



Economic  
Research  
Service

Situation and  
Outlook

SSS-M-296

Apr. 16, 2013

# Sugar and Sweeteners Outlook

**Stephen Haley, coordinator**  
[Shaley@ers.usda.gov](mailto:Shaley@ers.usda.gov)

**Andy Jerardo**  
[Ajerardo@ers.usda.gov](mailto:Ajerardo@ers.usda.gov)

## U.S. Sugar April 2013

The next release is  
May 16, 2013  
-----  
Approved by the  
World Agricultural  
Outlook Board.

On April 10, 2013, the U.S. Department of Agriculture (USDA) published in the *World Agricultural Supply and Demand Estimates* (WASDE) its latest sugar supply and use projections for Mexico and the United States for fiscal year (FY) 2013. The USDA projects Mexico sugar production at 6.117 million metric tons (mt), an increase of 227,000 mt from last month. The USDA projection of deliveries for human consumption is unchanged at 4.200 million mt. The USDA projects ending stocks at 27 percent of consumption, or 1.135 million mt. The USDA projects exports residually at 1.520 million mt. Based on reliable information, the USDA expects 110,000 mt to be exported to third countries outside of the North American Free Trade Agreement (NAFTA) area. Exports to the United States are projected at 1.410 million mt.

The USDA reduced its FY 2013 U.S. beet sugar forecast by 200,000 short tons, raw value (STRV) to 5.100 million STRV. The reduction was based on lower expected sugar production from the 2013/14 sugarbeet crop to be harvested prior to start of FY 2014. The USDA increased its forecast of Florida cane sugar production by 20,000 STRV to 1.850 million STRV based on processors' reporting of better prospects. Total sugar production (beet sugar plus cane sugar) is forecast at 8.980 million STRV.

The USDA increased sugar imports by 58,000 STRV to 3.036 million STRV. All of the increase is attributable to increased imports from Mexico. Based on pace to date, the USDA increased its forecast of deliveries for human consumption by 100,000 STRV to 11.480 million STRV. The USDA projects total ending-year stocks 222,000 STRV lower than last month at 2.136 million STRV. The implied ending stocks-to-use ratio is 18.0 percent, 2 percentage points lower than last month.

## Sugar and Sweeteners in the North American Free Trade Area

On April 10, 2013, the U.S. Department of Agriculture (USDA) published in the *World Agricultural Supply and Demand Estimates (WASDE)* its latest sugar supply and use projections for Mexico and the United States for fiscal year (FY) 2013. As reported last month, the *Comite Nacional Para El Desarrollo Sustentable de la Caña de Azucar* (Conadesuca) updated its estimate of the 2012/13 Mexico supply and use balance and has since released some details regarding its most recent sugar production forecast.

### Mexico Sugar and High Fructose Corn Syrup

The USDA projects Mexico sugar production at 6.117 million metric tons (mt), an increase of 227,000 mt from last month. Although signs of a larger crop were evident in early March, the USDA continued to anchor its projection in the March 2013 WASDE on the underlying parameter values of Conadesuca's existing official forecast. Immediately after the release of the March 2013 WASDE, Conadesuca released its new forecast of production at 6.247 million mt. Later in March, Conadesuca released a small portion of the supporting technical assumptions behind the forecast.

Table 1 shows technical detail of the USDA and Conadesuca forecasts. Although the April 2013 USDA forecast and the Conadesuca forecast are in rough agreement (Conadesuca is about 130,000 mt higher), underlying assumptions differ considerably. The USDA bases its forecast on interim data through March 30 and average historical relationships between parameter values through this date and final, end-of-season parameter values. The USDA allows for variability in parameter estimation and thus produces ranges within which there is strong statistical likelihood for those final values. In the past, Conadesuca has relied on factory surveys for its forecasts. In this latest forecast, it has not yet published its customary detailed factory forecasts.

The USDA projects area harvested at 702,000 hectares, while Conadesuca projects a record 768,000 hectares. Area harvested through April 6 has amounted to 509,718 hectares, running about 17,740 hectares behind the corresponding period averaged over the last 5 years. To reach the Conadesuca total, 258,175 hectares would have to be harvested by the end of June. This is about 100,000 hectares more than the average for the past 4 years. Although possible, achieving this would require a herculean effort. Conadesuca projects sugarcane yield at 71.4 mt per hectare and USDA projects the yield at 77.0 mt. The interim yield through April 6 is 84.5 mt per hectare. While the yield would be expected to decrease at the end of the harvest, the 15.5 percent decrease to 71.4 mt seems precipitous. Sucrose recovery is the most stable of the parameters—it is only here that both USDA and Conadesuca appear to agree.

Table 1 -- Mexico sugar crop parameter projections

	SSO: March 2013	SSO: April 2013	Conadesuca
Area (hectares)	712,684	701,797	767,893
Yield (metric ton/hectare)	72.99	76.96	71.36
Sugarcane (metric tons)	52,019,425	54,012,253	54,796,168
Recovery (percent)	11.32	11.33	11.40
Sugar (metric tons)	5,890,715	6,117,025	6,246,744

Source: U.S. Dept. Agriculture, World Agricultural Supply and Demand Estimates; Economic Research Service, *Sugar and Sweetener Outlook*.

Table 2 compares the USDA April WASDE forecast with that of Conadesuca. The largest difference between the series is for deliveries for human consumption. Originally, both USDA and Conadesuca were forecasting consumption at 4.20 million mt. Conadesuca increased its forecast to 4.40 million; the USDA made no adjustment. Table 3 shows sugar and high fructose corn syrup (HFCS) deliveries through the end of February. Both sugar and HFCS in 2012/13 are running behind the same period last year. Although Conadesuca reduced its HFCS forecast by 94,000 mt to 1.541 million mt, dry weight, the reduction in HFCS deliveries through February is less than 1-percent, while the corresponding sugar reduction is 2.6 percent.

