

High Fructose Corn Syrup (HFCS) in the U.S. Caloric Sweetener Supply

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**Ross Korves
Economic Policy Analyst**

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Key Points

In 2010, high fructose corn syrup (HFCS) accounts for 37.1 percent of the caloric sweetener market in the U.S. and other corn sweeteners account for another 11.8 percent.

At wholesale HFCS is most often priced \$0.05-0.08 per pound lower than refined cane and beet sugar. With the current tight domestic and international supply situation for sugar, HFCS prices have ranged between \$0.24-0.27 per pound lower than sugar.

At the average price spread of calendar years 2000-2009, HFCS would have saved U.S. consumers about \$992 million in 2010 compared to sugar. The larger actual price spread for 2010 resulted in U.S. consumers saving \$3.848 billion by using HFCS.

Carryover sugar supplies in the U.S. for the marketing year ending September 30, 2011 are expected to be 14.1 percent of consumption. About 13.5 percent is considered an acceptable carryover and prior to the last three years a "normal" carryover was 15-17 percent of consumption. There are no excess sugar supplies to immediately replace HFCS as a caloric sweetener.

U.S. sugar production in the marketing year beginning October 1, 2011 is projected by the World Agricultural Outlook Board (WAOB) of USDA at 8.19 million STRV, up 3.0 percent from the current year, but carryover supplies will be lower without additional imports of sugar.

Under various trade agreements the U.S. is required to import a minimum of 1.37 million short ton raw value (STRV) tariff rate quota (TRQ) sugar each year. Actual imports under the TRQ have exceeded the minimum in most recent years.

The WAOB has projected U.S. sugar consumption of 11.52 million STRV for the 2011/12 marketing year beginning on October 1, 2011. Sugar production, required import under trade agreements and Mexican sugar entering under NAFTA are projected to total 10.79 million STRV. The Secretary of Agriculture will likely authorize additional imports to meet domestic demand.

World sugar supply-demand balances are tight with world carryover supplies as a percent of total world disappearance the lowest in 20 years at 18 percent. For the U.S. to import more sugar, it will need to compete on price with other importers.

Projections of U.S. sugar cane production over the next ten years by USDA and the Food and Agricultural Policy Research Institute (FAPRI) show cane sugar production about the same as current production. Beet sugar has a greater chance of increasing production due to higher yields per acre harvested. Increases in production are not expected to replace more than 10 percent of current U.S. HFCS consumption, unless returns to sugar cane and sugar beet farmers are high enough to attract additional acres to those crops and returns to sugar refiners are sufficient to attract additional investments.

Introduction

High fructose corn syrup (HFCS) is an integral part of the sweetener supply for U.S. consumers. According to estimates by the U.S. Department of Agriculture (USDA) for 2010, HFCS accounted for 37.1 percent on a dry weight basis of the 20.4 million tons of total caloric sweeteners for domestic food and beverage use in the U.S. See Table 1. Cane and beet sugar was the largest category of caloric sweeteners at 50.0 percent. Other corn sweeteners accounted for 11.8 percent, and other sweeteners (honey and other edible syrups) were the other 1.1 percent of supply. HFCS and other corn sweeteners together account for 48.9 percent of caloric sweeteners.

The U.S. is the world's second largest consumer, after India, of caloric sweeteners, including high fructose corn syrup. The U.S. is the number five sugar producer with significant production of sugar beets and sugar cane, and the number one producer of HFCS.

Table 1
U.S. Total Estimated Deliveries of Refined Caloric Sweeteners
for Domestic Food and Beverage Use, by Calendar Year
1,000 Short Tons, Dry Basis

