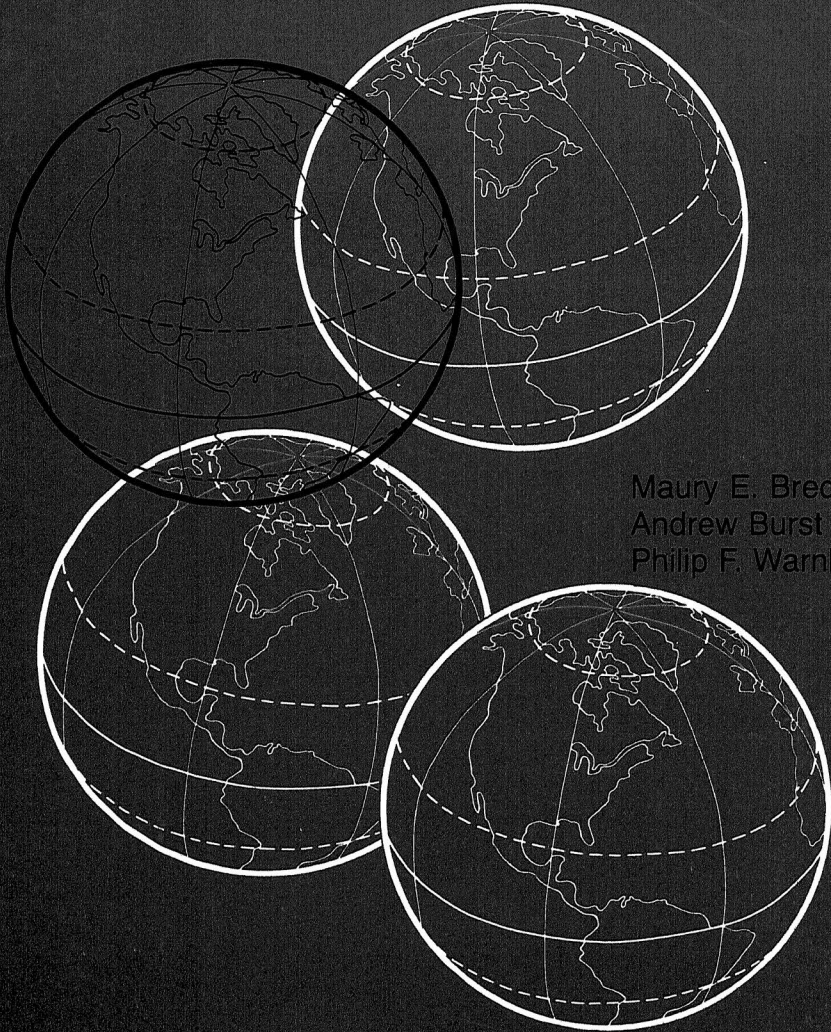


Growth and Structure of the Mexican Cattle Industry



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PREFACE

In the late 1970s a number of newly industrializing countries (NICs) emerged as important buyers of U.S. agricultural exports. Mexico, for example, became the third largest importer of U.S. agricultural products. Analysis of this growth in trade has proven difficult due to the lack of consistent data and information on the commercial agricultural sectors in each country. To overcome this deficiency, the Agricultural Economics Department initiated a research program emphasizing trade with NICs in general and Mexico in particular.

The Mexican research program keys on development of a cross-sectional description of the mixed feed industry and its input supply sector, and the principal uses of mixed feed, the commercial portions of the poultry, pork, dairy, and beef sectors. In addition, considerable effort was expended to develop a consistent time-series data set useful for quantitative economic analysis. The research results are published in a series of reports by the Agricultural Experiment Station of the University of Missouri.

Initial financial support was provided by the U.S. Feed Grains Council. This support enabled the research team to travel extensively in Mexico and devote considerable resources to the project. Additional support was provided by the Economic Research Service (USDA) through a cooperative agreement (#58-3J22-2-0479X). The staff of the Latin American Branch of ERS provided significant input. Finally, the Department of Agricultural Economics and the Agricultural Experiment Station of the University of Missouri has provided continuing support.

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and accounted for almost 10 percent of national beef production. States in the arid/semiarid region of northern Mexico are next in importance with Sonora, Chihuahua, Tamaulipas, and Sinaloa accounting for slightly over 17 percent of national production in 1980.

The areas are different in the amount of grazing land required to support a given number of animals and the type of beef cattle raised but similar in the organization of production. In the arid/semiarid regions an average of as many as 21 hectares is required to support one animal (Chihuahua) while in the wet tropics only about 2 hectares are required (Tobasco and Veracruz). In the arid/semiarid region, a sizeable proportion of the herd is comprised of European breeds (Hereford and Aberdeen Angus, for example) due to the long term relationship with U.S. producers and importers. In other areas, Zebu and the native breed Criollo predominate.

Despite the difference in climate and predominant breeds of livestock, the beef production system is universally a grassland enterprise. The restrictions on crop production by livestock producers, among other factors, has prompted producers to graze animals to the age of 18 to 24 months before selling. Feedlots are not common and if animals are fed cereals and concentrates at all it is for a short period (one to three months) before slaughter. This production practice is clearly reflected in the composition of the national herd. Only about a third of the herd is comprised of producing cows, about 12.5 percent are animals less than one year in age and a similar proportion are animals one to two years in age. The remainder of the herd is comprised of replacement heifers and other animals older than two years.

Dairy production in many states is dependent on irrigated feedstuff production but is still closely related to geoclimatic factors. The two largest milk producing states, Jalisco and Mexico, accounting for about 20 percent of national production, are classified as temperate and dry tropical. In many areas of these and surrounding states, a dualistic dairy production system has developed. A large number of small producers rely on grazing with some supplemental provision of mixed feed. If the dairy production system includes irrigated forage production, it tends to be large and uses modern production technology.

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EXECUTIVE SUMMARY

The first steps in economic analysis of livestock production include the qualitative description of: (1) the geoclimatic factors which determine the production processes; (2) government policies which play a major role in the adoption of technology and productive investments; and (3) other economic factors that influence demand and supply. With this background, a meaningful quantitative analysis of inventories, slaughter, and animal protein (meat and dairy product) production can be developed.

Before proceeding to the discussion of the organization of this publication and the summary of its content, an understanding of the historic role of livestock production in the agricultural economy of Mexico is necessary. Crop and livestock production have until very recently been treated as separate enterprises in the formulation of government policies and collection of data. As Yates points out, the Spanish language does not include a word to describe integrated crop and livestock production. There is no simple equivalent for the word "farmer." Rather, the word agricultor describes an individual who produces crops and ganadero describes an individual who manages livestock. Only recently has the term agropecuaria been used to inclusively reference crop and livestock production in Mexico.

Viewing crop and livestock (cattle) production as essentially separate production systems has origins in the goal of the Mexican Revolution to redistribute large landholdings (latifundos) used for cattle production to landless peasants to be used for crop production. Until recently, in order to prevent them from gaining control of large landholdings, livestock producers were prohibited from growing crops for livestock feed. This restriction was meant to maintain cropland in production of food grains for human consumption.

The perceived need to segregate crop and cattle production lead to far-reaching government regulation of the cattle sector. In addition to prohibiting crop production by cattle producers, government regulations have historically limited the size of landholdings and the trade of livestock products. A further result of the preoccupation with crop production was the collection of vast amounts of accurate data to the virtual exclusion of efforts to collect accurate livestock production data.

The distinction placed between crop and livestock production has blurred in recent years. The motivating factor has been the growth in the internal demand for animal proteins arising from rapid income and population growth. The Mexican government has attempted for some time to provide low-cost pastuerized milk to the urban poor. The mechanism includes price controls and government distribution. Concern with the provision of meat to the middle and upper income groups is a recent development given that Mexico exported live cattle and beef until the late 1970s.

The structure and productivity of the cattle sector, especially beef, reflect historical precedents. But the growth of internal demand, perhaps only temporarily slowed by the current economic crisis, has forced a reevaluation of government policies. The structure of the cattle industry has changed in recent years and will change even further as Mexico attempts to feed its rapidly growing and more affluent population.

Turning to the organization of this publication and this summary, the first section discusses the geoclimatic and government policies that shape the Mexican beef and dairy sectors. The section concludes with an overview of the growth of the cattle industry. Second, the growth and structure of the beef cattle industry are discussed. The final section describes the dairy and dairy product sectors.

Production Systems. Beef and dairy production systems vary widely. But a convenient arrangement to arrive at a more or less homogenous grouping of production systems is based on the geoclimatic classification of Mexico into arid/semiarid, temperate, dry tropical, and wet tropical. Roughly, the northern third of Mexico falls into the arid/semiarid classification; the central highlands into the semiarid or temperate classification; the central coastal areas into the dry tropical classification; and the Yucatan Peninsula into the wet tropical classification.

While beef production is distributed throughout Mexico, the eastern coastal states (dry and wet tropical) are the largest producers. The states of Veracruz, Chiapas, and Tabasco, ranked 1, 2, and 4 in beef production in 1980, produced almost 30 percent of national beef production. Jalisco, classified as temperate and dry tropical, on the west coast ranked third in beef production in 1980

The arid/semiarid region of northern Mexico includes some irrigated areas which have tended to specialize in dairy production. As a result, Coahuila, Chihuahua, and Durango account for about 20 percent of national milk production. Production is based almost universally on a highly technical production system and enterprises tend to be large.

The wet and dry tropical states are important dairy producers, but the production system is based on the joint production of beef and milk from native cattle breeds. As a result, although production units tend to be large, productivity tends to be low. Veracruz, ranked third in 1980, and Chiapas, tenth in 1980, together produced about 12 percent of national production.

Government Policies. Policies that affect beef and dairy production support two national goals. First, land tenure and other policies have been enacted to promote the redistribution of land. Second, price and trade policies support the provision of inexpensive food to the urban poor. Although policies have been slightly modified in recent years to promote production at the expense of social goals, policies, especially for the dairy sector, have tended to promote consumer interests at the expense of those of producers.

Land tenure laws have aimed at restricting landholdings to an amount required to support 500 head of cattle. Because of the diversity of geoclimatic areas, the determination of maximum landholding required subsequent clarification. In 1978, legislation provided for the establishment of range coefficients for each state, allowing a more accurate determination of the area required to support 500 head.

Beef producer groups allege that the land tenure laws discriminate against investment in production-increasing technology. The improvement of grazing land and the resulting increase in carrying capacity could lead to expropriation of a portion of the improved area. Further, they allege that the restriction on crop and forage production results in a production system that overutilizes the production capacity of grazing land while underutilizing the potential of the beef cattle sector.

Social concerns dominated government policy until the expansion of domestic demand resulted in significant price increases in the late 1970s and early 1980s. Recognizing the need to increase

production, the Agricultural Development Law of 1981 specifically allowed forage production by cattle producers. However, to this point in time, very few producers have taken advantage of the liberalized regulations.

A counterpart of the legislation to allow forage production by producers is the control of feeder cattle and beef exports. The northern states have historically exported large numbers of feeder cattle and beef to the United States. In an attempt to insure adequate supplies to the domestic market, increasingly restrictive export quotas have been adopted. In 1979, an export embargo was placed on feeder cattle and beef exports. Subsequently, the embargo on feeder cattle exports was lifted but that on beef exports remains in effect.

In addition to the land tenure regulations, government intervention in the dairy sector extends to pricing policy and input subsidies. Based on the goal of providing pasteurized milk and other dairy products to the urban poor, ceiling prices are enforced at the wholesale and retail level. Dairy producers argue that the ceiling prices have not increased to keep pace with inflation of input costs. As a result, it is alleged that the ceiling prices have tended to restrict expansion of dairy production. Clearly, there is some validity to that contention. In addition, the selection controls on certain products--pasteurized milk, in particular--have diverted milk to processed products which are not subject to price controls, such as cheese and butter.

Consumer concerns dominate trade policy for dairy products. Prices of dairy products are influenced by the imports of those products. In the case of powdered milk, for example, prices are greatly influenced by imports by the Mexican government.

GROWTH AND STRUCTURE
OF THE
MEXICAN CATTLE INDUSTRY

Maury E. Bredahl
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OVERVIEW OF THE CATTLE INDUSTRY

The dairy and cattle sectors are influenced, albeit in differing ways, by geoclimatic factors and government policies. These common factors affecting both the production systems of both sectors are discussed in the first two parts of this section. It concludes with a discussion of the growth of cattle inventories.

CATTLE PRODUCTION SYSTEMS

Beef and dairy production systems vary widely across Mexico. However, a convenient means to arrive at a more or less homogenous grouping of production systems is based on the geoclimatic classification of Mexico. Certainly there are no regional classifications that contain an entirely homogenous system of production, but various regions do emerge which contain certain characteristic types of cattle production systems. One of the divisions more commonly utilized to delineate Mexico's regional cattle production systems is based on the following four geoclimatic regions:

- (1) Arid/semiarid
- (2) Temperate
- (3) Dry tropical
- (4) Wet tropical

Under this type of classification system, the arid/semiarid region encompasses the entire northern region and the majority of both the northwestern and north central regions. The exceptions (areas or states that are in these three regions but not considered arid/semiarid) are the southern portions of Baja California Sur and Sinaloa, and the northwestern state of Nayarit. The temperate region encompasses the majority of the central region and includes portions of the west central region and the southern Pacific region states of Oaxaca and Chiapas. The third geoclimatic region, dry tropical, encompasses the majority of the Pacific coastal plain, the northern Gulf coast state of Tamaulipas, and sections of the states of Veracruz, San Luis Potosi, and Hidalgo (Las Huastecas). The dry tropical region also includes the northern coast area of the state of Yucatan. The last geoclimatic region, wet tropical, encompasses the

majority of the Yucatan Peninsula, and includes a portion of the central Gulf coast and the the state of Chiapas. Figure 1 broadly outlines these four geoclimatic regions and Table 1 lists the states included in each region. In the pages following, the characteristics of each region are discussed and the beef and dairy production systems are broadly outlined.

ARID/SEMIARID

The arid/semiarid north is characterized by scattered mountain ranges and vast stretches of high desert steppe. Rainfall and water resources are limited in most areas with only a short rainy season between the summer and early fall months. Annual average precipitation ranges between 200 and 800 millimeters. The temperature variation is more pronounced than in the remainder of the country, with cool-to-cold winters and long, hot summers. Crop production in the region is fairly limited. However, in the irrigated northwest and other isolated areas, wheat, sorghum, corn, oilseeds, cotton, horticultural crops, and alfalfa are grown extensively.

Vast expanses of natural rangeland make up most of the arid/semiarid northern region. During the late summer and early fall months, when rainfall in the region is most prevalent, rangelands and pastures support extensive cattle production without supplemental feeding of forage or concentrates. However, during the remainder of the year, when drier conditions persist, supplemental feeding may be required (CEPAL, p. 49). The ranges of the northern cattle regions are under such heavy use that productivity is being reduced and water resources are being depleted.

The predominant cattle enterprise is land-extensive feeder cattle production. A large proportion of this production has been exported to the United States as live animals. A complementary activity in this region is the fattening of feeder cattle for either the internal Mexican market or for slaughter and export.

