REGULATORY IMPLICATIONS OF U.S.-MEXICO DAIRY TRADE

AFPC Policy Research Report 96-1

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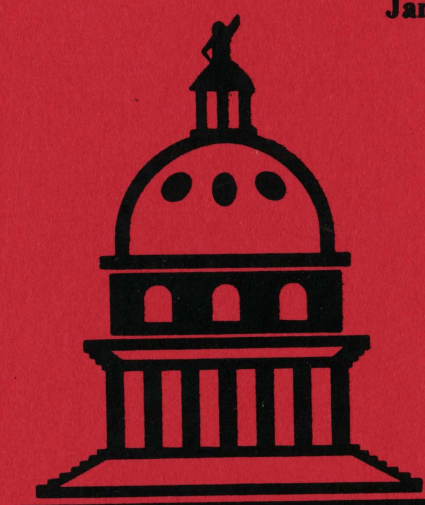

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REGULATORY IMPLICATIONS OF U.S.-MEXICO DAIRY TRADE

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ABSTRACT

Considering Mexico's status in recent years as the number one market for U.S. dairy exports, surprisingly little is known about the dairy sector of our southern neighbor. Most studies of the Mexican dairy sector have broadly examined social, economic and demographic factors of Mexico and concluded that with a milk production deficit in Mexico, rising income in the population and the proximity of the United States to Mexico, the trade in dairy products between the United States and Mexico should continue to increase. Actual analysis of producer and consumer prices for dairy products, processor margins for packaged milk and manufactured products with various component origins, the effects of differing trade scenarios on U.S. federal order and cooperative prices and examination of the incentives for Mexican producers to market milk in the United States have not been closely investigated. This study addresses these areas.

As it would be impractical to study the entire border area, a case study reflecting the economic conditions along the border area of El Paso, Texas and Juarez, Mexico was selected. This study examined Mexican producer and consumer milk and dairy product prices by utilizing and standardizing price data which was collected first-hand or by Texas A&M researchers. Gross processor margins were calculated by utilizing published and collected input prices and retail product prices. Actual ingredient costs to manufacture products were calculated by utilizing butterfat-skim accounting procedures, product yields and recipes. U.S. federal order and cooperative price effects of various trade scenarios were examined by utilizing a pooling model. The incentives for Mexican producers to market milk in the United

States were examined by comparing producer prices, hauling costs, distances from production areas to potential markets and regulatory requirements.

The results of this study indicated that currency rate fluctuations, at least in the short-run, can have major ramifications on trading patterns. In the wake of the December 1994 devaluation, Mexican produced milk could be transported considerable distance into the United States if it could receive U.S. prices. This study additionally identified cross border trade issues and identified opportunities for circumvention of existing U.S. federal order regulations.

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CHAPTER I

INTRODUCTION

U.S. dairy policy has traditionally concerned itself with meeting domestic consumption needs. Surplus production has been distributed through domestic and international food aid programs. Most U.S. "exports" have been in the form of donations or subsidized sales to needy countries. Securing export markets at the prevailing world price has not been a priority. While annual production in the United States has continued to increase, U.S. producers have faced decreasing government support. Lacking strong market determined sources of demand, prospects exist for even lower producer prices in the future.

Movements Toward Freer Trade in Dairy

The General Agreement on Tariffs and Trade (GATT) is the culmination of a series of agreements which began after World War II to develop formalized rules and a medium for dispute settlement among trading nations. GATT was established with a goal of increasing world trade and preventing trade disputes. It was conceived with five principles.

- Trade should not be discriminatory.
- Protection for domestic industries should be in the form of tariffs, rather than quotas and other non-tariff barriers.
- Negotiated tariffs are to be binding and if violated, compensation is appropriate.
- A consultation medium should be arranged to settle disputes.
- Trade barriers that existed before the original GATT agreement and survived negotiation are legal until arbitrated away (Knutson et al., *Policy Tools*, 1993).

The emergence of freer world trade as exemplified by the Uruguay Round of GATT has forced changes in traditional U.S. dairy policy. GATT reflects a new era in international affairs concerning agriculture. The Uruguay round of GATT began in 1986 with a focus on agricultural policy. The negotiations were contentious and extended through three U.S. presidential administrations until finally concluding in 1993. The agreement involves a complex arrangement of trade-offs and concessions among the 102 governments involved in the negotiations. During the negotiations process, the United States made several commitments. Specifically in dairy policy, the United States agreed to replace Section 22 quotas with tariff equivalents. These tariff equivalents will be reduced by a minimum 15 percent each year over a six-year period beginning in 1995. Additionally, the United States will establish a ceiling on the allowable subsidized dairy exports under DEIP with reductions from a base of 1986-1990 (USDA/FAS, *Dairy*, 1994).

The ultimate result of GATT will, most likely, be lower milk prices for U.S. producers. Dobson and Cropp (1995) reviewed prior studies of the impact of GATT on U.S. milk prices. The authors found a range of change in U.S. milk prices from a slight increase to a reduction of $.55 to $.60 per cwt when GATT is fully implemented in the year 2000. The projections differ due to varying assumptions about U.S. dairy imports and exports under the GATT agreement. Dobson and Cropp project a reduction of $.49 per cwt which is a decline of 3.8 percent from the 1995 base year. With GATT resulting in increased cheese imports and fewer NDM exports, the authors concluded that these changes will result in U.S. milk prices being more volatile and uncertain.

Richardson et al. (1994), utilized projections developed by the Food and Agricultural Policy Research Institute (FAPRI) and representative farm simulations maintained by the Agricultural and Food Policy Center (AFPC) to estimate the effects of GATT on 22 panel dairy farms. Due to lower milk prices and higher feed costs, 20 of the 22 panel dairy farms were estimated to experience lower net cash incomes for the years 1995-1998 relative to the pre-GATT baseline. These results are primarily due to reductions in DEIP sales and increases in imports of dairy products into the United States.

While GATT has indicated a trend toward freer trade on a global basis, traditional trading partners have also found a move toward freer trade advantageous. Various European countries have been involved in negotiations and agreements to eliminate barriers to trade since the late-1950's. A continental-wide European Economic Union is perhaps a possibility in the not-so-distant future. Likewise, the United States completed free trade agreements (FTA's) with Israel and Canada in 1985 and 1989, respectively.

Based on the successes of the Canada-United States Free Trade Agreement (CUSTA), negotiations were begun to extend freer trade to Mexico as well. The trilateral North American Free Trade Agreement (NAFTA) was implemented in 1994. NAFTA was conceived on several principles, among these:

- To strengthen friendship and cooperation among the signature countries.
- To expand and secure markets for the goods and services produced within the free trade area.
- To reduce trade distortions.
- To establish clear and beneficial rules governing trade (NAFTA, 1993).

With the implementation of NAFTA, studies have indicated the potential for dairy product trade between the United States and Mexico to increase (Knutson et al., *NAFTA,* 1993; Cox et al. 1994; Outlaw and Nicholson 1994). Canada chose not to include its dairy sector in either the Canada-United States Free Trade Agreement or NAFTA until 1998.

Dairy Trade with Mexico

This study addresses dairy issues arising from the liberalization of trade between the United States and Mexico and accentuated by the passage of the North American Free Trade Agreement (NAFTA) in 1993. Exports of unsubsidized fluid milk and related Class I and Class II products to Mexico have been a promising new development for the U.S. dairy industry. Mexico lacks the production capacity to meet its consumption needs and has been importing substantial quantities of non-fat dry milk (NDM) from foreign sources. Mexico has risen from an insignificant importer in the early 1980s, to its current status as the number one export market for dairy products in the world.

Utilizing USDA data[1], the trends in products imported by Mexico from the United States in the four major dairy commodity groups are as follows:

- Mexican fluid milk imports from the United States were non-existent before 1984, and have increased to a projected 80,000 metric tons in 1995.
- Cheese imports have been variable and generally quite less than 10,000 metric tons before 1990, with an increasing trend noted since that year. Cheese exports are projected to be 40,000 metric tons in 1995.

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[1] K. Gudmunds and A. Webb, *PS&D View Electronic Database*, (Washington DC: U.S. Department of Agriculture, Economic Research Service, November 1991 and updates)

- Butter imports from the United States were nonexistent before 1983, reached a high of 12,000 metric tons in 1985 and 1992, and are projected to be 21,000 metric tons in 1995.
- Mexico is the largest non-fat dry milk (NDM) importer in the world, totaling 200,000 metric tons in 1995.

Of special interest to Texas and other border-state producers has been the volume of fluid milk exports originating from the Texas (126), New Mexico-West Texas (138) and Arizona (131) federal orders. In the three-year period from June 1991 to June 1994, 245 million pounds of packaged fluid milk, bulk milk and cream were exported to Mexico. Exports from the three orders reached a high in November 1994 of 24.7 million pounds. A drastic reduction in exports was noted after the December 1994 devaluation of the peso. By May 1995, milk sales from Orders 106, 126 and 138 totaled only 2.9 million pounds. The linkage of the dairy trade with Mexico's economic health has raised several significant issues.

Resulting Federal Order Issues

In the United States, federal milk marketing orders have been utilized to price milk to handlers (processors) on the basis of use (classified pricing) and to pool receipts across all producers in an order market. Exports raise questions concerning both the pricing of milk exported and the pooling of receipts from that milk. If U.S. milk is exported to Mexico, processed, and imported into the United States, questions arise regarding how to protect the integrity of the order system.

There are differences of opinion over how milk sales to Mexico should be priced (classified) under federal orders. Alternatively, with the peso devaluation, the U.S. milk

market may become sufficiently attractive that Mexican farmers may seek to deliver milk to U.S. processors or to become members of U.S. dairy cooperatives. Alternatives such as a free trade zone for milk sales to and from Mexico, the establishment of orders in Mexico, and the verification of the class utilization of U.S. bulk milk exported to Mexico have been suggested. In light of these issues and options, it is important that USDA establish a coherent policy concerning trade of milk and milk products between the United States and Mexico.

Objectives and Procedures

The overall objective of this study was to analyze the potential economic factors impacting dairy trade with Mexico under NAFTA and GATT with implications being drawn for Federal milk marketing order policy. This was accomplished though an approach involving the following procedures:

- The competitiveness of U.S. and Mexican consumer and producer milk prices along the U.S. and Mexican border was evaluated. A case study was completed of consumer prices in the sister cities of Juarez, Mexico and El Paso, Texas. Consumer prices were compared for packaged milk, comparable varieties of cheese, butter, yogurt and ice cream.
- The profitability of Mexican dairy companies purchasing U.S. components to manufacture products was analyzed. Mexican dairy standards and product compositions with component prices from both countries were used to calculate gross processor margins. These comparisons were made exclusively using U.S. origin components, with exclusively Mexican components and with a mixture of Mexican and U.S. components. These comparisons were made for packaged milk (regular,

filled[2], and low-fat), cheese varieties (whole milk, vegetable fat and non-fat dry milk, and milk fat and non-fat dry milk compositions), ice cream and yogurt. Margins of these products by origin of the components were then compared.

- The effects of various trade scenarios on producer prices in the Texas and New Mexico-West Texas federal orders was evaluated. The scenarios include pooling milk sold to Mexico on the federal order and the effects of importing milk from Mexico (bulk and packaged). Comparisons were made for alternative milk prices (class prices) and for actual volumes of milk exported. This was done for selected months in 1994 and 1995 using Texas milk marketing order data and standard milk accounting procedures.
- The economic incentives for Mexican producers to market milk in the United States or seek membership in U.S. dairy cooperatives were analyzed. This was accomplished by using producer price data for U.S. and Mexican producers and considering shipping costs and regulatory procedures.

Report Organization

The remainder of this report is organized in six chapters. Chapter II reviews some economic dimensions of Mexican dairy sectors including pertinent prior studies relating the potential for increased trade in milk and milk products between the United States and Mexico. The subsequent four chapters correspond to the objectives of this study. Chapter III is an analysis of dairy product price competitiveness on the United States border with Mexico. Chapter IV describes the calculation of ingredient costs for various dairy products and the

[2] Filled milk refers to packaged milk in which the processor has replaced or supplemented the natural butterfat with a vegetable fat.

determination of gross processor margins. Chapter V analyzes the effects of various trade scenarios on federal order and cooperative blend prices in the Texas and New Mexico-West Texas Federal Orders. Chapter VI discusses the economic incentives for Mexican producers to market milk in the United States or join U.S. cooperatives. The final chapter, Chapter VII, presents the conclusions of this study.

CHAPTER II

THE MEXICAN DAIRY INDUSTRY, NAFTA, AND RELATED STUDIES

This chapter is arranged into four sections.

- The first section provides a broad overview of Mexico and the Mexican dairy sector.
- The second section examines the development of the North American Free Trade Agreement with special attention being centered on its dairy provisions.
- The third section reviews pertinent previous studies and research concerning the Mexican dairy sector.
- The fourth section explores specific issues raised by the increased trade in dairy products between the United States and Mexico which have been identified by researchers.

The National Characteristics of Mexico

While the citizens of the United States and Mexico are separated physically by only a river and a line in the desert, there are enormous cultural, social and economic divisions.

Comparative Area and Population Statistics

Mexico occupies a land area of approximately 20 percent of the United States or slightly less than three times the size of Texas. With a population estimate of 92.9 million in July 1994, Mexico has approximately 35 percent of the population of the United States. The 1994 population growth rate for Mexico was estimated to be 1.94 percent compared with 0.99 percent for the United States. The United States has a net in-migration rate of +3.38 migrants per 1,000 population. Mexico, on the other hand has an out-migration rate of -3.09 migrants

per 1,000 population. In other words, the U.S. rate of immigration is slightly larger than the Mexican rate of migration (Central Intelligence Agency 1994).

Comparative Social Statistics

Mexico has several ethnic divisions. Sixty percent of the Mexican population is Mestizo, or Indian-Spanish ancestry. The remaining population is 30 percent Amerindian, (aboriginal American ancestry) and 9 percent Caucasian. In comparison, the United States is classified as 83.4 percent White, 12.4 percent Black, and 0.8 percent Native American (Central Intelligence Agency 1994).

Mexico has a literacy rate, computed as those over age 15 who can read and write, of 87 percent. The comparable literacy rate for the United States is 97 percent. The life expectancy at birth for the total population in Mexico is 72.9 years. In the United States the life expectancy at birth is 75.9 years (Central Intelligence Agency 1994).

Comparative Economic Statistics

The standardized gross domestic product (GDP) for 1993 was $740 billion for Mexico compared with $6.4 trillion for the United States. In Mexico, agriculture accounted for 9 percent of the GDP and utilized over 25 percent of the labor force. As a comparison, in the United States, agriculture accounted for 2 percent of the GDP and utilized 2.8 percent of the labor force (Central Intelligence Agency 1994).

The national product per capita figures were $8,200 for Mexico and $24,700 for the United States. In Mexico, the 1993, national product real growth rate was 0.4 percent with an inflation rate in consumer prices of 8 percent. During this time, the United States experienced a growth rate of 3 percent and an inflation rate in consumer prices of 3 percent. The

respective unemployment rates were 10.7 percent for Mexico in 1992, and 6 percent for the United States in 1994. In 1992, the United States was the primary trading partner of Mexico. Both U.S. exports and U.S. imports accounted for 74 percent of Mexico's total trade (Central Intelligence Agency 1994).

Comparison of Infrastructure

The level of infrastructure influences a country's ability to produce and distribute goods and to trade. It, therefore, is very important to trade in milk. Mexico has 150,500 miles of roadways of which 52,660 miles are paved. The United States, in comparison, has 3,877,000 miles of paved highways including 52,700 miles of paved, four-lane, limited access interstate highways. Mexico has a rail network of 15,200 miles of trackways. The United States has 149,000 miles of mainline track. Mexico has 13 major ports, while the United States has 28 major ports (Central Intelligence Agency 1994).

Topography and Climate

Although Mexico can be considered to have a relatively large land area, surprisingly little of the country is favorable for agriculture. Two mountain ranges run the length of the country making about 50 percent of the country too steep to cultivate. The desert of northern Mexico makes about half of the country too arid for non-irrigated cultivation. Additionally, southern Mexico is tropical with poor, thin soils. Consequently, only about 15 percent of the country is considered arable. The government of Mexico has responded to its agricultural needs by initiating massive irrigation projects in northern and northwestern Mexico. Approximately one-fourth of Mexico's cultivated land is irrigated (Barry 1992).

Population Growth in Mexico

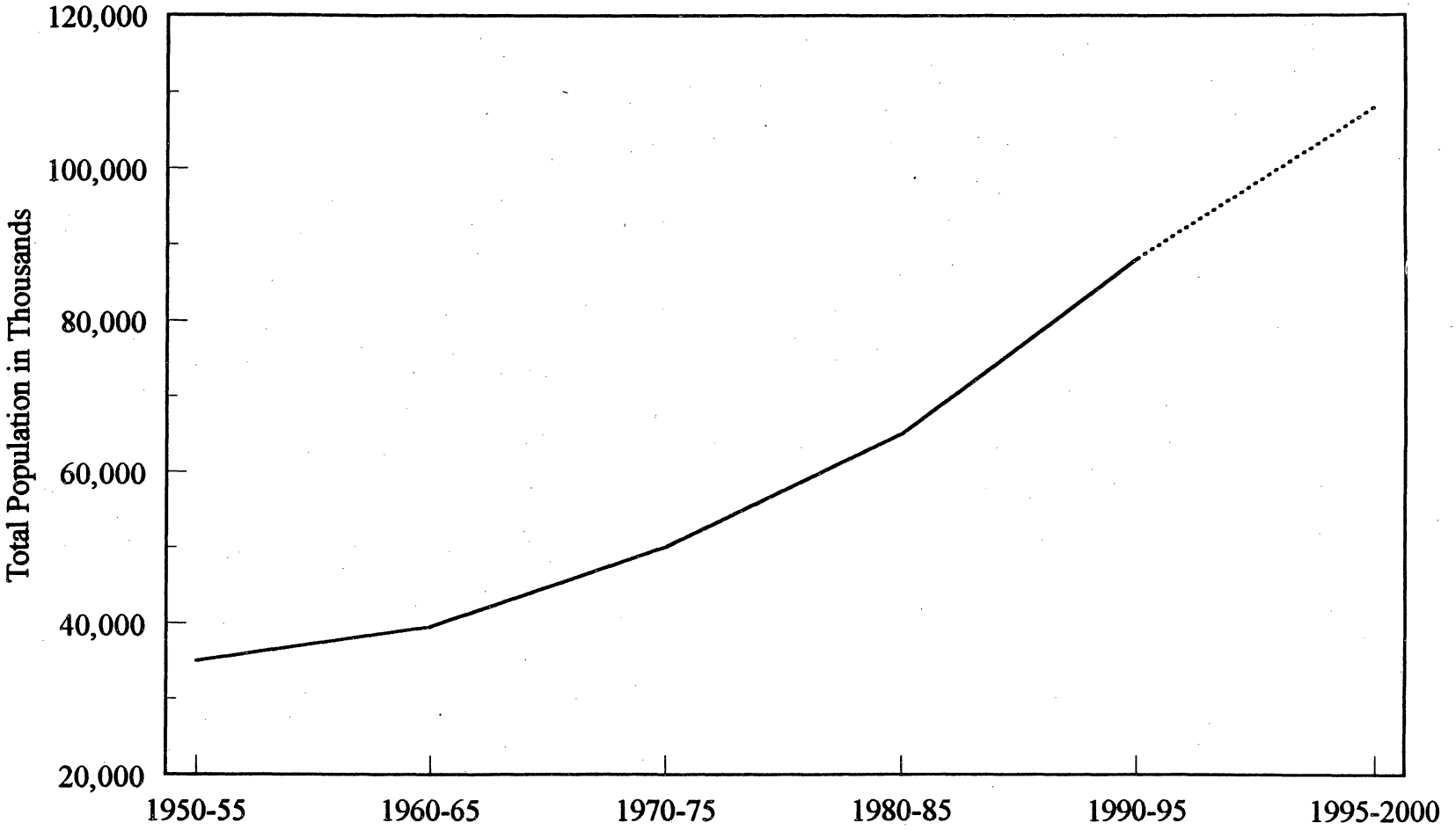
Figure 1 displays the population of Mexico from the year 1950 to a projection for the year 2000. It is apparent from the graph that Mexico's population has undergone explosive growth. In the 50 years following World War II, Mexico's population nearly quadrupled from under 25 million to almost 100 million people. Government sponsored population control programs has reduced the population growth rate from a high of nearly 3.5 percent to the present growth rate of less than 2 percent. Even with a reduction in growth, the number of first time job seekers still grows at an annual rate of 3.5 percent. This rate has far outstripped the growth rate of the Mexico economy (Barry 1992).

Population Age Distribution of Mexico

Figure 2 is a comparison of the population distributions of the United States and Mexico. The population distribution of the United States is more balanced with a distinguishing bulge representing the "baby boom". Mexico has a "bottom heavy", acuminate population distribution characteristic of a rapidly growing population. Over half of the Mexican population is 19 years of age or younger. Only 5 percent of the population is 60 years of age or older (Knutson et al., *NAFTA,* 1993). Reducing the rate of growth of a population with a acuminate distribution is very difficult. Like a rapidly moving freight train with many cars, the population has a momentum of its own and is very difficult to "stop".

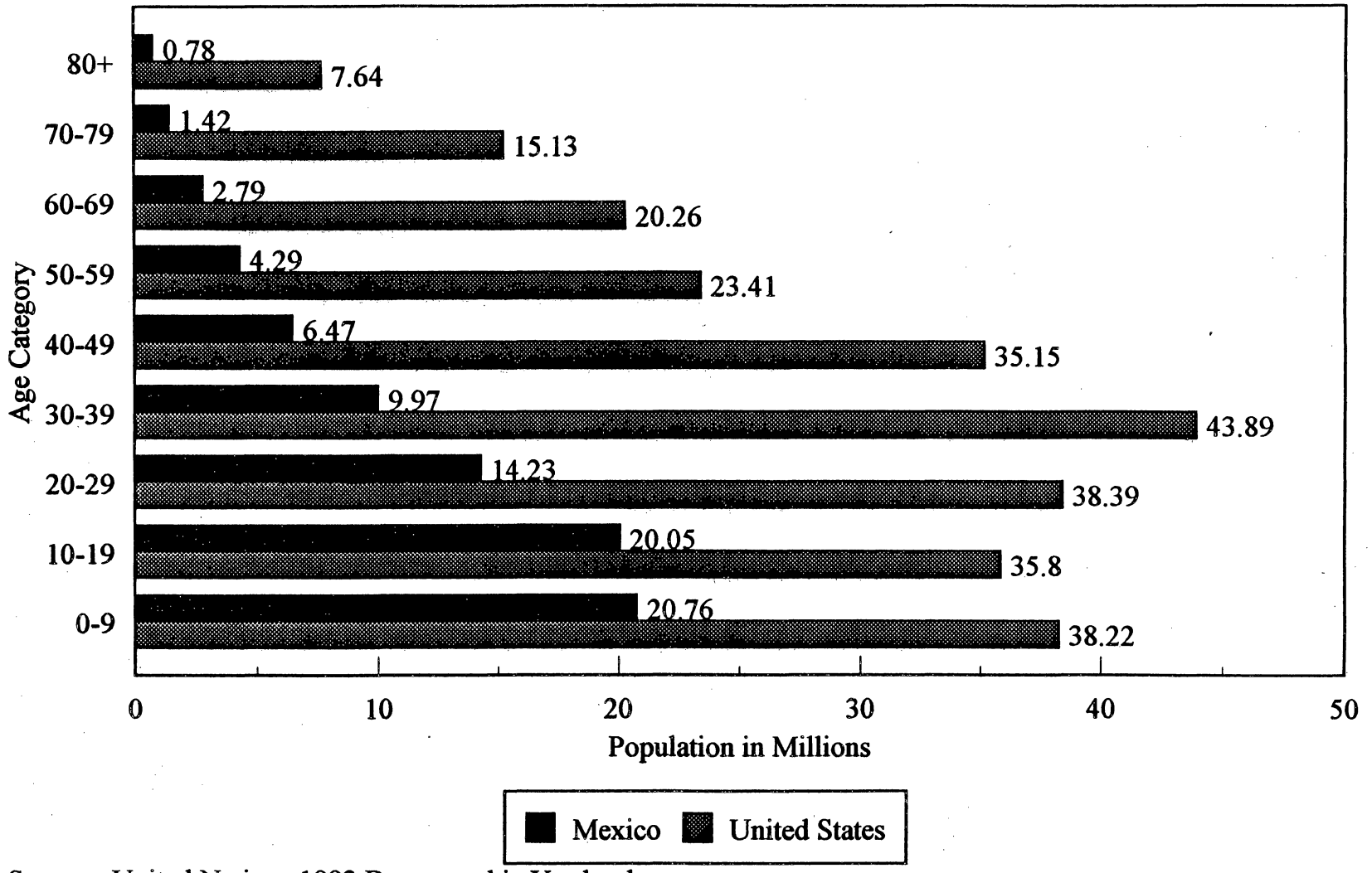
Geographical Population Distribution of Mexico

Figure 3 is a graphical representation of the percent of the Mexican population which has lived in urban areas over time. Mexico has experienced a strong urbanization trend from 43

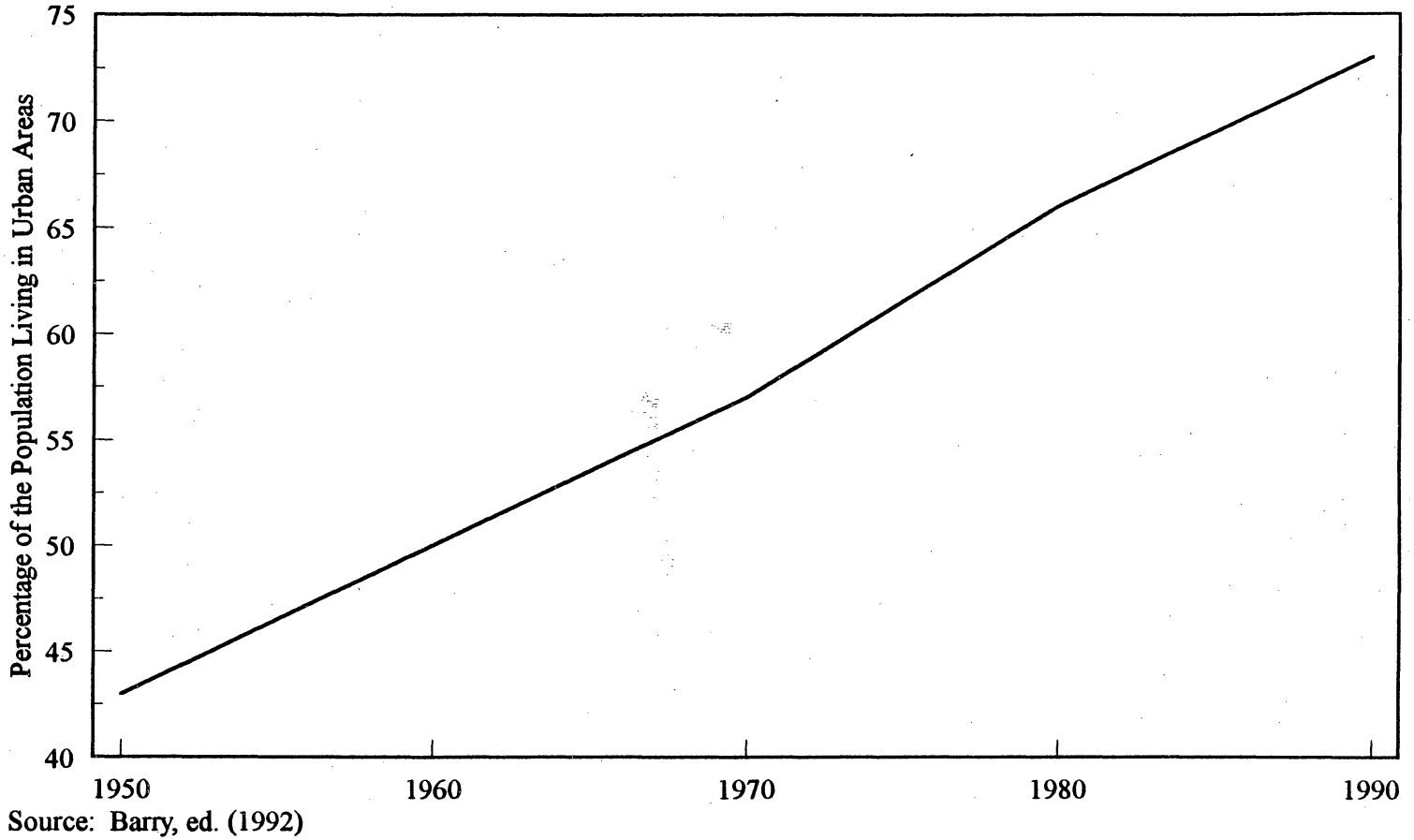


Source: Barry, ed. (1992)

Figure 1. Population Growth in Mexico, 1950-2000



Source: United Nations 1993 Demographic Yearbook
United States, 1993 Estimate; Mexico, 1990 Estimate
Figure 2. Age Distributions of the Populations of Mexico and the United States



Source: Barry, ed. (1992)

Figure 3. Urbanization Trend in the Population of Mexico, 1950-1990

percent urban dwellers in 1950 to approximately 73 percent urban dwellers in 1990 (Barry 1992). As an expression of this trend, in 1985, almost 50 percent of the population lived in the 12 largest cities (Knutson et al., *NAFTA,* 1993). Mexico City has the largest urban population with 20 million inhabitants which is larger than the population of Texas. The next largest cities are Guadalajara and Monterrey with over 3 million inhabitants respectively. The cities along the border with the United States account for over 3.5 million inhabitants and are growing rapidly (USDA/FAS, *Market,* March 1994).

Income Distribution in Mexico

There is a wide gap between the wealthy and the poor in Mexico. According to Millman (1994), Mexico ranks fourth behind the United States, Germany and Japan as a cultivator of extreme wealth. The July, 1994 issue of *Forbes* magazine listed 24 Mexican families or individuals as being in a list of the world's billionaires. Four more billionaires have been identified since then. Furthermore, the rich are getting richer. In 1991, only 2 Mexican billionaires were identified.

The National Dairy and Promotion Board (1991) study classified the Mexican population as 9 percent upper class, 27 percent middle class, 64 percent lower class. In a more recent classification by the U.S. Agricultural Trade Office in March 1994, the Mexican population was categorized as being 3 percent upper class ($5,000 or more U.S. dollar annual income), 1 percent upper middle class ($1,500-$5,000), 25 percent lower middle class ($500-1,500) and 61 percent lower class ($120-$500 annual income in U.S. dollars). The report concludes that probably 20 percent of the population can afford consumer products and this share was increasing rapidly.

Mexican Politics

Two main philosophies have dominated the Mexican political establishment for most of this century: the ideals of the Revolution of 1910, and mistrust of American meddling in Mexican domestic affairs. With Mexican political stability presently in a state of uncertainty, it is pertinent to briefly review the Revolution, its goals, the party it created and the problems of the present day.

The Mexican Revolution, which can be considered to linger to present day, began as opposition to the dictator, Porfirio Diaz, who ruled Mexico from 1876 to 1911. Diaz had been democratically elected, but maintained his rule by consolidating his power and suppressing opposition. The economy Diaz inherited was in disarray so in an effort to industrialize he encouraged foreign investment (Wilson 1991). While the reign of Diaz was a period of economic prosperity and political stability, the benefits were primarily accrued to the wealthy and foreign investors at the expense of an exploited peasantry (Barry 1993). When the economy ultimately worsened, the population revolted. The aspirations of the revolution were "...land reform, Indianism, anti-clericalism, nationalism, and no reelection. The main accomplishments were distribution of land to peasant collectives (ejidos), development of a social welfare-orientated government bureaucracy, nationalization of the petroleum industry in 1938 after a long series of disputes with foreign oil companies, regulation and control of foreign capital, and creation of a single dominant party -- the PRI, or Institutional Revolutionary Party -- based on the three component sectors (labor, peasants, and government employees)."[3]

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[3] A. Wilson, ed., *North American Free Trade Agreement: Issues for Congress*/91-282 E (Washington DC: The Library of Congress, Congressional Research Service, July 12, 1991), p. 15.

Since the 1910 Revolution, Mexico has been governed by a sequence of PRI presidents in a succession of single six-year terms. The elections have been spirited, but never really in doubt with the current PRI president designating his successor. Under the PRI, Mexico protected its domestic industry. Until recently, Mexico has experienced relative political stability and prosperity (Wilson 1991).

The debt crisis of the 1980s forced dramatic changes in the Mexican economy and in trade relations. The administration of President Miguel de la Madrid (1982-1988) faced negative economic growth and a loss of real wages for the average worker of 50 percent. These difficulties led to the whisker-close 1988 election of President Carlos Salinas de Gortari (1988-1994). Salinas won with 50.7 percent of the vote while facing two serious opposition parties. Many believe the election was stolen (Wilson 1991).

With allusions to Mexico's turbulent past, menacing events shocked Mexico in 1994. First was an armed Indian rebellion in Chiapas, then kidnappings of two prominent businessmen and finally the stunning assassination of the 1994 PRI election candidate Luis Donaldo Colosio. Additionally, in the 1994 election year, the PRI was torn between election reforms and staying in power. With the potential for revolt if the PRI stole the election, events made a usually certain election unpredictable (Solis 1994).

In the most closely watched Mexican election in history, PRI candidate Ernesto Zedillo Ponce de Leon was declared the victor with roughly a 20 percent margin over his nearest competitor (Robberson, "Zedillo" 1994). While it could be argued that the Mexican people voted for continuity of the PRI and NAFTA, it must also be considered that Zedillo voters were not happy with the economic status quo and wanted changes (Robberson, "Mexican"

1994). Before Zedillo could take office on December 1, another assassination rocked Mexico. Francisco Ruiz Massieu, the second-highest ranking official in the PRI was gunned down in September (Hughes 1994).

The Devaluation

According to Fuentes (1995), at the time of the election, Mexico was also on the verge of a financial crisis. The liberalization of trade prior to the NAFTA agreement had allowed imports to surge. Consequently, currency reserves had fallen from a high of $30 billion to $6 billion and were being depleted rapidly. Furthermore, most foreign investment had been in the stock market. Approximately 15 percent of foreign investment was in capital construction. Investors began to realize that Mexico's growth was being fueled by printing money.

By mid-November, President-elect Zedillo urged Salinas to devalue the peso (Fuentes 1995). This inevitable outcome had been postponed due to the August election. The economic consequences of a devaluation would have had an adverse effect on the PRI remaining in power. Furthermore, before Salinas, the last three Mexican Presidents had devalued the currency at the end of their 6-year terms to spare the new president the unpopularity and trauma. Salinas left office without devaluing the currency and the burden was shifted to Zedillo.

In late December 1994, in response to a slumping economy and the possibility of a run on the peso, Mexico devalued its currency and allowed it to float *(The Wall Street Journal* 1995). The devaluation led to a 40 percent plummet in the value of the currency. A full-fledged crisis developed as capital fled and investor confidence waned. This action spooked

the American financial community because Mexico had been considered a model of growth (Walte and Montague 1995).