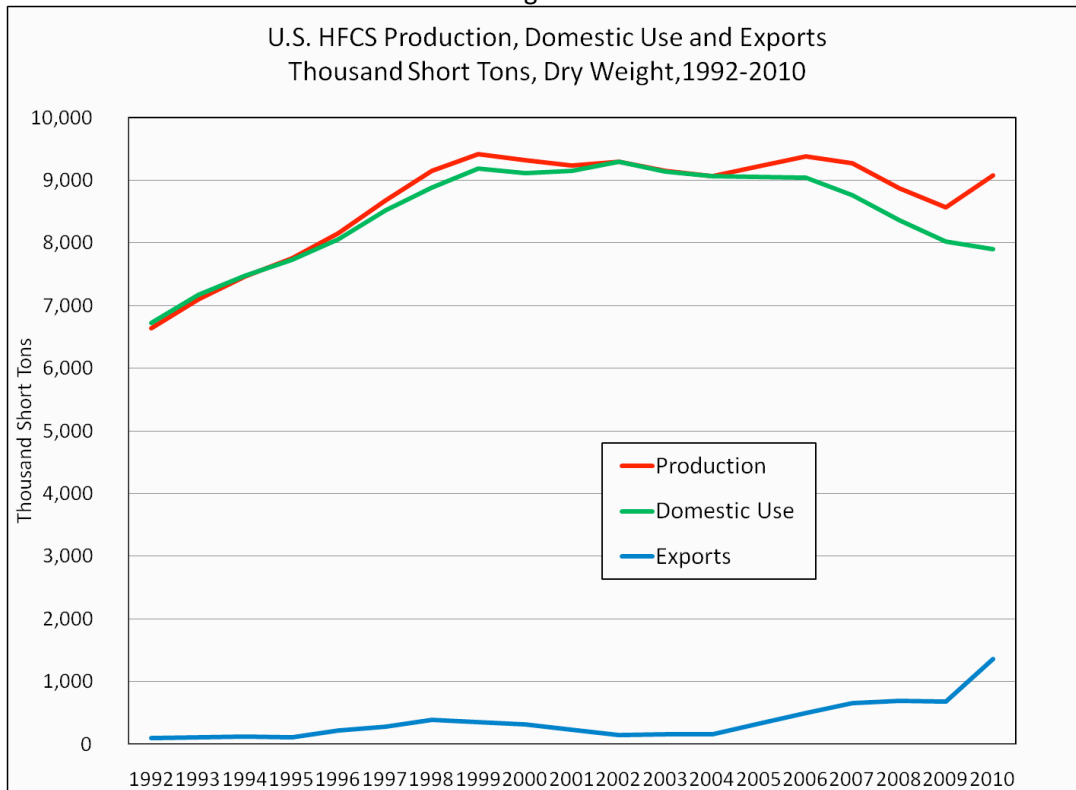
Year	Sugar	Percent of Total	HFCS	Percent of Total	Other Corn	Percent of Total	Other Sweetener	Percent of Total	Total Sweetener
2000	9,252	44.0%	8,845	42.1%	2,706	12.9%	217	1.0%	21,020
2001	9,195	43.8%	8,920	42.5%	2,675	12.7%	195	0.9%	20,985
2002	9,105	43.2%	9,045	42.9%	2,697	12.8%	215	1.0%	21,061
2003	8,848	43.0%	8,849	43.0%	2,658	12.9%	209	1.0%	20,564
2004	9,029	43.4%	8,779	42.2%	2,779	13.4%	195	0.9%	20,781
2005	9,324	44.3%	8,756	41.6%	2,742	13.0%	221	1.1%	21,043
2006	9,286	44.8%	8,702	41.9%	2,517	12.1%	240	1.2%	20,745
2007	9,230	45.2%	8,479	41.5%	2,516	12.3%	208	1.0%	20,432
2008	9,911	48.0%	8,080	39.1%	2,455	11.9%	220	1.1%	20,666
2009	9,740	48.6%	7,698	38.4%	2,408	12.0%	210	1.0%	20,056
2010	10,196	50.0%	7,555	37.1%	2,406	11.8%	232	1.1%	20,389

Source: ERS, USDA, Sugar and Sweeteners Yearbook

HFCS is produced as two types. HFCS-42 is comprised of 42% fructose, 53% glucose, and 5% polysaccharides and other sugars. For comparison, sugar is 50 percent fructose and 50 percent glucose. HFCS-42's main use is as a sweetener in baked goods and other foodstuffs. Its counterpart, HFCS-55, is 55 percent fructose, 42 percent glucose and 3 percent polysaccharides and other sugars. Its largest use is in soft drinks.