The most important cattle producing states of the region are Chihuahua with 2.4 million head (7 percent of national herd) and Sonora with 2.1 million head (6.1 percent). These states plus Sinaloa account for about 13 percent of national beef production. The carrying capacity of rangeland is illustrated by the estimated

FIGURE 1: Geoclimatic Regions, Mexico

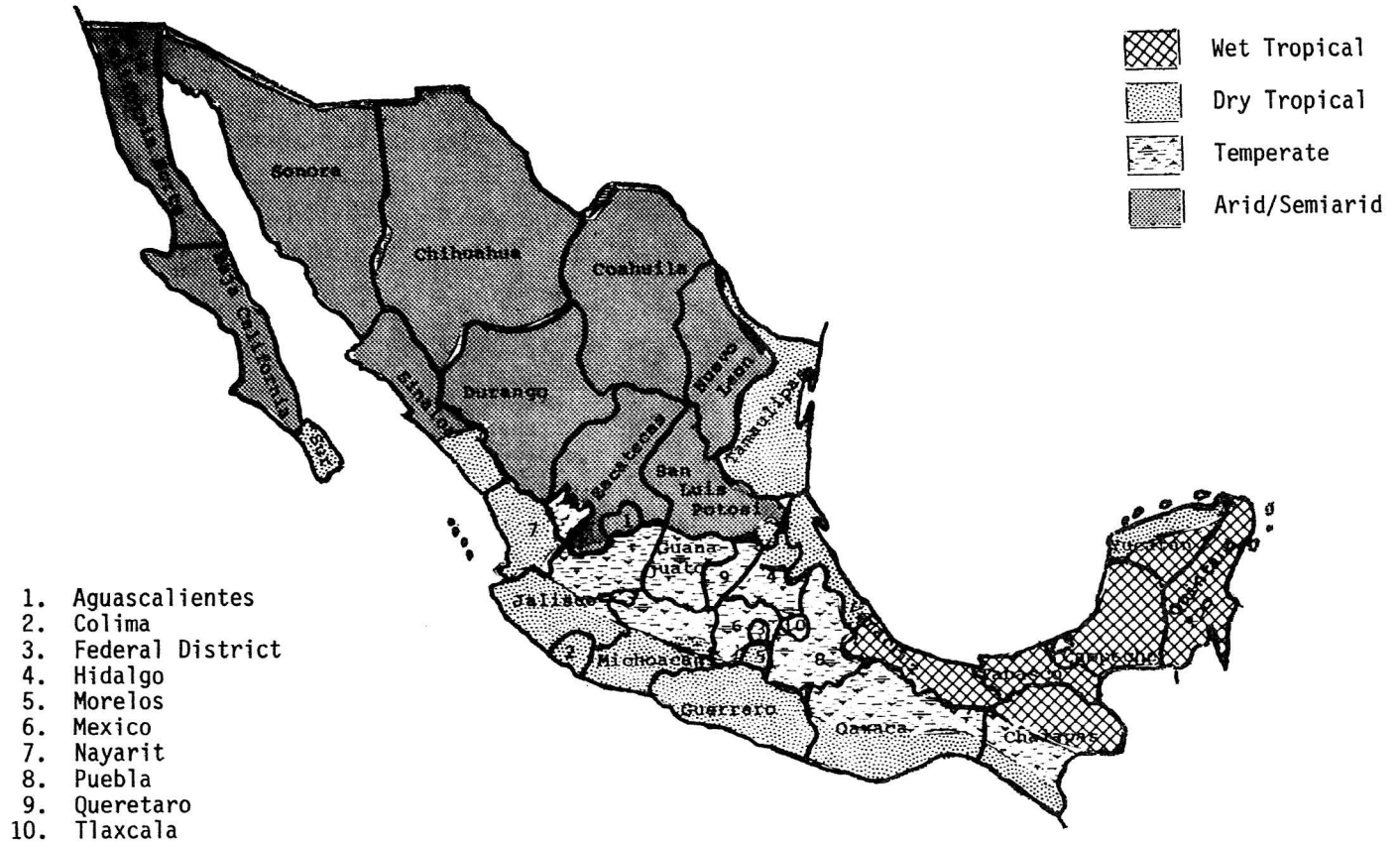


TABLE 1: States by Geoclimatic Region, Mexico

Arid/Semiarid	Temperate	Dry Tropical	Wet Tropical
Aguascalientes	Chiapas**	Baja California Sur*	Campeche
Baja California Norte	Federal District	Colima	Chiapas**
Baja California Sur*	Guanajuato	Chiapas**	Quintana Roo
Coahuila	Hidalgo*	Guerrero	Tabasco
Chihuahua	Jalisco*	Hidalgo*	Veracruz*
Durango	Mexico	Jalisco*	Yucatan*
Nuevo Leon	Michoacan*	Michoacan*	
San Luis Potosi*	Oaxaca*	Morelos	
Sinaloa*	Puebla	Nayarit	
Sonora	Queretaro	Veracruz*	
Zacatecas	Tlaxcala	Oaxaca*	
		San Luis Potosi*	
		Sinaloa*	
		Tamaulipas	
		Yucatan*	

Note: Single asterisk denotes states contained in two geoclimatic regions.
 Double asterisk denotes states contained in three geoclimatic regions.

range coefficient for Chihuahua of 20.7 hectares (area needed to support one animal). Overutilization, using that range coefficient, is estimated to be about 65 percent.

A large proportion of feeder cattle produced in the region, particularly in the states of Sonora, Chihuahua, Coahuila, and Durango, are exported to the United States. However, since 1979, feeder cattle exports have declined dramatically due primarily to an embargo imposed by Mexican officials on live cattle and meat exports to the United States. The 1979 embargo intended to increase domestic supply. Although feeder cattle exports were actively resumed in 1980, trade has remained well below export quotas because of the increased domestic demand. U.S. cattle importers prefer higher-yielding, fatter cattle breeds (reflecting U.S. consumer preferences) than are commonly produced in Mexico for domestic consumption. Over time the composition of the region's cattle herd has come to reflect the preferences of the export market. Consequently, the most common cattle breed produced for export is Hereford. However, Aberdeen-Angus, Charolais, Santa Gertrudis, and various crosses are also common. The importance of the export market to producers is illustrated by the fact that Chihuahua and Sonora account for 62 percent of national feeder cattle exports, but only 13 percent of the national herd.

In addition, a proportion of cattle produced in the region supplies domestic needs. Internally marketed cattle include indigenous breeds such as Zebu (Brahman or Indo-Brazil), especially from the states of Nuevo Leon and Coahuila, and Criollo (Mexican mixed breed) from the western sierra and the southern part of the region. These indigenous breeds, typically very lean, are generally marketed locally or shipped to the interior markets of the heavily populated central regions of the country. The region has become a supplier of feeder cattle to producers located in the states of Veracruz, San Luis Potosi, and Hidalgo. This movement reflects the Mexican export quota system prohibiting the export of cows and heifers less than eighteen months of age. These animals are often sent to other areas, such as the Las Huastecas, where they are raised for the domestic beef market.

Typically, cattle that are not marketed as feeders are grassfed until reaching approximately 250 kilograms (eighteen to twenty-four

months). Later, a period of confined feeding of three to four months follows. Weight gains of one kilogram a day are common.

Although feedlots for beef cattle are not common at this time, there are possibilities for such development. Areas bordering the United States that could use imported feed grains have the most potential. However, scarcity of feed, unfavorable input/output price relationships, cattle export restrictions, and land tenure regulations are the principal reasons that large-scale feeding operations have not developed to a greater extent. In fact, during certain periods, Mexico has imported fattened beef cattle from the United States, as well as exported feeder cattle to the United States to be fattened and imported.

Although the region is primarily noted for beef production, it also produces an important part of the national milk production. Dairy cattle enterprises are scattered throughout the region and are generally found in areas with irrigated crop production and in a few isolated areas that receive above-average amounts of precipitation. For example, the large irrigated areas of the La Laguna zone of Coahuila and Durango and of the northwest that produce large quantities of alfalfa and feed grains (corn, oats, and sorghum) are able to support a substantial herd of dairy cattle. These states produced almost a billion liters of milk in 1980, about 14 percent of nation production. The common dairy cattle breeds are Holstein and Jersey. Dairy operations are typically large and utilize modern production technology.

TEMPERATE

The temperate region has been partially settled for over ten centuries and has been under intensive agricultural production for hundreds of years. The region is characterized by steep mountains and high, broad, flat valleys. A large portion of once-plentiful forest resources that covered the steep slopes has been exhausted, and soil erosion is a serious problem. The more productive agricultural cropland is concentrated on more level lands in the lower valleys. Rainfed production of corn and other food crops, as well as grain sorghum and forage crops, predominate. Although in some cases slopes support crop production, the most common use is for cattle grazing.

With massive government incentives to producers of basic food and feed crops to meet the continual expansions of food production necessary to feed a rapidly growing Mexican populace, competition for agricultural land in this region has become intense. Although the region still supports a large cattle herd, land used for extensive type of cattle production has increasingly given way to basic food and feed crop production and confined or semiconfined cattle production systems. Producers have increasingly favored milk production, forcing beef production to the periphery of the region.

The most important states are Jalisco, Michoacan, Mexico, and Puebla. In total, these states accounted for about 25 percent of national milk production and 21 percent of national beef production. Jalisco ranks first in milk production and second in beef production on a national comparison. These data indicate the relative balance of beef and dairy production.

Mild temperatures characteristic of the temperate region favor European dairy cattle such as Holstein. Cattle enterprises in the temperate region, both dairy and beef, depend upon crop production. Cattle are grazed on fall-seeded grains during the winter months and on crop residue following harvest. The remainder of the year, various amounts of feed may be supplemented.

TROPICAL

The wet and dry tropical regions, situated along Mexico's Gulf coastal plain, encompass the Yucatan Peninsula as well as the central and southern Pacific coastal belt regions. Both areas are major agricultural producers of crops and livestock. In addition to corn, perennial crops such as coffee, cocoa, citrus, and sugar cane are produced. The wet tropical region produces rice, and the dry tropical region produces grain sorghum. Although the dry tropical region has long been a major livestock and crop area, a large proportion of the wet tropical region remains underdeveloped and underutilized.

The four most important states are Veracruz, Chiapas, Tabasco, and Tamaulipas. In aggregate, these states accounted for almost 30 percent of the national herd, a third of beef output, and 11 percent of milk production. Moreover, production has increased at a faster rate in these states than in other areas of Mexico.

Cattle production is a major activity. In the wet tropical region, the raising of Zebu or Criollo on pasture is common; little or no supplement is utilized. The dry tropical region supports principally Zebu, Criollo, and some European cattle breeds such as Hereford and Aberdeen-Angus. Although the cattle are fed primarily on range or pasture, some feed concentrates and forages are supplemented. Beef that is not consumed locally is generally sent to markets in the Federal District and other population centers of the central highlands.

Although cattle enterprises of the tropics are primarily oriented toward beef production, milk production has developed as a marginal and/or complementary activity to beef cattle production. In these tropical regions, a common type of milk production system is dual purpose (doble proposito). Under this system, beef cows (principally Zebu and Criollo, which are sometimes crossed with European breeds such as Brown Swiss and Holstein) are milked throughout the year. In a large segment of the wet tropical region, this is the dominant milk production system (Salmon).

These regions, especially the wet tropical region, are referred to as Mexico's agricultural frontier. In the dry tropical region, large expanses of the more productive agricultural land are being switched from livestock to the production of crops. Tamaulipas on the northeastern Gulf coast, for example, now produces over one-fourth to one-third of Mexico's grain sorghum output as well as large amounts of corn, beans, and oilseeds. In the wet tropical region, great expanses of tropical forests are being converted to pasture.

Although some suggest that these tropical regions ultimately will play a much larger role in Mexico's planned agricultural self-sufficiency, major obstacles will have to be overcome. Agricultural research and necessary supporting infrastructure are, to a large extent, extremely limited; large expanses of land are adversely affected by excessive rainfall and subsequent flooding; crop and livestock pests and diseases are a major problem and have hindered the introduction of new plant and animal species. Nevertheless, with careful planning and management, the region does have potential.

GOVERNMENT POLICY

The development and growth of Mexico's cattle industry has been heavily influenced by the policies of the Mexican government. A long history of land tenure laws and agricultural policies directly affect both the dairy and beef sectors. Furthermore, foreign trade, which is almost completely controlled by the federal government, has been used to support domestic agricultural policies.

Since the revolution and resulting constitution of 1917, the Mexican government has continually enforced limits on the size of Mexico's agricultural landholdings through land tenure laws. Land-extensive agricultural enterprises, such as the raising of cattle, have been particularly affected. Even though these laws have been changed and clarified over the years, many cattle producers still consider them overly restrictive and a disincentive to investment.

Mexico's domestic agricultural and foreign trade policies have also had considerable impact. For example, in order to keep prices at levels acceptable to consumers, especially to lower income consumers, processed fluid milk prices are controlled by the federal government. Input subsidies have been made available to milk producers; however, considerable distortion has occurred and Mexico has resorted to importing large quantities of a variety of dairy products to maintain domestic dairy supplies at adequate levels.

Mexico historically has been a large exporter of live cattle and beef. However, in an attempt to control the effects of exports on the domestic beef market, rigid restrictions are placed on live cattle and beef exports. Furthermore, although domestic beef prices are not under the same stringent controls as milk prices, they are controlled to varying degrees by the Mexican government. A discussion of government policies and laws and their effects on the cattle sector follows.

LAND TENURE POLICIES

The Mexican Revolution, which began in 1910, occurred partially as a result of unequal distribution of land and poor working conditions for low-income rural peasants (campesinos). The Constitution, and specifically the agrarian law of 1917, attempted to reorganize the structure of Mexican agricultural landholdings in order to more

equitably distribute public resources. The agrarian law, stated in Article 27 of the constitution and reiterated in various complementary rules and laws, restricted the size of agricultural landholdings, included provisions for the expropriation of large landholdings (latifundios), and subsequently provided land and water rights for communities in need. However, as evidenced from consequent legislation, classification of livestock holdings, necessary for the sake of legislative clarity, was especially difficult.

Article 27 broadly interpreted livestock holdings as agricultural properties, and therefore, as "small properties." This original interpretation, further defined in Fraccion XV of the 1946 constitutional reform, specified that livestock, as a small property, could not exceed the land area necessary to maintain 500 head of major livestock species or its equivalence in minor species, depending upon limits fixed by the law and the forage capacity of the land.

The Reglamento de Inafectabilidad Agrícola y Ganadera (1948) later attempted to clarify that a small property refers to an area that does not exceed 400 hectares of good quality rangeland or 800 hectares of brushland (monte) or arid rangeland. Furthermore, the Reglamento de Inafectabilidad once again restricted the area of a small property to no more than the amount of land necessary to sustain the equivalent of 500 head of major livestock.^{1/}

This legislation, however, did more to confuse than to clarify the issue. Good quality rangeland is further defined by the Reglamento de Inafectabilidad as that which can maintain one animal from a major livestock species on a maximum of ten hectares. This interpretation suggests that 5,000 hectares of good quality rangeland could support 500 head of a major livestock species and still be classified as a small property. Furthermore, even more land would be allowed for drier range or brushland under this qualitative interpretation. It is indeed clear that the drier regions could require more than the 800 hectares allowed by the Reglamento de Inafectabilidad to maintain 500 cattle or other major livestock species (CEPAL, p. 19).

However, a more serious problem of the legislation was soon detected. Quantitative restriction of area used for livestock did

not account for technologically improved usage of the land. Although these laws indicate a fixed relationship between livestock and land, a dynamic relationship conditioned by the technology applied actually exists (CEPAL, p. 17). Through increased use of modern technology or more efficient techniques, the land necessary to support 500 head of a major livestock species could be reduced. However, the adoption of more productive technology was inadvertently limited by the legislative attempts to determine a fixed relationship between livestock and land. This is especially true in parts of the arid and semiarid northern regions, where irrigation, pasture plantings, and other technologies could have been used to raise land productivity.

This problem was noted, and in the late 1930s and early 1940s, an effort was made to increase the efficiency of the livestock industry. The government began issuing concessions to livestock producers (principally beef cattle) for a 25 year period in order to allow them to raise the productivity of their property. After the 25 year time limit, the land would be reappraised, and the land which exceeded the area necessary to support 500 head of cattle would be subject to expropriation. Furthermore, during the period of the concession, two percent of the annual reproduction, or an equivalent in pesos, was to be collected by the Agrarian Department. Finally, in 1965, it was decreed that no prolongations should be granted. Later, under the Federal Agrarian Reform Law (1971) within the Reglamento de Inafectabilidad Agrícola y Ganadera, further issuance of this specific type of livestock concession was entirely eliminated.

In addition, the 1971 Agrarian Reform Law attempted once again to clarify the area required for livestock production. Article 250 qualified a maximum of 100 irrigated hectares as a small property, and moreover equated in terms of coefficients one irrigated hectare as (1) two hectares of temperate land, (2) four hectares of good quality rangeland, or (3) eight hectares of brushland (monte) or arid rangeland.

Under the 1971 Agrarian Reform Law, livestock producers who developed parts of their ranches for crop production or increased the carrying capacity of the land beyond the 500 animal limit were liable to have their lands reclassified and perhaps in part expropriated. The law, therefore, proved to be a disincentive to livestock

producers to increase the capacity of their rangelands to an amount in excess of the 500 animal limit or to supplement their income by growing complementary crops.

In an effort to alleviate this problem, the Mexican government, as ratified by the 1971 Agrarian Reform Law, began granting one-year mixed livestock/crop concessions (Certificados de Inafectabilidad Agropecuarios) and permanent livestock concessions (Certificados de Inafectabilidad Pecuarios).^{2/} The mixed livestock/crop concessions are issued on a case by case basis to allow ranchers to grow crops for one year without fear of expropriation. However, few ranchers respond to the opportunity partially because of the difficulty in obtaining the concession certificate, and partially because of the one-year time limit. The livestock concession, issued without consideration for future improvements, i.e., irrigation, drainage and/or other improvements, declared once more that rangeland be classified as a small property in order to meet agrarian reform requirements (Article 256).^{3/} There was no mention of a time limit for these livestock concessions. Again, the difficulty in obtaining these specific concessions has been noted, and the amount of concessions granted has been limited (CNG, March 1979, p. 3). Table 2 lists the total number of concessions by type granted as well as the area affected over the 1971-81 period.

The 1971 Federal Agrarian Reform Law also stated that the area of a small livestock property would be determined case by case depending on topographic and climatic factors. About this same time, the Technical Consultative Commission for the Determination of Range Coefficients (CETECOCA) was created, following the lead of various state commissions in Sonora and Chihuahua, to determine the minimum area necessary to maintain 500 head of cattle. The objective was to classify every zone in the country with a range coefficient according to forage capacity.

