted for 82 percent of Mexico's export value in 2007.

Farming contributes only 4 percent of Mexico's GDP, but accounts for about 15 percent of employment. Mexican agriculture is very diverse with large and growing production of tropical fruits and winter vegetables for export. Agricultural exports, which account for 10 percent of total Mexican export earnings, have more than quadrupled in value since implementation of NAFTA in 1994. Agricultural imports have also grown rapidly, and Mexico has a small agricultural trade deficit.

Milk production in Mexico about matches Wisconsin production and accounts for only 65–75 percent of domestic consumption of dairy products. Most of the milk produced domestically is used for fluid consumption and for artisan cheeses. Production systems range from large Western-U.S. type dry-lot dairies in the north to farms with one or two dual-purpose cows to provide fresh milk for families in the tropical south. The number of milk cows has been essentially constant for the last ten years; small gains in production have come mainly from improvements in genetics and management. Average milk yield per cow is only about one-sixth of average U.S. yield, though yields on large dairies in the north are near those in the U.S. Production growth has been strongest in the north, but that area faces increasing problems with water availability and quality. Supportive government policies to expand milk production have not proven to be very successful.

The Mexican dairy processing sector consists of a few large cooperatives and private companies, and a large number of smaller, generally regional companies. More than 25 percent of milk produced in Mexico is marketed through the informal sector as fluid milk or milk for farmstead and artisan cheeses. This segment is likely to diminish with economic development in Mexico as consumers increasingly demand product consistency, quality, and safety. Multinational dairy companies have had mixed success with direct investment in Mexico. Nestle has operated in Mexico for more than 60 years and is the second leading Mexican processor. Fonterra sold its Mexican cheese plant in 2004, but remains a major supplier of cheese from its Chilean subsidiary. U.S. dairy companies account for about one-half of Mexico's imports of dairy products. Competitors include Fonterra of New Zealand for SMP, WMP, MPC and cheese, Glanbia of Ireland for WPC, and Lafor + Lactoformulas of the Netherlands for AMF, cheese and casein.

Future opportunities for U.S. dairy exporters to Mexico depend to a large extent on dairy market growth compared to growth in internal milk consumption. Changes in consumption of dairy products will be influenced by

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changes in population and income. We expect Mexico's population will continue to grow at a rate of 1.0–1.5 percent annually. Changes in income are more speculative, especially given current negative growth rates. We anticipate reasonably rapid recovery from the current recession and a return to earlier increases in GDP and personal income of 1.5–2.5 percent per year. Given income elasticity of overall demand for dairy products of 0.7, these projected population and income growth figures would yield an annual increase in consumption of 2.00–3.25 percent.

Mexican milk production is not expected to increase by more than 2–3 percent per year due to challenges facing the production sector, most notably the increasing scarcity of water and competition for land to grow crops for internal consumption and export. Hence, we expect Mexico's self-sufficiency ratio in dairy to decline, meaning that more imports will be required to meet deficit needs.

While the overall level of Mexican dairy imports will increase, the composition of imports will likely change. Growing income will expand demand for more upscale items such as cheese, yogurt and processed food products containing dairy ingredients. But persistent poverty will still require large imports of SMP and WMP by Liconsa to supply feeding programs.

U.S. dairy exporters are well-positioned to meet Mexico's anticipated expanding demand for imports of dairy products. But they will need to accommodate the unique characteristics of the Mexican dairy market in order to take full advantage of growing opportunities.

INTRODUCTION

The Babcock Institute for International Dairy Research and Development instituted a dairy “Country Study” project in 2004. These comprehensive studies summarize information relating to the competitiveness and likely future strategies of selected foreign dairy producers, processors, exporters and government agencies. This information is intended to help U.S. firms and policymakers develop appropriate strategies and policies to exploit export opportunities and to accommodate the actions of foreign dairy companies and foreign governments in major countries that import U.S. dairy products or export dairy products to the U.S.

Previous Babcock country/regional studies involved Oceania (2004), Poland (2005), India (2006), Ireland (2007), and Brazil (2008). Related reports can be downloaded from the Babcock Institute web site: <http://babcock.cals.wisc.edu/?q=node/465>.

Mexico was selected for the 2009 country study. Mexico has been the largest market for U.S. exporters of dairy products, accounting for more than one-quarter of total foreign sales during the five-year period 2004–2008. In 2008, Mexico purchased U.S. dairy products valued at \$935 million. Mexico’s purchases from the U.S. have increased at an annual rate of 14 percent since implementation of the North American Free Trade Agreement (NAFTA) in 1994, which phased out all import tariffs on dairy products.

Mexico is also a major market for dairy-related inputs from the U.S., especially genetics in the form of semen and embryos, milking and dairy processing equipment, and dairy supplies.

Because of budget constraints, the Mexico dairy study team consisted of only two University of Wisconsin members: William D. Dobson is an emeritus professor in the Department of Agricultural and Applied Economics at the University of Wisconsin-Madison and an agribusiness economist with the Babcock Institute. Professor Dobson’s expertise is international agricultural trade, agribusiness management, and macroeconomics. Edward V. Jesse is an emeritus professor and former Extension dairy marketing and policy specialist in the Department of Agricultural and Applied Economics and director of trade and policy studies for the Babcock Institute. Professor

Jesse’s expertise is dairy farm management and dairy marketing and trade.

Unlike previous country studies, the Mexico study did not include a site visit. The study was conducted through an extensive review of print materials and internet sites, and interviews with industry experts in the U.S. and Mexico.

Throughout our literature review and personal interviews, we focused on questions related to a central theme: the ability of Mexico to supply milk and dairy products internally to meet domestic demand and related opportunities for U.S. exporters to fill deficit needs. Specific related questions included:

- What changes in Mexican milk production can be expected—how much milk will be produced domestically, where will it be produced, and what products will be it be used for? How have Mexican agricultural policies affected milk production and what policy changes are likely?
- What are the prospects for Mexico’s economy and how will economic growth affect demand for dairy products? In particular, what changes in the mix of dairy product consumption can be expected?
- What is the current status of the Mexican dairy processing sector and what changes are on the horizon?
- How have the volume and composition of U.S. exports of dairy products to Mexico changed over time and what caused these changes? What advantages and disadvantages do U.S. exporters have in serving the Mexican market?
- Who are the major competitors with the U.S. for Mexican dairy imports? What lies ahead for trade pacts that might alter competition?

The remainder of this paper is organized as follows: First, we describe Mexico’s geography and macroeconomic environment, emphasizing the importance of agriculture. Next, we describe and evaluate Mexico’s dairy farming and dairy processing sectors, followed by an assessment of future self-sufficiency. Finally, we summarize our assessment of U.S. dairy trade opportunities in Mexico.

GEOGRAPHY, ECONOMY AND AGRICULTURAL POLICIES

The characteristics of Mexico's geography and economy will shape the future for many of the country's industries, including the dairy industry. Mexico's agricultural, trade and social policies have had a significant impact on its agricultural sector and will continue to do so.

While the discussion of Mexico's economy is broad-ranging, emphasis is placed on income distribution and growth. These factors will affect the composition of Mexico's dairy imports from the U.S. and other countries. FAS-USDA describes the impact of income distribution and growth on Mexico's dairy imports as follows [48, p. 13]:

Mexico is expected to continue as a significant importer of dairy products to augment domestic production. While imports are likely to consist primarily of raw material and bulk products such as NFDM, higher-value products such as specialty cheeses and ice creams are also likely to find a home in Mexico's growing middle class as tastes, preferences, and shopping habits increasingly mirror those of the United States and Europe.

The analysis will suggest how closely Mexican consumer incomes are likely to approach those of the

U.S., and yield implications for U.S. dairy exports to Mexico.

Mexico's Geography

Occupying 1.97 million square kilometers of territory, Mexico is approximately one-fifth the size of the U.S. and three times larger than the state of Texas [40]. The country has a 1952 mile (3,141 km) border with the U.S. and borders with Guatemala and Belize to the south.

Mexico has 31 states and one federal district. Mexico City, the country's capital, comprises the Federal District. The country's terrain includes high, rugged mountains, low coastal plains, high plateaus, and desert. Mexico's climate ranges from tropical to desert conditions.

Water is a scarce resource in the country. It is both scarce and polluted in the north and either inaccessible or of generally poor quality in the center and extreme southeastern parts of the country. Raw sewage and industrial effluents pollute rivers in urban areas [40]. Water pollution is pronounced in Mexico City and in urban centers along the U.S.-Mexico border.

FIGURE 1. Boundaries and Major Cities of Mexico.



TABLE 1. Mexican states with lowest and highest poverty rates.

Lowest Poverty Rates	Highest Poverty Rates
Baja California	Hidalgo
Baja California Sur	Zacatecas
Distrito Federal	Guerrero
Nueva Leon	Chiapas
Aguascalientes	Oaxaca
	Tabasco
	Campeche

Source: Gunderson, Yanez, and Kuhn [18].

Poverty is still common in parts of Mexico and varies by geographic region. According to a 2000 USDA study, the Mexican states with the lowest and highest poverty rates are those shown in Table 1.

The states identified in the USDA study as the high poverty states define poverty as predominantly a rural and southern Mexico problem. The states in the list with the highest poverty rates include the five most rural states in Mexico and, except for Hidalgo and Zacatecas, states located in the south of Mexico. Lower poverty rates are found in states with close proximity to the U.S. Two Mexican states with the lowest poverty rates (Baja California and Nuevo Leon) border the U.S. and a third (Baja California Sur) is separated by only one state from the U.S.

A study by Gould and Kim indicated that consumer purchases of milk and cheese were substantially higher in Mexico states with the low poverty rates [16]. Their study suggests that milk and cheese purchases in Mexico will be highest in the Maquiladora belt (Mexican states with manufacturing facilities located near the U.S. border) and the Federal District. However, the Gould-Kim study tells little about how closely the Mexican consumption patterns for dairy products will approach those of the U.S.

Mexico's Economy

Mexico's economy has a checkered past, characterized by periods of reasonably strong growth that have propelled the economy into the trillion dollar GDP class. It also contains a mixture of modern and out-

moded industry and agriculture, increasingly dominated by the private sector. The figures in Table 2 provide a snapshot of population and economic conditions in Mexico mainly during 2008 and 2009.

Mexico's population is about one-third as large as that of the U.S. The country's population growth rate is modestly more rapid than the U.S. Mexico had a -3.61 percent net migration rate in 2009. However, this estimate may overstate the amount of out migration in 2009 since jobs in the U.S. have become scarcer for Mexican workers as a result of the U.S. recession, reducing the incentives for migration.

Mexico's relatively low unemployment rate (4.1 percent) in October 2008 is misleading, since underemployment may be as high as a quarter of the working population.

The lower figure in the range for the percent of Mexico's population below the poverty line (13.8 percent) is not much different from the U.S. figure. However, as noted in the footnote for Table 2, the asset-based percentage of people below the poverty line in Mexico may be as high as 40 percent. The low 13.8 percent figure reflects effects of government feeding programs for low-income people and other factors that push the food-based measure of the percentage of people in poverty into the mid to low teens.

The top 10 percent of households in Mexico received a slightly higher percentage of income than the comparable group in the U.S. Conversely, the lowest 10 percent of the households in Mexico receive a smaller percentage of the total income than their counterparts in the U.S.

Mexico's total GDP in Purchasing Power Parity (PPP) terms, which takes into account price differences in the two countries, equals about 11 percent of the comparable figure for the U.S. However, Mexico's GDP per capita in PPP terms is 30 percent of the U.S. figure. The surprisingly large differences between Mexico's total GDP (in PPP terms) and per capita GDP (in PPP terms) may reflect in part measurement errors. But, if Mexico's per capita GDP (in PPP terms) as shown in Table 2 is approximately correct, the figure must reflect a cost of living in Mexico that is sharply lower than in the U.S.

The GDP growth and inflation figures for Mexico identify an economy that performed reasonably well in 2008. However, the 2008 growth figure obviously fails

TABLE 2. Population and Economic Statistics for Mexico and U.S.

Item	Mexico	U.S.
1) Population (July 2009)	111,211,789	307,212,123
2) Population growth rate (2009)	1.13%	0.975%
3) Net migration rate (migrants per 1,000 population, 2009)	-3.61%	4.31%
4) Unemployment rate	4.1%	7.2%
5) Population below poverty line	13.8% to more than 40%	12.0%
6) Household income shares:		
Lowest 10%	1.2%	2.0%
Highest 10%	37.0	30.0
7) GDP (\$ trillion, 2008)	\$1.578	\$14.58
8) GDP/capita (PPP, 2008)	\$14,400	\$48,000
9) GDP real growth rate (2008)	1.3%	1.1%
10) Inflation rate for consumer prices (2008)	6.2%	4.2%
11) Top-3 exporting partners (value of 2007 exports in \$US)		
	U.S. 82.2%	Mexico 11.7%
	Canada, 2.4%	China 5.6%
	Germany 1.5%	Canada 2.4%

Sources: CIA World Factbook [40] for items 1-8 and 10 and 11 and International Monetary Fund [22] for item 9. Item 4 represents figures for October 2008 and December 2008 for Mexico and the U.S., respectively. While the unemployment figure for Mexico is relatively low, under employment may be as high as 25 percent for the country. Item 5 represents figures for 2006 and 2004 for the Mexico and the U.S., respectively. Mexico's figure for item 5 is 13.8 percent for a food-based definition of poverty and more than 40 percent for an asset-based definition of poverty. Item 6 represents 2006 and 2007 figures for Mexico and the U.S., respectively.

to reflect Mexico's decline into a severe recession in 2009, a recession that has been exacerbated by H1N1 and drug wars. Mexico's real GDP fell at annual rates of 8.2 percent and 10.3 percent in the first and second quarters of 2009, respectively, and is likely to show little increase until late in 2009 at the earliest.

Figures for the top-3 destinations for Mexico's exports show how heavily the country depends on the U.S. as a market for its export products. Eighty-two percent of Mexico's exports ended up in the U.S. in 2007.

Additional information on how incomes and income distributions have changed over time in Mexico appears in Table 3. Mexico's GDP per capita (in PPP) rose by 60 percent from 2001 to 2008. Households with the lowest 10 percent of income and households with the highest 10 percent of incomes both received a lower share of income as conditions in Mexico

changed from the early 2000s to later in the decade. This indicates that the broad middle group of Mexican households received a larger share of the income at the expense of the top and bottom groups. The Gini Index reveals a similar change. From 2000 to 2006, household incomes became modestly more equal in Mexico.

The figures in Tables 2 and 3 represent snapshots for a single year or changes over a relatively small number of years. A more comprehensive picture of how Mexico's economy weathered its sometimes turbulent past and arrived at its present condition is suggested by events described in Table 4. The events also identify the key developments to keep in mind when attempting to predict Mexico's economic future.

The points in Table 4 suggest that Mexico became very susceptible to external shocks after moving away from an emphasis on import substitution in the mid-1950s to the early 1970s. Mexico exported relatively

TABLE 3. GDP per Capita, Household Income Shares, and Gini Indexes for Mexico.

Year	GDP/Capita (PPP)	Household Income Shares*		Year	Gini Index
		Lowest 10 %	Highest 10 %		
2001	\$9,000	1.6%	41.1%	2000	54.6
2004	9,600	1.6%	39.4%		
2008	14,400	1.2%*	37.0%*	2006	47.9

Sources: CIA World Factbook, various years, 2002 to 2009 [41].

*The household income share figures are for 2006, the most recent figures available. A Gini Index of 0 indicates perfect equality (everyone receives the same income) and an index of 100 indicates perfect inequality (all income is received by one individual or family).

TABLE 4. Economic Events Affecting Mexico's Economy in Recent Decades.

Period	Events
Mid-1950s to Early 1970s	Mexico was a financially stable country with high growth and relatively low inflation in this period. The sharp run-up in world oil prices in 1973–74 generated increases in export revenues for Mexico's government from the state-owned oil industry. In addition, the recycling of Middle East petrodollars through European banks increased the availability of international capital for investment in Mexico. Mexico's government adopted expansionary policies that created capital inflows and an over-valued peso. Restrictive trade policies limited imports and non-oil exports.
Early 1980s	Falling oil prices and rising world interest rates prompted capital market participants to re-evaluate investment prospects in Mexico. Foreign investors rapidly withdrew funds from Mexico, precipitating an economic crisis. In August, 1982, Mexico's government announced that it could not meet scheduled debt payments. For much of the 1980s, Mexico labored under a heavy debt burden and recession. GDP growth per capita was negative for much of 1981 to 1988.
Late 1980s to Early 1990s	Under the Salinas Administration (1988–1994), the federal budget was transformed from deficit to surplus, import tariffs were cut sharply and inflation was reduced from 150 percent in 1987 to single digits in 1994. Mexico joined the U.S. and Canada to form the NAFTA in 1994. Exports boomed, imports grew even faster, and capital inflows in the form of volatile portfolio investments increased rapidly. Mexico's economy began to grow again in the early 1990s.
Peso Crisis of 1994–1995	In late 1994, capital market participants became skittish about the commitment of the incoming Zedillo administration to a stable dollar/peso exchange rate. Capital withdrawals quickly depleted Mexico's foreign exchange reserves. Subsequently, the peso was devalued and ultimately allowed to float freely. But this did not stem Mexico's peso crisis. Consequently, to prevent a spread of Mexico's problems into the global economy, a U.S.-led rescue package was developed to provide Mexico with a \$50 billion foreign exchange loan in February 1995. As part of the rescue plan, the Zedillo Administration implemented an austerity plan, which deepened Mexico's recession. Mexico's economy gradually recovered, partly because Mexico's weakened peso expanded exports. Foreign investors also returned to Mexico. Mexico's real GDP grew fairly rapidly from the late 1990s to 2006, before exhibiting more modest growth in 2007 and 2008.
2009 Recession	Partly because of shrinking exports to the U.S. and declining remittances from Mexican workers who no longer found work in the U.S., Mexico slipped into recession in early 2009. Mexico's peso declined by nearly a third against the U.S. dollar from August 2008 to early March 2009, making the peso the worst performer among the world's most traded currencies. Mexico's recovery will be linked to recovery in the U.S. and global economy. Drug wars and H1N1 flu will complicate the recovery efforts.

