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Sugar and Sweeteners Outlook

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February 2010 Sugar

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The next release is
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Approved by the
World Agricultural
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In the February 2010 *World Agriculture Supply and Demand Estimates* (WASDE), projected fiscal year (FY) 2010 production for Mexico is reduced 200,000 metric tons, raw value (MTRV) from last month based on weather-reduced sugar yields to date. Exports are reduced by the same amount. Projected FY 2010 U.S. sugar supply is decreased by 85,000 short tons, raw value (STRV) from last month due to lower imports from Mexico, more than offsetting higher sugar production. Imports from Mexico are reduced by 220,000 STRV. Beet sugar production and Louisiana cane sugar production are increased a combined 150,000 STRV due to anticipated output in September 2010 from next season's sugar crops. Florida cane sugar production is reduced 15,000 STRV based on a lower forecast of sugarcane for this year by the National Agricultural Statistics Service (NASS). Total use is unchanged. Ending-year stocks are projected at 1.055 million STRV, implying an ending stocks-to-use ratio of 10.0 percent.

U.S. Sugar

In the February 2010 *World Agricultural Supply and Demand Estimates* (WASDE), the U.S. Department of Agriculture (USDA) published its latest projections for fiscal year (FY) 2010. Expected U.S. beet sugar production is increased by 100,000 short tons, raw value (STRV) and is now projected at 4.500 million STRV. The increase is due to expected production in September from next season's sugar beet harvest and is not attributable to this year's harvest (see below for a summary of the 2009/10 sugar beet harvest).

The cane sugar forecast for FY 2010 is 3.472 million STRV, an increase of 35,000 STRV from last month's projection. The forecast for Louisiana is increased by 50,000 STRV to 1.500 million STRV. Similar to the case for beet sugar, this increase stems from expected September production from next season's sugarcane harvest. In the February 2010 Crop Production, the National Agricultural Statistics Service (NASS) lowered its projection of Florida sugarcane for sugar by 0.8 percent to 13.429 million tons, noting that freezing temperatures in mid-January had lowered expected yield by 0.3 tons to 36.1 tons/acre. Cane sugar production from Florida is now forecast at 1.665 million STRV.

Projected sugar production in Texas and Hawaii were left unchanged at a combined total of 307,000 STRV. Nonetheless, cold and wet conditions in Texas left December sugar production at only 1,259 STRV. Normally a total for December Texas production would be between 28,000 and 32,000 STRV.

Due to lower-than-expected sugar production in Mexico (see below), sugar imports from Mexico are reduced by 220,000 STRV and are now projected at 540,000 STRV. Mexican imports for the October-December period have totaled 105,820 STRV. All sugar has entered by surface transport and most is likely intended for direct consumption—that is, not for refining.

Total sugar imports through the end of December (not counting high-tier tariff sugar) are estimated at 701,000 STRV, or about 33.0 percent of expected imports. Raw sugar tariff-rate quota (TRQ) entries through February 2 are estimated at a relatively high amount of 558,910 STRV, or 54.0 percent of the expected total through 4 months of the fiscal year.

Total use projections were left unchanged. Exports are projected at 150,000 STRV. These are mostly exports occurring under the Refined Sugar Re-Export Program. The sum of deliveries for human use and miscellaneous use are projected at 10.140 million STRV. Other deliveries are projected at 235,000 STRV. These are the sum of deliveries for the Sugar-Containing Products Program, the polyhydric alcohol program, and livestock feed. Total ending-year stocks are projected at 1.055 million STRV, implying an ending-year stocks-to-use ratio of 10 percent.

In the *Sweetener Market Data* (SMD), deliveries for October-December 2009 are estimated at 2.736 million STRV, or about 4.3 percent more than deliveries for the same corresponding period last year. However, the Sugar and Sweetener Team of the Economic Research Service (ERS) believes that the SMD estimate of direct consumption imports is overstated by 194,000 STRV. Although SMD errors should be self-correcting over time, monthly estimates are deemed unreliable. The ERS Team estimates deliveries for human consumption through December 2009 at 2.591 million STRV, or 4.5 percent below the same period last year. More detailed analysis will be provided in the next issue of the *Sugar and Sweeteners Outlook*.

The Inter-Continental Exchange (ICE) raw sugar March No.16 futures contract has averaged 36.5 cents/pound (lb) the first week and a half of February, more than 12 cents higher than the corresponding world price (No.11 ICE March contract). The high margin reflects tightness in domestic supplies and is needed to keep the U.S. competitive in bidding TRQ sugar away from other importing countries. Also, uncertainty about future TRQ increases and Mexican imports are being factored into the market. In like fashion, the refined beet sugar price in the Midwest has been quoted by *Milling and Baking News* at 53 cents/lb since the week ending January 22.

Challenging weather conditions affected most sugar beet producers in 2009. Most areas experienced wet conditions during planting and harvest seasons. The cool, dry summer adversely limited yield potential during the growing season. However, only limited reports of root disease and pest issues, partially due to increased use of Roundup Ready and disease-resistant varieties of beets, offset weather-related obstacles and resulted in relatively strong yields according to many of the largest sugar beet cooperatives. Sugar content in the crop though was typically lower than average, particularly in the Upper Midwest, the result of the cool summer and early fall freezes.

Sugar beet producers in the Upper Midwest contended with wet conditions during both planting and harvest, delaying both activities. Producers near the Red River Valley, which was affected by severe flooding in the spring, reported that plantings were delayed over 2 weeks and some cases of abandoned acreage due to the wet conditions. A dry, cool summer affected root growth development in some areas, but root disease and fungus issues were not widely reported, resulting in strong yields by the larger cooperatives in Minnesota and North Dakota. Wet conditions returned in September, in time to complicate or stall the harvest. High levels of soil tare were reported in the region. Early freezes in September and October also pushed the harvest later into the fall and kept sugar content levels relatively low.

