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MINISTRY OF ECONOMY

DEPARTMENT OF BASIC INDUSTRIES

**ANALYSIS OF THE ECONOMIC, TECHNOLOGICAL AND MARKET POLICY STATUS
OF THE SWEETENER SECTOR IN MEXICO**



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INTRODUCTION

Sweeteners are additives that add a sweet taste to food. According to their ingredients they are classified as either natural (or nutritional) or artificial (or non-nutritional)¹. The first group is a major source of calories for human beings and among the most common items in the group are sugar or sucrose, high fructose corn syrup (HFCS)², bee honey, molasses and brown sugar. In the second group dextrose and maltose are the most common.

A characteristic of sweeteners is that they can be replaced with each other, especially in the food and beverage industry. However, this substitution is not perfect, since in industries such as confectionery, chocolate and desserts, sweeteners are used in their solid state, while in the dairy and beverage industries liquid sweeteners can be used. The taste of sweeteners and certain public health risks are other factors that influence choice. Notwithstanding the above, sugar is a very important product for human consumption because of its high energy content. Sugar provides an average of 12% of carbohydrates, an element that produces energy in the human body.

Worldwide, the sugar industry has evolved to become an important agricultural industry, generating employment and an exchange good for countries that produce and export sugar. In Mexico, the sugar industry is historically one of the most important because of its economic and social importance. The national sugarcane agriculture industry is an activity that generates more than two million jobs, both directly and indirectly. Production activities take place in 15 states and 227 municipalities.

Sugar production is carried out in 57 sugar mills spread throughout the country and has made it possible for 664,000 hectares of sugarcane to be industrialized. Production has reached nearly 5 million tons of sugar with a value close to 27 billion pesos, contributing 11.6% of the GDP in the primary sector and 2.5% of manufacturing GDP.

Globally, because of its impact on employment and income in rural areas where it is usually established, the sugar industry is a highly protected activity in virtually all producing countries. In Mexico, this has resulted in the survival of sugar mills and cane fields with high operating costs and low levels of competitiveness, few or no incentives to retrain, and, in addition, a pattern of land ownership that creates fragmentation and low productivity in the field and high cultivation costs³. This situation leads to the disintegration of production processes in sugarcane fields, the sugar industry, marketing and direct and indirect consumption.

With few exceptions, the vast majority of Mexican sugar mills are characterized by technological backwardness, low investment, high processing costs and deficiencies in the scale of production. This reduces the sector's ability to leverage its resources and coordinate processing links to produce in a more efficient way. Political influences in the writing of regulations that govern the sector, low or no incentive for sugarcane fields and sugar mills to adopt on their own actions that would increase competitiveness, and the public policy objectives of government dependents that govern the sector have all contributed to the creation of regulations that have not been conducive to reaching the developmental potential of the national sugar agriculture business.

¹ According to modifications to NOM-015-SSA2-1994 for the prevention, treatment and control of diabetes mellitus in primary care, being finally left as Mexican Official Regulation NOM-015-SSA2-1994 for the prevention, treatment and control of diabetes. Official Federal Journal, January 18, 2001

² Which is 1.5 times sweeter than sugar

³ Average hectare and average yield, 71.8 tons of sugarcane per hectare

Despite the historical, social and economic value of sugar in Mexico, today this industry faces changes in consumption patterns for health reasons along with increasing substitution and consolidation (by volume and price) by other sweeteners like HFCS and no calorie sweeteners. In recent years these have managed to penetrate the industrial and household consumption.

Therefore, the objective of this study is to analyze the evolution and recent status of the sweetener sector in Mexico and in its international context. The goal is to identify the primary weaknesses in the field, in industry and in current regulations in order to propose policy actions that might allow for new impetus to the competitiveness of the agricultural industry. In the first section, the international sugar and fructose sector is analyzed, demonstrating the evolution of production, consumption, prices and the role of the world's leading producers. Systematically, Mexico's status on the global stage is discussed and, in this same section, the case of the United States is presented, being selected as a comparison with the Mexican industry. In the second section, the evolution and current status of the sugar industry and that of other sweeteners in Mexico is presented. In the third section, the technological aspects of agribusiness are presented. Production efficiency, cost structure, production and marketing chains and technological development and innovation in the sector is detailed. Industrial and trade policy is included, using the United States as a benchmark, as is the security of supply and an analysis of national policy. Finally, the conclusions and policy recommendations derived from this study are presented.

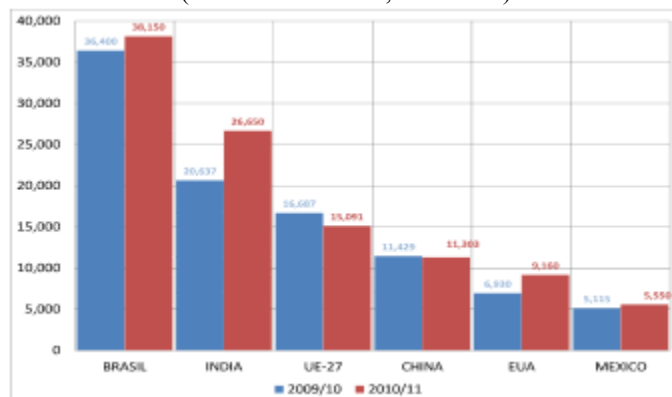
I. INTERNATIONAL SWEETENER MARKET

This section presents an analysis of the evolution of worldwide sugar production, consumption, international prices and trade. The role of the major producing and consuming countries is analyzed, highlighting Mexico's participation in that context. The evolution of yields in the field and in factories in Brazil, the United States and Mexico is also analyzed in order to determine their competitive international position. Additionally, it is necessary to analyze the market behavior of High Fructose Corn Syrup and its relationship to the sugar market. This product has gained relevance in the world as a substitute for sugar, both for family consumption and in industrial processes used in foods and beverage production. Since its introduction into the market up to the current date, it has been gaining market share among sweeteners. Finally the document presents the particular case of the US sugar industry, characterized by its high prices, strong barriers to entry into the system, and a marked process of replacing sugar with fructose. Later, this information will be used to perform a comparative analysis with the Mexican sugar industry.

I.1 Production

For over ten years, worldwide sugar production has shown an upward trend, registering an annual average growth rate (AAGR) of 2.3% for the 2000/01 to 2010/11 cycles. In the last sugar cycle (2010/2011) it reached 160.948 billion tons.

Graph 1. Sugar production in selected countries
(Thousands of tons, raw value)



Source: ERS, USDA.

For the 2009/10 and 2010/11 cycles, worldwide production increased by 7.7%, primarily due to higher volumes produced by countries like Brazil, which is considered to be the largest producer in the world with almost one quarter of world production, and India. These two countries recorded an increase of 4.8% and 29.1%, respectively. By contrast, the European Union (EU) recorded a decrease of 1.1% over the same period.

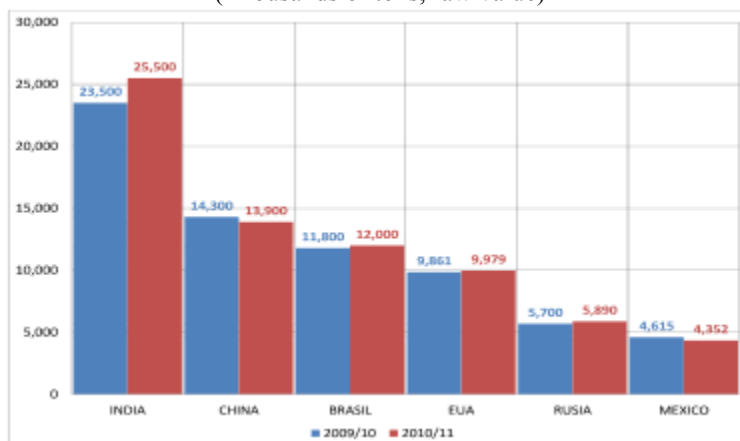
In the case of Mexico, production levels have put it in 7th place in the world with a production of 5.5 million tons in the 2010/11 cycle, reaching a share of 3.4% of total world production.

1.2 Consumption

The behavior of global sugar consumption depends mainly on population growth, incomes, price and the demand for substitute products. The trend in sugar consumption worldwide has remained stable from the 2000/01 cycle to date, showing an AAGR of 2.0% in this period. Global consumption recorded during the last sugar cycle was 158.6 million tons.

For the 2009/10 and 2010/11 cycles, worldwide sugar consumption increased by 2.4%, slower than the rate recorded for worldwide production.

Graph 2. Sugar consumption in selected countries
(Thousands of tons, raw value)



Source: ERS, USDA.

As far as consumption per country, India, China, Brazil, United States and Russia stand out. These countries accounted for 45.2% of global consumption during the 2010/11 cycle. India and Russia showed the largest increases in demand during the cycle at 8.5% and 3.3%, respectively. In regards to Mexico, it consumes 2.7% of worldwide production. However, during the last sugar cycle its consumption decreased by 5.7% due to the following two reasons: 1) Higher prices for sugar. 2) The increasing substitution of fructose in place of sugar in the domestic market, mainly by the country's food industry.

The dynamics of global sweetener production and consumption caused sugar inventory levels to drop drastically from 2008/09. In absolute terms this was a drop from 40.505 to 29.240 million tons between 2007/08 and 2008/09. Currently, world inventories have failed to recover and stand at 29.264 million tons. The United States Department of Agriculture (USDA) predicts that next year these numbers will drop even lower (28.817 million tons).

Graph 3. Worldwide sugar production, consumption and inventories, 1992/93-2010/11
(Thousands of tons, raw value)



Source: ERS, USDA.

The situation between sugar production and consumption throughout the world can be related when establishing sugar surplus and deficit regions. There are six sugar-consuming regions in the world. The first is Asia (comprising 36 countries), with a deficit of 6.3 million tons and annual consumption of 14.9 kg per capita.

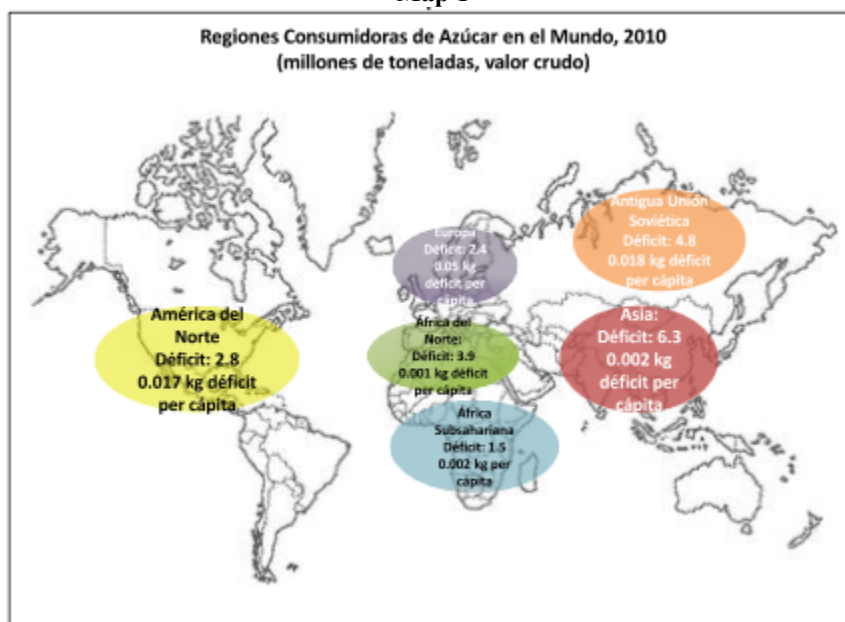
The second region with high consumption is the former Soviet Union (12 countries) with a deficit of 4.8 million tons. Third is North Africa with a deficit of 3.9 million tons of sugar consumption. In fourth and fifth place are North America and Europe with deficits of 2.8 and 2.4 million tons, respectively.

In North America, the deficit region is composed of two countries - Mexico and the US-, which have a total population of 422 million people who maintain high levels of sugar consumption, relative to their production levels. The per capita deficit in sugar consumption in this region amounts to 2.8 million tons.

Also, with the North American Free Trade Agreement (NAFTA) this region imposes a tariff of between 338 to 360 dollars per ton of sugar imported from outside the region, making it prohibitive to

import sugar from surplus regions of the world.

Map 1



Source: USDA.

Therefore, the abundance or scarcity of sugar in both countries and the existence of a trading environment that limits participation by other countries causes sugar prices to fluctuate widely depending on the gap between production and consumption, inventory levels and trade flows. This creates uncertainty and volatility in the region's consumer price of sugar.

I.3 International Prices⁴

As a result of increased consumption in comparison to sugar production and therefore lower inventory levels seen since the 2008/09 cycle, as of 2009 we have seen a trend of rising international prices.

This is reinforced when the relationship between final inventory levels and the international price of *Contract 11* sugar is demonstrated. When inventory levels are above or below their long-term trend, the international price of *Contract 11* responds in reverse. Therefore, it is expected that international sugar prices will continue to increase during the 2011/12 cycle, given that inventory levels will drop below their trend line and, in response, *Contract 11* prices will raise.

⁴ The international reference prices used for this study are:

Contract 11: Type of international price of raw sugar expressed in cents (dollar) per pound and published by the Intercontinental Exchange (ICE).

Contract 5: Type of international price of refined sugar expressed in cents (dollar) per pound and published by the NYSE Euronext.

Contract 16: United States national price of raw sugar expressed in cents (dollar) per pound and published by the Intercontinental Exchange (ICE)

Graph 4. Global inventory level and international crude sugar price, 1948-2011/12



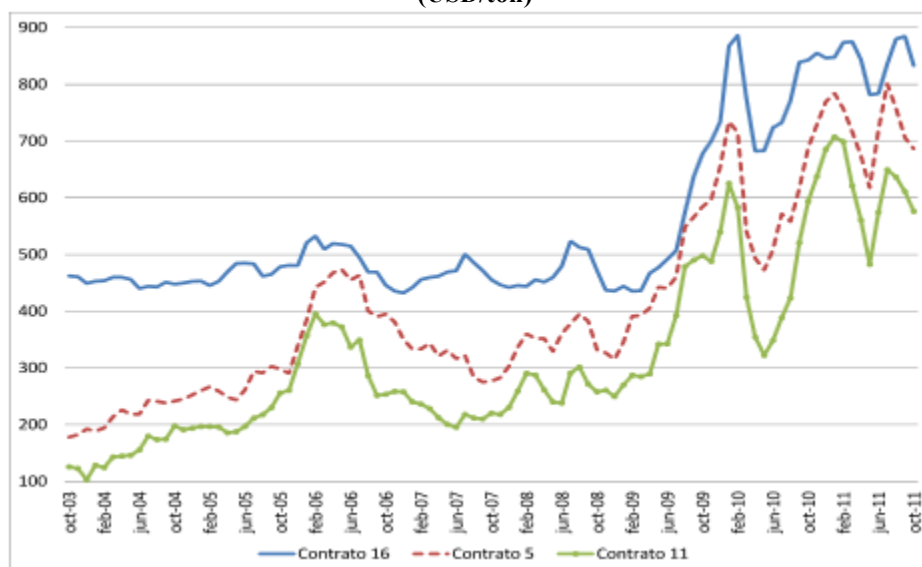
Source: ERS, USDA and Intercontinental Exchange (ICE).

For 2010, the trend in rising international sugar prices stopped after reaching historical highs. For example, in February *Contract 16* was \$886.56 USD per ton. In the month of December, refined *Contract 5* sugar was recorded to be at \$719.17 USD, while the price for contract 11 reached a peak of \$685.32 USD. According to the USDA, the key factors affecting the world sugar market during 2009 and the first half of 2010 were as follows:

1. Increasing pressure on sugar prices due to a fall in production during 2008/09, driving prices up to double the long-term average.
2. Higher production costs and increased use of ethanol in Brazil (produced from sugarcane) set the stage for higher prices.
3. Changes induced by production policies among Asian countries.

Up until 2011 the inertia of rising international sugar prices has adjusted, since prices for *Contract 16* reached \$884.87 USD in September, *Contract 5* stood at \$800.98 in July which was an all-time record, and *Contract 11* was at \$707.49 USD for the month of January. However, international prices have begun to decline in recent months.

**Graph 5. International prices for raw and refined sugar, October 2002 to November 2011
(USD/ton)**



Source: ERS, USDA and Intercontinental Exchange (ICE).

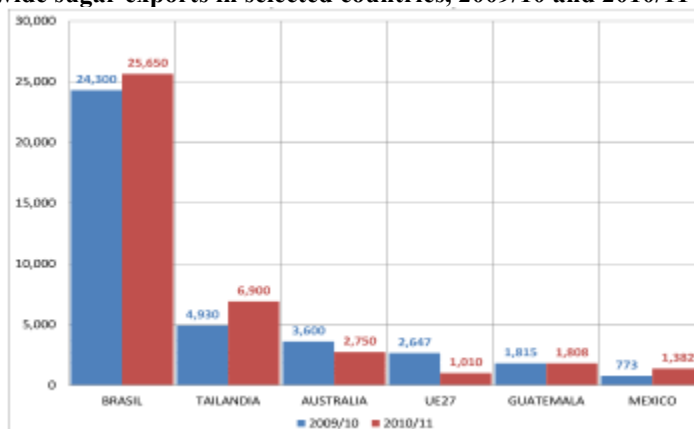
Although international sugar prices are expected to improve during the last weeks of October and November 2011, international sugar prices could fluctuate during the 2011/12 cycle due to:

- 1) Low inventory levels in recent years, and the slow global recovery.
- 2) The adverse impact of climate change (droughts, floods, frost, etc.) on production.
- 3) Performance against the prices of other commodities or substitute materials.
- 4) The implementation of national and international initiatives in the production of ethanol from sugarcane.

I.4 Foreign Market

In the period between 2000/01 and 2010/11, an average of 62.2% of total international production was traded in local markets. However, this has not been a steady tendency, as during the 2004/05 cycle this indicator was 65.7%. In contrast, during the 2008/09 cycle 65.5% of production was set to be sold in international markets.

Graph 6. Worldwide sugar exports in selected countries, 2009/10 and 2010/11 (thousands of tons)

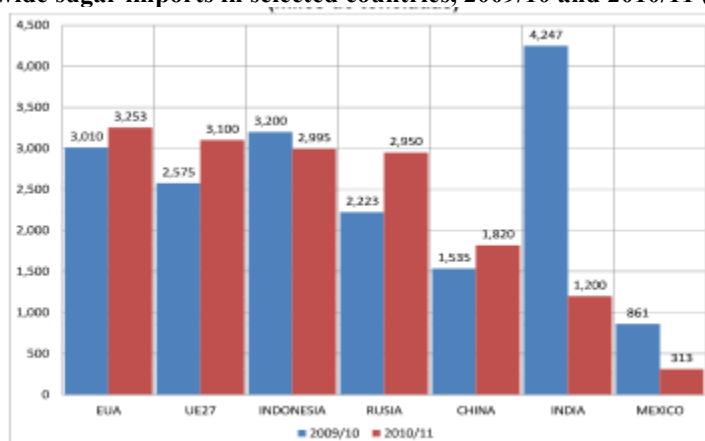


Source: ERS, USDA.

Global sugar exports grew at an average annual rate of 3.2% during the 2000/01 to 2010/11 period, which represents an accumulated volume of 524.315 million tons. The primary sugar exporting countries in the world are Brazil, Thailand, Australia, the EU-27 and Guatemala. This group accounted for 79.4% of total exports in the 2010/11 cycle. Brazil exported 67.2% of its total production during that period while Thailand and Mexico exported about 25%. Furthermore, Mexico ranked 7th in world exports during this same period, reaching 2.9% compared to the global total, its main destination market being the United States.

Meanwhile, worldwide sugar imports have increased at an average annual rate of 2.9% during the 2000/01 to 2010/11 period, reaching a total of 51.828 million tons during the last cycle.

Graph 7. Worldwide sugar imports in selected countries, 2009/10 and 2010/11 (thousands of tons)



Source: ERS, USDA.

The major importers of sugar in the world (by population and/or economics) who consume more than they can produce are the United States, India, Indonesia, Russia and China. Together these countries purchased 29.6% of world imports. Of these countries, the United States took 6.3% of the total during

2010/11, followed by the EU with 6.0% and Indonesia 5.8%.

1.5 Yields in the Field and in Sugar Mills

In this section, the yields obtained in sugarcane fields and sugar mills in Brazil, United States, and Mexico are analyzed to determine the position of the national sugarcane agroindustry in comparison to one of the world's primary producers (Brazil), and the main export destination (US).

1) Yields in the field

During the 2009/2010 cycle, countries with smaller tracts of land were the ones with the highest yields in sugarcane fields. Among them are: Peru with 128.85 tons per hectare (tons/ha), Colombia with 113 tons/ha, Guatemala with 99.8 tons/ha, Egypt with 99.1 tons/ha, and Mexico (in 15th place) with yields of 66.93 tons/ha which is lower than the global average of 77.7 tons/ha.

The impact that yields have on costs depends on the production technology being used. For example, lower production costs in cutting, lifting, transporting and milling the sugarcane required to produce one ton of sugar. To this must be added the costs for increased use of water and fertilizers in the field. In this regard, the case of Australia is notable. Australia is efficient in its high yields and high sugar extraction at its mills. This is possible because of a combination of the use of low-cost raw materials combined with the proper application of technology to recover more sugarcane sucrose.

Table 1. Area harvested and planted and sugar yields in selected countries (tons/ha), 2009/10

Pais	Superficie sembrada (miles de hectáreas)	Superficie cosechada (miles de hectáreas)	Superficie Cosechada/ Sembrada	Total cana molida (miles toneladas)	Rendimientos (%)	Cana molida para azúcar	Cana molida para alcohol
Perú	82	78	95.1%	10,060	128.85	10,060	
Colombia	202	185	91.6%	21,000	113.51	17,300	3,700
Guatemala	220	220	100.0%	21,955	99.8	21,455	500
Egipto	112	111	99.1%	11,000	99.1	11,000	
Suazilandia	53	51	96.2%	5,044	98.9	5,044	
Nicaragua	67	67	100.0%	6,000	89.55	4,000	2,000
Australia		365		30,000	82.19	30,000	
Indonesia	350	340	97.1%	26,600	78.24	26,600	
EE.UU.	364	340	93.4%	25,841	76	25,841	
El Salvador	63	61	96.8%	4,628	75.87	4,628	
Ecuador	75	60	80.0%	4,500	75	4,500	
Brasil	8,700	8,050	92.5%	603,000	74.91	262,300	340,700
Costa Rica	52	50	96.2%	3,500	70	3,500	
China	1,709	1,708	100.0%	115,587	67.63	115,587	
México	744	648	87.1%	43,370	66.93	43,370	
Argentina	322	310	96.3%	20,660	66.65	20,260	400
India	4,180	4,180	100.0%	277,800	66.46	190,800	87,000
Tailandia	1,055	1,035	98.1%	68,700	66.38	68,600	200
Zimbabue	38	36	94.7%	2,338	64.94	2,338	
Nigeria	30	9	30.0%	575	63.89	575	
Suráfrica	391	292	74.7%	18,655	63.89	18,655	
Filipinas	395	390	98.7%	19,500	50	19,500	
Pakistán	1,020	1,020	100.0%	50,000	49.02	50,000	

Source: USDA.

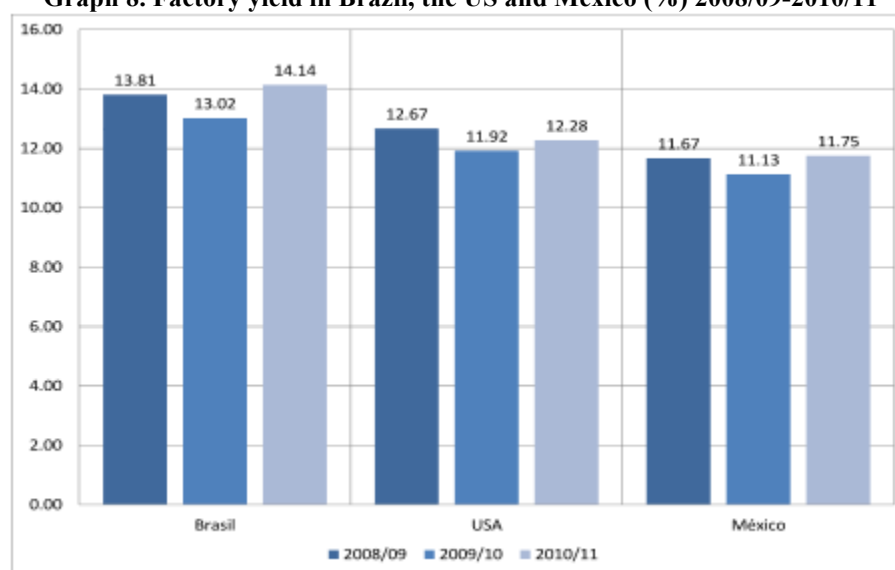
In the case of the Mexican sugar industry and its competitive position as measured by crop yields, a significant lag compared to other countries can be seen. The area planted and harvested for sugarcane is far greater than the countries at the top of the list, but their yields and sucrose extraction is much lower.

On the other hand, there are conditions that show potential for sugarcane harvests to increase in production capacity, since 87.1% of the planted area is harvested. This is a very low figure considering that the countries with higher numbers than Mexico have a ratio above 90%. Thus, better use of the areas harvested and planted, along with increased efficiency in extracting a greater amount of sucrose could put Mexico in a more competitive position compared to other countries.

2) Sugar Mills

Based on information available from main data sources of the sugar industry in Brazil, United States and Mexico, a comparison of sugar mill yields during the 2009/10 and 2010/11 cycles can be made⁵. As seen in the following graph, the Brazil's sugar mill yields are higher than that of countries like the United States and Mexico, at least during the last three production cycles.

Graph 8. Factory yield in Brazil, the US and Mexico (%) 2008/09-2010/11



Source: For United States: ERS, USDA; For Brazil: UNICA; For Mexico: CNIAA and CNDSCA.

Brazil obtained an average of 13.7% sugar compared to milled cane during the period considered. The United States obtained an average of 12.3% and Mexico averaged only 11.5%. During the 2010/11 period, the highest growth in sugar mill output was in Brazil with 8.6%. Meanwhile, Mexico grew 5.6% and the United States increased by 3%.