Sources: Zietz [56], Galbithink.org. [12], and Xinhua [54].

large quantities of oil in the early to mid-1980s. Consequently, exposure to conditions in the volatile world oil markets precipitated Mexico's problems with debt management in the early 1980s.

Mexico's economy became more open and Mexico's government practiced generally sound economic management in the late 1980s and early 1990s. But the prosperity of this period evaporated with the advent of the peso crisis of late 1994 and early 1995. Moreover, it did not take much to tip Mexico into the peso crisis. Apparently the crisis was precipitated in part by failure of the Zedillo administration to re-appoint a finance minister who had been instrumental in creating sound economic management practices in the Salinas administration. The peso crisis proved difficult to curb. It took a U.S.-led rescue plan to put Mexico's economy back onto a reasonably sound footing. However, as will be evident later, problems with maintaining the peso at the proper level continue.

Mexico's economy in recent years has been characterized by strong exposure to international market conditions and exceptionally strong linkages to the U.S. economy. The country's prosperity has been closely linked to exports to the U.S. and remittances from Mexican workers employed in the U.S. When these sources of revenue for Mexico's economy shrink, problems arise for the country.

Mexico's Oil Problems

Mexico's economy has experienced problems linked to turmoil in oil markets for decades. Presently, the country faces a different oil-related problem stemming from a probable major decline in oil production.

Mexico's crude oil production peaked in 2004 at about 3.38 million barrels per day (B/d). First Energy Capital forecasts that Mexico's oil production will decline to about 2.19 B/d in 2010—a drop of about 35 percent from peak period production [24]. Oil production forecasts, of course, are subject to substantial error and should be treated with caution. But other forecasts also suggest that declining production in Mexico's giant offshore Cantarell field will not be offset by temporary increases in production at the offshore Ku-Maloob-Zaap field, increased production from the newer onshore Chicontepic field and other

fields after 2010, leaving the country's overall oil production appreciably lower.

Mexico's declining oil production and increased domestic consumption will curtail the country's oil exports for the foreseeable future. Mexico exported about 1.88 million B/d of oil in 2001, a figure that expanded to 2.2 million B/d in 2005 [41]. By January 2009, Mexico's oil exports had dropped to about 1.24 million B/d. Barring unexpectedly large finds in new oil fields, this downward trend will continue.

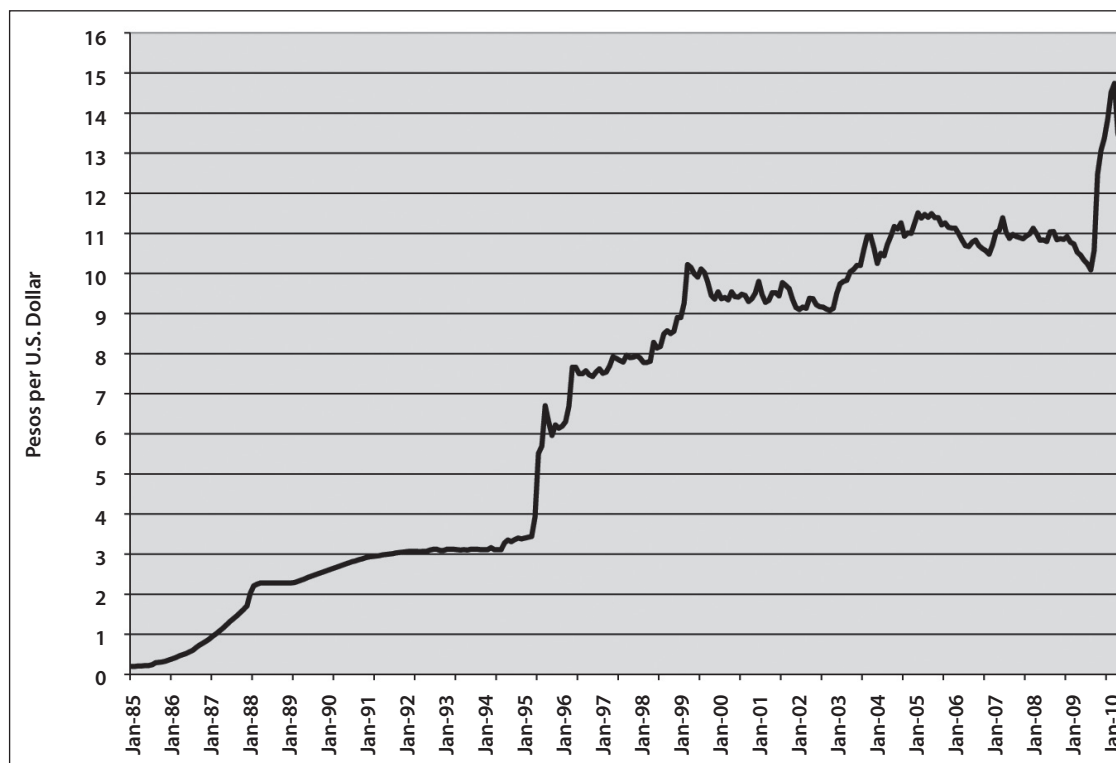
Falling oil production and lower oil exports are not good news for Mexico's economy. Oil revenues paid to the government by Mexico's state-owned oil company, PEMEX, account for about one-third of the revenue received by Mexico's government. Oil exports are also a major source of hard currency reserves. Mexico currently runs a relatively small current account deficit, frequently equal to 1 percent or less of real GDP. If oil exports fall as suggested above, this deficit is likely to increase substantially. This development could mean that Mexico's peso will decline to permit expanded exports of other products and keep the current account at desired levels.

Mexico's Exchange Rate

Mexico's exchange rate (peso vs. U.S. dollar) reflects the turmoil encountered by the country's economy in the 1990s and 2000s (Figure 2).

In particular, Mexico's peso crisis is revealed by the decline in the value of the peso from 1994 to 1995. The peso crisis had implications for U.S. dairy exports. For example, U.S. cheese exports to Mexico were expanding rapidly in the first half of the 1990s. Those exports peaked in 1994, contracted sharply in 1995, and remained relatively low until 2000 when they reached 10,301 metric tons, a new record. The recovery of U.S. cheese exports coincided with the renewal of rapid economic growth, lower unemployment, and lower inflation in Mexico [34].

More generally, the figures in Figure 2 show a gradually weakening Mexican peso relative to the U.S. dollar. It is also noteworthy that the Mexican peso declined in value against the U.S. dollar during the mid-2000s when many other currencies strengthened against the dollar. The secular decline of the Mexico

FIGURE 2. Mexican Peso/U.S. Dollar Exchange Rate.

Mexican peso devalued January 1, 2003, when 1 new peso was made equivalent to 1,000 old pesos. Values prior to 2003 are converted to new pesos. Sep 2009–Jan 2010 values are extrapolated.

Source: USDA-ERS [43].

peso is a potentially troubling sign of weakness in Mexico's economy. Presumably the gradually weakening peso was needed to keep Mexico's exports competitive in international markets and to keep foreign direct investment in Mexico at high levels. Interestingly, the weak peso has not produced a strong flare up of inflation in Mexico.

Mexico received a \$47 billion line of credit from the International Monetary Fund in April 2009 [23, 32]. Presumably this line of credit will discourage a run on the peso and depletion of Mexico's foreign exchange reserves.

Role of Agriculture in Mexico's Economy

Production agriculture accounts for about 4 percent of Mexico's overall GDP (Table 5). This is more than three times the comparable value in the U.S., but much less than the economic contribution in Argentina and Brazil, major South American crop and livestock producers. The contribution of production agriculture to

the Mexican economy has been falling as the economy has grown.

Due in large part to the ejido program (see below), employment in agriculture is disproportionately large compared to the contribution of agriculture to Mexico's economy. Agricultural employment is also large in comparison to the U.S. and Argentina, but similar to Brazil in terms of the ratio of percent employment to percent contribution to GDP.

Mexico produces a diverse agricultural commodity mix (Table 6). Meat, milk and eggs made up 45 percent of the value of production in 2007. Milk was third in value. Most of the commodities in positions 7 through 20 were fruits and vegetables, including several tropical species.

Mexico's agricultural exports increased slowly during the 30 years preceding the implementation of NAFTA (1994) and then expanded rapidly (Figure 3). Agricultural exports averaged less than \$500 million in 1961–63, \$3.2 billion in 1991–93, and \$12.9 billion in 2005–07.

TABLE 5. Percent of GDP and Employment by Sector, Selected Countries.

Country	Agriculture	Industry	Services
Percent of GDP			
Mexico	3.8	35.2	61.0
United States	1.2	19.2	61.0
Argentina	9.9	32.7	57.4
Brazil	6.7	28.0	65.3
Percent of Employment			
Mexico ('05)	15.1	25.7	59.2
United States ('07)	0.6	22.6	76.8
Argentina ('08)	1.0	23.0	76.0
Brazil ('03)	20.0	14.0	66.0

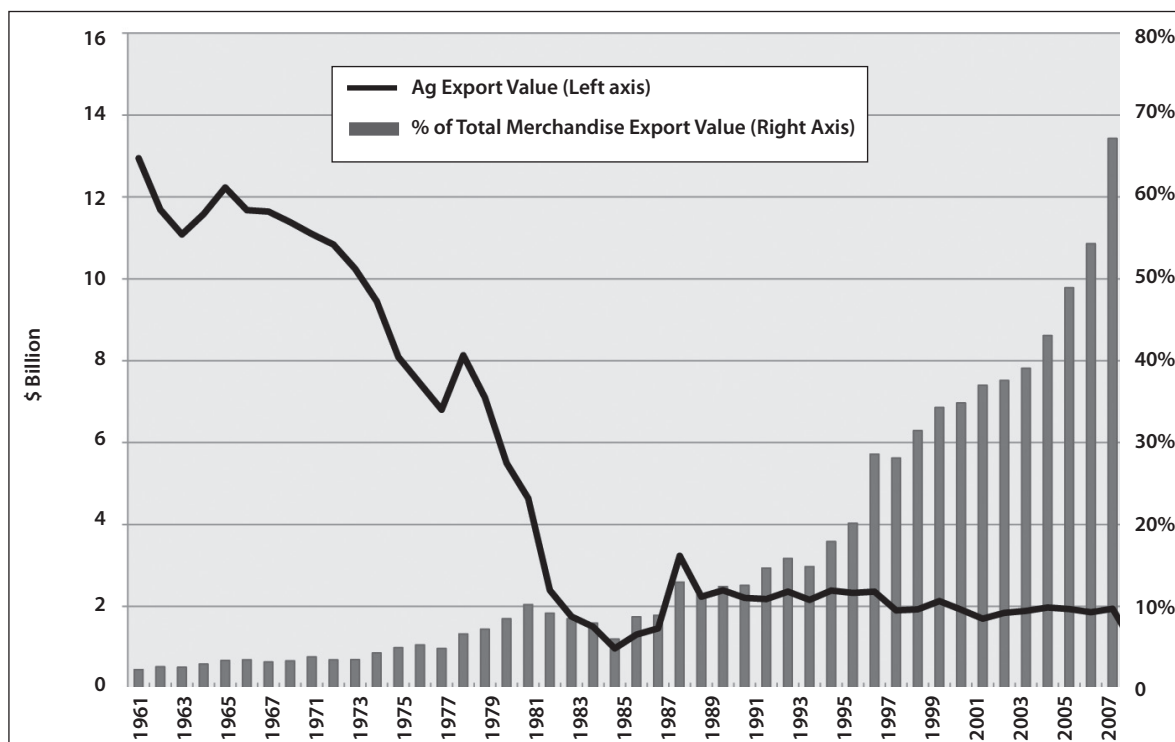
Source: CIA World Factbook [40]. Figures for percent of GDP are for 2008. Years for percent of employment are shown in parentheses.

TABLE 6. Top Ten Mexican Agricultural Products, 2007.

Rank	Commodity	2007 Production	
		Value in INT\$ Bil.	Volume in MT
1	Beef	3.72	1.80
2	Chicken	2.84	2.43
3	Milk	2.75	10.35
4	Eggs	1.90	2.29
5	Corn	1.62	23.51
6	Pork	1.10	1.09
7	Sugar Cane	1.08	52.09
8	Oranges	0.75	4.25
9	Tomatoes	0.75	3.15
10	Avocados	0.73	1.14
Total Top Ten		17.24	
Other Commodities		10.11	
Grand Total		27.35	

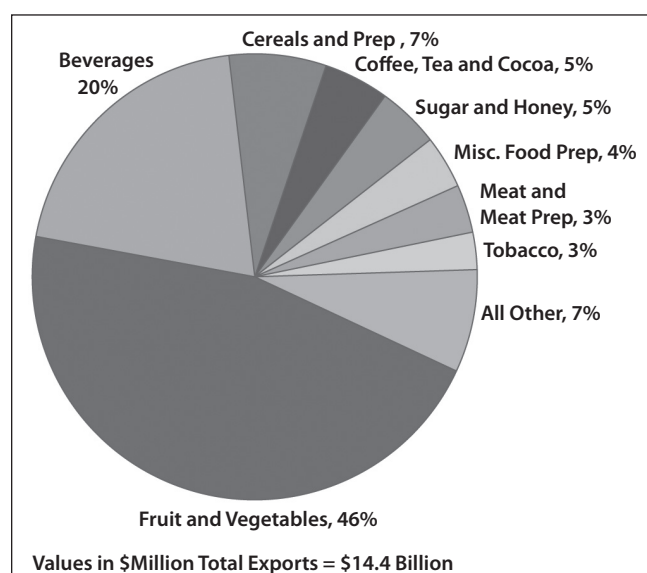
Source: FAOSTAT [10].

Note INT\$ is defined as world market price expressed in U.S. dollars. The monetary values in column 3 reflect 2007 production multiplied by average 1991–2001 world market prices.

FIGURE 3. Mexican Agricultural Exports.


Source: FAOSTAT [10].

FIGURE 4. Composition of Mexico Agricultural Exports, 2007.



Source: FAOSTAT [10].

Prior to the emergence of Mexico as a major oil exporter, agricultural exports accounted for more than half of Mexico's total export value. Agricultural exports fell to less than 10 percent of total exports in the mid-1980s, and have since stabilized at about 10 percent.

Mexico's agricultural export mix is heavily weighted toward fruits and vegetables—Mexico is a principal supplier of many vegetables to the U.S. during the winter months (Figure 4). Beverages, made up mainly of Mexican beers, are the second leading agricultural export item.

Mexican agricultural exports to the U.S. differ from the overall composition of exports (Table 7). Mexican

exports of fruits and vegetables to the U.S. accounted for more than one-half of the total value of Mexican agricultural exports, emphasizing the importance of proximity in dictating exports of perishable products. The proportion of global wine and beer exports about matched exports to the U.S. The U.S. took a much smaller proportion of Mexico's exports of cereals, coffee, tea, cocoa, and sugar than indicated in Figure 4.

Mexico's agricultural imports also took off with implementation of NAFTA. Import value averaged less than \$600 million in 1992–94 and \$16.4 billion in 2005–07 (Figure 5). As a proportion of total import value, agricultural imports peaked at 20 percent in 1983 and then fell gradually to 6.5 percent in 2007.

Compared to exports, agricultural imports are more balanced among commodities (Figure 6). Dairy was the fourth leading import in 2007 at 11 percent of total agricultural import value, behind cereals, meats, and oilseeds.

Imports of agricultural products from the U.S. represented about 14 percent of total Mexican agricultural imports in 2007. The U.S. supplied one-half or more of Mexican imports of cereals, meats, oil seeds and dairy products (Table 8). Exports to Mexico represented 31.3 percent of total U.S. meat exports and 26.4 percent of U.S. dairy product exports

While both exports and imports have been increasing rapidly, Mexico's agricultural trade balance has been slowly falling (Figure 7). Mexico showed a trade surplus of about \$400 million in 1996 and a trade deficit of \$4.8 billion in 2007.