Further west, in Idaho, Wyoming, Nebraska, Montana, and Colorado, planting conditions were generally more favorable. Some areas that experienced drought conditions in prior years saw more favorable water levels in 2009. There were some reports of delayed plantings and replantings in Idaho due to April snow and in Montana due to a late freeze in May. Overall, these States increased plantings over 20 percent in 2009 compared with the previous year, according to NASS. The cool summer limited the sugar content of the roots, but no major reports of pest or disease issues kept yields relatively high in these areas. Like other regions, a wet fall pushed the harvest later into the fall and freezing temperatures further limited sugar content on the crop.

Michigan sugar beet production shrank in 2009 from that of 2008. Heavy rains during the planting period caused seedling disease and soil crusting. Lack of precipitation during the growing season was also detrimental to overall yields. Additionally, rhizoctonia crown rot was prevalent in the region according to a cooperative in the area, even for resistant varieties of beets. A dry fall helped with a quick harvest, and cool temperatures in December made for good storage conditions.

Finally, California's acreage planted was lower in 2009 due to delays in contract negotiations and pressure from alternative crops. High temperatures raised pressures from pests and threatened yields; however, improving conditions and a warm winter helped offset some of the decreases in acreage with a higher yield, including a record high yield for the Imperial Valley in Southern California.

Overall, the 2009 sugar beet season was marked by difficult planting and harvesting conditions. A wet spring and cool summer limited root growth, but advanced seed varieties helped to manage weeds and combat root disease, allowing for strong final yields. Freezing temperatures early in the harvest season limited sugar content, with northern growers reporting sugar content levels between 15.5 percent and 17 percent, as opposed to historical averages, which are closer to 17-18 percent. Total sugar beet production in 2009 was 29.5 million tons, nearly a 10-percent increase from that of 2008, according to NASS's *January Crop Production Summary*. However, sugar beet production continued to trend downward during the past 4 years.

Table 1--U.S. sugar: Supply and use, by fiscal year, short tons 1/ 2/11/2010

Items	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
<i>1,000 short tons, raw value</i>							
Beginning stocks 2/	1,670	1,897	1,332	1,698	1,799	1,660	1,451
Total production 3/4/	8,649	7,876	7,399	8,445	8,152	7,484	7,972
Beet sugar	4,692	4,611	4,444	5,008	4,721	4,166	4,500
Cane sugar	3,957	3,265	2,955	3,438	3,431	3,318	3,472
Florida	2,154	1,693	1,367	1,719	1,645	1,577	1,665
Louisiana	1,377	1,157	1,190	1,320	1,446	1,397	1,500
Texas	175	158	175	177	158	152	170
Hawaii	251	258	223	222	182	192	137
Puerto Rico	0	0	0	0	0	0	0
Total imports	1,750	2,100	3,443	2,080	2,620	3,082	2,157
Tariff-rate quota imports 5/	1,226	1,408	2,588	1,624	1,354	1,370	1,257
Other program imports	464	500	349	390	565	308	350
Nonprogram imports	60	192	506	66	701	1,404	550
Mexico 6/				60	694	1,402	540
Total supply	12,070	11,873	12,174	12,223	12,571	12,226	11,580
Total exports 3/	288	259	203	422	203	137	150
Quota-exempt for reexport	288	259	203	422	203	137	150
Other exports	0	0	0				
CCC disposal, for export	0	0	0				
Miscellaneous	23	94	-67	-132	0	0	0
CCC disposal, for domestic nonfood use	0	0	0	0	0	0	0
Refining loss adjustment	0	0	0	0	0	0	0
Statistical adjustment 7/	23	94	-67	-132	0	0	0
Deliveries for domestic use	9,862	10,188	10,340	10,135	10,708	10,638	10,375
Transfer to sugar-containing products							
for exports under reexport program	142	121	106	169	141	113	175
Transfer to polyhydric alcohol, feed	41	48	51	53	61	46	60
Deliveries for domestic food and beverage use 8/	9,678	10,019	10,184	9,913	10,506	10,479	10,140
Total use	10,172	10,542	10,476	10,424	10,912	10,775	10,525
Ending stocks 2/	1,897	1,332	1,698	1,799	1,660	1,451	1,055
Privately owned							
CCC							
<i>Percent</i>							
Stocks-to-use ratio	18.65	12.63	16.21	17.25	15.22	13.47	10.02

CCC = Commodity Credit Corporation.

Note: Numbers may not add due to rounding.

1/ Fiscal year beginning October 1. 2/ Stocks in hands of primary distributors and CCC. 3/ Historical data are from Farm Service Agency (FSA) (formerly ASCS) Sweetener Market Data (SMD), and NASS, Sugar Market Statistics prior to 1992. 4/ Production reflects processors' projections compiled by the FSA.

5/ Actual arrivals under the tariff-rate quota (TRQ) with late entries, early entries, and TRQ overfills assigned to the fiscal year in which they actually arrived.

The 2009/10 available TRQ assumes shortfall of 200,000 tons. 6/ Starting in 2007/08, total includes imports under Mexico's WTO TRQ allocation for raw and refined sugar. 7/ Calculated as a residual. Largely consists of invisible stocks change. 8/ For FY 2008-10, combines SMD deliveries for domestic human use, SMD miscellaneous uses, and the difference between SMD imports and WASDE imports.

Table 2--U.S. sugar: supply and use (including Puerto Rico), fiscal years, metric tons 1/ 2/11/2010