The USDA and Conadesuca project ending stocks at 27 percent of consumption: 1.135 million mt for USDA and 1.189 million mt for Conadesuca. The USDA projects exports residually at 1.520 million mt—close to the Conadesuca projection of 1.527 million mt. Based on reliable information, the USDA expects 110,000 mt to be exported to third countries outside of the North American Free Trade Agreement (NAFTA) area. Exports to the United States are, therefore, projected at 1.410 million mt.

### **U.S. Sugar Supply and Use**

The USDA reduced its FY 2013 beet sugar forecast by 200,000 short tons, raw value (STRV) to 5.100 million STRV. The reduction was based on lower expected sugar production from the 2013/14 sugarbeet crop to be harvested prior to October 1, 2013, the first day of the new fiscal year.

Sugarbeet area for 2013/14 from the National Agricultural Statistics Service (NASS) Prospective Plantings shows planted area at 1.211 million acres, only 19,000 acres less than last year. Plantings are expected to be lower in Minnesota and North Dakota by 1.0 percent, by 2.8 percent in the Great Plains, and by 3.9 percent in the Pacific Northwest. Area is projected to remain the same in Michigan and California. Cold and wet weather conditions in a large proportion of the sugarbeet growing areas are expected to cut into early plantings and subsequent early harvesting. There is no reason to expect anything but a return to normal yields from last year's high levels. Although sugar production in 2013/14 could be in excess of 4.900 million STRV, the proportion of production gained from slicing in the August/September period would not be expected to be above average.

The USDA increased its forecast of Florida cane sugar production by 20,000 STRV to 1.850 million STRV based on processors' reporting of better prospects. Total sugar production (beet sugar plus cane sugar) is forecast at 8.980 million STRV.

The USDA increased sugar imports by 58,000 STRV to 3.036 million STRV. All of the increase is attributable to sugar from Mexico. Although more imports from Mexico are expected, the pace of imports will have to pick up to reach the projected 1.647 million STRV. The Foreign Agricultural Service (FAS) estimates these imports through the end of March at 685,104 STRV, or 41.6 percent of the full-year forecast. Monthly imports will have to average a high level of 160,400 STRV for the next 6 months to reach the forecast.

The import increase is more than offset by the aggregate production decrease: total supply is 122,000 STRV lower than last month, now projected at 14.001 million STRV.

The USDA increased its forecast of deliveries for human consumption by 100,000 STRV to 11.480 million STRV. Although many observers believe that deliveries are not strong this year, deliveries from beet sugar processors are 7.0 percent higher through February compared with last year. The comparable rate for cane sugar processors/refiners is 1.3 percent, and for direct consumption imports it is 4.9 percent.

Table 2 – Mexico: 2012/13 sugar production and supply and sugar and High Fructose Corn Syrup (HFCS) utilization

2012/13 Market year (Oct/Sept)	April 2013 WASDE	Current Conadesuca (3/2013)
	1,000 metric tons, actual weight	
Beginning stocks	966	966
Production	6,117	6,247
Imports	112	14
Imports for consumption	23	14
Imports for sugar-containing product exports (IMMEX) 1/	90	NA
Total supply	7,195	7,227
Disappearance		
Human consumption	4,200	4,403
For sugar-containing product exports (IMMEX)	340	
Domestic production for IMMEX 2/		108
Total	4,540	4,511
Exports	1,520	1,527
Exports to the United States & Puerto Rico	1,410	NA
Exports to other countries	110	NA
Total use	5,910	6,038
Ending Stocks	1,135	1,189
	1,000 metric tons, raw value	
Beginning stocks	1,024	1,024
Production	6,484	6,622
Imports	119	15
Imports for consumption	24	15
Imports for sugar-containing product exports (IMMEX)	95	NA
Total supply	7,627	7,660
Disappearance		
Human consumption	4,452	4,667
For sugar-containing product exports (IMMEX)	360	
Domestic production for IMMEX		114
Total	4,812	4,782
Exports	1,611	1,619
Exports to the United States & Puerto Rico	1,495	NA
Exports to other countries	117	NA
Total use	6,265	6,400
Ending stocks	1,203	1,260
Stocks-to-Human Cons. (percent)	27.0	27.0
Stocks-to-Use (percent)	19.2	19.7
High Fructose Corn Syrup (HFCS) Consumption (dry weight)	1,635	1,541

1/ Forecast.

2/ IMMEX = Industria Manufacturera, Maquiladora y de Servicios de Exportación; Conadesuca does not incorporate IMMEX sugar supply-use balance in its national sugar supply-use balance.

Table 3 -- Sweetener consumption in Mexico, October-March, 2009/10-2012/13

Year	Sugar	HFCS 1/	Sweetener	HFCS share
2009/10	1,854,163	491,005	2,345,168	20.9
2010/11	1,678,562	611,256	2,289,818	26.7
2011/12	1,748,213	665,184	2,413,397	27.6
2012/13	1,702,225	660,139	2,362,364	27.9

1/ HFCS = high fructose corn syrup.

Source: Conadesuca.

Table 4 -- Sugar and Sweetener Outlook April 2013 projection model of U.S. sugar deliveries for human consumption in fiscal year 2013

Model coefficients					
	Symbols	Total deliveries (I)	Beet deliveries (II)	Cane deliveries (III)	Direct Consump. imports (IV)
Constant	A	780,815	406,446	550,795	Residual = I - (II+III)
Shifter	B	-89,068	0	33,003	
Trend (value in FY 2013)	C	347,312	0	0	
Beet deliveries	D	0	0	-0.1996	
Oct	E	0	0	0	
Nov	F	-87,151	-42,409	-24,043	
Dec	G	-193,558	-84,581	-91,703	
Jan	H	-187,056	-62,273	-100,045	
Feb	I	-194,184	-64,822	-102,652	
Mar	J	-61,091	-21,325	-19,614	
Apr	K	-125,180	-40,815	-64,529	
May	L	-81,302	-17,941	-35,496	
Jun	M	-56,874	0	-19,295	
Jul	N	-72,606	-18,144	-35,747	
Aug	O	0	0	0	
Sept	P	0	0	0	

Model projections of monthly deliveries: total, beet sugar, cane sugar, and direct consumption imports (short tons, raw value).