Mexico's Agrarian Reform Act of 1915 and associated changes in the country's constitution in 1917

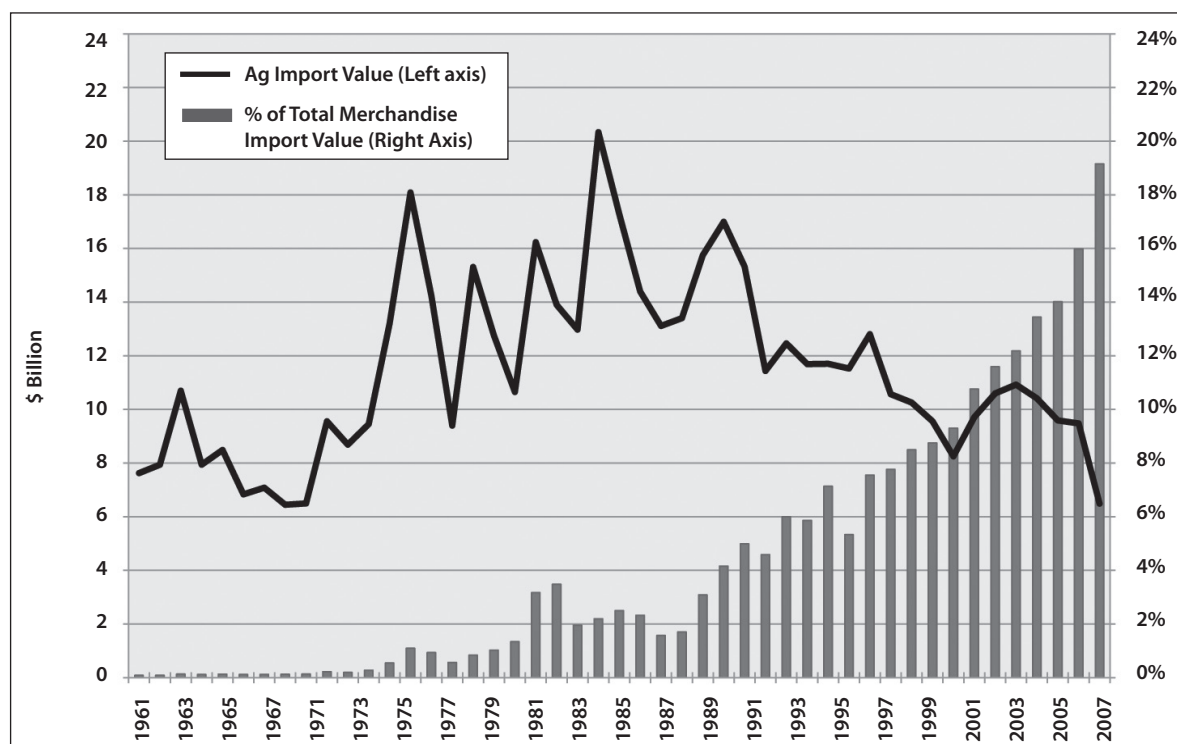
TABLE 7. Major Mexican Agricultural Exports to the United States, 2007.

Commodity	Value of Mexican Exports to the U.S. (\$Million)	Mexican Exports of commodity to the U.S. as a % of:	
		Total U.S. Import Value	Total Mexican Ag Export Value
Fruits and Vegetables	5,447	31.3%	53.6%
Wine and Beer*	1,595	19.3%	15.7%
Cereals & Preps	37	3.6%	0.4%
Coffee, Tea and Cocoa	309	6.3%	3.0%
Sugar	40	5.9%	0.4%

Source for Total Mexican exports is FAOSTAT [10] and source for U.S. imports from Mexico is FAS [51]. The two sources use slightly different commodity definitions, so the percentages in column 4 are approximate.

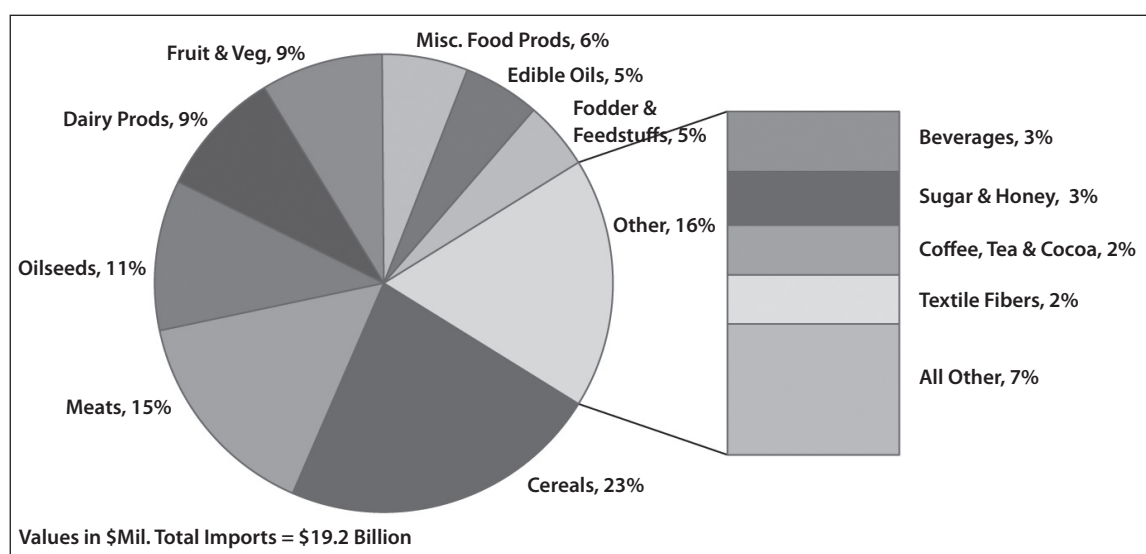
*Column 4 is percentage of Mexican exports of beverages represented by U.S. imports of Mexican wine and beer.

FIGURE 5. Mexican Agricultural Imports.

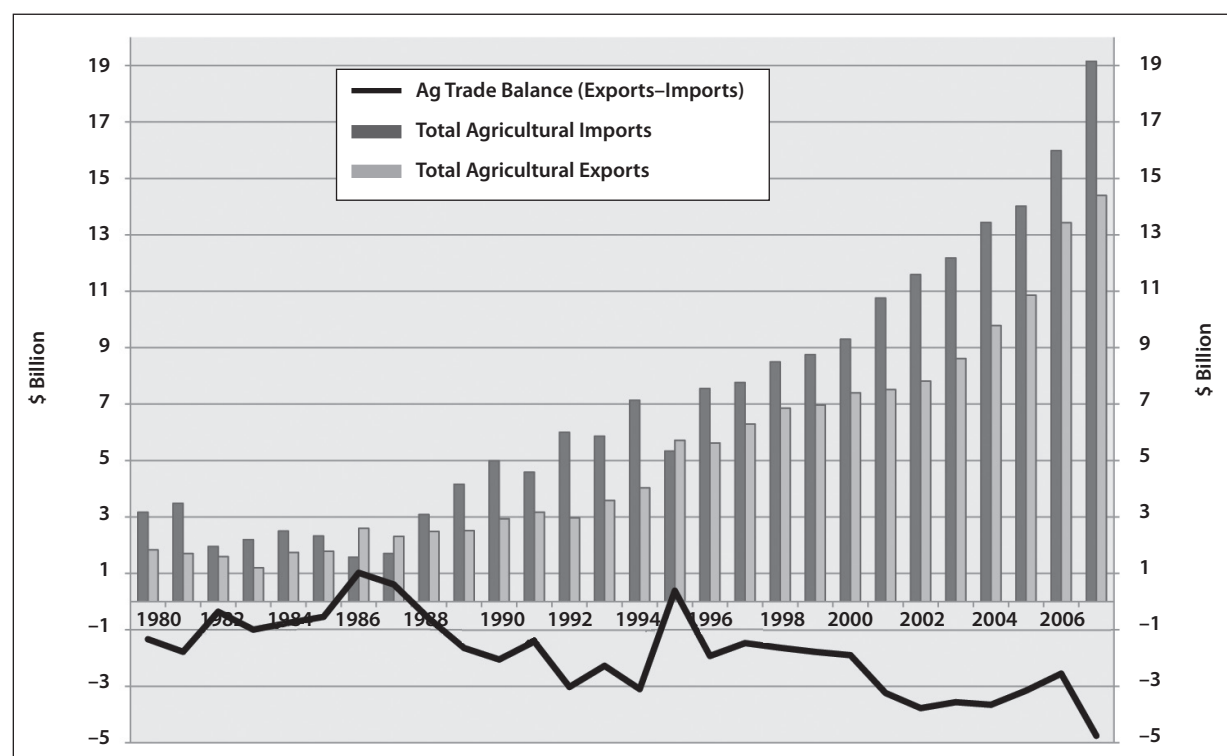


Source: FAOSTAT [10].

FIGURE 6. Composition of Mexico Agricultural Imports, 2007.



Source: FAOSTAT [10].

FIGURE 7. Mexico Agricultural Trade Balance.


Source: FAOSTAT [10].

TABLE 8. Major U.S. Agricultural Exports to Mexico, 2007.

Commodity	Value of U.S. Exports to the Mexico (\$Million)	U.S. Exports of commodity to the Mexico as a % of:	
		Total Mexican Import Value	Total U.S. Ag Export Value
Cereals	2,454	56.5%	17.5%
Meats	2,074	71.4%	31.3%
Soybeans*	1,161	57.1%	12.1%
Dairy Products	859	49.9%	26.4%

Source for Total Mexican imports is FAOSTAT [10] and source for U.S. exports to Mexico is FAS [51]. The two sources use slightly different commodity definitions, so the percentages in column 3 are approximate.

*Column 3 is percent of total Mexican imports of all oilseeds represented by imports of soybeans from the U.S.

Mexico's Agricultural and Trade Policies

shaped Mexico's agricultural policies for about seven decades (Table 9). The land redistribution systems facilitated by these two measures created the ejido system of communal land ownership in Mexico. Under the ejido structure, farmers could not sell or rent out the farmland in the communal system. Farmland remained the property of the state. And by 1988, about one-half of Mexico's arable land was controlled by the government through the ejido system [37].

The ejido system gave farmers little incentive to invest in or improve the land they worked. Moreover, a lack of capital and market incentives hampered

modernization and mechanization of agriculture. As a result, rural poverty was widespread in the late 1980s. Also, Mexico's agricultural trade surplus—which was equivalent to about 2.3 percent of the country's GDP during 1960 to 1965—turned negative for much of the 1980s [37].

In 1992, President Salinas pushed through sweeping reforms of Mexico's agricultural sector, which reduced the government role in agriculture, established private property rights, and integrated agriculture into the larger market economy. Under the reforms, farmers were given title to their land. This allowed them to sell the land, rent it to others, use the land as collateral for loans, and pass the land on to heirs.

TABLE 9. Components of Mexico's Agricultural and Trade Policies.

Component and Year Introduced	Major Effects
Agrarian Reform Act passed, 1915	Committed Mexico's government to redistributing land to peasants.
Revised Mexican Constitution became effective, 1917	Firmly established principle of land redistribution under ejido system.
Social Milk Supply Program became effective, 1944	This predecessor to Liconsa provided milk for low-income people.
Moderate import-substitution policy period, 1945 to mid-1960s	Programs sought to promote moderate growth in agricultural output and industrialization.
Conasupo created, 1965	This parastatal and state trading enterprise supported prices for 11 crops and intervened in milk powder markets.
Conasupo eliminated, 1980s through 2000	Conasupo price supports replaced, in part, by direct income transfers to farmers. Liconsa transferred to Ministry for Social Development as part of change.
Mexico became member of GATT, 1986	Import licenses eliminated and structure of border protection for Mexico's agricultural sector radically transformed.
Changes in government milk pricing, 1989 and later years	Government farm milk price regulation ended after 1989, but government retail price setting continued into the late 1990s.
Constitutional change ending ejido system, 1992	Individual farmers given title to land and allowed to sell or rent the land.
NAFTA implemented, 1994	Border protection measures lowered further. Tariff rate Quotas (TRQs) established for milk powder, corn, beans and barley, and schedule for elimination of tariffs established for these products.
Mexico-Chile free trade agreement became effective, 1999	Mexico provided preferential tariff treatment for cheese and other dairy products imported from Chile.
Milk sourcing changes under Liconsa, mid to late 2000s	Mexico's government encourages Liconsa to increase the amount of milk obtained from domestic sources.

Sources: Yunez-Naude [55], Smith [37], Liconsa [26], Dobson & Proctor [8], and SICE [36].

Conasupo, which was established in 1965 to support prices for 12 agricultural crops and intervene in milk powder markets in Mexico, became an additional target for reform. This program was gradually scaled down and was eliminated in 2000. Conasupo-generated support prices for agricultural products were then replaced by direct income support payments to farmers. The direct income payments too were gradually eliminated.

Liconsa—a milk subsidy program for low-income people that was initially part of Conasupo—was transferred into the Ministry for Social Development as part of the Conasupo reform package. Over the last several years, Mexico's government has encouraged use of domestically produced milk rather than imported milk powder for reconstitution into fluid milk or sold as milk powder in cachets distributed by Liconsa to low-income people at subsidized prices.

As a companion to reform measures affecting farmland and Conasupo, Mexico became a member of the General Agreement on Tariffs and Trade (GATT) in 1986 and a member of the North American Free Trade Agreement (NAFTA) in 1994. Under the NAFTA, Mexico lowered tariffs and other border protection measures affecting the U.S. and Canada by amounts in addition to those agreed to under the GATT (now the WTO). Canada elected to exclude dairy products from the NAFTA agreements, so the tariff reductions applied only to U.S.-Mexico dairy trade.

Tariff rate quotas were established for imported milk powder, corn, beans, and barley—important items in the diets of Mexican consumers—under the NAFTA and a schedule was established for complete elimination of the tariffs for these products. Tariffs facing U.S. milk powder exports to Mexico fell to zero on January 1, 2008. Mexico's tariffs on U.S. fluid milk, most cheeses and other dairy exports to Mexico were eliminated in 2003 under the NAFTA. The removal of the tariff on most U.S. cheese exports to Mexico provided a noteworthy advantage to U.S. dairy exporters compared to exporters located in non-NAFTA member countries.

Mexico's entry into a free trade agreement with Chile in 1999 provided lower tariffs for Chilean exports of dairy products to Mexico. Fonterra of New Zealand was a beneficiary of this trade agreement since a Chilean firm owned by Fonterra sold cheese

and other dairy products into Mexico under preferential tariff terms.

The changes in Mexico's agricultural and trade policies have substantially lowered the government support provided to the country's agricultural sector. The OECD summarized these impacts as follows in a 2006 policy note [33, p.4]:

The OECD uses the Producer Support Estimate (PSE) to gauge the level of government intervention in the sector, using a method that is applied consistently to all OECD countries, and increasingly to large non-member countries too. The current estimate for Mexico is 14%, meaning that 14% of gross receipts for the sector come from support, either price support or government expenditure that accrues to farmers. This is much lower than the OECD average (29%), not much different from the 16% currently reported by NAFTA partner the U.S., but significantly lower than Canada which currently reports 21%.

As noted earlier, Mexico's government has encouraged increased use of domestically produced milk for distribution by Liconsa. Information in Table 10 identifies impacts of this policy on milk powder imports and shows self-sufficiency levels for cheese and butter as well.

Curiously, Mexico's imports of milk powder as a percentage of consumption remained relatively stable through much of the 2000s, generally in the mid-40 percent range except for 2006 and 2007. Thus, the Mexican government's efforts to put in place a quasi-import substitution policy for milk powder appear to have had only limited effects to date. However, Mexican imports of milk powder are much lower than in the mid-1990s when imports equaled nearly 90 percent milk powder consumption.

Mexico's imports as a percentage of consumption for butter show little trend, generally remaining in the low 30 percent range. The country's cheese imports as a percentage of consumption, on the other hand, showed a modest increase during the 2000s.

According to USDA-FAS, Mexico produces about three-fourths of the milk used to manufacture dairy products consumed in the country. While the figures in Table 10 represent only gross product categories, the figures suggest that there has been little change in the

TABLE 10. Mexico's Imports as a Percentage of Consumption for Selected Dairy Products, 2000–2008.

Year	Nonfat Dry Milk			Cheese			Butter		
	Imports (1,000 MT)	Consumption (1,000 MT)	% of Con- sumption	Imports (1,000 MT)	Consumption (1,000 MT)	% of Con- sumption	Imports (1,000 MT)	Consumption (1,000 MT)	% of Con- sumption
2000	285	129	45.3	188	54	28.7	104	34	32.7
2001	286	141	49.3	206	66	32.0	105	35	33.3
2002	286	132	46.0	210	65	31.0	107	37	34.6
2003	291	129	44.3	204	78	38.2	117	40	34.2
2004	300	141	47.0	214	82	38.3	141	53	37.6
2005	311	155	49.8	230	89	38.7	144	51	35.4
2006	296	113	38.2	229	56	37.6	158	49	31.0
2007	313	111	35.5	233	89	38.2	179	53	29.6
2008	358	163	45.5	238	90	37.8	188	58	30.8

*Source: USDA-FAS, Dairy: World Markets and Trade [45]. Figures for 2008 are preliminary estimates.

overall level of self-sufficiency for skim milk powder and butter in Mexico during 2000 to 2008. The figures also raise the possibility, of course, that important changes in the consumption-import balance may be occurring within the broad product categories shown in Table 10. These changes cannot be identified using gross figures for all of Mexico.