Items	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10
<i>1,000 metric tons, raw value</i>							
Beginning stocks 2/	1,515	1,721	1,208	1,540	1,632	1,506	1,316
Total production 3/ 4/	7,846	7,145	6,712	7,662	7,396	6,789	7,232
Beet sugar	4,257	4,183	4,032	4,543	4,283	3,779	4,082
Cane sugar	3,590	2,962	2,681	3,119	3,113	3,010	3,150
Florida	1,954	1,536	1,241	1,559	1,492	1,431	1,510
Louisiana	1,249	1,049	1,079	1,198	1,312	1,267	1,361
Texas	159	143	159	161	143	138	154
Hawaii	228	234	202	201	165	174	124
Puerto Rico	0	0	0	0	0	0	0
Total imports	1,588	1,905	3,124	1,887	2,377	2,796	1,957
Tariff-rate quota imports 5/	1,113	1,277	2,348	1,473	1,228	1,243	1,140
Other program imports	421	454	317	354	513	279	318
Nonprogram imports	54	174	459	60	636	1,274	499
Mexico 6/	0	0	0	54	630	1,272	490
Total supply	10,950	10,771	11,044	11,088	11,404	11,092	10,505
Total exports 3/	261	235	184	383	184	124	136
Quota-exempt for re-export	261	0	184	383	184	124	136
Other exports	0	0	0	0	0	0	0
CCC disposal, for export	0	235	0	0	0	0	0
Miscellaneous	20	85	-61	-120	-1	1	0
CCC disposal, for domestic nonfood use	0	0	0	0	0	0	0
Refining loss adjustment	0	0	0	0	0	0	0
Statistical adjustment 7/	20	85	-61	-120	-1	1	0
Deliveries for domestic use	8,947	9,243	9,381	9,194	9,715	9,650	9,412
Transfer to sugar-containing products for exports under reexport program	129	110	96	153	128	102	159
Transfer to polyhydric alcohol, feed	38	44	46	48	56	42	54
Deliveries for domestic food and beverage use 8/	8,780	9,089	9,239	8,993	9,531	9,506	9,199
Total use	9,228	9,563	9,504	9,457	9,898	9,775	9,548
Ending stocks 2/	1,721	1,208	1,540	1,632	1,506	1,316	957
Privately owned	0	0	0	0	0	0	0
CCC	0	0	0	0	0	0	0
<i>Percent</i>							
Stocks-to-use ratio	18.65	12.63	16.21	17.25	15.22	13.47	10.02

CCC = Commodity Credit Corporation.

Note: Numbers may not add due to rounding.

1/ Fiscal year beginning October 1. 2/ Stocks in hands of primary distributors and CCC. 3/ Historical data are from The Farm Service Agency (FSA) (formerly ASCS), Sweetener Market Data (SMD), and NASS, Sugar Market Statistics prior to 1992. 4/ Production reflects processors' projections compiled by the FSA.

5/ Actual arrivals under the tariff-rate quota (TRQ) with late entries, early entries, and TRQ overfills assigned to the fiscal year in which they actually arrived.

The 2009/10 available TRQ assumes shortfall of 181,437 tons. 6/ Starting in 2007/08, total includes imports under Mexico's WTO TRQ allocation for raw and refined sugar. 7/ Calculated as a residual. Largely consists of invisible stocks change. 8/ For FY 2008-10, combines SMD deliveries for domestic human use, SMD miscellaneous uses, and the difference between SMD imports and WASDE imports.

Mexico Sugar and HFCS

Mexico sugar production for fiscal year (FY) 2010 is forecast at 5.100 million metric tons, raw value (MTRV), a reduction of 200,000 MTRV from the forecast last month. Although more area has been harvested this year through January 30 compared with last year (220,719 hectares (ha) compared with 184,929 ha) and more sugarcane harvested (14,158,544 metric tons (mt) compared with 13,870,989 mt), sugar produced is 4.1 percent lower (1.450 million mt compared with 1.512 million mt, actual weight). These data indicate sugarcane yield at 64.15 mt/ha, 14.5 percent lower than last year, and sugar yield at 6.569 mt/ha, 19.7 percent lower. The harvest has been affected by unusually cool, damp harvest conditions, especially in Veracruz, the largest sugar-producing State in Mexico. Production there is 10.2 percent lower than the same corresponding period last year. The weak start is considered an indicator of the poor prospects through the rest of the campaign. Other groups making production forecasts, like the National Sugarcane Growers Union, have reduced their forecasts recently.

The USDA projects Mexican sugar exports at 490,000 MTRV, a 200,000-MTRV reduction paralleling the lower production forecast. Sugar prices, which had been declining through the end of 2009 because of sugar imports, increased in January. The Mexico City standar price began the month at 37.6 cents/pound (lb) and finished at 43.8 cents/lb. The Mexico City refined price began at 41.4 cents/lb and was above 48 cents/lb midmonth, averaging 45.9 cents the entire month. These increased prices plus policymaker concerns about the affordability of domestic sugar are factors arguing for fewer exports. Even so, the export projection has a wide band around it. U.S. refined prices, Midwest, are higher in Mexico City at 53 cents/lb, but U.S. sugar raw prices are still lower. Also, there are reports that the Mexican Government's Secretariat of the Economy will officially announce a tariff-rate quota of up to 250,000 mt, providing for entry through mid-May.

The USDA projects Mexican consumption of high fructose corn syrup (HFCS) at 900,000 mt, dry weight, the same as last month. Depending on Mexican HFCS production, Mexican HFCS imports are expected to be between 450,000-550,000 mt, most of which are expected to come from the United States. For the first 2 months of the fiscal year (October and November), the United States has shipped to Mexico 136,500 mt of HFCS, more than 2.5 times as much as in the same period the previous year. This would be between 25-30 percent of the expected total. Exports for December 2009 will be released soon after the *World Agricultural Supply and Demand Estimates* and will likely give additional guidance for next month's forecast.

Table 3--Mexico: Sugar production and supply and sugar and HFCS utilization, by fiscal years 2/11/2010

Fiscal Year (Oct/Sept)	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10 1/
	<i>1,000 metric tons</i>						
Beginning stocks	1,194	1,237	1,965	1,294	1,718	1,975	488
Production	5,330	6,149	5,804	5,633	5,852	5,260	5,100
Imports	327	268	240	474	226	160	720
Supply	6,851	7,654	7,809	7,401	7,796	7,395	6,508
Disappearance							
Human consumption	5,380	5,279	5,326	5,133	5,090	5,065	4,900
Other consumption	220	282	323	390	414	475	400
Miscellaneous							
Total	5,600	5,561	5,649	5,523	5,144	5,540	5,300
Exports	14	128	866	160	677	1,367	490
Total use	5,614	5,689	6,515	5,683	5,821	6,907	5,990
Ending stocks	1,237	1,965	1,294	1,718	1,975	488	518
Stocks-to-human consumption	23.0	37.2	24.3	33.5	38.8	9.6	10.6
Stocks-to-use	22.0	34.6	19.9	30.2	33.9	7.1	8.6
HFCS consumption (dry weight)	135	355	667	698	782	653	900

1/ Forecast.