U.S. production of HFCS has been primarily for the domestic market until recent years when more has moved into exports, mostly to Mexico because U.S. HFCS has been cheaper than Mexican produced sugar. U.S. production grew in the 1990s, and then stabilized, until a downturn in the last few years. Increased exports in 2010 led to higher production.

Figure 1



Source: ERS, USDA, Sugar and Sweeteners Yearbook

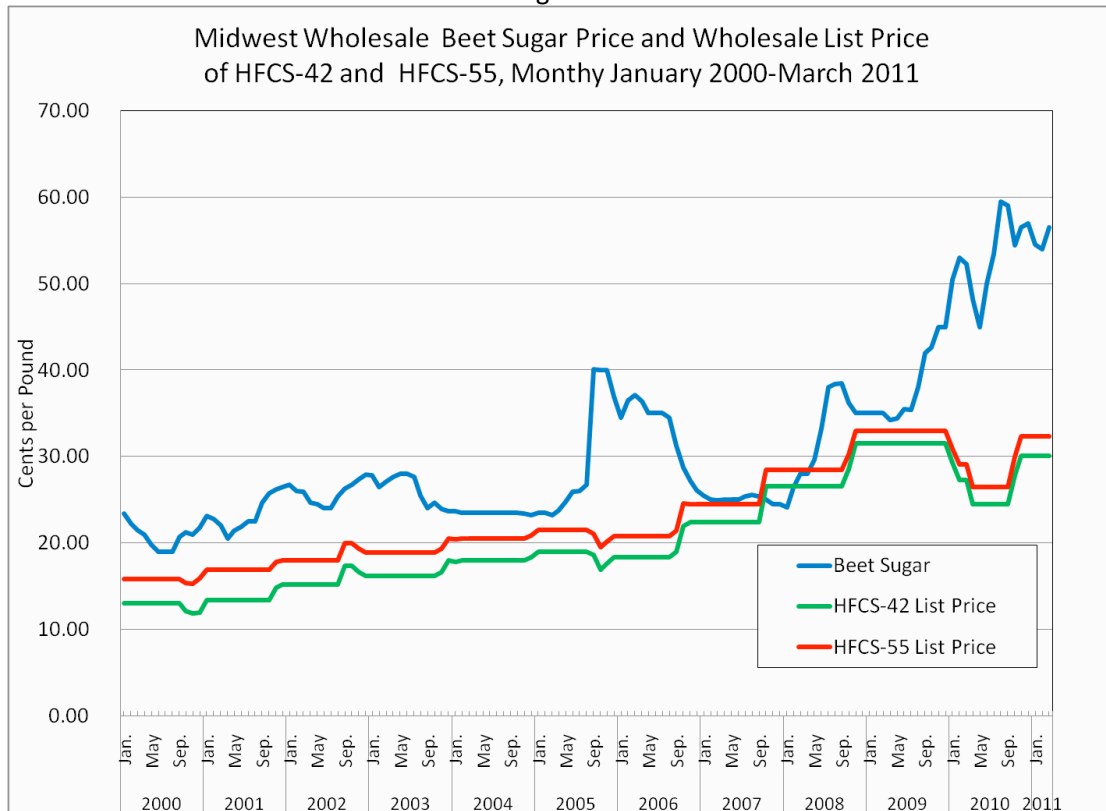
Wholesale HFCS and Sugar Prices

HFCS prices have historically been lower than refined cane and beet sugar as shown in Figure 2. The high prices for sugar in 2005 and 2006 were caused by supply disruptions associated with hurricane Katrina. Sugar prices since September 2009 have been at record highs due to tight supply-demand conditions in the U.S. and the rest of the world.

For January 2000 through December 2009, the simple monthly average price spread between the wholesale beet sugar price (the most often quoted wholesale sugar price) and the wholesale list price for HFCS-42 was \$0.081 per pound. For January 2010 through March 2011, the simple average monthly price spread between wholesale beet sugar and HFCS – 42 was \$0.263 per pound.