Synopsis

What is one to conclude from the information on Mexico's economy for U.S. dairy exports to Mexico? The following developments appear likely:

- Income inequality has declined modestly in Mexico in recent years. Higher incomes for the broad middle class in Mexico may increase consumption of imported specialty cheeses, ice cream and certain fluid milk items. However, a wide gap still exists between average incomes in Mexico and the U.S., which will limit the extent to which Mexico's dairy product consumption patterns mimic those of the U.S. Thus, the increase in imports of products such as specialty cheeses, ice cream and selected fluid milk items attributable to increases in incomes of Mexican consumers is likely to be modest, especially given the current weaknesses in Mexico's economy.
- The sharp decline in U.S. cheese exports to Mexico in the aftermath of the 1994–1995 peso crisis suggests that Mexico's cheese imports are sensitive to changes in consumer incomes.
- The pervasive and persistent nature of poverty in Mexico's rural and southern states suggests that imported skim and whole milk powders for reconstitution into fluid milk and sale to Mexico's low-income people at subsidized prices will continue to be important dairy import items for Mexico. Mexico's government has encouraged increased use of domestically produced fluid milk for this purpose, but has achieved little success.
- Figures for gross product categories (skim milk powder and butter) suggest that there has been little change in self-sufficiency levels for milk powder and butter in Mexico from 2000 to 2008. A modest increase in import percentages occurred for cheese during this period.
- Production agriculture accounts for about 4 percent of Mexico's overall GDP. This is more than 3 times the comparable value in the U.S. The contribution of production agriculture to Mexico's economy has fallen as the economy has grown.

- Dairy was Mexico's fourth leading import in 2007 at 11 percent of total agricultural import value, behind cereals, meats, and oilseeds.
- The weak peso will make imported U.S. dairy products more expensive for Mexican buyers. It also will make U.S. foreign direct investment

in Mexico's dairy industry potentially more attractive than exports.

- Mexico's problems with drug wars and H1N1 flu will slow the country's economic recovery and limit income-related increases in imported dairy products.

MEXICO'S DAIRY PRODUCTION SECTOR

Milk Production Growth

Mexico produced about 11 million MT of milk in 2008 from 6.9 million cows (Figure 8). This is roughly equivalent to Wisconsin milk production in 2008, which came from about 1.25 million cows.

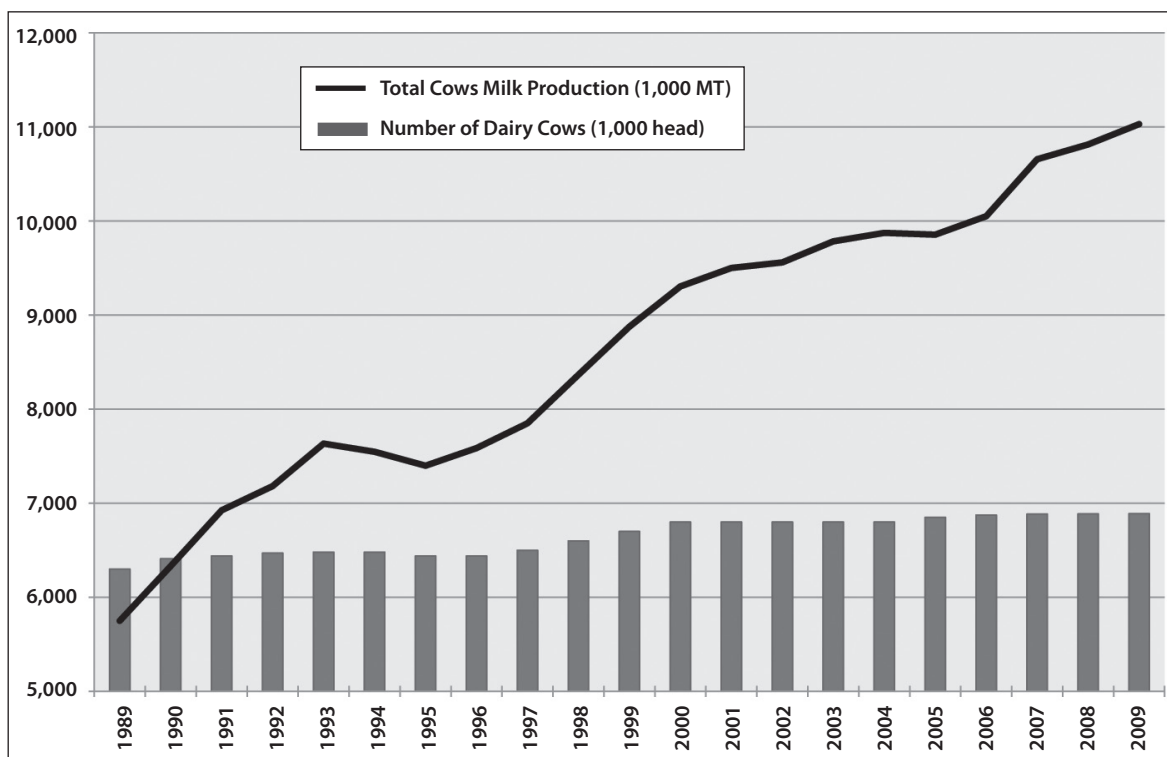
The number of cows in Mexico's dairy herd has been practically constant since 2000. Slowly growing yields increased total milk production by about 17 percent between 2000 and 2008. At 1,600 kg per year, milk production per cow remains low compared to the U.S. and other major dairy countries. Wisconsin milk per cow in 2008 was 5.5 times greater (Figure 9).

However, the percentage growth rate in Mexican milk yield has been slightly higher than Wisconsin.

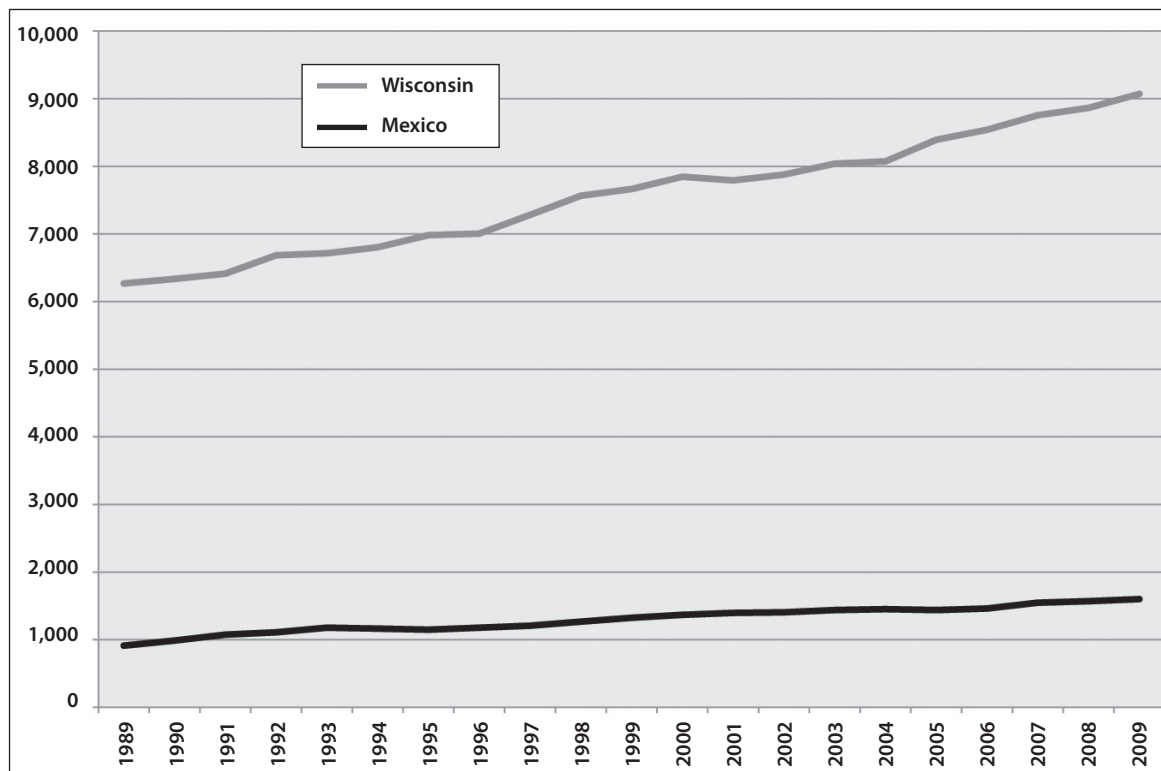
About two-thirds of reported milking cows are dual purpose (dairy-beef) cows that account for between 10 and 30 percent of milk production. Excluding dual purpose cows bumps current milk per cow to about 4,400 kg per year [21]. But the milk yield of specialized dairy cows has been stagnant since at least 1996.

Comparing Mexico's dairy farm productivity with the U.S. may not be meaningful given the stark differences in the nature of the dairy farming operations in the two countries. As an alternative, a comparison of Mexico's productivity gains to those of Brazil

FIGURE 8. Mexico Dairy Cows and Milk Production.



Source: FAS/PS&D [50].

FIGURE 9. Milk Yield per Cow, Mexico and Wisconsin..


Source: Mexico-FAS/PS&D [50]; Wisconsin-USDA/NASS [52].

is probably more relevant since both countries have dairy-beef operations and are home to a large number of diverse smaller producers. Mexico started with roughly the same production per cow as Brazil in 2000, but that figure had fallen to levels about ten percent below the comparable Brazilian figure by 2009 (Table 11). Apparently, the upgrading of dairy genetics and herd management is proceeding more rapidly in Brazil than in Mexico.

Dairy Farm Characteristics

Previous studies of dairy farming in Mexico have uniformly described the sector as diverse, which is, indeed, the case. Mexico's dairy farms range from large, state-of-the-art parlor-freestall operations, located mainly in the north, to the medium-size, small and "backyard" operations commonly found in central and southern Mexico. Three distinct dairy farming operations can be defined.²

TABLE 11. Milk Production per Cow in Mexico and Brazil, 2000-2008.

Year	Milk Yield per cow (MT/Head)		Mexico as % of Brazil
2000	1.37	1.38	99.3
2001	1.40	1.40	100.0
2002	1.41	1.45	97.2
2003	1.44	1.49	96.6
2004	1.45	1.53	94.8
2005	1.44	1.61	89.4
2006	1.46	1.65	88.5
2007	1.55	1.68	92.3
2008 (P)	1.57	1.73	90.8
2009 (F)	1.60	1.78	89.9

Source: USDA-FAS [45]. P=Preliminary; F=Forecast.

²The terminology here follows FAS [47], but descriptions are from FAS as well as Nicholson [31] and Arredondo [4]. Nicholson and Arredondo use category definitions that differ slightly from FAS, but essentially include the same farm types within categories. Nicholson defines Mexican dairy production systems as specialized, semi-specialized, and dual purpose; Arredondo uses intensive, family-owned, and tropical.

Confined Production Systems. These systems, used in the northern states of Mexico, are very similar to the confinement dairy systems used in the western U.S. and achieve similar milk yields (28–30 kg/day). Cows housed in the confinement systems are 95 percent Holsteins. Confinement cows are fed alfalfa, corn silage and concentrates (20–22 pounds of grain per day). Milk production per cow is substantially higher in this system than in the other production systems. All or nearly all of the milk produced is sold through the formal marketing chain. Most producers using confinement systems are members of full-service cooperatives that not only process their milk and market related dairy products, but also supply production inputs and services.

Semi-Confined Systems. The semi-confined systems exist primarily in the central states of Mexico. Farms tend to be small (10–30 cows) and productivity about one-half of that in confinement herds. Cows kept in the semi-confined systems are typically grazed at least part of the year and fed a mixture of grains (11–13 pounds per day), corn stover and other byproducts and forages. Cows are mostly Holsteins and Brown Swiss of lesser genetic potential than on the confinement operations. Investment in equipment on these farms is minimal and most labor is provided by the farm family. Milk produced by farms in this system is sold to Liconsa and other processors, made into farmstead cheese, or sold to artisan cheese makers.

Dual-Purpose Systems. Dual-purpose dairy farms are most often found in the south of Mexico, including the Mexican tropics. The dairy-beef cattle found on these farms graze on or are fed forages from cultivated pastures or native grasses. As is the case on dairy-beef farms elsewhere in the world, farmers operating these farms tailor their output in response to both milk and beef prices. Thus, milk marketed from these farms typically will fall during periods of high beef prices. Approximately 75 percent of Mexico's cows are found on these farms, but only about 30 percent of the milk produced in the country originates from these farms.

Location of Production

The biggest gains in milk production in Mexico continue to occur mostly in the north of the country.

Coahuila, located in north central Mexico bordering the U.S., recorded a noteworthy gain of over 50 percent in milk production from 2000 to 2008.

However, Jalisco—historically Mexico's biggest dairy state—and Hidalgo both located in the central region of the country also scored major gains in production from 2000 to 2008 (Table 12).

The figures in Table 12 show the extent to which milk production is becoming more concentrated in a limited number of top-producing states. For example, the aggregate increase in milk production outside of the top-10 dairy producing states was only about 141 million liters (6.3 percent) from 2000 to 2008. Moreover, the top three dairy states of Mexico each recorded a larger increase in milk production than the total for the states not in the top-10 producing states during this period. Presumably, the generally higher productivity gains on northern Mexico dairy farms will continue to be reflected in the country's national milk production figures. However, water shortages in northern areas may limit those milk production gains.

Seasonality of Milk Production

Milk production in Mexico does not exhibit strong seasonal swings of the kind found in countries that employ primarily pasture-based systems. Seasonal variability in production is similar to that observed in the U.S. (Figure 10). Mexico's milk production is lowest in January–April and highest in July–October. In 2007, milk production averaged 10 to 11 percentage points higher in July–October than in January–April.

Such relatively small seasonal swings in milk production may provide only limited incentives for dairy companies to build processing facilities to produce storable milk products such as milk powder to handle seasonal milk surpluses.

Cost of Production

Data on the cost of producing milk in Mexico are scarce, most likely because of the extreme diversity of operations and the absence of a formal farm advisory/extension system. Some information is available through the International Farm Comparison Network (IFCN), which in 2008 reported costs for two representative dairy farms in the state of Chihuahua [21]. One

TABLE 12. Top Milk Producing States in Mexico, 2008 and Change from 2000.