According to *The Wall Street Journal* (1995), the Clinton Administration proposed to Congress on January 12, 1995, a $40 billion emergency Mexican aid package in the form of loan guarantees to support the peso. Throughout the following two weeks, congressional support waned and the public was solidly against the proposal. On January 30, 1995, fear that the loan package was doomed caused a resurgent plummet in the value of the peso.

By January 31, 1995, Mexico was on the verge of a financial collapse (Walte and Montague, 1995). Without assistance, payment would have to be suspended on $17 billion in short-term debts. With the possibility of a world-wide financial panic, the Clinton Administration responded by executive order granting Mexico loans and loan guarantees in the form of access to $20 billion in the U.S. exchange stabilization fund. Tied with additional funds from the International Monetary Fund and commercial banks, the aid package totaled almost $50 billion. In the months following the devaluation, the loan guarantees have allowed Mexico's economic situation to stabilize.

The Economics of Devaluation

The December 1994 devaluation greatly impacted dairy product trade between the United States and Mexico. Consequently, it is worthwhile to briefly review some basic exchange rate concepts and their economic effects on the devaluating country.

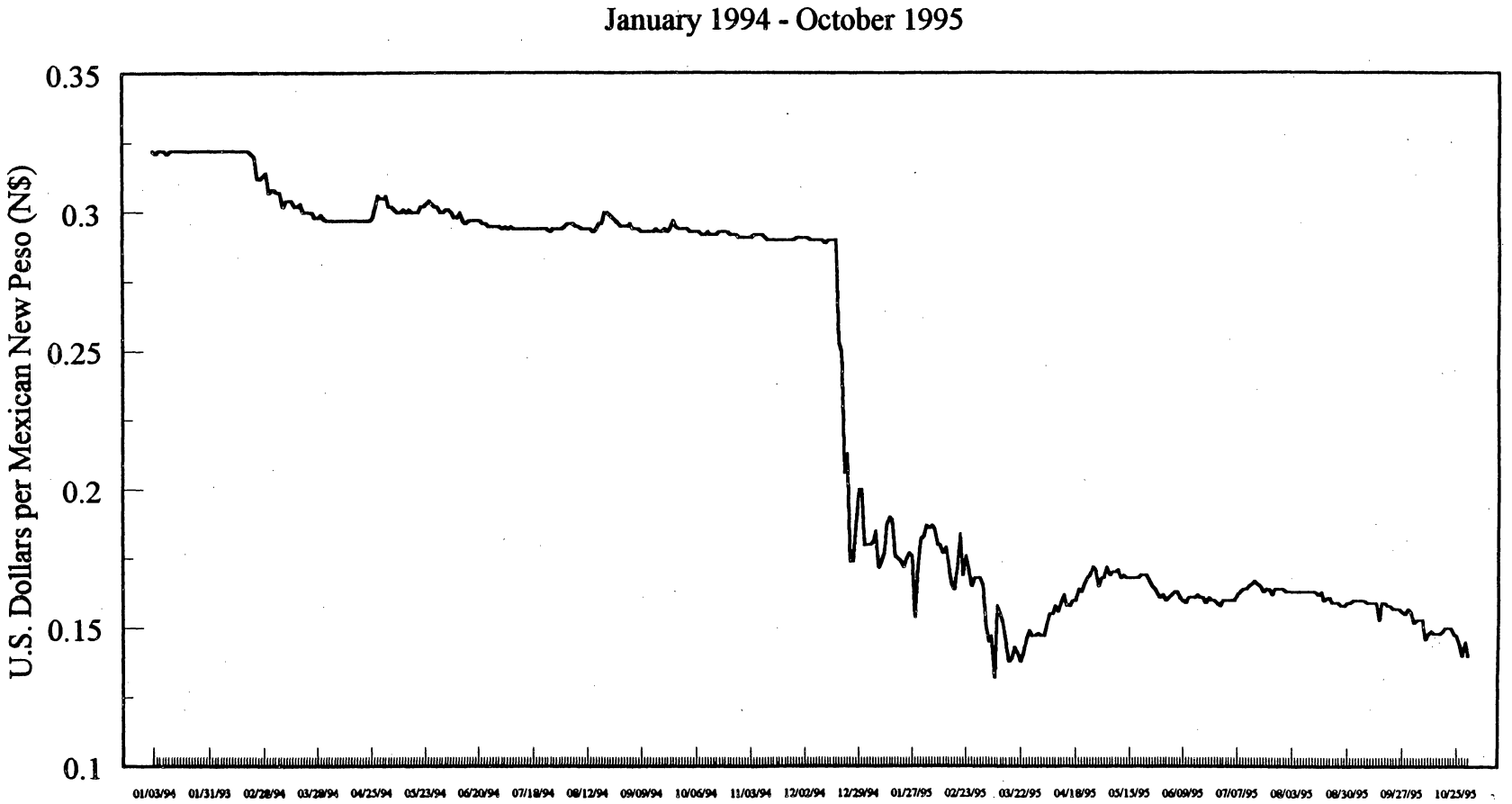
The foreign exchange rate is the rate in which two currencies are traded. In other words, the amount of one country's currency which is necessary to buy an amount of another

country's currency. For instance, in August 1994, an average N$3.381 Mexican New Pesos could be traded for $1.00 U.S. dollar.

Devaluation refers to a decision by a government, central bank or monetary authority to decrease the value of a currency relative to another currency. If a currency decreases in value relative to another currency in a market context it is referred to as depreciation. Devaluation and depreciation are two terms sometimes used interchangeably. In a strict economic context, devaluation occurs in a system of fixed exchange rates (monetary authority determined) and depreciation occurs when a currency has a floating exchange rate (market determined) (Mankiw 1992).

From November 1991 until December 1994, the Mexican government has maintained a floating exchange rate with predetermined higher and lower boundaries. If the exchange rate increased above or decreased below the predetermined band, the Mexican government would intervene to return the exchange rate to the determined value. After December 1994, the boundaries were removed and the peso floated freely. The value of the peso declined. As an example, an average N$3.381 New Pesos could purchase $1.00 U.S. dollar in August 1994. In March 1995, it would require an average N$6.777 New Pesos to purchase $1.00 U.S. dollar.

Figure 4 is a graph of the value of the new peso relative to the dollar from January 1994 to October 1995. Previously, in this text, exchange rates have been written in number of pesos per US$1.00. In this graph, the exchange rate was calculated as number of U.S. dollars per Mexican new peso so that the decline in value relative to the dollar could be noted. In this graph, it is easy to see the precipitous decline in value of the new peso relative to the



Source: Federal Reserve Statistical Service

Figure 4. Nominal Value of the Mexican New Peso Relative to the U.S. Dollar

dollar which occurred when the new peso was allowed to float in December 1994. Additionally, the fluctuations which occurred in the months following the free-fall are also apparent.

It is important to note that a currency devaluation initially affects only trade. If a currency is devalued by 50 percent, then goods purchased from abroad, such as packaged milk imported from the United States in a Mexican hypermarket, will now cost consumers in the country of the devalued currency twice as much. Additionally, after a devaluation, inputs purchased from abroad cost manufacturers twice as much. As an example, devaluation puts a cost-price squeeze on the progressive Mexican milk producer, who as a general trend imports feed, semen, replacement heifers and milking equipment. Consequently, one of the effects of a major devaluation is inflation. Over time, these inflationary pressures tend to force the process of economic readjustment with the effect of restoring the balance of trade based on competitive prices and economic conditions considering each country's comparative macroeconomic policies. The results of this study will clearly indicate this full cycle of adjustment.

The Mexican Dairy Sector

In the forefront of any discussion of the Mexican dairy sector is the fact that there are still many unknowns, making it a fertile research area. When data are available, they are often incomplete or dubious. Regulations governing production and manufacturing procedures are strict, but not enforced. Additionally, the situation facing researchers is compounded by the extreme diversity and level of technology in the dairy sector. Moreover, we have found that several mistakes have been made in analyzing the Mexican dairy economy. Perhaps this

is due to the lack of good data. It may also be due to the lack of objective analysis -- conclusions being based more on wishful thinking than on factual analysis.

This section analyzes the Mexican dairy industry in four subsections. The first subsection focuses on the Mexican producer, the second on the processor/manufacturer, and the third on the Mexican consumer. A final subsection discusses government dairy policies.

The Mexican Producer

Dairy production in Mexico is extremely varied with a trend toward different styles of operations accumulated in distinct geographical areas. The Mexican agricultural system is considerably more diverse than that of the United States. While most experts conclude that there are three main types of operations, they differ mildly in definition and significance. Some of the more recent attempts to classify the Mexican production sector are contained in Cox et al. (1994), Knutson et al., *NAFTA,* (1993), Hallberg et al. (1992), McClain and Harris (1991), and Schulthies and Schwart (1991). This study will utilize the SARH (the Ministry of Agriculture of Mexico) scheme which is contained in Cox et al. (1994).

The SARH scheme classifies Mexican producers into three production systems based on the breed of cattle utilized: specialized, semi-specialized and non-specialized.

Specialized dairies have an average herd size of 230 cows. Milk production in these herds ranges between 9,100 to 13,600 pounds of milk per cow per year. Schulthies and Schwart (1991) report that the larger confined dairies are analogous to the dry lot dairies in the American Southwest with some operations having 3,000 or more cows. Cox et al. (1994) report that the majority of these dairies use purebred Holstein serviced with artificial insemination. The cattle are fed forages and balanced rations. Milking and cooling

equipment is used with comparatively high health standards. This type of operation is clustered in the northern border states and near the major cities (Figure 5). While this type of operation comprises only 14 percent of the dairy cows in Mexico, they produce 55 percent of the milk (Knutson, et al. *NAFTA,* 1993).

Cox et al. (1994) identify a second generalized category: the semi-specialized dairy. Twenty-six percent of the Mexican dairy cows are in this category and they produce 17 percent of the milk. Semi-specialized dairies are common in southern and southwestern Mexico. This category includes two separate sub-groups: semi-confined farms and grazing family farms.

Semi-confined farms, have an average of forty cows with an typical production of 5,400 to 9,100 pounds of milk per lactation. They utilize primarily Zebu crossed with Holstein and Brown Swiss. The cows are maintained on native or improved pasture with supplemental rations. These farms lack the technological standards of the confined dairies. Milking is primarily by hand, there is no cooling equipment and sanitary standards are low (Cox et al. 1994).

The second sub-group of the semi-specialized dairies is the grazing family farm. This type of operation averages five cows with production around 680 to 1,600 pounds of milk per lactation. While Holsteins are utilized, they are of very poor quality. The cattle are grazed and fed forage (Cox et al. 1994).

Cox et al. (1994) identify a final category, the non-specialized, dual-purpose dairy. These operations are centered along the Gulf coast and in southern Mexico (Figure 5). While 45 percent of the dairy cows are in this category, they produce only 30 percent of the milk.

NOTE: This map represents regional generalizations.
Individual dairy types may be found throughout Mexico.

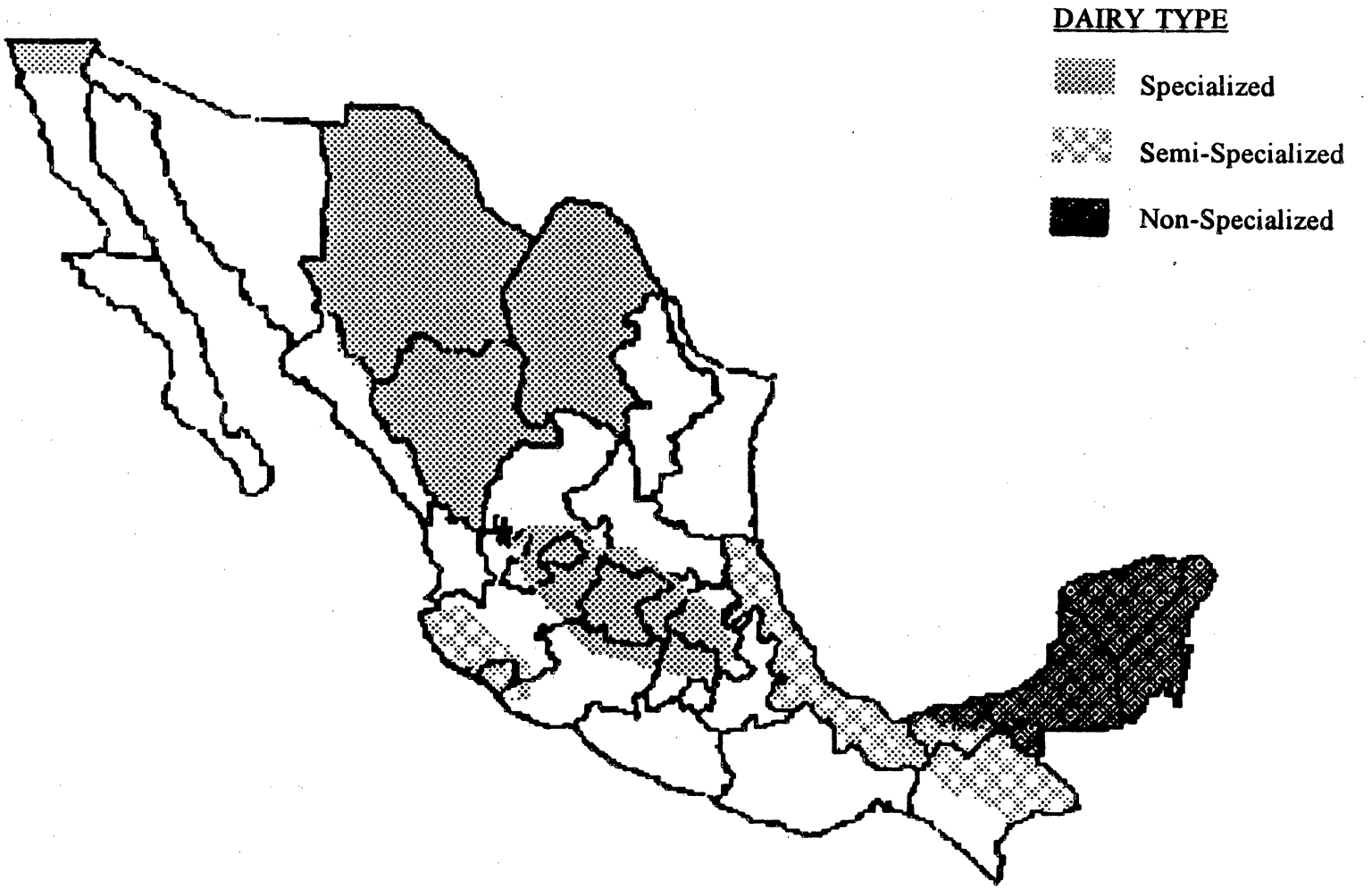


Figure 5. Map of Regional Dairy Production Types in Mexico

These farms produce both milk and beef, with cross-bred animals of Holstein, Swiss, "Criollo" and Zebu extraction. These farms average 80 cows with production around 1,700 pounds per lactation. The cows are mainly grazed, milking is by hand, and sanitation is very low.

Figure 6 is a map of Mexico showing an estimate of 1993 of milk production in million liters for each Mexican state. The government of Mexico estimated a 1993 production of 7,185 million liters. The largest milk production regions are concentrated in the northern states and the states surrounding Mexico City. The state of Jalisco leads milk production with 1,240 million liters. It is important to note that Chihuahua and Coahuila, which both border Texas, are estimated to be the second and fourth top milk producing states with an aggregate estimate for 1993 of 1,302 million liters of milk, or 18 percent of the total production.

The Role of Cooperatives

For the larger producers, cooperatives are at least as important in Mexico as they are in the United States. While their market shares may not be as large, in the absence of marketing orders, cooperatives are the primary pricing and market clearing apparatus. Cooperatives in Mexico may be either simple procurement operations that simply collect milk from producers and sells/distributes it in unprocessed form to noncooperative processors or procurement/processing cooperatives. Most of the procurement/processing cooperatives are involved in processing fluid as well as manufactured products. For procurement/processing cooperatives, membership is most likely selective. Two different share arrangements were recognized: one where producers are able to market the amount of milk in which they have

Figure 6. Mexican Milk Production by State, 1993 Forecast

shares for and another where producers are paid a higher price based on the number of shares they control.

The Mexican Milk Processing Sector

The Mexican milk processing sector has not been extensively researched and is not well understood by most researchers (Knutson et al. *NAFTA,* 1993). This lack of research is attributed to the fact that the industry had a high degree of government involvement and has only recently become privatized. The industry has been transformed from 1,100 government-owned enterprises in 1982 to 350 in 1990. Additionally, dairy products are processed by a relatively small number of large companies that comprise the majority of the output (the remainder is comprised of small local enterprises). The major packagers of fluid milk include Guilsa, Nestle and three cooperatives: Grupo Alpura, Grupo LALA and Boreal. In addition, there is a fringe of many small processors.

McClain and Harris (1991) relate that the Mexican government reported 2,800 processing plants in 1988. Of this number, 2,550 were very small cheese and butter manufacturers. There were 50 pasteurization plants and the remaining 200 produced non-fat dry milk, evaporated milk, yogurt or were milk rehydrators.

According to Schulthies and Schwart (1991), the processing sector is influenced by a lack of transportation and distribution. The raw milk of many small producers is neither refrigerated on the farm nor delivered to processing plants chilled. Additionally, practices which would be illegal in the United States are commonplace in Mexico. Water is frequently added to milk to extend its volume by both producers and processors. Furthermore, a practice known as filling is legal in Mexico if the product is correctly labeled. Filling involves the

substitution or addition of vegetable fats to supplement natural milk butterfat in manufactured dairy products and pasteurized milk. It has been estimated that up to 80 percent of the fat in milk products has been replaced by vegetable fats (Schulthies and Schwart 1991). This occurs because of the significance of imported NDM that is reconstituted and, most frequently, combined with vegetable fat.

The Mexican Consumer

Cox et al. (1994) concluded that the degree of diversity in the Mexican dairy market and the prevalence of data imperfections and limitations, make estimation of consumption of specific dairy products especially difficult. The report identified three different segments for the Mexican dairy product market:

- A "formal" sector which comprises sales made in supermarkets, ice cream shops, and other businesses, and sales to food and service operations.
- An "informal" sector composed of purchases from farmers who sell raw milk and cheese to city dwellers. Some analysts believe the "informal" sector composes up to 50 percent of all fluid milk consumption.
- A "government-subsidized" sector is headed by the government agency, Leche Industrializada Conasupo (LICONSIA), makes subsidized sales of milk to impoverished households.

In 1991, the aggregate dairy product consumption for Mexico was 46.4 percent of the United States. Since 1988, aggregate Mexican dairy product consumption has been growing at 2 percent annually, while consumption in the United States has been declining 0.2 percent. In 1991, Mexicans consumed 47 percent of the per capita U.S. fluid milk consumption, but

had almost three times per capita consumption of nonfat dry milk (NDM) compared to the United States. NDM is reconstituted by the Mexican government and blended with vegetable oil for distribution at subsidized prices to the poor (Knutson et al., *NAFTA*,1993).

Mexican cheese and butter consumption is well below the U.S. levels. In 1991, Mexicans consumed cheese at a per capita level 40 percent of the United States and consumed butter at a per capita level 20 percent of the United States. Butter and cheese are not items in the traditional Mexican diet. In comparison to Taco Bell and other American "Mexican food," cheese is consumed less sparingly. Beans have been preferred for protein needs over cheese (Knutson et al., *NAFTA*,1993).

Cheese and butter are seen as luxury food items for most of Mexico's population, which is poor (McClain and Harris, 1991). Fluid milk can also be considered a luxury item. According to a 1989 survey by the Mexican government, of domestically produced milk, 65 percent is consumed by high income consumers, 27.3 percent is consumed by middle income consumers, and only 8.7 percent is consumed by low income consumers which constitute 60 percent of the Mexican population. Another Mexican survey contained in Lorey (1990), studied monthly milk consumption in several municipal areas in 1984. Two trends were identified. The percentage of families consuming milk increased with income level, but the average consumption of milk per family was greater for lower income groups than for higher income groups.

National Dairy Promotion and Research Board (1991) report that most U.S. dairy products "have a strongly positive image among the Mexican populace." They suggest that

factors such as high quality, purity and consistency give U.S. products an edge over similarly priced Mexican counterparts.

Government Policies

Researchers have identified six main government policies which have influenced milk production in Mexico.

Land Use Legislation

One of the objectives of the 1910 Revolution involved land reform. Before the revolution, wealthy landowners used subjugated peasant labor to farm large plantations (haciendas). The Revolution redistributed the land and set criteria for its use. Agricultural land was classified as either privately owned or common land (ejidos). Privately-owned land was legally restricted by acreage limits for farming and ranching, with ranchers permitted larger holdings. If a landowner had property greater than the legal limit, it could be confiscated for ejidos use if need was demonstrated. This led to prudence on the part of private landowners who were more inclined to use their land for ranching than crop production and were handicapped from expansion (Cox et al. 1994).

Ejidos land was owned by the government, but managed by local communities. The right to use ejidos land was granted to users (ejidatarios) who could transfer stewardship to their heirs. Ejidatarios did not have title to the land, nor could they use it as collateral to obtain credit. It was the belief of the Mexican authorities that if ejidos land could be sold, it would eventually be controlled by the wealthy. The consequence of this policy was that ejidos were frequently small and impoverished with little opportunity for ejidatarios to improve their situation (Cox et al. 1994). Half of the arable land of Mexico was once ejidos

land which was also frequently of low quality and in two to ten acre parcels (Knutson et al., *NAFTA*, 1993).

In 1993, the Mexican constitution was reformed allowing for ejidatarios to decide whether they wish to maintain collective or opt for private ownership of ejidos land. If ejidatarios elect for ownership, they may buy and sell land. Either way, ejidos land may also now be used as collateral for loans. Furthermore, the restrictions on private land ownership are now abolished. A burgeoning land market is developing (Cox et al. 1994).

This recent revision of land reform is allowing Mexican producers to abandon the subsistence farming of the past and assume larger-scale operations (Knutson et al., *NAFTA*, 1993). Producers may now expand their operations by buying or renting land, including ejidos. Additionally, cropland can now be converted to pasture which was formerly illegal.

Price Controls

Until recently, standard milk prices were set by the Mexican government at the producer, processor and retail levels with a goal of keeping prices low for consumers. This situation was partially responsible for the decrease in production experienced in the early 1980s. Producers experienced a cost-price squeeze with rising input costs and fixed milk prices. They responded by liquidating their herds and reducing production (Knutson et al., *NAFTA*, 1993).

Since 1988, a new government pricing arrangement has been devised. The mechanism for determining milk prices was reformed at the producer level. Prices are now determined at the state or regional level by a commission consisting of federal and state government representatives, producers and processors. Attempts are made to set prices to reflect the local

economic conditions and costs and maintain pace with inflation. A maximum price is still set at the retail level, which is, in effect, a price ceiling on producers, but this policy could be relaxed soon (Cox et al. 1994).

Trade Regulations

As part of the broad-based effort to assume economic and industrial independence, trade restrictions were placed by the Mexican government on dairy products imported into Mexico. These restrictions include tariffs, import licenses, and a government monopoly on the importation of nonfat dry milk. These restrictions were reduced after Mexico's accession into GATT in 1986, and now are due to be modified into tariff-rate quotas which will be gradually eliminated under NAFTA (Cox et al. 1994).

Health Regulations

Mexico's health regulations affecting the dairy industry are comparable and in some instances, more stringent than those in the United States. These policies are contained in the *Diario Oficial*, Mexico's *Federal Register*. However, due to factors such as budgetary constraints, a lack of inspectors and with many of the smaller producers incapable of meeting the standards, they frequently go unenforced.

Restrictions on the Use of Grain in Feeds

Corn is the most important human dietary staple in Mexico. Until recently, Mexican law stipulated that grain of quality for human consumption could not be fed to livestock. This policy was enacted to ensure sufficient foodstuffs for the population and effectively acted as a subsidy to the small ejido farmers. As a consequence, most grain used for dairy rations was restricted in supply and has traditionally been of inferior quality or quantity. This policy

placed Mexican milk producers at a production disadvantage due to a poorly balanced ration (Schulthies and Schwart 1991).

Government Agencies

An agency of the Mexican Government, Compania Nacional de Subsistencias Populares (CONASUPO), has had the responsibility for assisting producers and supplying low-cost dairy products to the Mexican people. CONASUPO has provided technical assistance, support and a guaranteed price for raw milk to small producers (Schulthies and Schwart 1991). In addition, CONASUPO has the sole authority to import nonfat dry milk (NDM). A sub-agency of CONASUPO, Leche Industrializada Conasupo (LICONSA), has the responsibility for distributing the NDM to consumers. LICONSA reconstitutes 70 percent of the imported NDM and makes it available at subsidized prices to needy consumers in its distribution stores. The remaining 30 percent of imported NDM is sold by LICONSA to industry. NDM administered by LICONSA accounts for 17 percent of Mexico's milk market. With Mexico facing budgetary constraints, LICONSA has been realigned to primarily assist the poor with food subsidies. Most producer subsidies have now been abolished (Knutson et al., *NAFTA*, 1993).

Milk Producer Pricing Trends

Until recently, specific pricing arrangements for Mexican producers have not been extensively studied. Most large producers in Mexico are affiliated with a cooperative. The two major cooperatives in Mexico are Alpura and LALA. LALA is responsible for 55 percent of the milk marketed in Mexico.

Pricing Before the Devaluation

The following arrangement was afforded to members of the Alpura cooperative in Delicias in early 1994, which is believed to be representative of Alpura policies throughout most of Mexico. This time period was before the December 1994 devaluation of the peso. As opposed to cooperatives in the United States, which pay producers by volume and butterfat percentage and have no production limits, the large Mexican cooperatives have a base plan with two classifications.

One classification of quota shares is the founder level. Founders are either members or descendants of members who established the cooperative and have maintained their shares or members who purchased founder shares from the original owners. In early 1994, one founder quota share was valued at N$2,000 or about $645.00 in U.S. currency before the devaluation. A founder share entitles the member to market 24 liters per cow which was at that time valued at N$ 1.18 a liter or $15.37 per cwt U.S. equivalent. Through patronage, founders received N$1.20 to N$1.25 a liter or about $16.29 per cwt in U.S. equivalent. Milk marketed over the quota of 24 liters per cow was priced at N$1.00/liter or $13.03 per cwt in U.S. equivalent.

The second classification of quota shares is the supplier level. Suppliers must purchase membership in the cooperative by paying N$400 per cow each year or a pre-devaluation equivalent $129.00 in U.S. currency. They were entitled to market 24 liters per cow which, at that time, was valued at N$1.18 per liter or a pre-devaluation equivalent of U.S.$15.37 per cwt. As in the case of the founder share holders, suppliers received N$1.00 per liter for

overquota milk. An independent producer, one who is not a member of the cooperative and owns no shares, is offered the overquota price for their milk.

This arrangement may discourage new memberships as well expansion by members. In order to accrue the benefits of the cooperative, a producer must purchase, inherit founder shares, or annually purchase supplier shares. Otherwise, the producer receives the overquota price as an independent.

In the low-production, dual-purpose dairy-beef operations in the state of Chiapas, for N$25.00 a year (about $8.00 U.S.) producers are permitted to join a "cattle association" which is affiliated with a Nestle plant. Affiliated producers receive N$0.75 a liter for their milk and N$0.07 for hauling for a total of N$0.82 per liter (or about $9.77 per cwt in U.S. equivalent). Producers that do not have a marketing agreement with a plant must sell their milk at the prevailing market price. The market price fluctuates above and below the Nestle price and is extremely sensitive to the local supply.

Pricing After the Devaluation

Although Mexican producer prices have increased after the devaluation, they have not regained an equivalence in U.S. dollars to the levels which were seen before the devaluation. As an example, in August 1994 the quota price at the Alpura cooperative in Delicias was N$1.18/liter. In March 1995, the quota price in Delicias was N$1.30/liter. In U.S. equivalence, these prices represent $15.37/cwt and $13.03/cwt respectively. The overquota prices at Delicias were N$1.00/liter during August 1994 and N$1.30/liter during March 1995. These prices represent $13.03/cwt and $8.46/cwt respectively in U.S. equivalence. Producers in the Palenque area of Chiapas were receiving N$0.99/liter in March 1995 or about

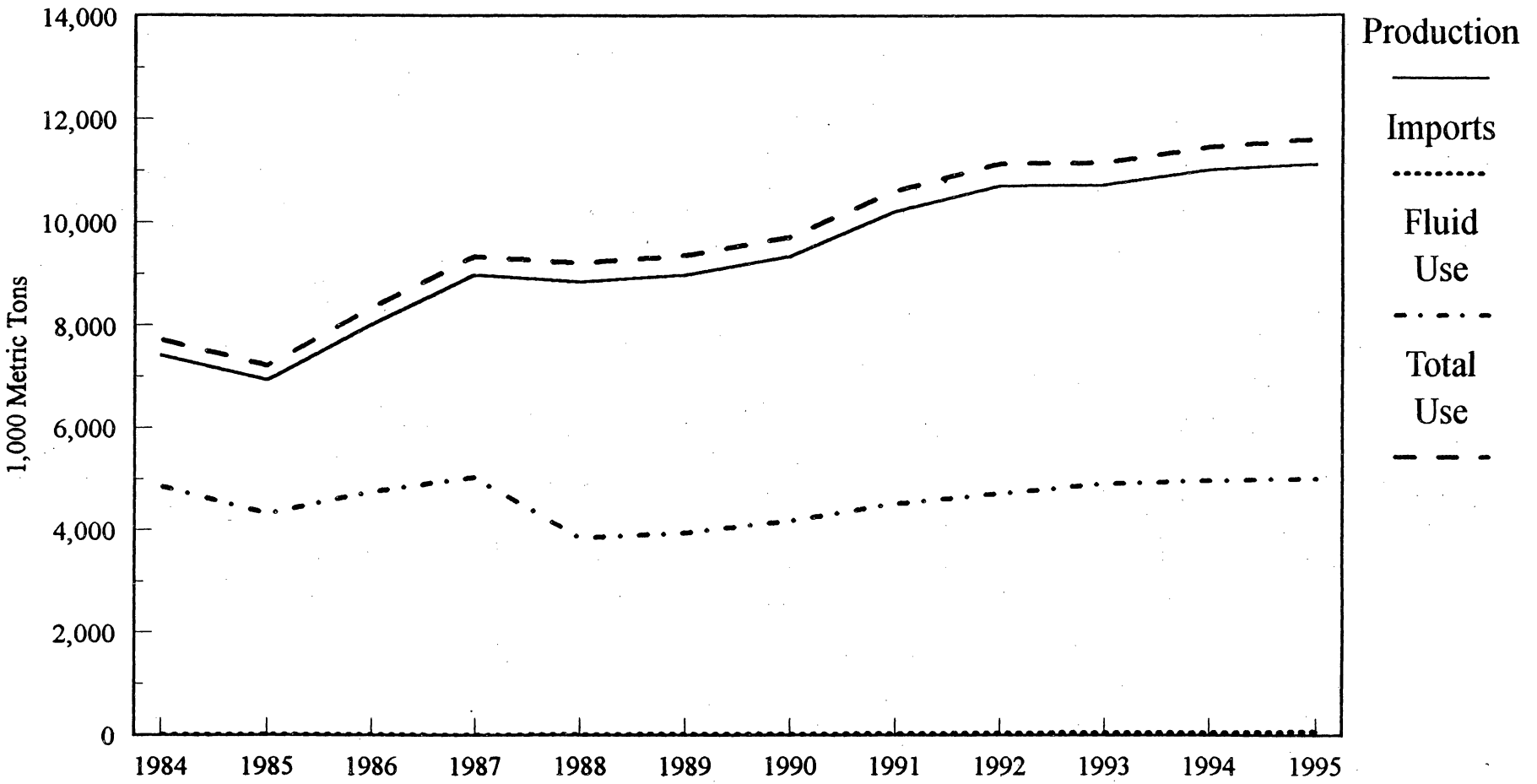
$6.45/cwt in U.S. equivalence. The September 1995 quota and overquota prices for Delicias were N$1.60/liter and N$1.44/liter, respectively. This is a U.S. equivalence of $11.15/cwt for the quota milk and $10.04/cwt for overquota milk.

Mexican Dairy Product Trends

Mexican government policies have directly effected milk production in Mexico. Milk production declined in the early 1980s as a result of government price controls (Figure 7). A rebound occurred in the late 1980s as a result of imports of quality cows from the U.S. dairy herd termination program, price liberalization, technological change and increases in scale of operations. Milk production has increased in Mexico since the mid-1980s and is expected to continue this trend (Knutson et al. *NAFTA*, 1993).

Mexico has faced production shortfalls and has been a net importer of dairy products for over thirty years. Although milk production has been increasing in Mexico, it has been outpaced by consumption. Mexico has relied on imports to fulfill its needs. Although appearing to be seemingly insignificant in Figure 7, Mexican imports of fluid milk have been rising. Examining Figure 8, purchases by Mexico of packaged fluid milk from the United States steadily increased from the early 1990s to the December 1994 devaluation and then declined sharply. A rebound has been noted since that time, although after the devaluation, fewer consumers can afford to buy imported products. Fluid milk imports to Mexico from the United States include cyclical purchases (centered in the Winter months) of bulk milk and cream (Figure 8).