Under the first article of the Reglamento Para la Determinacion de los Coeficientes de Agostadero, published in August 1978, the government began to estimate these coefficients. As of the spring of 1981 all but five states had their range coefficients (CNG April-May, 1981, p. 46).

Table 3 lists the average range coefficients for ten states and the Federal District. Table 3 also illustrates the amount of cattle

TABLE 2: Number of Concession Certificates Issued and Area Affected by Type of Concession, Mexico, 1971-1981

Year	Livestock Concessions		Mixed Livestock/ Crop Concessions		Crop Concessions		Total Concessions	
	Number Issued	Thousand Hectares	Number Issued	Thousand Hectares	Number Issued	Thousand Hectares	Number Issued	Thousand Hectares
1971	39	149.6			255	38.8	294	188.4
1972	253	997.1			1,213	125.4	1,466	1,122.4
1973	250	1,456.7			1,386	75.8	1,636	1,532.5
1974	327	506.3			5,966	34.8	6,293	541.2
1975	477	618.1			1,786	29.5	2,263	647.6
1976	144	53.3			11,384	181.6	11,528	234.9
1977	35	56.0	2	0.3	29	1.6	66	58.0
1978	0	0	0	0	129	4.2	129	4.2
1979	273	32.7	0	0	604	34.5	877	67.2
1980	650	291.0	4	1.0	1,547	54.2	2,201	346.2
1981 ^{a/}	616	266.7	9	2.1	828	32.8	1,453	301.7

Source: Portillo, Jose Lopez, August 1981C.

a/ Estimated for first three quarters (9 months).

TABLE 3: Range Coefficients and Actual vs. Ideal Stockings by State, Mexico

State	Average Range Coefficient (hectares/animal)	Actual Number of Cattle Supported (thousands)	'Ideal' Number of Cattle Supported (thousands)	Overutilization (percent)
Chihuahua	20.70	3,067	1,156	165
Colima	4.85	402	103	290
Durango	15.70	1,612	762	111
Guanajuato	10.20	790	300	163
Mexico	9.33	1,030	230	347
Michoacan	7.00	1,294	1,200	8
Morelos	10.85	295	45	555
Federal District	11.35	36	13	176
Puebla	7.82	975	434	125
Tabasco	1.94	718	1,249	(42) ^{a/}
Veracruz	2.03	4,123	3,587	15

Source: Presidencia de la Republica, et al.

^{a/} Underutilization.

that are able to be maintained according to the range coefficients, and includes the amount of cattle that are now supported. As can be seen, the majority of the states listed are severely overutilized. In the extreme case, the land supports 347 percent and 555 percent more cattle than suggested by the coefficients. Only the state of Tabasco was underutilized according to this measure.

In January 1981, the Agricultural Development Law (Ley de Fomento Agropecuario) was passed in an attempt to encourage cattle production and to improve utilization of land. The 1981 Agricultural Development Law has various provisions directly affecting livestock producers. One provision declares that any land utilized for livestock production should be incorporated as cropland. This especially pertains to land in Mexico's agricultural frontier (CNG April-May 1981, p. 47). Also, the 1981 Law states that livestock enterprises may grow forages without fear of expropriation in order to increase the productivity and efficiency of the livestock sector. The suggestion has been made that this is one of the more significant recent developments for the livestock sector (CNG April-May 1981, p. 48). Nevertheless, the various laws and articles concerning limits of a livestock enterprise still result in the overutilization of existing rangelands, but an underutilization of overall production potential.

CATTLE AND BEEF TRADE POLICIES

In recent years, the Mexican government has become increasingly concerned about the ability of the Mexican cattle industry to supply the domestic market with a sufficient quantity of beef at a reasonable price. Because of the type of cattle enterprise and the geographical proximity to U.S. markets, the northern regions of Mexico have exported feeder cattle to the United States since the 1930s (CNG May 1979, p. 16). This trade has traditionally provided mutual benefits for both countries. However, to assure that U.S. cattle and beef prices, generally higher than prices offered domestically (although lower in recent years), do not create shortages in the Mexican domestic beef market, the Mexican government has implemented live cattle and beef export controls. This quota system provides restrictions on the quantity and the quality of live cattle and beef that can be exported.

In response to limited domestic supply and increased prices in 1979, live cattle and beef exports to the U.S. were suspended. Although the claim is undocumented, the Mexican government maintains that cattle producers further compounded the shortage by withholding beef from the market (CNG April 1979, pp. 19-23). Suspension of live cattle exports was temporary; however, the embargo on beef exports has continued into the 1980s.

Live Cattle Export Quotas

Mexico's live cattle export quota is established according to domestic supply and demand, and climatic conditions in the northern regions. In normal years, the feeder cattle export quota is established at 450,000 to 850,000 head per quota year (September-August). However, if domestic beef supplies become tight, the Mexican government can lower the quota and restrict exports. The export quota is also directly related to the availability of feed. With pasture feeding predominant in the northern regions, weather conditions, especially droughts or early frosts, can reduce the carrying capacity of the grazing lands. To reduce the pressure on rangelands during such periods, and in especially severe cases, live cattle export quotas may be expanded to allow more cattle to be exported. Normally, the heaviest movement of cattle from south to north is during October to January, when temperatures in the region drop and precipitation slows.

Table 4 lists both the authorized feeder cattle export quotas and the actual quantity of exported cattle for the 1970 to 1980 quota years. As is apparent, the export quotas generally have been met. Low quotas reflect restrictions on exports as a result of domestic beef scarcity. On the other hand, high export quotas are indicative of severe weather conditions.

The implementation of Mexico's cattle export quota involves various government and producer institutions. The National Livestock Confederation (CNG), on behalf of the various regional cattle producer unions, submits a petition to the Secretary of Agriculture and Water Resources (SARH) in order to obtain certificates to export feeder cattle. SARH, through the Undersecretary of Livestock, then distributes export certificates based on internal supply and demand factors. The certificates are issued by the CNG to the regional

TABLE 4: Feeder Cattle Export Quotas and Actual Exports, Mexico, 1970/71-1980/81 (number of head)

Quota Year ^{a/}	Authorized Feeder Cattle Export Quota	Actual Feeder Cattle Exports
1970/1971	777,600	777,600
1971/1972	846,300	846,300
1972/1973	791,600	791,600
1973/1974	687,500	687,500
1974/1975	721,500	77,905
1975/1976	541,125	284,809
1976/1977	560,125	518,718
1977/1978	782,500	748,968
1978/1979	600,000	523,000
1979/1980	440,000	-- <u>b/</u>
1980/1981	500,000	-- <u>b/</u>

Source: CNG.

a/ September-August.

b/ Not available.

cattle unions, which in turn issue individual export permits to cattle producers. Table 5 lists the states allowed to export feeder cattle and their respective quotas for 1980/81.

In the 1980/81 cattle export year, the regional cattle unions solicited a petition to export 750,000 head of feeder cattle through the CNG. They also guaranteed a supply of 105,000 head of cattle for the internal domestic market. After consideration of the petition and domestic supply and demand, SARH authorized export certificates for 500,000 head. SARH also required that the 105,000 head offered for the internal market be sold to the National Bank of Rural Credit (Banco Nacional del Credito Rural, Banrural) for resale at domestic market prices in the Federal District (CNG April-May 1981, p. 27).

Qualitative requirements are also included in the feeder cattle export quotas. Live cattle exports historically have been restricted to male feeder cattle of a certain age and weight. In the 1980/81 export year, for example, live cattle exports were limited to castrated male animals less than eighteen months of age and with a minimum weight of 160 kilograms (CNG April-May 1981, p. 27).

In addition to the controls on feeder cattle exports, Mexico has quotas on the number of rodeo and bullfighting cattle that can be exported. In 1980/81, for example, Mexico placed a quota of 500 head on bullfighting cattle and 30,000 head on rodeo cattle exports. Furthermore, exporters were required to supply one animal to Banrural for each rodeo cow exported. The animals were then sold by Banrural in order to supply the domestic beef market (CNG April-May 1981, p. 30).

No quota exists for exports of registered Zebu cattle. Nevertheless, Zebu exports are controlled by a limited distribution of individual export permits (CNG April-May 1981, p. 31).

Beef Export Quota

Until recently, Mexico was a major exporter of beef. During the 1975-78 period, for example, beef exports averaged 37.0 thousand metric tons (TMT) annually (USDA/ERS). Beef is produced almost exclusively in the northern arid/semiarid region and is exported principally to the United States. Similar to the controls placed on live feeder cattle exports, the Mexican government regulates beef

TABLE 5: Cattle Export Quotas by State, Mexico, 1980/81 (number of head)

State	Feeder Cattle Quota	Rodeo Cattle Quota
Aguascalientes	3,000	510
Chihuahua	172,000	8,960
Coahuila	65,000	--
Durango	60,000	10,630
Jalisco ^{a/}	4,000	1,060
Nuevo Leon	20,000	--
San Luis Potosi	2,000	975
Sonora	136,000	3,750
Tamaulipas	15,000	--
Zacatecas	<u>23,000</u>	<u>4,115</u>
National total	500,000	30,000

Source: CNG, April-May 1981, pp. 27, 30.

Note: Quota established by SARH and SECOM for September-August.

a/ Only applies to a limited area of northern Jalisco.

exports by means of an export quota. Table 6 lists the quota on beef exports by state for 1978.

Reacting to the domestic beef supply shortage and the rising domestic price of beef in 1979, the Mexican government, through the SARH and the Secretary of Commerce (SECOM), declared the northern border closed to beef exports. The ban on beef exports to the United States was considered a particularly fitting solution to the shortage, since the high price paid by the United States for beef was blamed in part for the short supply of beef in the domestic market. Although beef production was up in 1980 by 4 percent, fear of further shortages has prevented Mexico from resuming exports in large quantities. The embargo has not, however, included live cattle exports after 1979.

In addition to Mexico's export quotas, the United States likewise places controls on beef imports from Mexico.^{4/} The United States requires that Mexico's beef exports meet certain sanitation standards such as a pesticide residue maximum and freedom from exposure to hoof-and-mouth disease. To insure that these sanitation requirements are met, Mexico owns federally monitored slaughter and packing houses in the northern beef regions. Although all beef exports go through these federally inspected plants (Tipo Inspeccion Federal, TIF), the majority of beef that goes through TIF is marketed domestically (CEPAL, p. 164).

The U.S. Meat Import Act of 1979, which imposes import controls on a variety of meat products, has aroused the interest of Mexican cattle producers. Curiously, Mexico has responded quite vocally to actions in accordance with the 1979 Act, even though exports to the United States have slowed to a trickle or stopped entirely. This response could be perceived as maneuvering for a future increase of beef exports.

MILK PRICE AND IMPORT POLICY

Because milk is considered essential to the diet of the Mexican populace and fundamental to the development of the younger population, the Mexican government has become involved in milk pricing. To make certain that milk is available to the Mexican consumer, especially the lower income classes, processed fluid milk prices are under strict government control. Undoubtedly, government

TABLE 6: Deboned Beef Export Quota by State, Mexico, 1978/79
(number of head)

State	Authorized Quota
Aguascalientes	3,316
Chihuahua	12,308
Coahuila	34,749
Durango	23,355
Guanajuato	13,673
Jalisco	42,907
Nayarit	8,396
Nuevo Leon	12,180
San Luis Potosi	14,937
Sonora	27,819
Tamaulipas	22,125
Zacatecas	<u>13,472</u>
National total	235,227

Source: CNG, April 1979, p. 23.

Note: Quota Year is September-August.

involvement in fluid milk prices is motivated by the fear that the relatively few numbers of companies within the industry would, if deregulated, set prices beyond the means of lower class consumers.

Price ceilings, or maximum prices, are placed at the post-processing and consumer levels. SECOM controls and sets ceiling prices based on recommendations from the National Price Commission, which is made up of representatives from various federal entities. Milk price ceilings exist nationwide; however, there are price differentials for eight different zones of the country. Furthermore, different qualities of processed fluid milk, based on butterfat content, type of packaging, and refrigeration, have different price levels.

The price controls have invoked controversy among Mexico's milk producers and Mexican government policy makers. Milk producers have argued that slowly rising price ceilings have not kept pace with more rapidly rising input prices. As a result, there has been a movement by producers out of milk production. As the incentives to process fluid milk have decreased, the production of non-controlled dairy products, such as cheese, butter, and cream, has increased.

In an attempt to insure domestic milk and dairy product supplies and to support SECOM's milk price controls, Mexico has turned to the international market. Dairy products, including powdered and evaporated milk, butrified fat, and cheese, were imported on a large scale throughout the 1970s and into the beginning of the 1980s. Mexico's 1972-80 milk deficit (imports of powdered, evaporated, and fluid milk as a percentage of total domestic milk production) averaged 12 percent.^{5/}

Although processed fluid milk is the only dairy product that is subject to stringent price controls, prices of other dairy products are influenced by the Mexican government. A majority of dairy products are imported by the Mexican government through the National Company of Subsistence Commodities (CONASUPO), a dependent of SECOM.^{6/} Because the government controls the majority of domestic powdered milk sales, and because powdered milk is a gross substitute for processed fluid milk and vice versa, the government to a large extent indirectly controls powdered milk prices.^{7/} Imports of powdered milk, the largest volume and value dairy product import, averaged over twice domestic production throughout the 1970s. This

situation is similar for other dairy products that are imported in large quantities and are substitutes for processed fluid milk, i.e., evaporated milk.

GROWTH AND COMPOSITION OF CATTLE INVENTORIES

As is the case for much of Mexico's livestock data, there are serious doubts about the accuracy of Mexican cattle inventory estimates. Most information available on Mexico's cattle production suggests that cattle numbers, especially those based on data prior to 1971, underestimate the actual herd. However, of all estimates of Mexico's cattle population, the 1960, 1970, and the preliminary 1980 census results are the most widely accepted and highly regarded.

Mexican cattle inventories have been steadily increasing over the past two decades. Over the 1960-1970 period, the Mexican livestock census recorded a 4 percent annual increase in cattle inventories from the 17.7 million head for 1960 to the 26.1 million head for 1970 (table 7). According to SARH, Mexico's cattle herd totaled 34.6 million head in 1980. The 1970-1980 cattle inventory growth rate averaged 2.9 percent.

Dividing Mexico's cattle inventory into a dairy and beef component is especially difficult. As in many countries with grass-based cattle production, the line dividing beef and dairy is not well-defined. A producer, for example, may raise cattle principally for beef production, but periodically milk a certain proportion of the cows. On the other hand, a producer who typically raises cattle for milk production may market some of the herd as beef. Furthermore, a Mexican producer may have a mixed herd of beef and dairy animals. Compounding this dichotomy is the importance of cattle as draft animals.

In spite of the difficulty in dividing dairy, beef, and work cattle into homogenous groupings, estimates are made for these cattle classifications. Of Mexico's total 1980 cattle inventory, 58.8 percent were classified as beef cattle, 35.4 percent were dairy cattle, and the remaining 5.8 percent cattle were classified as draft animals.

According to census estimates for the 1960-80 period, the dairy cattle herd as a share of aggregate cattle inventories declined, and

TABLE 7: Cattle Inventory by Type, Mexico, 1960-1980 (thousands of head)

Year	Dairy Cattle	Percent of Total Cattle	Beef Cattle	Percent of Total Cattle	Work Cattle	Percent of Total Cattle	Total Cattle
1960	7,513	42.5	8,497	48.1	1,659	9.4	17,669
1965	8,347	38.0	11,445	52.1	2,183	9.9	21,975
1970	9,724	37.3	13,462	51.7	2,866	11.0	26,052
1980 ^{a/}	12,256	35.4	20,344	58.8	1,990	5.8	34,590

Sources: 1960-1970: livestock censuses as quoted in NAFINSA.

1980: preliminary results of 1980 livestock census (VI) as quoted in SARH, Direccion General de Ganaderia, "Cattle Statistics." Mimeo, D.F., 1981.

a/ Preliminary.

the beef herd increased. The census also indicates an overall decline in work cattle. From 1960-80, the dairy herd, although increasing in absolute terms from 7.5 million to 12.3 million head, actually decreased in its relative share of total cattle inventories from 42.5 percent in 1960 to 35.4 percent in 1980. The beef cattle herd increased in absolute terms from 8.5 million head in 1960 to 20.3 million in 1980 and increased in share of total cattle inventories from 48.1 percent in 1960 to 58.8 percent in 1980. During the 1960-80 period, the number of work cattle increased only slightly from 1.7 million head to 2.0 million head. However, the work cattle's relative share of total cattle inventories declined from 9.4 percent to 5.8 percent during the same period.