The price spread between wholesale beet sugar and HFCS-55 was \$0.056 per pound for January 2000 through August 2009. The price spread for HFCS-55 for January 2010 through March 2011 was \$0.243 per pound.

Figure 2



Source: ERS, USDA, Sugar and Sweeteners Yearbook

Based on USDA estimates, in 2010 2.908 million tons of HFCS-42 were used in food and beverages in the U.S. If HFCS-42 had not been available and sugar was used in its place at the historical average monthly price spread for January 2000 through December 2009 of \$0.081 per pound, U.S. consumers would have paid \$471 million more for sugar than they paid for HFCS-42. Using the actual price spread for January 2010 through December 2010 of \$0.267 per pound, sugar as a replacement would have cost U.S. consumers an additional \$1.553 billion in 2010 compared to using HFCS-42.

Based on USDA estimates, 4.647 million tons of HFCS-55 were used in food and beverages in the U.S. in 2010. The wholesale price spread of sugar to HFCS-55 was \$0.056 per pound for January 2000 to December 2009 and \$0.247 per pound for January 2010 to December 2010. The cost difference for consumers at the 2000-2009 price spread was \$520 million for 2010 and \$2.296 billion with the higher price spreads for 2010.

The combined cost for sugar as a replacement for HFCS-42 and HFCS-55 at normal price spreads at the 2010 usage levels would have been an additional \$991 million. The higher price spreads for 2010 actually would have cost U.S. consumers an additional \$3.849 billion.

Sources of Replacement Sugar

Under current domestic sugar policies and trade agreements, the U.S. does not produce enough sugar to meet domestic demand and replace the current use of HFCS. Under WTO trade agreement the U.S. is required to import each year 1.256 million short tons raw value (STRV) of sugar under a tariff rate quota

(TRQ). The required amounts come in tariff free and additional sugar can enter with a tariff of \$0.1536 per pound. Other trade agreements increase required imports to a total to 1.371 million STRV. Imports of sugar from Mexico are in addition to the TRQ amounts and enter tariff free under NAFTA. Over the last three year including this year, actual annual imports minus re-exports have averaged 2.708 million STRV.

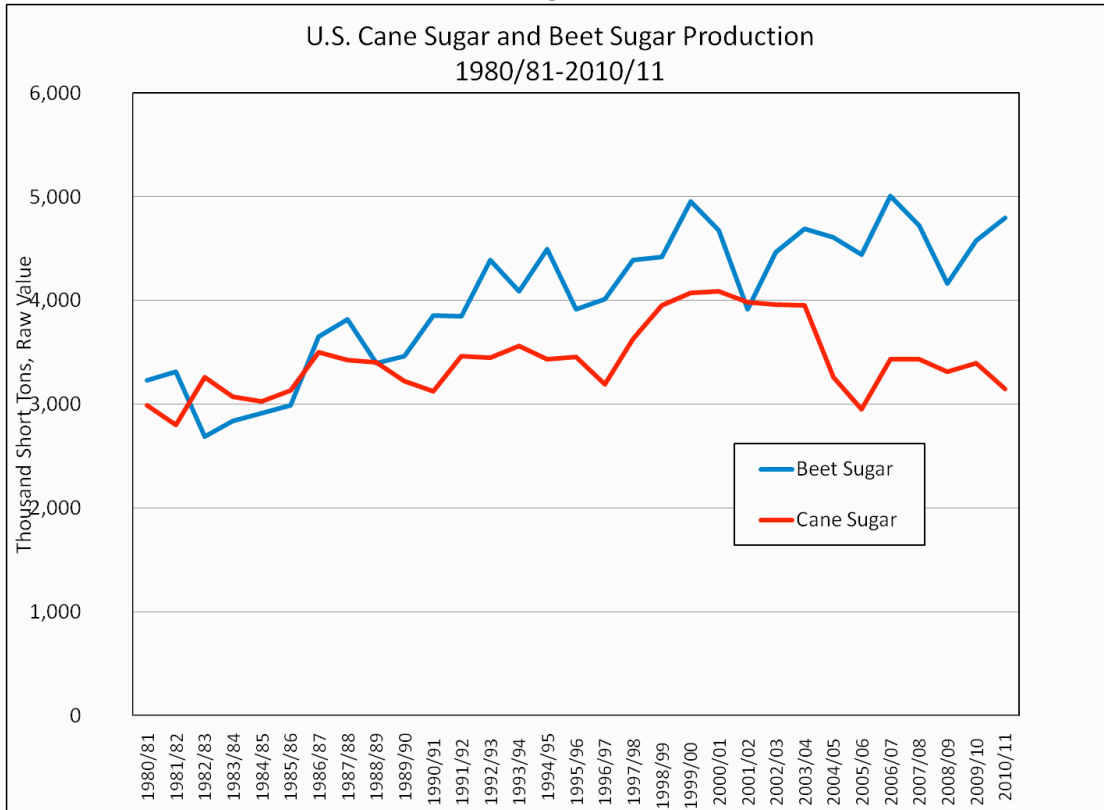
USDA manages the domestic sugar market so the total supply of domestic sugar marketed plus imported sugar is not large enough to depress prices for raw cane sugar and refined beet sugar below prices established by Congress. Domestic sugar marketing allotments prevent too much domestic production from entering the market and depressing market prices below the level mandated by Congress. For the 2010/11 marketing year all domestically produced sugar is eligible to be sold under marketing allotments.