Import trends for the major dairy commodities are presented in Figures 9, 10 and 11. These trends are described below:

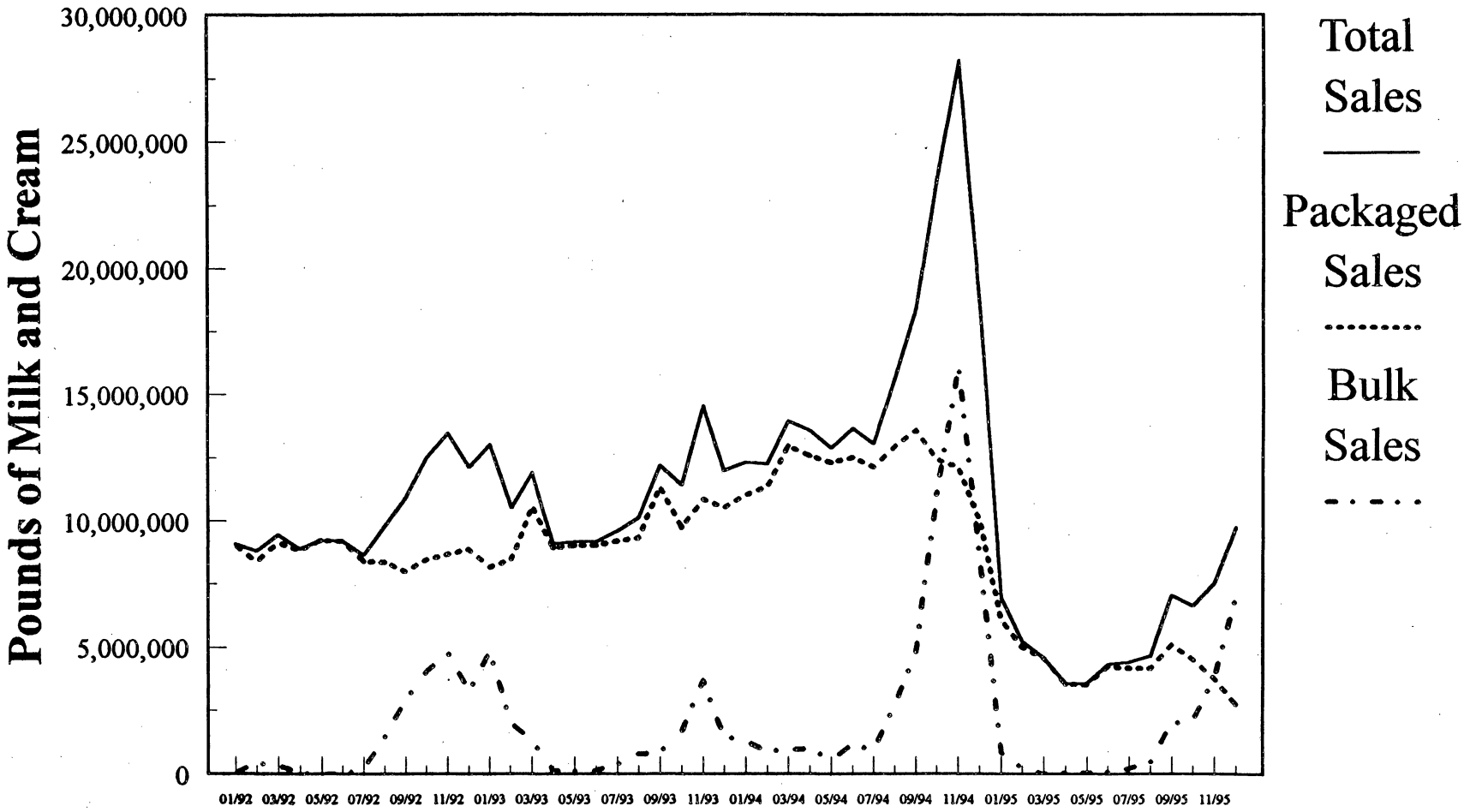


Source: USDA/ERS

Figure 7. Fluid Milk Trends in Mexico, 1984-1995

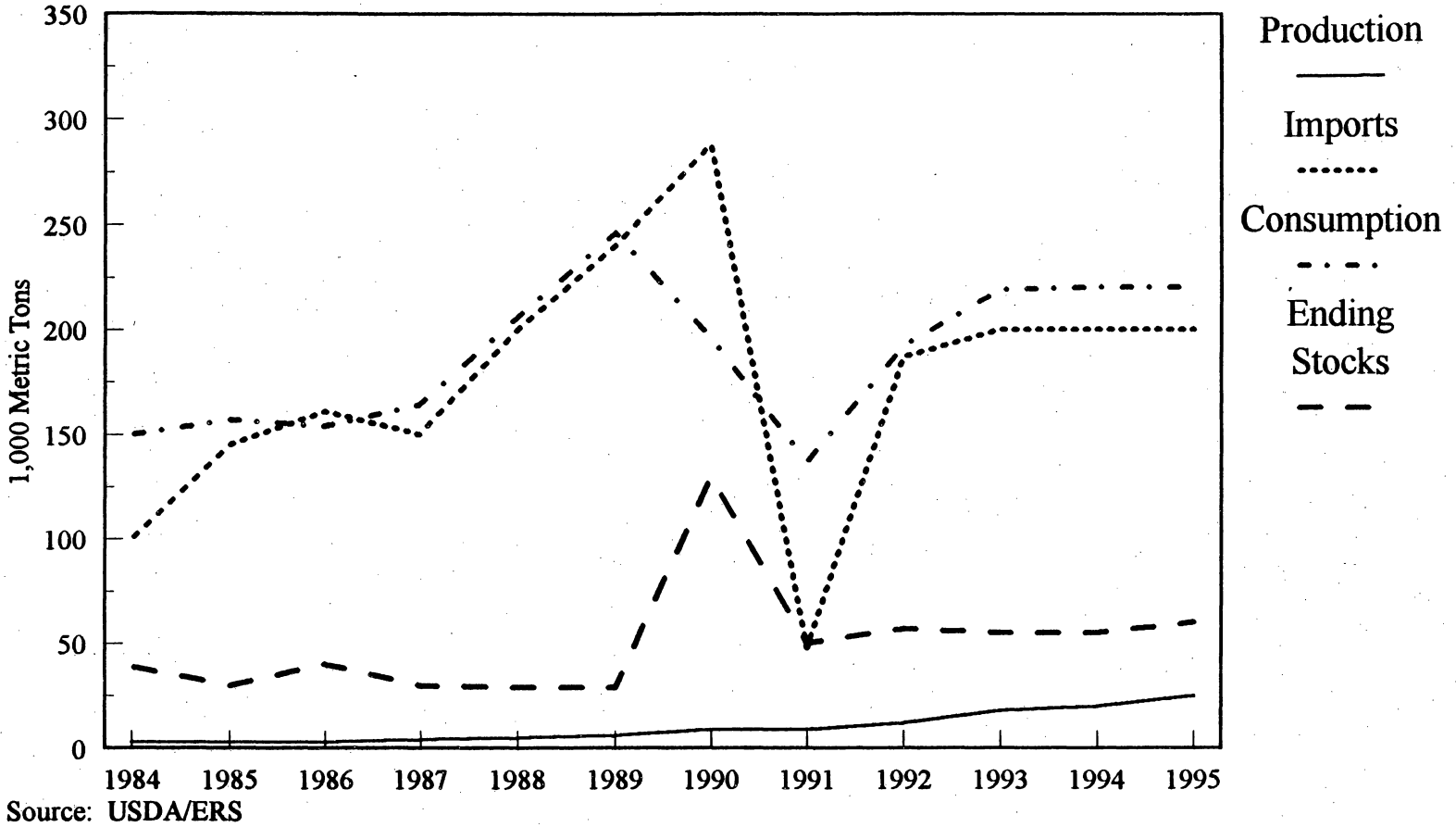
TRENDS IN U.S. EXPORTS OF FLUID MILK TO MEXICO, JANUARY 1992-DECEMBER 1995

From Orders 106, 126, 131 & 138 and Non-Pool Sources



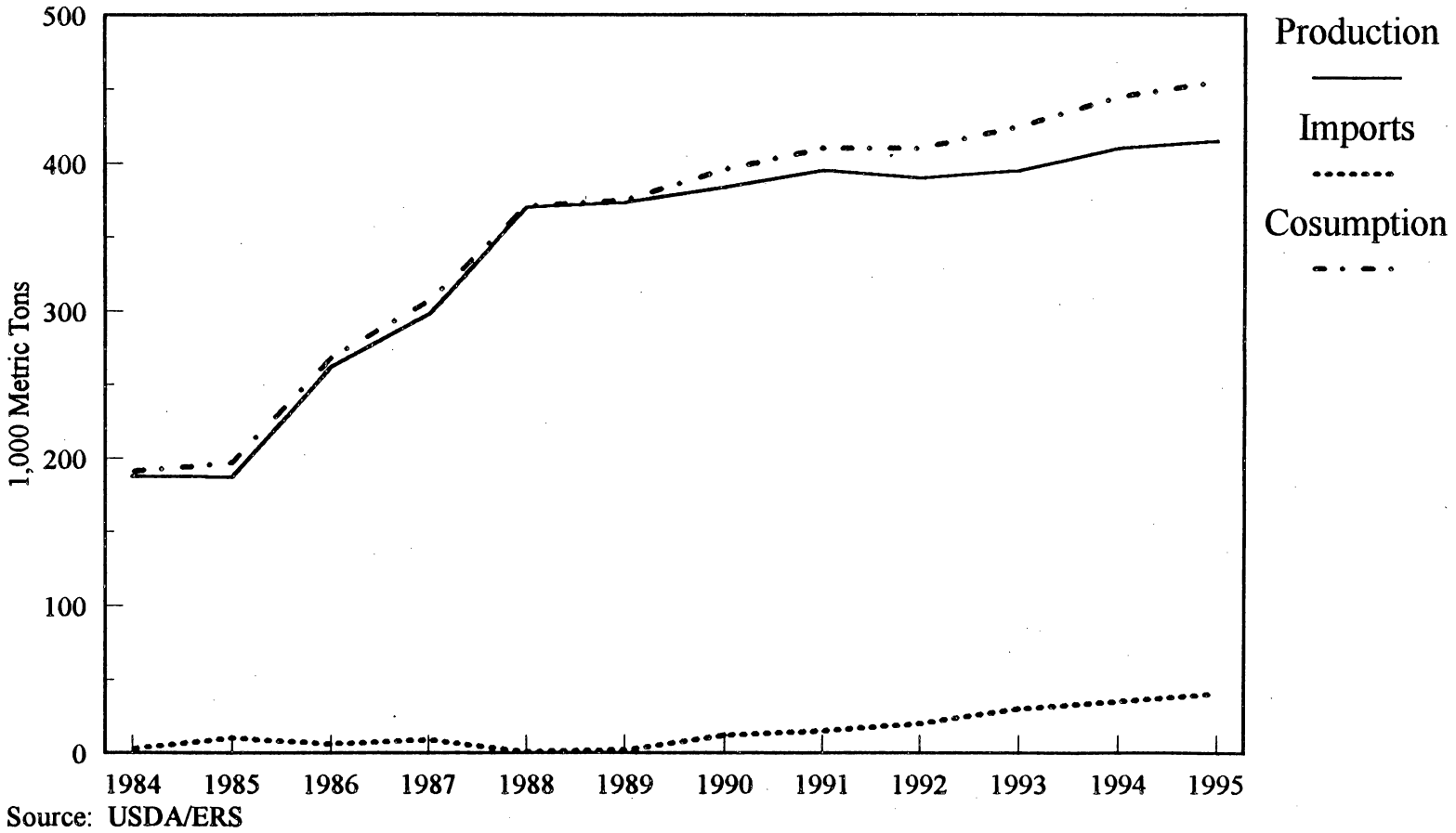
Source: USDA/AMS
Note: Data has been categorized to protect its confidentiality

Figure 8. Trends in U.S. Exports of Fluid Milk to Mexico



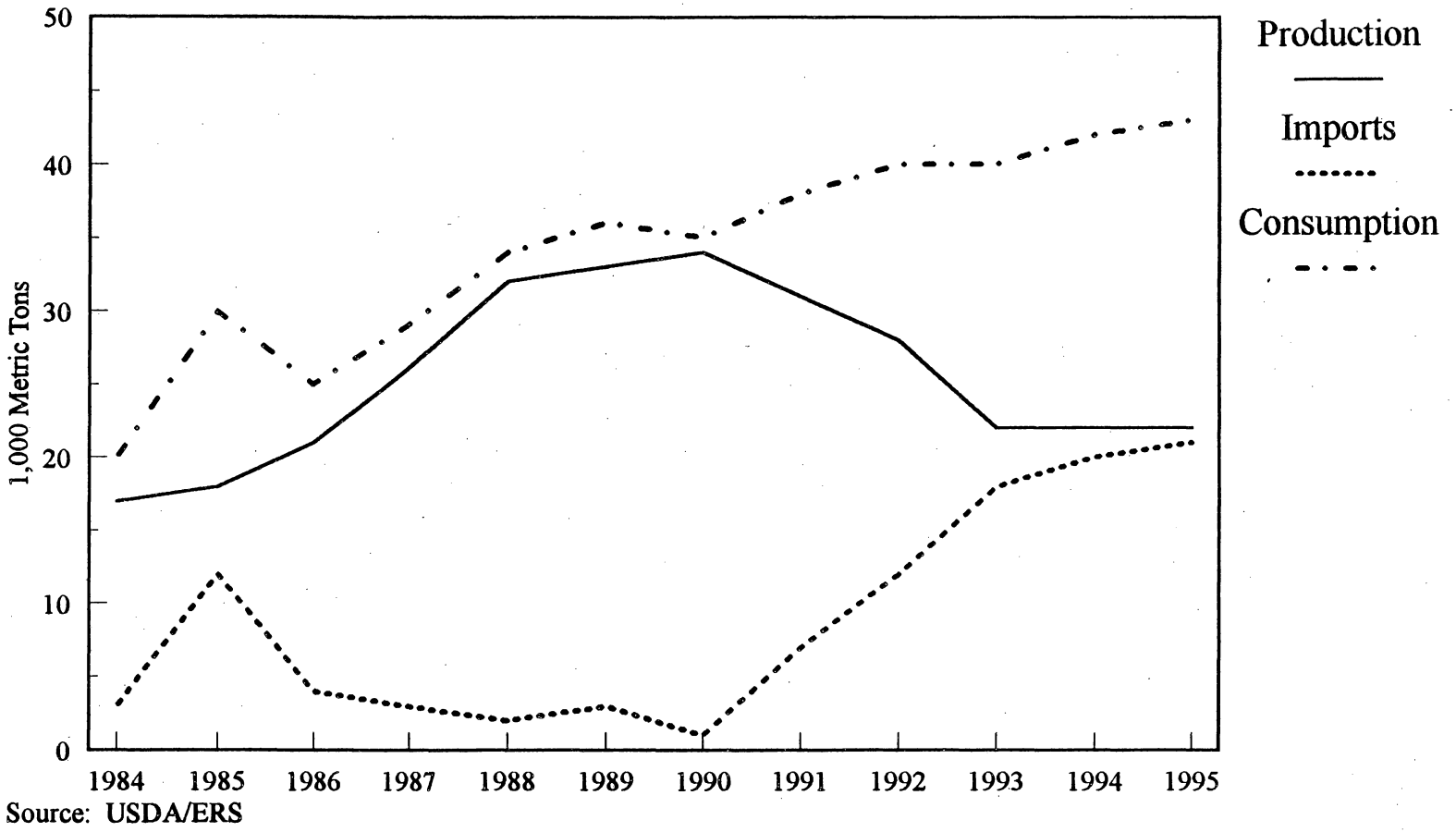
Source: USDA/ERS

Figure 9. Non-fat Dry Milk Trends in Mexico, 1984-1995



Source: USDA/ERS

Figure 10. Cheese Trends in Mexico, 1984-1995



Source: USDA/ERS

Figure 11. Butter Trends in Mexico, 1984-1995

- Throughout the last twelve years, most of Mexican consumption of NDM has been imported (Figure 9). Much of the 200,000 metric tons of imports have been blended with vegetable fat and used to fill the milk needs of lower income consumers.
- Over the same period, domestic cheese production in Mexico kept pace with consumption until 1989 (Figure 10). Recently, imports of cheese have been used to supplement domestic production shortfalls. Production has leveled off as consumption has increased. Mexico consumed an estimated 455,000 metric tons of cheese in 1995.
- Butter consumption in Mexico steadily increased from 1984 through 1995 with periods of significant imports fulfilling domestic production shortfalls centered around 1985 and 1993 (Figure 11). Butter consumption in Mexico is estimated to have been 43,000 metric tons in 1995.

The North American Free Trade Agreement

A free trade agreement (FTA) is a treaty between one or more nations to reduce or eliminate barriers to trade (Knutson et al., *Policy*, 1993). It advances the concept of freer trade which involves the elimination of tariffs, import licensing, and quotas, as well as allowing for freer market access among signature countries. The United States negotiated its first FTA with Israel in 1985. A second FTA was negotiated with Canada, the largest trading partner of the United States in goods and services, becoming effective on January 1, 1989 (Knutson et al., *Policy*, 1993). This section will address the development of liberalized trade with Mexico and the subsequent North American Free Trade Agreement (NAFTA). Subsections will discuss the background of the NAFTA agreement, its overall content, and the specific dairy provisions.

Background of the North American Free Trade Agreement

Facing economic catastrophe in 1986, Mexico sought membership in the General Agreement on Tariffs and Trade (GATT) to gain access to international markets for its products. As conditions for Mexico's accession into the GATT, Mexico began to reduce trade barriers and Mexican imports of U.S. products steadily increased. In 1987, a Bilateral Framework Agreement on Trade and Investment was agreed upon to improve consultations between the United States and Mexico. In October 1989, a negotiating mechanism known as the Trade and Investment Facilitation Talks was agreed upon to move beyond consultation to problem resolution. Studies indicated that both the United States and Mexico benefit from the reduced restrictions and increased trade (Mendelowitz 1991). In June 1990, the Facilitation Talks were succeeded by an announcement by Presidents Salinas and Bush that both countries would initiate negotiations for a free trade agreement (Sek 1992).

The NAFTA Negotiations

The formal proposal for a bilateral free trade agreement between the United States and Mexico was announced by President Salinas of Mexico in August 1990. In February 1991, Canada announced that they would join the process and discussions began for a trilateral free trade agreement. Formal negotiations between the three countries began on June 12, 1991. Fourteen months later, on August 12, 1992, President Bush announced that negotiations had concluded with an agreement (Sek 1992).

After the election defeat of President Bush, the prospects for the enactment of NAFTA began to look bleak. While Bill Clinton as a candidate said that he would support NAFTA, it was conditional on the negotiation of supplemental agreements to strengthen labor, ensure

environmental protection, and to prevent unexpected import surges. Throughout 1993, criticism of the agreement by organized labor and Congressional Democrats began to mount. Even after the negotiation of side-agreements, the critics felt they did not go far enough to guarantee a "fair" agreement for the United States. In September, with NAFTA appearing all but dead, Clinton began an all-out lobbying effort to resurrect the agreement. With an unconventional assortment of foes and supporters, NAFTA was actively debated both publicly and in the U.S. Congress. NAFTA ultimately passed both the House and the Senate. In the House, the vote was especially tumultuous with three-fifths of the Democratic members voting against the agreement. NAFTA was enacted on January 1, 1994.

Content of The Agreement

The NAFTA text is a comprehensive document of over 2,000 pages comprising 22 chapters and 7 special annexes. Some of the major provisions concern definition of rules of origin, elimination of tariffs for motor vehicles and parts, reduction in barriers for textiles and apparel items, expansion of the telecommunications, insurance and financial services trade, protection of international property rights, and expanding agricultural trade (Office of the Press Secretary 1992).

Through various timetables, NAFTA immediately eliminates or phases out all tariffs on goods meeting North American rules of origin within 15 years. Where practical, most non-tariff barriers such as quotas and import licenses were eliminated by the three countries. Provisions were established to provide for dispute settlement and emergency safeguards to protect threatened domestic industries. Additionally, signataries were allowed to set individual sanitary and phytosanitary measures and technical standards (Sek 1992).

Agricultural Provisions of NAFTA

NAFTA is an important agricultural agreement for the United States. In fiscal year 1993, Canada and Mexico were the second and third largest importers of agricultural products from the U.S. following Japan (USDA/FAS, *FATUS,* Jan./Feb. 1994). The reduction of trade barriers should increase agricultural trade among the three countries. Within the scope of agricultural trade, NAFTA actually encompasses two separate bilateral agreements. One agreement is between the United States and Mexico and the other is between Canada and Mexico. Agricultural trade between the United States and Canada was negotiated in the earlier Canada-United States Free Trade Agreement (CUSTA) (Rosson et al. 1992).

After the enactment of NAFTA, the United States and Mexico agreed to promptly eliminate tariffs on about one-half of agricultural goods; those which already had low duties. The tariffs on remaining agricultural goods will be eliminated over various timetables with the most sensitive products receiving special safeguards and eliminating tariffs over a period of 10 to 15 years. Some products will receive phased tariff-rate quotas. The United States agreed to reduce all non-tariff barriers, including Section 22 quotas (Rosson et al. 1992).

Besides reducing barriers to trade, one important goal of a free trade agreement is to insure that rules of origin for the products of signatory countries are in effect. Rules of origin prevent member countries from purchasing goods from outside of the free trade zone and then trading within the zone with preferential benefits. The rules of origin negotiated for NAFTA were placed in immediate effect. As a general standard, foreign materials may not make up more than 7 percent of the value of the product. Some other products, such as sugar and cotton, have special rules of origin. In the dairy sector, an important rule of origin exists.

Mexican imports of NDM from the European Community cannot be manufactured into cheese or yogurt and traded into the United States under the provisions of NAFTA (Rosson et al. 1992).

The Dairy Trade Provisions in NAFTA

NAFTA provisions concerning dairy trade comprise three categories: market access, sanitary and phytosanitary standards and rules of origin. These provisions affect only the United States and Mexico, since Canada chose to exclude its dairy sector from the agreement.

Market Access Provisions

The market access provisions of the agreement allow for the transition from the status quo to freer trade. During implementation, Mexico will convert its milk powder import licenses into transitional tariff rate quotas (TRQ). The TRQ will phase out over 15 years with the United States being allowed to initially ship up to 40,000 metric tons of skim and whole milk powder duty free. Imports over the TRQ will incur a 139 percent tariff. During the phase out, the permitted duty free amount will increase and the over-quota penalty tariff will decrease. Likewise, the United States will eliminate all tariffs on dairy products imported from Mexico including those which were guarded with Section 22 quotas. Similarly, U.S. TRQs will be phased out over 15 years.

Sanitary and Phytosanitary Standards

The sanitary and phytosanitary NAFTA provisions allow the host countries to maintain current health, safety and environmental standards. State and local jurisdictions may implement more strenuous standards as long as they are rooted in established scientific fact. This prevents the establishment of surreptitious trade distorting standards. With NAFTA, U.S.

imports of Mexican dairy products must meet the same health and inspection standards as their U.S. counterparts.

Rules of Origin

Rules of origin provisions permit only milk and milk products originating in the United States or Mexico to be traded under the favorable procedures of NAFTA. This does not preclude economic arbitrage with non-member imports such as stair-stepping. That is, Mexico could, for instance, import dairy products from countries outside of the agreement for domestic consumption and then export indigenous milk or milk products to the United States through the provisions of the NAFTA.

Recent Developments in Dairy Trade After The Initiation of NAFTA

After the initiation of NAFTA, it appears that the dairy trade has been one of the most problematic sectors of commerce. In May 1994, in Baja California, packaged milk from a U.S. creamery was impounded and not released until the day before its expiration date due to the lack of "proper" permits (House 1994). In Chihuahua, a virtual milk war broke out. First, Mexican producers in Chihuahua secured a 9 percent import tax on U.S. milk. Then claims arose that U.S. producers were unfairly subsidized and that unreasonable health rules prevent Mexican milk from being sold in the United States (Myerson 1994). During the summer of 1994, substantial harassment was directed at importers of U.S. milk. Drivers were beaten and detained, trucks were torched and products destroyed (Associated Press 1994). Mexico denied that these actions originated with Mexican dairymen (Myerson 1994).

In October 1994, the Mexican government proposed placing a 48-hour shelf life limit on imported pasteurized milk. According to Mexico, the reason for this proposal was to improve

its food safety standards. United States government and dairy industry officials considered this proposal a poorly disguised nontariff trade barrier. It would be nearly impossible for U.S. manufacturing plants to market milk in Mexico within two days of pasteurization (Lee 1995). This measure was not implemented. Following devaluation of the peso as of July 1995, and a marked decrease in U.S. exports of milk to Mexico, dairy trade squabbles between the United States and Mexico have cooled off considerably.

Review of Prior Studies and Research Concerning NAFTA and the Mexican Dairy Sector

Many difficulties face researchers in analyzing the economic incentives for increased trade in milk and milk products between the United States and Mexico. Foremost is that much is unknown about the Mexican dairy sector. This problem is compounded by a lack of accurate data and statistics. Furthermore, since NAFTA has only recently been implemented there is not, as yet, an indication of trends resulting from the agreement. Several pertinent studies have been written examining the dairy trade between the U.S. and Mexico in the context of a free trade agreement. These studies fall into two main groupings. The first category are studies prepared when NAFTA was still in an embryonic concept/negotiations stage. Most of these papers were released in 1991. The second grouping are those studies and reports released shortly before, or shortly after the ratification and implementation of NAFTA. These studies were prepared with knowledge of the provisions of the proposed agreement.

Studies and Reports Released Prior to The NAFTA Negotiations

The Mendelowitz report (1991) was prepared at the request of the House Agriculture Committee by the General Accounting Office of the United States Government. The report

investigated four areas. First, it examined the progress of the removal of agricultural trade barriers between the United States and Mexico. Second, the study explored the benefits of increasing trade. Third, it reviewed the remaining barriers to trade which would be the focus of free trade negotiation agreements. Fourth, it surveyed the views of U.S. producer organizations concerning liberalization of agricultural trade.

Although this study had a broad scope, it established several pertinent findings:

- It concluded that both Mexico and the United States would benefit from increased bilateral agricultural trade.
- It established that milk and milk products trade was significant with Mexico being the fourth largest U.S. agricultural market by value in 1989.
- It elicited comments from U.S. dairy industry representatives about delays caused by numerous inspections and the documentation required by the Mexican government, problems with payment and credit experienced by exporters, and concern over opening the U.S. market to Mexican dairy products.

A study performed for the National Dairy Promotion and Research Board (1991) was designed to primarily assist U.S. dairy product exporters in accessing the Mexican market. It provided a country overview of Mexico, demographics and communications, how to get into the Mexican market, and a discussion of the channels of distribution. The report indicated that in 1990, Mexico was the number one importer of U.S. fluid milk, NDM, and yogurt, number two importer of ice cream and number three importer of cheese and butter. It established that prospects for increased exports of U.S. dairy products are good, but are confined to a middle to upper class niche of approximately 31 million people. Finally, the

study described the characteristics of the various value-added dairy product markets and reviewed procedures for U.S. exporters to enter the Mexican market.

Schulthies and Schwart (1991) concluded that the high population growth rate and the potential for increases in per capita income with a free trade agreement and other reforms in Mexico held the potential for increased market expansion for U.S. dairy products. As per capita income increases, it is anticipated that the Mexican dairy product composition would change from NDM to finished products such as cheeses, ice cream and yogurt. Assuming increased trade of fluid milk and milk products and increased demand for milk in Mexico, the report listed those expected to benefit from a free trade agreement as being U.S. producers, Mexican processors and consumers, and large Mexican producers. Small Mexican producers were estimated to be negatively impacted. The milk quality of small producers is frequently not as dependable as larger producers and their costs of getting milk from the farm to the processor are higher. Furthermore, many small producers would most likely be unable to meet the higher quality standards the free trade agreement would encourage. Finally, the report suggested that since Mexico had already reduced many tariffs and trade barriers, the free trade agreement may have little effect in the dairy sector.

The McClain and Harris study (1991) was prepared for the American Farm Bureau Federation. It reviews the Mexican dairy industry including its producers and processors, as well as government policies which influence the dairy sector and analyzes trends in the dairy trade between the United States and Mexico.

The report projects Mexican milk supply and demand. Assuming both low and high rates of milk production and consumption growth in Mexico, the authors conclude that

consumption should continue to exceed supply. The report concludes that ultimate impacts of the free trade agreement would depend on actions of other trading countries and the magnitude of rising income in Mexico. The overall effects of implementation of a free trade agreement would be national in scope, but would effect different sectors differently. The report also discusses issues which should be resolved in free trade negotiations.

Studies and Reports Released After The Initial Negotiations

Rosson et al. (1992) relates the history and development of the NAFTA agreement. The report additionally summarizes the NAFTA agricultural provisions and provides specific fact sheets for individual commodities. The study relates the technical procedures establishing tariff rate quotas for milk powder and cheese. No conclusions are drawn regarding the consequences of NAFTA.

Knutson et al., *NAFTA* (1993) describes milk production in Mexico. It relates Mexico's diverse production systems, milk prices, costs of production, and factors influencing production, production of dairy products, and prospects for increased production. The paper indicates that significant investment, modernization and restructuring will have to occur for Mexico's dairy sector to be competitive with the United States.

The Knutson paper projects the potential for increased milk consumption as Mexico's population increases with half of the population currently under 20 years of age. Additionally, it discusses dairy imports into Mexico. The paper indicates that significant imports of nonfat dry milk has occurred as demand has outstripped supply. Also, due to the geographical location of the United States, the study finds an advantage for U.S. exports of fluid milk, ice cream and yogurt, breeding stock and milking equipment. Finally, the paper

indicates important issues raised include NAFTA's interaction with the federal milk marketing order system, membership in U.S. cooperatives and export subsidy policy.

Cox et al. (1994) developed a model to project the future of Mexico's milk deficit. The study utilized a hedonic spatial equilibrium model to analyze U.S. dairy sector. Four scenarios were generated. The most realistic scenario consisted of medium growth in Mexican dairy production (5-7 percent) and a high consumption growth (4 percent). Under these assumptions, aggregate total revenue for U.S. farms was very small, a growth of .1 percent.

Outlaw et al. (1994) analyzed the short and immediate-term effects of the implementation of NAFTA on the U.S. dairy industry. First, it reviewed the provisions of NAFTA which affect the dairy sector. The authors suggest that the effects of NAFTA will ultimately depend on factors such as the changes in consumption and production in Mexico and policies of countries which also trade with Mexico. It is indicated, though, that the prospects for increased trade are favorable due to its geographical location and considering Mexico's increasing population and potential for rising income. Also, with Mexico's milk deficit, it is doubtful that exports will enter the United States in quantity.

The paper also discusses issues raised by NAFTA which are currently unresolved. One issue concerns the effects of the integration of the Mexican and U.S. dairy sectors on the U.S. system of federal milk orders. Other issues raised concern cooperatives and U.S. export subsidy policy. The authors conclude that NAFTA should offer many positives and only a few negatives for the U.S. dairy industry.

Outlaw and Nicholson (1994) concludes that over the next five years, Mexico will be a viable market for U.S. dairy exports. The authors list the geographical proximity of the United States as giving it an advantage to U.S. producers. It is suggested that trends in Mexico of rising population and income, along with continued production shortfalls should continue. The paper concludes that there is also much potential for U.S. investment in Mexican production systems.

Dairy Issues Raised By NAFTA

The following section is based on the issues raised in two related papers, Knutson et al., *NAFTA,* (1993) and Outlaw et al. (1994). These are issues which have developed from the increased trade in milk and milk products between the United States and Mexico and are accentuated by the implementation of NAFTA. Assisting in the resolution of these issues is the fundamental objective of this study.

Federal Milk Marketing Order Issues

Both Knutson et al. *NAFTA* (1993) and Outlaw et al. (1994) relate that many complex unresolved federal marketing order issues exist. Some of the more relevant are discussed below.

- **The Pricing and Pooling of Raw Milk Sold to Mexico**

  Since federal milk marketing orders price milk utilized within an order by use, how should milk being exported to Mexico be priced? Mexico has not shown a willingness to allow the verification of the class use of exported U.S. milk in Mexican plants. Likewise, to incorporate Mexico into the federal order system as an bona fide separate "federal order" would be impractical. With U.S. producers along the border clearly

being in a position to directly export milk to Mexico, this milk could be packaged in Mexico and returned to the United States to compete with U.S. processors. Furthermore, should proceeds from sales to Mexico be pooled across the order? If premium prices have to be shared with the entire order, there is no incentive to pool raw milk sold to Mexico.

- **The Pricing of Packaged Milk Sold to Mexico**

  It has been established that significant quantities of packaged milk are being exported to Mexico. Likewise with the pricing of raw milk, the pricing of packaged milk creates problems. The way in which packaged milk is priced in the United States influences its profitability in Mexico. If it is priced the same as for regular fluid milk (Class I) it will not have as large an advantage in the Mexican market as if it is priced at a lower class or at the market blend. Furthermore, if it is priced low in the United States the potential exists for packaged milk exported to Mexico to move back across the border and compete with a federal order.

- **Treatment of Milk Exported from Mexico and Sold in the United States**

  For Mexican milk and dairy products to be sold in the United States, the producer must meet all U.S., state, and local health and safety standards. There are Mexican producers that could meet these standards. If this occurs, how should this milk be incorporated into the federal order system? Furthermore, some Mexican cooperatives have a two-tiered pricing plan and if the United States price is low enough, overquota Mexican milk could economically compete with U.S. producers.

Cooperative Issues

Knutson, et al. *NAFTA* (1993) and Outlaw, et al. (1994) address several cooperative issues. Since cooperatives have evolved with the federal order system and have significant influence on dairy policy, the resolution of these cooperative issues could influence trade.

- Should cooperative members be allowed to market milk directly to Mexico and still remain members?
- Should or will Mexican producers be allowed to become members of U.S. cooperatives?
- Will U.S. and Mexican cooperatives merge and assume an international role?

CHAPTER III

DAIRY PRODUCT PRICE COMPETITIVENESS ON THE UNITED STATES BORDER WITH MEXICO

This chapter analyzes the competitiveness of U.S. and Mexican consumer milk prices in Juarez, Chihuahua, Mexico and El Paso, Texas. Consumer prices for packaged milk, comparable varieties of cheese, butter, yogurt and ice cream were collected from U.S. supermarkets and Mexican hypermarkets in each city on August 10, 1994, March 11, 1995 and September 15, 1995. These values were then standardized to common units and converted to U.S. dollars.

Data Limitations

Several factors affect the extrapolatory value of this study.

- The scope of this study was limited to the twin cities of Juarez, Chihuahua, Mexico and El Paso, Texas. While retail prices in several U.S. border cities could be compiled from U.S. government sources, this data was not available from Mexico. Consequently, the cost of primary data collection limited the scope of the study. However, there is no reason to anticipate that competitive price behavior would be different at other major border cities.
- Rigorous statistical techniques for data selection were not utilized. Three large supermarkets/hypermarts of different chains were chosen at random in both El Paso and Juarez. The stores were sampled on August 10, 1994, March 11, 1995 and again on September 15, 1995. A fourth U.S. supermarket was substituted for an original store on the second sampling due to the purchase and consolidation of one of

the stores by another chain. No attempt was made to select these stores with formal scientific or statistical methods. Furthermore, the data were collected only on three separate occasions. This is not average or time-series data, but simply point estimates.

- For the purposes of this analysis, it is assumed that corresponding Mexican and U.S. milk and milk products are perfect substitutes, or in other words, corresponding products are the same product when in reality they may differ widely in quality and composition. As an illustration, one gallon of Mexican vitamin D fortified and homogenized whole milk was presumed to be the same as one gallon of U.S. vitamin D fortified and homogenized whole milk and so forth. At a U.S. milk bottling plant, for instance, U.S. federal inspectors sample at random production runs of whole, homogenized Vitamin D milk, to ensure that it has the required 3.25 percent butterfat and 8.25 percent milk solids as specified by federal product identity regulations. Any deviations in product composition from human or mechanical error are identified. Consequently, U.S. dairy products on the market are likely to meet their product identity requirements. Mexican dairy products are less likely to meet their specified product composition standards as mandated by the *Diario Oficial,* Mexico's *Federal Register.* Discussions with U.S. dairy technology and marketing specialists have related that Mexican milk is customarily extended with water and filled with vegetable fat. In addition, Mexican milk may have excessive bacteria counts and antibiotics may be present. While Mexican regulations and standards may be even stricter than those in the United States, they are not believed to be routinely enforced.