State	Milk Production, 2008	Change from 2000	
	1,000 liters	1,000 liters	Percent
1. Jalisco	1,809,681	+ 131,485	+7.8%
2. Coahuila	1,335,537	+ 471,786	+54.6
3. Durango	1,038,714	+ 141,587	+15.8
4. Chihuahua	853,962	+ 118,711	+16.1
5. Veracruz	699,932	+ 45,100	+6.9
6. Guanajuato	670,025	+ 40,733	+6.5
7. Hidalgo	468,641	+ 91,804	+24.4
8. Mexico	454,254	– 114,699	–3.
9. Puelba	391,442	+ 36,573	+10.3
10. Aguascalientes	380,117	– 10,410	–2.7
Total Top-10 States	8,102,305	+1,052,670	+14.9
Total Other States	2,396,689	+141,345	+6.3
Mexico Total	10,498,994	+1,194,015	+12.8

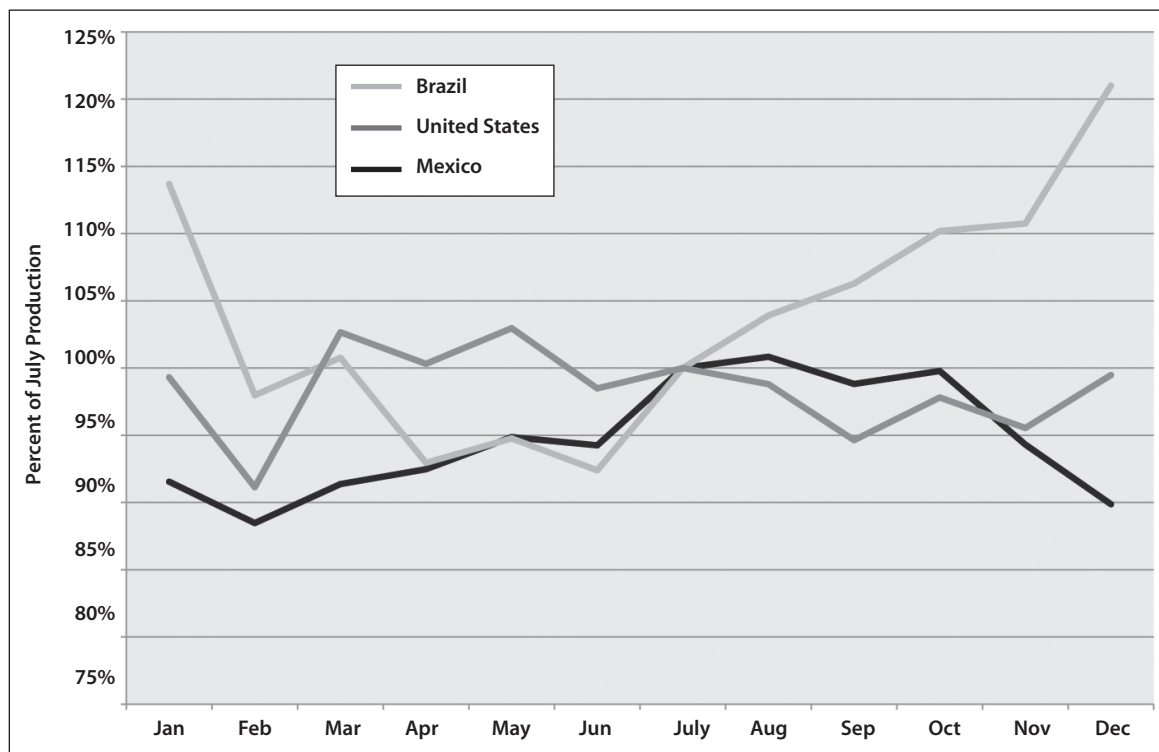


Sources: USDA-FAS GAIN Reports MX1191 [46] and MX8067 [48]. Figures for 2008 represent SAGARPA'S (Mexico's Agriculture Secretariat) forecast for the year.

farm is an 1,800-cow modern parlor-freestall operation with a milk yield of 6,822kg per cow per year. This farm employs 223 workers and has 700 hectares of cropland. The second farm is a 12-cow operation with a milk yield of 5,026kg per cow per year. This

farm uses 2.5 person-years of labor (mostly family) and has 12 hectares of cropland.

Total costs per 100kg (including opportunity costs) were \$53.40 for the large farm and \$50.10 for the small farm. But while the small farm showed lower costs of production, it received \$12/100kg less for its

FIGURE 10. Seasonality of Milk Production, 2007.

Source: Mexico - USDA-FAS [47]; U.S.-USDA-NASS [52]; Brazil-Dobson and Jesse [7].

milk and related dairy income (mainly cull cows). This left the large farm more profitable by about \$9/100kg.

The Mexico dairy costs reported by IFCN were higher than U.S. costs calculated using the same methodology. For example, full economic costs for a 350-cow Wisconsin representative farm were \$41.70/100kg. A California 1,710-cow farm showed full economic costs of \$42.70/100kg.

Farm Milk Prices

Mexico's farm milk prices defy easy overall characterization. They differ geographically and reflect quality differentials and a number of other factors. Country-wide average prices in comparison to the all-milk price in the U.S. are shown in Figure 11. Over time, average milk prices for Mexico and the U.S. have been very similar. Mexican milk prices have been more stable, with the exception of 1995 when the Mexican average milk price fell nearly 30 percent from 1994.

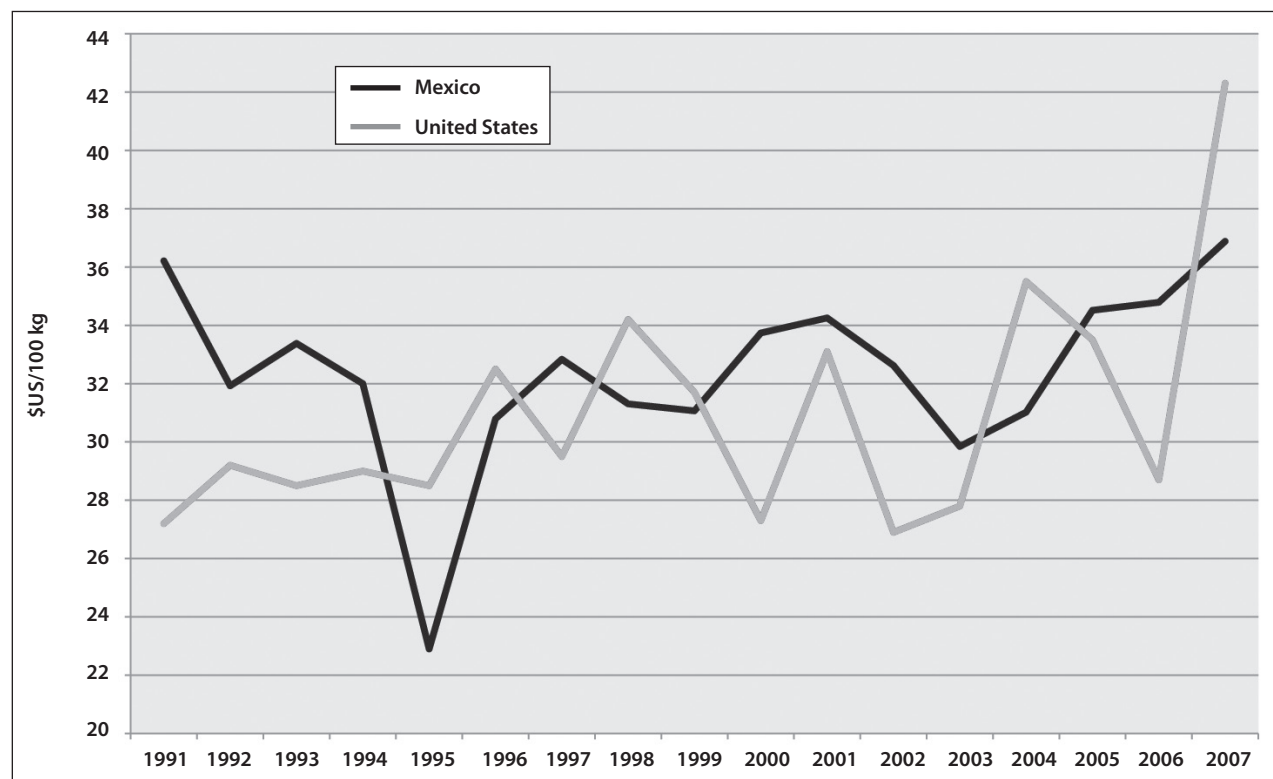
USDEC provided a snapshot of farmgate prices in Mexico for November 2007 (Table 13). Three points

stand out. Farm milk prices paid to small farmers located in the tropics were substantially lower than in other regions. By contrast, farmgate prices received by large farmers in the northern and central regions were relatively high, exceeding the all milk farmgate price in the U.S. Farm prices paid to Liconsa's suppliers were at an intermediate level.

Average farm milk prices in 2007 and early 2008 in Mexico appeared to be similar to average all milk wholesale prices paid to U.S. producers during these periods.

Liconsa's pay prices warrant additional discussion since they serve as a reference price in Mexico's dairy industry. USDA-FAS described 2007 and 2008 Liconsa producer pay prices, as follows [49, p. 10]:

LICONSA purchases fluid milk from smaller producers at prices mandated by Congress. In CY 2007, LICONSA purchased approximately 382.5 million liters of milk domestically. Mexico's Federal Income Tax Law . . . authorizes Congress to mandate the price LICONSA pays domestic producers for fluid milk in a given fiscal year. This price

FIGURE 11. Mexico and U.S. Milk Prices.


Source: Mexico—FAOSTAT [10]; U.S. USDA-NASS [52].

usually represents a maximum, and LICONSA may pay less depending on the quality of the milk and distance from the collection center. In 2007, prices paid by LICONSA, as mandated by Congress, averaged 4.27 pesos per liter (U.S.\$0.42 per liter). As stated earlier, LICONSA will be paying 4.7 pesos per liter for the majority of 2008. Private dairy prices paid 4.8 pesos per liter (U.S.\$0.46 per liter) to 5.2 pesos per liter (U.S.\$0.50 per liter) in 2007, and will likely pay more this year.

Liconsa announced a reduction in the agency's pay prices for producers in May 2009, reflecting the following considerations [11]:

... In 2008 the company (Liconsa) purchased 609 million liters of fresh milk from Mexican producers at a base price of 4.20 pesos per liter, with an additional 0.50 peso payment for producers meeting minimum quality standards. However, the company announced that it would begin paying producers 3.90 pesos per liter, (in addition to the 0.50 peso

TABLE 13. Average Farmgate Milk prices, November 2007.

Region, Organization and Country	Farmgate Average (Pesos per liter)	Prices Range	Average as % of U.S. Price
Tropical Zones (Small herds)	3.80	2.80 to 4.00	77.2
Large, Concentrated Herds (Lala, Alpura and similar herds in north and central Mexico)	5.40	5.20 to 5.60	109.8
Liconsa Supplier Herds (Mainly from Jalisco)	4.40	N.A	89.4
U.S. All Milk	4.92*	N.A	100.0

Source: USDEC [42].

*U.S. all milk price converted from U.S. dollars to Mexican pesos using US\$1.0 = 10 pesos.

quality payment), a reduction of 7 percent . . . Representatives of mainly small and medium Mexican milk producers argue that they cannot survive with reduced payment, citing production costs of 5.20 pesos per liter . . . Liconsa counters that a study conducted by the Secretariat of Economy shows that production costs are actually 3.20 pesos per liter, implying a 40 percent profit margin even at the reduced price and that current international low-fat milk prices are 2.85 pesos per liter.

Representatives of Mexico's medium-sized and small milk producers took their case for higher prices to the Mexican Congress, threatening to block imports of U.S. skim milk powder if their claim is not honored. It is unclear whether their request for restoration of higher prices will be accepted by the Congress.

Government and Private Programs Aimed at Increasing Milk Production

USDEC indicated that steps taken by Sagarpa (Mexico's Agricultural Secretariat) in the mid-2000s to increase Mexico's milk production included the following [42, p. 14]:

- Infrastructure improvements.
- Farm level help to improve milking practices and milking parlors.
- Genetic improvements in the dairy herd.
- Training and technical assistance.
- Helping farmers with the purchase of grains for dairy rations by providing advice on negotiating contract terms, prices and grain purchase arrangements.

As discussed elsewhere in this paper, Nestle has developed milk districts (milk collection systems) in the country's tropics, which enhance the quality and quantity of milk available in these regions for the company's processing plants. Nestle also typically provides technical assistance and micro loans to small dairy farmers in its milk districts around the world. Nestle has been motivated to take steps such as those

implemented in the Mexican tropics by the lure of lower milk prices in this area.

Mexico's government recognizes that the expense of obtaining cattle has limited milk production gains in Mexico. USDEC described in its 2008 report problems associated with lack of cattle and measures taken by Mexico's government to facilitate cattle imports, as follows [42, p. 27]:

To raise a calf until it can produce milk is very expensive in Mexico, as feed costs are high and Mexico is a net importer of grains. Hence, Mexico must import cows. At present, the country is severely restricted as to the origin of its imported cattle. The country has not had FMD for 50 years and has very strict sanitary restrictions in place. This meant that Mexico could not import cattle from the U.S. or Canada, as they both have had cases of FMD, and it certainly cannot import from Europe for logistical reasons. However, animals less than 24 months old have been authorized for import from the U.S. since April/May 2007, with the borders due to open to imports from Canada too, so this situation is set to change. Mexico imported approximately 20,000 cows from Australia and New Zealand in 2006—a costly option.

Synopsis

Mexico's overall milk production and milk production per cow recorded only limited gains during the 2000s. Gains in overall production in the northern and certain central regions of Mexico were relatively large, but water shortages may limit milk production gains there. Milk prices paid to farmers—especially in the northern regions—appear to be fully competitive. In Mexico's increasingly open economy, it is doubtful that farm milk prices could be much higher and still keep domestically-produced milk competitive with foreign imports. Certain measures taken by the Government of Mexico and Nestle may produce modest increases in Mexico's milk production.

MEXICO'S DAIRY PROCESSING AND MARKETING SECTOR

Mexico's dairy processing and marketing sector consists of several major players and a large competitive fringe of smaller firms. USDA-FAS describes the overall dairy processing and marketing sector as consisting of 310 companies employing more than 72,000 people and generating nearly 363,000 indirect employment opportunities [48]. The competitive fringe includes important second-tier firms that serve regional markets, and companies that supply Mexico's relatively large informal market. Data on the major groups of firms sheds light on competitive conditions facing dairy exporters serving Mexico and foreign direct investment opportunities in Mexico's dairy industry (Table 14).

Mexico's dairy processing and marketing sector differs from its U.S. counterpart in several important ways:

- Mexico has a sizable informal market where milk product quality may be sharply lower than in the products sold by U.S. dairy processing firms and in products sold by Mexican firms serving the country's formal market.
- Mexico's dairy sector is supplied by a large number (about 150,000) of small, non-commercial dairy farmers. By contrast, almost all of U.S. dairy farmers are commercial producers. The Mexican cooperatives, Lala and Alpura, are supplied primarily by larger, commercial dairy farmers.
- The cooperative share of milk intake in Mexico is substantially lower than the comparable U.S. figure, which is more than 85 percent [13].

Mexico's three-firm dairy manufacturing concentration ratio is about 68 percent or about the same as the comparable U.S. figure.

TABLE 14. Characteristics of Mexico's Milk Processing and Marketing Sector.

Item	Characteristic
1) Formal milk (% of total)	75%
2) Number of dairy farmer milk suppliers:	Commercial 7,000 Small non-commercial 150,000
3) Total number of dairy processors and marketers	310
4) Top-3 firms (In terms of formal milk processed)	No. 1 Lala No. 2 Nestle No. 3 Sigma
5) Percent of formal milk processed by top 3 firms	68%
6) Cooperative share of milk intake	42% (plus small unknown share held by cooperatives other than Lala and Alpura)
7) Product mix (As % of milk processed)	Fluid milk 31% Cheese 16% Milk powder 35% Butter 10% Other 8%
8) Self-sufficiency	67% to 76%

Sources: Most data are for the mid-to late 2000s. Items 1, 2 and 7 are from Galetto [13]. Item 3, 4, 5, and 6 are from USDEC [42]. The 67 percent self-sufficiency ratio in item 8 is a 2006 figure from USDEC [42]. The 76 percent self-sufficiency ratio is a 2008 figure obtained from USDA-FAS [48].

Major Players in Mexico's Dairy Processing and Marketing Sector

The major players in Mexico's dairy processing and marketing sector include dairy cooperatives, Lala and Alpura, and proprietary firms Nestle, Sigma and Chilchota. These five firms are the largest dairy firms in Mexico, measured in terms of formal milk processed (Table 15). A number of important, foreign-based processor-marketers operate in Mexico, including Danone of France and U.S.-based Kraft Foods.

Lala. Lala is largest of the Mexican dairy cooperatives was founded in 1950 in Torreon in the state of Coahuila [1]. The cooperative has nine factories located in Tijuana, Torreon, Monterrey, Guadalajara, Mexico City, Irapuato, Mazatlan, Veracruz, and Acapulco. The firm's milk processing throughput exceeds four million liters of milk per day. Lala's product line includes fluid milk, cream, yogurt, cheese, butter, infant foods and fruit juices.

Lala has made noteworthy acquisitions in recent years. The cooperative acquired Parmalat's Mexican milk processing assets after the financial collapse of the Italian firm in 2004 [14]. The Parmalat acquisition helped Lala to increase its share of certain segments of Mexico's dairy business to more than 40 percent. In May 2009, Lala acquired Dallas-based National Dairy

from Dairy Farmers of America [6]. Both acquisitions were motivated in part by Lala's desire to acquire valuable brands. In September 2009, Lala announced that it had acquired Farmland Dairies of New Jersey. Farmland Dairies distributes fluid milk products in the northeastern U.S., mainly in New York and New Jersey.

Lala is owned and supplied by the cooperative's farmer-member suppliers. Farrar, a writer specializing in transportation and location economics issues, provided insights about the location of Lala's milk suppliers in a 2000 article, as follows [9]:

... Lala (a shortened form of La Laguna meaning lake or lagoon) is well-situated. La Lagunera is the region around Torreon where most of the 220 dairy farms supplying Lala are located. (La Laguna refers to the Laguna de Mayran, a large lake fed by two rivers that existed before the flow of the rivers was interrupted by the building of dams in the 1960s.) Though this region is well within the borders of the Chihuahuan Desert, it has managed—with the help of irrigation—to become the most productive dairy region in North America, Lala officials say.

Alpura. Alpura was founded in 1970 and is the second largest Mexican dairy cooperative. The cooperative, headquartered near Mexico City, processes more than 2.3 million liters of milk per day [39]. Alpura's operations include seven plants and 20 company-owned distribution centers, as well as 60 independent distributors located across Mexico [27]. The cooperative produces a number of major products, including pasteurized milk, UHT milk, full cream and skim milk powders, cream, a line of probiotic and drinkable yogurts, dessert cups, and small quantities of cheese and butter.