If domestic production plus required imports under the WTO agreement and other trade agreements fall short of the amount needed to meet domestic demand, USDA is allowed to increase the quantity of raw cane sugar imports under the TRQ for the fiscal year to meet the demand without overburdening the market and forcing sugar prices below the minimum price set by Congress. An increase in imported sugar under the tariff rate quota cannot occur until after April 1 of the marketing year that begins on October 1. In April USDA increased the TRQ by 325,000 tons for the current marketing year. As noted earlier, sugar can also be imported above the TRQ amount if buyers are willing to pay the \$0.1536 per pound tariff.

The U.S. produces cane sugar, 40 percent of the crop in 2010/11 (October-September marketing year), and beet sugar, 60 percent of the 2010 crop. Cane is grown primarily in Florida and Louisiana in warm, humid climatic conditions, with small amounts produced in the lower Rio Grande River area of Texas and Hawaii. Cane acres harvested for sugar had a recent peak averaging 944,000 acres in 2000/01-2004/05 and declined to an average of 834,000 acres for 2005/06-2008/09 and to 830,000 acres for 2009/10. Sugar yield per acre of cane harvested has been fairly stable for 30 years averaging just over 4 tons per acre STRV. The yield was 3.80 STRV in 2010/11. Sugar production from cane also peaked in 2000/01-2004/05 at an average of 3.856 million STRV per year before declining to an average of 3.319 million STRV in 2005/06-2009/10 and to 3.152 million STRV in 2010/11. Production could increase in the years ahead if the current high prices lead to more planting of cane this year.

The Upper Midwest is the largest production area for sugar beets, with smaller amounts grown in the Great Lakes, Great Plains and Western regions. Total acreage harvested average 1.326 million acres in 2000/01-2004/05 and declined to an average of 1.189 million acres in 2005/06-2009/10 and to 1.156 million acres in 2010/11. Sugar beet yields in tons of beets per acre increased from an average of 22.1 tons in 2000/01-2004/05 to an average of 25.2 tons on 2005/06-2009/10 and 27.6 tons in 2010/11. Production increased from an average of 4.5 million STRV in 2000/01-2004/05 to an average of 4.6 million STRV for 2005/06-2009/10 and to 4.8 million STRV for the 2010/11 crop. Sugar beet production could increase if beet yields per acres continue to improve and market prices remained high for a sufficiently long period of time to attract additional land now producing other crops and investments in additional beet sugar processing facilities.

Figure 2



Source: ERS, USDA, Sugar and Sweeteners Yearbook

The Economic Research Service of USDA 2011 ten-year projections of a representative scenario for U.S. sugar production indicate only modest growth in sugar production over the next ten years. These projections assume current domestic sugar and imported sugar policies remain unchanged. Cane acreage remains flat and sugar cane production increase less than 1 percent per year due to small increases in yield per acre. Sugar beet acreage is expected to decline slightly, but growth in yield per acre will increase production slightly. Raw sugar prices will remain high enough to prevent government ownership of sugar. Tariff free sugar imports from Mexico will help balance supply and demand.