SPATIAL DISTRIBUTION OF CATTLE

Mexican cattle inventories are distributed throughout a wide part of the country. The leading cattle regions in 1980 were the Gulf, southern Pacific, west central, northern, and northwestern areas with 20.8 percent, 16.5 percent, 15.5 percent, 14.6 percent, and 12.3 percent, respectively, of total cattle inventories. The central and north central regions and the Yucatan Peninsula accounted for the remaining 20.3 percent of national cattle inventories (table 8).^{8/}

Of the top ten cattle inventory states in 1980, three were located in the Gulf region, three in the southern Pacific, two in the west central, and one in both the northern and northwestern regions. Veracruz, Tabasco, and Tamaulipas, all within the Gulf region, were among the leading cattle-raising states in 1980. Similarly, three of the four southern Pacific region states, Chiapas, Oaxaca, and Guerrero, were placed among the top ten. In the west central region, both Jalisco and Michoacan were considered principal cattle states. In the northern and northwestern regions, the principal cattle states were Chihuahua and Sonora, respectively. Combined, these ten states accounted for 62.2 percent of Mexico's total 1980 cattle inventories (table 9).

According to SARH, the west central, southern Pacific, and Yucatan Peninsula regions all had growth rates above the national 1972-80 average. Land development in the southern Pacific and Yucatan Peninsula was undoubtedly a principal factor in the growth of

TABLE 8: Cattle Inventory by Regions, Mexico, 1972 and 1980
(thousands of head)

Region	1980		1972		1972-1980
	Cattle Inventory	Percent of Total	Cattle Inventory	Percent of Total	Annual Average Rate of Growth
Northwest	4,268.4	12.3	3,400.4	12.4	2.9
North	5,045.9	14.6	4,196.0	15.4	2.3
North Central	2,269.9	6.6	1,878.9	6.9	2.4
West Central	5,372.3	15.5	4,138.0	15.1	3.3
Central	3,467.5	10.0	2,873.1	10.5	2.4
South Pacific	2,696.7	16.5	4,159.5	15.2	4.0
Yucatan Peninsula	1,294.1	3.7	987.5	3.6	3.4
Gulf	<u>7,175.6</u>	<u>20.8</u>	<u>5,701.3</u>	<u>20.9</u>	<u>2.9</u>
National total	34,588.4 ^{a/}	100.0	27,334.7	100.0	3.0

Source: SARH/DGEA, Dec. 1980.

^{a/} The 1980 cattle inventory total was recorded at 34,590.4 thousand head; however, when aggregating the states into regions they summed to 34,588.4 thousand head.

TABLE 9: Principle Cattle Inventory States, Mexico, 1972 and 1980 (thousands of head)

State	1980		1972		1972-80
	Cattle Inventory ^{a/} Number of head	Percent of National Total	Cattle Inventory Number of head	Percent of National Total	Average Annual Rate of Growth
Veracruz	4,039.4	11.7	3,303.4	12.1	2.5
Chiapas	2,934.7	8.5	1,922.5	7.0	5.4
Jalisco	2,765.0	8.0	2,164.0	7.9	3.1
Chihuahua	2,437.4	7.0	2,042.8	7.5	2.2
Sonora	2,117.2	6.1	1,757.1	6.4	2.4
Tabasco	1,581.1	4.6	1,153.9	4.2	4.0
Michoacan	1,558.8	4.5	1,099.3	4.0	4.5
Tamaulipas	1,555.1	4.5	1,244.0	4.6	2.8
Oaxaca	1,277.1	3.7	1,046.1	3.8	2.5
Guerrero	1,237.2	3.6	1,023.1	3.8	2.4
Total top 10	<u>21,503.1</u>	<u>62.2</u>	<u>16,756.1</u>	<u>61.3</u>	<u>3.2</u>
Others	<u>13,085.3</u>	<u>37.8</u>	<u>10,578.3</u>	<u>38.7</u>	<u>2.7</u>
National total	34,588.4	100.0	27,334.7	100.0	3.0

Source: SARH/DGEA, Dec. 1980.

a/ Greater than 1,200,000 head in 1980.

these two regions. Of the principal cattle states, Chiapas, Tabasco, and Michoacan all had rates of growth in cattle inventories substantially higher than the national average in the 1972-80 period. Again, land development, particularly in Chiapas and Tabasco, was undoubtedly a significant factor in the rapid growth rates recorded for these two states.

As evidenced by the spatial distribution, cattle production is located primarily outside the major population and agricultural centers of central Mexico. Poultry and swine production, which demand little of the area's scarce land resources, have become increasingly concentrated in this area. However, due to the land-extensive nature of cattle production, the bulk of cattle inventories has tended to remain largely outside of the central region. Although the milk production industry has moved considerably toward confined feeding systems, the majority of Mexico's cattle enterprises are still pasture- or range-based.

THE BEEF SECTOR

Beef cattle, accounting for nearly 60 percent of the total cattle herd in 1980, have historically comprised the largest segment within the cattle industry. Reflecting the grass-based production system, where animals are kept on grass until 18 to 24 months before slaughter, cows comprise only about a third of the national herd. Because the data do not explicitly address the purpose of retaining non-productive animals, the proportion of the herd accounted for by grassfed slaughter animals is difficult to determine. However, the data suggest about one-fourth are feeder cattle, 13 percent replacement heifers, and the remainder (about half the herd) are grassfed slaughter animals. Table 10 lists by type the composition of the 1980 beef cattle herd.

Prior to 1970, Mexico's beef industry was a primary component of the output of the livestock sector, the principal contributor of meat to the Mexican populace, and a large export earner. However, according to SARH and the General Department of Agricultural Economics (DGEA), beef production was surpassed by swine production in the 1970s. The increase in swine production reflects the demand of the emerging middle-income groups. In 1980, Mexico's beef output (carcass weight) was reported at 1.0 MMT, whereas swine production (carcass weight) was reported at 1.3 MMT. Furthermore, although exports of live feeder cattle, totaling 491 thousand head in 1980, have continued, beef exports have for the most part stopped.

Unlike poultry and swine, and to a lesser extent dairy, the majority of Mexico's beef cattle production has remained relatively independent of the movement toward confined feeding systems that has characterized the other major livestock enterprises. As a result of the land-extensive nature of the industry, beef production remains largely dependent on weather conditions.

This section presents a brief discussion of the spatial distribution of beef production, trends in inventories, slaughter, beef production, trade, supply, and prices.

SPATIAL DISTRIBUTION

According to SARH/DGEA, the majority of Mexico's 1980 beef carcass output was concentrated within the Gulf (24.6 percent), west central

TABLE 10: Beef Cattle Herd By Type, Mexico, 1980

Classification of Cattle	Number of Head (thousands)	Percent of Total Beef Cattle
Cows	7,593.6	34.0
Heifers (more than 2 years)	2,903.4	13.0
Mature bulls	2,903.4	13.0
Young bulls and steers	2,456.8	11.0
Females (one-two years)	2,903.4	13.0
Calves and yearlings	3,125.8	14.0
Feeder cattle	<u>2,233.4</u>	<u>10.0</u>
Total beef cattle	20,344.2	100.0
Total cattle ^{a/}	34,590.4	

Source: Preliminary results of the 1980 livestock census as quoted in SARH, Direccion General de Ganaderia, "Cattle Statistics." Mimeo, Mexico, D.F., 1981.

Note: Preliminary 1980 figures are used.

a/ Includes dairy, beef, and work cattle.

(17.4 percent), and southern Pacific (16.5 percent) regions of the country. Other important beef producing areas included the central (11.3 percent), the northwestern (11.3 percent), and the northern (10.2 percent) regions. Two additional regions, the north central and the Yucatan Peninsula, accounted for 6.2 percent and 2.5 percent of 1980 beef carcass output, respectively (table 11).

Mexico's principal beef producing states, according to the same 1980 SARH/DGEA estimates, are listed in table 12. The Gulf region states, including Veracruz, Tabasco, and Tamaulipas, are the largest beef producing states. Veracruz accounted for 14.8 percent of the total beef carcass output of over 1.0 million metric tons (MMT) in 1980. Tabasco and Tamaulipas produced, respectively, 5.4 percent and 4.4 percent of output in 1980. The states of Jalisco, Michoacan, and Guanajuato, in west central Mexico, were also principal beef states. According to SARH/DGEA 1980 estimates, Jalisco ranked second nationally in beef carcass output with 9.7 percent of total domestic output. Michoacan ranked eighth with 4.4 percent and Guanajuato twelfth with 3.2 percent. The state of Chiapas, ranking third nationally in beef production, and the states of Guerrero and Oaxaca, all within the southern Pacific region, accounted for 9.2 percent, 3.4 percent, and 3.2 percent, respectively, of Mexico's 1980 beef carcass output. Other major beef producing states in 1980 were the two central region states of Mexico with 3.7 percent and Puebla with 3.3 percent of domestic beef carcass production; the northern state of Chihuahua with 5.2 percent of production; the northwestern region's states of Sonora and Sinaloa with 4.5 and 3.0 percent of production, respectively; and the north central region's state of San Luis Potosi with 3.1 percent of total domestic carcass production.

Between 1972 and 1980, according to the SARH/DGEA, various regions registered growth rates of beef carcass production above the national average. The southern Pacific's beef output during this period, for example, increased at an average annual 7.8 percent, well above the national average of 5.3 percent. This above-average growth rate was also recorded by the southern Pacific region states of Chiapas (8.9 percent), Guerrero (6.5 percent), and Oaxaca (6.2 percent). The west central and central regions had above-average annual increases of 6.0 percent and 5.9 percent, respectively. Within these two regions the states of Michoacan (8.6 percent),

TABLE 11: Beef Production by Region, Mexico, 1972 and 1980

Region	1980		1972		1972-80
	(TMT)	Percent of National Total	(TMT)	Percent of National Total	Annual Average Rate of Growth
Northwest	120.0	11.3	80.0	11.3	5.2
North	109.1	10.2	90.8	12.9	2.3
North Central	65.4	6.2	47.2	6.7	4.2
West Central	180.1	17.4	113.4	16.0	6.0
Central	120.7	11.3	76.3	10.8	5.9
South Pacific	175.5	16.5	96.4	13.6	7.8
Yucatan Peninsula	27.0	2.5	20.1	2.8	3.8
Gulf	<u>262.3</u>	<u>24.6</u>	<u>182.9</u>	<u>25.9</u>	<u>4.6</u>
National total	1,065.1	100.0	707.0	100.0	5.3

Source: SARH/DGEA, Dec. 1980.

TABLE 12: Principal Beef Producing States, Mexico, 1972 and 1980

State	1980 Beef Production		Rank in 1972	1972 Beef Production		1972-1980
	(TMT)	Percent of National Total		(TMT)	Percent of National Total	Average Annual Rate of Growth
Veracruz	157.1	14.8	1	115.9	16.4	3.9
Jalisco	103.6	9.7	2	68.3	9.7	5.3
Chiapas	98.0	9.2	3	49.5	7.0	8.9
Tabasco	57.9	5.4	7	33.4	4.7	7.1
Sonora	55.7	5.2	5	40.4	5.7	4.1
Chihuahua	49.7	4.7	4	45.1	6.4	1.2
Tamaulipas	47.3	4.4	6	33.6	4.8	4.4
Michoacan	47.1	4.4	8	24.4	3.4	8.6
Mexico	39.4	3.7	9	23.6	3.3	6.6
Guerrero	35.8	3.4	12	21.6	3.1	6.5
Puebla	35.4	3.3	10	23.0	3.3	5.5
Guanajuato	34.4	3.2	15	20.7	2.9	6.5
Oaxaca	33.9	3.2	13	20.9	3.0	6.2
San Luis Potosi	33.5	3.1	11	22.7	3.2	5.0
Sinaloa	<u>32.4</u>	<u>3.0</u>	14	<u>21.0</u>	<u>3.0</u>	<u>5.6</u>
Total top 15	<u>861.1</u>	<u>80.9</u>		<u>564.1</u>	<u>79.8</u>	<u>5.4</u>
Others	<u>203.9</u>	<u>19.1</u>		<u>142.8</u>	<u>20.2</u>	<u>4.6</u>
National total	1,065.1	100.0		707.0	100.0	5.3

Source: SARH/DGEA, Dec. 1980.

Note: States listed all produced more than 30,000 head.

Mexico (6.6 percent), and Guanajuato (6.5 percent) had especially high growth rates. The slowest beef carcass production area was the northern region, with an average annual 2.3 percent growth rate. This slower growth rate is reflected by the state of Chihuahua, which increased only 1.2 percent annually 1972-80, although it remained the largest beef producing state in the region.

SLAUGHTER

Several slaughter estimates, many of which differ widely, exist for the Mexican cattle industry. Although estimates vary, the data are consistent enough to provide an informative overview. The most recent official cattle statistics are reported by SARH/DGEA from a series of updated slaughter estimates. Table 13, which combines SARH/DGEA data and the historical SIC beef cattle series data, lists as a discontinuous series Mexico's total cattle inventories and slaughter for the 1960-80 period.

The 1960 annual cattle slaughter of 1.8 million head totaled approximately 2.0 million head (CEPAL, 1975, p. 105). The 1965 total cattle slaughter, up a 4.7 percent average annual rate from 1960 levels, equaled approximately 2.5 million head. Mexico's slaughter in 1970 was nearly 3.2 million head, a 4.9 percent annual growth rate from 1965 and 4.8 percent from 1960 levels.

The quantity of cattle slaughtered between 1969 and 1980 increased at an average annual 5 percent rate from 3.0 million head in 1969 to 5.2 million head for 1980. Exceptionally high rates of growth in cattle slaughter in 1975 and 1979 were caused principally by severe weather. As carrying capacity and feed supplies decreased, the rate of cattle liquidation increased. These slaughter increases, however, were confined to the arid/semiarid areas of the country and were not nationwide.

Slaughter rates based on the quantity of cattle slaughtered as a percentage of cattle inventories have been calculated in table 14. These rates can be used to measure the gross productivity levels of Mexico's cattle subsector. According to a combination of sources, Mexico's slaughter rates increased from an 11.2 percent rate recorded for 1960 to a 15 percent rate for 1980.

TABLE 13: Cattle Inventories, Slaughter, and Rates of Growth, Mexico, 1960-1980

Year	Total Cattle Inventories (thousands of head)	Annual Slaughter (thousands of head)	Annual Growth Rate of Slaughter (percent)	Slaughter Rate ^{a/} (percent)
1960	17,669.0	1,961.0		11.2
1965	22,768.6	2,498.0	4.7	10.9
1966	23,464.7	2,524.0	1.4	10.7
1967	23,790.2	2,499.0	-1.0	10.5
1968	23,811.7	2,622.0	4.9	11.0
1969	23,257.5	2,803.0	6.9	12.1
1969	23,257.5	3,026.2		13.0
1970	25,499.2	3,156.0	4.2	12.4
1971	26,264.7	3,195.2	1.2	12.2
1972	27,334.7	3,472.0	8.7	12.7
1973	28,102.5	3,645.7	5.0	13.0
1974	28,815.8	3,802.5	4.3	13.2
1975	29,602.3	4,097.1	7.7	13.8
1976	30,461.0	4,206.9	2.7	13.8
1977	31,410.0	4,333.1	3.0	13.8
1978	32,438.7	4,546.7	4.9	14.0
1979	33,545.0	4,901.8	7.8	14.6
1980	34,590.4	5,177.7	5.6	15.0

Sources: 1960-69: SIC as quoted in CEPAL.

1969-80. SARH/DGEA, "Livestock Statistics." Mimeo, Mexico, D.F.

a/ Slaughter as a percentage of inventories.

TABLE 14: Cattle Inventories, Slaughter, and Slaughter Rates Including Exports, Mexico, 1960-80

Year	Total Cattle Inventories (thousands of head)	Domestic Slaughter (thousands of head)	Domestic Slaughter Rate (percent)	Total Slaughter ^{a/} (thousands of head)	Total Slaughter Rate ^{a/} (percent)
1960	17,669.0	1,961	11.2	2,531	14.3
1965	22,768.6	2,498	11.0	3,055	13.4
1970	25,499.1	3,156	12.4	4,090	16.0
1975	29,602.3	4,097	13.8	4,293	14.5
1980 ^{b/}	34,590.4	5,178	15.0	5,510	15.9

Sources: Compiled by authors from tables 13 and 16.

a/ Includes live cattle exports.

b/ Preliminary.

Table 14 also presents for comparison rates that include live cattle exports as a percentage of the cattle herd. According to these calculations, slaughter increased from 14.3 percent in 1960 to 16 percent in 1970 and decreased slightly to 15.9 percent in 1980.

MEAT PRODUCTION

In recent years, Mexico has centralized livestock estimates in an attempt to present consistent, updated statistics of inventories, slaughter, and meat production. However, with a large discrepancy in live weights and beef carcass output, estimates of beef production and beef by-products vary accordingly. Updated slaughter and production estimates for the years 1969-80, based on preliminary information from the 1980 livestock census, and historical estimates are listed in Table 15.