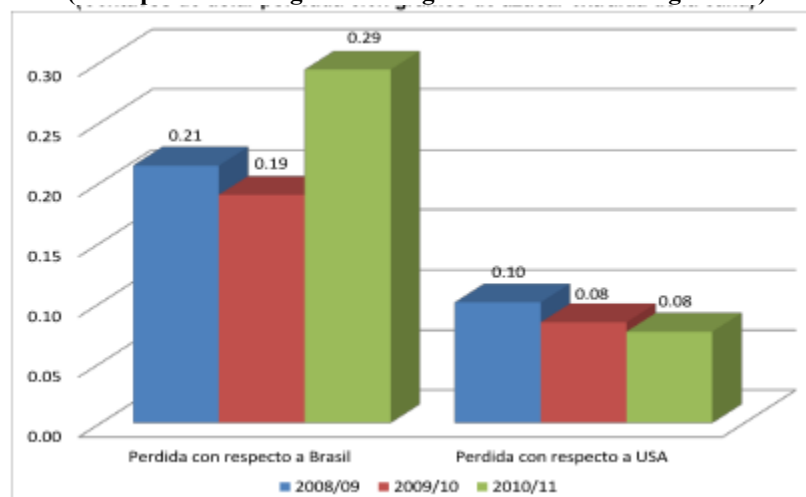
Poor performance in Mexico sugar mills not only made it less competitive against Brazil and the United States, but caused an economic loss for local sugar mills due to these conditions and the prices currently prevailing in the international market.

To clarify this, a simple exercise can determine the economic and opportunity losses: First, we determine the difference between Mexico's yield compared to Brazil's and the United States', separately. Second, we consider the average international price from January to October of 2011 for Contract 16.

⁵ Estimated sugar mill yields from sugar production in relation to the production of sugarcane, measured in terms of percentage.

The results indicate that domestic sugar mills lost 29 cents for every hundred grams of sugar extracted from sugarcane compared to if they were to operate under the same technological conditions as Brazilian sugar mills. If, however, they were to operate under the technological conditions of North American sugar mills the loss would only be 8 cents for every hundred grams during the 2010/11 cycle (see Graph 9).

**Graph 9. Economic Loss of Mexican Sugar Mills, 2008/09-2010/11
(cents per hundred grams of sugar extracted from sugarcane)**



Source: Self prepared, Ministry of Economy.

In the case of Mexico, a loss of competitiveness in the sugar industry is again clearly seen. Sugar mill yields end up being inferior when compared to the United States, and are far from countries like Brazil. In addition to this, the gap between sugar mill yields and, correspondingly, the efficiency of the Mexican industry, compared to those of the United States and especially Brazil appears to not have closed. Rather, it will continue to increase if the sugar milling industry in Mexico does not incorporate technological improvements that can close these gaps and improve sugar mill yields, with the aim of gaining international economic competitiveness.

Furthermore, economic loss would continue in sugar mill operations if technological and operational improvements to increase their efficiency are not implemented. This loss is currently estimated at 29 cents for every hundred grams of sugar extracted from sugarcane compared to operating under the same conditions as Brazilian sugar mills.

I.6 Fructose Market (HFCS)

The importance of High Fructose Corn Syrup (HFCS), since its appearance on the market to date, is very high. This is because it is a sugar substitute product for household consumption, and even more importantly, it is used for industrial purposes in producing foods and beverages.

The average annual growth in the global production of fructose during the 2006/07-2010/11 period was 3.5%, settling at 467.2 thousand tons during the last cycle. Cumulative production amounted to a total of 2.0416 million tons during the same period. Meanwhile, imports increased by 19.4% annually

on average during the same period, coming to 1.450 million tons for the 2010/11 cycle. Meanwhile, exports grew at a faster rate with an average annual growth rate of 38.5%.

Table 2. Global Fructose Balance, 2006/2007-2010/11 (thousands of tons)

Ciclo	2006/2007	2007/2008	2008/2009	2009/2010	2010/2011
Producción	407.1	342.5	361.7	463.1	467.2
Importaciones	306.9	442.6	329.3	975.0	983.6
Oferta Total	713.9	785.1	691.0	1,438.2	1,450.8
Consumo Doméstico	708.3	774.6	678.5	1,417.7	1,430.2
Exportaciones	5.6	10.5	12.5	20.4	20.6
Demanda Total	713.9	785.1	691.0	1,438.2	1,450.8

Source: USDA.

Worldwide fructose supply increased from 713.9 thousand tons in 2006/07 to 1.4308 million tons in 2010/11, representing an increase of 19.2% as an annual average. On the other hand, demand increased at the same rate, reaching 1.4508 million tons during the last year. Finally, consumption increased at an average rate of 19.2% during the mentioned period.

Thus, globally fructose has not only penetrated a market that was previously held by sugar, but it has rapidly gained market share, that is, when compared with the low growth rates for the production and consumption of sugar in the world seen in recent cycles. If this trend continues, fructose will continue to gain and solidify its worldwide market share.

I.7 Case Study: Sweetener Market in the United States

In this section, it is necessary to clarify the case of the United States which is Mexico's main trading partner in a large and widespread range of products. Sugar, therefore, is no exception, since a large part of exports are to this country. The sugar industry in the United States is characterized by high prices and strong barriers for entry in the form of tariffs, along with consumption that is higher than production. This has caused significant penetration of fructose into the American market. Therefore, this analysis of the sweetener market in the United States begins with HFCS and continues with the performance of the sugar market.

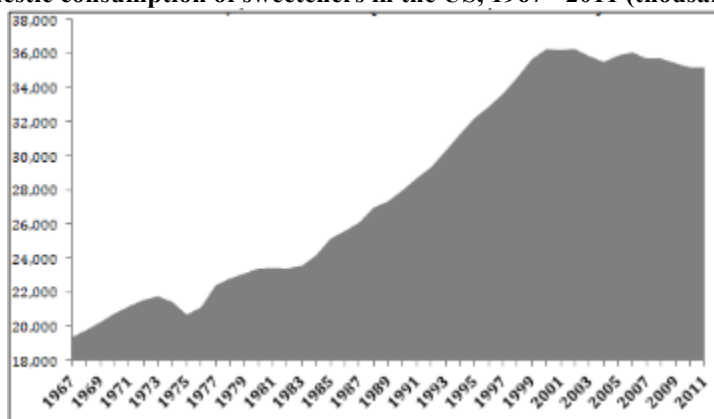
I.7.1 Fructose

In 1967, with the entry of HFCS into the sweetener market in the United States, a change in consumption patterns was reflected regarding both sugar and HFCS in domestic consumption and industrial processes.

Reflecting this change, domestic sweetener consumption in the United States recorded a faster growth rate in the 1984-2000 period. However, ever since 2001 consumption has remained stable, despite

showing signs of recovery in 2005 and 2006. From 2007 to 2011 a fall in demand for sweeteners was recorded but has not been strong enough to reverse the behavior pattern observed.

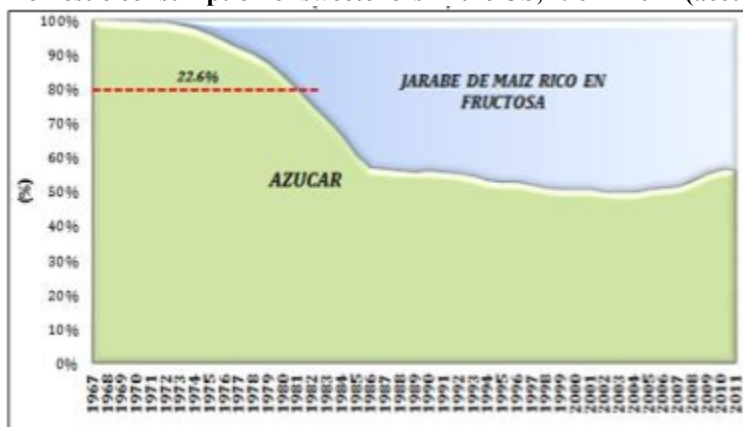
Graph 10. Domestic consumption of sweeteners in the US, 1967 - 2011 (thousands of short tons)



Source: USDA.

Since the introduction of HFCS, domestic consumption of sugar in the United States has ceded market share. This can be seen in the following graph that shows that the domestic consumption of sugar represented all sweetener consumption in 1967. Subsequently, and more notably since 1985, proportions of domestic sweetener consumption is divided equally between sugar and HFCS.

Graph 11. Domestic consumption of sweeteners in the US, 1967 - 2011 (accumulated %)



Source: USDA.

Therefore, both the change in household consumption patterns since the introduction of HFCS, as well as the recurrent changes in prices and supply of sugar in the United States has led to the development and consolidation of an important market segment for fructose as a substitute for sugar in this country. The market share gained by HFCS is located at about 50% in relation to sugar, and this proportion

does not seem to change over time.

1.7.2 Sugar

The sugar industry in the United States consists of sugarcane growers, sugar mills, refiners of raw sugarcane, sugar beet growers and sugar beet refiners.

According to the United States Department of Agriculture (USDA), the sugar industry is composed of approximately 1,000 sugarcane farms, 5,000 beet producing farms, 7 sugar beet processors, and 14 sugarcane processors. Employment in the sugar and confectionery products industry comes to a total of 68,000 positions in 2005, with approximately 14,000 employees in sugar manufacturing. This puts the sugar industry of the United States in fifth place among global producers for 2010/11, contributing to 4.6% of total worldwide production.

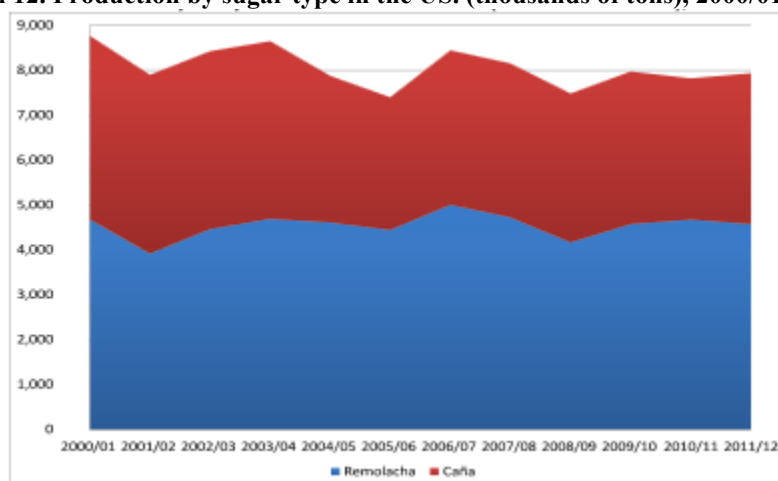
Among the key competitive factors in the sugar market in the US are sugar policy, low production costs, and the short distance to consumer markets. In addition, demand factors affecting competitiveness are determined by the sugar policy of the United States, implemented by a system of import quotas, domestic market allocations, and a loan program to support domestic prices. The latter topic is discussed in section IV of this document.

1) Production

Total sugar production for the 2010/11 cycle was 7.821 million short tons raw value, of which 40.2% is sugarcane and 59.8% is sugar beet. Compared to the preceding cycle, this represents a 1.9% decrease, mainly due to a reduction in sugarcane of 7.5%, while in the case of sugar beet there was a 2.2% increase.

For the 2011/12 cycle, production is expected to be 7.821 million tons, an increase of 1.5% in the total production of sugar - 6.8% for cane sugar and a reduction of 2.1% for beets.

Graph 12. Production by sugar type in the US. (thousands of tons), 2000/01-2011/12



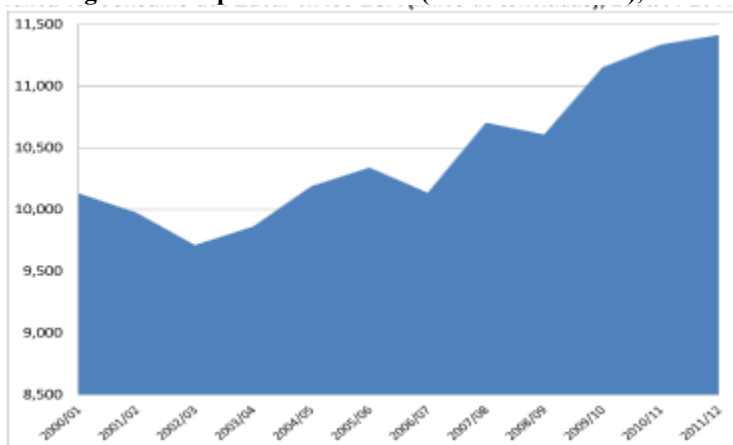
Source: ERS, USDA.

In the last decade, sugar production in the United States has come mainly from beets, with a share of about 56.5% of all production, while sugar produced from cane represented the remaining 43.5%.

2) Consumption

Sugar consumption in the US grew at an average annual rate of 1.1% during the 2000/01-2010/11 period, which contrasts with an average decrease in the production of this sweetener of 1.1%. This rising trend has led to consumption far outweighing production, and is made up for by imports. Currently sugar consumption stands at 11.335 million tons, i.e. 1.6% more than the previous year. Finally, it is estimated that for 2011/12 sugar consumption will increase by 0.7%, to settle at 11.415 million tons.

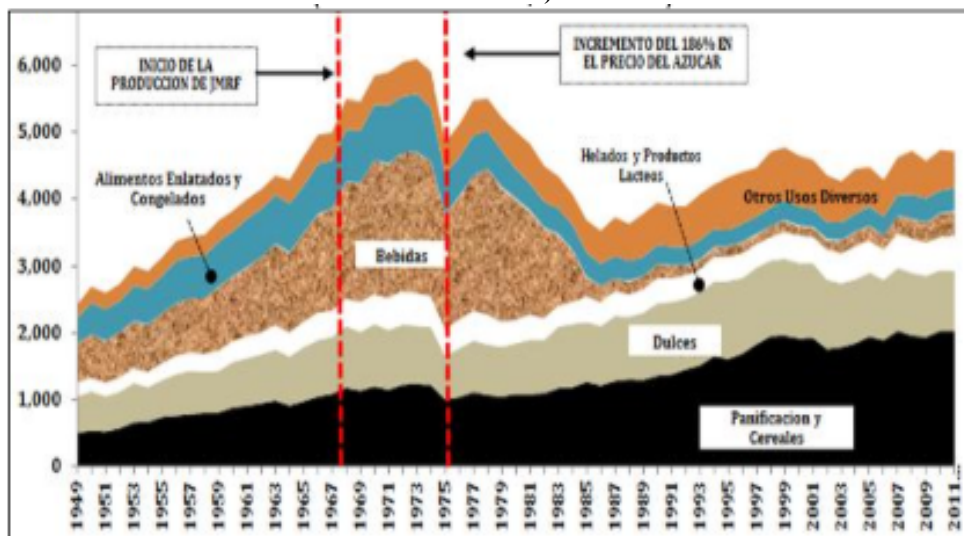
Graph 13. Sugar consumption in the USA. (thousands of tons), 2000/01-2011/12



Source: ERS, USDA.

As indicated, the entry of HFCS into the sweetener market in the United States in 1967 reflected changing domestic consumption and industrial demand patterns for sugar. Due to the 186% increase in the price of sugar in 1974 and its adverse effects on sales, the amount of sugar demanded for processes like the manufacture of beverages, candy, canned and frozen foods, ice cream and dairy products was reduced (See chart below).

Graph 14. Sugar sales in the US Industrial Sector according to Destination Sector, 1949-2011 (thousands of tons, raw value)

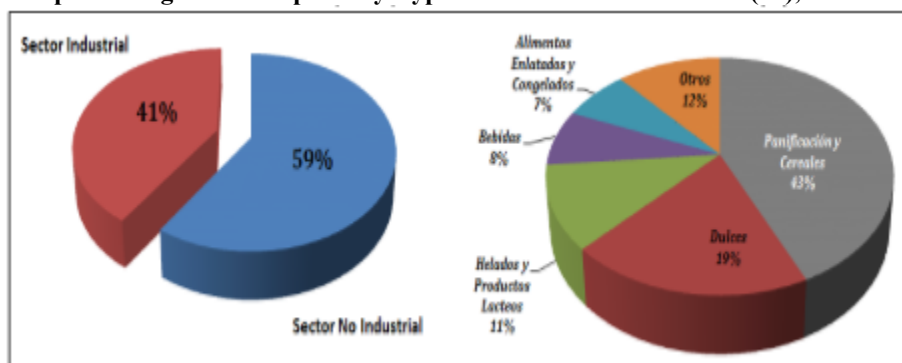


Source: ERS, USDA.

Sugar consumption in the United States has dropped and has been replaced by HFCS and other sweeteners⁶. This has been accompanied by growth in imports of *Sugar-Containing Products* to the United States. Another factor explaining the decline in sugar consumption is the change in foreign candy production⁷, along with dietary concerns about the consumption of carbohydrates in the United States in recent years. However, sugar sales have apparently begun to rebound from 2003.

In 2011 the industrial demand segment accounted for 41% of total demand, and the remaining demand was non-industrial or for household consumption. With regard to the demand from the industrial sector, distribution was as follows: 43% of demand was for breads and cereals, and the confectionery industry took 19%. Canned and frozen foods, beverages, ice creams and dairy products accounted for 26% of the demand (See charts below).

Graph 15. Sugar consumption by Type of Consumer in the USA. (%), 2010/2011



Source: USDA.

The behavior analyzed so far in the United States tells us that with the introduction of HFCS into the sweetener market, both direct consumption and industrial sugar consumption has changed. The balance sheet looks good for HFCS as it has penetrated and established itself in this market, now occupying a significant portion of it.

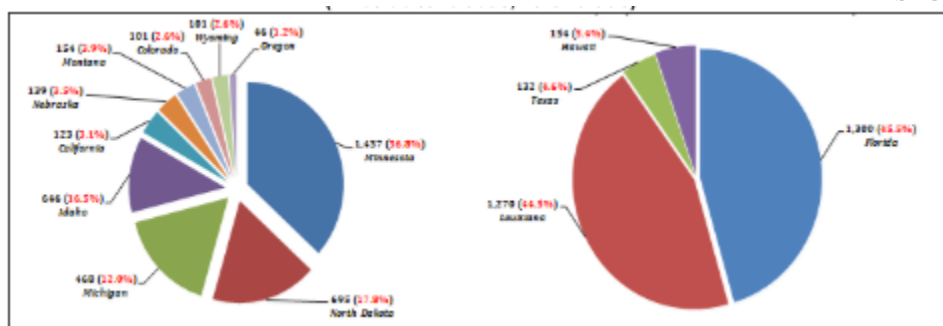
3) Regional Production

Regional production of beet sugar in the United States is performed in eleven producing states. Standing out among them are Minnesota (36.8%), North Dakota (17.8%), Michigan (12%) and Idaho (16.5%). Meanwhile, the main producing states of cane sugar are concentrated in the Gulf region and are as follows: Florida with 45.5%, Louisiana with 44.5%, Texas with 4.6% and Hawaii producing 5.8%. One feature of the sugar industry is that raw cane sugar refineries are generally located near seaports since these refineries process a significant amount of imported raw sugarcane.

Graph 16. Production of beet and cane sugar by state, 2010/2011 (thousands of tons, raw value)

⁶ Per capita consumption of refined sugar in the US declined from 102 pounds in 1970 to 63 pounds in 2006. The share of caloric sweeteners for use in food and beverages in the US with respect to refined sugar declined from 86 percent in 1966 to 45 percent in 2006, while the share of high fructose corn syrup increased from zero to 42 percent. USDA, ERS, Sugar and Sweeteners: Yearbook Data Tables. Data were calculated based on 1,000 dry base short tons.

⁷ It is estimated that the sugar content of Sugar-Containing Products imports to the USA has increased from 213,000 short tons, raw value in FY 1993 to 1,300,000 short tons, raw value FY 2006. USDA, ERS Sugar and Sweetener Outlook, SSS-248, February 5, 2007, 11.

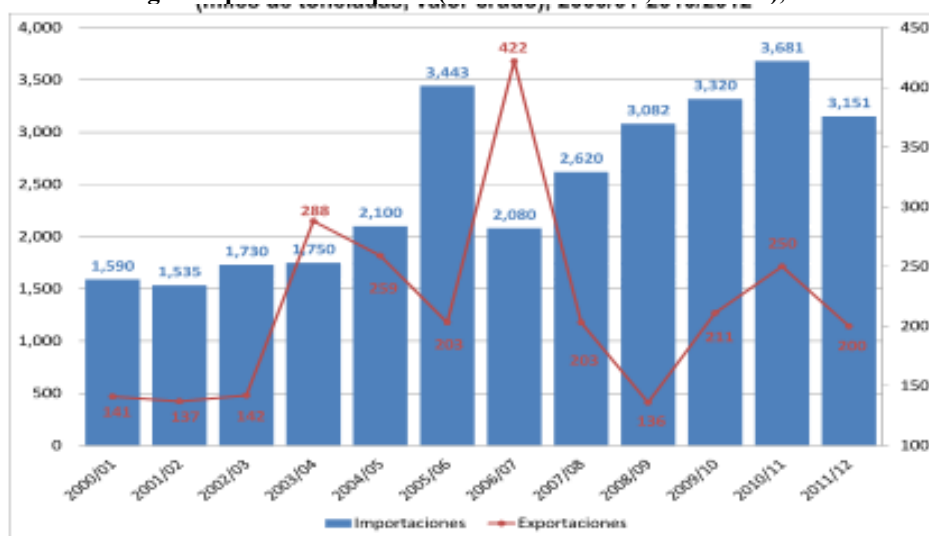


Source: USDA.

4) Foreign market

The large amount of sugar consumed is reflected in imports made by this country in an effort to meet the demand, which has grown by 7.9% annually on average during the 2000/01-2011/12 period. In contrast, sugar exports show a rate of 5.3% on average. During this same period, imports increased by up to 64% during 2005/06, and during this last cycle they increased by 10.9%. It is estimated that in 2011/12 imports will reach 3.151 million tons.

Graph 17. US: Sugar Imports and Exports (thousands of tons, raw value), 2000/01-2010/2012



Source: USDA.

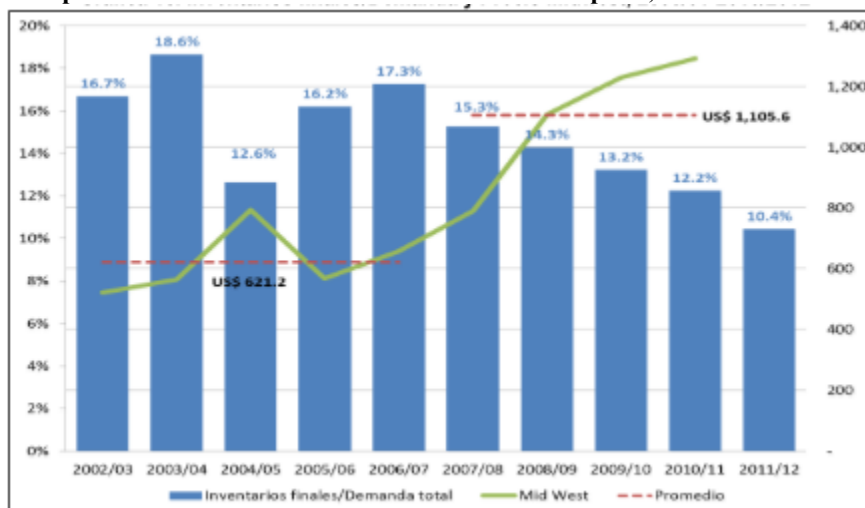
The demand in sugar consumption in the United States is filled by imports, which in recent years have increased to meet supply needs. Among these are sugar imports from Mexico which are beginning to occupy an important place in the US. However, more Mexican sugar in the US would create pressure on the supply and price of sugar in the Mexican market. Another factor contributing to this pressure which is found in both markets (which, as already mentioned, together constitute a deficit market) is the high tariff level for third party countries. This prevents the market from solving the demand problems in this region.

5) Final inventories, total demand and prices

The dynamics of US sugar consumption, production and trade growth results in final inventory levels relative to total demand being reduced substantially since 2007/08. It is estimated that by 2011/12 this ratio will stand at 7.8%, the lowest in the entire period under analysis. Conversely, the Midwest price

(reference spot price for refined sugar in the US) has increased almost double since this period, reflecting the failure of sugar to meet the consumption needs of households and the food industry.

Graph 18. Final inventories/demand and Midwest price, 2000/01-2010/2012



Source: USDA.

To relieve the pressure on the US price and return to acceptable levels in the relationship between final inventories and total demand will require an adjustment to be made in imports, either in the import quotas for third party countries or in sugar imports from Mexico.

II. NATIONAL SWEETENER MARKET

This section presents an analysis of sweeteners in Mexico, describing their behavior in key variables such as production, consumption, foreign trade, prices and importance in the regional productive structure as well as their social impact.

The pattern of sweetener consumption within our country is concentrated mainly on sugar. More recently HFCS and *Non-Caloric (NC)* products have begun to play a role. In general, the use of artificial sweeteners is difficult to identify because they are used in combinations that are not explicitly shown in consumer products. In the case of sugar however, it is considered to be a basic and essential ingredient for feeding the low-income Mexican population because of its high energy content.

The value of sugarcane in the agricultural sector during the 2000-2011 period was 18.550 billion pesos, and in 2011 its maximum value was 29.051 billion pesos. Harvested area totaled 673,000 hectares during the 2010/11 season, taking a 3.3% share of the national total for harvest year 2010. During this period there were 44,131,570 tons processed into sugar and alcohol (CONADESUC, 2011).

The domestic sugar industry is currently made up of 57 sugar mills, of which 54 remain in operation. The mills belong to 15 Mexican states and are located in 227 municipalities with a total population of 12 million people. The state of Veracruz has the highest number of sugar mills with a total of 22. It is the largest sugar producer in the country with an output of 1.8 million tons (36.7% of the national total) produced during the 2010/11 cycle.

Table 3. Socio-economic aspects of the sugar industry, 2011

Item	Value
States	15
Municipalities	227
Population of municipalities	12 million
Industrialized surface area	664,000 [ha]
Sugar mills	57
Production value of sugar	27 [billion pesos]
Sugarcane value	19.133 [billion pesos]
Percentage of the value of the primary sector	11.60%
Percentage of manufacturing GDP	2.50%

According to the National Chamber of Sugar and Alcohol Industries, this agribusiness provides about 930,000 direct jobs and approximately 2.2 million indirect jobs. It is considered an important activity not only because it has a high social impact, but also because of its high economic impact with an estimated production of 27 billion dollars annually, and economic benefits to the country totaling around 19 billion pesos⁸. According to the National Institute of Statistics, Geography and Information (INEGI as abbreviated in Spanish), it accounts for 0.4% of the total GDP, 11.6% of the primary GDP,

⁸ See Appendix A3, with information from the National Chamber of Sugar and Alcohol Industries (CNIAA as abbreviated in Spanish).

and 2.5% of the manufacturing GDP.

Table 4. Employment in the sugar industry (thousands), 2011

Item	Value
Sugarcane products	164
Agricultural workers	136
Sugarcane cutters	68
Sugarcane carriers	34
Workers (sugar mills)	36
Subtotal	440
Workers in consumer area	490
Direct jobs	930
Indirect jobs	1,270
Total jobs	2,200

However, low competitiveness and high costs associated with the sugar industry have led to the production of sugar being a historically protected activity, and one that, among other things, promotes the survival of technologically lagging sugar mills, with high processing costs and deficiencies in their production lines. Sugarcane fields that are dedicated to this activity are characterized by high fragmentation, low productivity and high cultivation costs.