The Food and Agricultural Policy Research Institute at the University of Missouri and Iowa State University has a slight different view of the next ten year. These projections also assume current policies for domestic sugar production and sugar imports remain unchanged. They expect cane sugar production to be flat over the next ten years, but believe sugar beet yields per acre are going to increase beet sugar production to 5.6 million STRV in 2020 from 4.8 million STRV for the 2010 crop. Their raw sugar prices average about \$0.09 per pound higher than USDA's price projections. For sugar beet refiners to build more capacity and farmers to expand acreage they will have to be convinced that profitable price will be maintained over enough years to recover additional investments.

Comparing U.S. cane sugar refining capacity as reported in the *Sugar Journal* with USDA estimates of FY2010 domestic sugar production and raw cane sugar imports indicate that cane sugar refiners operated at about 94 percent of yearly capacity. If more domestic sugar cane is produced and/or more raw cane sugar is imported, sufficient profitability will be needed to attract more investment in cane sugar refining in the U.S.

Current Market Conditions

Current caloric sweetener supplies are tight in the U.S. according to the May 11 World Agricultural Supply & Demand Estimates from the WAOB of USDA. Total U.S. sugar use for the current marketing year ending September 30, 2011 is projected by USDA at 11.44 million STRV, while total production and imports is projected at 11.54 million STRV. End of year stocks would be 1.61 million STRV, with a stocks-to-use ratio of 14.1 percent, just above the target of 13.5 percent often used for managing the program and below the 15-17 percent stocks-to-use ratio that had been somewhat “normal” in recent years. There are no “excess stocks” in the current U.S. sugar supply-demand balance to accommodate a shift away from HFCS.

The May 11 projections from the WAOB for FY2011/12, the marketing year beginning October 1, 2011, are not encouraging. U.S. production is expected to increase slightly to 8.190 STRV as the trend yield increase in sugar beets gives the same size crop as 2010 at 4.8 million STRV. Cool wet weather has delayed planting of sugar beets this spring in the Midwest and Plains by several weeks which will likely result in a below trend yield unless weather is more favorable than usual for the remainder of the growing season. Some sugar processing plants are suggesting that growers increase acreage by several percent to achieve total production equal to the marketing allotment for the plant. With the late season and strong market prices for other crops that may not occur.

Cane sugar production is expected to increase 240,000 STRV for 2011/12, up 7.6 percent from last year, to 3.39 million STRV as Florida is expected to have a more normal crop. Total use is projected to increase 80,000 STRV, 0.7 percent, to 11.52 million STRV.

U.S. imports for 2011/12 under the required TRQs are projected at 1.26 million STRV, 0.35 million STRV under other programs, 0.98 million STRV from Mexico and 0.01 million STRV from other countries. Imports from Mexico are projected down from 1.51 million STRV this year due to lower carryover stocks and less import, even though Mexican domestic production will be up slightly.

U.S. carryover supplies on September 30, 2012 would be an unreasonably low 0.89 million STRV, 7.7 percent of use for the year. The Secretary of Agriculture will not allow that to happen. He will increase the TRQs to keep adequate supplies, but under current law he cannot increase them until after April 1, 2012. If the target carryover is 13.5 percent of use and production and use match the current projections, the Secretary would need to increase the TRQ by 0.67 million STRV. Total imports would be 3.269 million STRV, down a little from imports for last year and this year.

The situation in the world market is equally challenging according to estimates by the Foreign Agricultural Service of USDA. End of marketing year world sugar stocks on September 30, 2011 are projected to be 18 percent of world disappearance, the same as the 2009/10 marketing year and the lowest percentage for the last 20 years. Projections for ending stocks for the 2011/12 marketing year are also 18 percent. The simple average of carryover percentages for the last 20 years has been 23 percent with a peak of 30 percent in the 2000/01 marketing year.

Increased sugar imports in the immediate years ahead will likely require prices in the U.S. to be high enough to replace consumption someplace else in the world.