According to the SIC beef production series, the 1960 cattle slaughter totaled 2.0 million head. At an average carcass weight of 149.2 kilograms each, production totaled 295.1 TMT (CEPAL, p. 105). In 1965, average yields increased to 155.8 kilograms and total carcass production stood at 386.7 TMT. This 1965 production was up a 5.6 percent average annual rate from 1960. In 1970, average carcass yields increased to 190.3 kilograms for a total carcass weight production of 600.4 TMT. Production was up a 9.2 percent average annual rate from 1965 levels and a 7.4 percent annual rate from 1960.

A direct comparison of the change in carcass production between 1968 and 1969 is impossible due to the use of a discontinuous series. The SIC reports a yield of 157.9 kilograms per animal carcass in 1968 and 1969. However, SARH/DGEA records a yield of 196.7 kilograms per animal in 1969. Assuming live and carcass weight measurements are equal between the two series, the slaughter rates suggest an increase in total carcass weight production of 15.4 percent between 1968 and 1969.

The higher annual rates of growth for the 1974-75 and 1978-79 periods reflect the severe weather conditions which forced higher slaughter rates and resulted in increased beef production in 1975 and 1979. SARH/DGEA estimates Mexico's 1980 beef production at 1,016.0 TMT, a total which accounts for a slaughter of 5.2 million head of cattle, an average live weight of 369.2 kilograms, and meat (beef

TABLE 15: Beef Slaughter, Live Weight, Yield, and Production, Mexico, 1960-81

Year	Slaughter ^{a/} (thousands of head)	Average Live Weight (kilograms)	Yield (percent)	Beef ^{b/} (TMT)	Annual Average Rate of Growth (percent)	Edible Offals (TMT)
1960	1,961.0			295.1		106.5
1965	2,498.0			386.7	5.6	173.9
1966	2,524.0			391.5	1.2	181.8
1967	2,499.0			395.1	0.9	178.9
1968	2,622.0			414.1	4.8	159.4
1969	1,803.0			442.5	6.9	155.4
1969	3,026.1			595.1		
1970	3,156.0			600.4	0.9	
1971	3,195.2			609.9	1.6	
1972	3,472.0	347.0	51.9	625.0	2.5	192.8
1973	3,645.7	350.0	52.0	663.5	6.2	203.5
1974	3,802.5	352.7	52.2	700.0	5.5	213.2
1975	4,097.1	356.0	52.3	762.9	9.0	231.5
1976	4,206.9	358.9	52.4	791.3	3.7	239.3
1977	4,333.1	362.1	52.5	823.7	4.1	248.2
1978	4,546.7	368.9	52.5	868.0	5.4	264.4
1979	4,901.8	367.8	52.8	951.9	9.7	284.8
1980	5,117.7	369.2	53.1	1,016.0	6.7	301.9
1981 ^{c/}	5,434.2	372.5	53.3	1,128.7	11.1	319.4

Sources: 1960-1969: SIC as quoted in CEPAL.
1969-1981: SARH/DGEA.

a/ Includes beef cattle slaughtered within the country for eventual export. Does not include live cattle exports.

b/ Carcass weight.

c/ Preliminary estimates are used for 1981.

carcass) yields of 53.1 percent. In addition, Mexico exported 491.0 thousand head of cattle in 1980. When exported cattle (utilizing an average carcass weight yield of 100 kilograms/head) are added to the 1980 figure for beef production, the total becomes 1,065.1 TMT. Production of edible offals, which averaged approximately 30 percent of beef carcass production, increased 5.8 percent annually from 192.8 TMT in 1972 to 301.9 TMT in 1980.

INTERNATIONAL TRADE

Mexico historically has been an exporter of beef and live cattle. Although Mexico continues to hold a net surplus in the foreign trade of live cattle and beef, serious cutbacks, especially in the late 1970s, have occurred in these exports. Mexico's beef product imports are principally made up of cattle hides, tallow and greases, edible beef cattle offals, and lesser quantities of beef and live cattle. Table 16 lists Mexico's imports and exports of live cattle and beef over the 1961-81 period.

According to USDA/FAS, Mexico's live cattle exports averaged 604.6 thousand head annually during the 1961-69 period and 594.7 thousand head during the 1970-80 period. Domestic beef supply shortages resulting from severe weather and associated cattle liquidations in 1978 account for the average annual decline of live cattle exports during the 1970-80 period. Beef exports, on the other hand, which averaged 40.4 TMT during the 1970-78 period, were embargoed during 1979 and the beginning of the 1980s.

Mexico has recently turned to the foreign market for fed-out beef cattle and beef carcasses. Imports have been supplied principally by the United States, Guatemala, and Costa Rica. In 1979, for example, 50,000 head of U.S. cattle were imported by Mexico for domestic consumption (Embassy 1981, p. 22). The lower costs of feeding out cattle in the United States made U.S. imports possible. It has been alleged, however, that the Guatemalan and Costa Rican imports were arranged at the presidential level in order to allow for payment of petroleum purchases (Embassy 1981; CNG April-May 1981, p. 18).

Mexico's beef and beef product imports include small amounts of beef and live cattle. Some quantity of beef and veal and a

TABLE 16: Live Cattle and Beef Trade, Mexico, 1961-81

Year	Live Cattle Exports (thousands of head)	Beef Equivalent of Live Cattle Exports ^{a/} (TMT)	Beef Exports (TMT)	Total Beef Exports (TMT)	Live Cattle Exports ^{b/} (thousands of head)	Beef Imports (MT)
1961	550	55.0	35.7	90.7	28	15.0
1962	776	76.6	38.6	115.2	13	57.0
1963	553	55.3	46.2	101.5	15	32.0
1964	358	35.8	32.3	68.1	13	38.0
1965	557	55.7	31.0	86.7	17	216.0
1966	589	58.9	38.8	97.7	20	319.0
1967	525	52.5	30.2	82.7	21	546.0
1968	712	71.2	45.7	116.9	19	326.0
1969	831	83.1	49.5	132.6	18	750.0
1970	934	93.4	52.1	145.5	13	863.0
1971	757	75.7	48.6	124.3	15	562.0
1972	966	96.6	58/3	154.9	21	518.0
1973	553	55.3	38.5	93.8	32	528.0
1974	363	36.3	19.6	55.9	36	354.0
1975	196	19.6	21.0	40.6	115	624.0
1976	508	50.8	34.9	85.7	96	840.0
1977	600	60.0	45.0	105.0	31	876.0
1978	815	81.5	45.2	126.7	26	720.0
1979	380	38.0	5.7	42.7	25	1,756.0
1980	332	33.2	1.4	34.6	17	1,415.0
1981 ^{c/}	400	40.0	5.6	45.6	25	1,900.0

Source: USDA/ERS.

^{a/} Average meat equivalent of exported cattle = 100 kg.^{b/} Average meat equivalent of imported cattle = breeding stock.^{c/} Preliminary.

proportion of live cattle are imported under the maquila system. Under this system, live animals or beef carcasses are imported, processed, and then exported. For example, while beef exports have been embargoed, exports of maquila beef have continued. In 1980, trade under the maquila system included exports of 100 MT of processed beef from live animals and carcasses imported from Australia and 835 MT of beef imported from the United States and exported to Japan (Embassy 1980, p. 22).

APPARENT SUPPLY

Mexico's 1980 domestic beef production was estimated preliminarily by SARH at 1.0 MMT. In the same year, beef imports and exports each totaled approximately 1.4 TMT. Table 17 lists Mexico's domestic beef production, beef imports and exports (not including live cattle), and apparent domestic beef supply (domestic production minus net exports) for the period 1965-81.

According to these data, Mexico's domestic beef production increased at an annual average 5.4 percent during the 1970-80 period. At the same time, beef exports declined from 52.1 TMT in 1970 to 1.4 TMT in 1980, and beef imports increased from 863.0 MT in 1970 to the 1.4 MT recorded for 1980. Total apparent beef supply increased at an annual average 6.3 percent.

TABLE 17: Domestic Beef Production, Exports, Imports, and Apparent Supply, Mexico, 1965-1981 (metric tons)

Year	Domestic Beef Production ^{a/}	Beef Exports ^{b/}	Beef Imports ^{b/}	Apparent Beef Supply
1965	386,700	35,694	216	351,222
1966	391,500	38,831	319	352,988
1967	395,100	30,225	546	365,421
1968	414,100	45,698	326	368,728
1969	595,128	49,524	750	546,354
1970	600,432	52,099	863	549,196
1971	609,932	48,636	562	561,858
1972	624,960	38,459	518	567,149
1973	663,517	38,459	528	625,586
1974	700,040	19,637	354	680,757
1975	762,880	20,985	624	742,519
1976	791,318	34,923	840	757,235
1977	823,722	44,966	876	779,632
1978	867,965	45,156	720	823,529
1979	951,930	5,705	1,756	947,981
1980	1,015,950	1,415	1,416	1,015,951
1981 ^{c/}	1,128,689	5,600	1,900	1,124,989

Sources: Domestic beef production: table 15.

Exports and imports: table 16.

Apparent supply: production minus net beef exports (exports minus imports).

a/ Discontinuous series 1965-68/1969-81.

b/ Does not include live cattle exports or imports.

c/ Figures for 1981 are estimated.

THE DAIRY SECTOR

Mexico's dairy cattle industry is an important component of the livestock sector and a major contributor to the country's animal protein food supply. For example, SARH and the National Milk Institute (INL) estimated Mexico's 1980 cows' milk production at approximately 6.7 billion liters.^{9/} At an average 1980 price of seven pesos per liter, Mexico's cows' milk production had a value of over 47.0 billion pesos (\$2.0 billion). Although the Mexican government has consistently stressed the importance of milk in the Mexican diet, attempts to keep prices low have resulted in less-than-adequate domestic milk production, regional and seasonal shortages, and a continued reliance on large quantities of imported dairy products.

Dairy cattle are the primary source of Mexico's milk supply, accounting for over 96 percent of milk production; a small percentage of domestic milk is derived from Mexico's goat herd (table 18). Included in table 18 are estimates of cows' milk production for 1960-69 (published by SARH) and a second series covering 1970-80 (published by SARH/INL). The goat milk production data were constructed from a 1960-72 and a 1972-80 series. Overlap years, 1970 for cow milk and 1972 for goat milk, are included in order to demonstrate the disparity in recorded milk production between the dated and updated versions. Also included, for the purpose of comparison, are the USDA/FAS estimates of total Mexican milk production for the period covering 1964 to 1980.

According to estimates from Mexico's SARH and INL, domestic milk production increased at a 4.2 percent annual rate over the 1970-80 period from 4.5 billion liters in 1970 to 6.7 billion in 1980. The growth in domestic milk production, however, was not entirely due to increases in Mexico's dairy herd, which increased 2.3 percent annually over the same 1970-80 period. Rather, a large proportion of the growth in milk production can be attributed to the movement away from traditional land-extensive types of dairy production systems to higher-yielding, confined feeding systems. In 1979, for example, although representing only approximately 12 percent of all dairy cattle, 58 percent of all domestic milk production was derived from confined systems.

TABLE 18: Milk Production, Mexico, 1960-1980

Year	Cattle Production (million liters)	Goat Production (million liters)	Total Production (million liters)	Milk Production Estimated by USDA/FAS (MT)
1960	1,867.1	113.2	1,980.3	--
1961	1,941.1	115.8	2,056.9	--
1962	2,019.4	118.1	2,137.5	--
1963	2,169.3	121.0	2,290.3	--
1964	2,672.3	122.8	2,795.1	4,450.0
1965	3,508.1	123.4	3,631.5	4,332.0
1966	2,846.2	124.2	2,970.4	4,493.0
1967	3,391.8	130.6	3,622.4	4,820.0
1968	3,489.9	94.2	3,584.1	4,511.0
1969	3,626.1	92.0	3,718.1	5,339.0
1970	4,483.0 ^{3,758.0/}	101.5	4,584.5	5,551.0
1971	4,694.0	105.9	4,799.9	5,843.0
1972	4,915.2	230.0 ^{107.2/}	5,145.2	6,007.0
1973	5,225.3	234.8	5,460.1	6,199.0
1974	5,500.0	240.0	5,740.0	6,331.0
1975	5,808.8	245.3	6,054.1	6,619.0
1976	5,907.3	252.1	6,159.4	6,350.0
1977	6,180.9	261.9	6,442.8	6,634.0
1978	6,509.6	265.4	6,775.0	6,930.0
1979	6,641.9	271.8	6,913.7	7,055.0
1980	6,741.5	279.7	7,002.0	7,010.0

Sources: Cattle, goat, and total production: SARH/DGEA as quoted in SPP 1979, SARH/INL.
 USDA/FAS data: USDA/ERS; July 1981A.

Included in this section is a description and analysis of Mexico's dairy industry. Topics discussed include the characteristics of Mexico's dairy cattle inventories, composition of the dairy herd, spatial distribution of production, and the different types of dairy production systems. The confined feeding system is emphasized because of its importance within the dairy subsector in general and, more specifically, because of its importance as a major utilizer of balanced feeds. Finally, milk utilization and the various dairy product industries, and trends, both present and historical, are examined.

COMPOSITION OF THE DAIRY HERD

Dairy cattle made up approximately 35 percent of the Mexican cattle herd totaling 34.6 million head in 1980. Cows and heifers, comprising 75 percent of the 1980 dairy herd, account for the majority of all Mexican dairy cattle. The remainder of the herd is made up of young cows, calves and yearlings, young and mature bulls, and steers. Table 19 presents the composition of Mexico's dairy herd in 1980.

Although estimates of lactating dairy cows vary, depending upon the data source, estimates by SARH, INL, and the CNG are fairly consistent. From Mexico's total 1980 dairy herd of 12.3 million head, SARH and INL estimate that 8.2 million head actually yield milk. The CNG places this estimate at a slightly lower 8.1 million head. USDA/FAS, which also reports Mexico's dairy cattle inventories, estimates that of 10.3 million head of dairy cattle in 1980, approximately one-half were milk yielding cows (USDA/FAS, July 1981A).^{10/} However, as previously discussed, the division of Mexico's cattle herd into a dairy segment is somewhat arbitrary, and classification is especially difficult.

Unlike the highly specialized dairy industry in the United States, the Mexican dairy enterprise varies widely in production system and type of dairy cow utilized. Some dairy production systems utilizing high-producing dairy breeds and intensive management practices may have daily milk output of twenty liters or more per cow. However, daily milk yields of one liter and less per cow are common for grazed Criollo cows.

TABLE 19: Dairy Cattle Herd by Type, Mexico, 1980

Type	Number of Head (thousands)	Percent of Dairy Herd
Cows	6,128.1	50.0
Heifers (greater than 2 years)	3,064.1	25.0
Mature bulls	122.6	1.0
Young bulls and steers	122.6	1.0
Females (one-two years)	2,596.4	21.0
Calves and yearlings	<u>122.6</u>	<u>1.0</u>
Total dairy cattle	12,256.2	100.0

Source: Preliminary results of the 1980 livestock census as quoted in SARH, Direccion General de Ganaderia, "Cattle Statistics." Mimeo, Mexico, D.F., 1981.

Note: Preliminary 1980 figures are used.

An overwhelming majority of the dairy herd consists of characteristically low milk-yielding Criollo cattle, and only a relatively small proportion is comprised of high-yielding European dairy cattle breeds, Criollo/Holstein crosses, and Criollo/Brown Swiss crosses. For example, of the approximately eight million head of dairy cattle for 1978, only one million were specialized dairy cows (SARH/INL, no date). The other seven million were Criollo.

SPATIAL DISTRIBUTION OF MILK PRODUCTION

Mexico's principal 1980 milk producing states are listed in table 20. The states of Jalisco and Michoacan, which lie within both the temperate and dry tropical regions, were major milk producers with 11.5 and 6 percent of the 1980 milk production, respectively. The temperate region states of Mexico, Guanajuato, and Puebla are also large milk producers with 8.9, 5, and 4.5 percent of total 1980 domestic production, respectively. The arid/semiarid northern region contains the major producing states of Coahuila, Durango, and Chihuahua with 7.4, 6.7, and 5.3 percent of 1980 milk production, respectively. The dry and wet tropical region state of Veracruz, also a major beef cattle state, produced 7.4 percent of Mexico's milk output in 1980. Finally, Chiapas, which lies within the wet and dry tropical as well as the temperate regions, produced 4.2 percent of Mexico's 1980 milk output.

The dry tropical and temperate region state of Jalisco, the temperate region states of Mexico and Guanajuato and the dry-wet tropical region state of Veracruz all recorded especially high rates of growth in milk output during the 1972-80 period. The northern arid/semiarid region states of Coahuila, Durango, and Chihuahua, however, had a substantially slower rate of growth in milk production than the national average during the same period.