Alpura draws its milk supply from the northern, central and southern regions of Mexico. The cooperative's approximately 180 dairy farmer suppliers are located in Chihuahua, Coahuila, Durango, Estado de Mexico, Guanajuato, Hidalgo, Jalisco, Puebla, Queretaro, San Luis Potosi and Tlaxcala.

Nestle. This Vevay, Switzerland-based firm is the world's largest food company. Nestle operated 456

TABLE 15. Processing market shares of Mexico's five largest processors and Liconsa.

Processor	Quantity Processed Annually (Bil. liters)	Processing Share (%)
Lala	1.75 to 1.95	30
Nestle	0.8 to 1.3	20
Sigma	0.35 to 0.65	18
Alpura	0.78 to 0.80	12
Chilchota	0.30 to 0.65	10
Liconsa	0.42	6
Other	0.23	4
Total	6.50*	100

Source: USDEC [42]. Figures represent estimates based on figures for 2007 and earlier years.

*An additional 3.6 billion liters annually is processed into artisan products by small operators or consumed on farms.

factories in 84 countries in 2008 [30]. Nestle's sales totaled about U.S.\$94 billion in 2008. Mexico was Nestle's 7th largest market in 2008, where the company's sales totaled 3.569 billion CHF (Swiss francs) or about U.S.\$3.040 billion.

Nestle has a large stable of brands for its milk powders, ice cream, yogurts, bottled water, fruit juices, coffees, candy and pet food [29]. Nestle's Mexican dairy product sales focus heavily on a diverse offering of powdered milks. Nestle reports that its Nido brand milk powder (a nutritional product formulated for growing children) is the world's No. 1 children's milk powder brand [30]. In the early to mid-2000s, Nestle's ranked No. 3 in the rapidly growing Mexican yogurt market, behind Danone and Yoplait. Nestle sells Omega 3 yogurt, which contains the omega 3 fatty acid that is marketed as a product carrying health benefits.

Nestle uses milk districts to procure milk of needed quality and quantity directly from local farmers in Mexico and many other foreign countries. The devices are employed because Nestle considers it risky to buy milk from third parties (middlemen) in most developing countries. Goldberg describes Nestle's milk district system as follows [15, p. 97]:

In simplest term, setting up a milk district involves negotiating agreements with farmers for twice-daily collection of their milk; installing chilling centers in the larger communes and collection points in the villages or adapting existing collection infrastructure; arranging transportation from collection centers to the district's factory; and implementing a program to improve milk quality.

Nestle set up one of its first milk districts outside of Europe in 1935 in Ocotlan, in Mexico's state of Jalisco, to obtain milk supplies for a milk condensing plant [15]. By 2004, Nestle had adapted its milk district model across many Latin American countries, the Caribbean, much of Asia and in Africa [15]. Nestle reports that in 2008 the milk district system was used to obtain milk supplies from 600,000 farmers globally and is the mechanism for providing technical assistance and about U.S.\$26 million in micro loans each year [30]

Nestle also buys milk from large commercial farms in Chihuahua and Torreon—northern regions of Mex-

ico—at premium prices [42]. Interestingly, Nestle believes that milk production will increase in northern Mexico because of genetic and other productivity improvements. However, the company concedes that milk production in certain northern areas of Mexico will be limited by water shortages and by excessive amounts of minerals in water obtained from artesian wells in these areas. Excessive quantities of minerals must be removed before using the water for irrigation.

Sigma. Sigma is one of Mexico's largest firms, with divisions focusing on processed foods, petrochemicals, steel, and auto parts. Sigma Alimentos, a Monterrey-based Sigma company, manufactures dairy products and other frozen and chilled food products. The 2003 revenues of Sigma Alimentos totaled about U.S.\$1.0 billion [42]. Sigma's food product lines include processed meats, iced coffee, fruit juices, fluid milk, soy milk, yogurts, chilled desserts, butter, and cheese. Sigma's yogurts and chilled desserts are produced under license using the Yoplait brand.

Sigma's cheese lines and related products expanded in the mid-2000s. Sigma and Grupo Chen formed a new company in 2004, which is charged with marketing and distributing the cheeses of both companies. This new company, which is wholly-owned by Sigma, markets about 50 different types of cheeses under a host of brands. In the 2004–2005 period, Sigma purchased the cheese business assets of New Zealand Milk (Mexico) from Fonterra of New Zealand. This purchase added about U.S.\$92 million to Sigma's annual revenues.

Chilchota. Durango-based Chilchota processes about 700,000 liters of fresh milk per day, producing approximately 6,000 tons of cheese, yogurts and caramel toffee products per month [42]. Chilchota's operations include a 12,000-cow dairy farm.

The firm sells a large number of cheeses under the Chilchota, Sello de Oro, Durangueno, Lagunero and Temazcal brands. Only the Chilchota and Sello de Oro brands are natural cheeses. Cheeses sold under the other brands are analogue cheeses made from vegetable fats and skim milk. These other brands, which are manufactured from low-cost ingredients, have enabled Chilchota to increase its share of cheese sales in Mex-

ico, especially through large city markets and food service distribution channels.

Chilchota imports small amounts of Chihuahua cheese from Uruguay and repackages the cheese for sale in Mexico.

Liconsa. The main function of this state-owned firm is to improve the nutrition and health of poor families in Mexico by producing and distributing quality milk or milk powder at subsidized prices. The main recipients of Liconsa milk are low-income, nutritionally-vulnerable populations, including children under the age of 12, young women between the ages of 13 and 15, pregnant or breast-feeding women, women between the ages of 49 and 55, the chronically ill or disabled, and adults 60 years of age or older [42].

Liconsa has two major programs: providing milk to the poor (Abasto Social de Leche) and purchasing local milk (Acquisition de Leche Nacional) [42].

The organization distributes fluid milk in regions where a suitable cold chain exists. In rural or other areas where no suitable cold chain is available, Liconsa distributes powdered milk in sachets to low-income people.

Liconsa is the biggest importer of skim milk powder and often holds a large percentage of Mexico's milk powder stocks. The firm usually uses about 60 percent of Mexico's imported and domestically-produced milk powder [25]. USDA-FAS summarized Liconsa's 2008 activities as follows [49, pp.7–8]:

LICONSA will distribute 1.12 billion liters of milk this year (2008). Of this amount 74 percent is fluid milk, and 26 percent is milk powder. From this total LICONSA allocates 84 percent, 940,000 liters, to be sold at the preferential price of 4.0 pesos per liter to qualifying persons. Although LICONSA has increased utilization of domestic fluid milk, its social programs continue to rely on imported NFDM (Liconsa's subsidized milk program represents) a significant government subsidy to consumers, which discourages domestic milk producers.

Liconsa has a demanding tender system for acquiring foreign suppliers of milk powder, which USDEC described as follows [42, p. 36]:

Any potential foreign supplier has to have a permanent representative/agent in Mexico in order to be

registered and considered as a supplier. Potential suppliers then get invited to tender, and a decision is based on several factors, including volume that can be supplied, quality, type of product, and competitive price.

Liconsa operates 10 plants and processes an average of about one million liters of milk per day and processes up to 30 percent more than the average during the flush milk production season [42]. USDEC reported in 2008 that Liconsa received milk from 12,000 mostly small farmers in eight Mexican states, including about 50 percent of all milk collected in Jalisco.

Mexico's government prescribes prices that Liconsa pays domestic producers for milk under the country's Federal Income law [49]. The prescribed prices are normally maximums and Liconsa may pay less depending on the quality of the milk and distance the producer is located from the collection center. In 2007, prices paid by Liconsa averaged 4.27 pesos per liter (\$0.42 per liter or about \$19 per hundredweight). Liconsa paid domestic producers 4.7 pesos per liter for milk during much of 2008.

Liconsa experienced budget problems in the late 2000s. Mexico's government considered proposals to abolish the organization and pass the social feeding programs to large commercial processors. Presumably such proposals, if adopted, would not be implemented during the recession that began in 2009.

Regional/Second-Tier Players

USDEC lists 23 firms as regional/second-tier players in Mexico's dairy processing business [42]. These firms use fresh raw milk and imported dairy ingredients in their operations. Products manufactured by these firms include pasteurized milk, UHT milk, chilled dairy products, skim milk powder, whole milk powder and cheeses. As noted earlier, most of these firms sell regionally rather than nationally. Prominent foreign-based firms in this 23-firm group are Danone and Kraft Foods.

Danone. French-based Danone recorded sales of 15.2 billion euros (about U.S.\$21.4 billion) in 2008 [17]. These revenues were generated partly from 160 plants in 120 countries. Danone reports that it is

No. 1 worldwide in fresh dairy products and No. 2 worldwide in packaged water and baby nutrition products. In 2007, Danone generated about 66 percent of its revenues in Europe, 16 percent in Asia, and 18 percent in the remainder of the world [2]. Danone's Mexican subsidiary is Danone de Mexico.

While Danone lacks Nestle's large footprint in the Mexican dairy market, the company is a leading marketer of yogurt products in Mexico. Danone's brands include the yogurt brands, Danone (Dannon in the U.S.) and Activia. Packaged water brands include Evian and Volvic. The company's baby food brands include Bledina, Nutricia, Milupa, Mellin, Dumex, and Cow & Gate.

Prior to the 2009 recession, Danone labeled Mexico as a promising growth market. The promise manifested itself partly in double-digit growth in sales of selected yogurts in Mexico in 2007. In anticipation of growth in dairy product sales, the company made investments to expand dairy processing capacity in Mexico in 2007. Danone's Irapuato, Mexico plant in the state of Guanajuato was one targeted for expansion and upgrading [20]. Danone's dairy product sales in Mexico deteriorated in the first quarter of 2009. How long this deterioration will persist and what impact the sales shortfalls will have on Danone's Mexican dairy operations is unclear at this writing.

Kraft Foods. Kraft has a relatively small presence in Mexico's dairy market. The company's Mexican dairy product sales are confined to processed cheese and cream cheese products.

Important Traders, Importers, and Distributors of Dairy Ingredients in Mexico

USDEC's 2008 Dairy Market report lists 22 domestic and foreign firms and a group of U.S. suppliers in the dairy trader, importer and distributor categories [42, pp. 77–78]. Unfortunately, the USDEC report provides only sketchy information on U.S. firms. Foreign and Mexican firms in the USDEC list, the products they handle, and functions they perform are summarized briefly below:

- Fonterra of New Zealand: Imported SMP, WMP, MPC and cheese.
- Glanbia of Ireland: WPC.

- Lafor + Lactoformulas of the Netherlands: Imported AMF, MPC, cheese, and casein.
- Industrias Lacteas Chihuahuaense of Spain: Local SMP, DWP.
- Dimat (Lactoland), Mexico and Germany: Milk substitutes.
- Philpott. Mexico, UK, and Ireland: SMP, WMP, fat-filled MP, cheese.
- 16 Mexican firms: A host of dairy ingredients and milk substitutes.

Fonterra, Glanbia, Lafor + Lactoformulas of the Netherlands, and Philpott are traders who negotiate for the purchase of supplies of dairy ingredients from overseas manufacturers. Industrias Lacteas Chihuahuaense of Spain is a processor-manufacturer of domestic SMP and DWP. Dimat is a distributor of local and imported milk substitutes. The 16 Mexican firms include traders, importers and distributors of numerous dairy products.

In the segment of the 2008 USDEC report dealing with dairy traders, importers, and distributors in Mexico, U.S. suppliers are described only as traders who deal in cheese, imported SMP, WMP, and concentrated milk. While this comment was doubtless meant to describe only a limited area of market activity by U.S. companies, it understates the role of U.S. firms in Mexico's dairy markets.

Mr. Ronaldo Fernandez, a USDEC official stationed in Mexico, provided the following, more complete information for 2009 on the identity of major U.S. suppliers of dairy products and the items they sell in Mexico:

- DairyAmerica and Darigold: SMP.
- Land O'Lakes, Davigisco, Glanbia USA, Leprino, and AMPI: Whey products (including lactose).
- Leprino, Lactalis, Gallo, Sargento, Kraft, Glanbia USA, and Schreiber Foods: Cheese.

It is evident that overlapping of functions exists between the U.S. firms and the group of 22 foreign and Mexican firms described above, making it useful to discuss broader activities of U.S. dairy exporting firms in Mexico. For example, Land O'Lakes and certain other U.S. firms employ trading companies as vehi-

cles for selling dairy products in Mexico. In addition, Schreiber Foods functions as both an exporter of cheese to Mexico and a manufacturer of cheese at the firm's Leon, Mexico plant.

U.S. companies have acquired large import market shares for certain dairy products imported by Mexico. For example, according to USDEC-Mexico Customs reports, U.S. firms had import market shares during January–July, 2009 in the 90 to 100 percent range for total whey products, lactose, fresh milk and cream, yogurt, ice cream and evaporated milk, and a 76 percent market share for SMP. U.S. firms had a lower, approximately 50 percent, share of Mexico's cheese imports in this same period.

The relatively large number of U.S. firms exporting dairy products to Mexico and the big import market shares identify Mexico as a market in which, to date, U.S. companies have competed successfully against a host of foreign and Mexican dairy firms.

Synopsis

Mexico's dairy processing sector is in transition and defies easy characterization. The sector includes the following important players and developments:

- Cooperatives, Lala and Alpura, and the large proprietary firms, Nestle, Sigma, Chilchota and Danone, serve upmarket segments of Mexico's consumer market.
- Liconsa, the Mexican parastatal firm, is a major importer of milk powder. Liconsa distributes

dairy products made from imported milk powder and domestic milk to low income consumers at subsidized prices. Competition among exporters is keen for supplying milk powder to Liconsa and other Mexican processors.

- Exporters and direct investors in Mexico's dairy markets will need to focus strongly on price competitiveness to sell undifferentiated cheese, butter and cream successfully in Mexico.
- Customers for specialty cheeses, ice cream, and other upmarket dairy products are concentrated heavily in large cities such as Mexico City, Monterrey and Guadalajara.
- U.S. firms receive preferential tariff treatment for exports of dairy products to Mexico. However, New Zealand's Fonterra cooperative also qualifies for preferred tariff treatment for exports of Chilean dairy products to Mexico from the cooperative's subsidiary, Soprole of Chile.
- Additional Mexican consumers may migrate from the informal market to the formal market when Mexico's economy recovers from the severe recession that began in 2009.
- Austrade has characterized competitive rivalry in Mexico's dairy markets as "moderate." This may understate the competitive rivalry for market share in Mexico's dairy markets. The time has long since passed when Mexico's dairy sales represented "low hanging fruit" for foreign companies.

WHITHER SELF SUFFICIENCY IN MEXICO'S MILK PRODUCTION

Mexico's dairy farmers produce considerably less milk than consumed by its population. USDA-FAS put the self-sufficiency level at 76 percent for 2008 [48]. Table 10, in an earlier section of this paper, shows that dairy imports as a percentage of consumption remained generally in the mid-40 percent range for skim milk powder, in the mid-30 percent range for cheese, and in the low 30 percent range for butter in

the late 2000s. In percentage terms, Mexico's big dairy import item, skim milk powder, showed little change from 2000 to 2008 with imports as a percent of consumption staying mostly in the mid-40 percent range. Since all the preceding figures imply a less than 76 percent self-sufficiency level, other dairy items, especially fluid milk, are being produced in Mexico at high enough levels to generate the 76 percent figure.

USDEC shows a generally lower and declining milk self-sufficiency ratio for the early and mid-2000s based on local milk vs. imports. Specifically, USDEC indicated that national milk production fell from 76 percent of domestic requirements in 2000 to 67.2 percent of domestic requirements in 2006 [42]. Rodrigo Fernandez, a USDEC staff member stationed in Mexico, put Mexico's milk self-sufficiency level at about 71 percent for 2008.

USDA-FAS points to several developments that will keep Mexico short of self-sufficiency in milk production, including the following:

- The agency argued in 2007 that after several years of impressive growth in milk production that production appears to be leveling off [49]. The leveling off was attributed to higher feed costs and infrastructure constraints. This claim appears to overstate the amount of leveling of production. According to USDA-FAS' own figures, Mexico's milk production grew by 4.7 percent per year between 1995 and 2000, 1.2 percent per year between 2000 and 2005, and 3.2 percent per year between 2005 and 2008 [45]. While milk production increases in Mexico for 2005 to 2008 have fallen short of the average for 1995 to 2000, the recent figures exceed the average for 2000 to 2005.
- "While Mexican milk production is increasing at an average of 1.5 percent per year, the food processing sector requires an increase of at least 3 percent per year [48]." It is unclear whether the 1.5 percent per year figure accurately reflects recent year-to-year increases in milk Mexico's milk production. Year-to-year increases in milk production for the recent 2000 to 2008 period averaged about 1.9 percent per year [45]. Thus, figures for the 2000s suggest that the moderately larger 1.9 percent figure is more appropriate as a benchmark.
- "Factors such as competitively priced imported milk, financial crisis, peso devaluation, inadequate sanitation, lack of genetics, cold storage and refrigeration infrastructure are limiting and will limit efforts to increase milk production not only with smaller producers, but also the small and medium sized dairies. Even

more sophisticated producers have continued to make modest productivity gains through improved genetics and herd improvement practices, however, they will face financial difficulties for the rest of 2008 and 2009 [48]."