- While given sufficient financial support, it would be possible to sample and test milk and dairy products and then value them with a standardized butterfat-skim accounting technique, it is apparent this would be meaningless. There are just too many inconsistencies. For instance, the Mexican government has set a price ceiling on Mexican packaged fluid milk. U.S. packaged fluid milk is priced by the market. Furthermore, a large percentage of Mexican fluid milk is reconstituted from milk powder and is not fresh. Price, quality and intangible factors, such as product perception, influence the purchases of consumers.

Case Study Site Advantages

Several advantages of the case study site of El Paso, Texas and Juarez, Chihuahua, Mexico are:

- While El Paso and Juarez are divided by the international boundary, their populations have similar ethnic and cultural characteristics and are "twin cities".
- This region is centrally located along the geographical boundary.
- Large areas of dairy production are in proximity to both areas.
- Conflicts have occurred in this area over the marketing of U.S. packaged milk across the border.

Sampling Procedures

August 10, 1994

Three stores of different chains were selected at random and visited in both Juarez and El Paso on August 10, 1994. The three Juarez stores visited were hypermarkets. These stores handled both groceries and general merchandise. The three U.S. supermarket were standard

American medium to large sized supermarkets-- a regional chain, a national chain and a local warehouse supermarket.

In each of the stores selected, varieties of fluid milk, non-fat dry milk, cheese and butter were located. Product identity, volume and price were recorded for each of the products of interest. Special attention was paid to recording compositional data, if it was available.

March 11, 1995

To evaluate the effects of the December 1994 devaluation of the peso on retail prices, a second sampling was taken on March 11, 1995. The three original Mexican hypermarkets were visited as well as three El Paso supermarkets. The local warehouse store had been purchased and consolidated by a retail chain. Consequently, a supermarket from another local chain was substituted.

As was the case in the previous sampling, varieties of fluid milk, non-fat dry milk, cheese and butter were located in the various stores. Information such as product identity, volume and price were recorded for each of the products of interest along with compositional data, if it was available. On this occasion, retail prices and volumes for ice cream and yogurt were also recorded.

September 15, 1995

To ascertain longer-term market price adjustments in the wake of the December 1994 devaluation of the peso, a third survey of retail prices was undertaken on September 15, 1995. Once again, the three Mexican hypermarts were visited. One of the hypermarts had been expanded on the same site and another had been greatly expanded at a different location. The three U.S. supermarkets were additionally sampled. As was the case previously, prices and

volume for varieties of fluid milk, non-fat dry milk, cheese, butter, ice cream and yogurt were recorded.

Data Standardization

The data was organized in table form and standardized into common units and monetary denominations. The standard units chosen for fluid milk were the United States convention of dollars per gallon. Hard manufactured products (non-fat dry milk, butter and cheese) were standardized into dollars per pound. Finally, ice cream and yogurt were standardized into common retail units of dollars per half-gallon and dollars per eight ounce containers respectively. A daily exchange rate of $3.10 new pesos per $1.00 U.S. dollar was used in the standardization calculations for August 10, 1994, $N6.0 new pesos per $1.00 U.S. dollar for March 11, 1995 and N$6.27 new pesos per $1.00 U.S. dollar for September 15, 1995.

The conversion of Mexican fluid milk into U.S. dollars per gallon was simplified due to Mexican milk being marketed in 3.78 liter containers which are equivalent to U.S. gallon containers. For these calculations, the Mexican price was simply divided by the exchange rate.

For manufactured products which were marketed in new pesos per gram, these values must be multiplied by 1,000 grams per kilogram then divided by 2.2046 pounds per kilogram and then divided by the exchange rate. Similar standardization calculations were developed for ice cream and yogurt prices.

Comparison of the Mexican Retail Outlets

All three U.S. supermarkets were very well stocked in dairy items. As a general rule, more dairy items of all categories could be found in U.S. supermarkets than in Mexican

hypermarts. Of each dairy product category, generally a house brand and several other competing national brands were available for purchase. To protect the confidentiality of the retail outlets, the six stores will be identified as Mex-1, Mex-2, Mex-3, U.S.-1, U.S.-2 and U.S.-3.

Mex-1

Of the three Mexican stores visited, the Mex-1 had the largest selection of grocery items. The grocery section of the Mex-1 appeared to be completely comparable to what consumers would experience at a medium-sized U.S. grocery store. U.S. brands predominated in the packaged milk. The milk was in a row of refrigerated, glass-doored cases. Of the three Mexican stores which were visited, the Mex-1 was the only one to initially have 2 percent low-fat milk.

The Mex-1 offered an astronomical variety of cheeses. Mexican hypermarkets have traditionally marketed cheese in a manner similar to the way U.S. supermarkets market lunchmeats and deli items. The cheeses are plastic-wrapped in a bulk barrel or bar form behind a refrigerated glass counter. Samples of the product were offered to prospective buyers and purchases were cut from the bulk barrel or bar, weighed and then wrapped. It should be noted that on the September 15, 1995 sampling, cheeses individually wrapped in plastic were available. This type of marketing had not been noted by the authors before in the hypermarts visited.

The remaining dairy products were marketed similarly to U.S. supermarkets. Products needing refrigeration were in open refrigerated cases and non-perishable items were on standard grocery shelves. In the Mex-1, margarine and spreads were extremely prevalent.

Judging by the area of shelf space, margarine would seem to be overwhelmingly preferred to butter by these consumers, but four brands of butter were available. Non-fat dry milk was hard to find and had limited shelf space. There was a wide selection of baby formula, sour cream and yogurt.

Mex-2

The original Mex-2 visited appeared to be an older store with less variety, particularly, of packaged fluid milk and greater selection of non-fat dry milk and milk powder, perhaps servicing a lower income population. There were a considerable variety of cheeses. Only two types of butter were available. The original Mex-2 was supplanted by a considerably larger structure at a different location in Juarez. On the September 15, 1995 sampling, the newer Mex-2 was observed to have considerably greater variety in all grocery items. The Mex.-2, marketed dairy products in the same fashion as the Mex-1.

Mex-3

Of the three Mexican stores visited, the Mex-3 originally had the least selection in both type and quantity of dairy items. There were only three varieties of fluid milk and only one brand of non-fat dry milk. There was a very limited selection of cheese and no butter. On the September 15, 1995 sampling, the Mex-3 was observed to have expanded at the same site. Consequently, a greater variety of grocery items were observed. The stock was marketed in a manner consistent with the marketing of grocery items in the United States.

Comparison of Retail Price Results

The following are summary tables of the retail prices. A product type, such as fluid whole milk, is listed in each table which compares the prices of each of the six retail outlets

for each of the three visits. If a product or brand was not located at a retail outlet during the sampling, it is denoted by the symbol "---".

Fluid Milk

Table 1 is a summary of the standardized fluid milk prices. All packaged milk must be assumed to be at its standard butterfat test. Mexican whole milk of "high-quality" should contain 3.39 percent butterfat and U.S. packaged whole milk should contain a minimum 3.25 percent butterfat. From label information, U.S. Brand A whole milk with a Spanish label, should test at 2.94 percent butterfat. This is similar to the Mexican standards for "preferred" whole milk which according to regulations should have a minimum of 2.91 percent butterfat. The U.S. low-fat packaged milk should test at 2.0 percent butterfat.

Mexican Brand X and Mexican Brand Y are two brands of Mexican produced milk. The prices of these two products were the same across three hypermarts on all three sampling occasions. The label of Mexican Brand Z indicated that this milk was imported, but packaged in Mexico.

The only Mexican hypermart which carried U.S. brands of packaged milk with English labels was the Mex-1 hypermart. U.S. Brand A English-label Vitamin D Whole Milk was $0.22 higher before the devaluation on August 10, 1994 and $0.61 higher three months after the devaluation on March 11, 1995 than U.S. Brand A Spanish-label Vitamin D Whole Milk. Package analysis would suggest that the English-label would test at U.S. minimum butterfat (3.25 percent) which has a higher butterfat percentage than the Spanish label (2.94 percent). U.S. Brand A English-label Vitamin D Whole Milk was not observed during the September 15, 1995 sampling.

Table 1. Comparison of Standardized Prices of Fluid Milk Found at Multiple Retail Outlets, August 10, 1994, March 11, 1995 and September 15, 1995

Supermarket Product	Date	Mex-1	Mex-2	Mex-3	U.S.-1	U.S.-2	U.S.-3
Mex. Brand X	08/10/94	$2.45	$2.45	$2.45	---	---	---
Spanish Label	03/11/95	$1.55	$1.55	$1.55	---	---	---
Whole Milk	09/15/95	$1.72	$1.72	$1.72	---	---	---
Mex. Brand Y	08/10/94	---	$2.74	$2.74	---	---	---
Spanish Label	03/11/95	---	$1.70	$1.70	---	---	---
Whole Milk	09/15/95	$1.90	---	---	---	---	---
Mex. Brand Z	08/10/94	---	---	---	---	---	---
Imported	03/11/95	---	---	---	---	---	---
Whole Milk	09/15/95	$1.90	---	---	---	---	---
U.S. Brand A	08/10/94	$2.68	---	---	$3.19	$2.69	$3.15
English Label	03/11/95	$2.16	---	---	$3.29	$3.29	$2.89
Whole Milk	09/15/95	---	---	---	$3.29	$3.27	---
U.S. Brand A	08/10/94	$2.46	$2.55	---	---	---	---
Spanish Label	03/11/95	$1.55	$1.92	---	---	---	---
Whole Milk	09/15/95	$2.10	---	$2.10	---	---	---
U.S. Brand B	08/10/94	$2.68	---	---	$3.17	$3.49	$3.28
English Label	03/11/95	$2.16	---	---	$3.19	$3.59	$2.29
Whole Milk	09/15/95	$2.19	---	---	$3.25	$3.57	$2.59
Supermarket	08/10/94	---	---	---	$2.59	---	$2.39
Store Brands	03/11/95	---	---	---	$2.79	---	$1.99
Whole Milk	09/15/95	---	---	---	$2.79	$1.97	---
U.S. Brand C	08/10/94	---	---	$2.65	---	---	---
Spanish Label	03/11/95	---	---	---	---	---	---
Whole Milk	09/15/95	---	---	$2.14	---	---	---
U.S. Brand A	08/10/94	$2.68	---	---	$3.19	$3.11	$3.25
English Label	03/11/95	$2.16	---	---	$3.29	$3.19	$2.29
Low-fat Milk	09/15/95	---	---	---	---	---	---
U.S. Brand A	08/10/94	---	---	---	---	---	---
Spanish Label	03/11/95	---	---	---	---	---	---
Low-fat Milk	09/15/95	---	$2.10	$2.10	---	---	---
U.S. Brand B	08/10/94	---	---	---	$3.19	$3.59	$3.38
English Label	03/11/95	---	---	---	$3.25	$3.69	$2.99
Low-fat Milk	09/15/95	$2.19	---	---	---	$3.69	$2.99

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00

Note: Milk prices are standardized to U.S. dollars per gallon.

The Mex-1 hypermart additionally carried U.S. English labeled low-fat milk. U.S. Brand A English label low-fat milk was observed on August 10, 1994 and March 11, 1995. U.S. Brand B English label low-fat milk was observed on September 15, 1995. During all three occasions, the prices of these English label packaged low-fat milks were identical to the corresponding price of the same brand of English label packaged whole milk. U.S. brand milk with Spanish labels were observed in all three hypermarts, but no U.S. brand was observed at all three hypermarts during any of the three samplings.

Overall, retail packaged milk in Mexico was priced lower both before and after the devaluation than packaged milk in the United States. Additionally, brands which could be directly compared between a U.S. and a Mexican retail outlet such as U.S. Brand A and U.S. Brand B, were approximately $0.50 cent less expensive in the Mexican hypermarkets before the devaluation on August 10, 1994 and approximately $1.00 less expensive after the devaluation on March 11, 1995 and September 15, 1995 than in the United States. As a general trend, U.S. prices remained relatively constant over the three samplings. Prices of packaged milk in Mexican hypermarkets, when converted to U.S. units and currency, lost considerable value when comparing the August 10, 1994 prices with the March 11, 1995 prices due to the effects of the devaluation. The September 15, 1995 prices indicated a move toward "parity" with the pre-devaluation August 10, 1994 prices.

Cheese

Surprisingly, no direct comparison of cheese could be made on the two prior samplings. U.S. cheese types were not found in the Mexican hypermarkets and only one Mexican type cheese was located in a U.S. supermarket. On the third sampling, Mexican varieties of cheese

and Mexican brands were located in U.S. supermarkets and U.S. type cheeses and U.S. brands were located in Mexican supermarkets. Table 2 is a summary of retail prices of chihuahua and cheddar cheeses. Table 3 summarizes prices of oaxaca, asadero, mozzarella and muenster prices.

Mexicans take great pride in their cheeses. There are many brands and varieties of the traditional cheeses. Oaxaca is a rindless unripened mozzarella-type string cheese which is marketed as a plaited ball. Oaxaca is compositionally the same as asadero, another Mexican cheese. A distinction can be made that asadero is generally kneaded into a loaf. Both oaxaca and asadero are melting-type cheeses. Chihuahua is a traditional cheese of the mennonite settlers of Mexico and is derived from the English cheese, chester. Chihuahua can be considered to be similar to American cheddar. Muenster is a semi-soft brick cheese of Germanic origin. It has excellent melting qualities (USDA/ERS, 1978).

There were especially many brands and varieties of chihuahua (Table 2) available in the Juarez hypermarts. The retail prices of chihuahua cheese were priced similarly per pound with the prices U.S. consumers paid for cheddar types before the devaluation on August 10, 1994. After the devaluation, on March 11, 1995, chihuahua was priced clearly less. Chihuahua prices on September 15, 1995 when converted to U.S. dollars had undergone some readjustment to their pre-devaluation value.

The single example of oaxaca cheese located on August 10, 1994 (Table 3) was valued relatively high in comparison to a U.S. mozzarella (a similar type of cheese) before the devaluation. After the devaluation on March 11, 1995, the oaxaca was valued slightly less

Table 2. Comparison of Standardized Prices of Chihuahua and Cheddar Cheese Varieties Found at Multiple Retail Outlets, August 10, 1994, March 11, 1995 and September 15, 1995

				Supermarket			
Product	Date	Mex-1	Mex-2	Mex-3	U.S.-1	U.S.-2	U.S.-3
Mex. Brand A	08/10/94	$3.40	---	---	---	---	---
Queso	03/11/95	$1.43	---	---	---	---	---
Chihuahua	09/15/95	---	$1.73	---	---	---	---
Mex. Brand B	08/10/94	$2.04	---	---	---	---	---
Queso	03/11/95	$1.20	---	---	---	---	---
Chihuahua	09/15/95	---	---	---	---	---	---
Mex. Brand C	08/10/94	---	---	---	---	---	---
Queso	03/11/95	---	---	---	---	---	---
Chihuahua	09/15/95	$2.82	$2.62	---	---	---	---
Mex. Brand D	08/10/94	---	---	---	---	---	---
Queso	03/11/95	---	---	---	---	---	---
Chihuahua	09/15/95	$2.60	---	---	---	---	---
Mex. Brand E	08/10/94	---	---	---	---	---	---
Queso	03/11/95	---	---	---	---	---	---
Chihuahua	09/15/95	$2.56	---	---	---	---	---
Mex. Brand F	08/10/94	---	---	---	---	---	---
Queso	03/11/95	---	---	---	---	---	---
Chihuahua	09/15/95	---	$2.15	---	---	---	---
Mex. Brand G	08/10/94	---	---	---	---	---	---
Queso	03/11/95	---	---	---	---	---	---
Chihuahua	09/15/95	---	$2.75	---	---	---	---
Mex. Brand H	08/10/94	$2.04	---	---	---	---	---
Queso	03/11/95	$1.48	---	---	---	---	---
Chihuahua	09/15/95	---	---	$1.63	---	---	---
Mex. Brand I	08/10/94	---	$2.03	---	---	---	---
Autentico	03/11/95	---	$1.40	---	---	---	---
Menonita	09/15/95	---	---	---	---	---	---
Mex. Brand J	08/10/94	---	---	$3.92	---	---	---
Queso	03/11/95	---	---	$1.56	---	---	---
Chihuahua	09/15/95	---	---	---	---	---	---
Supermarket	08/10/94	---	---	---	$3.29	$3.18	---
Store Brands	03/11/95	---	---	---	$2.99	$2.99	---
Cheddar	09/15/95	---	---	---	$2.99	$3.58	$1.89
U.S. Brand W	08/10/94	---	---	---	$3.34	$4.19	$3.18
Mild	03/11/95	---	---	---	$2.99	$3.50	$3.02
Cheddar	09/15/95	---	---	---	$3.53	$3.78	---

Table 2. Comparison of Standardized Prices of Chihuahua and Cheddar Cheese Varieties Found at Multiple Retail Outlets, August 10, 1994, March 11, 1995 and September 15, 1995 (Continued)

		Supermarket					
Product	Date	Mex-1	Mex-2	Mex-3	U.S.-1	U.S.-2	U.S.-3
U.S. Brand X	08/10/94	---	---	---	$2.39	---	---
Longhorn	03/11/95	---	---	---	$2.99	---	---
Cheddar	09/15/95	---	---	---	---	---	---
U.S. Brand Y	08/10/94	---	---	---	---	---	$2.99
Mild	03/11/95	---	---	---	---	---	$2.79
Cheddar	09/15/95	---	---	---	---	---	---
U.S. Brand Z	08/10/94	---	---	---	---	---	$2.88
Longhorn	03/11/95	---	---	---	---	---	$2.79
Cheddar	09/15/95	---	---	---	---	---	---
U.S. Brand Z	08/10/94	---	---	---	---	---	$2.89
Mild	03/11/95	---	---	---	---	---	$2.69
Cheddar	09/15/95	---	---	---	---	---	---

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00

Note: Cheese prices are standardized to U.S. dollars per pound.

than a U.S. mozzarella. On the third sampling, on September 15, 1995, three different brands of oaxaca were located in the Mexican hypermart, Mex-1 and an additional brand in the U.S. supermarket, U.S.-2. The oaxaca located in the Mexican hypermart was priced clearly less than the oaxaca in the U.S. supermarket.

A generic brand asadero was found in a U.S. supermarket before the devaluation on August 10, 1994. Relative to the other cheese vanities, it was priced less per pound. No examples of asadero were observed in any of the retail outlets during the March 11, 1995 sampling. On September 15, 1995, asadero cheese was located in one Mexican hypermart (Mex-3) and two U.S. supermarkets (U.S.-1 and U.S.-3).

An interesting trend was the abundance of muenster cheese located in both Mexican hypermarts and U.S. supermarkets. While no examples of muenster cheese were observed on either the August 10, 1994 or March 11, 1995 samplings, observations were recorded in

Table 3. Comparison of Standardized Prices of Oaxaca, Asadero, Mozzarella and Muenster Cheese Varieties Found at Multiple Retail Outlets, August 10, 1994, March 11, 1995 and September 15, 1995

				Supermarket				
Product	Date	Mex-1	Mex-2	Mex-3	U.S.-1	U.S.-2	U.S.-3	
Mex. Brand V	08/10/94		---	---	$3.92	---	---	---
Queso	03/11/95		---	---	$2.37	---	---	---
Tipo Oaxaca	09/15/95		$2.10	---	---	---	---	---
Mex. Brand W	08/10/94		---	---	---	---	---	---
Queso	03/11/95		---	---	---	---	---	---
Oaxaca	09/15/95		$2.35	---	---	---	---	---
Mex. Brand X	08/10/94		---	---	---	---	---	---
Queso	03/11/95		---	---	---	---	---	---
Oaxaca	09/15/95		---	---	---	---	$4.79	---
Mex. Brand Y	08/10/94		---	---	---	---	---	---
Queso	03/11/95		---	---	---	---	---	---
Oaxaca	09/15/95		$2.79	---	---	---	---	---
Generic	08/10/94		---	---	---	---	---	$1.99
Asadero	03/11/95		---	---	---	---	---	---
Cheese	09/15/95		---	---	---	$2.69	---	$1.99
Mex. Brand Z	08/10/94		---	---	---	---	---	---
Asadero	03/11/95		---	---	---	---	---	---
Cheese	09/15/95		---	---	$2.31	---	---	---
Supermarket	08/10/94		---	---	---	$3.19	$2.89	---
House Brands	03/11/95		---	---	---	$3.29	$2.29	---
Mozzarella	09/15/95		---	---	---	---	$3.78	---
U.S. Brand A	08/10/94		---	---	---	---	---	$2.79
Mozzarella	03/11/95		---	---	---	---	---	---
Cheese	09/15/95		---	---	---	---	---	$2.79
U.S. Brand B	08/10/94		---	---	---	---	---	$2.48
Mozzarella	03/11/95		---	---	---	---	---	$2.49
Cheese	09/15/95		---	---	---	---	---	$2.48
U.S. Brand C	08/10/94		---	---	---	---	---	---
Muenster	03/11/95		---	---	---	---	---	---
Cheese	09/15/95		$2.17	---	$1.87	---	$1.89	---
Supermarket	08/10/94		---	---	---	---	---	---
House Brands	03/11/95		---	---	---	---	---	---
Muenster	09/15/95		---	---	---	$3.19	$2.69	---
U.S. Brand D	08/10/94		---	---	---	---	---	---
Muenster	03/11/95		---	---	---	---	---	---
Cheese	09/15/95		---	---	---	---	$1.89	---
U.S. Brand E	08/10/94		---	---	---	---	---	---
Muenster	03/11/95		---	---	---	---	---	---
Cheese	09/15/95		---	---	---	---	$1.89	---

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
Note: Cheese prices are standardized to U.S. dollars per pound.

Mex-1, Mex-3, U.S.-1 and U.S.-2 on the September 15, 1995 sampling. Particularly, U.S. Brand C muenster was observed in retail outlets Mex-1, Mex-3 and U.S.-2. Additionally, supermarket U.S.-2 had four different brands of muenster cheese. Of the two muenster cheeses observed in Mexican hypermarts, when converted to U.S. dollars per pound, one was priced slightly less than the least-priced U.S. observations and the other was priced less than the two Supermarket House Brands of muenster. It should be noted that considerable quantities of muenster were observed. As many as twenty of the large muenster wholesale "bricks" were observed in one supermarket.

Butter

Table 4 is a comparison of butter prices in U.S. supermarkets and Mexican hypermarkets. On the August 10, 1994 sampling, butter had approximately the same retail value on both sides of the border. After the devaluation, on March 11, 1995, Mexican butter was valued less in comparison to U.S. retail prices. On the September 15, 1995 sampling, butter in Mexican hypermarts had a value equivalent in U.S. dollars per pound to the pre-devaluation sampling on August 10, 1994. Furthermore, the Mexican butter on September 15, 1995 was priced within the range of U.S. butter during the same time period. No U.S. brands of butter were not located in Mexican hypermarkets on any of the three samplings. Mexican butter was assumed to have the same composition as U.S. butter.

Non-fat Dry Milk

A comparison of standardized varieties of non-fat dry milk is found in Table 5. U.S. retail prices for non-fat dry milk stayed remarkably constant for the August 10, 1994 and March 11, 1995 samplings. U.S. prices exhibited some variability when the September 15,

Table 4. Comparison of Standardized Prices of Butter Varieties Found at Multiple Retail Outlets, August 10, 1994, March 11, 1995 and September 15, 1995

Product	Date	Supermarket Mex-1	Mex-2	Mex-3	U.S.-1	U.S.-2	U.S.-3
Mex. Brand A	08/10/94	$1.75	$1.92	---	---	---	---
Mantequilla	03/11/95	$0.98	$0.87	---	---	---	---
	09/15/95	---	$1.54	---	---	---	---
Mex. Brand B	08/10/94	---	$2.08	---	---	---	---
Mantequilla	03/11/95	$1.06	$1.23	---	---	---	---
	09/15/95	$1.54	---	---	---	---	---
Mex. Brand C	08/10/94	$1.82	---	---	---	---	---
Mantequilla	03/11/95	$1.14	---	---	---	---	---
	09/15/95	$1.90	$1.51	$1.96	---	---	---
U.S. Brand Y	08/10/94	---	---	---	$1.98	$1.99	$1.95
Butter	03/11/95	---	---	---	$1.98	$1.79	$1.99
	09/15/95	---	---	---	---	$2.20	$1.79
Supermarket	08/10/94	---	---	---	$1.19	$1.19	---
Store Brands	03/11/95	---	---	---	$1.19	$1.19	---
Butter	09/15/95	---	---	---	$1.79	$1.39	$1.49
U.S. Brand Z	08/10/94	---	---	---	---	$1.99	---
Unsalted	03/11/95	---	---	---	---	$1.89	---
Butter	09/15/95	---	---	---	---	$1.89	---

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00

Note: Butter prices are standardized to U.S. dollars per pound.

1995 sampling is compared to the prior two samplings. Mexican retail prices for non-fat dry milk can be considered to be valued within the range of U.S. supermarket retail values before the devaluation on August 10, 1994 and be priced considerably less on the March 11, 1995 sampling. The Mexican prices after the devaluation, on March 11, 1995, were almost half as much per pound as their U.S. counterparts. The prices observed at the September 15, 1995 sampling have increased, but have not regained a "parity" with the pre-devaluation August 10, 1994 prices.

In comparison to the enormous variety and shelf space afforded to non-fat dry milk in U.S. supermarkets, the Mexican hypermarkets were surprisingly poorly stocked in this item.

Table 5. Comparison of Standardized Prices of Non-fat Dry Milk Found at Multiple Retail Outlets, August 10, 1994, March 11, 1995 and September 15, 1995

				Supermarket			
Product	Date	Mex-1	Mex-2	Mex-3	U.S.-1	U.S.-2	U.S.-3
Mex. Brand X	08/10/94	$2.93	$3.17	---	---	---	---
NDM	03/11/95	$1.51	$1.83	---	---	---	---
	09/15/95	$2.45	$2.13	$2.61	---	---	---
Mex. Brand Y	08/10/94	---	$2.65	$2.77	---	---	---
NDM	03/11/95	---	$1.53	$1.66	---	---	---
	09/15/95	$2.14	$2.21	$2.15	---	---	---
Mex. Brand Z	08/10/94	---	---	---	---	---	---
NDM	03/11/95	---	---	---	---	---	---
	09/15/95	---	$2.02	---	---	---	---
U.S. Brand A	08/10/94	---	---	---	$3.74	$3.74	$3.67
NDM	03/11/95	---	---	---	$3.74	$3.74	$3.67
	09/15/95	---	---	---	$4.58	$3.00	$5.16
U.S. Brand B	08/10/94	---	---	---	$2.90	$2.90	$2.84
NDM	03/11/95	---	---	---	$3.00	$2.90	$2.84
	09/15/95	---	---	---	---	$2.80	---
U.S. Brand C	08/10/94	---	---	---	$2.80	---	$2.57
NDM	03/11/95	---	---	---	$2.81	---	$2.57
	09/15/95	---	---	---	$2.81	---	---
Supermarket	08/10/94	---	---	---	---	$2.81	---
Store Brand	03/11/95	---	---	---	---	$2.81	---
NDM	09/15/95	---	---	---	---	$2.32	---

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00

Non-fat dry milk prices are standardized to U.S. dollars per pound.

Although several brands of non-fat dry milk were observed, very meager shelf space was provided.

Ice Cream and Yogurt

Summaries of ice cream and yogurt retail prices are provided in Table 6 and 7. This data was only collected after the devaluation, on March 11, 1995 and September 15, 1995. When direct brand comparisons could be made, Mexican retail prices for ice cream, with one exception, were less expensive than the same brand in the United States. A similar statement can be made about Mexican retail yogurt prices. In comparison to other dairy products, ice

Table 6. Comparison of Standardized Prices of Ice Cream Found at Multiple Retail Outlets, March 11, 1995 and September 15, 1995

Product	Date	Mex-1	Mex-2	Supermarket Mex-3	U.S.-1	U.S.-2	U.S.-3
U.S. Brand R	03/11/95	$2.28	---	---	$3.59	---	---
Ice Cream	09/15/95	---	---	---	$3.99	---	---
U.S. Brand S	03/11/95	$1.66	$1.54	$3.25	---	---	---
Ice Cream	09/15/95	---	$2.07	$1.91	---	---	---
U.S. Brand T	03/11/95	$2.55	$2.25	$3.25	---	$3.09	---
Ice Cream	09/15/95	---	$2.54	$2.79	---	$3.09	---
U.S. Brand U	03/11/95	---	$1.64	---	---	---	$1.99
Ice Cream	09/15/95	---	---	---	---	---	$2.09
U.S. Band V	03/11/95	---	---	---	$2.79	---	---
Ice Cream	09/15/95	---	---	---	$4.49	---	---
U.S. Brand W	03/11/95	---	---	---	$4.99	$4.98	---
Ice Cream	09/15/95	---	---	---	$4.99	$3.99	---
U.S. Brand X	03/11/95	---	---	---	---	---	$2.79
Ice Cream	09/15/95	$2.14	---	$2.49	---	---	$2.89
U.S. Brand Y	03/11/95	---	---	---	---	---	---
Ice Cream	09/15/95	$1.65	---	---	---	---	---
U.S. Brand Z	03/11/95	---	---	---	---	---	---
Ice Cream	09/15/95	$1.72	---	---	---	---	---
Mex. Brand A	03/11/95	---	---	$2.47	---	---	---
Ice Cream	09/15/95	---	---	$2.13	---	---	---
Mex. Brand B	03/11/95	---	---	---	---	---	---
Ice Cream	09/15/95	---	$1.85	$1.94	---	---	---

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00

Ice Cream prices are standardized to U.S. dollars per half-gallon.

cream and yogurt appear to be very popular with Mexican consumers and this is true especially of U.S. brands. In comparison to the plethora of U.S. brands, only two brands of Mexican ice cream were located. Most brands of yogurt found in Mexican hypermarts would be familiar to U.S. consumers as either an accustomed brand or a foreign subsidiary of a well-known brand.

Table 7. Comparison of Standardized Prices of Yogurt Found at Multiple Retail Outlets, March 11, 1995 and September 15, 1995

Product	Date	Supermarket Mex-1	Mex-2	Mex-3	U.S.-1	U.S.-2	U.S.-3
Mex. Brand Y Yogurt	03/11/95	$0.42	$0.40	$0.43	---	---	---
	09/15/95	$0.47	$0.34	$0.34	---	---	---
Mex. Brand Z Yogurt	03/11/95	---	---	---	---	---	---
	09/15/95	---	---	$0.43	---	---	---
U.S. Brand A Yogurt	03/11/95	---	---	---	$0.69	$.0.69	$0.68
	09/15/95	---	---	---	$0.55	$0.69	---
U.S. Brand B Yogurt	03/11/95	$0.52	$0.36	$0.38	$0.59	$0.67	$0.80
	09/15/95	$0.37	$0.28	$0.46	$0.63	$0.76	---
U.S. Brand C Yogurt	03/11/95	$0.55	$0.42	$0.38	---	---	---
	09/15/95	---	$0.31	---	---	---	---
U.S. Brand D Yogurt	03/11/95	---	---	---	---	$0.43	---
	09/15/95	---	---	---	$0.45	---	---
Supermarket Store Brands Yogurt	03/11/95	---	---	---	$0.50	---	---
	09/15/95	---	---	---	$0.53	$0.45	---

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00

Yogurt prices are standardized to U.S. dollars per 8 ounces.

Retail Price Comparisons: Concluding Comments

With only three sampling observations, the authors hesitate to draw any elaborate conclusions. It is believed, though, that the samplings are not aberrations and reflect the economic conditions in retail outlets along the border area of El Paso, Texas and Juarez, Mexico both before and after the devaluation. Some facts are apparent from this study:

- Corresponding brands of products found both in Mexico and the United States were priced less in Mexican hypermarts than U.S. supermarkets. In addition, similar products were priced less in Mexican hypermarts than in U.S. supermarkets.

- Prices in Mexican hypermarts, when converted to U.S. dollars and corresponding retail units, were slightly less than their U.S. counterparts before the devaluation on August 10, 1994, considerably less after the devaluation on March 11, 1995 and had readjusted toward the pre-devaluation levels on September 15, 1995, but had not reached a level of "parity" with the pre-devaluation price levels.
- On the September 15, 1995 sampling, approximately nine months after the peso devaluation, in Mexican hypermarkets a different variety of brands and products were noted when compared to the prior two samplings. In packaged milk, fewer U.S. brand English-label packaged milk varieties were available and additionally, there was a decreased selection in Mexican brands of packaged milk. In cheeses, previous Mexican brands were no longer available and U.S. muenster was now available. Butter decreased in availability in Mexican hypermarts. In ice cream, the higher quality U.S. brands were no longer available. Excluding cheeses, this trend was not apparent in the U.S. retail outlets.

CHAPTER IV

DETERMINATION OF GROSS PROCESSOR MARGINS OF DAIRY PRODUCTS

This chapter analyzes the relative profitability of producing dairy products of varying compositions and component origins, utilizing a spreadsheet-based algorithm developed for this study. The value of the components in packaged milk could be directly determined from this model which is available from the authors. The dairy ingredient costs of hard manufactured products such as cheeses and butter were derived from mixtures developed with this model and published yields. The ingredient costs for soft products, such as ice cream and yogurt were derived based on their dairy compositions. Gross producer margins were calculated by subtracting the ingredient costs from actual retail prices.

Methodology

Data Collection and Formulation

Federal order class prices were collected for Zone 1 of Federal Order 138 (New Mexico-West Texas Federal Order) for the months of August 1994, March 1995 and September 1995. These are the three dates corresponding to the case study. The Class I, Class II, Class III, Class III-A and the butterfat differential were recorded for these three dates. Mexican average producer blend prices and the price of cream were collected for the Delicias area of Chihuahua for the same time periods.

Utilizing the spreadsheet-based algorithm, the skim value per pound and fat value per pound were calculated for the U.S. class prices for the three time periods. The formula for calculating the skim value per pound at each class price is as follows: (the class price - ((the fat test percentage x 10) x fat differential))/100. The formula for calculating the fat value per

pound at each class test is: (the class price - ((100 - the fat test percentage) x (skim value/pound))) / fat test percentage.

These formulas are based on butterfat-skim pricing principles which value milk and its components based on changes in butterfat in a 100 pounds (cwt) of milk. This technique utilizes the butterfat differential which is defined as the difference between the price of 1/10 pound of butterfat and the price of 1/10 pound of skim. As the composition of a cwt of milk increases or decreases by 1/10 pound of butterfat, the value of the milk changes by the butterfat differential. This concept can be visualized by considering 100 pounds of milk with 3.5 percent butterfat and 96.5 percent skim as having 35-- 1/10 units of butterfat. As the butterfat percentage decreases by each 1/10 unit it must be replaced by a 1/10 unit of skim to maintain 100 pounds (Schwart, et al. 1992). The butterfat differential changes monthly and is published by the USDA/AMS.