Sources: USDA, Foreign Agricultural Service, Production, Supply and Distribution database (historical data);
World Agricultural Supply and Demand Estimates.

Mexican Sugar and HFCS Long-Term Projections through Fiscal Year 2021

The USDA prepares long-term sugar projections for both the United States and Mexico in the fall for publication prior to the Agricultural Outlook Forum in February of the following year. First-year projections (2009/10 October/September marketing year—same as the U.S. fiscal year (FY) 2010) are the same as those published by the USDA's Foreign Agricultural Service (FAS) in the November 2009 Production, Supply, and Distribution (PSD) database. Mexican production for FY 2010 is forecast at 5.400 million metric tons, raw value (MTRV). (The forecast is lower than that now—see previous section of this report.) Consumption for food and beverages is forecast at 4.900 million MTRV, which is 165,000 MTRV lower than the previous year. High domestic sugar prices are expected to lead to increased consumption of high fructose corn syrup (HFCS), forecast at 900,000 metric tons (mt), dry basis.¹ This is 290,000 mt greater than the estimated 610,000 mt in FY 2009. It is assumed that the beverage industry consumes about 80 percent of that amount. HFCS is estimated to make up about 48 percent of combined sugar and HFCS sweeteners demanded by the Mexican beverage industry. Sugar exports are forecast at 690,000 MTRV, and almost all exported sugar is expected to be shipped to the United States. Ending stocks are forecast at 760,000 MTRV, implying a stocks-to-human consumption ratio of 15.5 percent. This stock level is low by historical standards. This report assumes that policymakers typically aim for a stocks ratio of about 22 percent to ensure adequate supplies from the end of the fiscal year to the beginning of the next season's sugarcane harvest.

Projections Framework

The Mexico sugar and sweetener projections are determined simultaneously with those for the United States. (The U.S. projections are part of a separate document released by the USDA just prior to the February USDA Agricultural Outlook Forum.) Assumptions made for the United States will affect the projections for Mexico. For the last several years, a modeling framework capturing market and policy dynamics in both countries produced a projections trajectory for the baseline. For marketing years beyond those reported in the *World Agricultural Supply and Demand Estimates* (WASDE) report (e.g., FY 2011 and beyond for this year), forecasting outcomes in U.S. and Mexican sugar markets were derived from pricing linkages between the two countries. Projections made this year are different because of specific assumptions made for the United States.

U.S. sugar supply and use over the long-term projections period are specified to resemble events and policy choices made in FY 2009. Specifically, U.S. producers do not expand area to keep pace with increases in domestic demand; U.S. policymakers do not increase sugar tariff-rate quotas (TRQs) above minimum access levels (as required by the World Trade Organization (WTO) and Free Trade Agreements (FTA)); and U.S. policymakers aim for an ending-year stocks-to-use ratio equal to FY 2009's 13.5 percent. Mexico is assumed to export sugar to the United States to meet this level. When necessary, Mexico is assumed to import sugar from the world market late in the fiscal year to assure sufficient supplies to meet domestic consumption requirements. As mentioned above, optimum ending-fiscal-year stocks in Mexico have been at about 22 percent of total-year deliveries for human consumption. Formal price linkages, the basis of past projections modeling, are absent.

This article presents two separate sets of results. The first is referred to as version A. For Mexico, it assumes sugar exports are made so that the resulting U.S. ending stocks-to-use ratio is 13.5 percent and that Mexico imports from the world market so that its ending stocks-to-consumption ratio equals 22.0 percent in all projection years. The second set is referred to as Version B. Here, prices are linked through trade (as in previous years' projections). Elements of both approaches are developed below. Also, within each set, differing scenarios are run to show alternative assumptions about the future—specifically, the effect of investments made in the Mexican sugar sector (none beyond maintenance assumed in the main baseline) and lower than forecast HFCS use in Mexico. Both are discussed below.

¹ High fructose corn syrup is measured in dry weight, unless noted otherwise.

Production

Table A-1 gives an overview of the Mexican component of the long-term projections model used for analysis. Sugar production comes from processing sugarcane grown in various regions in Mexico (fig. A-1).² Regional sugarcane area is a function of lagged regional sugarcane prices, indexed to a wholesale price index. Sugar production depends on available processing capacity.³ Maintenance of processing capacity depends on regional processor returns (sugar sales less grower payments) exceeding processing costs. Sugar yields are a joint function of trend growth and relative prices of fertilizers and chemicals used in production. Regional sugarcane prices derive from the price of sugar in Mexico and regional productivity measures.

Consumption

The USDA bases its projections of Mexican sweetener consumption on analysis of trends in the consumption of sweetener-containing products (SCPs) and in deliveries of sugar for distribution to households and other users (table A-3). For sweeteners in SCPs the procedure starts by gathering data and projections from Euromonitor International for the following SCPs: carbonated beverages, bakery and cereal products, sugar confectionery, chocolate confectionery, chewing gum, ice cream and other dairy products, and processed foods. The projections are extended through FY 2021 based on Euromonitor projections (through 2013 and 2014), product growth trends, and assumed growth in real Mexican per capita gross domestic product (GDP). The sweetener content of the products is then estimated based on product coefficients used by the Sugar and Sweeteners Team of the Economic Research Service (ERS) in estimating sugar contained in products imported into the United States.

Macroeconomic and demographic assumptions used in USDA's long-term agricultural projections indicate that between 2011 and 2021, Mexican population is projected to grow 10.6 percent and real per capita GDP 29.8 percent. (Also important for pricing linkages in Version B is an 11.6-percent real appreciation of the Mexican peso relative to the dollar.)