Mexico-based USDEC staffers, Rodrigo Fernandez and Larry Solberg, made similar comments, arguing that Mexico will remain substantially short of self-sufficiency in milk production for the foreseeable future in part for the following reasons:

- Mexican milk processors do not have the infrastructure for manufacturing the dairy ingredients that are in high demand in the country.
- Widespread poverty will continue to exist in Mexico, necessitating relatively large skim milk powder imports to supply government feeding programs for low income people.
- Water shortages will limit increases in milk production in the north of Mexico, the region of the country where milk production has increased most rapidly in recent years.
- Small milk producers in Jalisco and the Mexican tropics will continue to exit from the milk business.

The level of milk production self-sufficiency in the next year or two is difficult to predict because of the deep recession currently affecting Mexico's economy. Imports of items such as specialty cheeses, yogurt, and up-scale products containing dairy ingredients will likely decline in 2009 and 2010. However, imports of milk powder may increase to supply Liconsa's needs in this period as the number of people qualifying for subsidized milk increases. Thus, the composition of Mexico's dairy imports will likely change for at least the next year or two. How much this change in the composition of import product mix will affect the country's overall level of dairy imports is unclear.

Approximate growth in Mexico's aggregate dairy imports in more normal times can be estimated using population growth figures (1.13 percent/year), a proxy for income growth (1.3 percent/year) and an income elasticity of demand estimate (0.679). The population growth figure is taken from Table 2 in an earlier section of this report. Mexico's real GDP growth for 2008

(1.3 percent), as reported by the International Monetary Fund, is used as the proxy for income growth [22]. The income elasticity of demand estimate is from USDA-ERS [44]. Population growth added to the product of income growth and the income elasticity of demand for dairy products for Mexico yields an estimate of growth in dairy product consumption in Mexico of about 2 percent per year.

This estimate is subject to many qualifications, especially assumptions relating to income growth. If Mexico's income growth returns to the generally more robust figures for 2000 through 2007 when income growth averaged 3.1 percent per year, then the growth in dairy product demand would be about 3.2 percent per year. However, Mexico's economy faces a challenging future and there is no assurance that the country's income growth will approach the average level for 2000 through 2007, at least in the next few years.

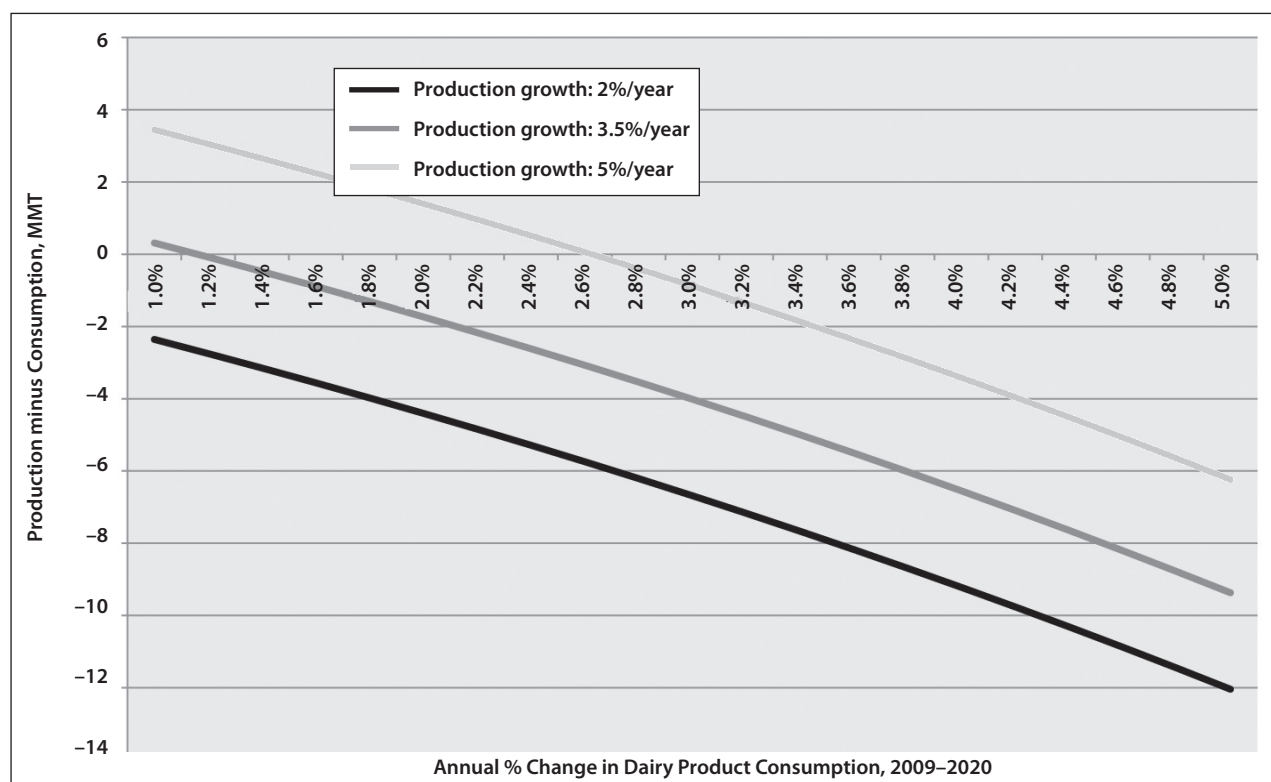
In addition, year-to-year changes in milk production in Mexico vary substantially. For example, year-to-year increases in milk production in the country ranged from 1.47 percent to 6.03 percent during 2005 to 2008. In the earlier 2000 to 2005 period, the year-

to-year changes in milk production ranged from -0.19 percent to 2.34 percent. These figures suggest that Mexico's dairy imports will exhibit considerable variability if past production patterns and related domestic production shortfalls continue in the future.

We tested the sensitivity of the future Mexican milk production-consumption balance to the assumptions about production and consumption growth by ranging growth rates and projecting surpluses/deficits in 2020. We used three fixed annual percentage changes in production, 2.0%, 3.5% and 5.0%, and ranged consumption growth from 1.0% to 5.0%. These values are believed to encompass the full range of plausible growth rates over the next 10 years. We used starting values (2008) of 11 million MT for milk production and 14.47 million MT for consumption. Consumption assumes a 76 percent self-sufficiency rate in 2008, or deficit milk production of 3.47 million MT. The results of the sensitivity analysis are shown in Figure 12.

If Mexican milk production continues to grow at the 2 percent average annual rate of this decade, then deficits occur at even very low rates of consumption growth. Production growth at the rate of 3.5 percent,

FIGURE 12. Projected Mexican Milk Surplus/Deficit, 2020.



Source: Mexico—FAOSTAT [10]; U.S. USDA-NASS [52].

greater than experienced on average between 1995 and 2008, would yield self-sufficiency only if consumption grew at 1 percent or less. If production growth jumped to 5 percent per year (unrealistic given recent experience), then Mexico would be self-sufficient in 2020 at annual consumption growth rates of less than about 2.5 percent.

Our analysis suggests that over the next several years, Mexico's self sufficiency ratio will not change much from the current 76 percent figure reported by USDA-FAS. In fact, a reduction in self-sufficiency seems more likely than an increase. Milk cow numbers are not increasing, meaning that production gains have been limited to what is possible through improved genetics and management. The relatively high income elasticity of demand for dairy products means that sustained personal income growth would push consumption gains well above those seen recently.

All this means Mexico will continue to be a major importer of dairy products. However, improvements in infrastructure—especially increases in storage capacity for milk powder and other dairy ingredients—would permit Mexico to smooth out dairy imports by allowing the country's dairy industry to store more product during years of larger-than-average increases in milk production.

USDEC provides more detail on the likely nature of the continued large Mexican dairy product imports needed to satisfy production shortfalls, in the following terms [42, p. 279]:

Mexico is basically adapted to an industrial model which uses SMP and AMF in large quantities, supplemented by whichever whey ingredients (permeate, lactose or SWP) and whichever milk proteins (MPC, caseins, WPC or caseinates) are available at the lowest prices. Fresh cheese is made from the lowest-cost ingredients (fresh milk mixed with milk proteins) and semi-hard cheese for domestic consumption is imported from the lowest-cost producer. This situation is not expected to change.

USDEC provides additional insights regarding the likely growth in consumption rates for dairy products in Mexico. These differential consumption growth rates, noted below, have implications for dairy imports [42, p. 279]:

- High growth consumption items: UHT milk, yogurt, and cheese.
- Low to medium growth consumption items: Pasteurized milk and cream.
- Negative growth consumption items: Retail milk powder and butter.

These forecasts probably will be most likely to materialize after the current recession ends and Mexico's consumption returns to more normal patterns. Thus, in more normal times, domestically-produced milk in Mexico probably will flow to the high and medium demand growth items in the schedule predicted by USDEC and imports will be used to satisfy the negative demand growth items, especially retail milk powder. The latter point has some longer-term negative implications for milk powder exports to Mexico.

Synopsis

In recent years, domestically-produced milk in Mexico has satisfied only two-thirds to three-fourths of domestic requirements. The future regarding level of self-sufficiency of milk production in Mexico might be characterized as follows:

- Under likely scenarios, Mexico will remain substantially short of self-sufficiency in milk production for the foreseeable future.
- During the current recession, demand for imported and domestically-produced milk powder and other dairy ingredients used to produce milk and milk powder for low-income people may be sustained at fairly high levels.
- After the recession that began in 2009 ends, Mexico's domestic milk production is likely to be channeled increasingly into high value-added items such as UHT milk, fluid milk, yogurt and selected cheeses. And, in more normal times, there may be some reduction in the demand for imported milk powder.
- U.S. firms appear to be well positioned by location and NAFTA-related tariff advantages to supply much of the dairy production shortfall that will prevail in Mexico.

IMPLICATIONS FOR U.S. DAIRY EXPORTS TO MEXICO

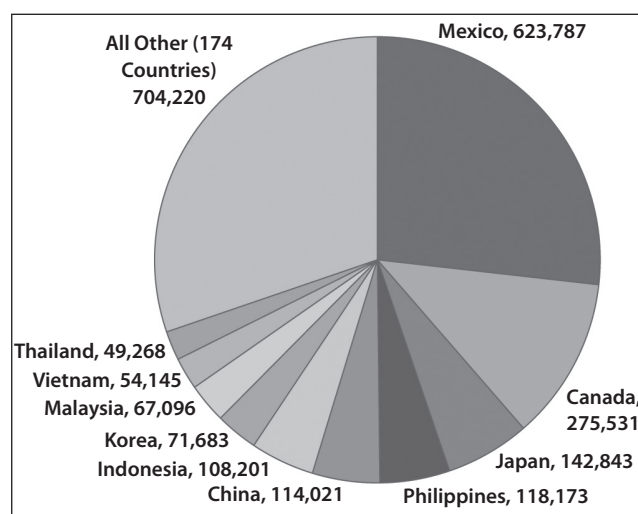
Current Status

Mexico has been the largest export market for U.S. dairy products for many years. During the five-year period 2004–08, the average annual value of exports to Mexico was about \$625 million (Figure 13). This represented about 27 percent of total U.S. dairy product export value compared to 12 percent for Canada, the second leading export market.

U.S. exports of dairy products to Mexico span the full spectrum of U.S. export offerings, ranking first in all but three major categories (Table 16). Over the last five years, Mexico accounted for more than one-half of U.S. export tonnage of fluid milk and cream, ice cream, condensed and evaporated milk, and casein.

In general, U.S. dairy export volume to Mexico has increased more slowly than total export volume (Table 16). However, the increase in Mexico export value between 1989–93 and 2004–08 has been about the same as the overall increase in U.S. dairy export value. This reflects a change in composition of U.S. exports to Mexico toward higher-valued products. Note, in particular, that the percentage changes in vol-

FIGURE 13. Average Value of U.S. Dairy Exports by Destination, 2004–08 Average (\$1,000).



Source: USDA-FAS [51].

TABLE 16. U.S. Exports of Dairy Products to Mexico, Average Annual Volume, 2004–08.

Product	Volume 1,000 MT	% of Total U.S. Export Volume	Mexico Rank	% Change, 89–93 to 04–08	
				Exports to Mexico	Total Exports
Nonfat Dry Milk	90,933	31.9%	1	135%	328%
Whey Products	52,883	15.9%	2*	225%	384%
Cheese	26,763	32.3%	1	611%	531%
Fluid Milk & Cream	18,542	53.7%	1	–48%	–18%
Ice Cream	12,905	50.4%	1	297%	22%
Cond. & Evap.	12,522	54.6%	1	237%	180%
Dry Whole Milk	5,858	21.9%	1	–45%	15%
Butter & Milkfat	3,695	19.4%	2**	–70%	–57%
Casein	2,766	58.3%	1	173%	69%
Yogurt	918	21.1%	1	–74%	–26%
Other Dairy Products	37,386	11.9%	3***	601%	390%
Total Volume	265,171	23.0%		151%	224%
Total Value (\$1,000)	623,787	26.4%		288%	292%

Source: USDA-FAS [51].

*China is leading market. **Russia is leading market. ***Canada and Japan are first and second ranked markets.

umes of cheese and “other” dairy products (consisting of higher-valued food products containing dairy ingredients, e.g., infant formula) are considerably larger for Mexico than for all destinations combined.

Mexico is not only a very large export market for U.S. dairy products, it is also a reliable buyer. During the first seven months of 2009, U.S. dairy export volume was down 26 percent from year-earlier levels (Table 17). Exports to Mexico were down only 5 percent. U.S. sales of cheese, whey, casein, and evaporated and condensed milk to Mexico were up at the same time total U.S. export volume was down.

Trends in U.S. exports for nonfat dry milk, whey, and cheese—the leading export products to Mexico—are illustrated in Figures 14–16.

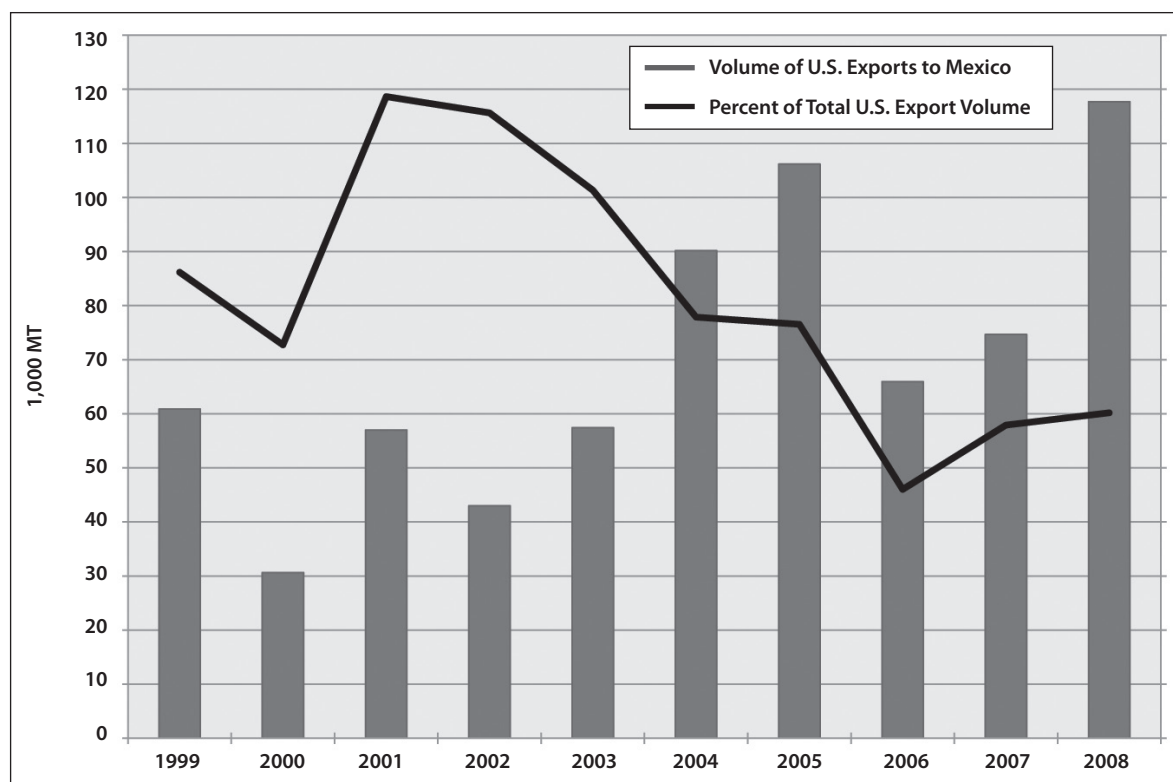
U.S. exports of nonfat dry milk to Mexico quadrupled between 2001 and 2008, but Mexico’s market share of U.S. nonfat dry milk declined as the U.S. became a bigger player in world powder markets. Much of Mexico’s nonfat dry milk imports are through Liconsa. This means nonfat dry milk imports vary year-to-year depending on Liconsa’s overall require-

TABLE 17. Change in U.S. Exports of Dairy Products to Mexico, January–July 2009 versus January–July 2008.