Delivery months	Formula	Total deliveries (I)	Beet deliveries (II)	Cane deliveries (III)	Direct Consump. imports (IV) 1/
Oct	A+B+C+D*(II)+E	1,044,236	451,422	512,609	80,205
Nov	A+B+C+D*(II)+F	1,034,596	385,218	521,274	128,104
Dec	A+B+C+D*(II)+G	742,204	315,055	414,213	12,936
Jan	A+B+C+D*(II)+H	921,152	383,590	465,350	72,212
Feb	A+B+C+D*(II)+J	877,137	368,676	423,153	85,308
Mar	A+B+C+D*(II)+J	977,969	385,121	487,325	105,522
Apr	A+B+C+D*(II)+K	913,879	365,631	446,301	101,948
May	A+B+C+D*(II)+L	957,757	388,505	470,768	98,484
Jun	A+B+C+D*(II)+M	982,185	406,446	483,389	92,350
Jul	A+B+C+D*(II)+N	966,454	388,302	470,558	107,594
Aug	A+B+C+D*(II)+O	1,039,060	406,446	502,684	129,930
Sept	A+B+C+D*(II)+P	1,039,060	406,446	502,684	129,930
Total projected deliveries	Sum	11,495,689	4,650,859	5,700,308	1,144,522

1/ Calculated as a residual; 2/ SMD = Sweetener Market Data from U.S. Dept. of Agricultural, Farm Service Agency.

Forecast: FY 2013

Source: U.S. Dept. of Agriculture: Economic Research Service, *Sugar and Sweetener Outlook*.

Table 4 shows the *Sugar and Sweeteners Outlook* (SSO) deliveries model. The first 5 months are actual deliveries. The rest-of-the-year deliveries are derived from the trends shown in the top panel. Total deliveries are shown at 11.496 million STRV, but the WASDE increase was rounded to an even 100,000 STRV. Direct consumption imports are implicitly projected at 1.129 million STRV in the WASDE accounting.

Total use increased 100,000 STRV in the WASDE. Along with the decrease in total supply, total ending-year stocks are projected 222,000 STRV lower than last month at 2.136 million STRV. The implied ending stocks-to-use ratio is 18.0 percent, 2 percentage points lower than last month.

## *Sugar Balances in Perspective*

Table 5 shows U.S. sugar supply and use by sourcing components as projected by the *Sugar and Sweetener Outlook*: beet sugar processors, cane sugar processors/refiners, and direct consumption imports. The division of ending stocks of 2.136 million STRV is projected as 1.220 million STRV held by beet sugar processors and 916,000 STRV by cane sugar processors/refiners.

Table 6 shows annual U.S. beet sugar supply and use balances since 1998/99 through the 2012/13 projection year. Table 7 gives the same information for cane sugar. Figure 1 shows historical ending stocks-to-use ratios for beet and cane sugar stocks. The projected 2012/13 beet sugar ratio at 25.8 percent is the highest valued ratio, far exceeding the 15.3 percent average for this historical series sample. The projected 2012/13 cane sugar ratio at 15.2 percent is lower than the 18.2 percent period average and less than the 19.3 percent ratio of 2011/12.

These data would seem to suggest that beet sugar is in more excess supply than cane sugar. Interestingly, the low range of the Midwest refined beet sugar price quote in *Milling and Baking News* the first week of April is 27 cents per pound, still above the minimum price-to-avoid forfeiture. The nearby Intercontinental Exchange No. 16 raw cane sugar futures price is averaging about 20.70 cents per pound, slightly below the minimum price-to-avoid forfeiture.

Table 5 -- 2012/13 U.S. sugar supply and use, by source, April 2013

Items	2012/13			
	All sources	Beet sugar	Cane sugar	Direct imports by nonreporters
	1,000 short tons, raw value			
Beginning stocks	1,985	845	1,140	0
Total production	8,980	5,100	3,880	0
Total imports	3,036	0	1,907	1,129
Total Supply	14,001	5,945	6,927	1,129
Total exports	175	18	158	0
Miscellaneous	0	0	0	0
Deliveries for domestic use	11,690	4,708	5,853	1,129
Transfer to sugar-containing products for exports under reexport program	180	45	135	0
Transfer to polyhydric alcohol, feed	30	12	18	
Deliveries for domestic food and beverage use	11,480	4,651	5,700	1,129
Total Use	11,865	4,725	6,011	1,129
Ending stocks	2,136	1,220	916	0
Stocks-to-use ratio	18.00	25.81	15.24	0.00

Source: U.S. of Agriculture, World Agricultural Supply and Demand Estimates, and Economics Research Service, *Sugar and Sweetener Outlook*.