DAIRY PRODUCTION SYSTEMS

In order to categorize dairy production systems, SARH and INL estimated in 1978 the quantity of cattle managed and milk derived for three types of production based on degree of confinement. These three main types of production are identified as confined, semi-confined, and grazing. Confined production is an intensive type of

TABLE 20: Principal Milk Producing States, Mexico, 1972 and 1980

State	Geoclimatic Region(s) _{a/}	1980		Rank	1972		1972-80	
		Milk Production (million liters)	Percent of National Total		Milk Production (million liters)	Average Annual Rate of Growth (percent)		
Jalisco	temp,dt	785.8	11.8	1	429.8	8.0		
Mexico	temp	598.6	8.9	4	362.6	6.5		
Veracruz	dt,wt	502.2	7.4	5	324.4	5.6		
Coahuila	arid	501.2	7.4	2	417.8	2.3		
Durango	arid	449.6	6.7	3	395.0	1.6		
Michoacan	temp,dt	403.5	6.0	6	319.7	3.0		
Chihuahua	arid	357.8	5.3	7	314.8	1.6		
Guanajuato	temp	339.5	5.0	10	204.0	6.6		
Puebla	temp	304.1	4.5	8	209.4	4.8		
Chiapas	temp,dt,wt	274.0	4.1	9	205.0	3.7		
Total top ten		<u>4,526.1</u>	<u>67.1</u>		<u>3,182.4</u>	<u>4.5</u>		
Others		<u>2,215.4</u>	<u>32.9</u>		<u>1,732.8</u>	<u>3.1</u>		
National total		6,741.5	100.0		4,915.2	4.0		

Source: SARH/DGEA, Dec. 1980.

a/ Geoclimatic regions were abbreviated as follows:

- temp - temperate
- arid - arid/semiarid
- dt - dry tropical
- wt - wet tropical

system and grazing is an extensive system. Semi-confined production is a combination of the other two types of enterprises.

With an estimated 8.2 million head of dairy cattle and average annual milk yields of 794 liters per cow, SARH and INL placed Mexico's national milk production at 6,509.5 million liters in 1978.^{11/} Table 21 shows dairy herd inventories, yield, and milk production by type of enterprise for 1978. As the data suggest, confined dairy production is the most important source of milk production. Although representing only 12.7 percent of the dairy herd, this system, due to 458 percent higher yields than the national average, produced 58 percent of Mexico's milk. Semi-confined milk production systems comprised 19.9 percent of the total dairy herd and produced 16.2 percent of domestic milk. Finally, dairy cows under the grazing system, although accounting for 67.4 percent of the total dairy herd, produced only 25.8 percent of Mexico's 1978 milk output.

SARH and INL also compare dairy cattle inventories, milk production, and type of dairy enterprise according to geoclimatic regions. These regions, which have already been identified, are arid/semiarid, temperate, dry tropical, and wet tropical. Although these geoclimatic regions generally follow state borders, they do divide some states into two or, in the extreme case of Chiapas, three different regions.

Table 22 compares dairy cattle inventories, yield, and annual milk production by geoclimatic region for 1978. The data record much higher average annual yields for the temperate region. Although containing only 23.2 percent of the dairy cattle herd, the temperate region was estimated to account for 40.2 percent of total domestic milk production in 1978. The tropical regions (both wet and dry) had substantially lower yields than the national average. In 1978, the milk yields from cattle in the wet tropical region were 56.7 percent of the national average and in the dry tropical region 68.6 percent. Although the two tropical regions together accounted for over 50 percent of the domestic dairy cattle inventories in 1978, their combined milk production was only approximately 32 percent of the national total. Finally, the arid/semiarid region contained 25.7 percent of the dairy cow herd and produced 27.2 percent of domestic milk.

TABLE 21: Dairy Herd Inventory, Milk Yield, and Milk Production by Type of Enterprise, Mexico, 1978

Type of Enterprise	Dairy Herd Inventory (thousands of head)	Percent of National Total	Yearly Average Yields (liters/cow)	Percent of National Average	Milk Production (million liters)	Percent of National Total
Grazed	5,525.4	67.4	304	38.3	1,680.3	25.8
Semi-confined	1,635.4	19.9	644	81.1	1,053.9	16.2
Confined	<u>1,037.9</u>	<u>12.7</u>	<u>3,637</u>	<u>458.1</u>	<u>3,775.3</u>	<u>58.0</u>
National total	8,198.7	100.0	794	100.0	6,509.5	100.0

Source: SARH/INL.

TABLE 22: Dairy Herd Inventory, Milk Yield, and Milk Production by Geoclimatic Region, Mexico, 1978

Geoclimatic Region	Dairy Herd Inventory (thousands of head)	Percent of National Total	Yearly Average Yields (liters/cow)	Percent of National Average	Milk Production (million liters)	Percent of National Total
Arid/semiarid	2,104.4	25.7	841	105.9	1,770.6	27.2
Temperate	1,902.6	23.2	1,375	173.2	2,615.2	40.2
Dry tropical	2,502.4	30.5	545	68.6	1,364.3	20.9
Wet tropical	<u>1,689.3</u>	<u>20.6</u>	<u>450</u>	<u>56.7</u>	<u>759.4</u>	<u>11.7</u>
National total	8,198.7	100.0	794	100.0	6,509.5	100.0

Source: SARH/INL.

Combining Tables 21 and 22 allows the comparison of dairy cattle inventories and milk output for each geoclimatic region by the type of production system employed. Table 23 presents the dairy cattle inventory comparisons and Table 24 the comparisons for Mexico's 1978 milk production.

CONFINED SYSTEM

Of approximately 1.0 million dairy cattle managed under the confined production system in 1978, 53 percent were in the temperate region and 28.9 percent in the arid/semiarid region. The dry and wet tropical regions accounted for 16.1 percent and 2 percent of all confined dairy cattle, respectively. Correspondingly, of the confined dairy system's total milk output, 55.2 percent was produced in the temperate region and 30.9 percent from the arid/semiarid region. The remaining 13.9 percent of the confined system milk production was derived from the dry and wet tropical regions.

The Undersecretary of Livestock of SARH and INL have estimated the number of dairy cattle, average annual yield, and total milk production for the confined dairy cattle states. Table 25 presents these characteristics for principal confined system states based on the number of dairy cattle in 1979. According to these estimates, the top two confined-feeding dairy states in 1979 were Jalisco and Mexico, which had a combined total of 27.1 percent of Mexico's confined dairy cattle and provided 26.9 percent of milk produced by this system. Other principal confined system dairy states were Guanajuato, Coahuila, Puebla, Michoacan, Durango, Chihuahua, the Federal District, and Queretaro which each supported over 35 thousand head of confined dairy cattle in 1979. Combined, these ten states accounted for 70.8 percent of confined dairy cattle and 75.7 percent of milk derived from this type of system.

SEMI-CONFINED SYSTEM

According to SARH and INL, of the 1.6 million semi-confined dairy cattle in 1978, the dry tropical region supported 32.9 percent, followed by the arid/semiarid, wet tropical, and temperate regions with 28.5, 22.6, and 16 percent of the national total, respectively. Again, the quantity of milk derived from the semiconfined system largely reflects this same distribution.

TABLE 23: Dairy Herd Inventory by Geoclimatic Region and by Type of Enterprise, Mexico, 1978

Geoclimatic Regions	Confined		Semi-Confined		Grazed	
	(thousands of head)	Percent of Total	(thousands of head)	Percent of Total	(thousands of head)	Percent of Total
Arid/semiarid	300.2	28.9	465.8	28.5	1,338.3	24.2
Temperate	549.6	53.0	261.3	16.0	1,091.7	19.8
Dry tropical	167.1	16.1	538.0	32.9	1,797.3	32.5
Wet tropical	<u>21.0</u>	<u>2.0</u>	<u>370.3</u>	<u>22.7</u>	<u>1,298.0</u>	<u>23.5</u>
National total	1,037.9	100.0	1,635.4	100.0	5,525.4	100.0

Source: SARH/INL.

TABLE 24: Milk Production by Geoclimatic Region and by Type of Enterprise, Mexico, 1978

Geoclimatic Regions	Confined		Semi-Confined		Grazed	
	(million liters)	Percent of Total	(million liters)	Percent of Total	(million liter)	Percent of Total
Arid/semiarid	1,166.1	30.9	261.9	24.8	342.6	20.4
Temperate	2,082.2	55.2	179.8	17.1	352.6	21.0
Dry tropical	474.8	12.6	350.2	33.2	539.3	32.1
Wet tropical	<u>51.6</u>	<u>1.3</u>	<u>262.1</u>	<u>24.9</u>	<u>445.8</u>	<u>26.5</u>
National total	3,775.3	100.0	1,053.9	100.0	1,680.3	100.0

Source: SARH/INL.

TABLE 25: Principal Confined Dairy Cattle States, Mexico, 1979

State	Number of Head	Percent of National Total	Annual Yields (liters/cow)	Percent of National Average	Milk Production (million liters)	Percent of National Total
Jalisco	129,753	14.3	3,989	93.0	517.6	13.3
Mexico	116,078	12.8	4,575	106.6	531.1	13.6
Guanajuato	66,028	7.3	4,548	111.5	314.2	8.1
Coahuila	65,039	7.2	5,641	131.5	366.9	9.4
Puebla	58,439	6.4	3,744	87.3	218.8	5.6
Michoacan	49,227	5.4	4,007	93.4	197.3	5.1
Durango	45,256	5.0	5,638	131.4	255.2	6.5
Chihuahua	39,010	4.3	5,081	118.4	198.2	5.1
Districto Federal	38,925	4.3	4,270	99.5	166.2	4.3
Queretaro	<u>35,611</u>	<u>3.9</u>	<u>5,277</u>	<u>123.0</u>	<u>187.9</u>	<u>4.8</u>
Total top 10	<u>643,366</u>	<u>70.8</u>	<u>4,590</u>	<u>107.0</u>	<u>2,953.2</u>	<u>75.7</u>
Others	<u>265,968</u>	<u>29.2</u>	<u>3,563</u>	<u>83.1</u>	<u>947.6</u>	<u>24.3</u>
National total	909,334	100.0	4,290	100.0	3,900.8	100.0

Source: SARH/INL.

Note: Table includes states with more than 30,000 dairy cattle under the confined system.

GRAZING SYSTEM

Of the four geoclimatic regions, the dry tropical region supports the largest number of grazing dairy cattle. Almost a third of the dairy herd under the grazing system in 1978 was located in Mexico's dry tropics. The arid/semiarid, wet tropical, and temperate regions followed with 24.2, 23.5, and 19.8 percent of all 1978 grazed dairy cattle, respectively.

The distribution of milk production within the grazing system reflects the dairy cattle inventories in the various zones. Of the 1.7 million liters of milk derived from the grazed dairy system in 1978, 32.1 percent was produced in the dry tropical region, 26.5 percent in the wet tropical region, 21 percent in the temperate region, and 20.4 percent in the arid/semiarid region.

Although well over 50 percent of all Mexico's dairy cattle was managed under the grazing production system, milk output from this type of system was only 25.8 percent of national milk production. The large differential between the quantity of dairy cattle grazed and the milk derived from this type of system is due to the much smaller milk yields which are characteristic of the system.

FEED UTILIZATION

The quality and quantity of feed utilized by dairy producers depends heavily on the location of the dairy operation and the type of production system used. In the land-extensive systems common to the dry and wet tropical regions and a large proportion of the arid/semiarid north, grazing with little or no supplemental feeding predominates. Small amounts of supplements, such as locally produced forages and/or balanced feed concentrates, may be utilized during certain periods of the year. The dairy enterprises of the arid/semiarid north also utilize substantial amounts of alfalfa, and corn, grain sorghum, oat, and barley forages. As the dairy cattle enterprise becomes more intensive, larger quantities of feeds are utilized. Feeds in Mexico's central temperate region also consist of alfalfa and grain forages.

According to CANACINTRA's Section of Balanced Animal Feed Manufacturers (CANACINTRA 1981A), from a total of 7.5 MMT of balanced feed reportedly produced in Mexico in 1978, only 16 percent was

utilized by the dairy subsector. Of this feed utilized, Mexico's balanced feed industry supplied 62.5 percent and integrated dairy producers the remaining 37.5 percent. The larger dairy enterprises are the most common producers of their own balanced feeds, while smaller producers generally purchase their feed requirements.

The dairy producers who balance their own feed usually receive some proportion of their feed production inputs (grains and oilseeds) from CONASUPO at subsidized rates. In the case where prepared feed is purchased by the dairy producer, the feed is sold at a government regulated price reflecting a subsidy given by CONASUPO to the feed manufacturer.

From a total of 1.2 MMT of balanced feed utilized by the dairy subsector in 1980, 78.8 percent was utilized by the confined system and the remaining 21.2 percent by the semi-confined system (CANACINTRA 1981A). Table 26 presents CANACINTRA's estimates of dairy cow inventories, milk production, and feed usage by system.

TABLE 26: Lactating Cows, Milk Production, and Feed Utilization by Type of Dairy Production System, Mexico, 1980

Type of Dairy Production System	Number of Lactating Cows (thousands)	Milk Production (million liters)	Utilization of Balanced Feed	
			(kg/cow)	Total (TMT)
Commercial dairy cattle				
Confined	650	3,575	1,500	975
Semi-Confined	350	1,925	750	263
Non-commercial dairy cattle				
Grazed	<u>3,000</u>	<u>1,000</u>	--	--
National total	4,000	6,500	2,250	1,238

Source: CANACINTRA, 1981A.

Note: Figures for 1980 are estimates and do not necessarily conform to other estimates.

The DAIRY PRODUCTS INDUSTRY

STRUCTURE AND MARKET ORGANIZATION

Mexico's dairy products industry can be divided into several categories. Common aggregations of dairy products are:

- (1) fluid milk production: pasteurization, rehydration, homogenization, and bottling;
- (2) production of evaporated, condensed, and powdered milk; and
- (3) production of cheese, butter, and cream.

Nearly all of Mexico's milk supply can be included in one of these three categories.^{12/} The only major exception is raw milk that is consumed without intermediate processing, known in Mexico as leche bronca.

A relatively small number of companies are involved in the processing of dairy products, with a few large companies characteristically dominating output. For example, forty-five of the largest producers, comprising 8 percent of the industry, accounted for 68 percent of total production value. The remaining 32 percent of total production value was divided among medium (25 percent) and small (7 percent) producers. Table 27 compares the number of establishments and value of production by size for the dairy industry.

Table 28 illustrates the degree of concentration of establishments within the three dairy production categories. Of 556 dairy products companies in 1979, 74 percent produced cheese, cream, and butter, and 24 percent processed fluid milk. Only 2 percent of the companies within the industry were involved in the production of condensed, evaporated, and powdered milk.

Growth of the dairy products industry has been considerable in recent years. As evidenced in Table 29, production volume of all dairy products for the 1970-79 period increased at an average annual 6.6 percent from 289.6 TMT in 1970 to 514.5 TMT in 1979.^{13/} Value of these products increased at an average annual 22.4 percent (in deflated pesos) from 4,172.5 million pesos in 1970 to 25,174.2 million in 1979.

Table 29 also includes the volume and value of production for each category of dairy product. Of the three categories, the volume

TABLE 27: Concentration of Dairy Product Processing and Production Industries, Mexico, 1979

Type of Establishment ^{a/}	Number of Establishments	Percent Of Total Establishments	Value of Production (million pesos)	Percent of Value of Production
Small	411	74.0	1,762.2	7.0
Medium	100	18.0	6,293.6	25.0
Large	<u>45</u>	<u>8.0</u>	<u>17,118.4</u>	<u>68.0</u>
Total	556	100.0	25,174.2	100.0

Sources: X Industrial Census (1975), SPP, CANACINTRA, INL, SARH, as quoted in Presidencia de la Republica, et al.

a/ Classifications were made as follows:

Small establishment: less than 25 workers.

Medium establishment: 25-100 workers.

Large establishment: greater than 100 workers.

TABLE 28: Number of Dairy Product Production Establishments by Subgroupings, Mexico, 1970 and 1975-1979

Dairy Product Industry Subgroup	1970	1975	1976	1977	1978	1979
Fluid milk processing: pasteurization, rehydration, homogenization, and bottling	148	81	112	133	133	133
Production of evaporated, condensed and powdered milk	12	10	10	11	11	11
Production of cheese, butter and cream ^{a/}	<u>340</u>	<u>361</u>	<u>386</u>	<u>399</u>	<u>414</u>	<u>412</u>
Total	500	452	508	543	558	556

Sources: Industrial Censuses 1970 and 1975, SPP, CANACINTRA, INL, SARH as quoted in Presidencia de la Republica, et al., p. 133.

a/ Does not include a large number of the smaller establishments.