To illustrate the application of butterfat-skim pricing, an example is presented for the August, 1994, Federal Order 138 Class I price which is relevant to the study area. To determine the value of skim per pound, the Class I price, $13.60/cwt standardized at 3.5 percent butterfat test, was subtracted by 35 (3.5 multiplied by 10 for 35 1/10 units of fat at the standardized 3.5 butterfat test) multiplied by the butterfat differential (35 x .065 cents/point = 2.275) for a result of 11.325. This is the value of 100 pounds of milk testing 0 percent butterfat. This result, 11.325, was then divided by 100 to calculate the value of skim per pound or .1133. Utilizing the formula, (the class price - ((the fat test percentage x 10) x fat differential))/100 the result is (13.60 - ((3.5 x 10) x .065)))/100 = $.1133/pound.

As an illustration of the determination of the value of fat per pound, the same August, 1994, Federal Order 138 Class I price @ 3.5 percent butterfat test, $13.60/cwt, is subtracted from the result of 100 - the fat test percentage at test (100-3.5 = 96.5 which is the percentage of skim in the milk) multiplied by the value of skim/pound calculated above (.1133). The total result above is then divided by the butterfat percentage. Utilizing the formula, (the class price - ((100 - the fat test percentage) x (skim value/pound))) / fat test percentage or ($13.60 - ((100 - 3.5) x (.11325))) / 3.5 = $.7632/pound.

Table 8 contains the values for skim and fat which were calculated utilizing the before mentioned formulas and the Class prices for Federal Order 138 for August 1994, March 1995 and September 1995 (USDA/AMS, *Report*, September 1995).

Mexican producer milk prices were collected for the Delicias area of Chihuahua for August 1994, March 1995 and September 1995. These values were in new pesos (N$)/liter. A price in N$/liter was converted to US$/cwt by dividing by 2.27 pounds of whole milk per liter then multiplying by 100 (for 100 pounds) and finally dividing by the Mexican exchange rate. An example is: N$1.18/liter / 2.27 pounds of whole milk per liter / N$3.38 per one dollar x 100 pounds = $15.375/cwt (Table 9).

Additional market prices for cream and vegetable fat were also collected. These prices were in N$ per kilogram. A price in N$/kilogram can be converted into US$/cwt by first dividing by 2.2046 kilograms per pound then dividing by the Mexican exchange rate and finally multiplying by 100. An example is: N$8.00/kilogram / 2.2046 / N$3.38 per one dollar x 100 pounds = $107.33/cwt A Mexican price in $new pesos/kilogram can be converted into US$/pound by dividing by 2.2046 pounds in one kilogram and then dividing

Table 8. Fat and Skim Prices, Federal Order 138 (Zone 1) August 1994, March 1995 and September 1995

Date	F.O. 138 Class Price	Fat and Skim Prices	
	$ per cwt	Skim $/lb.	Fat$/lb.
Class I			
08/94	$13.60	$0.1133	$0.7632
03/95	$13.70	$0.1171	$0.6871
09/95	$13.58	$0.1085	$0.8885
Class II			
08/94	$11.84	$0.0957	$0.7457
03/95	$12.20	$0.1021	$0.6721
09/95	$11.53	$0.0880	$0.8680
Class III			
08/94	$11.73	$0.0946	$0.7446
03/95	$11.89	$0.0990	$0.6690
09/95	$12.08	$0.0935	$0.8735
Class III-A			
08/94	$10.38	$0.0811	$0.7311
03/95	$10.22	$0.0823	$0.6522
09/95	$10.90	$0.0817	$0.8617
Butterfat Differential			
08/94	$0.065/point		
03/95	$0.057/point		
09/95	$0.078/point		

Source: U.S. Department of Agriculture/Agricultural Marketing Service

by the Mexican exchange rate. An example is: N$2.15 / 2.2046 pounds per kilogram / N$3.38 per one dollar = $.290/lb. (Table 9).

An approximation of the Mexican value of fat/pound was calculated by dividing the calculated value of Mexican cream in U.S.$/cwt by the cream test. In this case, the cream test is unknown, but has been assumed to be 35 percent butterfat. An example is: $107.33/cwt Mexican cream / 35 = $3.067/lb. (Table 9).

An approximation of the Mexican value of skim/pound was calculated by subtracting from the Mexican producer price converted to $US /cwt the (butterfat percentage @ test x value of fat/pound) and then dividing this result by (100 - milk butterfat percentage @ test).

An example is: ($15.375/cwt - (3.20% butterfat x $3.067/lb.)) / (100 - 3.20% butterfat) = $.0574/lb.

Table 9 is a summary of Mexican derived fat and skim values.

Table 9. Mexican Derived Fat and Skim Prices, August 1994, March 1995 and September 1995

Date	Actual Mexican Price	Conversions to U.S. Conventions		
		Price in US$	Skim$/lb.	Fat$/lb.
Quota Price				
08/94	N$1.18/liter	$15.37/cwt	$0.0954	$1.917
03/95	N$1.40/liter	$9.11/cwt	$0.0536	$1.225
09/95	N$1.60/liter	$11.15/cwt	$0.0643	$1.538
Overquota Price				
08/94	N$1.00/liter	$13.03/cwt	$0.0712	$1.917
03/95	N$1.30/liter	$8.46/cwt	$0.0469	$1.225
09/95	N$1.44/liter	$10.04/cwt	$0.0529	$1.538
Cream				
08/94	N$5.00/kilogram	$67.08/cwt	---	$1.917
03/95	N$6.40/kilogram	$42.88/cwt	---	$1.225
09/95	N$7.50/kilogram	$53.83/cwt	---	$1.538
Vegetable Fat				
08/94	N$2.48/kilogram	---	---	$0.333
03/95	N$4.09/kilogram	---	---	$0.274
09/95	N$5.30/kilogram	---	---	$0.380

The August 1994 average exchange rate was N$3.38 to US$1.00
The March 1995 average exchange rate was N$6.77 to US$1.00
The September 1995 average exchange rate was N$6.32 to US$1.00

Additional data were located for the months of August 1994, March 1995 and September 1995 for cottonseed oil and NDM and are presented in Table 10.

Table 10. Additional Product Component Prices, August 1994, March 1995 and September 1995

Date	Cottonseed Oil	World NDM		U.S. NDM	
		Dry	Reconstituted	Dry	Reconstituted
August 1994	.2371/lb.	.788/lb.	.0709/lb.	1.060/lb.	.0954/lb.
March 1995	.2641/lb.	.970/lb.	.0873/lb.	1.065/lb.	.0959/lb.
September 1995	.2650/lb.	1.005/lb.	.0905/lb.	1.072/lb.	.0965/lb.

NOTE: Prices are FOB
Reconstituted NDM = (dry value * 9)/100

Standard compositions for dairy products in both the United States and Mexico were researched. United States minimum standards for products were taken from USDA/FSQS 1980, USDA/ARS, *Cheese*, 1978 and Campbell and Marshall 1975. A summary of the standards appears below in Table 11.

Table 11. United States Minimum Federal Standards for Dairy Products

Product Type	Water %	Fat %	Skim%	Solids-Not-Fat %
Whole Milk	88.50	3.25	96.75	08.25
Low-fat Milk	89.75	2.00	98.00	08.25
Low-fat Milk	90.25	1.50	98.50	08.25
Skim Milk	91.25	0.50	99.50	08.25
Milk Skim	91.00	0.50	99.50	08.50
Milk Cream	61.90	38.00	62.00	00.10
Heavy Cream	58.50	41.00	59.00	00.50
Cheddar Cheese	39.00	30.50	69.50	30.50
Mozzarella Cheese	60.00	18.00	82.00	22.00
Cheshire Cheese	40.00	29.50	70.50	30.50
NDM Powder	03.50	00.50	99.50	96.00
Butter	19.90	80.00	20.00	00.10

Mexican compositional standards for fluid products were obtained from the *Diario Oficial*, Mexico's Federal Register. Standards for solids-not-fat, butterfat, protein and vegetable fat were listed in grams/liter for various fluid products. These standards were converted to percentages by dividing by the weight of whole milk in grams/liter and

multiplying by 100 percent. An example is: 35.00 grams/liter of butterfat / 1031.00 grams/liter in whole milk multiplied by 100 percent = 3.39 percent butterfat. These standards and their conversions are listed in Table 12.

Table 12. Mexican Dairy Product Standards

Product	Units	Butterfat	Solids-Not-Fat	Protein
High-Quality Pasteurized Whole Milk	grams/liter	35.00	84.00	33.00
	percentage	3.39%	8.15%	3.20%
Preferred Pasteurized Whole Milk	grams/liter	30.00	83.00	30.00
	percentage	2.91%	8.05%	2.91%
Pasteurized Semi-fat free Milk	grams/liter	16.00	86.00	----
	percentage	1.55%	8.34%	----
Filled Milk From NDM & Vegetable Fat	grams/liter	30.00	82.00	----
	percentage	2.91%	7.95%	----

1031.00 grams/liter in whole milk

Standards for Mexican cheeses were located in Villegas 1993. Three cheeses were selected. These cheeses correspond to the Mexican cheeses observed in Mexican hypermarts in Juarez and El Paso supermarkets on August 1994, March 1995 and September 1995. Of the three cheeses, chihuahua, oaxaca and asadero, two different recipes for chihuahua were listed. These two recipes of chihuahua result in two different compositions. They are listed as chihuahua M1 and chihuahua M2. These standards as well as the before-mentioned standards for fluid products are listed below in Table 13.

Table 13. Minimum Mexican Standards for Dairy Products

Product Type	Water %	Fat %	Skim %	Solids-Not-Fat %
High-Quality Milk	88.46	03.39	96.61	08.15
Preferred Milk	89.04	02.91	97.09	08.05
Low-fat Milk	90.11	01.55	98.45	08.34
Filled Milk	89.14	02.91	97.09	07.95
Chihuahua M1 Cheese	33.80	32.30	67.70	33.90
Chihuahua M2 Cheese	32.50	36.10	63.90	31.40
Oaxaca Cheese	46.10	20.50	79.50	33.40
Asadero Cheese	48.80	21.60	78.40	29.60
*Milk Skim	91.00	00.50	99.50	08.50
*Milk Heavy Cream	61.90	38.00	62.00	00.10
*NDM Powder	03.50	00.50	99.50	96.00
*Butter	19.90	80.00	20.00	00.10

* = Mexican Standards Unknown, U.S. Compositional Standards.

Standards for dairy components used in the model are presented in Table 14.

Table 14. Percentages of Fat and Skim in Dairy Components

Component	Percent Solids-Not-Fat	Percent Fat
Milk Cream	---	03.50%
Milk Skim	08.50%	---
Heavy Cream	---	38.00%
Wet Solids	34.00%	---
Non-Fat Dry Milk	09.26%	---
Vegetable Fat	---	100%

Scenarios to Examine

Seven scenarios were chosen to represent various compositional origins for dairy products produced in the United States and Mexico. The scenarios are as follows:

- Domestic Butterfat-Skim: Products produced from fluid milk originating in the country in which it was produced.
- Domestic Vegetable Fat-World NDM: Products produced utilizing vegetable fat purchased domestically as a substitute for butterfat and NDM purchased on the world market.

- Domestic Vegetable Fat-U.S. NDM: Products produced utilizing domestic vegetable fat and NDM purchased at the U.S. market price.
- U.S. Heavy Cream-World NDM: Products produced utilizing U.S. heavy cream and NDM purchased on the world market.
- U.S. Heavy Cream-U.S. NDM: Products produced utilizing U.S. heavy cream and NDM purchased at the U.S. market price.
- Domestic Vegetable Fat-Domestic Skim: Products produced utilizing domestic vegetable fat as a substitute for butterfat and skim originating in the country in which it was produced.
- Domestic Vegetable Fat-U.S. Wet Solids: Products produced utilizing domestic vegetable fat and U.S. wet solids.

Model Formulation and Description

A spreadsheet-based algorithm was developed to calculate the value of the ingredients in dairy product mixtures in US$/cwt utilizing butter-fat skim accounting procedures. The model was expanded to additionally calculate the value of fluid product mixtures in N$/liter and a formula to calculate the value of solid dairy product mixtures in N$/kilogram was also included. This model requires the percentages of solids-not-fat and fat in the dairy product (for either a natural or a filled product) and the price per pound of the fat and skim components (of various origins) as inputs.

To calculate the value of a quantity of a dairy product manufactured from components, the prices of the fat and skim components, the percentages solids-not-fat and fat in the components, the desired solids-not-fat and fat percentages in the manufactured product, and

the quantity of product to be produced must be known. In all cases in this study, 100 pounds of product were produced. The other values are found in various tables. The values of fat and skim components per pound are found in Table 8 for the United States and Table 9 for Mexico. Values for U.S. non-fat dry milk and vegetable fat as well as world non-fat dry milk are found in Table 10. The percentages of solids-not-fat and fat in the components are found in Table 14. These values are for standard dairy component products. The percentage skim in a fat component and the converse, is assumed to be negligible. The desired solids-not-fat and fat percentages in each product are found in Table 11 for the United States and Table 13 for Mexico. An example of the computational procedure is contained in Appendix A.

With the spreadsheet model and inputs of prices of various components from Tables 1,2,3,4,6 and 7, tables were constructed of outputs of dairy fluid products manufactured:

- In the United States under U.S. standards in US$/cwt.
- In Mexico under Mexican standards in US$/cwt.
- In the United States under Mexican standards in US$/cwt.
- In Mexico under United States standards in US$/cwt.

Model Limitations for Fluid Milk

This model only calculates the value of the components necessary to produce the desired fluid or manufactured product. It does not calculate the total cost of production or manufacturing costs of dairy products. Production costs vary widely due to differences in technology.

Additionally and most importantly, this model was found to exaggerate the value of products manufactured from domestic milk in Mexico. This occurs due to the realities of attempting to correlate a system in Mexico which pays its producers based solely on volume with a system in the United States which uses butter-fat skim accounting. Mexican products are not valued on a component basis.

A Mexican market value of cream was used to establish a fat and a skim price similar to the U.S. convention. In reality, the Mexican cream price is not tied to the value of fat in fluid milk as is the case in the United States. If Mexican milk prices are converted to U.S. butterfat-skim accounting, the butterfat is valued too high relative to U.S. fat prices. However, it is believed that this model is correct for assessing the cost of purchasing components from the marketplace such as non-fat dry milk and U.S. heavy cream.

Calculations for Hard Products

The above model is only valid for calculating the value of fluid mixtures. The ingredient values of the U.S. and Mexican whole and two-percent milks were calculated utilizing this model. Additionally, this model was utilized to calculate the value of non-fat dry milk since it is directly derived from a skim fluid mixture. Water has no value in the pricing of dairy components. It was assumed that approximately 9 pounds of powder can be derived from a cwt of skim.

To calculate the value of a solid product, it is necessary to first calculate the value of a cwt of fluid mixture of which the solid mixture is to be derived. The value of a cwt of manufactured product can then be derived utilizing published yields. Published cheese and butter yields are based on producer milk testing at 3.67 percent butterfat. Calculations were

performed utilizing the above model to determine the value of producer milk and mixtures testing 3.67 percent fat and 8.60 percent solids-not-fat. The resulting values are summarized in Table 15.

Table 15. Ingredient Costs to Manufacture 100 Pounds of Fluid Mix @ 3.67 Percent Fat and 8.60 Percent Solids-Not-Fat from Various Component Origins in US$/cwt

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Fluid Mix					
	1/US	2/M	3/US	4/M	5/US	6/M
Domestic Butterfat-Skim	$11.85	$16.23	$11.99	$9.66	$12.21	$11.84
Domestic Vegetable Fat-World Non-Fat Dry Milk	$7.70	$8.05	$9.38	$9.42	$9.69	$10.11
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$10.06	$10.41	$10.20	$10.24	$10.27	$10.69
U.S. Heavy Cream-World Non-Fat Dry Milk	$9.56	$9.56	$10.86	$10.86	$11.92	$11.92
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$11.92	$11.92	$11.69	$11.69	$12.50	$12.50
Domestic Vegetable Fat-Domestic Skim	$9.98	$10.41	$10.51	$6.17	$9.98	$7.59
Domestic Vegetable Fat-U.S. Wet Solids	$9.98	$10.33	$10.51	$10.54	$9.98	$10.40

1/ Made with August, 1994 prices and U.S. domestic origins
2/ Made with August, 1994 prices and Mexican domestic origins
3/ Made with March, 1995 prices and U.S. domestic origins
4/ Made with March, 1995 prices and Mexican domestic origins
5/ Made with September, 1995 prices and U.S. domestic origins
6/ Made with September, 1995 prices and Mexican domestic origins

The yields of the cheeses identified in this study were located in the literature (Villegas 1993, FAO/UN 1990, USDA/ARS 1978). The yields for oaxaca, asadero, cheddar, mozzarella, and cheshire were identified. The yield for chihuahua was not found, but FAO/UN 1990, related that chihuahua is very similar in both method of production and composition to cheshire. Consequently, the yield of cheshire was substituted for chihuahua.

The yields of Mexican cheeses were recorded in kilograms of products produced per liter of milk. The U.S. yields were in pounds of cheese produced per 100 pounds of milk. To standardize the Mexican yields to the U.S. convention the Mexican yields were divided by 100 multiplied by 2.2046 pounds per liter then divided by 2.27 pounds of whole milk per liter and then multiplied by 100. The U.S. cheese yields were recorded in ranges. The average of the range was recorded for the standardized yield. Table 16 summarizes the yields utilized in this analysis.

Table 16. Yields of Selected Cheese Varieties

Cheese Variety	Published Yield	Standardized Yield
Chihuahua M1	N/A	10 pounds per cwt
Chihuahua M2	N/A	10 pounds per cwt
Oaxaca	9-10.5 kg / 100 liters	9.47 pounds per cwt
Asadero	9-11 kg / 100 liters	9.71 pounds per cwt
Cheddar	9.5-11 pounds per cwt	10.25 pounds per cwt
Mozzarella	13-15 pounds per cwt	14.0 pounds per cwt
Cheshire	9-11 pounds per cwt	10 pounds per cwt

The yield for butter manufactured from the cream of producer milk testing at 3.67 percent butterfat was calculated. Butter, regardless of the manner of manufacture, is about 80.2 percent butterfat (Campbell and Marshall 1975). The percentage butterfat in producer milk (in this case it is assumed to be 3.67) can be divided by .802 (the percentage milkfat in butter) which gives a result of 4.58 pounds. This value, 4.58, is the predicted yield in pounds of butter per 100 pounds of producer milk. As an estimate of an actual yield of butter per 100 pounds of producer milk, 4.48 was used to account for loss in the manufacturing process. To calculate a cost per pound of cheese and butter, the producer price of standardized milk per hundredweight was divided by the cheese and butter yields.

Model Limitations for Hard Products

U.S. federal order prices are standardized for milk at 3.5 percent butterfat. For instance, the U.S. Federal Order 138 (zone 1) August 1994 price for Class III milk (manufacturing grade) was $11.73/cwt. Adjusting this price for milk at 3.67 percent butterfat through butterfat-skim accounting techniques results in a price of $11.85/cwt. This is the value which appears in Table 22 for domestic butterfat-skim milk made with August 1994 prices with U.S. producer origins.

Mexican producer milk is not priced by components. Although Mexican producers would receive an equivalent $15.37/cwt, the butterfat test of this milk is unknown. Through imposition of butterfat-skim accounting techniques, a Mexican value of butterfat and skim was established. These values equalized the Mexican producer price at 3.20 percent butterfat. Although, this is simply happenstance, it probably reflects reality. When milk is priced solely on volume, producers have a strong incentive to add water to their milk. Additionally, lower quality milk (high somatic cell and bacteria counts) reduces product yields. Consequently, product manufacturers get lower yields and have to purchase more milk to manufacture the same amount of product.

Finally, calculations were made to simulate the use of vegetable fat to fill dairy products. Mixtures with vegetable fat would have to undergo additional processes such as homogenization and pasteurization to retain the vegetable fat in solution. From discussions with dairy technology specialists, vegetable fat can substitute butterfat on a 1:1 basis. For filled milk, this has no effect on product yield. In manufactured products such as cheese, the published yields are based on recovering 90 percent of the butterfat in the original producer

milk or mixture. With a mixture filled with vegetable fat, due to its inherent nature, less than 90 percent of the vegetable fat would be recovered. The degree of recovery depends on the manufacturing processes and methods. Consequently, cheese yields from vegetable fat filled mixtures would, in reality, be slightly less than those listed from dairy components. For the comparisons in this study, this was deemed to have negligible effect on the results and was ignored.

Calculations for Soft Products

Ice cream and yogurt are manufactured with fundamentally different processes when compared to cheese and butter. In the manufacture of cheese and butter, an approximate yield is known based on the test of the producer milk or a mixture manufactured from dairy components. Furthermore, the resulting product is almost a 100 percent derivative (salt and trace chemicals are added) of the initial producer milk or mixture.

In the manufacture of ice cream and yogurt, a considerable percentage of the final product mass will be sugars, stabilizers and most likely fruit or candy flavorings. Additionally, in the case of ice cream, the amount of over-run must be considered. Over-run is the mixing of air with the initial mixture. Over-run gives the finished product a light fluffy texture and allows the consumer to serve the final product more easily. More importantly, it also stretches the yield for the manufacturer. The amount of over-run in ice cream differs widely between manufacturers. Two manufacturers can utilize the same mix and using differing over-runs one manufacturer can easily double his yield relative to the other. Furthermore, the dairy composition in ice cream and yogurt can be derived from other dairy components such as dried whey or dried buttermilk. Considering the multitude of mix recipes

and components which are available to manufacture ice cream and yogurt, many assumptions have to be made to calculate the value of the dairy components in a volume of product.

Ice Cream

Table 17 lists the U.S. federal compositional standards for plain ice cream.

Table 17. Federal Standards for Plain Ice Cream.

Component	Magnitude	Standard	Unit
Milkfat	Minimum	10.0	Percent
Total Milk Solids	Minimum	20.0	Percent
Stabilizer	Maximum	0.5	Percent
Weight Per Gallon	Minimum	4.5	Pounds
Food Solids Per Gallon	Minimum	1.6	Pounds

Source: *Federal and State Standards for the Composition of Milk Products*

From discussions with a dairy manufacturing specialist, a plausible dairy mix for comparing the manufacturing costs of ice cream was developed. The following assumptions were made:

- The dairy mixture utilized to manufacture ice cream will have 20 percent milk solids. This level is the minimum U.S. standard for ice cream. The 20 percent milk solids will be broken down as follows: 10 percent of the total mixture will be butterfat, 7.5 percent of the mixture will be non-fat dry milk powder and 2.5 percent of the mixture will be milk whey.
- An 80 percent over-run will be calculated. This level is consistent with U.S. industry practice for standard ice cream.

- The value of other components such as sugars, fillers and flavorings are ignored. The prices of these items vary widely and they are non-dairy.
- The dairy component costs were calculated for one-half gallon of ice cream which is the standard retail unit in both the United States and Mexico.
- The ice cream mix will be assumed to weigh 9.2 pounds per gallon and the ice cream product will be assumed to weigh 4.5 pounds per gallon.

For 100 pounds of mix under the assumptions listed above, 10 percent of the mixture will be butterfat, 7.5 percent of the mixture will be NDM and 2.5 percent of the mixture will be milk whey. To calculate the volume of ice cream which can be manufactured utilizing the before-mentioned assumptions, the quantity of mix must be multiplied by 1.8 (for a 80 percent over-run). A cwt of ice cream mix will therefore make 180 pounds of ice cream product.

To manufacture a cwt of ice cream product with an 80 percent over-run, 56 pounds of total mix is needed (the result of 100 pounds of ice cream mix divided by 1.80). It follows then that multiplying the percentage quantities of ingredients necessary to produce 100 pounds of ice cream mix by 56 pounds will give the quantity of ingredients necessary to manufacture 100 pounds of ice cream product. These quantities are 5.6 pounds of butterfat, 4.20 pounds of NDM, and 1.40 pounds of milk whey.

Table 18 summarizes this information and includes U.S. prices of these dairy ingredients for the time periods of August 1994, March 1995 and September 1995. Table 19 is a similar table which includes Mexican prices for these dairy ingredients for August 1994, March 1995 and September 1995. Since ice cream is assumed to weigh 4.5 pounds per gallon, there are

2.25 pounds per half gallon of ice cream. The cost per half gallon of the dairy ingredients in ice cream can then be calculated by dividing the total values in Tables 18 and 19 by 2.25 pounds per half gallon of ice cream.

Table 18. Quantities of Dairy Products Necessary to Manufacture 100 Pounds of Ice Cream Product with U.S. Ingredient Market Prices.

Dairy Component	Time Period	Quantity Needed in Pounds	Prices of Ingredients	Total Value
Butterfat	08/10/94	5.60 pounds	$.7457/lb.	$4.18
	03/11/95	5.60 pounds	$.6741/lb.	$3.78
	09/15/95	5.60 pounds	$.8680/lb.	$4.86
Non-Fat Dry Milk Powder	08/10/94	4.20 pounds	$1.060/lb.	$4.45
	03/11/95	4.20 pounds	$1.065/lb.	$4.47
	09/15/95	4.20 pounds	$1.072/lb.	$4.50
Milk Whey	08/10/94	1.40 pounds	$.1925/lb	$0.27
	03/11/95	1.40 pounds	$.2100/lb.	$0.29
	09/15/95	1.40 pounds	$.2100/lb.	$0.29
Total	08/10/94	11.20 pounds	---	$8.90
	03/11/95	11.20 pounds	---	$8.54
	09/15/95	11.20 pounds	---	$9.65

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
Source of Prices: USDA/AMS
NOTE: prices are FOB

Table 19. Quantities of Dairy Products Necessary to Manufacture 100 Pounds of Ice Cream Product with Mexican Ingredient Market Prices.

Dairy Component	Time Period	Quantity Needed in Pounds	Prices of Ingredients	Total Value
Butterfat	08/10/94	5.60 pounds	$1.917/lb.	$10.74
	03/11/95	5.60 pounds	$1.225/lb.	$6.86
	09/15/95	5.60 pounds	$1.538/lb.	$8.61
Non-Fat Dry Milk Powder	08/10/94	4.20 pounds	$0.788/lb.	$3.31
	03/11/94	4.20 pounds	$0.970/lb.	$4.07
	09/15/95	4.20 pounds	$1.005/lb.	$4.22
Milk Whey	08/10/94	1.40 pounds	$.1925/lb.	$0.27
	03/11/95	1.40 pounds	$.2100/lb.	$0.29
	09/15/95	1.40 pounds	$.2100/lb.	$0.29
Total	08/10/94	11.20 pounds	---	$14.32
	03/11/95	11.20 pounds	---	$11.22
	09/15/95	11.20 pounds	---	$13.12

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
Source of Prices: Derived from producer prices and USDA/AMS
NOTE: prices are FOB

Yogurt

Table 20 lists the Texas state compositional standards for low-fat yogurt.

Table 20. Texas Department of Health Standards for Low-fat Yogurt

Component	Magnitude	Standard	Unit
Milkfat	Minimum	0.5	Percent
Milkfat	Maximum	2.0	Percent
Total Milk Solids	Minimum	8.25	Percent
Stabilizer & Emulsifier	Maximum	0.6	Percent

Source: *Texas Administrative Code, Title 25*

From discussions with a dairy manufacturing specialist, a hypothetical mix for comparing the manufacturing costs of yogurt was developed. The following assumptions were made.

- This product will have 1.25 percent butterfat and 11 percent milk solids-not-fat.
- The value of other components such as sugars, fillers and flavorings are ignored. The prices of these items vary widely and they are non-dairy.
- The dairy component costs were calculated for 8 ounces of yogurt which is the standard retail unit.

To manufacture 100 pounds of yogurt product from its ingredients, 1.25 percent of the mixture will be butterfat and 11 percent of the mixture will be solids-not-fat. Therefore, there will be 1.25 pounds of butterfat and 11 pounds of solids-not-fat in a cwt of yogurt. For this mix, non-fat dry milk will be used for solids-not-fat. The value of dairy ingredient per cwt of yogurt can be easily calculated. Table 21 summarizes these calculations for U.S. market prices. Table 22 is a summary of the same calculations utilizing Mexican market prices.

The value of the dairy ingredients in an 8 ounce standard retail container of yogurt can then be calculated. There are 200, one-half pound units (8 ounces) in 100 pounds of yogurt. Therefore, the total dairy ingredient values are divided by 200 for the value of the dairy ingredients in 8 ounces of product.

Table 21. Quantities of Dairy Products Necessary to Manufacture 100 Pounds of Yogurt Product with U.S. Ingredient Market Prices.

Dairy Component	Time Period	Quantity Needed in Pounds	Prices of Ingredients	Total Value
Butterfat	08/10/94	1.25 pounds	$0.7457/lb.	$0.93
	03/11/95	1.25 pounds	$0.6741/lb.	$0.84
	09/15/95	1.25 pounds	$0.8680/lb.	$1.09
Non-Fat Dry Milk Powder	08/10/94	11.0 pounds	$1.060/lb.	$11.66
	03/11/95	11.0 pounds	$1.065/lb.	$11.72
	09/15/95	11.0 pounds	$1.072/lb.	$11.79
Total	08/10/94	12.25 pounds	---	$12.59
	03/11/95	12.25 pounds	---	$12.56
	09/15/95	12.25 pounds	---	$12.88

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
Source of Prices: USDA/AMS
NOTE: prices are FOB

Table 22. Quantities of Dairy Products Necessary to Manufacture 100 pounds of Yogurt Product with Mexican Ingredient Market Prices.

Dairy Component	Time Period	Quantity Needed in Pounds	Prices of Ingredients	Total Value
Butterfat	08/10/94	1.25 pounds	$1.917/lb.	$2.40
	03/11/95	1.25 pounds	$1.225/lb.	$1.53
	09/15/95	1.25 pounds	$1.538/lb.	$1.92
Non-Fat Dry Milk Powder	08/10/94	11.0 pounds	$0.788/lb.	$8.67
	03/11/95	11.0 pounds	$0.970/lb.	$10.67
	09/15/95	11.0 pounds	$1.005/lb.	$11.06
Total	08/10/94	12.25 pounds	---	$11.07
	03/11/95	12.25 pounds	---	$12.20
	09/15/95	12.25 pounds	---	$12.98

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
Source of Prices: USDA/AMS
NOTE: prices are FOB

Trends in Ingredient Values: August 1994, March 1995 and September 1995

The results of this analysis were influenced by changes in the ingredient values during the time periods. Therefore, it is important to briefly identify the pertinent trends:

- U.S. producer milk prices were relatively constant during the time period. The U.S. federal order 138 blend price varied 5 percent during August 1994 through March 1995.
- The per cwt equivalent value of the Mexican cooperative quota milk price decreased 41 percent from August 1994 to March 1995 due to the effects of the December 1994 devaluation. In U.S. equivalent terms, the quota milk price increased 22 percent from March 1995 to September 1995, but was still only 73 percent of its August 1994 value.
- The world price of NDM increased 27 percent from August 1994 to March 1995 compared with a 1 percent increase in U.S. NDM prices during the same time period.
- The U.S. price of vegetable fat (cottonseed oil) increased 11.8 percent from August 1994 to March 1995. The Mexican price of vegetable fat increased an equivalent 14 percent during the same time period.

Ingredient Cost Results

Fluid Milk: August 1994

The ingredient costs of manufacturing 100 pounds of U.S. fluid milk produced at minimum standards (3.25 percent fat and 8.25 percent solids-not-fat) and Mexican high-quality pasteurized milk (3.39 percent butterfat and 8.15 percent solids-not-fat) with various

component origins and August 1994 prices are presented in Table 23. The Mexican per cwt costs of fluid milk ($15.72/cwt) are higher for the month of August, 1994 than the U.S. counterpart ($13.44/cwt) due to a higher butterfat percentage and a higher overall producer price. The higher butterfat percentage would cost the U.S. producer an additional $0.09/cwt.

The least-cost scenario for the U.S. processor is U.S. vegetable fat and reconstituted non-fat dry milk purchased on the world market. It should be noted that the legality of this option varies from state to state. Where it is legal, this mixture must be properly identified as a filled milk product. The two-lowest cost scenarios for the Mexican producer are Mexican vegetable fat reconstituted with non-fat dry milk purchased on the world market ($7.98/cwt) and importing U.S. heavy cream and non-fat dry milk purchased on the world market ($9.44/cwt).

Fluid Milk: March 1995

The ingredient costs of producing a cwt of U.S. fluid milk produced at minimum standards (3.25 percent fat and 8.25 percent solids-not-fat) and Mexican high-quality pasteurized milk (3.39 percent butterfat and 8.15 percent solids-not-fat) with various component origins and March 1995 prices are presented in Table 24. The Mexican processor has the least-cost butterfat-skim composition due to the devaluation of the peso ($9.17/cwt for packaged milk at U.S. standards from Mexican producer milk verses $13.56/cwt for packaged milk at U.S. standards from U.S. producer milk). An increase in world non-fat dry milk prices is reflected in the relative rise in the ingredient costs of product compositions utilizing that component. This is reflected by the Mexican vegetable fat and reconstituted non-fat dry milk composition being now valued higher than Mexican butterfat-skim ($10.19/cwt and

Table 23. Ingredient Costs of Fluid Whole Milk at Minimum Standards Manufactured from Selected Component Origins in US$/cwt at August 1994 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$13.44	$15.72	$13.53	$15.46
Domestic Vegetable Fat-World Non-Fat Dry Milk	$7.63	$7.98	$7.66	$7.94
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$10.00	$10.35	$10.02	$10.31
U.S. Heavy Cream-World Non-Fat Dry Milk	$9.34	$9.44	$9.44	$9.34
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$11.71	$11.80	$11.80	$11.31
Domestic Vegetable Fat-Domestic Skim	$11.73	$10.35	$11.75	$6.51
Domestic Vegetable Fat-U.S. Wet Solids	$11.73	$12.07	$11.75	$12.04

1/ U.S. Made at U.S. Standards
2/ Mexican Made at Mexican Standards
3/ U.S. Made at Mexican Standards
4/ Mexican Made at U.S. Standards

$9.33/cwt respectively). Domestic vegetable fat and skim is still, clearly, the least-cost solution for the Mexican processor ($6.11/cwt). U.S. whole fluid milk ingredient values have had no real relative change when compared to August 1994 conditions.

Fluid Milk: September 1995

The ingredient costs of producing a cwt of U.S. fluid milk produced at minimum standards (3.25 percent fat and 8.25 percent solids-not-fat) and Mexican high-quality pasteurized milk (3.39 percent butterfat and 8.15 percent solids-not-fat) with various component origins and September 1995 prices are presented in Table 25. Although Mexican

Table 24. Ingredient Costs of Fluid Whole Milk at Minimum Standards Manufactured from Selected Component Origins in US$/cwt at March 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$13.56	$9.33	$13.64	$9.17
Domestic Vegetable Fat-World Non-Fat Dry Milk	$9.30	$9.36	$9.33	$9.34
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$10.13	$10.19	$10.16	$10.17
U.S. Heavy Cream-World Non-Fat Dry Milk	$10.68	$10.76	$10.76	$10.68
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$11.51	$11.59	$11.59	$11.51
Domestic Vegetable Fat-Domestic Skim	$12.19	$6.11	$12.21	$6.08
Domestic Vegetable Fat-U.S. Wet Solids	$12.19	$12.24	$12.21	$12.22

1/ U.S. Made at U.S. Standards
2/ Mexican Made at Mexican Standards
3/ U.S. Made at Mexican Standards
4/ Mexican Made at U.S. Standards

prices have undergone readjustment in the ten months following the December 1994 devaluation, the Mexican processor still has the ingredient cost advantage utilizing Mexican domestic milk. The ingredient costs for a Mexican processor utilizing Mexican domestic milk would be $11.43/cwt compared with $13.49/cwt for U.S. producer milk at Mexican standards. This is still contrary to the pre-devaluation (August 1994) relationship. The least-cost scenarios for the Mexican processor would be utilizing Mexican vegetable fat and skim ($7.50/cwt) and Mexican vegetable fat and NDM purchased on the world market ($10.03/cwt). These are strategies of which Mexican processors have been known to pursue.