The procedure for estimating and projecting sugar deliveries for nonindustrial uses is based on the estimates and projections of sweeteners in SCPs described immediately above. For the estimation of the historical series, estimated sweeteners in SCPs are subtracted from the sum of PSD estimates of sugar deliveries for human consumption and HFCS deliveries for the period 1997-2009. The series is projected forward based on population and GDP growth.

Table A-5 shows sweetener deliveries, by component and total, for the projections period. Per capita sweetener consumption is not shown to grow through 2021. Sweetener consumption is mostly a matter of increases in population, with real income gains seeming to matter little. These results are from Euromonitor and ERS analysis and should be interpreted as very conservative. Other growth scenarios could be incorporated for sensitivity analysis (although not pursued in this article).

HFCS substitutes for sugar in beverage and food manufacturing. Most HFCS is used in beverages. The framework assumes that, by FY 2013, the Mexican beverage industry can source 75 percent of its sweetener needs from HFCS. The industry is specified to use less HFCS only if domestic sugar prices approach the cost of importing HFCS from the United States. Factors that might contribute to this scenario would be a runup in corn prices, similar to what happened 2 years ago.

² These regions are the same as those used by LMC International in its costs of production studies. Those costs of production are used in the ERS modeling of Mexican sugar production.

³ Table A-2 shows the equations of the production specification.

Table A-1--ERS long-term sugar and sweeteners projections model: factors affecting Mexican sugar supply and utilization

Beginning stocks	+ Production	+ Imports	= Net exports	+ Deliveries	+ Ending stocks
-- previous year ending stocks level	Sugar processed from: -- Sugarcane > function of lagged regional sugarcane prices, which are derived from estandar sugar price > production dependent on available processing capacity > processing capacity dependent on processor returns (sugar sales revenue less sugarcane grower payments) exceeding processing costs	-- Imports for IMMEX sugar-containing product exports (exog.) plus: Version A -- Mexican Government sets tariff-rate quota so that end year stocks-to-consumption ratio equals 22 percent Version B -- High-Tier Tariff Imports if price = world price + tariff + marketing costs; otherwise, equal to zero	-- dependent on Mexico exportable sugar surplus: * HFCS use in Mexico; and Version A * Mexico exports sugar to the United States so that ending year U.S. stocks-to-use ratio equals 13.5 percent Version B * linkage of U.S. raw and Mexican estandar sugar prices	-- Deliveries for human consumption = industrial end use demand + direct household demand > Growth in per capita sweetener consumption by end use as function of real GDP growth > Sugar use as a fixed share of industrial end user sweetener demand, unless price of sugar draws near to cost of procuring HFCS (then sugar substitutes for HFCS) -- Other deliveries: sugar to Mexico IMMEX program.	Version A *Mexico import policy assures that ratio of ending stocks to sugar consumption equals 22 percent Version B *Ending stocks calculated as residual: Total supply less use

Source: USDA, ERS, Sugar and Sweeteners Team.

Figure A-1

Sugar in Mexico - Location of Sugarmills by Production Region



Table A-2--ERS long-term sugar and sweeteners projections model, regional sugar production, Mexico

Area harvested:

Area harvested (i) = ϕ * (Area adjustment(i)) * (Adjustment for production capacity adjustments(i))

for i = CE (Central), GU (Gulf) , NE (Northeast) , NW (Northwest) , PC (Pacific), SO (South)

Area adjustment(i,t) = f (real sugarcane price(t-1),..., real sugarcane price(t-n))

Adjustment for change in production capacity(i,t) = Min(1-period lag value, $\phi/(1+\exp(-\alpha*(\text{processor return}(t-1)-\text{processor cost}(t-1))/\text{processor cost}(t-1)))$)

where ϕ = exogenous increase in process capacity, and processor return is sales revenue less payments to growers.

Sugar and sugarcrop yields:

Sugarcane yield (i) = $\alpha_0 + \alpha_1 \text{Trend} + \alpha_2 \text{sugarcane price}(t-1)/\text{fertilizer price}(-1)$

Cane sugar yield (i,j) = $\beta_0 + \beta_1 \text{Trend} + \beta_2 \text{Sugarcane yield (i,j)}$

Source: USDA, ERS, Sugar and Sweeteners Team.

Table A-3--ERS long-term sugar and sweeteners projections model, sweetener deliveries for consumption, Mexico

Procedure:

(1) Gather data and projections from Euromonitor International for consumption of sugar-containing products (SCPs)

- o Carbonated beverages
- o Bakery and cereal
- o Sugar confectionery
- o Chocolate confectionery
- o Gum
- o Dairy products (including ice cream)
- o Processed foods

(2) Extend projections through FY 2021.

$$\ln(\text{food category variable, per capita}) = \beta_0 + \beta_1 * \text{shift variable (year index)} + \beta_2 * \text{trend} + \beta_3 * \ln(\text{real per capita GDP})$$

(3) Estimate sweetener content of products.

(4) Derive estimate for sugar deliveries to nonindustrial end users.

$$\text{Nonindustrial sweetener deliveries} = \text{Total sweetener deliveries for consumption} \\ - \text{industrial end user sweetener deliveries}$$

$$\ln(\text{nonindustrial deliveries/industrial end user deliveries}) = \beta_0 + \beta_1 * \ln(\text{per capita GDP})$$

(5) Derive trade off between sugar and high fructose corn syrup (HFCS) Maximum HFCS penetration:A and sugar trade off:B

(A)

Maximum HFCS shares assumed for analysis, by industry:	
Beverages 1/	75.0%
Food manufacturing:	
Bakery and cereal	18.4%
Confectionery	5.1%
Dairy	40.9%
Processed foods	74.4%

1/ share achieved in 2013; interim values 2010: 48.3%; 2011: 57.2%; 2012: 66.1%; 2013: 75.0%.

(B) Flexible share approach: Max coeff (from A)* Flexibility coeff

$$\text{Flexibility coeff} = [1 / (1 + \exp(-\phi * (\text{Estandar price} - \text{Cost Variable}) / \text{Cost Variable}))]$$

$$\text{Cost Variable} = \text{HFCS production cost (U.S.)} + \text{transport} + \text{processor return}$$

Source: USDA, ERS, Sugar and Sweeteners Team.