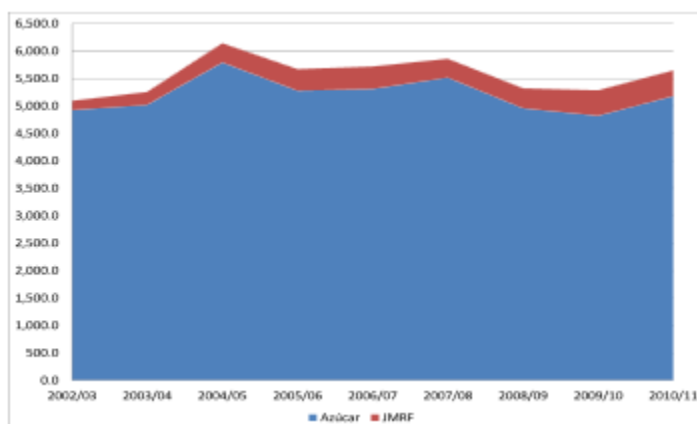
The latter has led the sugar industry to face structural problems such as the loss of ability to leverage its resources, articulate processing activities, and thereby push development. Also, the lack of an adequate regulatory framework and lack of better policy actions that would boost growth have depressed the sugar industry in this country.

As a result, the sugar market has lost share relative to HFCS. The level of HFCS consumption is 29.7%, while sugar represented the remaining 70.7% during the 2010/11 cycle.

II.1 Production

Domestic production of HFCS has experienced an average annual growth of 15.6% during 2002/03 to 2010/11 cycles, representing an aggregate of 3.1867 million tons during these years. The penetration of this sweetener is seen not only in its growth, but also in its share of domestic production, as it has grown from 3.3% in 2002/03 to 8.3% in 2010/11. Meanwhile, sugar production grew at a rate of 0.6% annually on average during the 2002/03 and 2010/11 periods, reaching a level of 5,184 tons during this last cycle.

Graph 19. Sugar and HFCS production, 2002/03-2010/11



Source: National Balance of Sweeteners, with preliminary fructose production information for September.

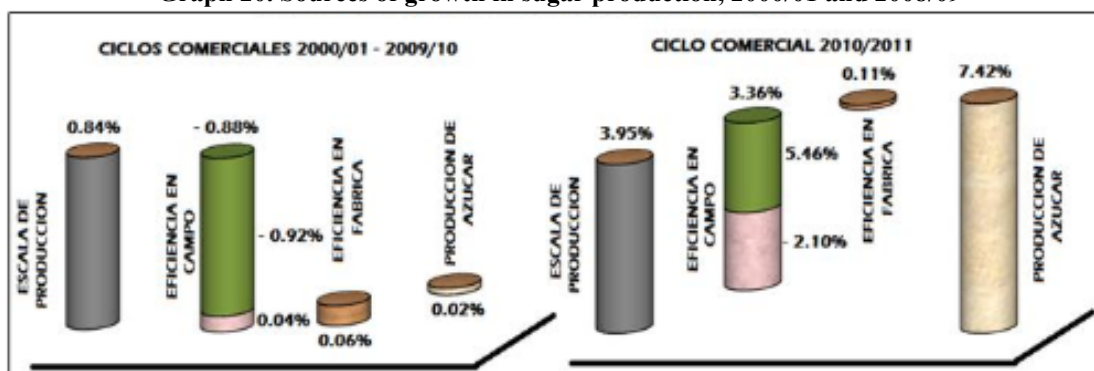
The historical growth of sugar production can be explained by several factors, such as:

- 1) Variations in the scale of production (measured by industrialized surface).
- 2) Field productivity (amount of sugarcane per hectare and sucrose content of sugarcane).
- 3) Sugar mill efficiency, which is measured as the amount of sucrose received by the mill and transformed into sugar.

During the last business cycle, the 7.4% growth was mainly due to an increase in the scale of production and in the field.

On average, growth in sugar production was 0.02% during the 2000/01 to 2009/10 period, and was mainly due to a steady increase in the scale of production, a factor which determines most sugar production growth. However, the steady growth of sucrose content in sugarcane has been nullified by a lower quantity of sugarcane per hectare, and finally sugar mill efficiency provided a marginal contribution to production growth.

Graph 20. Sources of growth in sugar production, 2000/01 and 2008/09



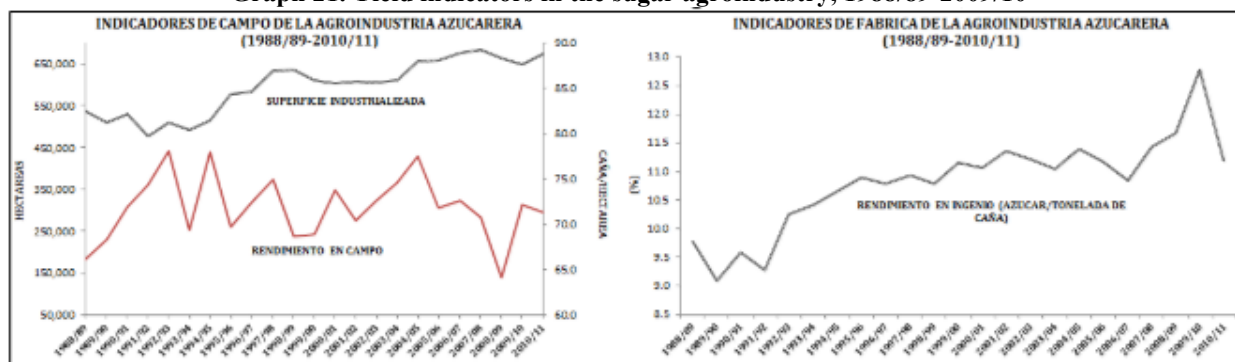
Source: Self written.

Therefore, production growth is explained mainly by changes in the scale of production instead of what would be hoped - improvements in production processes in the field or in sugar mills.

Long-term analysis

In a long-term analysis of the sugar industry which records 22 cycles of field indicators (industrialized surface area and sugarcane obtained per hectare) a wide fluctuation in yields is seen and there is a marked downward trend since the 2005/06 cycle. During the same period, sugar mill yields show a systematic improvement in the production process; however it can be inferred that although the sucrose content of industrialized sugarcane has increased modestly, it has grown at a slower rate during each successive production cycle.

Graph 21. Yield indicators in the sugar agroindustry, 1988/89-2009/10



Source: 1988/89 -2009/10, CNIAA; 2010/11 CONDESUCA.

Sugar production in Mexico has remained steady in recent years, and its growth dynamic stayed at an average of 0.02% per year during the 2000/01 to 2009/10 period. In contrast, the production of HFCS increased at an average rate of 15.6% per year, and its share in the production of sweeteners in Mexico increased from 3.3% to 8.3%. This is not only due to loss of productivity and competitiveness in the sugar industry, but is also due to the increased presence and better growth dynamics of HFCS as a substitute product in the consumption of sweeteners in Mexico, mainly in the food and beverage sectors.

II.2 Consumption

Sugar consumption has declined in recent years as a result of several changes, such as in domestic and international prices, the supply and demand of sugar, people's consumption habits, the food industry's demand and the presence of substitute products such as HFCS and non-caloric sweeteners.

Specifically, sugar consumption fell by 2.7% as an annual average during 2002/03 to 2010/11. In contrast, HFCS consumption increased at a 40% annual average rate during the same period. Comparatively, sugar consumption increased from 4.9349 million tons in 2002/03 to 3.950 million tons during 2010/11.

During 2002/03 sugar represented 93.3% and HFCS represented 2.9%. However, this ratio has changed over time, and HFCS has now reached 27.3%. This shows the penetration that HFCS has made into the sweetener market in the country, growing even faster than its own production levels.

Furthermore, the presence of Non-Caloric sweeteners is notable, which may become relevant in the national sweetener market if consumption patterns lean toward low calorie foods. Besides the above, these types of products can take market share due to their "sweetness". For example, Sucralose is 600 times more powerful than Sucrose (sugar) and Aspartame is 200 times stronger than sucrose.

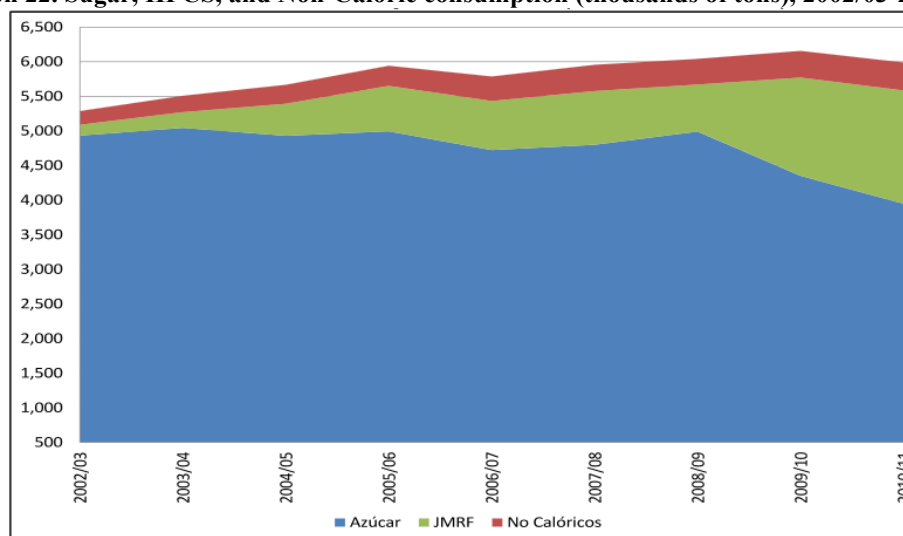
Table 5. Sweetening power

Product	Sweetening power
Lactose	0.25
Galactose	0.3
Sorbitol	0.5-0.6
Glucose	0.7
Xylitol	1
Fructose	1.1-1.3
Mannitol	0.7
Sorbitol (D-glucitol)	0.6
Aspartame	200
Saccharin and salts	300
Sodium or calcium cyclamate	50
Sucralose	600
Neohesperidine	1500

The sweetening power of sugar is determined relative to sucrose, the reference for sugar (a solution of 30 g/L at 20°C is assigned a sweetening power of 1). *Has been synthesized in the laboratory but has not yet had an industrial use. Obtained from oranges, stable, soluble in water and ethanol and very suitable for use in dry products.

Non-Caloric product consumption has grown at an average annual rate of 10.7%, and holds an average market share of 5.5%. Consumption of these products was 2.898 million tons during the period referred to.

Graph 22. Sugar, HFCS, and Non-Caloric consumption (thousands of tons), 2002/03-2010/11

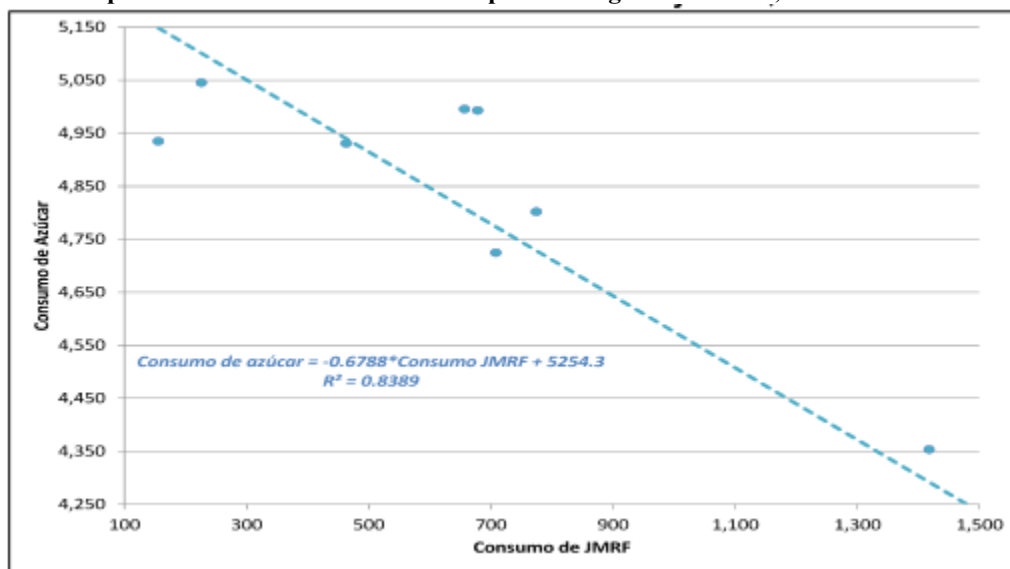


Source: National Balance of Sweeteners, with preliminary fructose production information for September. Non-Caloric estimates are preliminary, SE-DGCE.

Consumption of HFCS and other products such as Non-Caloric sweeteners has increased in recent years at a faster rate than sugar consumption, taking more than a quarter of the sweetener market in Mexico. To this is added the international market behavior of sweeteners, i.e. a gradual penetration and integration of HFCS into a market previously held by sugar. This is seen to be a practically irreversible

process since sugar consumption levels have failed to regain their share of the sweetener market.

Graph 23. Substitution in the consumption of sugar and HFCS, 2002/03-2010/11



Source: National Sweetener Balance.

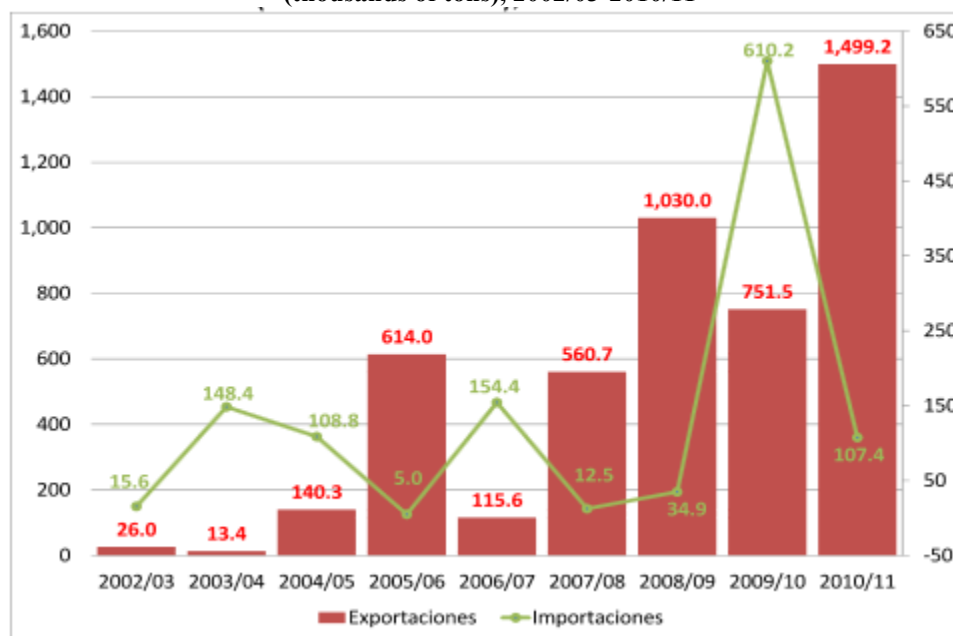
II.3 Foreign market

Foreign trade of Mexican sugar is framed within the NAFTA dynamic. The main destination of Mexican exports is the United States which, as has been seen, is a major sugar consuming country and whose imports are duty free under NAFTA.

Meanwhile, imports of sugar into Mexico are conducted under import quotas with preferential tariffs by means of a quotas mechanism. This is done in order to ensure supply and maintain stability in the price of sugar for the food industry and households. The main countries of origin for Mexico's sugar imports are in Central America and include Guatemala, Nicaragua, Brazil, Colombia and others.

The average growth rate of sugar exports stood at 66% during 2002/03 to 2010/11, and on average the volume of exports during this same period was 518 thousand tons per year.

Graph 24. Sugar Exports and Imports
(thousands of tons), 2002/03-2010/11



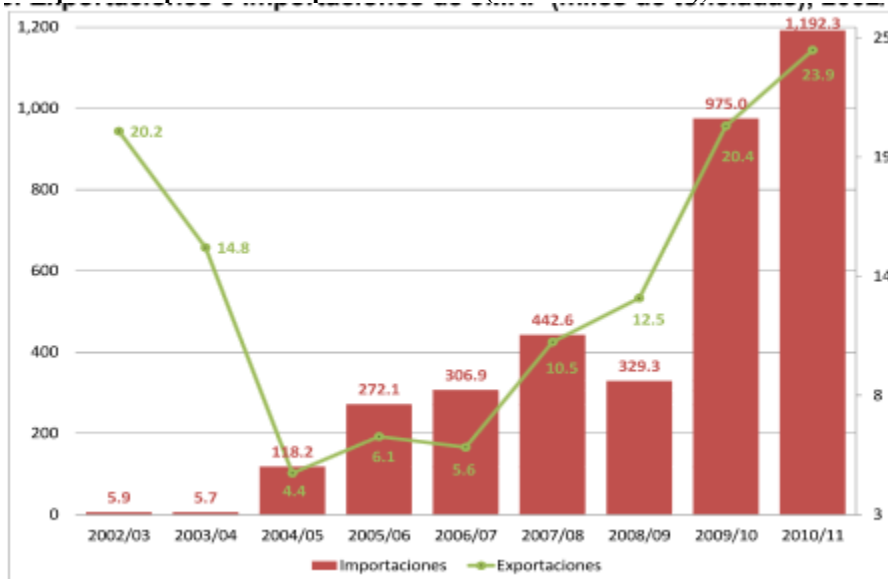
Source: National Sweetener Balance.

For this last cycle the maximum export volume reached was 1,499 million tons, i.e. 124% compared to the preceding cycle, and the main target market of domestic exports was the United States which took 99% of these exports.

In the case of imports, these amounted to a cumulative total of 1.197 million tons, or an average of 2.6% of all production during the period being considered.

With regards to HFCS, the foreign trade outlook is diametrically opposite to that of sugar. As a result of the accelerated growth rate of consumption in Mexico, well above production levels, imports coming mainly from the United States are growing at an average rate of 94.1%. Thus, these imports supply 40% of domestic HFCS consumption. During this same period, exports grew at a rate of 2.2%

Graph 25. Exports and Imports of HFCS (thousands of tons), 2002/03-2010/11



Source: National Sweetener Balance.

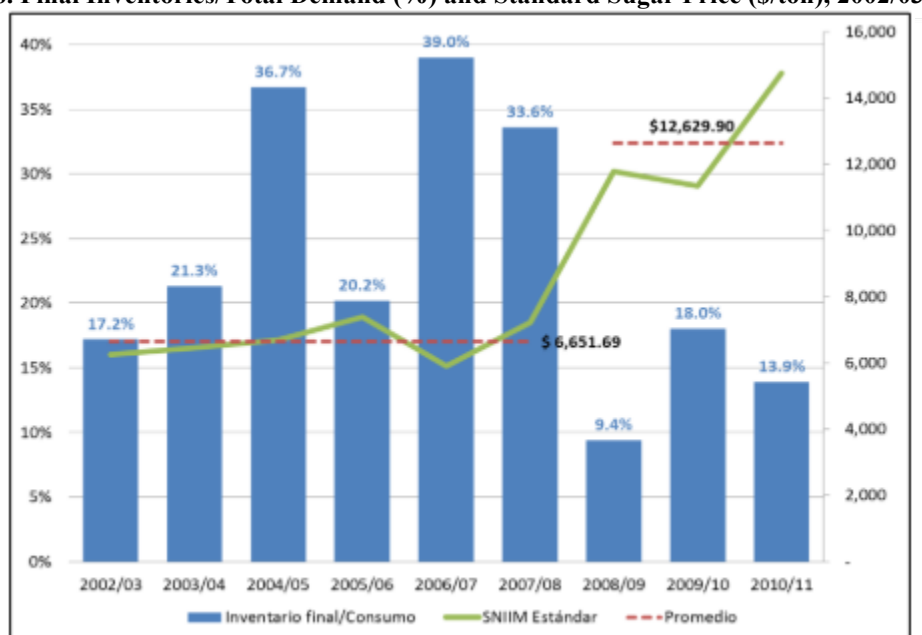
Foreign trade of sweeteners is closely linked to the dynamics of the US market. Here, sugar exports are mainly directed towards the US market since its sugar production levels are lower than consumption levels and are even lower than Mexico's exportable supply. Furthermore, the tariffs provided by NAFTA are being taken advantage of.

However, the increasing use of HFCS in Mexico has accelerated imports of this product, coming mainly from the United States sweetener market.

II.4 Prices and inventories

Final inventory levels relative to total demand determine the path of sugar prices. During the 2002/03 to 2007/08 cycles, the relationship of final inventories/total demand (I/D) stayed at an average of 28% and during this time prices remained stable. However, ever since 2008/09 the reduction in inventory/demand of up 9.4% caused sugar prices to increase to nearly double the previous period, and this trend will continue if the I/D is kept below 20%.

Graph 26. Final Inventories/Total Demand (%) and Standard Sugar Price (\$/ton), 2002/03-2010/11

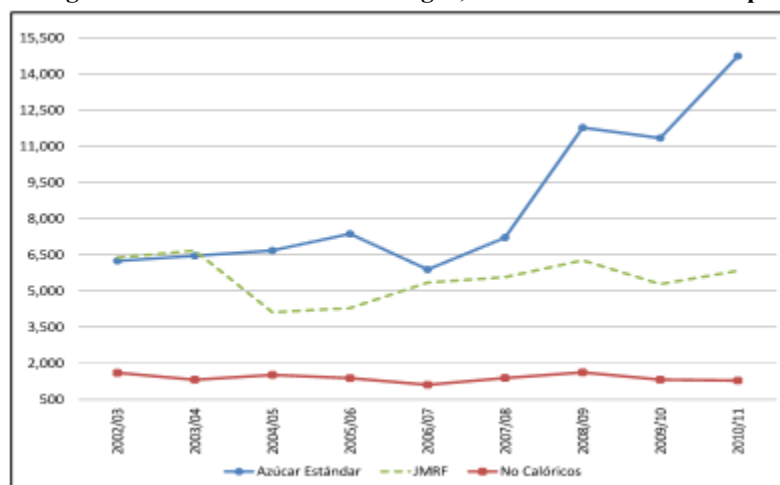


Source: National Sweetener Balance.

Notes: Prices as of October 2011

The evolution of standard sugar prices shown above has led to a widening gap when compared to the price of other sweeteners (substitutes). In 2003 the price of sugar was at the same level as HFCS. However, as of this date it has increased at an average rate of 12%, lower than the increase of HFCS and Non-Caloric product prices which were 5.1% and -2.3%, respectively.

Graph 27. Average annual Price of Standard Sugar, HFCS and Non-Caloric products (\$/ton)

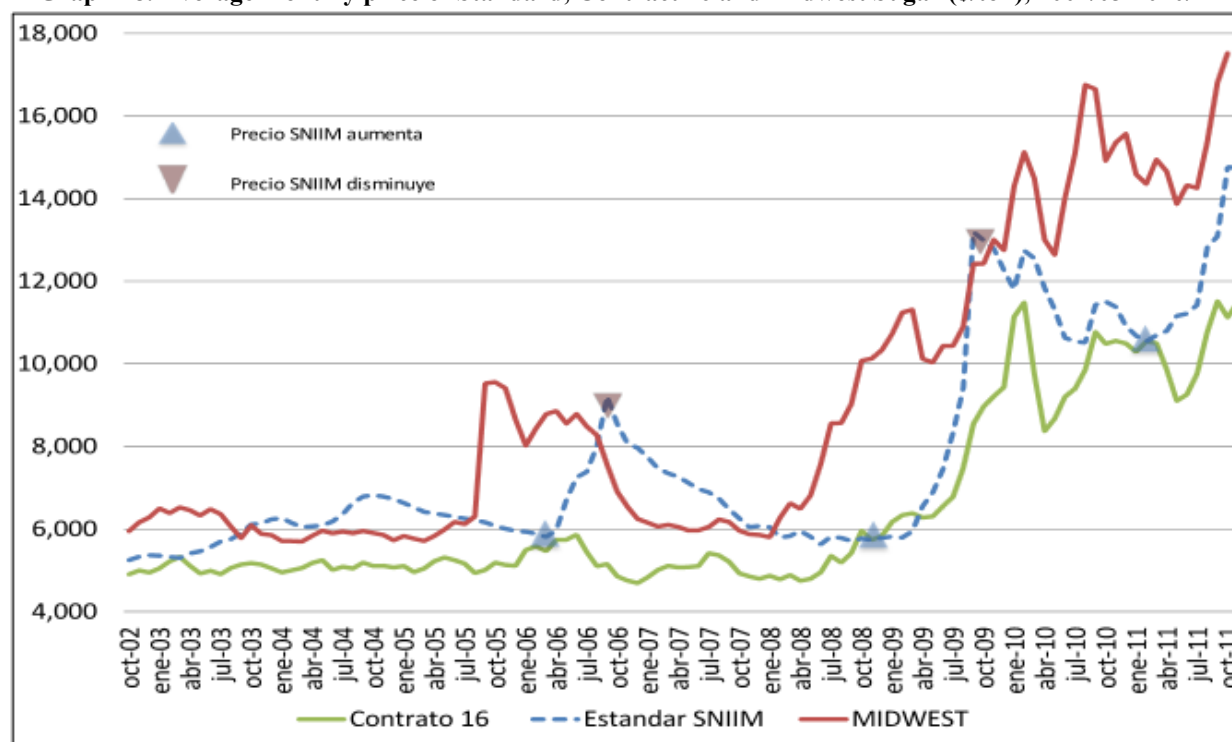


Source: For sugar: SNIIM, SE; for HFCS and Non-Caloric: DGCE, SE. Notes: Prices as of October 2011

As indicated, the region comprising Mexico and the United States, with a common and restrictive tariff for third countries, causes price behaviors that are explained by the specific supply and demand conditions at any given time.

The standard SNIIM price increases when it is close to the price of Contract 16 (raw sugar reference in the US) and decreases when the price exceeds Midwest (refined sugar reference in the US). The following chart shows this behavior, where there are three moments of increase or rise: March 2006, November 2008 and February 2011. Contrary to this behavior, there are two moments at which the price of standard sugar exceeds Midwest and decreases: September 2006 and December 2009.

Graph 28. Average monthly price of Standard, Contract 16 and Midwest Sugar (\$/ton), 2002/03-2010/11



Source: For sugar: SNIIM, SE; for HFCS and Non-Caloric: DGCE, SE. Notes: Prices as of October 2011

The above behavior would indicate that the price of standard sugar in Mexico establishes an inverse pattern with respect to sugar prices in the United States in order to build a reserve margin for exportation of the product.