Product	Percent Change in Export Volume	
	All Countries	Mexico
Nonfat Dry Milk	–48%	–21%
Cheese	–27%	13%
Whey Products	–5%	25%
Dry Whole Milk	–48%	–8%
Casein	–31%	7%
Ice Cream	7%	34%
Butter	–81%	–16%
Fluid Milk & Cream	–4%	–58%
Condensed & Evaporated	–52%	6%
Yogurt	17%	–29%
Other Dairy Products	3%	–49%
Total Export Volume	–26%	–5%

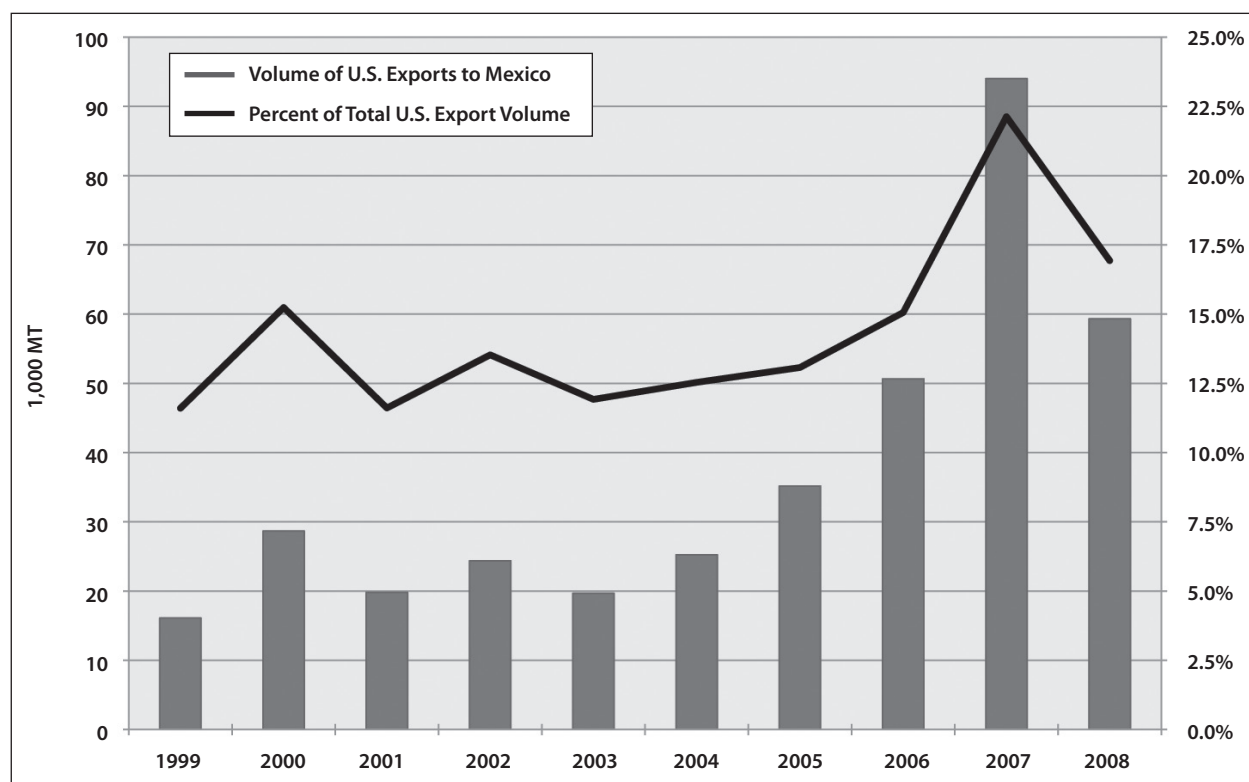
USDA-NASS [51].

FIGURE 14. U.S. Exports of Nonfat Dry Milk to Mexico.



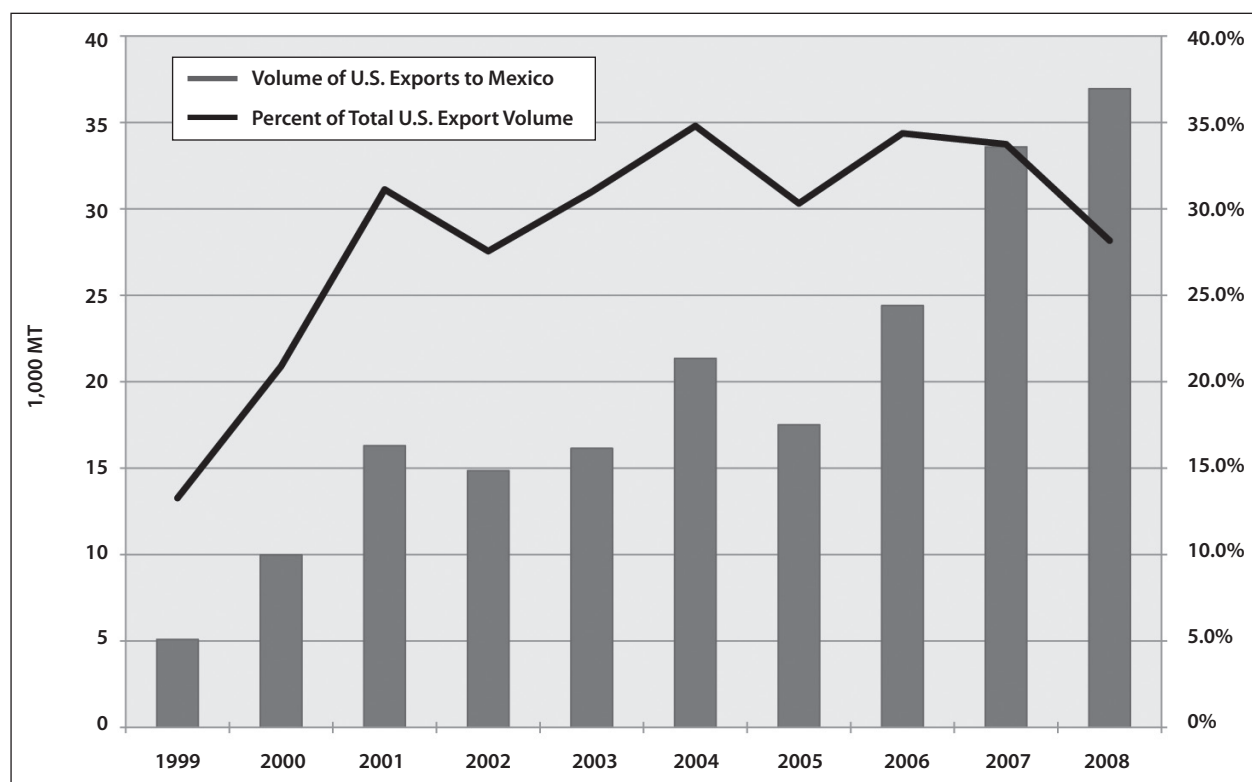
Source: USDA-NASS [51].

FIGURE 15. U.S. Exports of Whey to Mexico.



Source: USDA-NASS [51].

FIGURE 16. U.S. Exports of Cheese to Mexico.



Source: USDA-NASS [51].

ments and the availability of locally-produced milk to meet them.

U.S. exports of whey and whey derivatives to Mexico have also increased rapidly over the last ten years, but fell off sharply in 2008. Imported whey and lactose are used by Mexican dairy processors to produce a host of dairy products. Mexican processors frequently substitute whey and whey protein concentrates for skim milk powder in manufacturing applications when price differentials favor whey products.

U.S. exports of cheese to Mexico have grown steadily and its share of total U.S. cheese exports has been stable at about 30 percent since 2001. The composition of Mexican imports of U.S. cheese generally mirrors the overall composition of U.S. cheese exports. An exception is fresh cheese—Mexico took nearly 60 percent of U.S. export tonnage in 2008 and the category has shown the largest growth in volume among cheeses imported from the U.S.

One indicator of the potential for future exports of U.S. dairy products is per capita consumption of dairy products in Mexico. Mexico's per capita consumption of the three dairy products listed in Table 18 is a relatively small percentage of the figures for the other countries in the table. Income and cultural factors may account for part of the large shortfall in per capita consumption of dairy products in Mexico compared to the U.S. and EU. However, Mexico's consumption of dairy products also is low compared to Argentina, where income and cultural factors presumably would be less important for explaining the differences in per capita consumption.

TABLE 18. Per Capita Consumption of Dairy Products, Mexico and Selected Other Countries, 2006.

Country	Fluid Milk liters	Cheese kg	Butter kg
Mexico	40.7	2.1	0.4
Argentina*	65.8	10.7	0.7
U.S.	83.9	16.0	2.1
EU	92.6	18.4	4.2
Australia*	106.3	11.7	3.7
New Zealand*	90.0	7.1	6.3

Source: Intl. Dairy Federation Bulletin 423/2007 as reported in USDEC [42, p. 154].

*Figures for 2005.

The potential for expanded U.S. exports of cheese to Mexico appears to be particularly large given that per capita consumption of cheese is only about 13 percent of the U.S. figure and 11 percent of the EU figure. But, for reasons discussed elsewhere in the paper, Mexican incomes must grow substantially if U.S. cheese exporters are to have a good chance to fill a major part of U.S.-Mexico gap in per capita cheese consumption. Such increases in consumer incomes are far from certain given the problems facing Mexico's economy in both the short-term and the longer-run. U.S. dairy exporters also must make available more cheeses of the types preferred by Mexican consumers if they wish to fill a big part of the consumption gap. Mr. Marc Beck of USDEC contends that good opportunities exist to expand U.S. exports of gouda cheese to Mexico.

The gap in fluid milk consumption in Mexico compared to other countries in Table 18 augurs well for continued exports of U.S. skim milk powder to Mexico for use in producing reconstituted milk. But except for locations near the U.S. border, exports of fluid milk from the U.S. to Mexico will be limited by transportation cost factors.

The relatively small per capita consumption of butter in Mexico reflects the fact that Mexican consumers, for the most part, make much wider use of vegetable fats than butter. Vegetable oil tends to be used for cooking [42]. Margarine is used for sandwiches and cooking, particularly in the industrial bakery segment. Reflecting these use practices, the margarine market is about five times as large as the butter market in Mexico. USDEC forecasts declining consumption of butter in Mexico and indicates that the Mexican market for butter is not likely to be a growth item for U.S. dairy exports [42].

USDEC developed forecasts for 2008 relating to opportunities for dairy ingredient exports from the U.S. to Mexico [42]. While forecasts for a past year are of limited use, they do identify the importance of economic growth for U.S. dairy exports to Mexico. USDEC forecast potential growth opportunities for three export items even in the absence of Gross National Product (GNP) growth in Mexico.

- SMP or other solids with < 1.5% dairy fat.

- Concentrated milk or cream powder or other dairy solids with > 1.5% fat, not containing sugar or sweeteners.
- Caseinates.

For several other dairy products, USDEC's forecast of expanded U.S. exports was conditional on Mexican GNP growth:

- Anhydrous milkfat (AMF).
- Hard or semi-hard cheeses.
- Products consisting of natural milk ingredients, whether or not containing sugar or other sweeteners.
- Lactose powder containing > 99% purity, anhydrous lactose, dry basis.
- Casein.

The forecast for the latter group of items might be interpreted as a quasi-forecast of potential growth in U.S. dairy ingredient exports to Mexico when near-normal economic conditions return to Mexico.

Income and production growth scenarios described in the paper imply little change or a decline in self-sufficiency in milk production in Mexico. This development will be an important contributor to maintenance and growth in U.S. dairy exports to Mexico.

Mexico's domestic dairy industry and Mexico's government have sought to reduce dairy imports. While Mexico's milk production has increased modestly in recent years, water shortages in the north of Mexico—where milk production is increasing most rapidly—are likely to limit the amount of those increases. Efforts by Mexico's government to increase use of domestically-produced milk for Liconsa's programs also have had little apparent effect on imports of U.S. dairy products.

Finally, the zero tariffs applied by Mexico to all U.S. dairy exports under the NAFTA will bolster the other advantages enjoyed by U.S. dairy exporters.

Competitiveness of U.S. Dairy Exporters in the Mexican Market

USDEC gives an upbeat assessment of the competitiveness of U.S. dairy exporters for serving the Mexican market, as follows [42, p. 241]:

In addition to offering products to Mexico with the lowest tariffs, U.S. suppliers also have the advantage of short delivery times, which means that in the case of 10 to 30-day terms after delivery to the customs post at the border, the client can receive the product before he has paid for it. At present, the U.S. is the preferred supplier for SMP, and it will only lose this status if it has no more SMP available. The same applies for all whey derivatives, AMF and MPC. The U.S. presently is not the main cheese supplier into Mexico, except for Mozzarella, because there are no U.S. companies making the type of Gouda cheese which the Mexicans want to import.

Private labeling for major distributors in Mexico is another development that has emerged to help U.S. suppliers compete with Mexico's biggest domestic dairy-food processors. USDEC in its 2008 report describes the nature of this private labeling activity, involvement of U.S. firms in the activity (Table 19) and forecasts that this business will increase in the future.

This private label activity appears to be a promising avenue for diversifying and expanding high-valued U.S. dairy exports to Mexico.

While numerous factors point to continued large U.S. dairy exports to Mexico, U.S. firms probably will need to adjust strategies to take account of the following developments if they are to remain strongly competitive:

- Mexican dairy companies that sell dairy products at premium prices are losing market share to second-tier, regional dairy companies, which sell at marginally lower prices. This development probably will assume increased importance during the current economic recession.
- Price continues to be a key driver in Mexico's dairy markets. Hence, the market will be strongly influenced by vegetable-fat based products or blends rather than dairy fats.
- Local fresh milk in Mexico will continue to be used to produce pasteurized milk, most UHT milk, premium sweet cream, and premium local cheeses. Among other things, this reflects the desire of domestic producers to channel available

TABLE 19. Imported Dairy Products Being Sold as Private Label Products in Mexico.

Product	Main Marketing Companies in Mexico	Countries of Origin for Products Sold by Mexican Supermarkets and Distributors
SCM	Nestle	Chile, Singapore, US
Evaporated Milk	Nestle	U.S.
Gouda Cheese	Esmeralda, Sigma, Lala and Regional Producers	Chile
Ice Cream	Unilever, Nestle	U.S.
Analogue Processed Cheese	Sigma, Lala, Nestle, Chilchota	U.S.
Cream Cheese	Kraft	U.S.
Fermented Milk	Yakult, Nestle, Lala, Unifoods	U.S. (Industrias Cor.)
Coffee Creamers	Nestle, Lautrec, Industrias Cor,	U.S.

Source: USDEC [42, p. 265].

locally-produced milk into the highest valued uses.

- There will continue to be a focus on milk extension technologies in Mexico, particularly those that involve use of MPC.

The Negatives

Factors that warn the U.S. dairy industry against exhibiting excessive exuberance about growth in U.S. dairy exports to Mexico include the following:

- Increases in U.S. exports of up-scale dairy products such as premium cheeses and ice cream will be limited by the severe economic recession that gripped Mexico beginning in 2009. The recessionary environment may temporarily bolster U.S. exports of skim milk powder and other low-cost ingredients to Mexico.
- Opportunities for up-scale dairy exports remain uncertain over the longer-run because of the relatively weak economic prospects facing Mexico's economy.
- Price competition from domestic and foreign firms for sales of undifferentiated cheeses, butter and cream will remain strong in Mexico.
- Weakness in the peso relative to the U.S. dollar will make U.S. dairy exports relatively expensive. This development may encourage U.S. foreign direct investment in Mexico's dairy industry rather than dairy exports.

- Liconsa represents a potential "wild card" in the U.S. dairy export situation. If Mexico's government should turn over processing and distribution of dairy products for low-income people to commercial firms in Mexico, this would necessitate a change in the channels through which U.S. skim milk powder is exported to Mexico. These changes should be manageable but could be temporarily disruptive. Any government hand over of Liconsa's importing and processing functions to private firms is unlikely to occur until after the recession, which began in 2009, ends.

Synopsis

Prospects for continued large U.S. dairy exports to Mexico appear bright partly for the following reasons:

- Mexico is likely to remain substantially short of self-sufficiency in milk production for the foreseeable future. We see little prospect of internal milk production increasing at rates that come close to matching growth in consumption.
- Per capita consumption of dairy products in Mexico is low. In the future, Mexican consumers will likely demand additional dairy products which U.S. firms can be well-positioned to supply.
- U.S. firms have the potential to supply increased quantities of high-valued private label products

for Mexican firms or multi-national firms operating in Mexico.

- U.S. firms have major proximity and tariff advantages for serving the Mexican market relative to competitors.

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