Trade, Ending-Year Sugar Stocks, and Prices

Ending-fiscal-year sugar stocks are the difference between total sugar supplies (beginning stocks, production, and imports) and total use (sugar deliveries and exports). The price of Mexican *estandar* sugar is an inverse function of the ratio of ending-year stocks to sugar consumption. If HFCS is available in Mexico at a lower price than domestic sugar, there is an incentive to substitute HFCS for that sugar, thereby adding more sugar to ending stocks and leading to lower sugar prices, all else constant.

The sweetener-trade phase-in period of the North American Free Trade Agreement (NAFTA) was complete as of January 1, 2008. Trade in all sweeteners between Mexico and the United States is now duty free, with no quantitative restrictions, which implies a link between domestic Mexican sugar prices and those in the United States when Mexico exports sugar to the United States. If sugar prices are higher in the United States than in Mexico, it might be expected that sugar from Mexican stocks would be exported to the United States. A trading equilibrium results when price differences are equal to transport and marketing costs, with adjustments made for the bilateral exchange rate and quality differences.⁴

As explained above, sugar baseline projections this year are based on fixed ending stocks-to-use assumptions (version A), with price parity relationships (version B) used for contrasting alternative scenarios. The framework is shown in figure A-2. Version A assumes Mexico exports to the United States for the U.S. to achieve the 13.5-percent stocks-to-use ratio. U.S. TRQ imports do not rise above WTO and FTA minimum levels. Mexico imports from the third countries to reach its ending stocks target. Prices between the two countries are independent of each other. In Version B, Mexico ships sugar to the United States until price parity (explained above) is achieved. There are no Mexican sugar imports from third countries in version B.

Long-Term Projections of Sugar Supply and Use in Mexico—Version A

Table A-5 shows Mexican sugar supply and use, along with HFCS use and sugar prices, from FY 2011 through 2021. Production averages about 5.8 million MTRV over the projections period. Production increases up to FY 2013 (5.975 million MTRV) because of lagged, earlier-period price effects increasing sugarcane area to 681,000 hectares. After FY 2011, annual *estandar* prices rise by small amounts, reflecting exchange rate changes with no changes to the underlying stocks-to-consumption ratio.⁵ Exports average 1.679 million MTRV, while imports average 729,000 MTRV. With nearly constant prices in both Mexico and the United States, dynamics are largely determined by population growth, especially after FY 2013 when HFCS plateaus at 75 percent of the beverage sweeteners market.

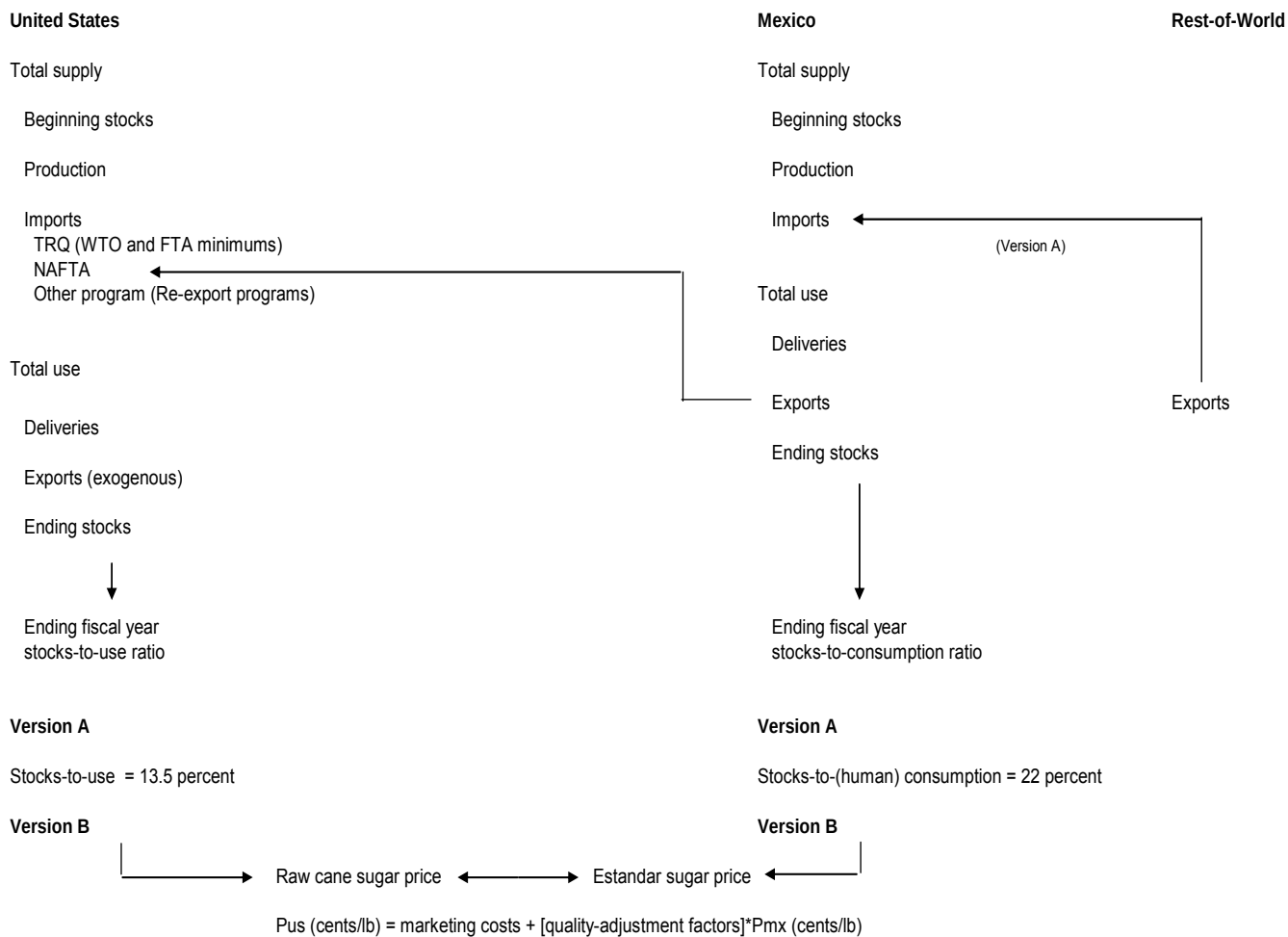
The baseline scenario assumes no net investment increases in the Mexican sugar sector.⁶ Incentives for investment should not be ignored. One incentive is the increased stability emanating from access to the U.S. market. Another is also reduced competition in Mexico because of implied marketing allotment limitations for U.S. sugar producers (a perceived restriction to U.S. producers to 85-percent of the U.S. market) and restrictions on policymakers to increase TRQ imports. U.S. producers themselves may see advantages to investment in Mexican sugar facilities, already seen for certain U.S. refiners and traders.