TABLE 29: Volume and Value of Dairy Product Production, Mexico, 1970 and 1975-1979

Year(s)	Fluid Milk Processing: Pasteurization, Rehydration, Homogenization, and Bottling		Production of Evaporated, Condensed, and Powdered Milk		Production of Cheese, Butter, and Cream		Total Dairy Products	
	Volume (TMT)	Value (million pesos)	Volume (TMT)	Value (million pesos)	Volume (TMT)	Value (million pesos)	Volume (TMT)	Value (million pesos)
1970	112.7	2,141.4	106.8	1,220.7	70.1	710.4	289.6	4,072.5
1975	132.3	5,451.4	156.0	3,129.0	123.4	1,357.6	411.7	9,938.3
1976	158.2	5,956.5	157.0	3,470.4	104.7	2,793.7	429.9	12,220.6
1977	151.8	7,893.1	197.4	3,637.0	124.8	4,648.1	474.0	16,178.2
1978	156.4	9,766.9	215.6	6,193.8	154.0	6,537.3	526.0	22,498.0
1979	161.8	12,874.0	208.5	5,932.8	144.2	6,367.4	514.5	25,174.2
Average annual rate of growth 1970-1979 (%)	4.1	22.1	7.7	19.2	8.3	27.6	6.6	22.4

Sources: Industrial Censuses (1970 and 1975), SPP, CANACINTRA, INL, SARH, as quoted in Presidencia de la Republica, et al., pp. 139, 144-146.

and value of cheese, butter, and cream output showed the most dramatic increases over the 1970-79 period. Production volume averaged annually 8.3 percent, while production value grew at an average annual rate of 27.6 percent. The growth in output volume of evaporated, condensed, and powdered milk increased at an average annual rate of 7.7 percent, and production value over the same period averaged 19.2 percent. Whereas the volume of production for fluid processed milk grew at an average rate of only 4.1 percent over the 1970-79 period, the production value increased at an average 22.1 percent.

Apparent 1970-79 supply and utilization of milk, shown in table 30, was compiled by SARH and the Secretary of Programming and Budget (SPP). Because apparent supply is based only on cows' milk production and does not completely correspond with SARH estimations of milk production, table 30 is presented only in order to demonstrate the relative utilization of milk.

For example, of a total 1979 milk supply of 7,426.2 million liters, a sizable 38.1 percent was utilized for leche bronca. Processed fluid milk and the production of cheese, butter, and cream accounted for roughly a quarter of milk utilization. Evaporated, condensed, and powdered milk production utilized 13.3 percent, a relatively low percentage, of Mexico's 1979 milk supply.

The total 1970-79 apparent milk supply grew at a 4.8 percent annual rate. While raw and processed milk utilization grew more slowly, the other categories of milk production increased at a faster average annual growth rate. Some of the growth in non-fluid milk production could be the result of price controls, albeit with an increased demand.

DAIRY PRODUCT SUPPLY

Mexico's cows' milk production is characterized by a high degree of seasonality. Figure 2 demonstrates Mexico's monthly cows' milk production for 1978. The estimates place milk production at the highest levels between June and December, with peak output during August and October. Milk production for October is estimated at over 900 million liters, or three times the average 300 million liters produced per month between January and May.

TABLE 30: Milk Supply and Utilization, Mexico, 1970-1979 (million liters)

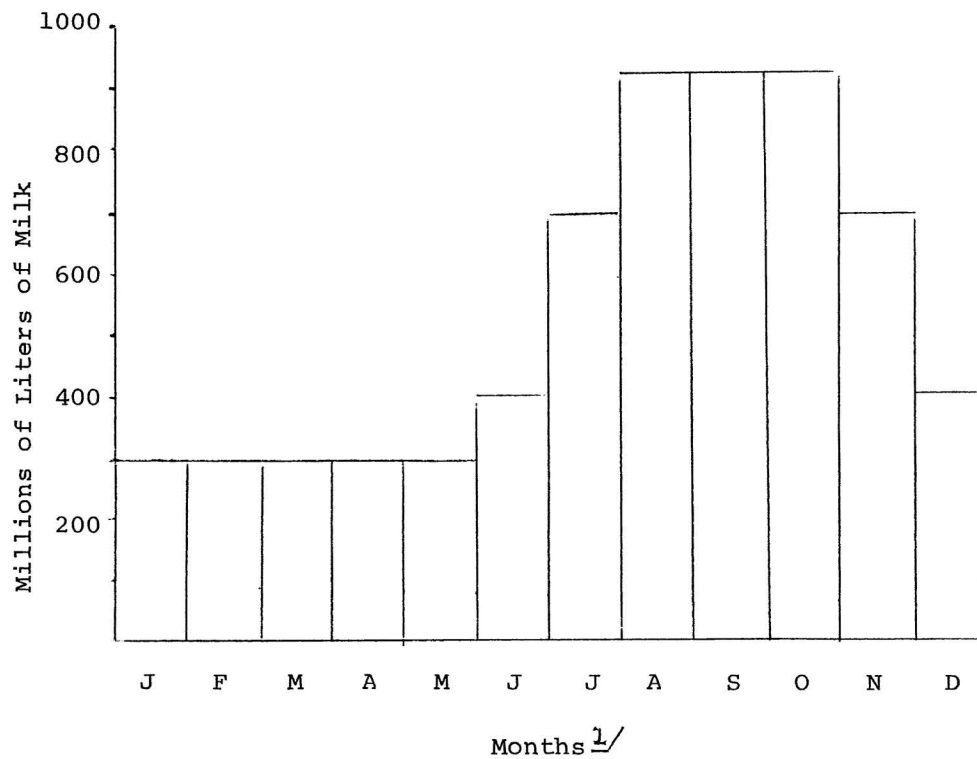
Years(s)	Total Apparent Supply ^{a/}	Fresh Raw Milk (Leche Bronca)		Pasteurization, Rehydration, Homogenization, and Bottling ^{b/}		Condensed, Evaporated, and Powdered		Cream, Butter, and Cheese	
		Volume	Percent of Total	Volume	Percent of Total	Volume	Percent of Total	Volume	Percent of Total
1970	4,877.1	2,053.3	42.1	1,263.2	25.9				
1971	5,208.5	2,177.2	41.8	1,338.6	25.7	624.2	12.8	936.4	19.2
1972	5,473.7	2,244.2	41.0	1,373.9	25.1	645.8	12.4	1,046.9	20.1
1973						673.3	12.3	1,182.3	21.6
1974	6,449.7	2,463.8	38.2	1,831.7	28.4				
1975	6,068.4	2,688.3	44.3	1,462.5	24.1	767.5	11.9	1,386.7	21.5
1976	6,184.5	2,647.0	42.8	1,527.6	24.7	703.9	11.6	1,213.6	20.0
1977	6,953.8	2,795.4	40.2	1,794.1	25.8	748.3	12.1	1,261.6	20.4
1978	7,758.7	2,932.8	37.8	1,908.7	24.6	862.3	12.4	1,502.0	21.6
1979	7,426.2	2,829.4	38.1	1,871.4	25.2	1,062.9	13.7	1,854.3	23.9
						978.7	13.3	1,737.7	23.4
Average annual rate of growth 1970-79 (%)	4.8		3.6		4.5		5.1		7.1

Sources: SARH/DGEA; Instituto Nacional de la Leche, SARH; Direccion General de Estadistica, SPP, as quoted from Presidencia de la Republica, et al., p. 142.

a/ Total apparent supply was apparently derived from summing cows' milk production and estimated powdered milk imports (in fluid equivalents).

b/ Includes the rehydration of imported powdered milk.

FIGURE 2: Seasonality of Cows' Milk Production, Mexico



Source: SARH/INL.

1/ 1978 milk production.

Dairy products that are able to be stored, such as evaporated, condensed, and powdered milk, play an especially important role during periods of lower milk production. However, domestic production has failed to meet the demand for non-perishable dairy products, and Mexico has, as a result, become reliant upon imports for milk availability.

FLUID MILK PRODUCTION

An average 25.5 percent of Mexico's cows' milk supply during the 1970-1979 period was pasteurized, rehydrated, homogenized, and bottled. Although processed fluid milk utilizes a major portion of apparent milk supply, a potentially greater portion could be used. The milk processing industry tends to work considerably below capacity as a result of chronic raw fluid milk shortages and disincentives due to price controls. Estimates suggest that, on the average, milk processing plants are working at approximately one-half of their total capacity (Presidencia, p. 143). Furthermore, because of large capital investments and other such barriers, entry into the milk processing industry is difficult. The industry presently is extremely concentrated, with 70 percent of all processed fluid milk production controlled by five companies: Lala, Alpura, Chipilo, Estrella de Zalpa, and Boreal (Presidencia, p. 143).

Over the 1970-79 period, domestic production of processed fluid milk increased at an average rate of 4.5 percent from 1,263.2 million liters in 1970 to 1,871.4 million in 1979. Domestic production throughout most of the 1970s was supplemented by relatively small milk imports. However, during 1979 and 1980, milk imports increased significantly from 1.3 million liters in 1978 to 13.3 million in 1979 to an estimated 30.6 million liters in 1980. Table 31 lists production, imports, and apparent supply of processed fluid milk over the 1970-80 period.

EVAPORATED, CONDENSED, AND POWDERED MILK PRODUCTION

The industry involved in the production of evaporated, condensed, and powdered milk utilized an average 12.5 percent of domestic milk supplies during the 1970-79 period. Production of evaporated, condensed, and powdered milk is one of the most modern and efficient enterprises of the dairy products industry, and of all the dairy

TABLE 31: Processed Fluid Milk, Domestic Production, Imports, and Apparent Supply, Mexico, 1970-1980 (million liters)

Year(s)	Domestic Production	Imports ^{a/}	Apparent Supply
1970	1,263.2	--	1,263.2
1971	1,338.6	--	1,338.6
1972	1,373.9	0.4	1,374.3
1973	1,445.6	0.6	1,446.2
1974	1,831.7	1.5	1,833.2
1975	1,462.5	1.2	1,463.7
1976	1,527.6	0.6	1,528.2
1977	1,794.1	0.3	1,794.4
1978	1,908.7	1.3 ^{b/}	1,910.0
1979	1,871.4	13.3 ^{b/}	1,884.7
1980	--	30.6 ^{c/}	--
Average annual rate of growth 1970-79 (%)	4.5		4.5

Sources: Domestic production: table 26.
Imports: SARH/INL.
Apparent Supply: Domestic production plus imports.

^{a/} Converted from MT using 1 kilo = .947 liters.
^{b/} Preliminary.
^{c/} Estimated.

related industries it is the smallest and most concentrated. In 1979, for example, only eleven establishments were involved in the production of evaporated, condensed, and powdered milk. Out of the nineteen different brands of these dairy products marketed in Mexico, eleven were from Nestle, five from Mead Johnson, and one from CONASUPO (Conalac).^{14/}

Table 32 lists the production, imports, and apparent milk supply of evaporated, condensed, and powdered milk. The highest annual production growth rates for these three products over the 1960-79 period were recorded for evaporated milk at 11.4 percent, followed by powdered at 8.7 percent, and condensed at 4.2 percent. Over the more recent 1972-79 period, powdered milk production increased fastest, averaging 12.3 percent annually, followed by evaporated milk at 10.2 percent. Condensed milk production decreased 0.2 percent over the 1972-79 period. Imports of powdered milk increased at an average 10.5 percent rate during 1972-79, and imports of evaporated milk increased only 1 percent. In accordance with the general decrease in production, reflecting a recent decline in demand, imports of condensed milk were minimal.

Although not apparent from the overall growth rates of production and imports, this segment of the dairy product industry suffers from great fluctuations in demand. When processed fluid milk and leche bronca supplies are high, demand for evaporated, condensed, and powdered milk declines and vice versa.

CHEESE, BUTTER, AND CREAM PRODUCTION

The third major category of the dairy products industry, which utilized an average 21.3 percent of Mexico's milk supply over the 1970-79 period, includes cheese, butter, and cream production. This subgroup had the largest increase in aggregate output volume within the dairy industry over the 1970-79 period. Reliable Mexican data are not available to analyze the production and growth rates for the disaggregated components of the subgroup. However, USDA/FAS estimates cheese and butter production and imports presented in table 33. According to these estimates, cheese and butter production increased annually at 9 percent and 1.5 percent, respectively, over the 1970-79 period.

TABLE 32: Evaporated, Condensed, and Powdered Milk Production, Imports, and Apparent Supply, Mexico, 1960/64-1980 (metric tons)

Year(s)	Evaporated			Condensed			Powdered		
	Domestic Production	Imports	Apparent Supply	Domestic Production	Imports	Apparent Supply	Domestic Production	Imports	Apparent Supply
1960/64 ^{a/}	23,883	--	--	12,666	--	--	7,416	--	--
1965/69 ^{a/}	42,549	--	--	16,589	--	--	9,353	--	--
1970	63,976	--	--	20,401	--	--	10,801	36,300	47,101
1971	65,198	--	--	22,946	--	--	11,525	38,400	49,925
1972	76,016	15,492	91,508	25,965	(0)	25,965	13,492	39,040	52,532
1973	77,349	14,524	91,873	23,201	(0)	23,201	14,985	43,480	58,532
1974	91,850	14,091	105,941	23,555	(0)	23,555	20,293	96,880	117,173
1975	93,598	16,039	109,637	17,923	(0)	17,923	20,507	14,720	35,227
1976	107,674	13,864	121,538	22,977	1	22,978	21,789	50,690	72,489
1977	145,110	10,159	155,269	21,949	2	21,195	23,311	77,230	100,541
1978	146,557	11,018	157,575	22,835	1	22,836	29,637	75,890	105,527
1979	150,262	16,596	166,858	25,624	(0)	25,624	30,483	78,480	108,963
1980	--	52,268	--	--	0	--	--	162,782	--
Average annual rate of growth (%)									
1960-79	11.4			4.2			8.7		
1972-79	10.2	1.0	9.0	-0.2	0.0	-0.2	12.3	10.5	11.0

Sources: Domestic production: NAFINSA, pp. 210-12; imports: SARH/INL; apparent supply: domestic production plus imports.

^{a/} Annual average for the period.

TABLE 33: Cheese and Butter Production and Imports, Mexico, 1964/69-1981 (metric tons)

Year(s)	Cheese		Butter	
	Production	Imports	Production	Imports
1964/69	45,500	333	6,028	524
1970	67,000	1,000	7,000	4,000
1971	74,000	1,000	6,700	3,067
1972	82,000	0	6,800	1,367
1973	92,000	0	7,000	103
1974	102,000	1,000	7,000	0
1975	113,000	2,000	8,000	0
1976	113,000	2,000	8,000	0
1977	115,000	2,000	8,000	0
1978	130,000	2,000	8,000	0
1979	145,000	2,000	8,000	0
1980	155,000	2,000	8,500	0
1981 ^{a/}	160,000	2,000	8,900	0
Average annual rate of growth 1970-79 (%)	8.0	7.2	1.3	

Source: USDA/ERS

^{a/} Preliminary figures were used.

INTERNATIONAL TRADE

Throughout the 1970s Mexican milk production under government price controls continually fell short of domestic demand. This trend has continued into the the 1980s. The result is a continuing dependence on massive imports of dairy products in order to augment domestic supplies.

Dairy product imports, averaging 2,452.4 million pesos annually during the 1977-80 period, constitute more than 40 percent of Mexico's total livestock and livestock product imports (SARH/DGEA Boletín Interno, 1981). Although dairy product imports remained considerable throughout the period, a pronounced increase occurred in 1980, a year noted for its exceptionally large imports of dairy products. Imports totaling 4,583.7 million pesos (\$200.2 million) in 1980 fully doubled the 2,210 million pesos (\$96.9 million) of imports recorded for 1979.^{15/}

Mexico's dairy product imports consist of powdered milk, evaporated milk, butrified fat, cheeses, milk-feed substitutes for livestock, and lactose. Powdered milk, butrified fat, and evaporated milk comprise the majority of these imports. During the 1975-78 period, powdered milk accounted for an average of approximately 49 percent of the total value of Mexico's dairy product imports. In the same period, butrified fat accounted for an average 24.4 percent and evaporated milk for 11.3 percent of the total value of Mexico's dairy product imports. Table 34 demonstrates the composition of Mexico's major dairy product imports for the 1975-78 periods.

Dry powdered milk and, to a lesser extent, evaporated milk imports have become an integral component of Mexico's total milk availability. Mexico's powdered milk imports were 9.1 percent of total domestic milk production which averaged 6557.8 million liters in 1975-79.^{16/} In 1980, Mexico imported 162.8 TMT of powdered milk, or approximately 23.2 percent of Mexico's total 1980 domestic milk production of 7,002.0 million liters. Table 35 lists Mexico's imports of powdered, evaporated, and condensed milk in fluid milk equivalents, as well as fluid milk imports for 1970-80.