Table 6 -- U.S. beet sugar supply and use

Items	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Beginning stocks	686	575	1,072	910	550	684	720	577	663	860	650	530	621	559	845
CCC	0	0	235	458	83	0	17	0	0	0	0	0	0	0	0
Private	686	575	837	452	467	684	703	577	663	860	650	530	621	559	845
Total production	4,421	4,974	4,680	3,915	4,462	4,692	4,611	4,444	5,008	4,721	4,214	4,575	4,659	4,900	5,100
Total imports	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total supply	5,107	5,549	5,752	4,825	5,012	5,376	5,331	5,021	5,671	5,581	4,863	5,105	5,280	5,460	5,945
Total exports	0	0	0	0	0	49	37	25	187	28	13	21	20	29	18
Miscellaneous	106	-1	142	-21	67	-25	-3	-61	-3	-31	-20	-49	-48	-7	0
Deliveries for domestic use	4,426	4,478	4,700	4,297	4,260	4,631	4,720	4,393	4,627	4,935	4,340	4,512	4,749	4,593	4,708
Transfer to sugar-containing products for exports under reexport program	0	0	0	0	0	11	11	8	42	7	17	35	53	30	45
Transfer to polyhydric alcohol, feed	7	12	13	12	4	13	24	25	23	33	20	11	15	19	12
Deliveries for domestic food and beverage use	4,419	4,465	4,686	4,285	4,256	4,607	4,684	4,360	4,562	4,894	4,303	4,466	4,681	4,544	4,651
Total use	4,532	4,477	4,842	4,276	4,328	4,656	4,753	4,358	4,811	4,932	4,333	4,484	4,721	4,615	4,725
Ending stocks	575	1,072	910	550	684	720	577	663	860	650	530	621	559	845	1,220
CCC	0	235	458	83	0	17	0	0	0	0	0	0	0	0	NA
Private	575	837	452	467	684	703	577	663	860	650	530	621	559	845	NA
Stocks-to-use ratio	12.68	23.95	18.79	12.85	15.80	15.47	12.15	15.22	17.88	13.17	12.22	13.85	11.84	18.31	25.81
Private stocks-to-use	12.68	18.70	9.33	10.91	15.80	15.10	12.15	15.22	17.88	13.17	12.22	13.85	11.84	18.31	NA

Source: U.S. Dept. of Agriculture, WASDE, and Economics Research Service, *Sugar and Sweetener Outlook*.

Table 7 – Cane sugar supply and use balance

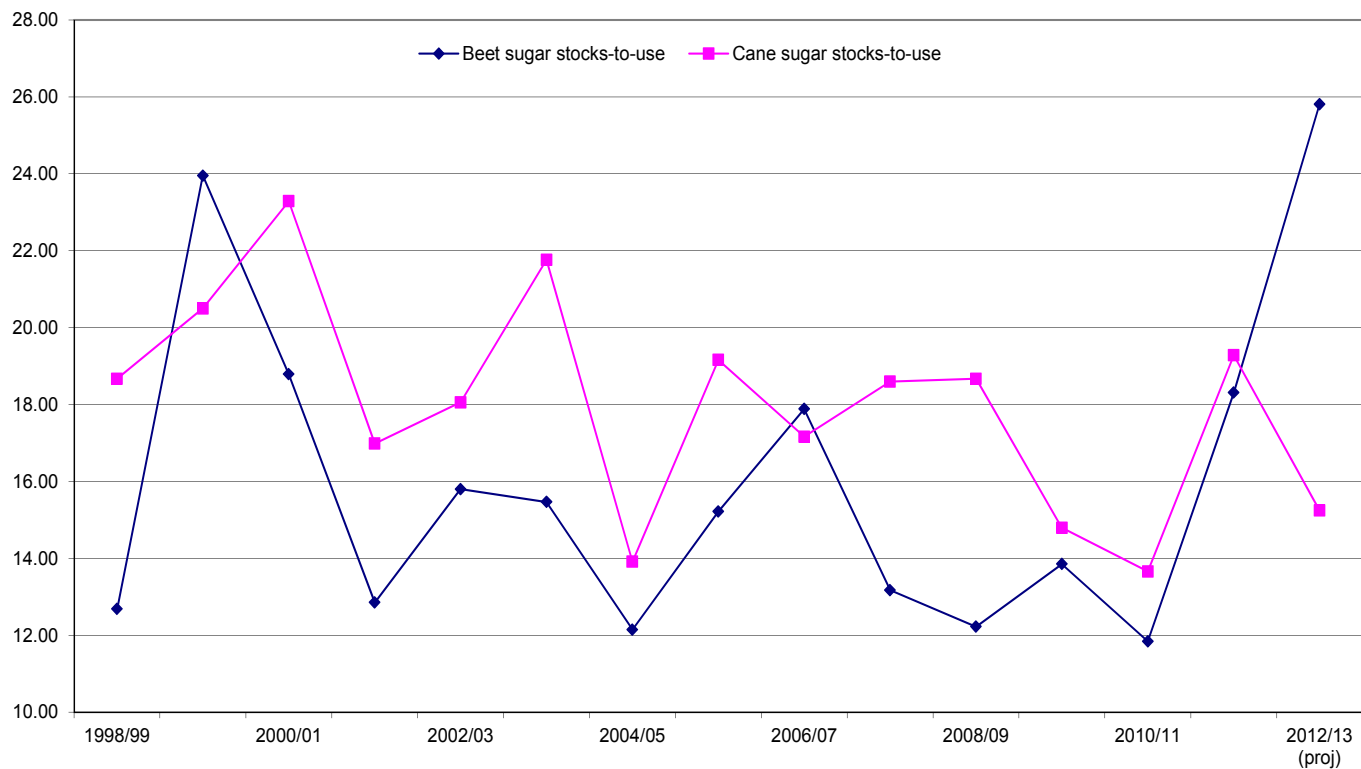
Items	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13
Beginning stocks	993	1,064	1,144	1,270	978	986	1,177	754	1,034	938	1,015	1,004	889	819	1,140
CCC	0	0	48	295	179	0	0	0	0	0	0	0	0	0	0
Private	993	1,064	1,096	975	799	986	1,177	754	1,034	938	1,015	1,004	889	819	1,140
Total production	3,946	4,076	4,089	3,985	3,964	3,957	3,265	2,956	3,438	3,431	3,317	3,392	3,172	3,587	3,880
Total imports	1,824	1,586	1,489	1,483	1,507	1,643	1,734	2,722	1,933	2,101	2,052	2,505	2,755	2,644	1,907
Raw imports	1,824	1,586	1,489	1,483	1,507	1,643	1,702	2,498	1,878	2,004	1,844	2,374	2,490	2,448	NA
Refined imports							32	224	55	97	208	130	265	196	NA
Total supply	6,763	6,726	6,723	6,738	6,449	6,586	6,176	6,433	6,405	6,470	6,384	6,901	6,816	7,050	6,927
Total exports	229	124	141	137	142	230	226	178	235	175	121	188	227	240	158
Miscellaneous	-143	-138	-54	21	-60	32	-145	-111	-81	34	-279	-2	81	-63	0
Deliveries for domestic use	5,613	5,596	5,367	5,601	5,381	5,147	5,341	5,332	5,313	5,247	5,538	5,826	5,690	5,733	5,853
Transfer to sugar-containing products for exports under reexport program	169	86	98	156	183	131	110	97	127	134	103	166	143	111	135
Transfer to polyhydric alcohol, feed, ethanol	17	19	20	21	20	29	25	26	29	28	26	24	18	14	18
Deliveries for domestic food and beverage use	5,427	5,490	5,248	5,425	5,177	4,987	5,207	5,209	5,157	5,086	5,408	5,637	5,528	5,609	5,700
Total use	5,699	5,582	5,453	5,759	5,462	5,409	5,422	5,398	5,466	5,456	5,380	6,012	5,997	5,911	6,011
Ending stocks	1,064	1,144	1,270	978	986	1,177	754	1,034	938	1,015	1,004	889	819	1,140	916
CCC	0	48	295	179	0	0	0	0	0	0	0	0	0	0	NA
Private	1,064	1,096	975	799	986	1,177	754	1,034	938	1,015	1,004	889	819	1,140	NA
Stocks-to-use ratio	18.67	20.50	23.29	16.99	18.06	21.77	13.91	19.16	17.16	18.60	18.67	14.79	13.66	19.28	15.24
Private stocks-to-use	18.67	19.64	17.89	13.88	18.06	21.77	13.91	19.16	17.16	18.60	18.67	14.79	13.66	19.28	NA