⁴ *Estandar* sugar produced in Mexico is a very high polarity sugar. Its use in the U.S. refining industry helps that industry reduce its costs.

⁵ The modeling framework determines *estandar* prices for July-September (third quarter of the calendar year). The annual *estandar* price is projected as a weighted average of the current and previous third-quarter *estandar* price. The *estandar* price for FY 2011 is higher than succeeding years because the stocks-to-consumption ratio for FY 2010 is lower than 22 percent, indicating a higher price for the first part of FY 2011.

⁶ When the modeling framework was originally developed, more attention was paid to the possibilities of losing processing capacity resulting from trade liberalization scenarios dictating reductions in U.S. sugar loan rates. While the 2008 Farm Act brought increases in loan rates, thus providing for more downward price security, marketing allotments implied limits on the overall size of the U.S. market for U.S. sugar companies.

Figure A-2--ERS long-term sugar and sweeteners projections model, simplified sugar sector representation



Source: USDA, ERS, Sugar and Sweeteners Group.

Table A-4--ERS long-term sugar and sweeteners projections model: Mexico, assumptions, sweetener deliveries to end users, marketing year 2011-21

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	<i>1,000 metric tons, refined value equivalent</i>										
Beverage deliveries	1,639	1,650	1,658	1,668	1,679	1,689	1,699	1,709	1,720	1,730	1,741
Industrial food deliveries	1,123	1,142	1,160	1,178	1,198	1,219	1,240	1,262	1,284	1,307	1,330
Bakery & cereal	754	765	776	787	798	809	820	831	842	853	865
Confectionery	272	276	279	283	288	293	298	303	309	314	320
Dairy	48	49	51	53	55	58	61	64	67	70	74
Processed foods	50	52	54	55	57	59	62	64	66	69	71
Nonindustrial deliveries	2,802	2,828	2,852	2,879	2,906	2,934	2,963	2,991	3,021	3,051	3,082
Total sweetener deliveries	5,564	5,619	5,670	5,726	5,783	5,842	5,902	5,962	6,024	6,088	6,152
Total sweetener deliveries, per capita (kg)	48.9	48.9	48.8	48.7	48.7	48.7	48.7	48.7	48.8	48.8	48.9

Source: USDA, ERS, Sugar and Sweeteners Team.

Table A-5--Version A, base sugar supply, utilization, and price projections for Mexico, fiscal years 2011-21

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
	<i>1,000 metric tons, raw value (MTRV) 1/</i>										
Beginning stocks	760	1,056	1,048	1,020	1,028	1,039	1,049	1,060	1,071	1,083	1,094
Area (1,000 hectares)	665	676	681	676	667	655	639	636	625	622	624
Sugar yield (MTRV/hectare)	8.655	8.620	8.776	8.823	8.871	8.919	8.965	9.000	9.064	9.106	9.158
Sugar production	5,753	5,830	5,975	5,966	5,914	5,841	5,726	5,726	5,667	5,661	5,715
Imports	1,073	500	239	323	441	580	763	833	959	1,056	1,249
Supply	7,586	7,385	7,263	7,309	7,383	7,460	7,539	7,619	7,697	7,800	8,057
Disappearance	4,801	4,765	4,637	4,674	4,721	4,769	4,819	4,869	4,921	4,971	5,025
Consumption	4,801	4,765	4,637	4,674	4,721	4,769	4,819	4,869	4,921	4,971	5,025
Other disappearance	0	0	0	0	0	0	0	0	0	0	0
Exports	1,729	1,572	1,606	1,607	1,624	1,642	1,660	1,678	1,693	1,736	1,926
Ending stocks	1,056	1,048	1,020	1,028	1,039	1,049	1,060	1,071	1,083	1,094	1,106
High fructose corn syrup (dry weight)	1,038	1,126	1,299	1,319	1,332	1,345	1,358	1,371	1,384	1,401	1,414
Estandar (cents/lb)	25.09	23.87	23.99	24.12	24.24	24.36	24.49	24.61	24.74	24.86	24.99

1/ Unless indicated otherwise.

Source: USDA, ERS, Sugar and Sweeteners Team, projections from ERS long-term sugar and sweeteners model.

A second scenario assumes that investment in Mexican producing facilities (except the two factories in the high-cost Northwest region) causes sugarcane area to expand by an annual rate of 2 percent. The version A specification limits the analysis, however. Although production increases by an average of 441,000 MTRV over the projections period (table A-6), imports are displaced exactly by the same amount due to the ending stocks assumption. Nonetheless, investment projections take on more interest under the version B specification.

Alternative Long-Term Projections of Sugar Supply and Use in Mexico—Version B

The version B base is determined through trade flows bringing about sugar pricing parity between the United States and Mexico. The course for both countries' sugar sectors is set by initial supply conditions in the United States and Mexico and by assumptions about U.S. policy. The FY 2010 ending stocks-to-use ratio is a historically low 9.6 percent in the United States, and stocks-to-consumption in Mexico is 15.5 percent. It is assumed that U.S. policymakers do not increase TRQs above minimum access levels and U.S. producers do not expand capacity to increase production potential. No special assumptions are initially made regarding investment in Mexican processing. In these circumstances, annual U.S. stocks-to-use ratios do not rise above the FY 2010 level.