Of the total value of Mexico's dairy product imports over the 1972-77 period, the United States supplied an average 29 percent of the dried or powdered milk; 7.7 percent of the dehydrated, butrified

TABLE 34: Major Dairy Product Imports, Volume and Value, Mexico, 1975-1978

Type of Dairy Product	1975		1976		1977		1978 ^{1/}	
	Volume (TMT)	Value (Thousand pesos)	Volume (TMT)	Value (Thousand pesos)	Volume (TMT)	Value (Thousand pesos)	Volume (TMT)	Value (Thousand pesos)
Powdered milk	20.9	236,307	53.6	416,707	65.5	665,929	77.7	845,192
Evaporated milk	16.0	106,798	13.9	105,362	10.2	127,680	11.0	161,287
Hydrogenated shortenings	2.8	61,127	8.4	174,738	14.2	421,568	14.2	427,919
Cheeses	1.3	25,778	2.4	80,401	2.0	72,281	2.9	117,109
Milk substitute for livestock	1.9	11,668	3.0	23,287	1.8	20,007	2.3	27,289
Lactose	1.7	9,585	3.4	29,666	2.4	27,544	3.4	42,839
Others		<u>65,517</u>		<u>85,121</u>		<u>24,485</u>		<u>34,847</u>
Total dairy products		516,780		915,282		1,359,494		1,656,482

Sources: SARH/DGEA 1981.

TABLE 35: Powdered, Evaporated, Fluid, and Condensed Milk Imports in Fluid Equivalents, Mexico, 1970-1980
(thousand liters)

Year	Powdered Milk ^{a/}	Evaporated Milk ^{b/}	Fluid Milk ^{b/}	Condensed Milk ^{a/}	Equivalent Milk ^{a/}
1970	363,000				394,500
1971	384,000				516,300
1972	517,020	25,820	388	1	543,229
1973	455,430	24,207	647	(0)	480,284
1974	920,950	23,485	1,509	(0)	945,944
1975	209,010	26,732	1,201	(0)	236,943
1976	536,920	23,107	566	2	560,606
1977	656,690	16,932	344	5	673,961
1978	776,990	18,363	1,302	2	796,657
1979	779,400	27,660	13,295	(0)	820,355
1980	1,627,820	87,113	30,579	(0)	1,745,512

Sources: Compiled by authors from SARH/INL, see Tables 30 and 31.

a/ Conversion ratios used:

powdered milk: 1 MT = 10,000 liters; evaporated milk: 1 MT = 1,667 liters; condensed milk: 1 MT = 3,333 liters.

b/ Fluid milk in liters.

shortenings; and nearly all of Mexico's evaporated milk imports. Other major suppliers of powdered milk during 1972-77 included Canada, Australia, and Ireland. Mexico's principal dehydrated hydrogenated shortening source was New Zealand, which supplied an average 56 percent of Mexico's annual imports of that product (Comercio Exterior 1979).^{17/}

According to the USDA/FAS, the exports of U.S. dairy products to Mexico totaled \$69.3 million in 1981 (Embassy 1982, p. 43). These 1981 U.S. dairy exports to Mexico were up considerably from the \$48.4 million in exports recorded by USDA/FAS for 1980, the \$25.3 million for 1979, and the annual average of \$15.2 million in 1974-78. In fact, of the U.S. total agricultural exports to Mexico in 1981, dairy product exports ranked fifth behind food and feed grains, oilseed and oilseed products, sweeteners, and cattle hides (Embassy 1982, p. 43).

APPARENT SUPPLY

Mexico's total apparent milk supply is made up of domestic milk production and net milk imports.^{18/} Table 36 lists Mexico's total milk production, milk import and export equivalents, and total apparent milk supply for the 1970-80 period. Also included in table 36 is the importance of imports in Mexico's total apparent milk supply, i.e., the self-sufficiency ratio.

Over the 1970-80 period, Mexico's apparent milk supply increased a total of 79.4 percent, from 4,877.1 million liters calculated for 1970 to 8,747.5 million liters in 1980. This corresponds to an annual average rate of growth of 6 percent. Domestic milk production, on the other hand, grew at a 4.6 percent annual rate during the same period. The differential between production and supply is accounted for by the 16 percent annual rate of growth recorded for milk imports.

Mexico's milk self-sufficiency percentage reflects the importance of milk imports in Mexico's total milk supply. Throughout the 1970s, Mexico ran a considerable deficit in milk production. According to these rough estimates, Mexico produced domestically an average of 90.7 percent of total milk availability during the 1972-79 period. In 1980, which was a particularly poor milk production year, Mexico produced only 80 percent of their total apparent milk supply.

TABLE 36: Milk Production, Imports, Exports, Supply, and Self-Sufficiency Ratio, Mexico, 1970-1980
(million liters)

Year(s)	Domestic Milk Production ^{a/}	Milk Import Equivalent	Milk Exports	Apparent Milk Supply ^{b/}	Self-Sufficiency Ratio (Percent)
1970	4,483.0	394.5	0.4	4,877.1	91.9
1971	4,694.1	516.3	9.0	5,201.4	90.2
1972	5,145.2	543.2	0.1	5,688.3	90.5
1973	5,460.1	480.3	4.5	5,975.9	91.4
1974	5,740.0	945.9	0.1	6,685.8	85.9
1975	6,054.1	236.9	1.2	6,289.8	96.3
1976	6,159.4	560.6	0.4	6,719.6	91.7
1977	6,442.8	674.0	0.6	7,116.2	90.5
1978	6,775.0	796.7	1.3	7,570.4	89.5
1979	6,913.7	820.4	0.2	7,733.9	89.4
1980	7,002.0	1,745.5	--	8,747.5	80.0
Average annual rate of growth 1970-79 (%)	4.6	16.0		6.0	

Sources: Compiled by authors, see Tables 33 and 35. Milk exports from Presidencia de la Republica, et al.

a/ Includes cow and goat milk.

b/ Apparent milk supply is equal to domestic milk production plus net milk imports and does not account for changes in stocks.

PRICES

The Mexican government, through SECOM, actively intervenes in milk prices. Price controls are in the form of both a minimum guaranteed milk producer price and price ceilings on various qualities of processed fluid milk. Prices for most other dairy products, as well as leche bronca, are not controlled.

MILK PRICES

Table 37 presents comparisons of the GDP price deflator (reflecting economy-wide price levels), the implicit livestock sector price deflator, producer milk prices (average rural price), and the corresponding price indices for the period 1960-79. Producer milk prices either equaled or surpassed economy-wide and livestock sector price increases throughout the 1960s and first half of the 1970s but have lagged behind these increases in the latter half of the 1970s.

Throughout the 1960s, economy-wide prices increased an annual average rate of 3.5 percent. During the 1960-65 period, producer milk prices increased at a 2.7 percent annual rate accelerating to 5.8 percent during 1965-70. In comparison, livestock sector prices increased at a rate of 1.8 percent for 1960-65 and 3.1 percent for 1965-70. In the 1970-75 period, producer milk prices increased at an average rate of 15.2 percent, substantially greater than the 12.4 percent recorded for the GDP and 7 percent for the implicit livestock sector deflators. However, over the 1975-79 period, increases in producer milk prices averaged 14.1 percent annually, whereas the GDP and implicit livestock sector deflators increased at a 23 and 32.7 percent annual rate, respectively.

DAIRY PRODUCT PRICES

Table 38 lists price indices for the three major dairy product industries as well as price indices for both the GDP and the three subgroupings combined. Growth in prices for dairy products was substantially less than economy-wide price increases over the 1970-79 period. During that time, the growth of prices of the aggregated dairy product subgroupings totaled 254.4 percent, whereas economy-wide prices increased 310.9 percent.

TABLE 37: GDP Deflator, Implicit Livestock Sector Price Deflator and Absolute Prices, and Corresponding Indices for Cows' Milk at the Producer Level, Mexico, 1960-1979

Year(s)	GDP Price Deflator (1970=100)	Livestock Sector Price Deflator (1970=100)	Milk Producer Price (pesos/liter) _{a/}	Price Index (1970=100)
1960	70.8	78.6	1.25	65.8
1961	73.2	79.4	1.33	70.0
1962	75.4	82.2	1.26	66.3
1963	77.8	80.8	1.31	68.9
1964	82.2	87.2	1.45	76.3
1965	84.1	86.0	1.43	75.3
1966	87.4	87.8	1.68	88.4
1967	89.9	92.5	1.57	82.6
1968	92.1	89.9	1.70	89.5
1969	95.7	98.3	1.77	93.2
1970	100.0	100.0	1.90 ^{1.84/}	100.0
1971	104.5	97.6	2.00	105.3
1972	110.3	104.8	2.10	110.5
1973	123.9	118.0	2.40	126.3
1974	153.7	125.8	3.10	163.2
1975	179.3	140.2	3.86	203.2
1976	218.2	177.3	4.07	214.2
1977	288.2	260.3	5.10	268.4
1978	340.4	331.3	5.78	304.2
1979	410.9	435.0	6.54	344.2

Continued, p. 80.

TABLE 37: GDP Deflator, Implicit Livestock Sector Price Deflator and Absolute Prices, and Corresponding Indices for Cows' Milk at the Producer Level, Mexico, 1960-1979 (continued)

Year(s)	GDP Price Deflator (1970=100)	Livestock Sector Price Deflator (1970=100)	Milk Producer Price (pesos/liter) ^{a/}	Price Index (1970=100)
Average annual rate of growth (%)				
1960-65	3.5	1.8	2.7	
1965-70	3.5	3.1	5.8	
1970-75	12.4	7.0	15.2	
1975-79	23.0	32.7	14.1	

Sources: GDP and livestock sector deflator: Bank of Mexico S.A. as quoted in NAFINSA.
Milk producer price: constructed by authors from SARH/DGEA as quoted in SPP 1979 and INL.

^{a/} Discontinuous series.

TABLE 38: Dairy Product Price Indices, Mexico, 1970-1979
(1970=100)

Product Subgroup	1970	1975	1976	1977	1978	1979
Fluid milk processing: pasteurization, rehydration, homogenization, and bottling	100.0	154.4	168.2	224.3	256.0	325.1
Production of condensed, evaporated, and powdered milk	100.0	152.4	196.2	255.2	301.4	320.4
Production of cream, cheese, and butter	<u>100.0</u>	<u>207.1</u>	<u>260.7</u>	<u>364.1</u>	<u>418.4</u>	<u>441.4</u>
Average	<u>100.0</u>	<u>171.7</u>	<u>202.3</u>	<u>243.0</u>	<u>304.5</u>	<u>354.4</u>
GDP price deflator	100.0	179.3	218.2	288.2	340.4	410.9

Source: Bank of Mexico S.A. as quoted in Presidencia de la Republica, et al.

Price increases within the three subgroupings over the 1970-79 period were not entirely homogenous. Of all three subgroups, the cheese,

butter, and cream industries, surpassing the GDP price index of 310.9 percent with a 341.4 percent price level, had the largest aggregate price increase for the 1970-79 period. However, the aggregate price increases of 225.1 percent for the processed fluid milk and 220.4 percent for the evaporated, condensed, evaporated, and powdered milk industries were considerably less than the GDP price index.

The slow growth rate of processed milk prices can be attributed to ceiling prices. The slower growth rate of condensed, evaporated, and powdered milk likely is due to the massive quantities of relatively cheap imported products.^{19/}

Although milk at the producer level has no ceiling price, the ceiling price on processed milk undoubtedly is reflected, to some extent, in the milk producers' price. Prices paid to milk producers by other nonpasteurized fluid milk product producers (who are not governed by ceiling prices) could well be in excess of that paid by processed milk producers. Perhaps as a result, a diversion of domestically produced milk away from pasteurized milk to leche bronca and other dairy products has occurred (Embassy 1981, p. 19).

NOTES

- 1/ The Reglamento defined major livestock species as cattle, mules, and asses; and minor livestock species as goats, sheep, and pigs. The forage capacity of an area necessary for one cow is equal to that for five minor species. One mule or ass is equivalent to seven heads of a minor species. Furthermore, rangeland was considered good quality when a maximum of 10 hectares could maintain one animal from a major species (Fraccion V, Article 58). "Forage capacity" is determined by the number of head of a major livestock species or its equivalent in minor species that is able to be maintained according to the land's "range coefficient." Range coefficients were intended as the extension necessary and sufficient for the development of one head of a major livestock species...without taking into consideration possible capital investment to improve the pasture (Article 54).
- 2/ A crop concession is also available.
- 3/ Also pertains to the crop concession.
- 4/ Since 1964 the United States has also placed national quotas on the quantity of beef imported from various beef exporting countries under Public Law 88-482, called the "Beef Import Quota Bill." These quotas are based on an ad hoc formula (Cepal, p. 161) and have been superseded by the "Meat Import Act of 1979" (USDA/FAS November 1981).
- 5/ Also, large quantities of illegally imported dairy products, especially powdered milk, allegedly enter Mexico principally from the U.S.
- 6/ CONASUPO also purchases domestically produced milk and produces various dairy products including processed fluid and powdered milk (LICONSA).
- 7/ Powdered milk imports are also rehydrated for sale as fluid milk.
- 8/ To more effectively describe and analyze Mexico's livestock production on a regional basis, this study divides the country into eight regions, following state borders:
 - Northwestern: Baja California Norte, Baja California Sur, Sonora, Sinaloa, and Nayarit;
 - North: Chihuahua, Coahuila, Nuevo Leon, and Durango;
 - North central: Aguascalientes, San Luis Potosi, and Zacatecas;
 - West central: Guanajuato, Jalisco, and Michoacan;
 - Central: Federal District (D.F.), Hidalgo, Morelos, Puebla, Queretaro, State of Mexico, and Tlaxcala;
 - Southern Pacific: Chiapas, Colima, Guerrero, and Oaxaca;

Yucatan Peninsula: Campeche, Quintana Roo, and Yucatan; and
Gulf: Tabasco, Tamaulipas, and Veracruz.

While these regions by no means represent completely homogenous units, they do possess similar social, economic, topographic, and climatic characteristics.

- 9/ The National Milk Institute is a dependency of SARH.
- 10/ CANACINTRA and Nestle, which also estimate dairy cattle inventories, both recorded 4.0 million head (1980 estimates).
- 11/ The number of dairy cattle estimated does not conform with other estimates of Mexico's dairy herd.
- 12/ Rehydrated powdered milk imports are apparently included in the table.
- 13/ Aggregate volume figures (combined and individually for the three subgroups) are presented here for gross comparison purposes only. When aggregating, processed fluid milk was apparently divided by a factor of ten to make weight comparisons possible.
- 14/ Nestle was recorded by the 1975 Industrial Census to have the top four (in output value) evaporated, condensed, and powdered milk production plants in Mexico (Montes 1981).
- 15/ Using a U.S.\$ = 22.9 Mex. exchange rate in 1980, and U.S.\$ = 22.8 Mex. in 1979.
- 16/ A conversion rate of 10 liters of fluid milk per kilogram of powdered milk is used here and elsewhere in the report. The USDA/FAS estimated Mexico's 1975-79 nonfat dry milk (NFD) imports at an annual average of 55.4 TMT and placed Mexico's 1980 NFD milk imports at 180 TMT, over three times the annual average for the 1975-79 period.
- 17/ All the 1972-77 period import shares were compiled from the Secretaria de Industria y Comercio, Anuario Estadístico del Comercio Exterior de los Estados Unidos Mexicanos, and are based on total value of imports. Imports of dairy products into Mexico's "free zones" were accounted to the U.S. share.
- 18/ Data on stocks were not available. However, stocks of powdered and condensed milk are significant. USDA/FAS, for example, which does estimate Mexico's NFD milk stocks, placed 1978-79 ending-year stocks at an average of 1,970 MT (19.7 million liters) annually and at year-end 1980, at 5,500 MT (55.0 million liters).
- 19/ CONASUPO sells imported powdered milk at a price substantially lower than domestically produced powdered milk (CONASUPO 1981).

GLOSSARY

- Banrural (Banco Nacional del Credito Rural): National Bank of Rural Credit.
- Campesino: rural peasant.
- CANACINTRA (Camara Nacional de la Industria de Transformacion): Mexican Chamber of Commerce.
- Certificados de Inafectabilidad Agropecuarios: mixed livestock/crop concessions.
- Certificados de Inafectabilidad Pecuarios: livestock concessions.
- CETECOCA: Technical Consultative Commission for the Determination of Range Coefficients.
- CNG (Confederacion Nacional Ganadera): National Livestock Confederation.
- CONASUPO (Compania Nacional de Subsistencias Populares, S.A.): National Company of Subsistence Commodities.
- Criollo: native Mexican cow breed.
- DGEA (Departamento General de Economia Agricola): General Department of Agricultural Economics.
- INL (Instituto Nacional de la Leche): National Milk Institute.
- Latifundios: large landholdings.
- Leche bronca: unprocessed raw milk.
- Maquila: Process under which Mexican cattle are fattened in the United States and shipped back to Mexico without paying customs duties.
- Reglamento de Inafectabilidad Agricola y Ganadera: Agricultural and Livestock Concession Regulation.
- SAG (Secretaria de Agricultura y Ganaderia): Secretary of Agriculture and Livestock.
- SARH (Secretaria de Agricultura y Recursos Hidraulicos): Secretary of Agriculture and Water Resources.
- SECOM (Secretaria de Comercio): Secretary of Commerce.
- SPP (Secretaria de Programacion y Presupuesto): Secretary of Programming and Budget.
- TIF (Tipo Inspeccion Federal): federally inspected slaughter houses.

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