Source: U.S. Dept. of Agriculture, WASDE, and Economics Research Service, *Sugar and Sweetener Outlook*.



Figure 1  
**Ending stocks-to-use ratios for beet sugar and cane sugar, 1998/99 to 2012/13 1/**

Percent



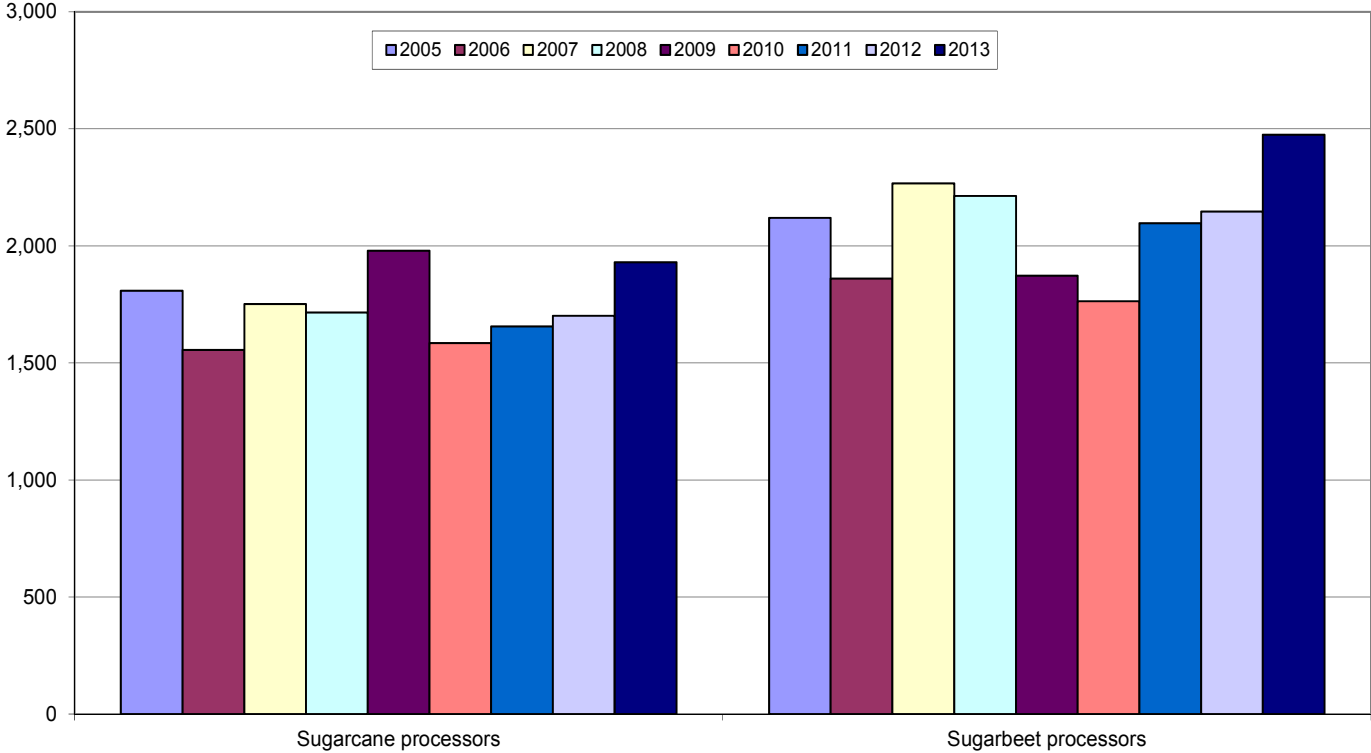
1/ 2012/13 projected.