Table A-7 shows results for Mexico. Average annual production is only 2.4 percent higher in version B than in version A, although version B FY 2021 production is 5.9 percent higher. Substantially higher prices are not seen in Mexico until FY 2018. Up to then, the version B prices exceed those in version A by less than 2 cents per pound (lb). Although the margins increase after FY 2017, prices affect production only after significant lags. Also, the assumption of no Mexican sugar imports from third countries means less total sugar supply and less sugar to export. Version B's average export level is only about 80 percent of that of version A—1.338 million MTRV per year.

Investments in Mexican processing facilities that imply annual 2-percent area expansion push out total annual supply, which leads to expanded exports—1.565 million MTRV compared with the version B base of 1.338 million MTRV—and increased stocks carryover. Average standar prices decrease 12.8 percent from the base to 24.54 cents/lb. The resulting stocks-to-consumption ratio at 22.9 percent is close to the optimum level, providing for increased domestic food security.

Reducing HFCS use in Mexico leads to less exportable sugar supply. Two scenarios are run where HFCS constitutes 50 percent of beverage sweetener demand (down from 75 percent in the base) for both the scenario with no investment and the scenario with 2-percent per annum area increase. Exports fall between 144,000 MTRV and 153,000 MTRV as more sugar is used domestically. Standar prices rise about 28 percent relative to the comparable base scenarios.

Summary

The long-term projections in this article present different perspectives on sugar and sweeteners in Mexico, as well as the United States. Version A represents something of a cooperative fixed-stocks policy in both countries. The ratios used here are arbitrary but do illustrate the approach; other assumptions could be added and modifications made. Version B represents a price-based trade approach. A scenario of restricted HFCS use in Mexico illustrates the effects. Also suggestive are gains available from increased investment in the Mexican sugar sector. Further research regarding costs and tradeoffs with investments in alternative sugar-producing areas could be an extension of this type of analysis.

Table A-6--Comparison of scenario results for Mexico: Sugar supply, use, and prices, average of fiscal year (FY) 2011-21

Item	Scenarios: 1/					
	1.Base - Version A (V-A)	2.Mexico 2% inv. - V-A	3.Base - Version B(V-B)	4.Mexico 2% inv. - V-B	5.HFCS 50% - V-B	6.HFCS 50%, 2% inv.- V-B
	<i>1,000 metric tons, raw value (MTRV) 2/</i>					
Beginning stocks	1,028	1,028	610	1,055	353	667
Area (1,000 hectares)	651	701	664	707	687	725
Sugar yield (MTRV/hectare)	8.905	8.903	8.941	8.908	9.004	8.950
Sugar production	5,798	6,239	5,937	6,299	6,190	6,492
Imports	729	287	136	136	136	136
Supply	7,554	7,554	6,683	7,490	6,680	7,295
Disappearance	4,816	4,816	4,781	4,817	5,174	5,180
Consumption	4,816	4,816	4,781	4,817	5,174	5,180
Other disappearance	0	0	0	0	0	0
Exports	1,679	1,679	1,338	1,565	1,194	1,411
Ending stocks	1,059	1,059	565	1,108	312	704
Stocks-to-consumption (ratio)	0.220	0.220	0.119	0.229	0.061	0.135
High fructose corn syrup (dry weight)	1,308	1,308	1,341	1,307	970	964
Estandar (cents/lb)	24.49	24.49	27.69	24.54	31.84	27.32

1/ Scenarios:

1. Base - Version A (V-A): US stocks-to-use = 13.5%, Mx stocks-to-consumption = 22 %
2. Mexico 2% inv., V-A : same as no.1 except investment in sugar industry results in annual 2-percent area increase
3. Base - Version B (V-B): Mexican estandar - U.S. raw sugar price parity
4. Mexico 2% inv., V-B : same as no. 3 except investment in sugar industry results in annual 2-percent area increase
5. Same as no.3 except HFCS 50% of beverage sweetener demand, down from 75 %
6. Same as no. 4 except HFCS 50% of beverage sweetener demand, down from 75 %

2/ Unless indicated otherwise

Source: USDA, ERS, Sugar and Sweeteners Team, projections from ERS long-term sugar and sweeteners model.

Table A-7--Version B, base sugar supply, utilization, and price projections for Mexico, fiscal years 2011-21

Item	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
<i>1,000 metric tons, raw value (MTRV) 1/</i>											
Beginning stocks	760	655	588	661	732	756	722	620	518	402	298
Area (<i>1,000 hectares</i>)	665	676	681	680	675	667	654	655	648	650	655
Sugar yield (<i>MTRV/hectare</i>)	8.655	8.626	8.804	8.860	8.905	8.951	8.997	9.036	9.111	9.168	9.244
Sugar production	5,753	5,834	6,000	6,025	6,009	5,966	5,882	5,918	5,907	5,957	6,054
Imports	136	136	136	136	136	136	136	136	136	136	136
Supply	6,649	6,625	6,723	6,822	6,877	6,858	6,741	6,674	6,561	6,494	6,489
Disappearance	4,801	4,706	4,584	4,635	4,690	4,741	4,788	4,834	4,883	4,935	4,990
Consumption	4,801	4,706	4,584	4,635	4,690	4,741	4,788	4,834	4,883	4,935	4,990
Other disappearance	0	0	0	0	0	0	0	0	0	0	0
Exports	1,193	1,332	1,479	1,454	1,432	1,395	1,332	1,321	1,276	1,261	1,239
Ending stocks	655	588	661	732	756	722	620	518	402	298	259
High fructose corn syrup (<i>dry weight</i>)	1,038	1,182	1,348	1,355	1,361	1,372	1,387	1,404	1,420	1,435	1,447
Estandar (<i>cents/lb</i>)	25.70	26.47	26.78	26.20	25.93	26.06	26.65	27.74	29.11	30.99	32.94

1/ Unless indicated otherwise.

Source: USDA, ERS, Sugar and Sweeteners Team, projections from ERS long-term sugar and sweeteners model.



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