However, the reserve margin in many cases causes the price level in Mexico to rise considerably, causing uncertainty for domestic consumers in both households and industry.

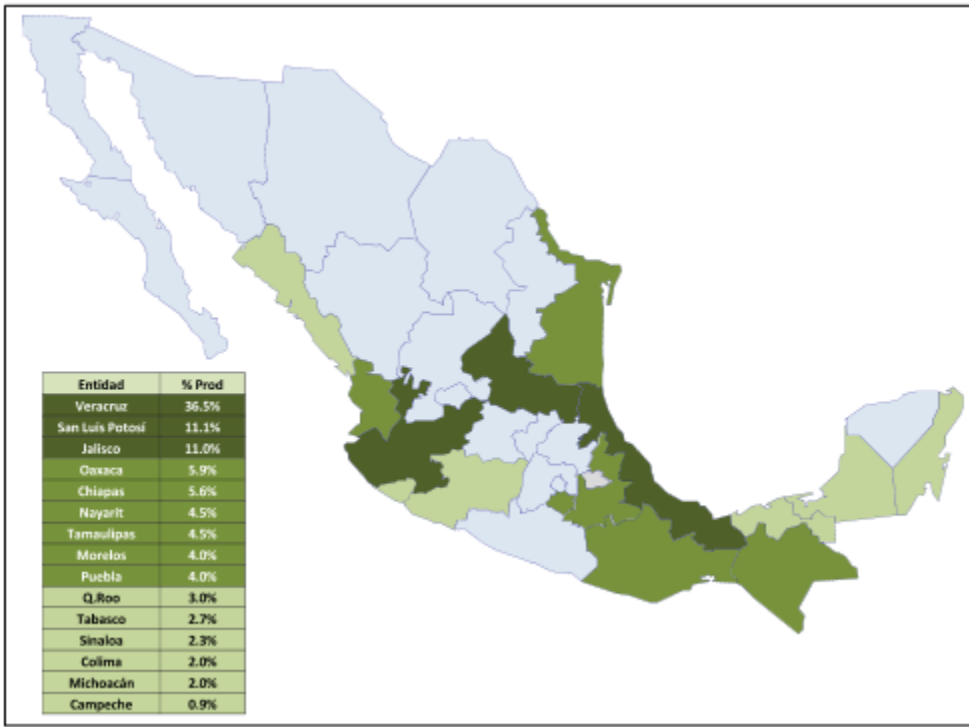
II.5 Regional Situation

This section presents the regional status of sugar production in Mexico, highlighting the major producing regions and institutions. It also presents regional efficiency indicators that allow the classification of states according to their production standards, regarding the sugar mills and sugarcane fields located in the specific state. Finally, an exercise is carried out to see the socio economic impact of sugar mills in local areas within the country.

II.5.1 Production

Sugar production during the 2010/11 cycle was located in 15 states of the country which generated the following numbers: Veracruz with 36.5% of production, San Luis Potosí with 11.1%, Jalisco with 11%, Oaxaca with 5.9% and Chiapas with 5.6%. These states hold 70% of domestic production and the remaining 30% is located in ten other states.

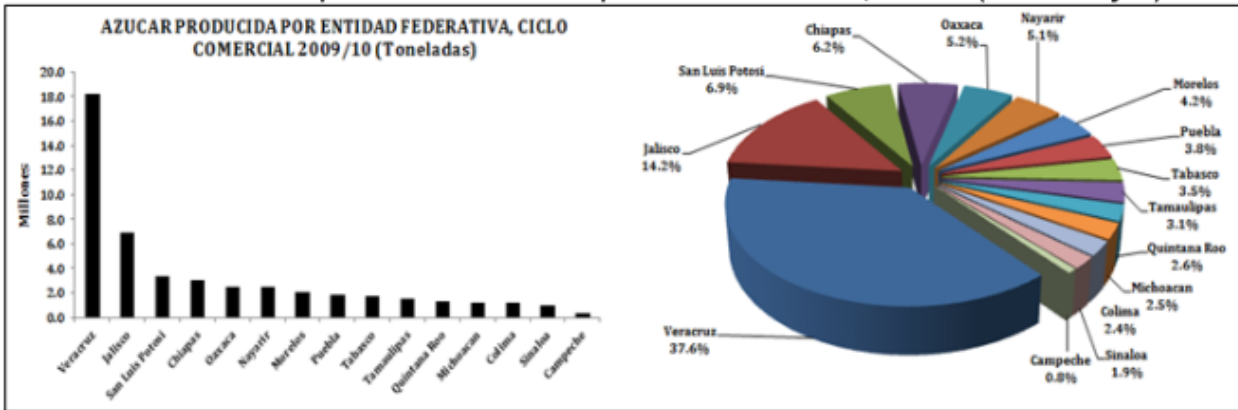
Map 2. Sugar production per State (%), 2010/2011



Source: CONADESUA.

With information from the 2009/10 cycle, with respect to industrialized surface area, three quarters of this is concentrated in six states: 37.6% in Veracruz, 14.2% in Jalisco, 6.9% in San Luis Potosí, 6.2% in Chiapas, 5.2% in Oaxaca and 5.1% in Nayarit. The remaining 25% is located in 10 other states.

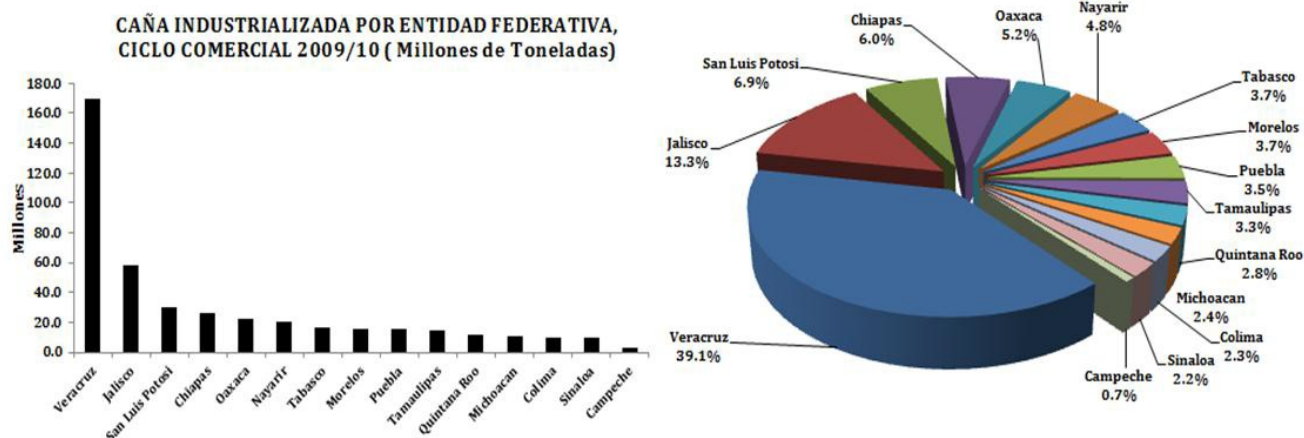
Graph 29. Industrialized surface area per state, 2009/10 (hectares and %)



Source: Self-written.

Processed sugarcane showed a similar distribution. Out of a total of 43,370 industrialized tons, 39.1% were located in Veracruz, Jalisco followed with 13.3%, San Luis Potosí with 6.9%, Chiapas with 6% and Oaxaca with 5.2%. Together these states accounted for 68% of total volume. The remaining 32% was distributed in eleven other states.

Graph 30. Industrialized sugarcane per state, 2009/10 (tons and %)



Source: Self-written.

II.5.2 Regional efficiency indicators

To analyze the efficiency of sugar production as a whole, it is necessary to analyze the efficiency with which raw materials are transformed both in the field and in sugar mills on a regional basis. This efficiency determines the amount of sugar being supplied according to each state. To accomplish this analysis, an approximation of performance indicators from fields and mills is carried out for each location. To make this more accurate performance indicators are used, which are approximated according to the following items:

1. Industrialized sugarcane per hectare (tons of cane per hectare).
2. Sucrose in sugarcane (sucrose content of sugarcane, %).
3. Sugar mill efficiency (amount of sucrose delivered to the mill that is converted into sugar, %).

Based on the first two indicators identified, the first link in the chain is described from a regional perspective.

a) Sugarcane fields

For the 2009/10 business cycle, the average national yield from the field stood at 72.1 tons/ha of sugarcane, while average sucrose content in sugarcane was 13.6%. From these two indicators it is possible to generate classifications to identify an indicator of competitiveness in sugarcane fields at the

state level in sugar production for the business cycle mentioned.

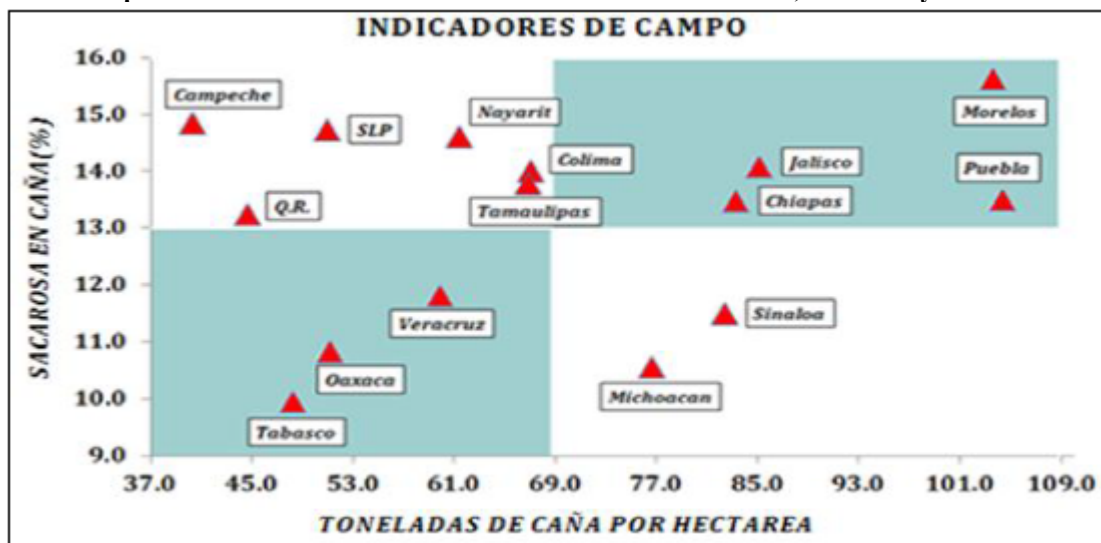
The classifications grouped fifteen producing states into four groups:

1. Field yields and sugarcane sucrose content yields are above the national average (upper right quadrant).
2. The sugarcane sucrose indicator is above the national average, but field performance is below the national average (upper left quadrant).
3. Field yields and sugarcane sucrose content yields are below the national average (lower left corner).
4. Field yields are above the national average, but the sucrose content is below the national average (lower right quadrant).

Based on this classification, the following graph was generated. On the left side are the states that were grouped and segmented according to the field performance indicators. As can be seen, group I consists of the states of Morelos, Chiapas, Jalisco and Puebla.

Group II consists of the states of Campeche, Quintana Roo, San Luis Potosi, Nayarit, Colima and Tamaulipas. The third group is made up of Veracruz, Tabasco and Oaxaca and the last group includes the states of Michoacán and Sinaloa. On the right side, the share of the industrialized surface area corresponding to each group is shown.

Graph 31. Field Indicators and industrialized area distribution, business cycle 2009/10



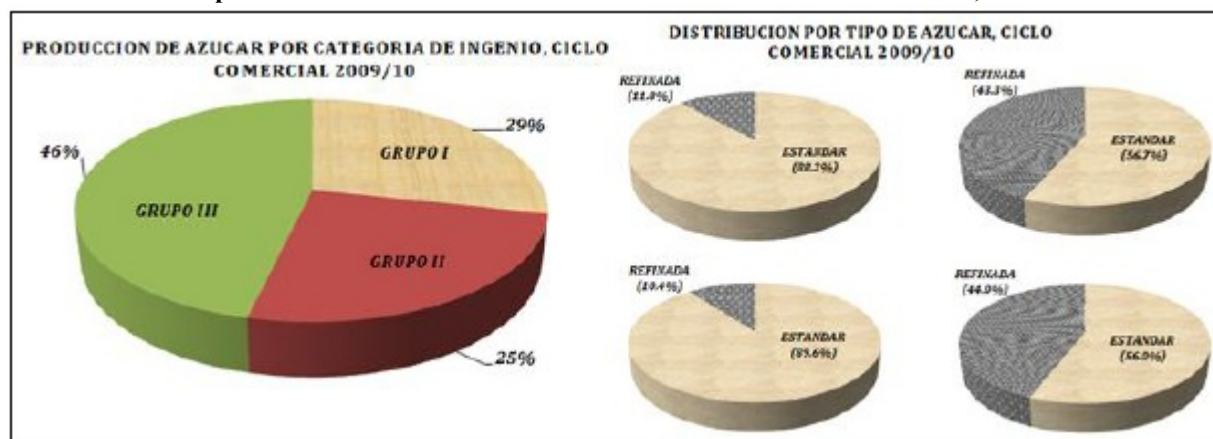
Source: Self-written.

What stands out in this grouping is that just over half of the surface area used in the production of sugarcane is concentrated in states that recorded field indicators below the national average. Meanwhile, in states with much better conditions where sugarcane fields should be located due to their better indicators, only 18.4% of the total surface area is located. The rest of the industrialized area distribution is in states which have a higher than average sugarcane sucrose content or where field performance is above average, but not both.

In the following graph, the left side shows sugar production according to the grouping described above. As can be seen, the states classified in Group III held a 46% share of sugar production, while those in Group I had 29%.

Combining this information shows that sugar cane fields that produce the most sugar are characterized by production systems where the scale of the operation (more industrialized surface) determines the growth level and dynamics of sugar production. The sugarcane fields located in the states of Morelos, Chiapas, Jalisco and Puebla are characterized by intensive production systems that make more use of factors such as capital and labor than of just land. Together these two groups contributed 75% of the sugar produced during the 2009/10 business cycle.

Graph 32. Field Indicators and industrialized surface area distribution, 2009/10

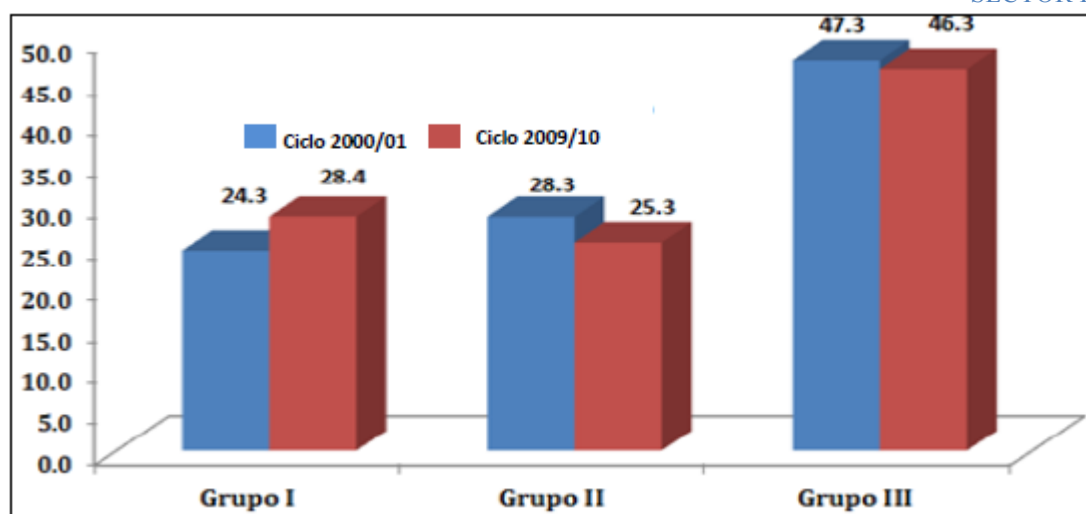


Source: Self-written.

The right side of this graph groups together all standard and refined sugar production. As seen, states making intensive use of land are also characterized by more standard quality sugar production, while states with lower intensive land use are characterized by the production of standard and refined sugar.

Finally, by comparing the share of sugar production during the 2000/01 business cycle with that of 2009/10, a greater share of sugar produced by sugar mills whose production standards are above national average can be seen, and a declining share is seen in the total sugar produced by sugar mills whose cane fields are below average.

Graph 33. Share of sugar production by type of sugar mill, cycles 2000/01 and 2009/10



Source: Self-written.

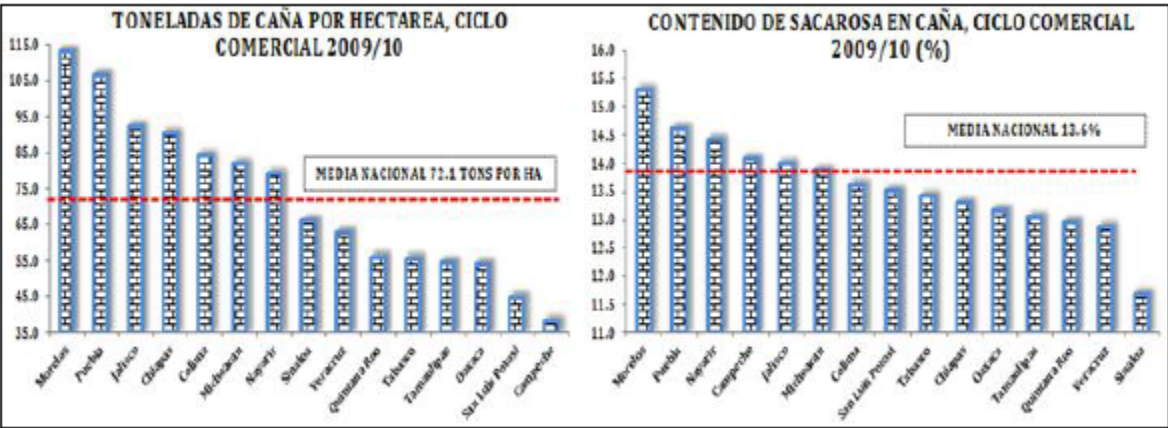
The classification of states according to their field performance indicates that just over half of the surface area used for the production of sugarcane is concentrated in states that recorded sugarcane field indicators showing their sugarcane had very low standards, including the main producer, Veracruz. Also, most sugar production is concentrated in states with characteristics or field and sucrose yield standards that are far below the national average. Other states that produce less sugar have production indicators that are much higher than the national average. Therefore, the spatial distribution of sugar production in the country is fragmented among states that produce high volumes of sugar but whose production technology are limited. On the other hand, in states where production is done in less volume, there is the potential to grow due to their production technology. However, the scale of production in sugarcane fields is a major restriction.

b) Sugar mills

To the above information regarding sugarcane fields we add the sugar mill efficiency indicator. This is done to carry out a complete analysis of the value chain status and to specify in detail its behavior according to each state.

From the results obtained so far, it can be seen that despite the large production volume of Veracruz as compared to national production, its cane field yield indicators are below the national average. Field indicators are lower than the national average of 72.1 tons per hectare and are even below the average sucrose content of sugarcane with 13.6%.

Graph 34. Tons of sugarcane per hectare and sucrose content in sugarcane per state, 2009/10 (tons/ha-%)



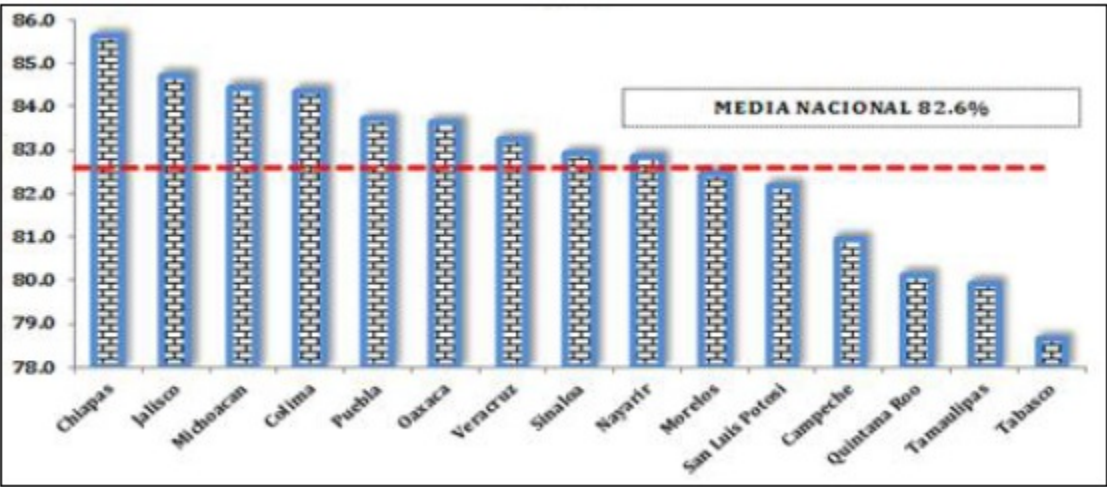
Source: Self-written.

Considering these indicators and linking them to the sugar produced, the states of Puebla, Morelos and Jalisco simultaneously recorded field yields (cane per hectare and cane sucrose content) higher than the national average. Together they produced 1.071 million tons of sugar which represented 22.2% of total production. Meanwhile, the state of Veracruz, with 37.6% of total production, recorded a cane per hectare level that was 39.6% below the average of the previously mentioned states and a sucrose content that was 12% lower.

This indicates the existence of technological heterogeneity used in sugar cane cultivation and cane sugar production from sugar cane fields in several states. This is because in some states alternatives besides just using more land are being used intensively in to increase production, such as in the case of Puebla, Morelos and Jalisco (states with higher yields). In other states, such as Veracruz, production is obtained by making greater use of non-reproducible factors or by using more land.

To quantify the heterogeneity of field indicators and describe the value chain from a regional perspective, these factors are complemented by a sugar mill efficiency indicator whose geographical distribution is as follows⁹:

Graph 35. Sugar mill efficiency by state, 2009/10 (%)



⁹ Sugar mill efficiency refers to the allocation of productive economic resources to obtain a greater volume of goods and/or services produced

Source: Self-written.

In regards to this indicator, sugar mills in Chiapas, Oaxaca, Jalisco, Colima, Quintana Roo, Nayarit, Veracruz, Michoacán and Puebla stand out. These states are well above the national average. If we combine these indicators with industrialized surface area, we can calculate the sugar production that the state of Veracruz would have achieved if its field yields were at the level of the former states such as Puebla, Morelos and Jalisco. Thus, the sugar production in the state of Veracruz, with field yields similar to those of Puebla and Morelos, would have been of 3.4104 million tons, 87.8% higher than what was actually accomplished during the last season. Similarly, the same exercise for the states of Puebla, Morelos and Jalisco were carried out, but using yield indicators from the state of Veracruz for each of these three states. The results indicate that if the states had reported the yield percentages of the state of Veracruz, their production would have been 42.9% lower.

Therefore, both the efficiency in fields and in sugar mills is better in the states of Morelos, Puebla, Jalisco, San Luis Potosi, Chiapas and Oaxaca. These states have very high production standards which are above the national average as far as yields obtained from fields and sugar mills. These mills are characterized by their basing production on the use of factors such as labor and physical capital. However, their production volume is less than states like Veracruz which, despite being characterized by its high sugar production levels, has production standards that are lower than other states. The production scale in Veracruz is achieved through the use of more land.

A government program implemented at its three levels to improve the field performance indicators in the state of Veracruz would significantly increase the supply of sugar in the domestic market. This would improve producers' income levels given the region's deficit situation in Mexico and the US.

II.5.3 Importance of the sugar industry in rural areas

In order to analyze the socio economic impact of sugarcane production in the country's regions, states and their corresponding municipalities were first classified into the following two categories:

- a) Producers
- b) Remaining non-sugarcane producers

Secondly, the following variables were identified: population, economic units, those whose main activity is agriculture, available surface area, aggregated value and marginalization¹⁰. This last index is used to evaluate the development of sugarcane producing municipalities. The basic premise for this analysis is that the production of sugarcane has a positive effect in the states and municipalities where it is performed, causing a lower rate of marginalization, i.e. reducing low income, improving access to

¹⁰ The marginalization index is the result of an estimation of main components of four measurements and nine indicators: education (illiteracy and population without complete basic education); housing (occupants in homes without running water or sewage and toilet, with dirt floors, no electricity and overcrowding); income (employed population earning up to two minimum wages); distribution of the population (population in towns with less than 5000 inhabitants). This index is constructed using socioeconomic indicators that reflect social exclusion, each of which uses values between 0 and 100 where: zero is when none of the inhabitants of a given analysis unit suffer the deprivation referred to by the indicator and one hundred is when all inhabitants are affected by the said form of social exclusion. Therefore, the marginality index is a good indicator of the relative level of deprivation in which significant proportions of the population are living in each state or municipality.

education and providing proper housing and other basic services.

As previously mentioned, in Mexico sugarcane is produced in fifteen states, five of which contributed 69% of all national production during the 1999/2000 to 2009/2010 cycles. These five are Veracruz, San Luis Potosi, Jalisco, Oaxaca and Tamaulipas¹¹.

These same states contributed \$2.1909 trillion pesos of aggregated value, i.e. 43% of the national aggregated value for 2008. The average contribution per state was 2.9% of aggregated value, lower than the average contribution of states that do not produce sugarcane which is 3.3% (see table below).

Table 6. Aggregated value of sugarcane producing states

States	Aggregated Value Million pesos	Share		Population (2005)	Share
		Subset	Average State		
Sugarcane producers Sugar (15)	2,190,853	43.4%	2.9%	46,065,494	44.6%
Non-producers (17)	2,859,629	56.6%	3.3%	57,197,894	55.4%
National	5,050,481	100.0%		103,263,388	100.0%

Source: DGIB with Economic Census data from 2009 by INEGI and the CONAPO Marginality Index of 2005.

The main attribute of sugarcane producing states is that they are closely linked to agricultural activities, since they hold 62% of all agricultural economic units whose main source of income is agricultural activity. Furthermore, 41% of their surface area is dedicated to this activity, while other states dedicate only 18% to agriculture.

Table 7. Agricultural units and available surface area

States	Economic units: Agricultural (a)	Share	Hectares Agricultural (a)	Share	Primary Income (b)	Share	Share Agric/Total
Sugarcane producers							
Sugar (15)	2,270,383	60%	17,096,086	57%	2,014,334	62%	41%
Non-producers (17)	1,484,661	40%	12,806,005	43%	1,212,664	38%	18%
National	3,755,044		29,902,092		3,226,998		27%

(a) Units reporting farming as their main activity.

(b) Units reporting farming as their main source of income.