Source: U.S. Dept. of Agriculture, Farm Service Agency, Sweetener Market Data, World Agriculture Supply and Demand Estimates, Economic Research Service, *Sugar and Sweetener Outlook*.

Figure 2 shows a historical series since 2005 of estimated sugar stocks at the end of February held by sugarcane and sugarbeet processors. Here February 2013 cane sugar stocks are above the average. It is instructive to note that Louisiana cane sugar production for the 2012/13 harvest campaign exceeded the previous year's campaign by 300,000 STRV. Earlier this year, there were reports that a Louisiana cane sugar refinery was experiencing technical problems that may have affected its demand for raw sugar. Given that certain restrictions exist that make domestic transport expensive, it is possible that there is more raw sugar available than the amount that can clear the market.

**Figure 2**  
**Sugar stocks held by sugarcane and sugarbeet processors, end of February**

1,000 short tons, raw value



Source: U.S. Dept. of Agriculture: Farm Service Agency, Sweetener Market Data.

## HONEY

U.S. honey production dropped 1.3 million pounds, or 1 percent, to 147.1 million pounds in 2012. Despite a 5.3-percent increase in honey-producing bee colonies last year, the national average yield per colony fell by 6 percent. Among major honey-producing States, California and Montana were largely responsible for the yield and production retreats in 2012. While California's number of honey-producing colonies was cut 8 percent, Montana's colonies expanded 2.8 percent. Montana's 44-percent yield collapse in 2012 resulted largely from record dry months from July to September due to high heat and low precipitation, especially in the southern area of the State. Drought in 2012 also reduced California's honey crop significantly as yield per colony fell 27 percent. California's dry weather and heat during the spring and fall limited honey production from wildflowers and raised the mite population.

As a result of a smaller domestic honey crop in 2012, honey's average price climbed to \$1.95 per pound, up 10.5 percent from \$1.77 in 2011. This raised the total value of production by nearly 10 percent to \$287 million in 2012, from \$262 million in 2011. In farm value per colony, the average in 2012 is a record \$109, up 4 percent from \$105 per colony in 2011. The States with the top crop values per colony in 2012 were Wisconsin (\$141), North Dakota (\$130), Minnesota (\$126), and South Dakota (\$122). By contrast, California (\$68) and Montana (\$99) have the lowest farmed honey value per colony among the major producers in 2012, due largely to their relatively low yields.

The retail price of natural honey averaged \$5.55 per pound in 2012, up 40 cents from \$5.15 per pound in 2011. Given the wholesale price of \$4.09 per pound in 2012, the retail price margin over the wholesale price increased from \$1.37 per pound in 2011 to \$1.46 per pound in 2012. Despite larger imports, domestic honey producers received 8 percent higher prices and retailers earned 6 percent higher profit margins in 2012. In percentage terms, however, the retail price margin of 36 percent over the wholesale price is the lowest in the past 7 years.

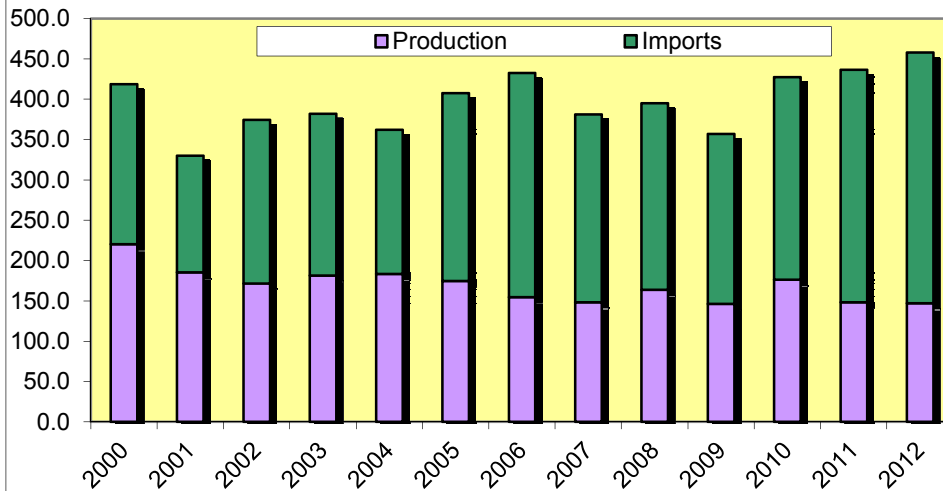
The smaller national honey crop boosted imports by nearly 8 percent in 2012, which raised domestic honey supply by 2.7 percent. In per capita terms, honey consumption amounted to 1.4 pounds, ranking among the highest levels over the past two decades. Only in 2006 and 2000 did per capita consumption also exceed 1.4 pounds. As a share of domestic use, imported honey approached 70 percent in 2012, the highest level thus far. Since 2002, the import share of U.S. honey consumption averaged 60 percent. Using producer prices, average consumer spending for honey amounted to a record \$2.19 per capita in 2012, more than double the \$1.06 per capita consumption value in 2007.

U.S. imports of natural honey were up 7 percent in 2012, due to significantly larger shipments from Argentina and Canada, both of which exported 20 million pounds more to the United States than in 2011. The average import unit value of \$1.34 per pound in 2012 is about the same as in 2011, but 16 percent higher than in 2010. In terms of import value, honey shipments from India and Vietnam are behind only by those from Argentina and are well ahead of shipments from Canada, the fourth top honey supplier to the United States. The next two largest suppliers of honey after Canada are Brazil and Argentina, both of which are well ahead of Mexico.