Table 25. Ingredient Costs of Fluid Whole Milk at Minimum Standards Manufactured from Selected Component Origins in US$/cwt at September 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$13.39	$11.43	$13.49	$11.22
Domestic Vegetable Fat-World Non-Fat Dry Milk	$9.62	$10.03	$9.64	$9.99
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$10.20	$10.61	$10.22	$10.57
U.S. Heavy Cream-World Non-Fat Dry Milk	$11.64	$11.76	$11.76	$11.64
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$12.22	$12.33	$12.33	$12.22
Domestic Vegetable Fat-Domestic Skim	$11.36	$7.50	$11.38	$7.46
Domestic Vegetable Fat-U.S. Wet Solids	$11.36	$11.77	$11.38	$11.73

1/ U.S. Made at U.S. Standards
2/ Mexican Made at Mexican Standards
3/ U.S. Made at Mexican Standards
4/ Mexican Made at U.S. Standards

U.S. ingredient costs have undergone minimal change when compared with August 1994 and March 1995 values.

Low-fat Milk: August 1994

The ingredient costs of producing a cwt of U.S. low-fat milk produced with minimum standards (2.00% butterfat and 8.25% solids-not-fat) and Mexican high-quality pasteurized milk (1.55% fat and 8.34% solids-not-fat) at various component origins with August 1994 prices are presented in Table 26. Due to the decrease in butterfat percentage in low-fat milk relative to whole milk and Mexican skim being valued lower than U.S. skim, the Mexican processor has a cost advantage ($12.63/cwt for U.S. processed milk at U.S. standards vs.

Table 26. Ingredient Costs of Fluid Low-fat Milk at Minimum Standards Manufactured from Selected Component Origins in US$/cwt at August 1994 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$12.63	$12.36	$12.34	$13.18
Domestic Vegetable Fat-World Non-Fat Dry Milk	$7.42	$7.50	$7.35	$7.61
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$9.82	$9.91	$9.76	$10.02
U.S. Heavy Cream-World Non-Fat Dry Milk	$8.48	$8.16	$8.17	$8.47
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$10.88	$10.58	$10.58	$10.88
Domestic Vegetable Fat-Domestic Skim	$11.58	$9.91	$11.52	$10.02
Domestic Vegetable Fat-U.S. Wet Solids	$11.58	$11.67	$11.52	$11.77

1/ U.S. Made at U.S. Standards
2/ Mexican Made at Mexican Standards
3/ U.S. Made at Mexican Standards
4/ Mexican Made at U.S. Standards

$12.36/cwt for Mexican milk processed at U.S. standards). The least-cost scenarios for the Mexican processor would be Mexican vegetable fat and NDM purchased on the world market ($7.50/cwt) and U.S. heavy cream and world NDM ($8.16/cwt).

Low-fat Milk: March 1995

The ingredient costs of producing a cwt of U.S. low-fat milk produced at minimum standards (2.00% butterfat and 8.25% solids-not-fat) and Mexican high-quality pasteurized milk (1.55% fat and 8.34% solids-not-fat) at various component origins with March 1995 prices are presented in Table 27. The effects of the devaluation afford the Mexican processor

a tremendous cost advantage utilizing a domestic vegetable fat-skim scenario ($5.70/cwt for Mexican made vegetable fat-skim of Mexican component origin at U.S. standards vs. $12.00/cwt for U.S. made vegetable fat-skim of U.S. origin at U.S. standards. This is the least-cost scenario for the Mexican low-fat milk processor.

Low-fat Milk: September 1995

The ingredient costs of producing a cwt of U.S. low-fat milk produced at minimum standards (2.00% butterfat and 8.25% solids-not-fat) and Mexican high-quality pasteurized milk (1.55% fat and 8.34% solids-not-fat) with various component origins and September 1995 prices are presented in Table 28. With September 1995 prices, the Mexican processor retains a price advantage relative to the U.S. processor for domestic butterfat-skim composition ($8.71/cwt for Mexican producer milk at Mexican standards verses $12.41/cwt for U.S. producer milk at U.S. standards). The least-cost scenario for the Mexican processor would be the utilization of Mexican vegetable fat and skim ($6.92/cwt). It would cost the Mexican processor an additional $4.17/cwt if U.S. origin vegetable fat and skim were used.

Estimates of Manufactured Product Costs

The values in Table 15 were calculated using the previously mentioned model for fluid product compositions at 3.67 percent fat and 8.60 percent solids-not-fat. This composition should closely mimic the composition of whole producer milk. From these compositions, manufactured product costs were then derived based on product yields.

Table 27. Ingredient Costs of Fluid Low-fat Milk at Minimum Standards Manufactured from Selected Component Origins in US$/cwt at March 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$12.85	$7.18	$12.59	$7.70
Domestic Vegetable Fat-World Non-Fat Dry Milk	$9.08	$9.02	$9.00	$9.10
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$9.92	$9.87	$9.85	$9.95
U.S. Heavy Cream-World Non-Fat Dry Milk	$9.93	$9.66	$9.66	$9.93
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$10.77	$10.51	$10.50	$10.77
Domestic Vegetable Fat-Domestic Skim	$12.00	$5.70	$11.94	$5.80
Domestic Vegetable Fat-U.S. Wet Solids	$12.00	$11.95	$11.94	$12.02

1/ U.S. Made at U.S. Standards
2/ Mexican Made at Mexican Standards
3/ U.S. Made at Mexican Standards
4/ Mexican Made at U.S. Standards

Mozzarella and Oaxaca Cheeses: August 1994

The ingredient costs of producing U.S. mozzarella cheese (18.0% fat and 22.0% solids-not-fat) and Mexican oaxaca cheese (20.50% fat and 33.40% solids-not-fat) with various component origins and August 1994 prices are presented in Table 29. Utilizing domestic producer milk, the ingredient costs for 100 pounds of mozzarella cheese would cost the U.S. processor $84.64 and the Mexican processor utilizing Mexican milk, an equivalent $115.93. The Mexican processor would half the value of the ingredients of oaxaca by utilizing NDM purchased on the world market filled with Mexican vegetable fat rather than using Mexican producer milk ($85.01 verses $171.38 for per cwt of product).

Table 28. Ingredient Costs of Fluid Low-fat Milk at Minimum Standards Manufactured from Selected Component Origins in US$/cwt at September 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$12.41	$8.71	$12.06	$9.38
Domestic Vegetable Fat-World Non-Fat Dry Milk	$9.40	$9.50	$9.32	$9.63
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$9.99	$10.09	$9.91	$10.22
U.S. Heavy Cream-World Non-Fat Dry Milk	$10.65	$10.29	$10.29	$10.65
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$11.23	$10.88	$10.88	$11.23
Domestic Vegetable Fat-Domestic Skim	$11.16	$6.92	$11.09	$7.06
Domestic Vegetable Fat-U.S. Wet Solids	$11.16	$11.27	$11.09	$11.39

1/ U.S. Made at U.S. Standards
2/ Mexican Made at Mexican Standards
3/ U.S. Made at Mexican Standards
4/ Mexican Made at U.S. Standards

Mozzarella and Oaxaca Cheeses: March 1995

The ingredient costs of producing a cwt of U.S. mozzarella cheese (18.0% fat and 22.0% solids-not-fat) and Mexican oaxaca cheese (20.50% fat and 33.40% solids-not-fat) with various component origins and March 1995 prices are presented in Table 30. After the devaluation of the peso, the ingredient cost of Mexican oaxaca cheese with domestic origin is valued approximately $40.97 higher than the U.S. produced mozzarella ($102.01 verses $85.64 respectively). The Mexican oaxaca processor would have almost a $20.00 per cwt product comparative advantage utilizing Mexican producer milk relative to U.S. producer milk ($102.0/cwt for oaxaca produced from Mexican producer milk verses $126.61/cwt for oaxaca

Table 29. Ingredient Costs of Mozzarella and Oaxaca Cheeses Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at August 1994 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$84.64	$171.38	$125.13	$115.93
Domestic Vegetable Fat-World Non-Fat Dry Milk	$55.00	$85.01	$81.31	$57.50
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$71.86	$109.93	$106.23	$74.36
U.S. Heavy Cream-World Non-Fat Dry Milk	$68.29	$100.95	$100.95	$68.29
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$85.14	$125.87	$125.87	$85.14
Domestic Vegetable Fat-Domestic Skim	$71.29	$109.93	$105.39	$74.36
Domestic Vegetable Fat-U.S. Wet Solids	$71.29	$109.98	$105.39	$73.79

1/ U.S. Made Mozzarella
2/ Mexican Made Oaxaca
3/ U.S. Made Oaxaca
4/ Mexican Made Mozzarella

produced from U.S. producer milk). After the devaluation, the utilization of domestic skim filled with vegetable fat is the least-cost composition for the Mexican processor ($65.15/cwt).

Mozzarella and Oaxaca Cheeses: September 1995

The ingredient costs of producing a cwt of U.S. mozzarella cheese (18.0% fat and 22.0% solids-not-fat) and Mexican oaxaca cheese (20.50% fat and 33.40% solids-not-fat) with various component origins and September 1995 prices are presented in Table 31. Comparing the three time periods, U.S. prices have remained relatively constant. The increase in the world price of NDM is noted as the cost of products manufactured with world NDM have increased over the time period. At September 1995 prices, the ingredient costs of oaxaca

Table 30. Ingredient Costs of Mozzarella and Oaxaca Cheeses Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at March 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$85.64	$102.01	$126.61	$69.00
Domestic Vegetable Fat-World Non-Fat Dry Milk	$67.00	$99.47	$99.05	$67.29
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$72.86	$108.13	$107.71	$73.14
U.S. Heavy Cream-World Non-Fat Dry Milk	$77.57	$114.68	$114.68	$77.57
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$83.50	$123.44	$123.44	$83.50
Domestic Vegetable Fat-Domestic Skim	$75.07	$65.15	$110.98	$44.07
Domestic Vegetable Fat-U.S. Wet Solids	$75.07	$111.30	$110.98	$75.29

1/ U.S. Made Mozzarella
2/ Mexican Made Oaxaca
3/ U.S. Made Oaxaca
4/ Mexican Made Mozzarella

utilizing Mexican producer milk would be $3.90/cwt less than the use of U.S. producer milk ($125.03/cwt and $128.93 respectively). Likewise, the ingredient costs of a mozzarella manufactured from U.S. producer milk would be $2.64/cwt higher than a mozzarella produced from Mexican producer milk ($87.21/cwt verses $84.57/cwt). The least-cost combination for the Mexican processor would be Mexican vegetable fat and skim ($80.15/cwt).

Cheddar and Chihuahua Cheeses: August 1994

The ingredient costs of producing a cwt of U.S. cheddar cheese (30.5% fat and 30.5% solids-not-fat) and Mexican chihuahua cheese (32.30% fat and 33.90% solids-not-fat) with

Table 31. Ingredient Costs of Mozzarella and Oaxaca Cheeses Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at September 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$87.21	$125.03	$128.93	$84.57
Domestic Vegetable Fat-World Non-Fat Dry Milk	$69.21	$106.76	$102.32	$72.21
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$73.36	$112.88	$108.45	$76.36
U.S. Heavy Cream-World Non-Fat Dry Milk	$85.14	$125.87	$125.87	$85.14
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$89.29	$132.00	$132.00	$89.29
Domestic Vegetable Fat-Domestic Skim	$71.29	$80.15	$105.39	$54.21
Domestic Vegetable Fat-U.S. Wet Solids	$71.29	$119.82	$115.39	$74.29

1/ U.S. Made Mozzarella
2/ Mexican Made Oaxaca
3/ U.S. Made Oaxaca
4/ Mexican Made Mozzarella

various component origins and August 1994 prices are presented in Table 32. Chihuahua and cheddar have greater relative ingredient costs when compared to oaxaca and mozzarella due to a higher butterfat percentage. Before the devaluation, the ingredient cost of cheddar from Mexican producer milk would be approximately $40.00 higher per cwt of product than for producer milk purchased in the United States ($158.34 vs. $115.61 respectively). The least cost composition for the Mexican processor manufacturing chihuahua would be NDM purchased on the world market filled with vegetable fat ($80.50 per cwt of product).

Table 32. Ingredient Costs of Cheddar and Chihuahua Cheeses Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at August 1994 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$115.61	$162.30	$118.50	$158.34
Domestic Vegetable Fat-World Non-Fat Dry Milk	$75.12	$80.50	$77.00	$78.54
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$98.15	$104.10	$100.60	$101.56
U.S. Heavy Cream-World Non-Fat Dry Milk	$93.27	$95.60	$95.60	$93.27
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$116.29	$119.20	$119.20	$116.29
Domestic Vegetable Fat-Domestic Skim	$97.37	$102.10	$99.80	$101.56
Domestic Vegetable Fat-U.S. Wet Solids	$97.37	$103.30	$99.80	$100.78

1/ U.S. Made Cheddar
2/ Mexican Made Chihuahua M1
3/ U.S. Made Chihuahua M1
4/ Mexican Made Cheddar

Cheddar and Chihuahua Cheeses: March 1995

The ingredient costs of producing a cwt of U.S. cheddar cheese (30.5% fat and 30.5% solids-not-fat) and Mexican chihuahua cheese (32.30% fat and 33.90% solids-not-fat) with various component origins and March 1995 prices are presented in Table 33. After the devaluation, at March 1995 prices, a processor manufacturing cheddar would have an approximately $22.74 per cwt comparative advantage utilizing Mexican producer milk relative to U.S. producer milk ($94.24/cwt vs $116.98/cwt respectively). Domestic vegetable fat-skim is now the least-cost composition for the Mexican chihuahua manufacturer ($61.70 per cwt of product).

Table 33. Ingredient Costs of Cheddar and Chihuahua Cheeses Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at March 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$116.98	$96.60	$119.90	$94.24
Domestic Vegetable Fat-World Non-Fat Dry Milk	$91.51	$94.20	$93.80	$91.90
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$99.51	$102.40	$102.00	$99.90
U.S. Heavy Cream-World Non-Fat Dry Milk	$105.95	$108.60	$108.60	$105.95
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$114.05	$116.90	$116.90	$114.05
Domestic Vegetable Fat-Domestic Skim	$102.54	$61.70	$105.10	$60.20
Domestic Vegetable Fat-U.S. Wet Solids	$102.54	$105.40	$105.10	$102.80

1/ U.S. Made Cheddar
2/ Mexican Made Chihuahua M1
3/ U.S. Made Chihuahua M1
4/ Mexican Made Cheddar

Cheddar and Chihuahua Cheeses: September 1995

The ingredient costs of producing a cwt of U.S. cheddar cheese (30.5% fat and 30.5% solids-not-fat) and Mexican chihuahua cheese (32.30% fat and 33.90% solids-not-fat) with various component origins and September 1995 prices are presented in Table 34. For the processor manufacturing cheddar cheese, utilizing Mexican origin producer milk would net $3.61/cwt of product ($115.51/cwt manufactured with Mexican producer milk verses $119.12/cwt manufactured with U.S. producer milk). Likewise, in manufacturing chihuahua cheese, utilizing Mexican producer milk would save the processor $3.80/cwt of product

Table 34. Ingredient Costs of Cheddar and Chihuahua Cheeses Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at September 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/M	4/M/US
Domestic Butterfat-Skim	$119.12	$122.20	$118.40	$115.51
Domestic Vegetable Fat-World Non-Fat Dry Milk	$94.54	$96.90	$101.10	$98.63
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$100.20	$102.70	$106.90	$104.29
U.S. Heavy Cream-World Non-Fat Dry Milk	$116.29	$119.20	$119.20	$116.29
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$121.95	$125.00	$125.00	$121.95
Domestic Vegetable Fat-Domestic Skim	$97.37	$99.80	$75.90	$74.05
Domestic Vegetable Fat-U.S. Wet Solids	$97.37	$99.80	$104.00	$101.46

1/ U.S. Made Cheddar
2/ Mexican Made Chihuahua M1
3/ U.S. Made Chihuahua M1
4/ Mexican Made Cheddar

($118.40/cwt verses $122.20/cwt). The least-cost composition for the Mexican chihuahua cheese processor would be Mexican vegetable fat and world NDM ($96.90/cwt).

Butter: August 1994, March 1995 and September 1995

The ingredient costs of producing cwt of butter (80.0% fat and 0.10% solids-not-fat) with U.S. and Mexican component origins and August 1994, March 1995 and September 1995 prices are presented in Table 35. Before the devaluation, the utilization of U.S. producer milk as opposed to Mexican originated milk would offer the processor a clear advantage ($264.51 verses $362.28 respectively). After the devaluation in March 1995, the Mexican processor had the comparative advantage if producer milk was utilized ($215.63/cwt with Mexican

Table 35. Ingredient Costs of Butter Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at August, 1994, March 1995 and September 1995 Prices

Selected Component Origins	Costs of Ingredients to Manufacture 100 Pounds of Product 1/US/US	2/M/M	3/US/US	4/M/M	5/US/US	6M/M
Domestic Butterfat-Skim	$264.51	$362.28	$267.63	$215.63	$272.54	$264.29
Domestic Vegetable Fat-World Non-Fat Dry Milk	$171.88	$179.69	$209.38	$210.27	$216.29	$225.67
Domestic Vegetable Fat-U.S. Non-Fat Dry Milk	$224.55	$232.37	$227.67	$228.57	$229.24	$238.62
U.S. Heavy Cream-World Non-Fat Dry Milk	$213.39	$213.39	$242.41	$242.41	$266.07	$266.07
U.S. Heavy Cream-U.S. Non-Fat Dry Milk	$266.07	$266.07	$260.94	$260.94	$279.02	$279.02
Domestic Vegetable Fat-Domestic Skim	$222.77	$232.37	$234.60	$137.72	$222.77	$169.42
Domestic Vegetable Fat-U.S. Wet Solids	$222.77	$230.58	$234.60	$235.27	$222.77	$232.14

1/ Made at U.S. Standards August, 1994 prices
2/ Made at Mexican Standards August, 1994 prices
3/ Made at U.S. Standards March, 1995 prices
4/ Made at Mexican Standards March, 1995 prices
5/ Made at U.S. Standards September, 1995 prices
6/ Made at Mexican Standards September, 1995 prices

producer milk verses $267.63/cwt for U.S. producer milk). At March 1995 prices, a Mexican processor could decrease his butter ingredient costs by slightly more than 60 percent by filling domestic skim with vegetable fat instead of utilizing Mexican producer milk ($137.72 verses $215.63 per cwt of product, respectively). At September 1995 prices, the utilization of Mexican producer milk verses U.S. producer milk would save the butter processor $8.25/cwt ($272.54/cwt for U.S. producer milk verses $264.29/cwt for butter manufactured from Mexican producer milk). At September 1995 prices, the utilization of Mexican skim filled with vegetable fat is the least-cost scenario for the Mexican butter manufacturer ($169.42/cwt).

Non-fat Dry Milk: August 1994, March 1995 and September 1995

The ingredient costs of producing a cwt of non-fat dry milk (0.05% milkfat and 96.00% solids-not fat) with U.S. and Mexican component origins at August 1994, March 1995 and September 1995 prices are presented in Table 36. Only the utilization of producer milk (skim) was calculated. At August 1994 prices, a NDM processor utilizing U.S. producer milk had the least ingredient costs ($8.44/cwt of product for the U.S. producer milk verses $10.45/cwt for NDM manufactured from Mexican producer milk). The ingredient costs for a processor utilizing Mexican components decreased to 57 percent of their August 1994 value in March 1995 when compared to the United States due to the effects of the devaluation ($10.45 vs. $5.95 per cwt of product). Ingredient costs of U.S. origin ingredients increased by 7 cents between August 1994 and March 1995. Between March 1995 and September 1995 the ingredient cost of NDM manufactured from U.S. producer milk increased an additional $0.05/cwt ($8.56/cwt). During the same time period, the ingredient costs of NDM produced from Mexican producer milk increased $0.08/cwt (6.03/cwt).

Table 36. Ingredient Costs of Non-fat Dry Milk Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at August 1994, March 1995 and September 1995 Prices

	Costs of Ingredients to Manufacture 100 Pounds of Product					
Selected Component Origins	1/US/US	2/M/M	3/US/US	4/M/M	5/US/US	6M/M
Domestic Butterfat-Skim	$8.44	$10.45	$8.51	$5.95	$8.56	$6.03

1/ Made at U.S. Standards August, 1994 prices
2/ Made at Mexican Standards August, 1994 prices
3/ Made at U.S. Standards March, 1995 prices
4/ Made at Mexican Standards March, 1995 prices
5/ Made at U.S. Standards September, 1995 prices
6/ Made at Mexican Standards September, 1995 prices

Estimates of the Dairy Ingredient Costs of Ice Cream and Yogurt

The dairy ingredient costs of ice cream and yogurt were estimated based on previously discussed recipes and input prices.

Ice Cream: August 1994, March 1995 and September 1995

The dairy ingredient costs of producing a cwt of ice cream (10% milkfat and 10% solids-not-fat) with U.S. and Mexican component origins at August 1994, March 1995 and September 1995 prices are presented in Table 37. The utilization of U.S. dairy ingredients offers the least dairy ingredient costs for the manufacture of a cwt of ice cream for both U.S. and Mexican processors. U.S. origin ingredient costs decreased by 36 cents between August 1994 and March 1995 ($8.90/cwt to $8.54/cwt). The equivalent costs of utilizing Mexican origin ingredients decreased by US$3.10 due to the effects of the devaluation during the same time period ($14.32/cwt to $11.22/cwt). The dairy ingredient costs of ice cream increased a further $1.11/cwt for the U.S. processor from March 1995 to September 1995 ($8.54/cwt to $9.65/cwt). During the same time period, the Mexican dairy ingredient costs for ice cream increased $1.90/cwt ($11.22/cwt to $13.12/cwt).

Yogurt: August 1994, March 1995 and September 1995

The dairy ingredient costs of producing a cwt of yogurt (1.25% milkfat and 11% solids-not-fat) with U.S. and Mexican component origins at August 1994, March 1995 and September 1995 prices are presented in Table 38. Before the devaluation, during August 1994, the dairy ingredient costs for the processor utilizing U.S. components is $12.59/cwt and $11.07/cwt for the processor utilizing Mexican components. After the devaluation, during March 1995, the dairy ingredient costs for the utilization of U.S. and Mexican components are

$12.56/cwt and $12.20/cwt respectively. Finally, during September 1995, the ingredient cost would be $12.88/cwt for the use of U.S. components and $12.98/cwt for the utilization of Mexican origin components.

Table 37. Dairy Ingredient Costs of Ice Cream Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at August 1994, March 1995 and September 1995 Prices

	Costs of Ingredients to Manufacture 100 Pounds of Product					
Selected Component Origins	1/US/US	2/M/M	3/US/US	4/M/M	5/US/US	6/M/M
Domestic Butterfat and Non-Fat Dry Milk and U.S. Milk Whey	$8.90	$14.32	$8.54	$11.22	$9.65	$13.12

1/ Made at U.S. Standards August, 1994 prices
2/ Made at Mexican Standards August, 1994 prices
3/ Made at U.S. Standards March, 1995 prices
4/ Made at Mexican Standards March, 1995 prices
5/ Made at U.S. Standards September, 1995 prices
6/ Made at Mexican Standards September, 1995 prices

Table 38. Dairy Ingredient Costs of Yogurt Manufactured at Minimum Standards from Selected Component Origins in US$/cwt at August 1994, March 1995 and September 1995 Prices

	Costs of Ingredients to Manufacture 100 Pounds of Product					
Selected Component Origins	1/US/US	2/M/M	3/US/US	4/M/M	5/US/US	6/M/M
Domestic Butterfat-Skim	$12.59	$11.07	$12.56	$12.20	$12.88	$12.98

1/ Made at U.S. Standards August, 1994 prices
2/ Made at Mexican Standards August, 1994 prices
3/ Made at U.S. Standards March, 1995 prices
4/ Made at Mexican Standards March, 1995 prices
5/ Made at U.S. Standards September, 1995 prices
6/ Made at Mexican Standards September, 1995 prices

Determination of Gross Processor Margins

With the estimates of the values of the dairy components utilized to manufacture various products it is possible to calculate gross processor margins by subtracting these values from comparable retail dairy product prices. For the purposes of this study, gross processor

margins are defined as the difference between the value of the dairy ingredients from producer milk necessary to produce one retail unit of product and the average retail price of one retail unit of product. The retail prices for selected dairy products were presented in the previous chapter.

U.S. and Mexican Produced Fluid Milk, Cheeses and Soft Products

Gross processor margins for U.S. produced packaged milk, cheddar and mozzarella cheeses, ice cream and yogurt were derived by subtracting the calculated value of the dairy ingredients from U.S. producer milk necessary to produce one retail unit of product (found in Tables 23-34, 37 and 38) from the average retail price of the retail unit of product found in U.S. supermarkets in El Paso (Tables 1-3, 6 and 7). Mexican gross producer margins for fluid whole milk, chihuahua and oaxaca cheeses were similarly derived from subtracting the calculated value of Mexican producer milk utilized to manufacture one retail unit of product (Tables 23-34) from the average retail price of the retail unit of product found in Mexican hypermarts in Juarez (Tables 1-3).

United States Produced Products Imported By Mexico

Gross producer margins for U.S. produced packaged milk, ice cream and yogurt for retail sale in Mexican hypermarts was calculated by subtracting the calculated value of the dairy ingredients manufactured with U.S. producer milk (Tables 23-25, 37 and 38) from the average retail price of the retail unit of product found in Mexican hypermarts in Juarez (Tables 1, 6 and 7).

U.S. and Mexican Produced Butter and Non-fat Dry Milk Powder

Butter and non-fat dry milk are usually jointly manufactured products. Butter is manufactured from the cream portion of the producer milk and non-fat dry milk is produced from the skim. Considering that 4.25 pounds of butter and 9 pounds of non-fat dry milk can be produced from a cwt of producer milk, the value of the ingredients was calculated by multiplying the yield of each joint product by the calculated value of one pound of each product (Tables 35 and 36) and then adding the result. The retail price of the joint product was calculated by multiplying the average retail price of butter and non-fat dry milk (Tables 4 and 5) by their respective yields. The difference of the value of the ingredients and the total retail price was then divided by 13.25 (the sum of the yields). This result was the gross producer margin of the jointly produced butter and non-fat dry milk. These calculations were preformed for both U.S. and Mexican butter and non-fat dry milk.

Estimates of Gross Processor Margins

Gross producer margins for fluid milk, cheeses, ice cream and yogurt were calculated by subtracting the value of the dairy ingredients from producer milk necessary to produce one retail unit of product from the average retail price of the retail unit. The gross processor margins for butter and non-fat dry milk were calculated as jointly produced products.

Gross Processor Margins for U.S. Fluid Milk, Cheeses Ice Cream and Yogurt

Table 39 presents gross processor margins for U.S. produced fluid whole milk, 2% low-fat milk, cheddar and mozzarella cheeses, ice cream and yogurt. For U.S. products during the time periods of August 1994, March 1995 and September 1995, the gross processor margins were influenced to a greater degree by variations in the average retail prices than the value of

the dairy ingredients. These margins were less in March 1995 than in August 1994. In March 1995, the margins were between 90 and 95 percent of their value in August 1994. The margins for packaged milk were additionally less in September 1995 than in March 1995.

Table 39. Estimates of U.S. Gross Processor Margins for Selected Dairy Products in Common Retail Units at August 1994, March 1995 and September 1995 Prices Manufactured From U.S. Producer Milk

Product	Time Context	Retail Unit	Value of Ingredients	Average Retail Price	Margin
Fluid	08/94	gallon	$1.16	$2.99	$1.83
Whole	03/95	gallon	$1.17	$2.92	$1.75
Milk	09/95	gallon	$1.15	$2.87	$1.72
2%	08/94	gallon	$1.09	$3.29	$2.20
Low-fat	03/95	gallon	$1.11	$3.12	$2.01
Milk	09/95	gallon	$1.07	$2.96	$1.89
Cheddar	08/94	pound	$1.16	$3.15	$1.99
Cheese	03/95	pound	$1.17	$2.97	$1.80
	09/95	pound	$1.19	$3.15	$1.96
Mozzarella	08/94	pound	$0.85	$2.84	$1.99
Cheese	03/95	pound	$0.86	$2.69	$1.83
	09/95	pound	$0.87	$3.02	$2.15
Ice Cream*	03/95	half-gallon	$0.19	$3.57	$3.38
	09/95	half-gallon	$0.22	$3.65	$3.43
Yogurt*	03/94	8 ounces	$0.06	$0.68	$0.62
	09/95	8 ounces	$0.06	$0.58	$0.52

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
(*) does not include sugars, fillers or flavorings

The margins for cheeses, though, were greater. Fluid milk margins were 94 to 98 percent of their March 1995 value in September 1995. Cheese margins were 109 to 117 percent of their March 1995 value in September 1995. Ice cream margins were 101 percent of their March

1995 value in September 1995 and yogurt margins were 84 percent of their March 1995 value in September 1995.

Gross Processor Margins for Mexican Fluid Milk and Cheeses

Table 40 is a summary of the gross processor margins for Mexican produced whole milk, low-fat milk, chihuahua and oaxaca cheeses. Gross processor margins were influenced by the devaluation. The margins after the devaluation (March 1995) were 41 to 66 percent of their value prior to the devaluation (August 1994). In September 1995, Mexican gross processor margins were between 52 and 107 percent of their pre-devaluation value in August 1995.

Table 40. Estimates of Mexican Gross Processor Margins for Selected Dairy Products in Common Retail Units at August 1994, March 1995 and September 1995 Prices Manufactured From Mexican Producer Milk

Product	Time Context	Retail Unit	Value of Ingredients	Average Retail Price	Margin
Fluid	08/94	gallon	$1.36	$2.57	$1.21
Whole	03/95	gallon	$0.80	$1.61	$0.81
Milk	09/95	gallon	$0.99	$1.77	$0.78
Chihuahua	08/94	pound	$1.62	$2.69	$1.07
Cheese	03/95	pound	$0.97	$1.41	$0.44
	09/95	pound	$1.22	$2.36	$1.14
Oaxaca	08/94	pound	$1.71	$3.92	$2.21
Cheese	03/95	pound	$1.02	$2.37	$1.35
	09/95	pound	$1.25	$2.41	$1.16

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
NOTE: Prices and values have been standardized to U.S. units and currency.

Gross Processor Margins for Mexican Imported Fluid Milk, Ice Cream and Yogurt

Table 41 presents gross processor margins for U.S. produced fluid milk, ice cream and yogurt found in Mexican hypermarts. The gross processor margins were influenced by the

devaluation. The margins for imported fluid milk were 55 percent of their August 1994 value after the devaluation in March 1995. During September 1995, the margins for imported fluid milk were 67 percent of their value in August 1994. Additionally, the margins for ice cream were 90 percent of their March 1995 value in September 1995. Likewise, the margins for yogurt were 81 percent of their March 1995 value in September 1995.

Table 41. Estimates of Gross Processor Margins for Selected Imported Dairy Products in Common Retail Units at August 1994, March 1995 and September 1995 Prices Found in Mexican Retail Outlets

Product	Time Context	Retail Unit	Value of Ingredients	Average Retail Price	Margin
Fluid Whole Milk	08/94	gallon	$1.16	$2.60	$1.44
	03/95	gallon	$1.17	$1.95	$0.78
	09/95	gallon	$1.15	$2.11	$0.96
Ice Cream*	03/95	half-gallon	$0.25	$2.32	$2.07
	09/95	half-gallon	$0.30	$2.16	$1.86
Yogurt*	03/95	8 ounces	$0.06	$0.43	$0.37
	09/95	8 ounces	$0.06	$0.36	$0.30

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
(*) does not include sugars, fillers or flavorings
NOTE: Prices and values have been standardized to U.S. units and currency.

Gross Processor Margins for U.S. and Mexican Butter and Non-fat Dry Milk

Table 42 presents gross processor margins for U.S. and Mexican jointly produced butter and non-fat dry milk. The U.S. gross processor margins for August 1994 and March 1995 were remarkably constant. An increase in the margin for U.S. butter and non-fat dry milk is noted when comparing August 1994 to September 1995 due to higher average retail prices. Mexican margins were 54 percent of their August 1994 value in March 1995 (after the

devaluation). Margins for butter and non-fat dry milk were 89 percent of their August 1994 value in September 1995.

Table 42. Estimates of Gross Processor Margins for Butter and NDM Powder in Common Retail Units at August 1994, March 1995 and September 1995 Prices Manufactured from Producer Milk

Product	Time Context	Value of Ingredients(*)	Product Retail Price(*)	Difference	Product Pounds	Margin
U.S. NDM	08/94	$12.00	$35.66	$23.66	13.25	$1.79
Powder and	03/95	$12.14	$35.67	$23.53	13.25	$1.78
Butter †	09/95	$12.35	$38.62	$26.27	13.25	$1.98
Mexican NDM	08/94	$16.33	$33.95	$17.62	13.25	$1.33
Powder and	03/95	$09.70	$19.18	$09.48	13.25	$0.72
Butter †	09/95	$11.78	$27.34	$15.56	13.25	$1.17

The August 10, 1994 exchange rate was N$3.1 to US$1.00
The March 11, 1995 exchange rate was N$6.0 to US$1.00
The September 15, 1995 exchange rate was N$6.3 to US$1.00
(†) jointly manufactured products
(*) values are for NDM and butter produced jointly from 100 pounds of producer milk
NOTE: Prices and values have been standardized to U.S. units and currency.

Product Ingredient Costs and Gross Processor Margins: Concluding Comments

Due to higher producer prices in Mexican cooperatives before the devaluation than in the United States, Mexican products manufactured from a domestic butterfat and skim composition were determined to be valued higher than their U.S. counterparts. Also, a higher domestic market value of butterfat (relative to the U.S.), provided a strong price incentive for Mexican processors to sell butterfat and utilize vegetable fat to fill products. After the devaluation, comparing Mexican producer quota prices to their U.S. values, they were 59 percent lower in March 1995 when compared to August 1994. Consequently, the ingredient costs of producing fluid milk and products utilizing Mexican producer milk were less in March 1995. Under March 1995 conditions, the utilization of Mexican producer milk would be the least-cost natural component origin scenario in all cases with the exception of ice

cream. The relatively high market value of butterfat offers the Mexican processor a strong incentive to fill products with vegetable fat and sell the butterfat. Comparing the Mexican producer quota prices to their U.S. equivalents, Mexican producer prices were 73 percent of their August 1994 value in September 1995.