Source: DGIB Agricultural Census data from 2007 by INEGI.

The state marginalization index shows the states in the best position are Baja California, Coahuila, D.F. and Nuevo Leon, while the states of Chiapas, Guerrero and Oaxaca have a very high marginality index¹². Of the fifteen states that report sugarcane production, eight of them have a high or very high marginalization index, two have medium levels, and five have low marginalization. On average, sugarcane producing states have a high degree of marginalization compared to the rest of the states in Mexico.

Table 8. Development indicators in sugarcane producing states

States	Population	Basic Education	Housing without Low	Small	Marginalization
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¹¹ Agroindustrial Development of Sugarcane Harvests 1999/2000 - 2009/2010.

¹² According to CONAPO estimates

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		Incomplete	Services	Salaries	Locations	Index
Sugarcane producers Sugar (15)	46,065,494	18.7%	15.9%	51.5%	36.0%	36.0%
Non-producers (17)	57,197,894	13.7%	12.5%	41.3%	27.4%	-32.0%

Source: DGIB with data from CONAPO Marginality Index of 2005.

At the municipal level, there are 225 municipalities that are registered as sugarcane growers, i.e. 9.1% of the total. Their total population is 12.4 million (about 12% of the total) during the year 2010 and their average contribution to the national aggregated value is 7.1%. It is worth noting that the average contribution to aggregated value is lower than the national average, both at the municipal level and in per capita terms.

Table 9. Development indicators in sugarcane producing states

	Aggregated Value	Share		Population		Ag. Value Per capita
Municipalities	Millions of pesos	Subset	Municipal average	(2005)	Share	Millions of pesos
Sugarcane producers Sugar (227)	360,227	7.1%	0.032%	12,375,837	12.0%	29.1
Non-producers (2227)	4,690,254	92.9%	0.042%	90,887,551	88.0%	51.6
National	5,050,481	100.0%		103,263,388	100.0%	48.9

Source: DGIB with Economic Census data from 2009 by INEGI and the CONAPO Marginality Index of 2005.

Agricultural economic units dedicated to the cultivation of sugarcane (477,697) represent 13% of all units engaged in farming and use 14% of the national agricultural surface area (4.3 million hectares), and 45% of the agricultural area of their respective municipalities. The surface area occupied per sugarcane unit is 15% higher than the surface area used for other crops.

Table 10. Agricultural units and available surface area at municipal level

	Economic units: Agricultural (a)	Share	Agricultural hectares	Share	Primary Income (b)	Share	Share
Municipalities							Agric./Total
Sugarcane producers (225)	477,697	13%	4,280,253	14%	382,263	12%	45%
Non-producers (2229)	3,277,347	87%	25,621,838	86%	2,843,359	88%	25%
National	3,755,044		29,902,092		3,226,998		27%

(a) Units reporting farming as their main activity.

(b) Units reporting farming as their main source of income.

Source: DGIB Agricultural Census data from 2007 by INEGI.

In contrast to the high state marginalization index (0.36), the marginality index of the 225 sugarcane producing municipalities (17% of all municipalities in the 15 states) is low (-0.32).

In evaluating each of the development indicators it is concluded that sugarcane producing municipalities report problems mainly in the following areas:

- Education: 23.8% of the population is illiterate or has not completed basic education.
- Small Towns: 56.7% of the population lives in towns with less than 5,000 inhabitants, i.e. rural areas.
- Income: 60.7% of the population receives income of less than two minimum salaries.

Table 11. Socio economic characteristics of sugarcane producing municipalities and states

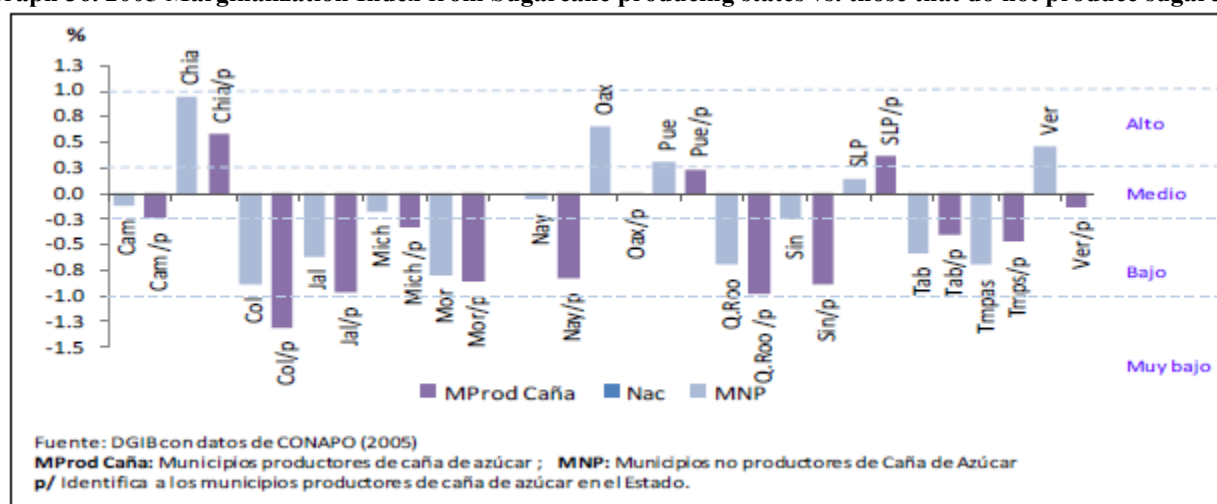
Municipalities	Population	Basic Education Incomplete	Housing without Services	Low Salaries	Small locations	Marginalizati on index
Sugarcane producers (227)	12,375,837	23.8%	18.0%	60.7%	56.7%	-41.0%
Non-Sugarcane prod. m. (1345)	33,689,657	32.2%	24.8%	79.1%	80.3%	34.0%
Non-producers (2227)	90,887,551	22.4%	18.7%	56.0%	60.8%	-22.0%
National	103,263,388	15.7%	14.0%	45.3%	29.0%	

Source: DGIB with data from CONAPO Marginality Index of 2005.

Within the 15 sugar-producing states there is also a contrast. Sugarcane producing municipalities have lower levels of marginalization than those municipalities that do not produce cane.

The marginalization index of municipalities that do not produce sugarcane shows higher levels than in producing municipalities. This indicates a significant lag in all the aspects being evaluated, i.e. education, housing, income and size of town. These municipalities are characteristically smaller than those that produce cane, with 80% of their population living in towns of less than 5,000 inhabitants. In addition, 60.7% of the population earns less than 2 minimum salaries, 23.8% have not completed basic education, and almost 18% of the houses show a lag in some of the indicators (mainly regarding overcrowding and the availability of piped water).

Graph 36. 2005 Marginalization Index from Sugarcane producing states vs. those that do not produce sugarcane



The states that produce sugar cane are characterized by a greater share in agricultural production, but show greater lags in development social development indicators.

However, at the municipal level, sugarcane producing municipalities maintain a marginality index which indicates a better quality of life compared to non-producing municipalities.

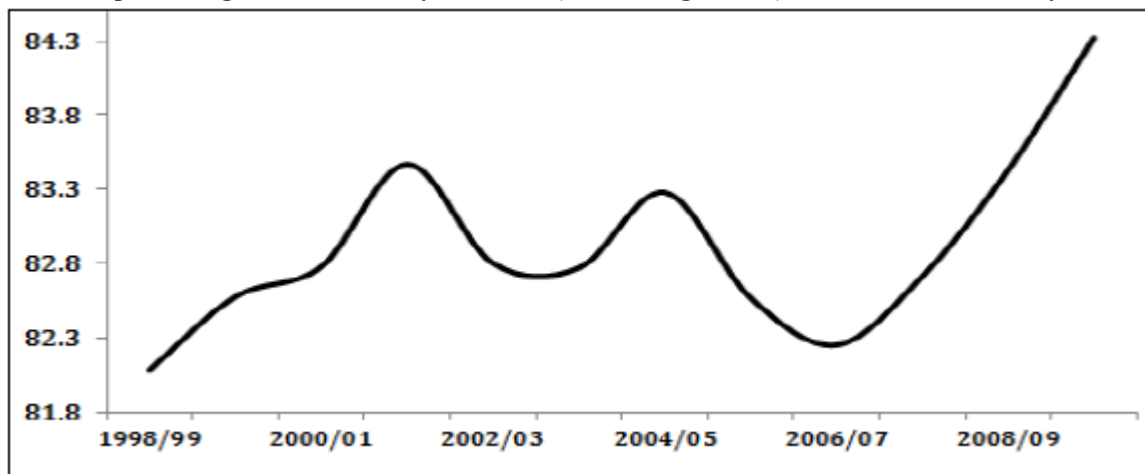
III. TECHNOLOGICAL ASPECTS

This section presents the technological aspects of the Mexican sugar industry. The analysis is carried out in five sections: First, the production efficiency of sugar mills in terms of the productive systems used to produce sugar in both the field and in mills. Second, the sugar chain is analyzed, but here from the perspective of economic units composed of sugarcane fields and sugar mills. Third, an international cost comparison is made between Mexico, the United States and the global average in order to determine the competitive position of Mexico. A comparison is also made of the costs related to the domestic industry between 2005 and 2009. Fourthly, an optimal marketing chain is analyzed and proposed for the domestic sugar industry. Finally, aspects of the technological and innovative development of the sector are highlighted.

III.1 Production Efficiency in the Field and in Sugar Mills

Sugar mill production levels depend on the ability to convert sugarcane content into sucrose, so the ratio of sugar produced by the sugar mill compared to total sucrose received from the field is an indicator of the efficiency with which this process is performed. For the 1998/99 to 2009/10 period, the behavior that this indicator has shown at the national level has been markedly cyclical, as shown below:

Graph 37. Sugar Mill Efficiency Indicator (sucrose/sugar cane), 1998/99 and 2008/09 cycles



Source: Self-written.

This indicator was between a minimum of 82.1% during the 1998 to 1999 business cycle up to a high of 84.3% in the most recent cycle of 2009/10. By incorporating this indicator into the analysis of sugarcane field indicators as described in the previous section, a new classification can be created which, in addition to the efficiency indicators taken from sugarcane fields, includes an efficiency indicator for sugar mills. To create this new classification the following procedure was followed:

The growth rate of sugar production for each sugar mill was calculated for each cycle. This can be divided into the following growth sources (or rates), and this measurement is used as a *proxy* for efficiency in fields and sugar mills:

- 1) *Scale of production, measured by industrialized surface area.*
- 2) *Productivity in the Field*, which can be subdivided into these two components:
 - i. The amount of sugarcane per hectare.
 - ii. The sucrose content of sugarcane.
- 3) *Sugar mill efficiency*, which is measured as the amount of sucrose received by the mill and transformed into sugar.

Once the calculation for each of the 57 sugar mills that were in operation during the 2000/01 to 2007/08 period is completed, the average of the following two indicators was calculated:

- 1) Field Productivity
- 2) Sugar mill efficiency

Under this procedure the following grouping of sugar mills was made:

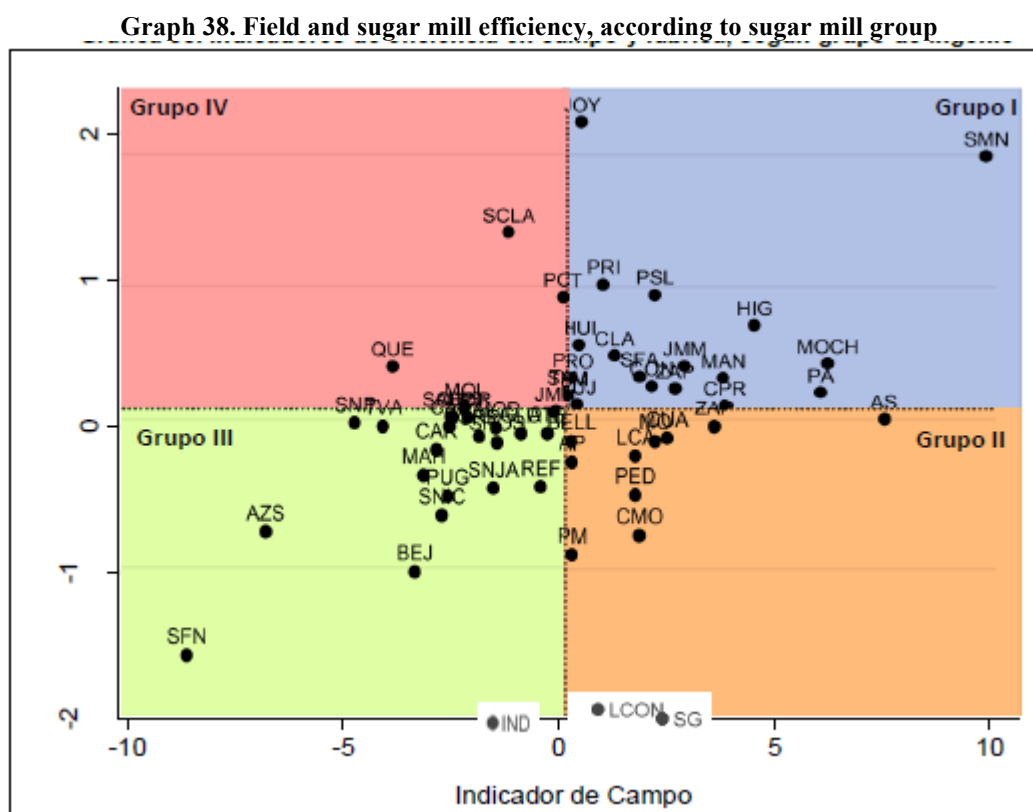
I) Sugar mills whose sugarcane field and mill efficiencies were above the national average (top right, blue).

II) Sugar mills with field efficiency that was greater than the national average, but mill efficiency was below average (bottom right, orange).

III) Sugar mills with mill yields that were above the national average, but that showed below average field efficiency (top left, red).

IV) Sugar mills that were below the national efficiency average both in the field and in mills (bottom left, green).

The following graph shows the grouping made of sugar mills. The black dots represent averages in the field and in mills, respectively.



Notes:

Groups, abbreviations, and names of sugar mills are: Group I: JOY-La Joya; PRO-La Providencia; PSL-Plan de San Luis; HUI-Huixtla; ZAP-Emiliano Zapata; PRI-La Primavera; HIG-El Higo; MOCH-Los Mochis; TAM-Tamazula; SMN-San Miguel del Naranjo; SFA-San Fco. Ameca; MAN-El Mante; JMM-Jose Ma. Martinez; CPR-Central Progreso; PUJ-Pujilic; SNM-San Miguelito; CON-Constancia; PA-Plan de Ayala; CLA-Casasano la Abeja.

Group II: CUA-Cuatotolapam; ZAP-Zapoapita; AP-Alianza Popular; PM-Pablo Machado; MO-Melchor Ocampo; AS-Aarón Sáenz; LCA-Lázaro Cárdenas; CMO-Central Motzorongo; PED-Pedernales;

Group III: BELL-Bellavista; SFN-San Francisco; El Naranjal; ALP-Adolfo López Mateos; TVA-Tres Valles; MAH-Mahuixtlan; SNIC-San Nicolas; CAR-El Carmen; JMM-Jose Ma. Morelos; ATE-Atencingo; PUG-Puga; AZS-Azuremex; REF-El Refugio; BEJ-Benito Juarez; DOR-El Dorado; GLO-La Gloria; CAL-Calipam; SCRIS-San Cristobal; MOD-El Modelo; SNJA-San Jose de Abajo; SNP-San Pedro; SRP-San Rafael del Puete; SROS-Santa Rosalia;

Group IV: SCLA-Santa Clara; QUE-Queseria; MOL-El Molino; POT-El Potrero.

The dashed black lines denote the average efficiency indicator in sugar mills: 0.07 and field: 0056, respectively. To improve visual assessment, the Independencia, La Concepción, and San Gabriel mills were excluded. Field and sugar mill efficiency indicator values for IND-Independencia are -1.29, -11.3; LCON-La Concepción 0.97, -10.74; and SG-San Gabriel 2.56, -11.0.
Source: Self-written.

As can be seen, a total of 19 mills are put in Group 1, and represent mills that have efficiency above the national average in both field and mill operations. These mills are characterized by higher productivity in the field (sugarcane per hectare), and for more extraction of sucrose from sugarcane to be transformed into sugar. This quadrant represents the mills that are in the best efficiency conditions both in the field and in sugar mills.

On the other hand, the sugar mills belonging to group 3, a total of 22 mills, have field efficiency indicators that are below average and their mill productivity does not allow for maximum extraction of sucrose from sugarcane due to the technology being used. These represent the mills that are in some of the worst efficiency conditions, and it is necessary to correct deficiencies in all value chain links in order to improve production efficiency. Here, public policies aimed at improving the status of these mills would have to include the two dimensions analyzed (field and sugar mill), and the results would be seen in the long run.

The mills in group 2, a total of 12, maintain field efficiency indicators that are above average, but their mill efficiency is very limited. Through adequate impetus to their industrial structure, these mills could become stronger and better positioned as far as mill efficiency. Finally, group 4, with four mills, are in the position to extract more sucrose from sugarcane at their sugar mills. By not doing so, their field efficiency poses a limit to production. Providing field support to these sugar mills could easily place them in the group of mills with optimal production processes both in the field and in their mills.

This indicates that the majority of the sugar mills (22 units) have very limited efficiency features that would increase their production and competitiveness. This is because they are lower than national efficiency levels. In contrast, only 19 sugar mills operate at optimal efficiency and production standards. There are other mills that, through appropriate agricultural and industrial support, could achieve higher efficiency standards in the short and long term, and therefore have higher levels of productivity and competitiveness.

In this context, the efficiency of Mexican sugar cane fields and sugar mills also indicates that there is an agribusiness that is very behind and with heterogeneous production characteristics. This, in turn, causes fragmentation in the sugar industry's production and undermines competitiveness.

III.2 Field to Sugar Mill Value Chain

Based on the information from the previous section it is possible to classify the field to sugar mill value chain into two groups:

- 1) Scale: Sugar mills where sugar output level is determined by the industrial surface area being used.
- 2) Efficiency: Sugar mills where sugar output levels are determined by factors such as the use of labor and capital, in addition to land use.

The results of this sugar mill classification are set out in the table below. The number of mills belonging to the Efficiency group comes to a total of 27, and a total of 30 mills are classified as Scale.

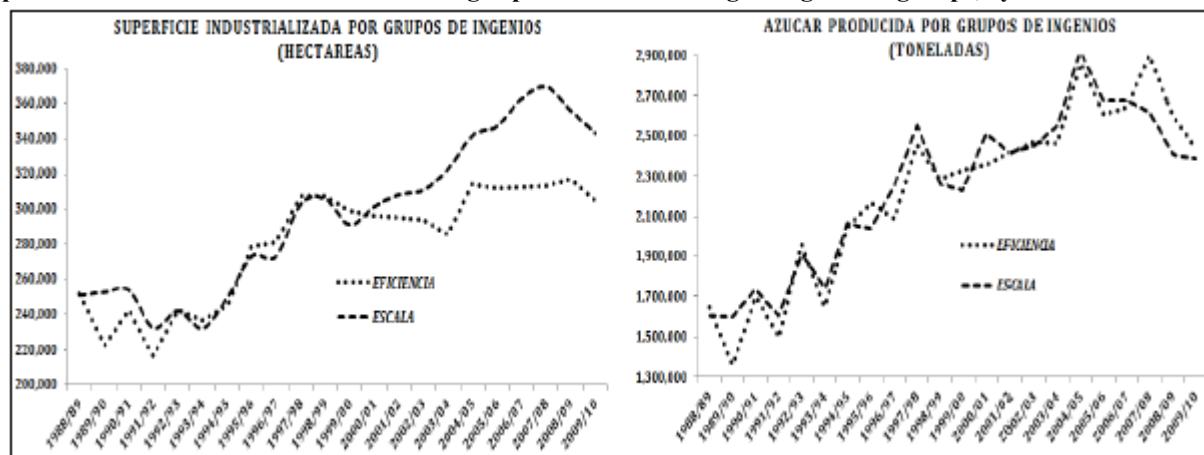
Table 12. Classification of sugar mills according to value chain characteristics: Efficiency and scale

EFFICIENCY	SCALE
Aarón Sáenz	Adolfo López Mateos
Alianza Popular	Atencingo
Bellavista	Azsuremex
Casasano la Abeja	Benito Juárez
Central Motzorongo	Calipam
Central Progreso	Cuatotolapam
Constancia	El Carmen
El Higo	El Dorado
El Mante	El Modelo
El Molino	El Potrero
Emiliano Zapata	El Refugio
Huixtla	Independencia
Jose Ma. Martínez	Jose Ma. Morelos
La Primavera	La Concepción
Lázaro Cárdenas	La Gloria
Los Mochis	La Joya
Melchor Ocampo	La Providencia
Pedernales	Mahuixtlan
Plan de Ayala	Pablo Machado
Plan de San Luis	Puga
Pujilic	San Cristobal
Queseria	San Fco. El Naranjal
San Fco. Ameca	San Gabriel
San Miguel del Naranjo	San Jose de Abajo
San Miguelito	San Nicolas
Tamazula	San Pedro
Zapoapita	San Rafael del Puete
	Santa Clara
	Santa Rosalía
	Tres Valles

Source: Self-written.

Using this same classification, the following chart shows the industrialized surface area and sugar production according to sugar mill groups for the last 21 cycles. As shown on the left side, the group of mills characterized by a value chain dominated by production *Scale* has increased, while those mills whose value chain is characterized by field and mill *Efficiency* have at least maintained a constant level of production in recent cycles.

Graph 39. Industrialized surface area and sugar produced according to sugar mill groups, cycles 1998/99 to 2009/10



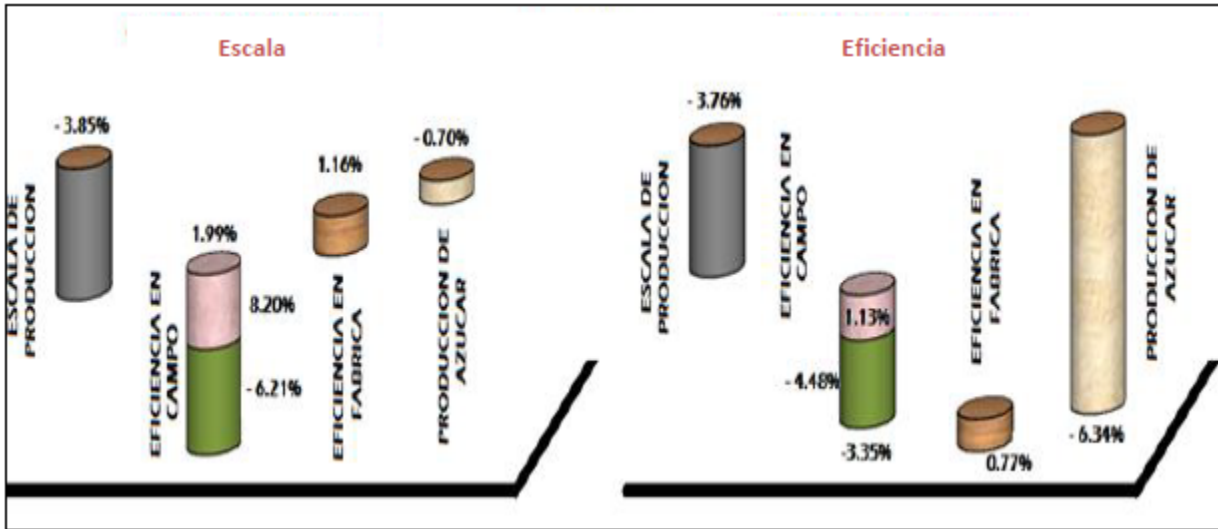
Source: Self-written.

In this context, the graph on the right shows sugar production according to sugar mill groups. The mills whose value chain is classified as Scale recently obtained a lower amount of sugar from the field. By contrast, those sugar mills where sugar production volume is determined by Efficiency produce less in the field but have higher mill production. Sugar production for the 2009/10 cycle was the result of a reduction of 61.3 thousand tons in the volume of production by the mills classified as Scale. This, in turn, was more than offset by an increase of 164.8 thousand tons in the level of sugar production from the group in the Efficiency value chain.

During this same cycle variations in the growth of Scale and Efficiency sugar mills were explained by variations in the Efficiency mills, since these experienced a significant decrease in sugarcane fields (-4.48%), although to some extent this was offset by greater production efficiency (0.77%). This has caused this type of mills to reduce their output by 6.34%, more than that of Scale mills.

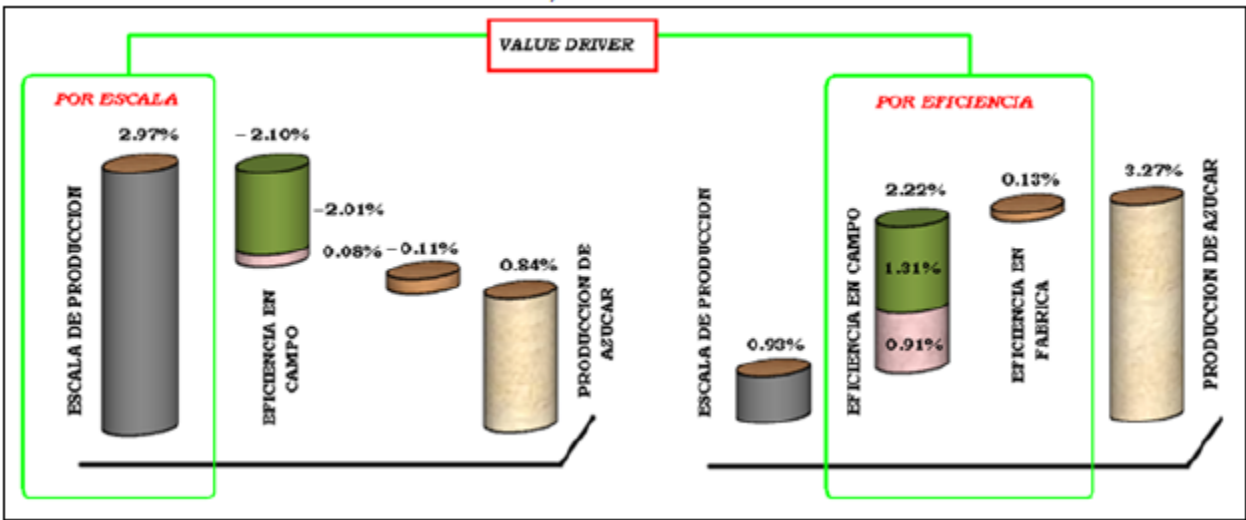
Moreover, during the 2000/01 to 2009/10 cycles, a decrease in the rate of growth at Scale classified mills reflected a separating of sugar production growth rates between these two groups. This is because the "value driver" of this value chain has put surface area efficiency at a disadvantage both in the field and at sugar mills. Upon combining the information from both of these groups and applying the decomposition analysis according to growth sources, the following results are obtained.