The circumvention of Chinese honey exports by transshipment through Indonesia, India, Malaysia, Thailand, South Korea, and Taiwan before final shipment to the United States was terminated in 2012. A duty of \$2.63 per kilogram on honey blends, which include Chinese honey, appears to have closed the loophole on the existing antidumping order against Chinese honey. Nevertheless, increased U.S. imports from foreign honey producers have offset smaller U.S. production, as yields per bee colony declined in 2012. Not only have prices of bee-pollinated crops increased in tandem with bee rental feeds for pollination, but the reduced yield per colony has pushed honey prices up as well.

### As U.S. honey production declines, imports increase

Million pounds



Source: U.S. Dept. of Agriculture: National Agriculture Statistical Service, Honey; U.S. Census Bureau.

## Contacts and Links

### Contact Information

Stephen Haley, (202) 694-5247, [shaley@ers.usda.gov](mailto:shaley@ers.usda.gov) (coordinator)

Andy Jerardo, (202) 694-5266, [ajerado@ers.usda.gov](mailto:ajerado@ers.usda.gov)

Erma J. McCray, (202) 694-5306, [ejmccray@ers.usda.gov](mailto:ejmccray@ers.usda.gov) (web publishing)

### Subscription Information

Subscribe to ERS' e-mail notification service at <http://www.ers.usda.gov/updates/> to receive timely notification of newsletter availability. Printed copies can be purchased from the USDA Order Desk by calling 1-800-363-2068 (specify the issue number).

### Data

Tables from the *Sugar and Sweeteners Yearbook* are available in the Sugar and Sweeteners Topics at <http://www.ers.usda.gov/topics/sugar/>. They contain the latest data and historical information on the production, use, prices, imports, and exports of sugar and sweeteners.

### Related Websites

Sugar and Sweeteners Outlook <http://www.ers.usda.gov/Publications/SSS/>

WASDE <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documented=1194>

Sugar Topics <http://www.ers.usda.gov/topics/Sugar/>

### E-mail Notification

Readers of ERS outlook reports have two ways they can receive an e-mail notice about release of reports and associated data.

- Receive timely notification (soon after the report is posted on the web) via USDA's Economics, Statistics and Market Information System (which is housed at Cornell University's Mann Library). Go to <http://usda.mannlib.cornell.edu/MannUsda/aboutEmailService.do> and follow the instructions to receive e-mail notices about ERS, Agricultural Marketing Service, National Agricultural Statistics Service, and World Agricultural Outlook Board products.
- Receive weekly notification (on Friday afternoon) via the ERS website. Go to <http://www.ers.usda.gov/Updates/> and follow the instructions to receive notices about ERS outlook reports, *Amber Waves* magazine, and other reports and data products on specific topics. ERS also offers RSS (really simple syndication) feeds for all ERS products. Go to <http://www.ers.usda.gov/rss/> to get started.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and, where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, et c.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.



Economic  
Research  
Service

Situation and  
Outlook

SSS-M-296 SA

April 16, 2013

## Sugar and Sweeteners Outlook: Special Article

# Indeterminacy in Measuring U.S. Sugar Deliveries for Human Consumption

**Stephen Haley, coordinator**  
[shaley@ers.usda.gov](mailto:shaley@ers.usda.gov)

Approved by the  
World Agricultural  
Outlook Board.

The Sugar and Sweetener Outlook (SSO) believes that the direct consumption import component of U.S. sugar delivery estimates reported in the Sweetener Market Data (SMD) for human consumption are biased and underreported. This problem arose after the implementation of the sweetener provisions of the North American Free Trade Agreement (NAFTA) in January 2008. The share of deliveries directly imported as refined sugar by entities that do not report to the U.S. Department of Agriculture (USDA) increased dramatically (last two columns, table A-1). Although the USDA records an estimate of these deliveries in its Sweetener Market Data (SMD), these estimates do not match with similar estimates made by the SSO. The SSO works with USDA's Foreign Agricultural Service (FAS) in analyzing primary trade data for isolating imports by those who report to the USDA and by those who do not. These latter entities are called "nonreporters."

The data do not match for two reasons. First, imports are not necessarily counted in the same month by SMD and SSO. SSO reporting is derived from primary trade data from U.S. Customs and Border Protection (CBP). CBP records all sugar imports when they officially enter into U.S. customs territory. This means that SSO records sugar going to SMD reporters and nonreporters in the same delivery month.

Data reported to SMD by cane sugar refiners, on the other hand, are recorded when ships, barges, or other transport vehicles are unloaded at the refinery entry point. This may occur in the same month in which the sugar clears customs, but often it is recorded in the following month. SMD then calculates nonreporter deliveries by subtracting the sum of refiners' imports for a particular month from total imports for the same month as reported by FAS using CBP and U.S. Census import data. (Table A-2 sets out the procedures used by FAS and the Farm Service Agency (FSA) that compiles the SMD.) The problem is that a good portion of sugar imports that refiners report as having entered in one month may have been counted by CBP and Census as having entered the previous month.

Table A-1 -- Sugar deliveries for human consumption, by supply source

Fiscal year	Total domestic deliveries - food use	Domestic food use deliveries - beet sugar processors	Domestic food use deliveries		Direct imports by SMD nonreporters	Direct imports: percent of total
			- cane processors/refiners			
			1,000 short tons, raw value		Percent	
1991/92	8,772		3,821	4,901	49	0.6
1992/93	8,930		4,114	4,767	48	0.5
1993/94	9,196		4,256	4,877	63	0.7
1994/95	9,218		4,279	4,880	59	0.6
1995/96	9,445		4,139	5,262	44	0.5
1996/97	9,565		3,903	5,641	20	0.2
1997/98	9,672		4,288	5,361	23	0.2
1998/99	9,873		4,419	5,427	28	0.3
1999/2000	9,993		4,465	5,490	38	0.4
2000/01	10,000		4,686	5,248	65	0.7
2001/02	9,785		4,285	5,425	76	0.8
2002/03	9,505		4,256	5,177	71	0.7
2003/04	9,678		4,607	4,987	84	0.9
2004/05	10,019		4,684	5,207	128	1.3
2005/06	10,184		4,360	5,209	615	6.0
2006/07	9,913		4,562	5,157	194	2.0
2007/08 <sup>1/</sup>	10,394		4,894	5,086	414	4.0
2008/09	10,512		4,303	5,408	801	7.6
2009/10	10,917		4,466	5,637	814	7.5
2010/11	11,193		4,681	5,528	984	8.8
2011/12	11,141		4,544	5,609	988	8.9
2012/13 (5-months)	4,619		1,904	2,337	379	8.2

<sup>1/</sup> Sugar provisions of the North American Free Trade Agreement (NAFTA) fully implemented on January 1, 2008.