As a general trend, gross processor margins were slightly less for U.S. processors in March 1995 when compared to August 1994. Due to the effects of the devaluation, Mexican gross processor margins were between 50 and 70 percent of their August 1994 value in March 1995. U.S. gross processor margins decreased for fluid milk, cheddar cheese and yogurt when comparing March 1995 with September 1995. U.S. gross producer margins increased for mozzarella cheese and ice cream during the same time period. Mexican gross producer margins decreased for fluid whole milk and oaxaca cheese and increased for chihuahua cheese comparing March 1995 with September 1995.

CHAPTER V

EVALUATION OF POOLING SCENARIOS FOR MILK SOLD TO AND RECEIVED FROM MEXICO

The objective of this chapter was to analyze the effects of various milk trade scenarios on producer prices in the Texas and New Mexico-West Texas federal orders. Five scenarios representing movements of packaged and producer milk across the border were examined for three alternative time periods.

Model Formulation

A pooling model was developed by Robert B. Schwart, Jr. with the assistance of USDA/Agricultural Marketing Service (AMS) personnel to simulate the supply and utilizations of milk in Texas. This model evaluates alternative cooperative strategies of pooling and not pooling milk on the federal order as well as simulating effects on cooperative and federal order blend prices from milk originating in and being exported to Mexico.

Simulation Time Frame

The months of August 1994, December 1994 and March 1995 were chosen to simulate market conditions.

- August 1994 represents a period of decreased milk production in the Texas and West Texas-New Mexico federal orders due to warmer summer weather. Due to decreased supply, a higher percentage of the producer milk goes to fluid utilization. Additionally, the movement or pooling of milk to other federal orders or destinations is normally at a low.

- December 1995 is a transition month and represents non-typical market conditions. The first half of the month has characteristics of summer and fall market conditions. Milk production is increasing after the summer low and milk demand has increased from the summer period due to factors such as school lunch usage and holiday demand. The second half of December is more characteristic of the spring market conditions. Milk demand decreases the latter half of December when school is out of session and the production of specialty seasonal products such as eggnog and cheeses decline. Additionally, December ends with most plants shut down for the holidays.
- March 1995 represents the spring flush period. Milk production is at a seasonal high. Consequently, movement of milk to other orders or alternative markets is at a high.

Assumptions in the Model

The following assumptions are included in the model:

- All milk evaluated in this model is assumed to test 3.5 percent butterfat. Federal order prices are announced for milk standardized at 3.5 percent butterfat.
- This model assumes that the two federal orders which regulate the minimum prices handlers must pay producers for milk in Texas and New Mexico are merged and are one order. Currently, the Texas Marketing Order (Federal Order No. 126) regulates central, eastern and southern Texas and the New Mexico - West Texas Order (Federal Order No. 138) regulates the Texas Panhandle, El Paso County, the state of New Mexico and three counties in southwestern Colorado. Procedures are currently underway to merge these two orders.

- The federal order prices calculated in the model are for Zone 1 in Dallas, Texas. Prices within the federal order are further adjusted depending upon the location of the receiving plant within the order. These geographic delineations are called zones and prices within the zones themselves represent transportation distances from Zone 1. Producer prices within a federal order are announced at Zone 1 and are adjusted from that price.
- This model assumes that one cooperative operates in the Texas-New Mexico region. In reality, at least four cooperatives operate in this region and they are very competitive.
- This model assumes that the cooperative weighs its pooling and marketing decisions based on the net return associated with the procurement and handling of each load of milk. Consequently, milk that is not pooled on the federal order may appear to be sold for a price lower than Class III or Class III-A when compared to other markets (Mexico). In actuality, if the costs associated with handling are considered, the net returns may be higher. In this model, $12.00/cwt was used as a realistic Mexican offer price.

Model Description

Figure 12 represents the origins, movements and utilizations of milk under the four assumptions. The model is a spreadsheet-based representation of Figure 12. The hexagon shape entitled "Local FMO" represents the local federal order which is the merged Federal Orders 126 and 138. The box entitled "Cooperative" refers to the single, simplified cooperative analyzed in this model. The hexagon entitled "Other FMO's" refers to other U.S.

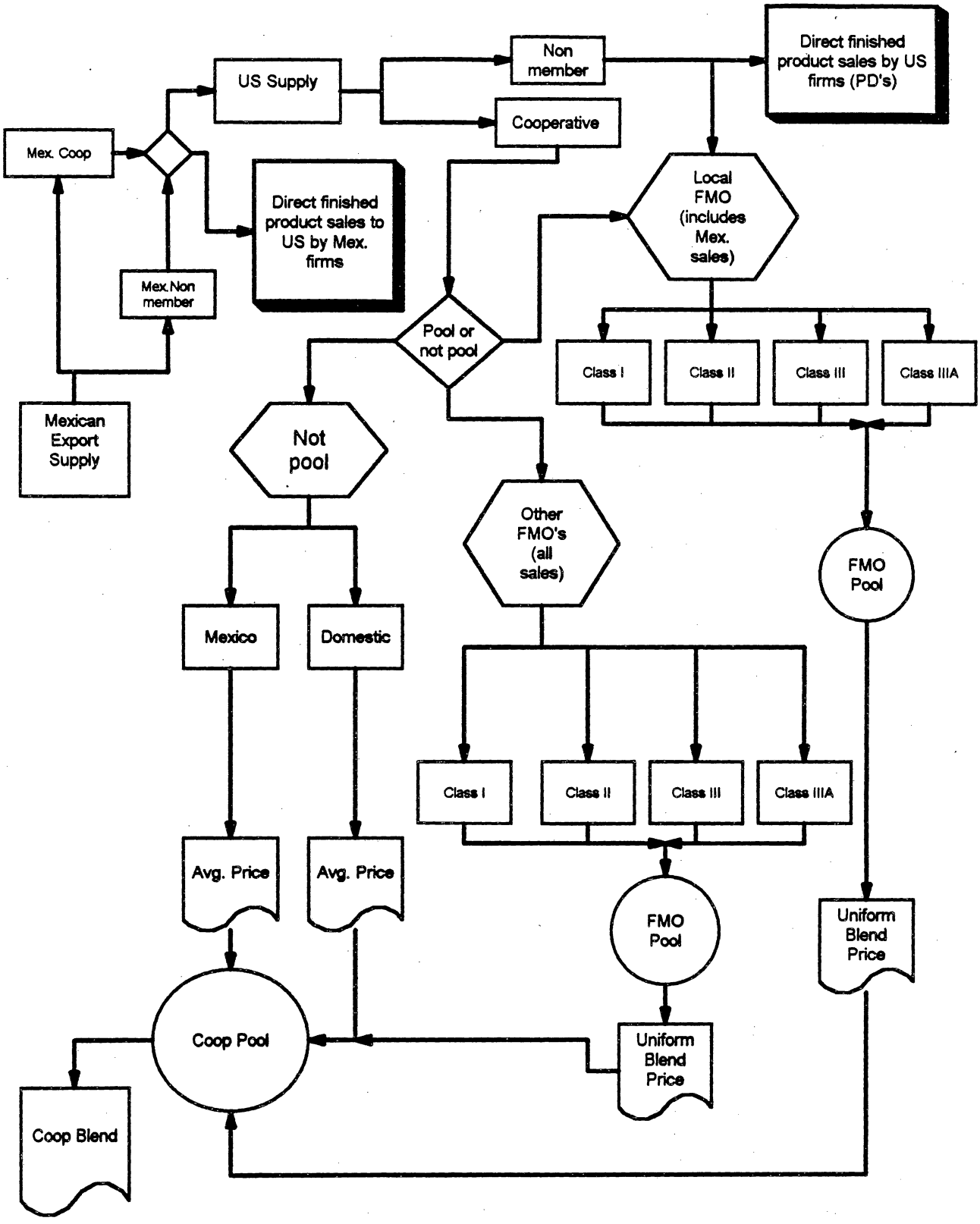


Figure 12. Schematic of a Regional Milk Market

federal marketing orders.

Milk can enter into the federal marketing order from several sources. The gateway for milk in this model is the U.S. supply box in Figure 12. The U.S. supply represents fluid milk produced domestically in the United States and fluid milk exported from Mexico to the United States (Mexican Export Supply box) which meets federal order and state health department requirements. Milk exported from Mexico to the United States can be either from a Mexican cooperative or from a producer or producers who are not affiliated with a cooperative. Mexican milk can enter the U.S. supply through the federal order or it can enter the U.S. market directly as packaged milk. The three-dimensional box, direct finished product sales to the United States by Mexican firms, represents sales of Mexican packaged milk along the border area of the United States.

Fluid milk produced in the United States can be either from a cooperative or a non-member. Referring to Figure 12, non-member milk can be either pooled on the local federal marketing order (Local FMO hexagon) or be packaged and sold in the United States as a producer/distributer. The second option implies that the producer packages and sells his/her own fluid milk. It should be noted that a packaging plant could be purchased or constructed on the U.S. side of the border by a Mexican producer and this entity could sell packaged milk of Mexican origin as a producer/distributer. Cooperative milk can be pooled on the local federal marketing order, pooled on an external federal order or not be pooled. This decision is represented by the pool or not pool diamond.

The Local FMO hexagon represents milk pooled on the principle order from the cooperative, U.S. non-cooperative member milk and Mexican imports. Once milk is pooled

on the federal order, the Class I, Class II, Class III and Class III-A utilizations are determined. These are the total quantities of milk used in each Class over the entire market. The circle (FMO Pool) represents the total dollar value of milk delivered to handlers in the federal order by producers. It is calculated by multiplying the quantity of milk utilized in each class by the class price. A small fee is assessed from the FMO Pool to cover federal order operating expenses. A uniform blend price is then calculated as a weighted average of all use values. Producers are paid the uniform blend price after location and butterfat adjustments are made.

Milk that was not pooled on the local federal order by the cooperative can be pooled on other federal milk orders. This possibility is represented by the other FMO's (all sales) hexagon. For milk pooled on other orders, the Class I, Class II, Class III and Class III-A utilizations are calculated. The circle FMO Pool represents the other order pool. A uniform blend price for this order is then determined.

Returning to the Pool or not pool diamond in Figure 12, the third and final option for the cooperative is to not pool the milk. The milk can be not pooled domestically or not pooled on the Mexican market and an average price of the nonpooled milk is calculated. Cooperatives will not pool for two main reasons. Either the cooperative is able to receive a high price for its producer milk from a handler (either domestically or for a Mexican destination) and it does not wish to share these benefits across the pool (with competitors and other producers) or for some reason the milk did not qualify properly for the order. As a rule, the cooperative will try to pool as much milk as possible on the local order. The next alternative will be pooling milk on other federal milk orders.

Referring to Figure 12, the coop pool, is calculated from a weighted average of producer milk marketed in the local FMO at its uniform blend price, the milk marketed on other FMO's at their uniform blend prices and milk non-pooled to Mexico and domestically at their average prices. From this cooperative pool, a fee is assessed for operations, location adjustments and butterfat adjustments are made and a cooperative blend is determined. Cooperative producers are then paid at the cooperative blend with location and component premium adjustments.

Scenarios Examined

With the cooperation of the Texas / West Texas-New Mexico Milk Market Administrator's office, five scenarios were developed which most typically describe past marketing activities and realistically suggest plausible activities for the foreseeable future.

- A baseline was developed to represent actual market conditions in August 1994, December 1994 and March 1995.
- A scenario representing 10 million pounds of bulk shipments from Mexico (fluid imports) pooled on the market for each of the three months. It is assumed that the Mexican milk was pooled on the order by an external cooperative or non-member.
- The simulation of 10 million pounds of Mexican packaged fluid product being imported for each of the three months. It is assumed that the Mexican milk is marketed in the United States and displaces sales from the local Class I market.
- An estimation of the effects of increased packaged fluid product sales (10 million pounds) into Mexico from the United States for August 1994, December 1994 and March 1995. It is assumed that the increased packaged sales to Mexico (Class I)

are part of the FMO pool and came out of what had been classified as Classes III and III-A.

- The effects of the cooperative not pooling 10 million pounds of producer milk and shipping it to Mexico for a price equal to the producer pay price. It is assumed that this milk came out of what had been classified as Classes III and III-A.

Results

Tables 39-53 are a summary of the results. Since this section utilized actual market order data, steps have been taken to protect its confidentiality. The uniform market price is presented as a combination of the local blend price and the other federal market orders blend price. Additionally, realistic location and transportation adjustments have been assessed.

August 1994

August 1994, represents a month of seasonal below-average milk production. Approximately 677 million pounds of milk were pooled on the local order. Of the three

Table 43. Prices Resulting from Alternative Pooling Strategies: August 1994 Baseline

Month: August Scenario: Baseline	pounds	$/cwt in Zone 1 for milk @ 3.5% b.f.
Class I use	352,113,558	$14.41
Class II use	102,968,624	$11.84
Class III & III-A use	221,940,264	$11.25
Package Milk Marketed From Mexico	0	
Non-Pooled Producer Milk Exported to Mexico[4]	0	$0.00
Uniform Market Price (all market wide)	677,022,446	$13.14
Cooperative Blend (all market wide)	677,022,446	$12.87

[4] Non-pooled milk refers to producer milk that is in the Coop pool, but the Coop has withheld from the federal order pool.

Table 44. Prices Resulting from Alternative Pooling Strategies: August 1994 Mexican Bulk Shipments

Month: August Scenario: Bulk Shipments from Mexico Pooled on the Market	pounds	$/cwt in Zone 1 for milk @ 3.5% b.f.
Class I use	352,113,558	$14.41
Class II use	102,968,624	$11.84
Class III & III-A use	231,940,264	$11.25
Package Milk Marketed From Mexico	0	
Non-Pooled Producer Milk Exported to Mexico	0	$0.00
Uniform Market Price (all market wide)	687,022,446	$13.14
Cooperative Blend (all market wide)	677,022,446	$12.86

months, fluid utilization was at a relative high at 52.0 percent. Referring to Table 43, under the baseline scenario, a uniform market price of $13.14/cwt and a marketwide cooperative blend price of $12.87/cwt were calculated.

Assuming that 10 million pounds of Mexican bulk milk was pooled on the local federal marketing order, the cooperative blend price would decrease to $12.86/cwt (Table 44). The near zero change from the baseline results from the local cooperative's strategy. The Mexican bulk milk forced the cooperative to divert another 10 million more pounds additional milk to Classes III and III-A. With location adjustments, transportation credits and settlement fund adjustments there was actually an increase in total pooled dollars. Simulating the importation of 10 million pounds of packaged milk from Mexico (Table 45), the cooperative blend price would drop $0.03/cwt from the baseline to $12.84/cwt under August 1994 conditions.

Increased package fluid sales into Mexico would increase the cooperative blend price $0.06/cwt to $12.93/cwt (Table 46) under simulated August 1994 conditions. It should be noted that packaged milk sales to Mexico offer an additional sales opportunity for the cooperative. Although producer deliveries are down during August, market balancing

Table 45. Prices Resulting from Alternative Pooling Strategies: August 1994 Mexican Packaged Imports

Month: August Scenario: Mexican Packaged Fluid Products are Imported	pounds	$/cwt in Zone 1 for milk @ 3.5% b.f.
Class I use	342,113,558	$14.41
Class II use	102,968,624	$11.84
Class III & III-A use	231,940,264	$11.25
Package Milk Marketed From Mexico	10,000,000	
Non-Pooled Producer Milk Exported to Mexico	0	$0.00
Uniform Market Price (all market wide)	677,022,446	$13.12
Cooperative Blend (all market wide)	677,022,446	$12.84

(diversion of residual milk to Class III and Class III-A utilization after all other uses have been satisfied) is still occurring. During August 1994, packaging 10 million pounds of milk for export to Mexico prevented this milk from being shifted into non-fat dry milk powder.

Finally, if the cooperative did not pool 10 million pounds of milk and shipped it to Mexico for a price paid in Mexico which was equal or greater than the price paid in the alternative markets, Table 47, the uniform market price was calculated to be $13.17/cwt, an increase of $0.03/cwt. The cooperative blend price under this scenario would be $12.89/cwt,

Table 46. Prices Resulting from Alternative Pooling Strategies: August 1994 U.S. Packaged Sales

Month: August Scenario: Increased Packaged Fluid Sales into Mexico	pounds	$/cwt in Zone 1 for milk @ 3.5% b.f.
Class I use	362,113,558	$14.41
Class II use	102,968,624	$11.84
Class III & III-A use	211,940,264	$11.25
Package Milk Marketed From Mexico	0	
Non-Pooled Producer Milk Exported to Mexico	0	$0.00
Uniform Market Price (all market wide)	677,022,446	$13.20
Cooperative Blend (all market wide)	677,022,446	$12.93

Table 47. Prices Resulting from Alternative Pooling Strategies: August 1994 Co-op Does Not Pool for an Equal Price in Mexico

Month:	August	pounds	$/cwt in Zone 1
Scenario:	Co-op Does Not Pool and Ships to Mexico for a Price Equal To the Alternative Price		for milk @ 3.5% b.f.
Class I use		352,113,558	$14.41
Class II use		102,968,624	$11.84
Class III & III-A use		221,940,264	$11.25
Package Milk Marketed From Mexico		0	
Non-Pooled Producer Milk Exported to Mexico		10,000,000	$12.00
Uniform Market Price (all market wide)		667,022,446	$13.17
Cooperative Blend (all market wide)		677,022,446	$12.89

which is $0.02/cwt above the baseline cooperative blend price for August 1994.

December 1994

This month can be considered to represent non-typical market and production conditions. Approximately 693 million pounds of milk were pooled on the local federal order. Fluid utilization was 47.2 percent. Under the baseline scenario, Table 48, a uniform market blend price of $13.36/cwt and a cooperative blend price of $13.09/cwt were calculated. Under conditions of 10 million pounds of Mexican bulk milk being pooled on the local order (Table

Table 48. Prices Resulting from Alternative Pooling Strategies: December 1994 Baseline

Month:	December	pounds	$/cwt in Zone 1
Scenario:	Baseline		for milk @ 3.5% b.f.
Class I use		327,339,656	$15.45
Class II use		78,764,838	$12.24
Class III & III-A use		287,232,923	$10.93
Package Milk Marketed From Mexico		0	
Non-Pooled Producer Milk Exported to Mexico		0	$0.00
Uniform Market Price (all market wide)		693,337,417	$13.36
Cooperative Blend (all market wide)		693,337,417	$13.09

Table 49. Prices Resulting from Alternative Pooling Strategies: December 1994 Mexican Bulk Shipments

Month: December Scenario: Bulk Shipments from Mexico Pooled on the Market	pounds	$/cwt in Zone 1 for milk @ 3.5% b.f.
Class I use	327,339,656	$15.45
Class II use	78,764,838	$12.24
Class III & III-A use	297,232,923	$10.93
Package Milk Marketed From Mexico	0	
Non-Pooled Producer Milk Exported to Mexico	0	$0.00
Uniform Market Price (all market wide)	703,337,417	$13.31
Cooperative Blend (all market wide)	693,337,417	$13.03

49), the uniform market price decreased $0.05/cwt to $13.31/cwt and the cooperative blend price decreased $0.06/cwt to $13.03/cwt. Table 50 summarizes the effects of 10 million pounds of Mexican packaged milk being imported. Under this scenario, the uniform market price decreased $0.08/cwt to $13.28/cwt and the cooperative blend price decreased $0.09/cwt to $13.00/cwt.

Simulating increased packaged fluid milk sales to Mexico, Table 51, increases the uniform market price $0.06/cwt to $13.42/cwt and increased the cooperative blend price

Table 50. Prices Resulting from Alternative Pooling Strategies: December 1994 Mexican Packaged Imports

Month: December Scenario: Mexican Packaged Fluid Products are Imported	pounds	$/cwt in Zone 1 for milk @ 3.5% b.f.
Class I use	317,339,656	$15.45
Class II use	78,764,838	$12.24
Class III & III-A use	297,232,923	$10.93
Package Milk Marketed From Mexico	10,000,000	
Non-Pooled Producer Milk Exported to Mexico	0	$0.00
Uniform Market Price (all market wide)	693,337,417	$13.28
Cooperative Blend (all market wide)	693,337,417	$13.00

Table 51. Prices Resulting from Alternative Pooling Strategies: December 1994 U.S. Packaged Sales

Month: December Scenario: Increased Packaged Fluid Sales into Mexico	pounds	$/cwt in Zone 1 for milk @ 3.5% b.f.
Class I use	337,339,656	$15.45
Class II use	78,764,838	$12.24
Class III & III-A use	277,232,923	$10.93
Package Milk Marketed From Mexico	0	
Non-Pooled Producer Milk Exported to Mexico	0	$0.00
Uniform Market Price (all market wide)	693,337,417	$13.42
Cooperative Blend (all market wide)	693,337,417	$13.15

$0.06/cwt to $13.15/cwt. Finally, under December 1994 market conditions as presented in Table 52, if the cooperative shipped 10 million pounds of milk to Mexico which was not pooled on the federal order, the uniform market price would increase $0.03/cwt to $13.39/cwt and the cooperative blend price would increase $0.01/cwt to $13.10/cwt.

March 1995

March 1995, can be considered to represent the seasonal flush period of increased milk

Table 52. Prices Resulting from Alternative Pooling Strategies: December 1994 Co-op Does Not Pool for an Equal Price in Mexico

Month: December Scenario: Co-op Does Not Pool and and Ships to Mexico for a Price Equal To the Alternative Price	pounds	$/cwt in Zone 1 for milk @ 3.5% b.f.
Class I use	327,339,656	$15.45
Class II use	78,764,838	$12.24
Class III & III-A use	277,232,923	$10.93
Package Milk Marketed From Mexico	0	
Non-Pooled Producer Milk Exported to Mexico	10,000,000	$12.00
Uniform Market Price (all market wide)	683,337,417	$13.39
Cooperative Blend (all market wide)	693,337,417	$13.10

Table 53. Prices Resulting from Alternative Pooling Strategies: March 1995 Baseline

Month:	March	pounds	$/cwt in Zone 1
Scenario:	Baseline		for milk @ 3.5% b.f.
Class I use		339,307,406	$14.51
Class II use		100,010,871	$12.20
Class III & III-A use		333,087,853	$11.27
Package Milk Marketed From Mexico		0	
Non-Pooled Producer Milk Exported to Mexico		0	$0.00
Uniform Market Price (all market wide)		772,406,130	$12.94
Cooperative Blend (all market wide)		772,406,130	$12.67

production. Approximately 772 million pounds of fluid milk were pooled on the local order. Of the three months, fluid utilization was at a low of 43.9 percent. Under the baseline conditions, the uniform market price was $12.94/cwt and the cooperative blend price was $12.67/cwt (Table 53). Analyzing the effects of 10 million pounds of Mexican bulk milk pooled on the local order (Table 54), results in a decrease in the uniform market price of $0.03/cwt to $12.91/cwt and a decrease in the cooperative blend price of $0.04/cwt to $12.63/cwt. Table 55, represents the effects of receiving 10 million pounds of packaged milk from Mexico under March 1995 market conditions. Under this scenario, the uniform market

Table 54. Prices Resulting from Alternative Pooling Strategies: March 1995 Mexican Bulk Shipments

Month:	March	pounds	$/cwt in Zone 1
Scenario:	Bulk Shipments from Mexico Pooled on the Market		for milk @ 3.5% b.f.
Class I use		339,307,406	$14.51
Class II use		100,010,871	$12.20
Class III & III-A use		343,087,853	$11.27
Package Milk Marketed From Mexico		0	
Non-Pooled Producer Milk Exported to Mexico		0	$0.00
Uniform Market Price (all market wide)		782,406,130	$12.91
Cooperative Blend (all market wide)		772,406,130	$12.63

Table 55. Prices Resulting from Alternative Pooling Strategies: March 1995 Mexican Packaged Imports

Month:	March	pounds	$/cwt in Zone 1
Scenario:	Mexican Packaged Fluid Products are Imported		for milk @ 3.5% b.f.
Class I use		329,307,406	$14.51
Class II use		100,010,871	$12.20
Class III & III-A use		343,087,853	$11.27
Package Milk Marketed From Mexico		10,000,000	
Non-Pooled Producer Milk Exported to Mexico		0	$0.00
Uniform Market Price (all market wide)		772,406,130	$12.89
Cooperative Blend (all market wide)		772,406,130	$12.61

price decreased $0.05/cwt to $12.89/cwt and the cooperative blend price decreased $0.06/cwt to $12.61/cwt.

Table 56 is a summary of the results of simulating increasing packaged fluid sales to Mexico. Under March 1995 conditions, the uniform market price would increase $0.04/cwt to $12.98/cwt and the cooperative blend price would increase $0.04/cwt to $12.71/cwt. Finally, if the cooperative did not pool 10 million pounds of fluid milk and shipped it to Mexico for a price equal or greater than the price in an alternative market, the uniform market price would

Table 56. Prices Resulting from Alternative Pooling Strategies: March 1995 U.S. Packaged Sales

Month:	March	pounds	$/cwt in Zone 1
Scenario:	Increased Packaged Fluid Sales into Mexico		for milk @ 3.5% b.f.
Class I use		349,307,406	$14.51
Class II use		100,010,871	$12.20
Class III & III-A use		323,087,853	$11.27
Package Milk Marketed From Mexico		0	
Non-Pooled Producer Milk Exported to Mexico		0	$0.00
Uniform Market Price (all market wide)		772,406,130	$12.98
Cooperative Blend (all market wide)		772,406,130	$12.71

Table 57. Prices Resulting from Alternative Pooling Strategies: March 1995 Co-op Does Not Pool for an Equal Price in Mexico

Month:	March	pounds	$/cwt in Zone 1
Scenario:	Co-op Does Not Pool and and Ships to Mexico for a Price Equal To Alternative Price		for milk @ 3.5% b.f.
Class I use		339,307,406	$14.51
Class II use		100,010,871	$12.20
Class III & III-A use		323,087,853	$11.27
Package Milk Marketed From Mexico		0	
Non-Pooled Producer Milk Exported to Mexico		10,000,000	$12.00
Uniform Market Price (all market wide)		762,406,130	$12.96
Cooperative Blend (all market wide)		772,406,130	$12.68

increase $0.02/cwt to $12.96/cwt and the cooperative blend would increase $0.01/cwt to $12.68/cwt. These results can be examined in Table 57.

Conclusions: Pooling Scenarios

Milk utilized for fluid consumption has the highest value in the federal order classified pricing scheme. Consequently, whether milk is traded in bulk or in a packaged form has implications on the results (i.e., the importation of Mexican packaged milk directly displaces U.S. packaged milk). Under three different market conditions (August 1994, December 1994 and March 1995) and the assumptions of the model, pooling 10 million pounds of Mexican bulk milk on the local federal order would result in an average decrease in the marketwide cooperative blend price of 3.7 cents per cwt. Importing 10 million pounds of Mexican packaged fluid milk, not under the pool, would result in an average decrease in the average marketwide cooperative blend price of 6 cents per cwt. Increasing packaged fluid milk sales to Mexico, under the pool, would increase the average marketwide cooperative blend price 5.3 cents per cwt. Finally, if the cooperative did not pool 10 million pounds of milk and shipped

it to Mexico for a price equal to the alternative value price ($12.00/cwt), for the three months, the marketwide cooperative blend would net an average increase from the baseline of 1.3 cents per cwt.

CHAPTER VI

FEASIBILITY OF MEXICAN PRODUCERS MARKETING MILK IN THE UNITED STATES

The objective of this chapter was to determine the economic incentives for Mexican producers to market milk in the United States or seek membership in U.S. dairy cooperatives. Producer prices were compared for U.S. producers in the El Paso area (Federal Order 138) and Mexican producers belonging to a cooperative in the Delicias area of Chihuahua for August 1994, March 1995 and September 1995. Highway distances were calculated between three major milk producing areas in Mexico and potential markets in Texas. From discussions with dairy industry specialists and representatives, hauling costs were assessed per mile and the feasibility of moving milk various distances was examined. Finally, regulatory and health requirements were examined for Mexican producers wishing to market milk in Texas. A comparison was made of relevant Mexican and U.S. standards.

Methods

The following methods were utilized to determine the feasibility of Mexican producers marketing milk in the United States.

Producer Price Comparisons

As a case study, producer prices were collected for the region surrounding El Paso, Texas and Juarez, Chihuahua, for August 1994, March 1995 and September 1995. In the United States, Federal Order 138 (zone 1) regulates the minimum prices handlers must pay producers (a federal order views a cooperative as one large producer) for Grade A milk in El Paso County, Texas and the vicinity. Federal Order 138 average blend prices were readily

available in USDA/AMS (1995). The federal order blend price is not a precise gauge for determining what individual producers actually receive for their milk. The federal order blend price does not include deductions for costs of hauling and milk cooperative adjustments. Consequently, the USDA has begun to publish mailbox prices[5] for various regions in the country. Mailbox prices for the three months in the El Paso region were provided by the Federal Order 126/138 milk market administrator's office. Mexican producer prices were provided to Texas A&M researchers by the Alpura Cooperative in Delicias, Chihuahua, which is a large dairy producing area near Juarez. These three price series were standardized and compared.

Highway Distances

Actual highway miles between three of the major dairy producing regions of Mexico and potential markets were calculated. The dairy producing regions selected were the Delicias area of Chihuahua, Torreon area (La Laguna) of Coahuila and the Mexico City vicinity. As a comparison, two routes from New Mexico to San Antonio are included. A summary of the distances is presented below (Table 58).

Transportation Cost and Feasibility

Transportation costs of a fluid milk product were based on the per loaded mile capital

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[5] "The 'mailbox' price is defined as the net price received by dairy farmers for milk, including all payments received for milk sold and deducting costs associated with marketing the milk. All payments for milk sold include, where applicable: over-order premiums; quality, component, breed, and volume premiums; payouts from state-run over-order pricing pools; payments from superpool organizations or marketing agencies in common; payouts from programs offering seasonal production bonuses; and, monthly distributions of cooperative earnings. Costs associated with marketing milk include, where applicable: hauling charges, cooperative dues, assessments, equity deductions/capital retains, and reblends; the Federal milk order deduction for marketing services; Federally-mandated assessments such as the National Promotion Program and budget deficit reduction; and advertising/promotion assessments above the national program level. Other deductions, such as loan, insurance or feed mill assignments are not included (USDA/AMS, August 1995, p. 2)."

Table 58. Actual Highway Distances Between Major Dairy Producing Areas in Mexico and Potential Markets

Route	Miles	Kilometers
Delicias, Chihuahua to Ciudad Juarez, Chihuahua	288	465
Delicias, Chihuahua to San Antonio, Texas	700	1126
Torreon, Coahuila to Ciudad Juarez, Chihuahua	515	831
Torreon, Coahuila to San Antonio, Texas	527	848
Torreon, Coahuila to Nuevo Larado, Tamaulipas	367	592
Mexico City to Nuevo Larado, Tamaulipas	738	1191
Mexico City to San Antonio, Texas	923	1485
Clovis, New Mexico to San Antonio, Texas	515	829
Artesia, New Mexico to San Antonio, Texas	502	808

NOTE: Mileage is not indicative of highway conditions

and operating costs (the cost to purchase, run and maintain) a standard milk truck with a 50,000 pound load. After discussions with dairy marketing specialists and industry representatives, an estimation of a one-way loaded mile cost for such a truck operated by a U.S. milk cooperative was found to be US$1.50. This would be $0.0030/cwt per mile. If this truck was contracted instead of operated by the cooperative, the rate would be about US$1.80 per loaded mile. If a lucrative backhaul such as U.S. heavy cream or vegetable oil could be arranged, the cost could be as low as US$1.00 per mile.

The movement of milk over 1,000 miles by a standard 50,000 pound tanker is common in the U.S. dairy industry today. It should be noted that milk tankers are not refrigerated and are merely a large insulated "thermos". Forty degrees fahrenheit is the maximum temperature upon receipt which most processing and packaging plants will accept bulk milk. In a discussion with a dairy technology specialist, it was revealed that milk cooled to 36 degrees fahrenheit, which is a common practice, can maintain a temperature below 40 degrees for literally days in a properly insulated milk truck.

Regulatory and Health Requirements

The health and sanitation requirements for producers in El Paso County, Texas, are found in the *Texas Administrative Code, Title 25 §217.* The corresponding standards for Mexican producers are found in the *Dario Ofical, Title 4 §1.* A 1988 copy of this document was translated by Ken D. Hall and provided to the author. These standards were recorded and compared.

Results

Utilizing producer price data for U.S. and Mexican producers and considering shipping costs and regulatory procedures, the economic incentives for Mexican producers to market milk in the United States was examined. Each of the three considerations discussed above will be described in turn.

Border Producer Price Comparisons

A comparison of producer prices for the border region appears in Table 59. El Paso prices are represented both by the El Paso mailbox price and the Order 138 (Zone 1) uniform blend price standardized at 3.5 percent butterfat for the months of August 1994, March 1995 and September 1995 (USDA/AMS, 1995). The Mexican prices are representative of the quota price paid to producers by the Alpura cooperative in Delicias, Chihuahua.

The El Paso mailbox price estimates what U.S. producers in that area actually received for their milk. It is listed to make a more direct comparison with the quota prices which are listed for Mexican cooperative members in Delicias. A Mexican producer who is not a member of a U.S. cooperative and has gained market access to a U.S. packaging plant would receive the federal order uniform blend price. Such a producer would base his/her decision as

to whether to market milk at that plant in the United States after calculating an individual mailbox price (federal order uniform blend price minus transportation from Mexico). It should be noted that any conclusions based on a comparison of U.S. producer prices with those in Mexico must consider that U.S. prices are based on a butter-skim or additional component pricing scheme[6] and Mexican milk is priced by volume with a base plan.

In the months preceding the peso devaluation in December 1994, a price incentive existed for U.S. producer milk or products to be exported to Mexico. Therefore, there was no price incentive for Mexican cooperative members who were not exceeding their quota of 24 liters of milk/cow per day (6.34 gallons) to market milk in the United States. As an example, in August 1994, U.S. producers in El Paso were receiving a mailbox price of US$11.40/cwt (US$12.18/cwt federal order uniform blend) for 3.5 percent butterfat standardized milk. Their counterparts with quota in Delicias were receiving N$1.18/liter or an

Table 59. Comparison of Prices in El Paso and Delicias, August 1994, March 1995 and September 1995

Month	El Paso Producer Mailbox Price @ 3.5% bf	El Paso Federal Order 138 (Zone 1) Uniform Blend @ 3.5% bf	Delicias Alpura Cooperative Quota Price
Aug. 1994	$11.40/cwt N$0.88/liter	$12.18/cwt N$0.94/liter	$15.37/cwt N$1.18/liter
Mar. 1995	$11.31/cwt N$1.74/liter	$12.07/cwt N$1.86/liter	$9.11/cwt N$1.40/liter
Sept. 1995	$11.92/cwt N$1.71/liter	$12.70/cwt N$1.82/liter	$11.15/cwt N$1.60/liter

The August 1994 exchange rate was N$ 3.381 to US$ 1.00
The March 1995 exchange rate was N$6.777 to US$ 1.00
The September 1995 exchange rate was N$6.320 to US$ 1.00

[6] The prices in this study have been based on butterfat-skim accounting.

equivalent US$15.37/cwt.