Graph 40. Growth sources for sugar production in Scale and Efficiency value chains, cycle 2009/10



Source: Self-written.

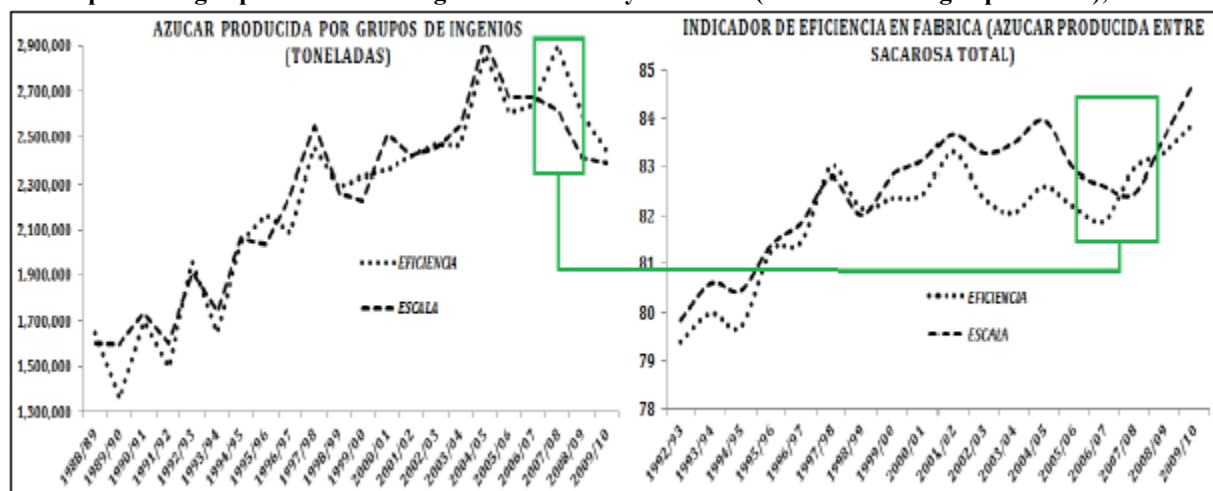
Graph 41. Growth sources for sugar production in Scale and Efficiency value chains, cycle 2000/01-2009/10



Source: Self-written.

In this last graph, we see not only the similarities and/or differences in the sources of production variation, but also the behavior of its actual levels. The lower sugar production levels in the Scale mills are understood to be due to lower efficiency in the field and in sugar mills as compared to mills that are characterized by their Efficiency. This can be seen most clearly in the following graph (left), where the drop in production at Scale mills is faster.

Graph 42. Sugar produced and Sugar mill efficiency indicator (sucrose/total sugar produced), 2009/10



Source: Self-written.

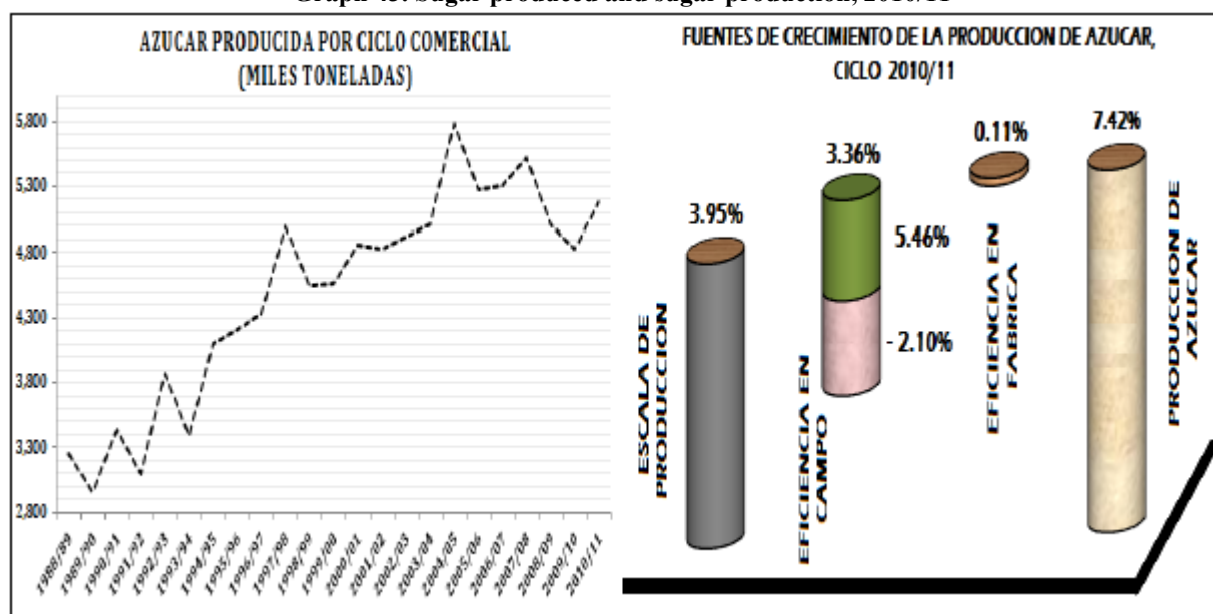
Meanwhile, the Scale mills are characterized by the fact that they depend on land area, have higher levels of sucrose acquisition (right side of the graph), and, because of this, this group of sugar mills has systematically stayed above Efficiency based sugar mills (the latter supposes higher mill yields). However, the Scale mills have advantages regarding sugar cane (the raw material) sucrose yields in that they produce higher volumes in comparison to Efficiency based mills. They also use diverse production systems.

From the above analysis, it can be concluded that sugar mills face serious deficiencies in increasing productivity and competitiveness as there is not complete integration in the value chain of this agricultural industry. The predominant feature is a heterogeneous production line, composed of mills and sugarcane fields that produce a large variety of quality standards, many of which are well below average reference parameters. This causes fragmentation in sugar industry's production chain and thereby results in a low level of productivity and industrial competitiveness.

III.2.1 Recent Trends

Based on the latest information from the 2010/11 cycle, total sugar production increased by 7.4%, rising from 4.8255 million tons during the 2009/10 cycle to 5.1835 million tons during the latter cycle. The sources of this increase were production scale and field efficiency.

Graph 43. Sugar produced and sugar production, 2010/11



Source: Self-written.

III.3 Costs Analysis

Production cost estimates and comparisons between countries serve a number of objectives. First, these form the basis for comparing the competitiveness of production and for calculating government support to encourage the production and marketing of sugar and sweeteners from the respective industries in producing countries. In addition, trends in production costs can be compared to assess the feasibility of production in markets that can be freed. Finally, information regarding the contribution of each component of production and marketing costs can be used to interpret the impact of various factors, such as exchange rates or raw material prices, on production incentives in different countries. This information also helps in the formation of regional trade preferences such as NAFTA.

All of this information can back up decisions about production, investment and policy alternatives for future market expectations (USDA, 2011).

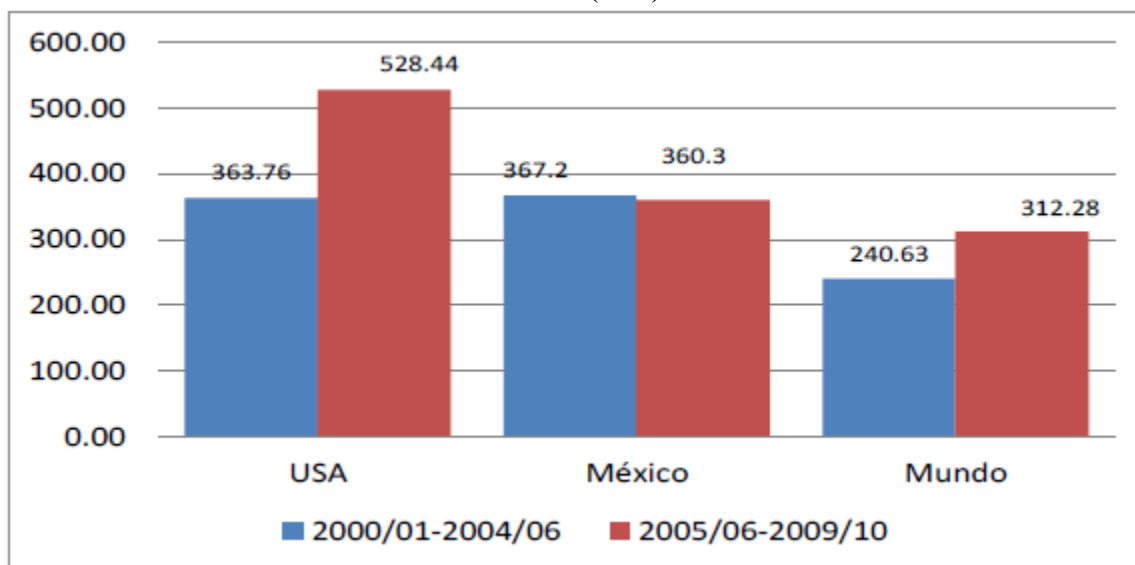
1) International costs

Therefore, a costs comparison is made between the US and Mexico in order to determine the competitiveness of the domestic sugar industry with respect to one of its major trading partners which is also the main consumer of Mexican sugar. The data comes from Economic Research Service (ERS) of the USDA, with information from LMC International (See Appendix A1).

Sugar production in the United States and Mexico is of considerable volume. In the United States, sugar is produced from sugar beets and sugarcane, while in Mexico, sugar comes only from sugarcane. Therefore, the average cost of the production of raw sugar in Mexico reached 367.20 USD/t during the

2000/01 to 2004/06 period. This was an average production cost higher than in the United States and higher than the global average. During the 2005/06 to 2009/10 period, the average cost of production for the Mexican sugar industry declined by 1.9%, while costs in the US increased by 45.3%, and by 29.3% worldwide. This placed sugar production in Mexico just above the world average, and below the average cost in the United States.

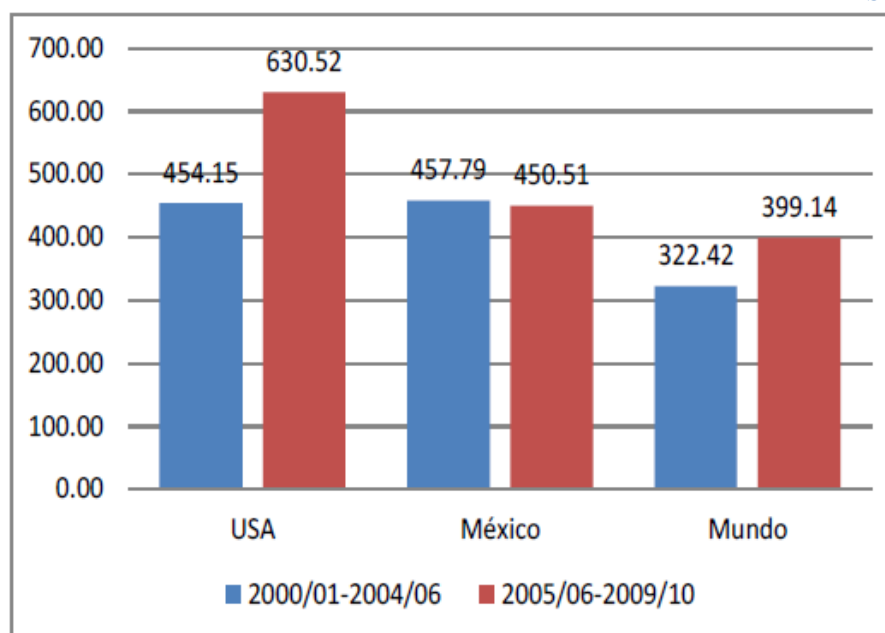
Graph 44. Average cost of sugar production in Mexico, the United States and the World, 2000/01-2004/06, 2005/06-2009/10 (USD)



Source: ERS, USDA.

Regarding the average cost of refined sugar, the picture is similar. The average cost of producing this type of sugar for the domestic industry was 457.79 USD during in the 2000/01 to 2004/06 period, a figure that is below the global average, but very similar to that of the United States. During the next period which was from 2005/06 to 2009/10, the average cost of refined sugar in the United States was 630.52 USD. This was an increase of 38.8%. In Mexico, the average cost was estimated at 450.51 USD, representing a decrease of 1.6%. The average global cost was 399.14 USD, an increase of 23.8% over the previous period (see graph below).

Graph 44. Average cost of refined sugar production in Mexico, the United States and the World, 2000/01-2004/06, 2005/06-2009/10 (USD)



Source: ERS, USDA

In Mexico, the cost structure is above the global average, so its competitive ability to place its product on the international market is very difficult. Therefore, given the similarity in the cost structure of the United States, this competitive situation can be taken advantage of in placing a greater amount of sugar in the US market.

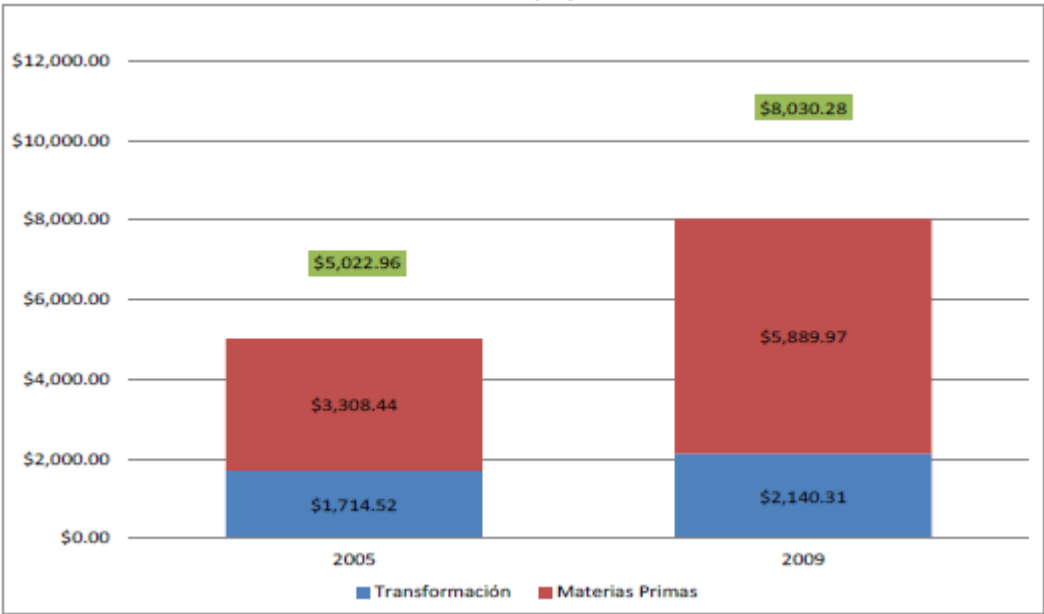
2) Mexican sugar industry costs

Including all the costs of Mexican sugar mills, such as for raw materials and sugar processing, during 2005 and 2009, it can be seen that the cost of sugar production has increased during this period¹³. From the above it is clear that total costs increased by 16.9% on average per year during 2005 and 2009. During the period between 2005 and 2009, changes in the total costs were mainly due to the increased cost of raw material (crushed cane), which increased by 21.2% as an annual average (see graph below).

In proportion, nearly 75% of the total costs for the production of sugar are raw materials, which in turn are determined by the reference price for sugarcane (see Appendix A2). This is important since the freeing and/or fixing of sugarcane prices can significantly impact the competitive position of the sugar industry both nationally and internationally. Therefore, it is necessary to optimize the production processes of the sugar value chain.

Graph 46. Average costs: Raw material, processing and totals in the sugar industry, 2005, 2009 and 2010 (\$/t)

¹³ For methodological explanation see Appendix A4.



Source: Preparation and calculations self-performed.

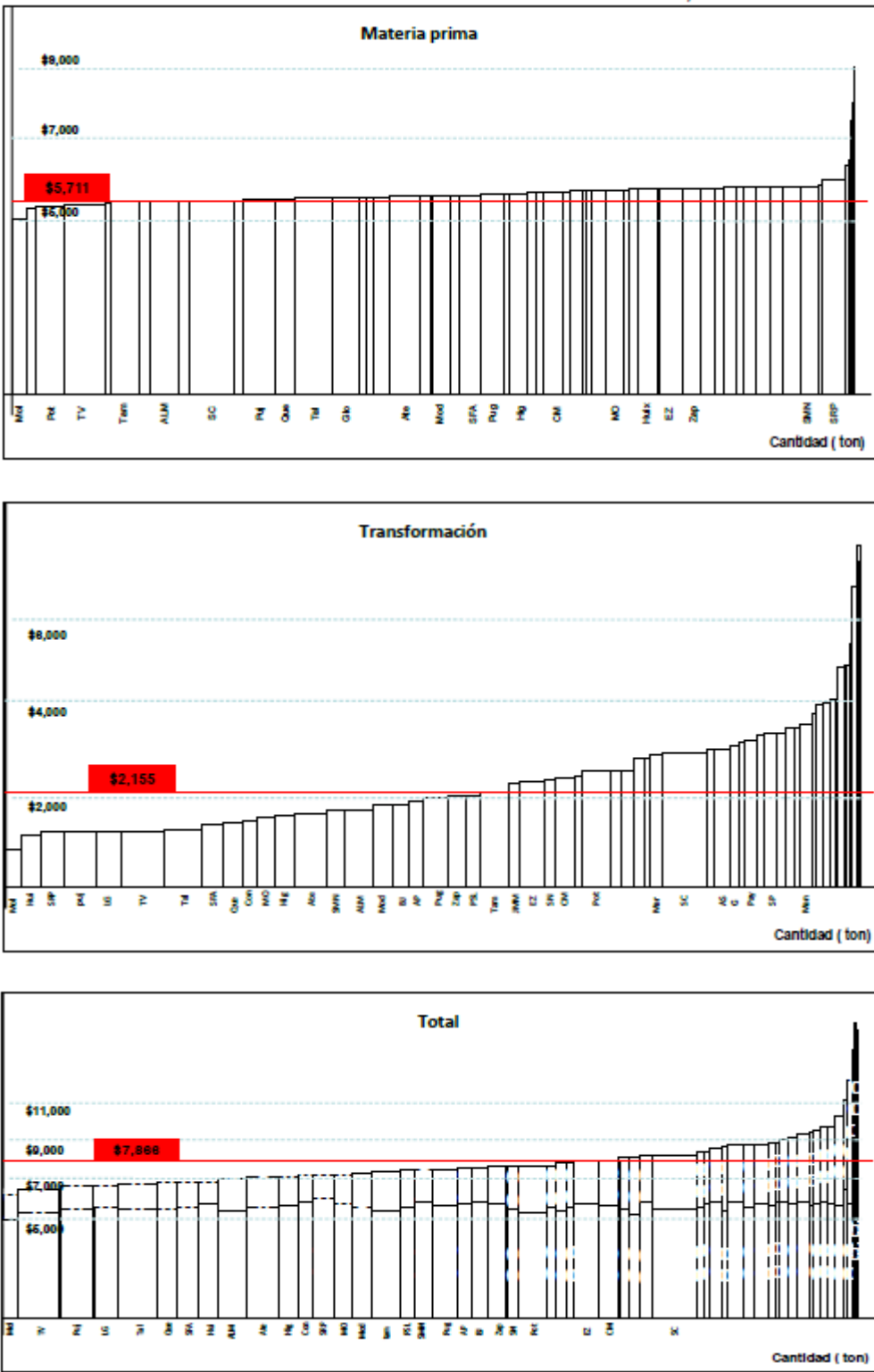
In this same line of thought, the following graphs show the calculations of raw materials, processing and total costs for the same 2005 and 2009 periods per sugar mill. On the horizontal axis, each bar represents the production volume of each mill, and the vertical axis represents the cost level. The dotted line represents the average cost in each case.

As shown, the sugar mill production cost, for each component and their respective totals, decreases along with the production level, but there are mills that produce very little sugar at very high costs. However, the reference prices of sugarcane, depending on the price of sugar, provide the necessary protection for them to continue operating under inefficient conditions.

Keeping this in mind, the mills that operate under these conditions have no incentive to modernize their equipment and make the necessary investments to increase their competitiveness and operational levels. For example, during 2005 most of the mills were operating above the cost of raw material, and just under half were operating at a cost equaling the average between processing and total costs.

Graph 47. Cost Curve for the Sugar Industry, 2005
Quantity (ton)

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SECTOR IN MEXICO

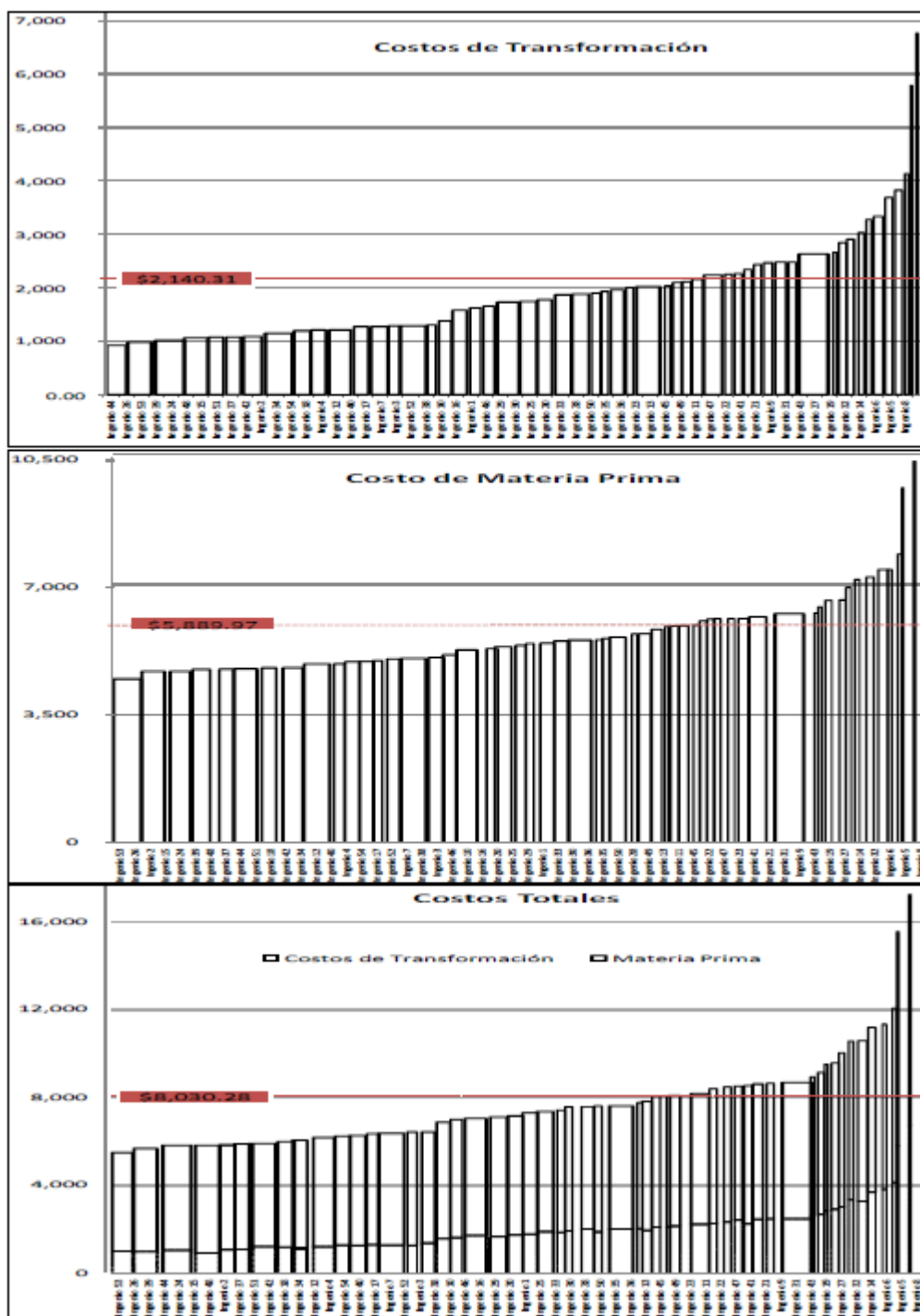


Source: Preparation and calculations self-performed.

In 2009, the status of production costs at Mexican sugar mills improved, as not only was the average cost of processing reduced, but most mills operated below average cost levels. However, the presence of sugar mills with low production volumes and high costs persists.

Graph 48. Cost curve in the Sugar Industry, 2009

ANALYSIS OF THE ECONOMIC, TECHNOLOGICAL AND MARKET POLICY STATUS OF THE SWEETENER SECTOR IN MEXICO



Source: Self calculated and created

In addition, Mexico has a more cost-competitive position with respect to the United States since the average cost of sugar and refined sugar production was lower during the 2005/06 to 2009/10 period. However, relative to the global average cost, the Mexican sugar industry is significantly distant, making it necessary for sugar mills, and for the industry in general, to improve its production standards in order to reduce the gap and form a domestic industry which is more homogeneous and more internationally competitive.

With respect to the cost structure of sugar mills, it is clear that the main cost determinant is the cost of

raw materials, or sugar cane, which in turn is determined by the reference price point. This may offer an opportunity to improve sugar mill production. Besides the above, production volume scale inversely determines sugar mill cost levels. This means that greater production volume equals lower production costs. Many of these mills operate at the limits of the average cost or above them, as their production volume compared to total production is limited by sugar mills' production scales.

IV. SUGAR INDUSTRY POLICY

In this section, sugar trade policy is examined. First, a case study of US sugar policy is presented in order to describe and understand the elements that comprise it. Second, the current status of sugar trade policy in Mexico is presented.

IV.1 United States

The US sugar program uses price supports, domestic marketing allotments, and tariff-rate quotas to influence the amount of sugar available to the US market. The program holds US sugar prices above comparable levels in the world market. The origin of the program can be traced to legislation in the Agriculture and Food Act of 1981 (1981 Farm Act). The program has been reauthorized with some modifications in succeeding Farm Acts. An important aspect of the program is that it operates, to the maximum extent possible, at no cost to the Federal Government by avoiding the forfeiture of loans from the USDA's Commodity Credit Corporation (CCC).

A new measure introduced in the Food, Conservation, and Energy Act of 2008 (2008 Farm Act) to help avoid loan forfeitures is the Feedstock Flexibility Program (FFP). The FFP will divert sugar in excess of domestic food consumption requirements to ethanol production.

The following is an explanation of sugar policy instruments used by the United States.

1) Domestic Price Support

The 2008 Farm Act allows the USDA to make loans available to processors of domestically grown sugarcane and to domestic processors of sugar beets at set loan rate levels for fiscal years (FY) 2009-13. Loans are taken for a maximum term of 9 months and must be liquidated along with interest charges by the end of the fiscal year in which the loan was made. Unlike most other commodity programs, the sugar program makes loans to processors and not directly to producers. The reason is that sugarcane and sugar beets must be processed into sugar before they can be traded and stored. To qualify for loans, processors must agree to provide payments to producers that are proportional to the value of the loan received by the processor for sugar beets and sugarcane delivered by producers. The USDA has the authority to establish minimum producer payment amounts.

2) Flexible Marketing Allotments

Sugar sold in the United States for domestic human consumption by domestic sugar beet and sugarcane processors is subject to marketing allotments, as a way to guarantee the sugar loan program. The overall allotment quantity (OAQ) is determined subject to two conditions: 1) domestic sugar

prices remain above forfeiture levels and 2) the OAQ is at least 85 percent of estimated deliveries for domestic human consumption for the marketing year (October to September).

3) Feedstock Flexibility Program

The Feedstock Flexibility Program operates to divert sugar from food use to ethanol production. On September 1 (1 month before the end of the marketing year), the USDA announces the amount of sugar (if any) to be made available for sale to ethanol producers.

4) Tariff-Rate Quotas (TRQ) and other trade measures

The United States establishes separate tariff-rate quotas (TRQ) for imports of sugar. Prior to the start of the fiscal year (October 1-September 30), the Secretary of Agriculture announces the quantity of sugar that may be imported at the preferential in-quota tariff rate during that fiscal year.

Under the Uruguay Round Agreement on Agriculture (AoA), the United States agreed to make available for import a minimum quantity of raw and refined sugar each marketing year. This amount is equal to 1.139 million metric tons, raw value (MTRV). Included in this amount is a commitment to import at least 22,000 MTRV of raw sugar.

According to the Harmonized Tariff Schedule of the United States (Ch.17, Additional US Note 5 (a) (ii)), whenever the Secretary of Agriculture believes that domestic supplies of sugars may be inadequate to meet domestic demand at reasonable prices, the Secretary may modify any quantitative limitations that have previously been established, but not below the minimum quantities under the AoA.

The raw cane sugar TRQ is currently allocated to 40 countries based on a representative period (1975-81) when trade was relatively unrestricted. The refined sugar tariff rate quota is currently allocated to Canada and Mexico, and there is a quantity of refined sugar that is available to all countries on a first-come, first-served basis. Likewise, there is an allocation for specialty sugars, which is also on a first-come, first-served basis.

The in-quota tariff for sugar is equal to 0.625 cents per pound. The over-quota tariff is 15.36 cents per pound for raw sugar and 16.21 cents per pound for refined sugar. In addition to the over-quota tariffs, there are safeguard duties based on the value or quantity of the imported sugar.

5) Re-Export Programs

The United States also operates two re-export programs, as well as a sugar-for-polyhydric alcohol import program, to help US sugar refiners and manufacturers of sugar-containing products compete in world markets. The program allows US participants to buy sugar at world prices for use in products that will be exported onto the world market.

6) Dominican Republic-Central American Free Trade Agreement

Under these agreements there are specific provisions for trade in sugar. The United States establishes country-specific TRQ for DR-NAFTA countries, starting at a total of 107,000 metric tons in 2006 (year 1) and growing to 151,140 metric tons in year 15, thereafter growing by 2,640 metric tons per year. A 2,000-metric-ton TRQ, with no growth, is established for Costa Rica.

IV.2 Mexico

As mentioned, the sugarcane agribusiness has a high social and economic impact due to the opportunities and employment generation in Mexican industry and farming. It has multiple effects on the economic activity of sugarcane regions. Being a high-energy product it has been considered that sugar is a basic part of the Mexican diet and is also an important material for the industrial food and beverage manufacturing sector. It is estimated that in Mexico the sugar industry supports about two million Mexicans and creates jobs in both agriculture and manufacturing.

The features of the cultivation and processing of sugar cane, its social implications and the peculiarities of the sugar market have led to booms and crises throughout the history of our country. These circumstances have necessitated the direct intervention of government policies in an effort to balance and reorganize the sector, as occurs in most countries where this activity is carried out.

This is made evident with the existence of a specific legal and institutional framework for the development of the sugar industry, which is not observed with other farming products and activities. This support is given even if the recipients are also beneficiaries of public resources that are allocated to support agriculture development.

Article 25 of the constitution provides that the law shall establish mechanisms to facilitate all forms of social organization for the production, distribution and consumption of socially necessary goods. Therefore, on August 22, 2005, the Sustainable Development of Sugar Cane Act was enacted in the interest of public and social order due to its basic and strategic outlook for the national economy.

This Act states that sugarcane is a basic and strategic commodity and that the planting, growing, harvesting and industrialization of sugar cane is of public interest. The Act is intended to regulate the activities associated with contract farming along with the sustainable development and integration of sugarcane and all the processes that are involved, ranging from planting to marketing of sugarcane, its products, by-products, co-products and other derivatives.

The Act provides a specific institutional framework through the establishment of a National Committee for the Sustainable Development of Sugarcane, CONADESUCA. This body coordinates and implements all activities established by law that are related to the sugarcane agribusiness. The highest authority in this area is the CONADESUCA Board of Directors which is composed of public and private organizations seeking to coordinate and combine actions to address and monitor the most important issues in the sector. Notable among these issues is the development of national sugar stocks and a deciding on a methodology for determining the sugarcane reference price for each sugar cycle.

SAGARPA is the entity responsible for mandating and coordinating with the three levels of government. It also coordinates public policies aimed at promoting profitability, productivity and the competitiveness of the sugarcane agribusiness. Furthermore, it establishes programs for the promotion and development of the sugarcane agribusiness and promotes schemes that encourage investment in sugarcane fields and in the cane sugar industry.

The Ministry of Economy is part of the CONADESUCA Board of Directors and, in accordance with their duties, is responsible for promoting, guiding, encouraging and stimulating national industry along with setting policy for the industrialization of agricultural products, in coordination with the competent

entities. It is also responsible for formulating and directing policies that ensures the supply of basic commodities in the country.

It has the authority to establish non-tariff regulation measures, such as import quotas, to resolve imbalances and risks in the supply of sugar.

In this area, the Ministry of Economy establishes policy measures aimed at providing security regarding the availability of enough sugar to satisfy sugar consumers' needs. This is especially important considering the fact that sugar is not only important to end consumers, but is also an important raw material for several industries that produce foods, beverages and other products. During the sugar cycles ranging from 2008 to 2011, and within the framework of its powers, the Ministry of Economy, reacting to the needs of all members of the supply chain, implemented various sugar importation quotas. This has facilitated the orderly importation of the product and thereby has ensured a domestic supply of sugar.

V. CONCLUSIONS AND RECOMMENDATIONS

The international picture is of an industry that is highly protected in nearly all producing countries. There are, on one hand, regions with severe deficits such as Asia, the ex-Soviet Union, North Africa, North America and Europe. On the other hand there are countries with a surplus such as Brazil, Guatemala, Thailand and Australia.

In North America (Mexico and US), the abundance or scarcity of sugar in this region which is formed by the two countries, along with a trade policy that limits the participation of third parties, causes sugar prices to fluctuate widely according to the gap between production and consumption and between inventory levels and foreign trade flows. This creates uncertainty and volatility in the region's consumer price of sugar.

In Mexico and the US, sugar mill yields are inferior to those of countries like Brazil. The competitive position of Mexico is even lower than that of the US, a situation that will worsen as long as technological improvements that would compensate for this lag and improve performance in sugarcane production are not implemented. These changes would make Mexico more competitive internationally.

One reason for this problem is the rapid penetration of high fructose corn syrup into the North American market since it is presented as a sugar substitute product, especially in the food and beverage markets. If this trend continues, fructose will continue to gain and solidify its worldwide market share.

In Mexico, the sector performs one of the most important activities in terms of economic and social development in rural communities, generating a value of nearly 30 billion pesos and using a land area of 673,000 hectares. It harvests 44.1 million tons of sugarcane which is processed into sugar and alcohol by 57 sugar mills in 227 municipalities located in 15 of the country's states. The industry generates about 2 million direct and indirect jobs, producing 0.4% of the country's GDP, 2.5% of the manufacturing GDP and 11.6% of the primary GDP.

The region comprised of Mexico and the United States, with its common and restrictive tariff for third countries, creates price behaviors that are explained by the specific supply and demand conditions at any given time.

The standard domestic price increases when it is close to the price of Contract 16 (raw sugar reference in the US) and decreases when it passes the Midwest price (refined sugar reference price in the US).

The above behavior indicates that the price of standard sugar in Mexico establishes an inverse pattern with respect to sugar prices in the United States in order to build a reserve margin for exportation of the product. However, the reserve margin in many cases causes a reduction in inventory which causes the price level in Mexico to rise considerably. This in turn causes uncertainty for domestic consumers in both households and industry.

Additionally, regarding field and sugar mill efficiency, technological heterogeneity exists in sugar cane cultivation and sugar production derived from sugarcane fields in several states. This is because in some states alternatives besides just using more land are being used intensively to increase production while in other states production is obtained by making greater use of non-reproducible factors or by using more land.

This has resulted in the survival of sugar mills and cane fields with high operating costs and low levels of competitiveness with few or no incentives to convert. In addition, the pattern of land ownership creates fragmentation and low productivity in the field along with high crop costs. This situation leads to the disintegration of productive processes in sugarcane fields, the sugar industry, marketing and direct and indirect consumption of sugar.

With few exceptions, the vast majority of Mexican sugar mills are characterized by technological backwardness, low investment, high processing costs and deficiencies in the scale of production. This reduces the sector's ability to leverage its resources and coordinate transformation links to produce in a more efficient way.

Political influences in the writing of regulations that govern the sector, low or no incentive for sugarcane fields and sugar mills to adopt on their own actions that would increase competitiveness, and the public policy objectives of government dependents that govern the sector have all contributed to the creation of regulations that have not been conducive to reaching the developmental potential of the national sugar industry.

Regarding the technological aspects, it can be concluded that sugar mills face serious deficiencies in increasing productivity and competitiveness as there is not complete integration in the value chain of this agricultural industry. The predominant feature is a heterogeneous production line, composed of mills and sugarcane fields that produce a large variety of quality standards, many of which are well below average reference parameters.

This causes fragmentation in the sugar industry's production chain and thereby results in a low level of productivity and industrial competitiveness.

Finally, in regards to trade policy, Mexico and the United States form a region with a common tariff on sugar from third countries. However, in the case of the United States, a range of tools that have resulted in a market full of quantitative restrictions that maintain high market prices are applied. This causes prices in Mexico to fluctuate around these levels generating highly feasible windows of opportunity for Mexican sugar exports to that market. This reduces inventories in Mexico and causes price irregularities. This has moved Mexican trade policies to focus on establishing measures to provide security regarding the availability of sugar in meeting the needs of the country's consumers. This is especially important considering this is not only an end consumer product, but it is an important raw material for various industries that produce food, beverages and other products.

RECOMMENDATIONS

1. Significantly increase the domestic sugar supply. This would be done through a government program at its three levels, in an effort to improve field yield indicators specifically in the state of Veracruz. The goal is to bring these levels up to those of Puebla and Morelos.
2. Place the Mexican sugar industry in a better competitive position relative to other countries, through better use of planted and harvested land along with increased efficiency to extract a greater amount of sucrose from sugarcane. Specifically, provide support for higher yields in cane fields and in sugar mills that have been identified as lagging behind at a medium level (immediate results) and lagging behind at low levels (long term results) in accordance with section III of this document.
3. Avoid price volatility in the domestic market with the most expeditious implementation of import

quotas based on information about foreseeable shortages (low inventory levels) in the domestic market to avoid speculation and its effect on Mexican households and to stabilize the industry that uses this product as a raw material.

4. Generate a database that provides more precise information about the annual consumption of sugar by industrial companies that use it as a raw material in their production processes. This would streamline the supply-demand integration process, reduce production costs and eliminate information failures.
5. Analyze feasible options to create a new sugar inventory reporting mechanism that would provide reliable and timely information and eliminate the information gaps that may exist in the Mexican sugar market.
6. Explore the possibility of forming agreements aimed at amending the regulations governing the sector in order to make it more competitive, encourage development and be well positioned to export surpluses to the US, solidifying Mexican sugar's share in the US market for the long term.

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- Ministry of Economy, National Information and Market Integration System (SNIIM as abbreviated in Spanish). <http://www.economia-sniim.gob.mx/>
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APPENDICES

Appendix A1. LMC international costs methodology

Estimated producers' costs

LMC bases its estimates on a cost engineering scheme. Their calculations take into account the use of labor (wages), machinery, fuels, chemical products and fertilizers, according to the alternative technologies being used in field operations and sugar mill processes. The data, therefore, represents current average costs, and do not necessarily reflect the minimal cost that could be achieved.

The costs of producing sugar from sugarcane and beets are arrived at from three levels:

- ✓ The first includes field costs. This covers the costs included in preparing the soil before planting up to delivery of the sugarcane or beets to the sugar mill. Estimates are made for labor, capital, and for all fuels, chemicals, and fertilizers used in the field.
- ✓ The second level is the factory stage. For sugarcane, this includes all costs from the initial arrival of the cane up to delivery of raw sugar to the sugar mill's storehouse. For beets, this includes all elements up to the delivery of refined white sugar for storage at the mill. For both sugarcane and beets, all proceeds from byproducts are directed towards covering mill costs. As with field costs, estimates are divided into labor, capital, fuel and chemicals.
- ✓ The third level refers to all other costs that cannot be properly included as a field or sugar mill cost.

HFCS costs are calculated differently. Unlike sugar, the purchase of agricultural raw materials (for example corn), is recorded as a factory cost. The close links between producers and manufacturers that typify the sugar industry are absent in the relationship between farmers and the owners of grain mills.

The HFCS production process produces several additional products, including ethanol, corn oil, food products, starches, related sweeteners and other chemicals. Because of the joint nature of products coming out of the production process, LMC determines HFCS production costs in two stages:

- ✓ The first is the process of turning corn into starch. This process is common to all products derived from starch.
- ✓ The second stage is the conversion of starch to HFCS. The yields from byproducts are separated from processing costs and are applied against corn costs, thereby reducing the cost of the raw material.

Administrative costs are implicitly included in processing costs, and therefore are not separated out as in the case of sugar.

The data are reported in terms of US dollars using official foreign exchange rates. Thus, a country can become a low-cost producer when its currency is devaluated, and the contrary occurs when the currency appreciates. (Although not shown here, LMC uses various deflators when it issues estimated

information to give a clearer picture of the varying costs). Capital costs are estimated based on replacement costs. Real interest rates are used in the valuation of capital, and capital gains are excluded from income calculations.

Because earning from investment in capital goods is spread over several years, using the current exchange rates can distribute depreciation charges. By contrast, LMC links capital costs to the price index of capital goods from the US, denominated in US dollars. The ideal way to record land costs is to relate its value to its most likely alternative use (for example, opportunity cost). This procedure is easier in the case of sugar beets, where comparisons with cereal and other grain crops are almost always available. Information from land leasing systems can be used to associate a value with land use. In cases where this procedure may be difficult, the costs associated with obtaining adequate land for cultivating sugarcane are treated as a separate production process.

Appendix A2. Methodology for determining the reference price for sugar and sugar cane

In November 2010, based on the proposals of the National Organizations of Sugarcane Providers and the National Chamber of Sugar and Alcohol Industries, the Undersecretary of Agriculture decided to modify the methodology used for the calculation of the reference price for standard sugar which is used for the purchase of sugarcane. This applied starting from the 2010/2011 harvest season, as follows:

Reference price and pay periods

Pre-liquidation

The reference price for one kilogram of standard sugar for the payment of the pre-liquidation of sugarcane shall be the end result of the final adjustment immediately preceding the cycle.

Final-liquidation

In the first fifteen days of June of each year, using the average prices observed during the month of May, the reference price of sugar for the purpose of payment of the final-liquidation of sugarcane shall be adjusted according to the average weighted price of domestic standard sugar for wholesale and the average for exports as established in section 2.2, paragraph e, subparagraphs i and ii of the Agreement. This shall be calculated from the estimated domestic balance for the corresponding sugar cycle based on the balance prepared by the National Committee for the Sustainable Development of Sugarcane (CONADESUCA) in May.

Final adjustment

As provided for in the Agreement, in October the final adjustment to the reference price for sugar will be calculated using the sugar balance and the average prices observed at the end of the corresponding cycle, as published by CONADESUCA.

The result of the final adjustment will be paid no later than December of the current year.

Definitions and calculation procedure for the reference price of one kilogram of standard basis sugar.

Domestic standard wholesale sugar price (Domestic Market):

a) 23 supply centers (CEDAS) within the country are included and reported on by the National Market Information and Integration System (SNIIM). These are grouped into six geographical regions, according to the following relationship:

Region	CEDAS (Number of CEDAS per State)	States that make up each region
	Distrito Federal	Distrito Federal Mexico

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Central	Mexico (2)	Morelos Hidalgo Tlaxcala Guerrero
West	Jalisco (1) Guanajuato (2) Michoacán (1)	Jalisco Colima Aguascalientes Zacatecas Michoacán Guanajuato
Northwest	Sinaloa (1) Nayarit (2)	Sinaloa Nayarit Durango Sonora Chihuahua BCS Baja California
Northeast	Nuevo León (3) San Luis Potosí (1) Querétaro (1)	Nuevo Leon Coahuila Tamaulipas San Luis Potosi Querétaro
Gulf	Puebla (1) Veracruz (4)	Puebla Veracruz Oaxaca
Southeast	Chiapas (1) Yucatán (1) Tabasco (1)	Yucatan Campeche Quintana Roo Tabasco Chiapas

b) The simple average monthly price is built including the frequent daily standard sugar prices reported by SNIIM in the supply centers located in each region.

c) The simple average monthly price for each region is weighted based on the population of the states that make up the region with respect to the total national population, according to the latest Population and Housing Census or the National Population Census carried out by the National Institute of Statistics and Geography (INEGI).

The domestic standard wholesale sugar price for sugarcane payment is calculated by discounting 6.4% from the price defined in subsection “c”.

Average price of sugar exports made during the sugar cycle.

For the corresponding period, the average export price is determined based on information published by ICE Futures (NYBOT), as follows:

- US Exports: Contract 16 (or its substitutes) plus 6%, less \$50.
- Exports to IMMEX companies: Contract 16 (or its substitutes) plus 6%, less \$50.

- c. Exports to third countries: Contract 11 plus 6%, less \$30.
- d. For purposes of exchange rates, the FIX exchange rate is applied as determined monthly and published by the Bank of Mexico for the corresponding period.
- e. For purposes of weighting the reference price for sugarcane payments, exports include the actual export volume, up to an amount not exceeding the exportable surplus, according to the following definitions:
 - i. Exportable surplus: volume of sugar that results from the difference between domestic production and total sales of sugar mills during the corresponding cycle.
 - ii. Total sugar mill sales: beginning inventory plus domestic production plus temporary sugar mill export returns minus total real exports minus final inventory.
 - iii. Total real exports: these are as reported by the Tax Administration System through the General Customs Administration for the corresponding sugar cycle.

Inventory audits

Commercial sugar sale operations, physical sugar inventories and the accounting record for these with respect to each fiscal year and sugar cycle for sugar mills shall be audited and certified by the Ministry of Public Administration.

These audits shall be performed on the following dates:

- a. By December 31 of each year for physical inventories with certified financial statements.
- b. By May 31 of each year.
- c. By September 30 of each year.

Publication

CONADESUCA will publish on its website all basis information, calculations and results regarding the application of this methodology. The methodology may be modified when there is an agreement within the Group.

Outline for sugarcane payment

According to LDSCA (Sustainable Development of Sugarcane Law), the price of sugarcane is calculated using the following formula:

$$P_{cane} = 0.57 \left(\frac{KARBE}{TCN} \right) P_{ref}$$

Where:

Pref: Set reference price for standard base sugar

Pcaña: Sugarcane price

$\frac{KARBE}{TCN}$: Kilograms of recoverable standard base sugar
Per Net ton of Cane

Reference price for sugarcane payment:

According to the LDSCA, the reference price for the payment of sugarcane is calculated as the weighted average of the domestic price and the estimated export price.

$$P_{ref} = \alpha * P_n + (1 - \alpha) * P_{ex}$$

Where:

P_{ref} : Set reference price for standard base sugar

α : Expected participation from domestic consumption with respect to expected production

$\alpha = \frac{C_e}{Q_e}$: Expected consumption of sugar in the domestic market
Expected Sugar production

P_n : Estimated Price of standard sugar in the domestic market

$(1-\alpha)$: expected participation of domestic surplus with respect to expected production

P_{ex} : expected export price

Annex A3. Direct and indirect jobs in the sugar industry and in regional production

Direct and indirect jobs in the sugar industry, (people)

SUGAR MILL	Maintenance workers	Producers	Shift workers	Cutters	Transporters	Retired	No. of employees	
							Direct	Indirect
Aaron Sáenz	883	1,778	820	808	76	237	4,602	22,299
Adolfo López Mateos	696	3,139	3,562	1,668	686	164	9,915	49,083
Alianza Popular	530	3,372	1,572	1,623	552	165	7,814	38,575
Atencingo	893	7,437	9,042	1,716	1,458	364	20,910	103,458
Azsuremex	380	635	404	497	64	45	2,025	9,990
Bellavista	435	2,317	1,182	364	162	228	4,688	22,756
Benito Juárez	578	3,767	3,868	1,874	1,248	139	11,474	56,953
Calipam	460	1,673	3,098	483	132	96	5,942	29,422
Casasano	479	2,071	684	347	154	159	3,894	18,993
Central Motzorongo	659	3,911	3,042	2,102	664	140	10,518	52,170
Central Progreso	714	2,352	1,672	1,334	734	149	6,955	34,328
Constancia	397	2,049	1,972	1,244	370	94	6,126	30,348
Cuatotlapam	369	2,182	2,046	1,452	356	224	6,629	32,473
El Carmen	659	2,754	2,340	825	350	210	7,138	35,060
El Dorado	534	1,031	402	98	166	227	2,458	11,609
El Higo	724	1,275	1,024	1,632	336	119	5,110	25,193
El Mante	769	1,975	1,720	395	568	203	5,630	27,541
El Modelo	756	4,140	3,494	1,491	304	123	10,308	51,171
El Molino	443	1,792	2,134	530	400	132	5,431	26,759
El Potrero	1,509	6,743	7,040	3,321	1,154	288	20,055	99,411
El Refugio	383	985	636	725	250	100	3,079	15,095
Emiliano Zapata	1,053	5,778	5,108	1,215	492	461	14,107	69,152
Huixtla	575	1,388	706	1,075	572	60	4,376	21,700
Independencia	120	0	0	0	0	297	417	1,194
José María Morelos	448	1,949	2,890	401	238	183	6,109	29,996
La Concepción	55	0	0	0	0	82	137	439
La Gloria	911	5,805	4,416	2,368	1,022	108	14,630	72,826
La Joya	458	1,868	294	684	498	153	3,955	19,316
La Margarita	639	2,368	1,446	1,371	434	156	6,414	31,602
La Primavera	410	466	452	203	376	214	2,121	9,963
La Providencia	676	3,118	3,418	1,276	500	189	9,177	45,318
Lázaro Cárdenas	287	1,572	868	679	174	153	3,733	18,206
Los Mochis	959	11	22	235	948	403	2,578	11,681
Mahuixtlán	412	4,025	2,618	694	158	98	8,005	39,731
Melchor Ocampo	733	1,923	1,514	533	348	163	5,214	25,581
Nuevo San Fco. el	456	2,265	3,134	936	620	255	7,666	37,565
Naranjal								
Pedernales	265	3,394	1,854	728	256	116	6,613	32,717
Plan de Ayala	485	2,778	2,082	1,838	422	371	7,976	38,767
Plan de San Luis	613	3,069	4,036	1,561	784	51	10,114	50,417
Puga	977	4,218	4,896	1,145	604	240	12,080	59,680
Pujilic	913	4,729	5,132	2,438	836	119	14,167	70,478
Quesería	519	2,061	1,354	1,126	440	207	5,707	27,914
San Cristóbal	2,020	8,528	8,880	3,562	3,044	778	26,812	131,726
San Fco. Ameca	597	4,519	1,040	1,075	348	183	7,762	38,261
San Gabriel	73	0	0	0	0	64	137	493
San José de Abajo	631	2,164	2,100	1,067	346	120	6,428	31,780
San Miguel del								
Naranjo	637	3,477	3,100	1,082	526	102	8,924	44,314
San Miguelito	508	3,498	4,886	893	518	145	10,448	51,805
San Nicolás	371	2,195	2,888	841	306	69	6,670	33,143
San Pedro	644	3,690	3,842	1,694	1,160	442	11,472	56,034
San Rafael de Pucte	553	1,018	0	1,134	432	58	3,195	15,801
Santa Clara	568	2,449	2,596	634	314	205	6,766	33,215
Santa Rosalía	605	2,057	1,422	1,239	968	95	6,386	31,645
Tala	854	7,633	6,364	1,791	714	349	17,705	87,478
Tamazula	881	3,188	2,550	453	290	287	7,649	37,382

ANALYSIS OF THE ECONOMIC, TECHNOLOGICAL AND MARKET POLICY STATUS OF THE SWEETENER
SECTOR IN MEXICO

Tres Valles	754	4,503	4,492	3,033	1,502	110	14,394	71,640
Zapoapita	724	2,373	1,962	2,233	728	129	8,149	40,358
National Total	35,634	161,455	144,116	65,766	31,102	10,821	448,894	2,212,005