The situation reversed with the December 1994 devaluation. In March 1995, the U.S. Federal Order 138 uniform blend price was $12.07/cwt (US$11.31/cwt El Paso mailbox price)for 3.5 percent butterfat standardized milk. During this same month, the Mexican producer price was an equivalent $9.11/cwt. It should be noted that even with a N$0.22/liter price increase received after the devaluation, Mexican producers have an incentive to gain access to U.S. markets and the associated higher prices. At September 1995 prices, the Delicias quota holder would now receive an equivalent $11.15/cwt. During this same month, the average blend price in Federal Order 138 was $12.70/cwt (US$11.92 El Paso mailbox price).

Table 60 presents the Alpura Cooperative overquota prices for the same time periods. Not considering transportation costs, a comparison of the August 1994, Mexican equivalent overquota price of $11.02/cwt with the U.S. federal order blend price of $12.18/cwt (US$11.40 El Paso mailbox price) would suggest an incentive for the movement of Mexican overquota milk into the United States. A potential margin of $1.16/cwt existed during this month if the Mexican producer could receive the U.S. federal order blend price. After the devaluation, during March 1995, there existed a stronger price incentive for Mexican producers to market overquota milk in the United States. Not considering transportation, for March 1995, a margin of $2.96/cwt existed if the Mexican producer could receive the U.S. federal order blend price. At September 1995 prices, the Delicias overquota price was an equivalent $10.04/cwt. A potential margin of $2.66/cwt existed if the Mexican producer

Table 60. Comparison of Prices in El Paso with Overquota Price in Delicias, August 1994, March 1995 and September 1995

Month	El Paso Producer Mailbox Price @ 3.5% bf	El Paso Federal Order 138 (Zone 1) Uniform Blend @ 3.5% bf	Delicias Alpura Cooperative Overquota Price
Aug. 1994	$11.40/cwt N$0.88/liter	$12.18/cwt N$0.94/liter	$13.03/cwt N$1.00/liter
Mar. 1995	$11.31/cwt N$1.74/liter	$12.07/cwt N$1.86/liter	$8.46/cwt N$1.30/liter
Sept. 1995	$11.92/cwt N$1.71/liter	$12.70/cwt N$1.82/liter	$10.04/cwt N$1.44/liter

The August 1994 exchange rate was N$ 3.381 to US$ 1.00
The March 1995 exchange rate was N$6.777 to US$ 1.00
The September 1995 exchange rate was N$6.320 to US$ 1.00

could market his/her overquota milk in the United States and receive the U.S. federal order blend price.

Physical Constraints

The major milk producing areas of Mexico are separated from their counterparts in the United States by only distance. No appreciable water or topographical barriers would impede the movement of milk. Actual highway miles between three of the major dairy producing regions of Mexico and potential markets were calculated. Estimates of the one-way per loaded mile costs of hauling milk with a standard 50,000 pound loaded milk truck were then utilized to provide a rough estimate of the hauling costs of transporting milk under various distances. A summary table (Table 61) is presented below. It is derived from multiplying the hauling cost per hundredweight by the mileage.

With U.S. milk at an average blend price for March, 1995 of $12.07/cwt and a Mexican cooperative quota price of US$9.11/cwt, Mexican milk could be moved 800 miles at the U.S.

Table 61. Estimate of U.S. Fluid Milk Hauling Costs at Various Distances

Distance in Miles	One-Way Hauling Cost with 50,000 Pound Load Per Hundredweight of Fluid Milk		
	Cooperative	Contractor	Backhauling
100	$0.30	$0.36	$0.20
200	$0.60	$0.72	$0.40
288 (Delicias to Juarez)	$0.86	$1.04	$0.58
367 (Torreon to Nuevo Larado)	$1.10	$1.32	$0.73
515 (Clovis to San Antonio)	$1.55	$1.85	$1.03
515 (Torreon to Juarez)	$1.55	$1.85	$1.03
527 (Torreon to San Antonio)	$1.58	$1.90	$1.04
700 (Delicias to San Antonio)	$2.10	$2.52	$1.40
923 (Mexico City to San Antonio)	$2.77	$3.32	$1.85
1000	$3.00	$3.60	$2.00

NOTE: Does not consider highway conditions.

contract hauling rate and still break even if it received the U.S. price. If a backhaul could be arranged, this same milk hauled 1,000 miles and receiving a U.S. price could receive US$0.96/cwt above the blend price. For Mexican cooperative overquota milk under the same circumstances, this milk could net US$1.61. The movement of Mexican milk a considerable distance into the United States, during the price conditions in March 1995, was certainly economically and technically feasible.

At September 1995 conditions, Mexican quota milk could be marketed 700 miles into the United States and still net $0.15/cwt if a backhaul could be arranged. Additionally, Mexican overquota milk could be marketed 700 miles and net $1.26/cwt if a backhaul could be arranged. Although incentives exist for Mexican producers to market milk in the United States, the economic feasibility has decreased substantially 9 months after the devaluation.

Regulatory Constraints

Mexican producers can not merely pull a loaded milk truck on the U.S. side of the Rio Grande and receive U.S. prices. A discussion was held with a dairy marketing specialist as to

what conditions would need to be met for Mexican producer to receive U.S. prices. The first requirement would be either gaining membership in a U.S. cooperative or the negotiation of a market with a U.S. manufacturing or bottling plant. Currently, the cooperatives in Texas have been in a competitive mode and a long-standing policy of open membership has been significantly restricted. Generally, cooperatives alone have the scale to negotiate contracts with large packaging plants, so membership in a cooperative is virtually a necessity for gaining access to a market.

If Mexican producers can not gain membership in a U.S. cooperative, the other alternative would be to negotiate for themselves a market with a U.S. packaging or manufacturing plant. With a highly competitive fluid market existing in the dairy industry in Texas, packaging plants are offering very few premiums above the uniform blend price. With Federal Orders regulating the minimum price handlers must pay producers (cooperatives), and with prices offered generally at that minimum price, the quality and consistency of the producer milk has become the primary criterion in market negotiation. To gain a market from U.S. producers, Mexican producers would have to guarantee quality and consistency standards to a packaging plant at least equal to their U.S. counterparts and most likely at a lower price.

The next requirement facing Mexican producers who gain access to the U.S. market is their milk will have to undergo the same testing and pass all the health requirements which U.S. producers currently face. The milk will have to be tested for the presence of antibiotics, excessive somatic cell counts (white blood cells), and meet identity standards.

The United States has two milk producer classifications. An operation with a permit to produce fluid grade milk must meet Grade A standards. Grade B refers to manufacturing

grade milk, which is not regulated by Federal Orders. The Grade A milk and producer standards for Texas, which are identical to the federal standards are found in the *Texas Administrative Code, Title 25*. It should be noted that in the United States, state standards must be comparable or superior to federal standards. The Texas state identity standards for fluid grade producer milk are presented in Table 62.

Table 62. U.S. Grade A Raw Milk and Pasteurized Grade A Milk and Milk Product Standards

Criterion	U.S. Standard
Grade A Raw Milk	
Temperature	Cooled to 50 degrees Fahrenheit and maintained thereat until processing
Bacteria Limits	100,000 per milliliter for individual producer milk before commingling with other producer milk 300,000 per milliliter after commingling
Antibiotics	No detectable zone with listed method
Somatic Cells	Not to exceed 1,500,000/milliliter
Pasteurized Grade A Milk and Milk Products	
Temperature	Cooled to 45 degrees Fahrenheit or less and maintained thereat.
Bacteria Limits	20,000 per milliliter
Coliform Limit	Not to exceed 10 per milliliter
Phosphatase	Less than 1 microgram by specified test.

Source: *Texas Administrative Code, Title 25*

Mexico has six different health classifications. Producers must hold a permit for one of the six classifications and can only market milk of that type. The standards for "high-quality pasteurized milk producers", the most stringent, are found in Title Four of the *Dario Oficial*,

Mexico's *Federal Register*. They are summarized in Table 63, Mexican raw and pasteurized milk standards.

Although a Mexican "high-quality pasteurized milk producer" meeting Mexican standards would most likely meet minimum Texas health standards, U.S. cooperatives and plants

Table 63. Mexican Raw and Pasteurized Milk Standards

Criterion	Mexican Standard
High Quality Pasteurized Milk Raw and Packaged Milk Standards	
Bacteria Tests	Five of last six bacterial counts taken in a month at the dairy farm should be less than 50,000 coliform/milliliter; at the storage plant be less than 75,000 coliform/millimeter; in the pasteurization plant before treatment be less than 150,000 coliform/millimeter and after pasteurization and packaging, be less than 5 coliform/millimeter.
Density	Not less than 1.029 at 15 degrees Celsius
Refraction Rate	At 20 degrees Celsius, not less than 37 and not more than 39 at listed method
Lactic Acid	Not less than 1.4 and not more than 1.7 grams/liter
Solids-Not-Fat	Not less than 85 nor more than 89 grams/liter
Chlorides	Not less than 0.85 nor than 1.2 grams/liter
Cryoscopy Value	Between -0.530 degrees and -0.560 degrees at listed method
Alcohol Test	Negative reaction to alcohol test of 68% and a positive reaction to an alcohol test of 96%
Lactose	43.0 to 50.0 grams/liter at listed methods
Protein	33.0 grams/liter minimum
Tests	Be negative for inhibitor and sucrose tests
Identity Standards	Final product should not contain less than 35 grams/liter of its own of packaged high milk fat, 84 grams/liter non-fat milk solids, or 33 grams/liter of its own quality milk protein and have a negative reaction to the phosphate test.
Pasteurized Milk	

Source: *Diario Oficial*

additionally have their own milk temperature and bacteria count standards. From discussions with industry representatives, 40 degrees fahrenheit is the highest temperature in which a load of milk will normally be accepted (50 degrees fahrenheit is the actual Texas Department of Health standard). Lower somatic cell counts and higher protein and butterfat values than the federal/state standards are encouraged by premiums.

Finally, Mexican producers will have to face the same producer (farm) inspection requirements as their U.S. counterparts. The equipment and facilities of producers in Texas are inspected by the Texas Department of Health. Technically, Texas Agriculture Department health inspectors would have the power to periodically inspect Mexican operations wishing to market milk in Texas. These standards, which refer to all aspects of dairy production, including the construction of facilities, equipment condition and animal health are too numerous and specific to mention. They are located in the *Texas Administrative Code, Title 25 § 217.7.* For Mexican producers not meeting these standards, there will be additional costs to come into compliance.

Feasibility of Mexican Producers Marketing Milk in the United States: Summary

This chapter compared producer prices along the border area. Before the devaluation, in August 1995, the potential existed for Mexican cooperative overquota milk to be shipped into the United States for a higher price. After the devaluation, in March 1995, Mexican producers would receive a higher price for all milk if it could be marketed in the United States. At the prices the Mexican producers receive at the Delicias cooperative, it was feasible to market milk 1,000 miles from its origin into the United States if the U.S. price was

received. By September 1995, the price incentives for Mexican producers to market milk in the United States had dissipated.

The distances separating some of the major milk producing regions in Mexico and potential markets in the United States are technologically and economically feasible for the movement of fluid milk. Mexican producers or cooperatives wishing to market fluid milk in the United States will have to secure a market in the highly competitive U.S. dairy industry. Finally, although economic price incentives exist for the movement of Mexican milk into the United States, the enforcement of existing U.S. sanitary regulations will act as a restriction to milk movement.

CHAPTER VII

DISCUSSION AND CONCLUSIONS

Mexico will continue to have a milk production deficit throughout the foreseeable future. A consideration of Mexico's annual population growth rate and having a large proportion of the population too poor to pay market prices assures this. Consequently, Mexico will continue to import large quantities of dairy products. Past policy suggests that the Mexican production deficit will be made up two ways: by continuing to purchase non-fat dry milk powder on the world market (it is reconstituted and filled with vegetable fat) and purchasing bulk shipments from the United States. The reduction in fluid sales to Mexico from the U.S. border federal orders which has been noted in the wake of the December 1994 devaluation should be a short-run phenomenon.

Economic theory suggests that Mexican producer prices would continue to rise after the December 1994 devaluation. The devaluation put a cost-price squeeze on the the progressive Mexican producer, who generally imports feed, replacement heifers, semen and milking equipment. With the devaluation, those items now cost the Mexican producer twice as much. Even after Mexican producer prices rise to a level equal or even greater than those in the United States, a Mexican producer who seeks stable prices might wish to join a U.S. cooperative or otherwise market milk in the United States.

Considering the structural changes occurring in the Mexican dairy industry, in the longer-run, milk production in Mexico should increase to the extent that domestic requirements are better met. With this in mind, Mexican producer prices should adjust to be more on par with

prices in the United States. With greater milk production, the export of over-quota milk from Mexico to the United States should become even more attractive.

Issues to be Resolved in United States-Mexican Dairy Trade

The results of this study highlight several potential areas of concern for U.S. dairy policymakers.

Devaluation Effects

The December 1994 devaluation of the peso severely effected the export of packaged milk from the United States to Mexico for six months. Furthermore, the December devaluation reversed the natural economic incentives. Mexico is a nation with a milk deficit. The United States is a surplus producer. Economic theory would suggest that the United States would export milk to Mexico and that Mexican producer prices could be higher than U.S. producer prices. The devaluation created a price incentive, at least in the short-run, to not only reduce trade, but reverse trading trends. In the months after the devaluation, an economic incentive existed for milk to move from Mexico to the United States.

The lack of integration of the Mexican and U.S. economies results in exchange rate fluctuations having ramifications on trade. Market imperfections are an obvious and perhaps unavoidable consequence. The December 1994 peso devaluation indicates that macroeconomic factors can influence dairy trade and federal orders to a larger degree than underlying efficiency considerations.

Classified Pricing Influences Trade

U.S. dairy policy (federal orders and classified pricing) influences how U.S. origin packaged milk will be priced at retail in U.S. or in Mexican supermarkets/hypermarts. Based

on the results of this study (using August 1994, March 1995 and September 1995 in Juarez, Mexico and El Paso, Texas as a case study) as a general trend, both before and after the December devaluation, U.S. packaged milk was priced higher than Mexican packaged milk in retail stores. Additionally, U.S. origin packaged milk was priced higher in U.S. supermarkets than in Mexican hypermarts. This trend was even observed in products of the same brand.

Several facts should be recalled. First, even though Mexican producer prices at the Alpura Cooperative were actually higher before the devaluation than U.S. prices, U.S. origin producer milk at retail in Mexico is competing with Mexican packaged milk which has its price determined by the Mexican government. Secondly, Mexico has a large percentage of its population which is too poor to pay market prices for U.S. origin goods.

Retail packaged milk price determination by the Mexican government decreases the profitability of Mexican milk at retail and encourages processors to fill products with vegetable fat. Conversely, U.S. processors regulated by federal orders pay the Class I price for beverage use milk. Classified pricing by federal orders results in U.S. fluid products sold in Mexican markets for less than the Class I equivalent price (plus transportation and processing) being sold for a loss. Consequently, Mexican packaged milk is "underpriced" in the market context and consequently of lesser quality, while U.S. packaged milk is "overpriced" in the market context and of superior quality.

Existing regulations encourage arbitrage. For both U.S. and Mexican handlers, moving moving bulk milk to a plant on the opposite side of the border and then packaging offers advantages (less regulation or higher prices). Additionally, a quandary exists at the U.S. federal order level on how to classify bulk milk or heavy cream exported to Mexico. It may

be known with some certainty that a shipment of bulk milk or cream will be packaged by a Mexican processor, but without verification, the ultimate utilization cannot be confirmed. Consequently, should exported bulk milk and cream be credited at Class I, Class II, Class III, etc.? This classification will influence the profitably for the U.S. exporter and the milks ultimate pricing in the Mexican retail outlet.

Border Arbitrage Opportunities

The liberalization of trade between the United States and Mexico has presented opportunities for both U.S. and Mexican processors to circumvent U.S. federal order requirements. Figure 13 is a representation of four potential scenarios resulting from cross border processing and then trade in dairy products. These scenarios are simple representations of trade of bulk/packaged milk based on plant location and generalized movement of product.

In Figure 13, the national border is represented by the single vertical line transecting the diagram. In the figure, Mexican territory is represented on the left and the United States is represented on the right. The squares represent milk packaging plants. The letters "M" and "U" represent Mexican and United States ownership or control respectively.

The first scenario is the location of a Mexican owned or controlled plant on the Mexican side of the border. A Mexican owned or controlled plant in Mexico can purchase U.S. or Mexican producer milk, package it and sell it in the United States and not be regulated by the federal milk marketing orders under NAFTA (Figure 13). This scenario results in displacement of sole U.S. origin packaged milk at retail. From the results of the pooling

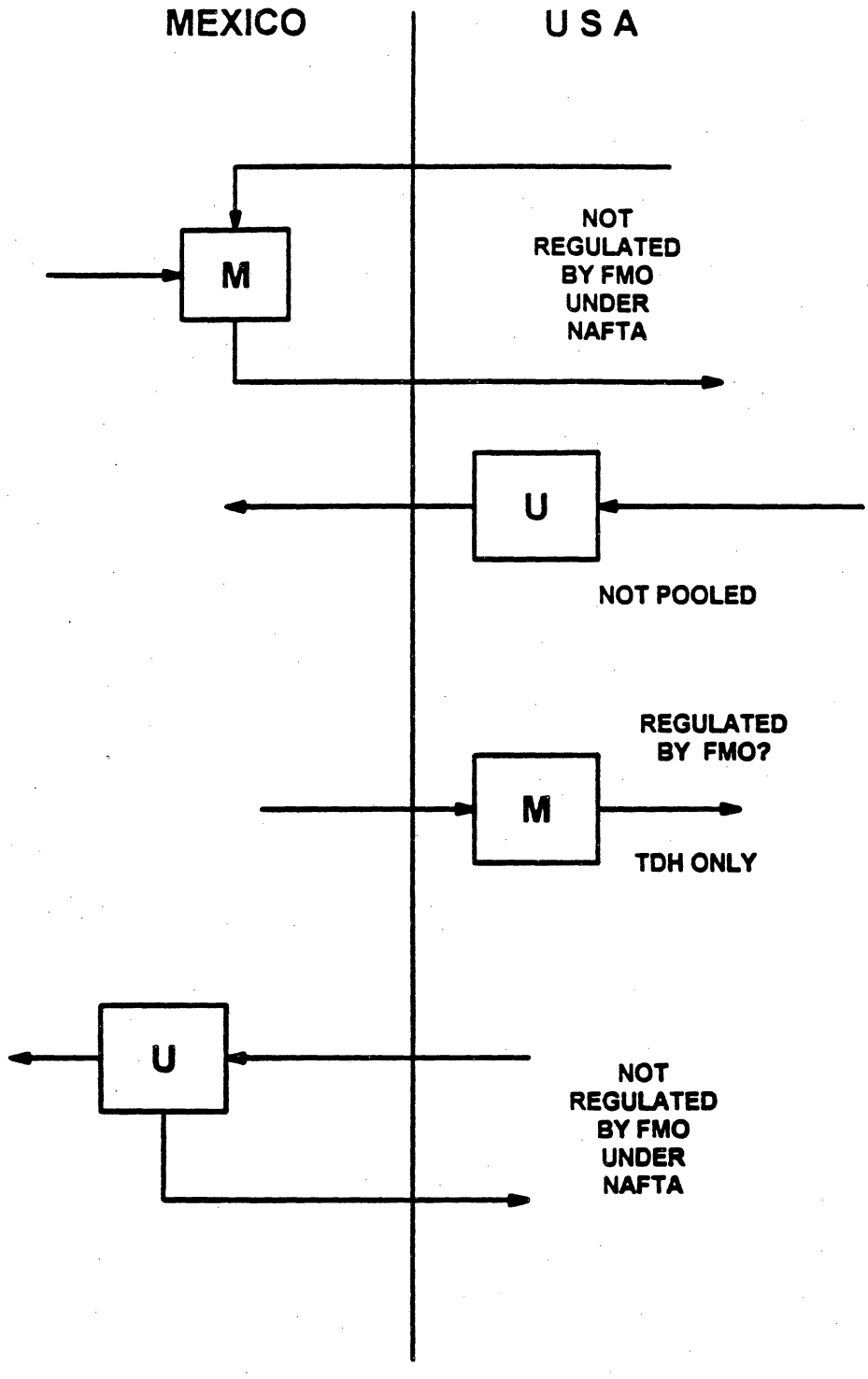

Figure 13. Potential Fluid Milk Trade Patterns Along the U.S.-Mexican Border

model in this study (Chapter V) this scenario has the most adverse impact on U.S. federal order and cooperative blend prices.

The second scenario is a U.S. owned plant in the United States packaging U.S. origin milk and selling it to retail stores in Mexico. This scenario has been occurring since at least 1991. In these situations, the fluid milk is not pooled on the federal order (Figure 13). This scenario was also addressed in the pooling model of this study. It nominally raised U.S. producer and cooperative blend prices.

The third scenario is for an enterprising Mexican producer association to purchase or construct a packaging plant in the United States and market their milk through this plant as a producer/distributer. With present regulations, this plant could be unaudited by the local federal order (Figure 13). The only United States regulations would concern meeting the local state health requirements. As in the first scenario, packaged milk entering the United States would reduce U.S. federal order and cooperative blend prices. This scenario was not specifically addressed in the pooling model in Chapter V.

The fourth scenario is the purchasing or construction of a United States controlled plant in Mexico. This plant could import milk from the United States, package it and then sell it to either Mexican or U.S. retail outlets (Figure 13). It is believed that such a plant would be unregulated by federal orders under NAFTA. This scenario was likewise not addressed in the pooling model in Chapter V of this study.

It is obvious that these scenarios can be extended infinitely considering displacement, stair-stepping, trade in products (rather than just fluid milk) and the lack of regulatory cohesion. For instance, U.S. produced non-fat dry milk powder can be shipped to a Mexican

reconstitutor/packager simultaneous with Mexican packaged milk being shipped to the United States. In essence, a Mexican processor can reconstitute powder purchased from the United States (cheaper than using Mexican producer milk) for Mexican fluid needs and package Mexican producer milk for sale in the United States Recall that the Mexican government has a price ceiling on Mexican packaged milk. For the Mexican processor, any price above the price ceiling would be preferred to what is received in Mexico. A Mexican processor can lower his/her costs while the United States gets flooded with cheaper Mexican packaged milk (relative to U.S. packaged milk). U.S. producer prices would receive a double-jeopardy. U.S. producers would see their milk exported as lower-priced powder rather than fluid milk and also face displacement of their fluid market from Mexican packaged milk imports.

Verification and Inspection

In the United States there are two separate milk inspection responsibilities. Public heath concerns are the responsibility of the local state health department. Inspection by the local health department occurs at all levels (producer, processor and retail). At each level, the milk must meet its proper identity standards and be free of adulteration. Facilities and equipment are also inspected for sanitation.

The federal orders are charged with auditing packaging and processing plants to assure that producers are paid properly for their milk. In other words, insuring that every unit of butterfat and skim is accounted for properly based on usage. For instance, producer milk made into cheese has whey as a byproduct which can be utilized in the manufacture of ice cream. The whey has to additionally be accounted for.

The presence of a national border raises many concerns with dairy health regulations. If packaged Mexican milk is imported into the United States, should the United States demand the right to inspect Mexican producer/processor facilities? The converse is that since U.S. milk is being exported to Mexico, should Mexican inspectors be allowed to inspect U.S. producer/processor facilities? Besides national sovereignty issues, these are difficult questions owing to the inequality of enforced regulations. Recalling that Mexican standards are frequently more stringent than those of the United States, but infrequently enforced, actual standards will first have to be equalized across the border. Furthermore, a mechanism will have to be established to insure that standards are fairly, not punitively, enforced across boundaries.

An additional question concerns the verification of the ultimate usage of U.S. federal order pooled bulk shipments imported into Mexican plants. Voluntary verification of usage in Mexican plants would presumingly assure that U.S. producers are properly paid for their milk according to its use. It is unclear that verification would be permitted by the Mexican government. As was discussed previously, in absence of verification, how should the federal order credit pooled bulk shipments to Mexico?

International Cooperative Membership

Perhaps in the not so distant future, U.S. or Mexican milk cooperatives will assume international membership. The extension of membership, it must be assumed, would require the new member to abide by the cooperative's rules and standards. It is unclear which countries' health and regulatory requirements would be enforced. If Mexican producers join U.S. cooperatives, then theoretically, their milk can be pooled on a nearby federal marketing

order the same as other cooperative member's milk. Although the milk would perceivably have to meet the standards of the handler, it is unclear whether U.S. state health inspectors would be extended the right to inspect the milking facilities (a necessary requirement for Grade A classification). After crossing the border, the United States would have the right to inspect the vehicle of transportation and pull samples. Would this be adequate?

Study Limitations and Additional Research

This study is limited by several factors. First and foremost, the United States and Mexico value milk differently. The United States has a classified pricing system. Milk is valued by butterfat-skim component pricing. In Mexico, there is no federal pricing system. The most likely arrangement is cooperative associations offering quota shares with a base plan. This milk is valued on volume. Realizing that U.S. milk is priced in dollars per hundredweight and Mexican milk is priced in new pesos per liter should give the reader some idea of the difficulty in making direct comparisons.

Secondly, this study identified only short-run conditions in a limited geographical area (El Paso, Texas and Juarez, Mexico). Caution should be used when extrapolating the results of this study along the entire border with Mexico. More research is necessary concerning Mexican producer and consumer pricing. More data points, both in a time context and in a location sense, would be necessary to adequately describe the economic incentives for increased trade in milk and milk products along the border area with Mexico.

Another limitation is the nature of dairy manufacturing. Manufacturing costs vary by plant. This is due to differences in technology and differences in the quality of the manufacturing components. To adequately ascertain manufacturing costs of Mexican and U.S.

dairy products one would have to comprehensively survey Mexican and U.S. plants. Plant manufacturing costs are sensitive and almost always remain confidential. Specifically, more research needs to be undertaken in simulating dairy manufacturing methods and technologies in economic analysis. This area is more art than science.

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APPENDIX A

Example Computational Procedures for Calculating Component Values

The following example is for 100 pounds ($Product_{vol.}$ = 100) of U.S. fluid whole milk formulated at minimum standards of 3.25 percent butterfat ($\%Fat_{desired}$= 3.25) and 8.25 percent solids-not-fat ($\%SNF_{desired}$= 8.25) manufactured from standardized skim ($\%SNF_{Skim}$= 8.50) and cream ($\%Fat_{Fat}$= 3.50). The prices used for fat and skim ($Price_{Fat}$ = \$0.763; $Price_{Skim}$= \$0.113) represent the Federal Order 138 (Zone1) Class I prices for the month of August 1994 found in Table 8.

The price of SNF at desired test (SNF_{price}@ Test) is calculated from subtracting the desired fat percentage ($\%Fat_{desired}$) from 100 percent and multiplying this result by the price of skim ($Price_{Skim}$) and dividing this total result by the desired percent solids-not-fat ($\%SNF_{desired}$).

(1) SNF_{price}@ Test = $((100 - \%Fat_{desired}) Price_{Skim})) / \%SNF_{desired}$

The percent water in desired product ($\%Water_{desired}$) is calculated from subtracting from 100 the sum of the desired percent solids-not-fat ($\%SNF_{desired}$) and the desired percent fat ($\%Fat_{desired}$).

(2) $\%Water_{desired} = (100 - (\%SNF_{desired} + \%Fat_{desired})$

The volume solids-not-fat in the desired product (Vol. $SNF_{desired}$) is calculated by dividing the desired percent solids-not-fat ($\%SNF_{desired}$) by 100 and then multiplying the result by volume of product desired ($Product_{vol.}$).

(3) Vol. $SNF_{desired} = ((\%SNF_{desired})/100) Product_{vol.}$

The volume of fat in the desired product (Vol. $Fat_{desired}$) is calculated by dividing desired percent fat ($\%Fat_{desired}$) by 100 and then multiplying the result by volume of product desired ($Product_{vol.}$).

(4) Vol. $Fat_{desired}$ = ($\%Fat_{desired}$ /100) $Product_{vol.}$

The volume of water in desired product (Vol. $Water_{desired}$) is calculated by subtracting from the volume of product desired ($Product_{vol.}$) the sum of volume of solids-not-fat in desired product (Vol. $SNF_{desired}$) and volume of fat in desired product (Vol. $Fat_{desired}$).

(5) Vol. $Water_{desired}$ = $Product_{vol}$ - (Vol. $SNF_{desired}$ + Vol. $Fat_{desired}$)

The volume of skim component needed (Vol $Skim_{needed}$) is calculated by dividing the percent solids-not-fat in skim component ($\%SNF_{Skim}$) by 100 and then dividing the volume solids-not-fat in desired product (Vol. $SNF_{desired}$) by this result.

(6) Vol. $Skim_{needed}$ = (Vol. $SNF_{desired}$) / ($\%SNF_{Skim}$ / 100)

The volume of the fat component needed (Vol. Fat_{needed}) is calculated by dividing the volume of fat in the desired product (Vol. $Fat_{desired}$) by the result of dividing the percent fat in the fat component ($\%Fat_{Fat}$) by 100.

(7) Vol. Fat_{needed} = (Vol. $Fat_{desired}$) / ($\%Fat_{Fat}$ / 100)

The volume of water available in inputs (Vol. $Water_{inputs}$) is calculated by adding together the volume of skim component needed (Vol. $Skim_{needed}$) and the volume of fat component needed (Vol. Fat_{needed}) and subtracting this sum by the sum of the volume of solids-not-fat in desired product (Vol. $SNF_{desired}$) and the volume of fat in desired product (Vol. $Fat_{desired}$).

(8) Vol. $Water_{inputs}$ = (Vol. $Skim_{needed}$ + Vol. Fat_{needed}) - (Vol. $SNF_{desired}$ + Vol. $Fat_{desired}$)

The volume of water in the desired mix (Vol. $Water_{mix}$) is calculated by subtracting the volume of product desired ($Product_{vol}$) by the sum of the volume solids-not-fat in desired product (Vol. $SNF_{desired}$) and the volume of fat in desired product (Vol. $Fat_{desired}$).

(9) Vol. $Water_{mix}$ = $Product_{vol}$ - (Vol. $SNF_{desired}$ + Vol. $Fat_{desired}$)

The volume of water to be added to desired mixture (Vol. $Water_{add\ mix}$) is calculated by subtracting the volume of water available in inputs (Vol. $Water_{inputs}$) from the volume of water in the desired mix (Vol. $Water_{mix}$) .

(10) Vol. $Water_{add\ mix}$ = Vol. $Water_{mix}$ - Vol. $Water_{inputs}$

The value of solids-not-fat in the mixture (SNF_{value}) is calculated by multiplying the price of solids-not-fat at desired test (SNF_{price}@ Test) by the volume of solids-not-fat in desired product (Vol. $SNF_{desired}$).

(11) SNF_{value} = (SNF_{price}@ Test) (Vol. $SNF_{desired}$)

The value of fat in mixture (Fat_{value}) is calculated by multiplying the price per pound of fat ingredient($Price_{Fat}$), by volume of fat in desired product (Vol. $Fat_{desired}$).

(12) (Fat_{value}) = ($Price_{Fat}$)(Vol. $Fat_{desired}$)

The total value of the mixture in US$/cwt ($Mixture_{value}$) is calculated by adding the value of solids-not-fat in mixture (SNF_{value}) and the value of fat in mixture (Fat_{value}).

(13) Mixture $_{value\ US\$/cwt}$ = SNF_{value} + Fat_{value}

In the example mentioned above, the total value of the mixture will be $13.44 which represents the value of the dairy skim and cream components utilized to manufacture 100 pounds of whole milk testing 3.5 percent butterfat and 8.5 percent solids-not-fat under the minimum Federal Order 138 prices in effect during the month of August, 1994.

Supplementary Conversions

To convert the total value of a fluid mixture (Mixture $_{\text{value US\$/cwt}}$) from US$/cwt, the convention utilized in United States to value fluid milk, to N$/liter, the convention used to value fluid milk in Mexico requires the weight of the fluid mixture in pounds/gallon. This value must be calculated.

A formula for calculating the pounds per gallon of a fluid milk mixture was located in Dunham 1956. The formula utilizes the following constants: the specific gravity of butterfat ($SpecGrav_{butterfat}$) = 0.939, specific gravity of cottonseed oil ($SpecGrav_{cottonseed\ oil}$) = 0.917, specific gravity of milk solids-not-fat ($SpecGrav_{SNF}$)= 1.613, specific gravity of water ($SpecGrav_{water}$) = .99973.

The formula is as follows: The weight of a mixture in pounds per gallon (Weight $_{mixture}$) = 8.343 multiplied by the result of dividing 100 by the sum of the following: [the percentage weight of fat in the mixture (% Weight $_{Fat}$) divided by the specific gravity of the fat used ($SpecGrav_{butterfat}$) for natural dairy products or ($SpecGrav_{cottonseed\ oil}$) for filled products] + [the percentage solids-not-fat in the mixture (% Weight $_{SNF}$) divided by the specific gravity of milk solids-not-fat ($SpecGrav_{SNF}$)] + [the percentage water in the mixture (% Weight $_{Water}$) divided by the specific gravity of water (($SpecGrav_{water}$)].

(14) Weight $_{mixture}$ = 8.343 [100 / ((% Weight $_{Fat}$ / $SpecGrav_{butterfat}$) + (% Weight $_{SNF}$ / $SpecGrav_{SNF}$) + (% Weight $_{Water}$ / $SpecGrav_{water}$))]

The convert the value of a fluid mixture in US$/cwt to N$/liter (Mixture $_{\text{value N\$.liter}}$), the total value of mixture in US$/cwt (Mixture $_{\text{value US\$/cwt}}$) is divided by 100 and then multiplied by the pounds per gallon of mixture (Weight $_{mixture}$) then divided by 3.7854 liters per gallon

and then multiplied by the Mexican exchange rate ($Mex_{exchange\ rate}$). The average Mexican exchange rate ($Mex_{exchange\ rate}$) for the month of August was N$3.381 per US$1.0.

(15) $(Mixture_{value\ N\$.liter}) = ((Mixture_{value\ US\$/cwt} / 100)\ (Weight_{mixture}) / 3.7854)\ (Mex_{exchange\ rate})$

The value of a solid mixture in N$/kilogram ($Mixture_{value\ N\$.kilogram}$) is calculated by dividing the total value of mixture in US$/cwt ($Mixture_{value\ US\$/cwt}$) by 100 and then dividing this result by .4536 kilograms per pound and then multiplying this result by the Mexican exchange rate ($Mex_{exchange\ rate}$).

(16) $(Mixture_{value\ N\$.kilogram}) = ((Mixture_{value\ US\$/cwt} / 100) / .4536)\ (Mex_{exchange\ rate})$

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