Source: National Chamber of Sugar and Alcohol Industries

SUGAR PRODUCTION PER SUGAR MILL, 2009/2010 HARVEST

(Tons)				
REGION	SUGAR MILL	STATE	VOLUME	%
CENTRAL	Atencingo	Puebla	179,579.0	3.72
	Casasano "La Abeja"	Morelos	58,934.0	1.22
	Emiliano Zapata	Morelos	142,330.0	2.95
	Calipam	Puebla	5,466.0	0.11
			386,309.0	8.01
HUASTECAS	Alianza Popular	San Luis Potosí	78,602.0	1.63
	Plan de Ayala	San Luis Potosí	68,992.0	1.43
	Plan de San Luis	San Luis Potosí	81,959.0	1.70
	San Miguel del Naranjo	San Luis Potosí	102,722.0	2.13
	Aarón Sáenz	Tamaulipas	84,104.0	1.74
	El Mante	Tamaulipas	66,090.0	1.37
	El Higo	Veracruz	110,619.0	2.29
	Zapoapita	Veracruz	102,963.0	2.13
			696,051.0	14.42
WESTERN	Quesería	Colima	114,921.0	2.38
	Bellavista	Jalisco	35,633.0	0.74
	Tala	Jalisco	214,485.0	4.44
	José María Morelos	Jalisco	54,496.0	1.13
	Melchor Ocampo	Jalisco	99,948.0	2.07
	San Francisco Ameca	Jalisco	119,159.0	2.47
	Tamazula	Jalisco	161,004.0	3.34
	Lázaro Cárdenas	Michoacán	30,002.0	0.62
	Santa Clara	Michoacán	62,679.0	1.30
	Pedernales	Michoacán	29,589.0	0.61
	El Molino	Nayarit	94,317.0	1.95
	Puga	Nayarit	152,675.0	3.16
	Eldorado	Sinaloa	42,003.0	0.87
	La Primavera	Sinaloa	28,156.0	0.58
	Los Mochis	Sinaloa	22,316.0	0.46
			1,261,383.0	26.14
	Adolfo López Mateos	Oaxaca	152,890.0	3.17
	El Refugio	Oaxaca	28,332.0	0.59
	La Margarita	Oaxaca	68,656.0	1.42
	Central Motzorongo	Veracruz	111,353.0	2.31
	Central Progreso	Veracruz	53,887.0	1.12

ANALYSIS OF THE ECONOMIC, TECHNOLOGICAL AND MARKET POLICY STATUS OF THE SWEETENER
SECTOR IN MEXICO

GULF	Constancia	Veracruz	78,567.0	1.63
	El Carmen	Veracruz	47,349.0	0.98
	El Modelo	Veracruz	108,314.0	2.24
	El Potrero	Veracruz	156,352.0	3.24
	Independencia	Veracruz	3,420.0	0.07
	La Concepción	Veracruz	1,416.0	0.03
	La Gloria	Veracruz	148,505.0	3.08
	La Providencia	Veracruz	70,356.0	1.46
	Mahuixtlán	Veracruz	41,042.0	0.85
	Nuevo San Francisco	Veracruz	32,738.0	0.68
	San Cristóbal	Veracruz	244,422.0	5.07
	San Gabriel	Veracruz	10,065.0	0.21
	San José de Abajo	Veracruz	43,895.0	0.91
	San Miguelito	Veracruz	46,840.0	0.97
	San Nicolás	Veracruz	60,138.0	1.25
	San Pedro	Veracruz	65,767.0	1.36
	Tres Valles	Veracruz	228,078.0	4.73
Subtotal			1,802,382.0	37.35
SOUTHEAST	La Joya	Campeche	36,704.0	0.76
	Huixtla	Chiapas	115,014.0	2.38
	Pujilic- La Fe	Chiapas	183,327.0	3.80
	San Rafael de Pucté	Quintana Roo	125,204.0	2.59
	Azsuremex	Tabasco	10,155.0	0.21
	Presidente Benito Juárez	Tabasco	104,180.0	2.16
	Santa Rosalía	Tabasco	54,688.0	1.13
	Cuatotolapam	Veracruz	50,142.0	1.04
			679,414.0	14.08
TOTALS			4,825,539.0	100.00

Source: National Chamber of Sugar and Alcohol Industries (CNIAA) and distribution of the National Sugarcane Union. A.C. CNPR

Sugarcane producers, 2008/2009 harvest

SUGAR MILL	Producers			
	CNC	CNPR	OTHERS	Total
Aaron Sáenz	1,368	410	0	1,778
Adolfo López Mateos	1,358	1,757	24	3,139
Alianza Popular	2,586	786	0	3,372
Atencingo	2,916	4,219	302	7,437
Azsuremex	433	192	10	635
Bellavista	1,726	590	1	2,317
Benito Juárez	1,833	1,433	501	3,767
Calipam	124	833	716	1,673
Casasano	1,729	342	0	2,071
Central Motzorongo	2,390	1,382	139	3,911
Central Progreso	1,516	821	15	2,352
Constancia	1,063	898	88	2,049
Cuatotolapam	1,159	973	50	2,182
El Carmen	1,584	472	698	2,754

ANALYSIS OF THE ECONOMIC, TECHNOLOGICAL AND MARKET POLICY STATUS OF THE SWEETENER
SECTOR IN MEXICO

El Dorado	830	200	1	1,031
El Higo	763	375	137	1,275
El Mante	1,115	834	26	1,975
El Modelo	2,393	1,722	25	4,140
El Molino	725	1,067	0	1,792
El Potrero	3,223	3,230	290	6,743
El Refugio	667	310	8	985
Emiliano Zapata	3,224	2,551	3	5,778
Huixtla	1,035	353	0	1,388
Independencia	0	0	0	0
José María Morelos	504	704	741	1,949
La Concepción	0	0	0	0
La Gloria	3,597	2,184	24	5,805
La Joya	1,721	147	0	1,868
La Margarita	1,645	722	1	2,368
La Primavera	240	120	106	466
La Providencia	1,409	1,114	595	3,118
Lázaro Cárdenas	1,138	433	1	1,572
Los Mochis	0	0	11	11
Mahuixtlán	2,716	1,100	209	4,025
Melchor Ocampo	1,166	757	0	1,923
Nuevo San Fco. el				
Naranjal	698	416	1,151	2,265
Pedernales	2,467	927	0	3,394
Plan de Ayala	1,737	1,041	0	2,778
Plan de San Luis	1,051	387	1,631	3,069
Puga	1,770	1,880	568	4,218
Pujilic	2,163	896	1,670	4,729
Quesería	1,384	676	1	2,061
San Cristóbal	4,088	3,867	573	8,528
San Fco. Ameca	3,999	519	1	4,519
San Gabriel	0	0	0	0
San José de Abajo	1,114	954	96	2,164
San Miguel del Naranjo	1,927	1,550	0	3,477
San Miguelito	1,055	2,216	227	3,498
San Nicolás	751	1,444	0	2,195
San Pedro	1,769	1,464	457	3,690
San Rafael de Pucte	1,018	0	0	1,018
Santa Clara	1,151	1,037	261	2,449
Santa Rosalía	1,346	711	0	2,057
Tala	4,451	3,182	0	7,633
Tamazula	1,913	1,275	0	3,188
Tres Valles	2,257	2,246	0	4,503
Zapoapita	1,392	981	0	2,373
National Total	89,397	60,700	11,358	161,455

Source: National Chamber of Sugar and Alcohol Industries

Irrigation and Seasonal Surface Area, 2008/2009 Harvest

Sugar Mill	Hectares			
	Irrigated	Aux Irrig.	Seasonal	Total
Aarón Sáenz	18,887			18,887
Adolfo López Mateos		344	23,270	23,614

ANALYSIS OF THE ECONOMIC, TECHNOLOGICAL AND MARKET POLICY STATUS OF THE SWEETENER
SECTOR IN MEXICO

Alianza Popular		4,119	14,209	18,328
Atencingo	13,050			13,050
Azsuremex			3,332	3,332
Bellavista		3,482		3,482
Benito Juárez			16,268	16,268
Calipam	2,204			2,204
Casasano	3,957			3,957
Central Motzorongo	500		16,260	16,760
Central Progreso		689	9,796	10,485
Constancia	1,330		9,906	11,236
Cuatotolapam			10,810	10,810
El Carmen	440		7,612	8,052
El Dorado	6,107			6,107
El Higo	14,730			14,730
El Mante	16,779			16,779
El Modelo		10,019	852	10,871
El Molino		935	8,415	9,350
El Potrero		8,647	13,118	21,765
El Refugio	1,080		3,302	4,382
Emiliano Zapata	10,452			10,452
Huixtla			13,369	13,369
Independencia				0
José María Morelos		2,639	5,646	8,285
La Concepción				0
La Gloria	3,956	10,695	2,564	17,215
La Joya	720		7,635	8,355
La Margarita	846		13,608	14,454
La Primavera	5,787			5,787
La Providencia		1,492	8,695	10,187
Lázaro Cárdenas	3,020			3,020
Los Mochis	13,320			13,320
Mahuixtlán		2,178	2,796	4,974
Melchor Ocampo	8,757			8,757
Nuevo San Fco. el Naranjal			6,431	6,431
Pedernales	3,183			3,183
Plan de Ayala		4,372	9,462	13,834
Plan de San Luis		3,452	11,970	15,422
Puga		6,225	12,871	19,096
Pujilic	15,688			15,688
Quesería	3,717	1,316	7,042	12,075
San Cristóbal			44,533	44,533
San Fco. Ameca		11,840		11,840
San Gabriel			6,961	6,961
San José de Abajo		1,950	5,363	7,313
San Miguel del Naranjo		2,823	20,899	23,722
San Miguelito			7,391	7,391
San Nicolás			8,829	8,829
San Pedro			10,754	10,754
San Rafael de Pucté		876	21,516	22,392
Santa Clara		6,189		6,189
Santa Rosalía	291		8,877	9,168
Tala		16,220	4,695	20,915
Tamazula	14,282	2,073		16,355
Tres Valles			36,630	36,630
Zapoapita		14,193		14,193
National Total	163,083	116,768	415,687	695,538

Source: Sugarcane field diagnosis, inventory and investment required for factories,			
Universidad Autónoma de Chapingo.			

Appendix A4. Cost methodology for Mexican sugar mills

The methodology used for calculating the costs of Mexican sugar mills is as follows:

- Costs are estimates based on data from 2005 and 2009.
- They are composed of raw material costs and processing costs:

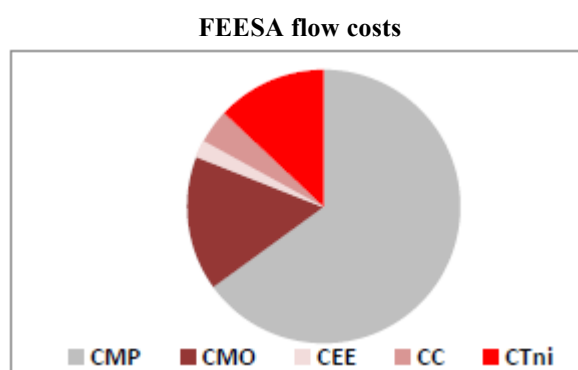
Costs calculated for FEESA sugar mills, 2005

For 2005, real data on FEESA sugar mill flows are available, provided by the Regional Offices. Additionally, consumption data are available for the following items:

- Crushed Sugarcane
- Electric power
- Fuel Oil
- Labor

Costs calculated for FEESA sugar mills during 2005 are as follows:

***CMP** = Raw Material Cost*
***CMO** = Labor Cost*
***CEE** = Electrical Energy Cost*
***CC** = Fuel Oil Cost*
***CTni** = Unidentified Costs*



Raw materials costs for FEESA sugar mills, 2005

Raw material costs are calculated using the Harvard formula for each mill.

$$RMC = \text{Reference Price (\$/kg)} * 0.57 * KARBE * \text{Crushed Sugarcane}$$

Processing costs calculated for FEESA sugar mills

Identified processing costs

$$\frac{[FEESA \text{ flow cost}]_i}{[FEESA \text{ consumption}]_i} = [Implicit \text{ price}]_i$$

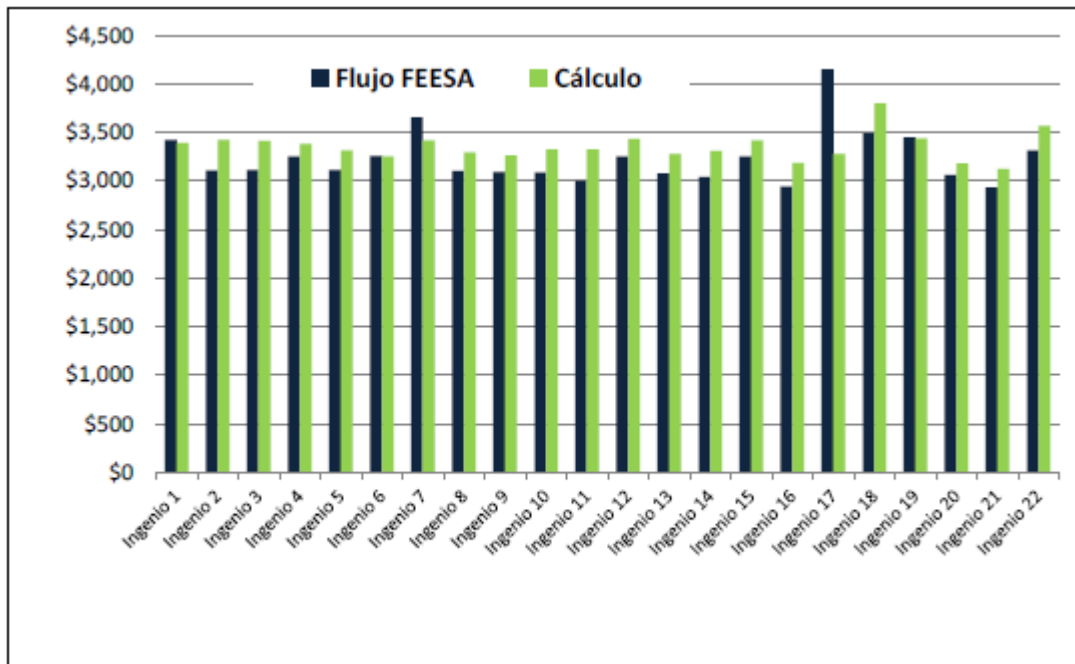
i = Electrical energy, Fuel oil, labor and unidentified

Unidentified processing costs

$$\frac{[Unidentified FEESA \text{ flow cost}]_i}{[FEESA \text{ flow cost}]} = \alpha$$

After identifying the implicit price and unidentified cost share, the exercise is performed sugar mill by sugar mill.

Costs calculated for FEESA sugar mills, 2005

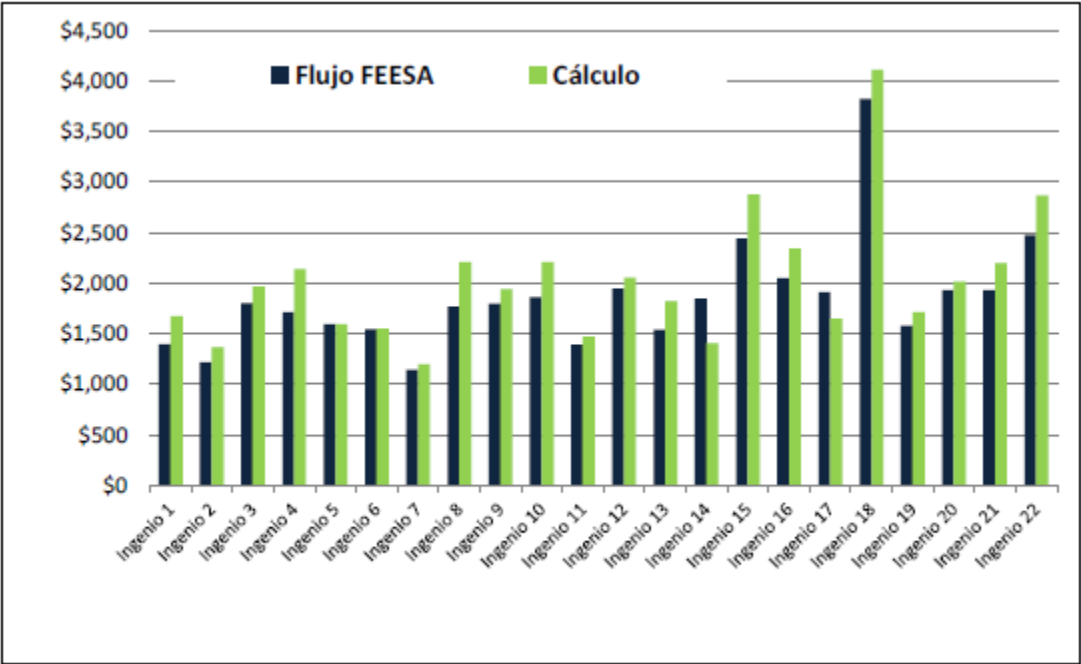


Standard and refined sugar production is integrated to the standard value, the factor is 1.07/1.04.

Costs calculated for FEESA sugar mills, 2005

$$PC = EEC + FOC + UC$$

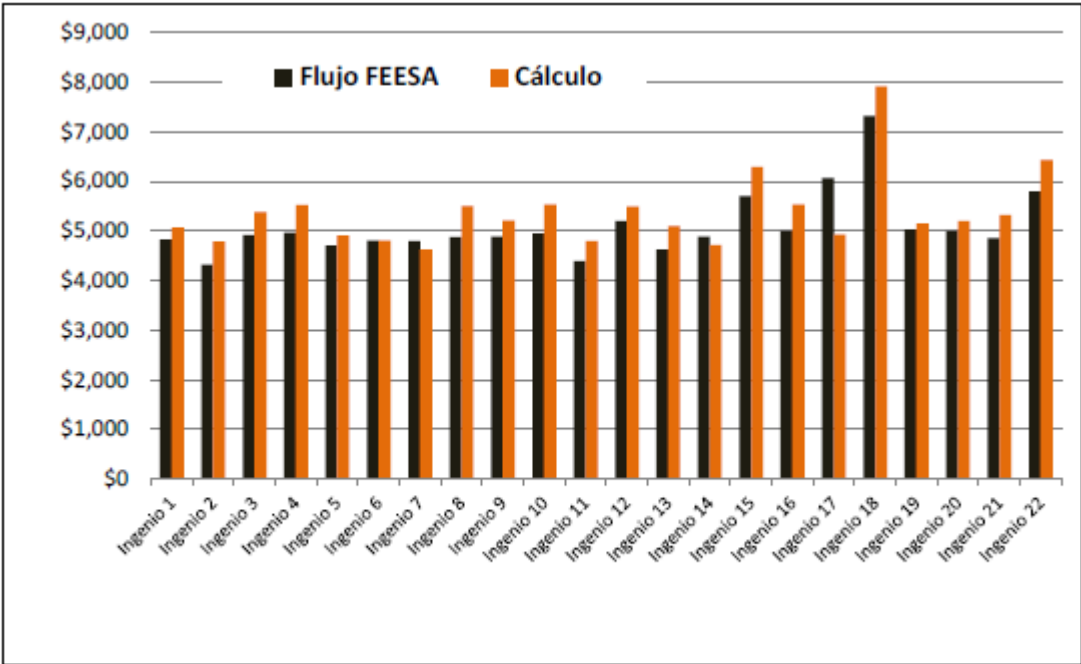
FEESA flow costs and calculated costs, 2005



Standard and refined sugar production is integrated to the standard value, the factor is 1.07/1.04.

Costs calculated for FEESA sugar mills, 2005

$$\text{Cost} = \text{RMC} + \text{PC}$$



Standard and refined sugar production is integrated to the standard value, the factor is 1.07/1.04.

Industry cost estimation, 2005

Processing costs are divided into two components:

$$CRM = \text{Reference Price (\$/kg)} * KARBE * \text{crushed cane}$$

Processing costs are divided into two components:

$$PC = UPC + KPC$$

Unidentified Production costs were estimated using the size of the sugar mills, according to FEESA mills.

$$UPC = f(\text{size}, \text{FEESA UPC})$$

Known processing costs (electricity, fuel oil and labor) are calculated according to consumption and implicit prices.

$$KPC = EEC + FOC + LC$$

Industry cost estimation, 2009

Raw material costs are determined by the reference price of Karbe and crushed cane.

$$CRM = \text{Reference Price 2009 (\$/kg)} * 0.57 * KARBE * \text{Crushed cane}$$

- Known processing costs are determined by the consumption and prices of electricity, fuel and labor.
- Unidentified processing costs are calculated from undetected costs in 2005 updated for inflation.

$$EEC = \text{Energy consumption 2009} * \text{current implicit price}$$

$$FOC = \text{Fuel consumption 2009} * \text{current implicit price}$$

$$LC = \text{Labor use 2009} * \text{current implicit salary}$$

$$PC = EEC + FOC + LC + [UPC_{2005} * Inf]$$

Appendix A5. Standards

In mid-2008, the Directorate General of Standards of the Ministry of Economy (DGN-SE as abbreviated in Spanish) notified the National Standardization Technical Committee of Sugar and Alcohol Industries (CTNNIAA as abbreviated in Spanish) of the cancellation of 57 Mexican sugar industry standards. This was done because during more than 15 years they had not been revised or updated and extensions to their validity had not been requested.

Therefore, CTNNIAA initiated an extensive project to review and update 52 Mexican sugar industry standards, requesting the Directorate General of Standards (DGN as abbreviated in Spanish) of the Ministry of Economy (SE as abbreviated in Spanish) to incorporate them into the 2009 National Standardization Program. It was agreed to permanently void the remaining five standards by virtue of their ineffectiveness.

By the beginning of 2009, with the aim of stimulating participation of sugar mill specialists (field and sugar mill lab chemicals) and of CTNNIAA members, an internet portal was designed for the National Chamber of Sugar and Alcohol Industries (CNIAA as abbreviated in Spanish). This provided access to the 52 standards being reviewed and updated. In June 2009, a Working Subgroup was added to conduct meetings in different regions of the country where sugar is produced.

In the period from June to August 2009, 10 regional meetings were held. Subsequently, meetings were held in Mexico City with representatives from independent laboratories, representatives from activated carbon suppliers and specialized sugar mill chemists to review some details regarding the standards.

This work completed the first stage of the review and update of the 52 standards. These were grouped into four subjects: KARBE (11), sugar (13), processes (20) and activated carbon (8).

Because the review and updating process of the 52 Mexican sugar industry Standards was not completed, CTNNIAA rescheduled 51 Mexican Standards into the National Standardization Sugar Industry Program (PNNIA as abbreviated in Spanish) for 2010, and agreed to cancel one because of duplicity. In addition, seven new subjects were added.

Of the 51 Mexican Standards subject to revision and updating, four of them under the KARBE subject are of great impact to sugar mills and domestic producers of sugar cane. Therefore, CTNNIAA reiterated to the Technical Factory Group (GTF as abbreviated in Spanish) of the National Committee for the Sustainable Development of Sugarcane (CONADESUCA) the importance of vital field research in performing proper reviews and updates. It was made clear that federal budget support would be needed for this work and this support was approved.

Field research work regarding the four KARBE standards began in mid-December of 2009 in ten of the country's sugar mills and the tests were completed on May 19, 2010.

In June 2010, the following Standards projects were reviewed by CTNNIAA:

- I. PROY-NMX-F-000-SCFI-2009. - Sugar Industry - Liquid Sugar – Specifications.
- II. PROY-NMX-F-000-SCFI-2009. - Sugar Industry - Micro-crystalized sugar – Specifications.

III. PROY-NMX-EE-XXX-SCFI-2009.-Sugar Industry - polypropylene sacks, polyethylene lined sacks and laminated sacks for sugar packing - Specifications and Test Methods.

With regard to these Standards, the following was agreed to:

- ✓ Liquid Sugar Standards Project: Send for revision by DGN-SE for its prompt publication.
- ✓ Micro-crystallized Sugar Standards: Review of the project by CTNNIAA members. At the next meeting it will be decided whether to send for review by DGN-SE.
- ✓ Super Sack Standards project: Review of the project by the RAFIPACK Company, for submission to CTNNIAA in its next meeting.

Standard NOM-051-SSA/SCFI-2009:

Since the entry into force of the North American Free Trade Agreement (NAFTA), CTNNIAA and CNIAA have communicated, through various public and private forums (DGN-SE, CODEX Mexico, CONCAMIN and CNA), their posture regarding the Agricultural Sugar Industry. This has been in an effort to separate the generic term "sugars", which has been used in standards, into the terms "Sugar" and "Fructose and Glucose", due to the different natures of disaccharides (sugar) and monosaccharides (fructose and glucose). To date there has not been a favorable response.

In the recent revision and update of NOM-51, CNIAA expressed its position to authorities. Its position coincided with that of the Independent National University of Mexico's (UNAM as abbreviated in Spanish) Chemistry Faculty and with the National Sugarcane Union's (Union Nacional de Cañeros, A.C., C.N.P.R.) opinion. The proposed change to sugar terms is as follows, according to the differentiation that is proposed to change paragraphs 3.3 and 4.2.7.4:

DRAFT VERSION	PROPOSED CHANGE
3.3 Sugars All monosaccharides and disaccharides present in a food or non-alcoholic beverage.	3.3 Sugars 3.3.1 Fructose and Glucose All monosaccharides in syrup and/or solid form present in a food or non-alcoholic beverage. 3.3.2 Sugar All disaccharides present in a food or nonalcoholic drink.
4.2.7.4 The declaration of the expiration or best before date is not required for: • ... • Solid sugar; • Confectionary products consisting of aromatic or colored sugars; • Chewing gum.	4.2.7.4 The declaration of the expiration or best before date is not required for: • ... • Solid sugar; • Confectionary products consisting of aromatic or colored sugar or fructose; • Chewing gum

DGN-SE resolution regarding the CNIAA recommendation:

In the Official Gazette of the Federation dated March 19, 2010, the Ministry of Economy and the Ministry of Health, by means of the Directorate General for Standards and the Federal Commission for Protection against Health Risks (COFEPRIS as abbreviated in Spanish), published their responses to comments received regarding the Mexican Official Standards Project "PROY-NOM-051-SCFI/SSA1-2009". The corresponding CNIAA recommendation, from UNAM's chemical faculty and the UNC-

CNPR, was very clear-cut but used very weak and unconvincing arguments according to the Universidad Iberoamericana de Leon, PROFECO, Dr. Maria del Carmen Duran, the BENEIO Goup, UNC-CNPR, CNIAA and the National Public Health Institute (INSP as abbreviated in Spanish).

Regarding the inclusion of definitions of fructose and glucose, unlike sugar, it is considered that this proposal is not appropriate as it is consistent with the Guidelines on Nutrition Labeling CAC/GL 2-1985 (amended in 2009) by CODEX which only states that added sugars must be reported and does not distinguish between types of sugar:

"3.2.4 When a claim is made regarding the amount or type of carbohydrates, the total amount of sugar must be included..."

Finally, in the Official Gazette of the Federation dated April 5, 2010, authorities issued Official Mexican Standard NOM-051- SCFI/SSA1-2010. This is a general specification for the labeling of food and pre-packaged nonalcoholic drinks regarding commercial and health information. As is evident, this Official Mexican Standard does not include CNIAA's opinion and continues to use the term "sugar" to encompass all natural sweeteners. Importantly, at CNIAA's request, in the section stating: *"The following companies and institutions participated in the preparation of this Official Mexican Standard"*, the reference to the sugar industry was removed because it did not and will not agree with the position taken by the government to continue to use the term "sugars".

With the revision of the four Mexican Standards concerning sugar quality, CTNNIAA aims toward:

- The possibility of changing the Official Mexican Standards.
- Integration of international standards (ICUMSA) and, therefore, current US standards.
- Ensure that sugar produced in the country's sugar mills is healthy and safe.