Source: U.S. Dept. of Agriculture: Farm Service Agency, Sweetener Market Data (SMD).

Table A-2 -- USDA sugar import data sourcing

USDA agency/ import type	Agency source	Measurement
<b>Foreign Agricultural Service (FAS): Import Policies and Export Reporting Division</b>		
A. Raw and refined sugar tariff-rate quotas (TRQs) :minimum access commitments under World Trade Organization (WTO) and Free Trade Agreements (FTAs), and specialty sugar TRQ	U.S. Customs and Border Protection (Customs)	converted to raw value by Customs
B. Re-export program imports	FAS Ag Licensing System updates daily from Customs. Data is adjusted when re-export licensees report to FAS licensing software.	Initial import numbers are commercial weight and not adjusted. Re-export licensees make pol adjustments to convert to raw value.
C. Imports from Mexico under the North American Free Trade Agreement (NAFTA) and high-tier tariff imports.	U.S. Census Bureau, Foreign Trade Division	Converted to raw value by FAS. Sugar from Mexico is multiplied by 1.06. High-tier tariff sugar is converted to raw value by multiplying by 1.07.
<b>Farm Service Agency (FSA): Sweetener Market Data (SMD)</b>		
D. Quantity of raw foreign sugar purchased, either directly by the SMD reporter as "importer of record" or from a SMD non-reporter who is the "importer of record." This sugar must have already been physically cleared through U.S. Customs and Border Protection for processing.	See: <a href="http://www.fsa.usda.gov/Internet/FSA_File/sugar_data_user_manual.pdf">http://www.fsa.usda.gov/Internet/FSA_File/sugar_data_user_manual.pdf</a> - "CCC-835 On-Line Reporting Instructions" for listing of cane refiners, cane processors, and beet processors who report to the SMD.	Raw value = ((measured polarization - 92)* 0.0175+0.93)*actual weight: for sugar from sugarcane testing at a polarization of 92 or above. For sugar measuring less than 92, divide weight of total sugar content (i.e., sucrose and invert sugars) by 0.972.
E. Quantity of refined foreign sugar purchased, either directly by the SMD reporter as "importer of record" or from a SMD non-reporter who is the "importer of record." This sugar must have already been physically cleared through U.S. Customs and Border Protection for processing. Refined sugar does not required further refinement by the SMD reporter.		Refined sugar not meant for further processing is converted to raw value by multiplying actual weight by 1.07.
F. Imports by SMD nonreporters: calculated as difference between total sugar imports reported by FAS in raw value and converted from metric to short tons, and total sugar imports reported by SMD reporters.		

Source: U.S. Dept. of Agriculture: Farm Service Agency, Dairy and Sweeteners Analysis Branch.



The top panel of table A-3 shows FAS import data from CBP and Census since the beginning of fiscal year (FY) 2008. The middle panel shows the corresponding SMD refiners' import data. The bottom panel shows the resulting calculated nonreporter data. As can be seen, there are numerous negative entries that are a consequence of the timing mismatch in the two underlying data series. This randomness makes the interpretation of monthly sugar delivery data less reliable for discerning consumption trends and projecting annual delivery totals.

A second problem comes from differing methodologies for converting sugar import data into raw equivalent value. Refined sugar is at least 99.5 percent pure sucrose, while raw sugar measures something less than that, sometimes lower than 92 percent. In order to have equivalent measurement units to sum or to compare quantities across sugar of differing sucrose levels, sugar reporting uses a 96 pol standard. (Table A-2 describes some of the technical detail of the conversion factors employed.)

It is not clear that CBP/FAS and SMD methodologies provide the same results. Preliminary SSO analysis implies that SMD conversion factors provide for a larger upward adjustment to reach raw value equivalence than the CBP/FAS factors. The problem, therefore, is that the present method of calculating nonreporter imports yields a lower value than it would if the conversion methods yielded closer results.

### *SSO Analysis of FAS and Census Import Data*

In order to measure the extent of the problem (and also to provide an alternative series for discerning delivery trends and making projections), the SSO has worked with FAS personnel in analyzing CBP data to separate out sugar imports going to SMD reporters from those going to nonreporters. The analysis includes examination of tariff code classifications, port entries, import volumes, and other pertinent data factors.

Table A-4 shows the results applied to publicly available sugar import data from the U.S. Census Bureau. The top panel shows total sugar imports; the second shows raw and refined sugar imports going to SMD importers; the third shows sugar going to nonreporters; and the fourth panel shows the monthly nonreporter shares. These data are not adjusted to raw value equivalence. The SSO uses a factor of 1.07 to convert the data to raw value equivalence in analyzing sugar delivery trends for forecasting. More of the detail behind the conversion is provided below.

Table A-3 – Sugar imports in USDA's Sweetener Market Data (SMD), by SMD reporters and non-reporters

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
<u>Short tons, raw value</u>													
A = Total sugar imports: Foreign Agricultural Service													
2007/08	190,824	209,426	194,594	149,320	203,131	171,404	293,999	245,552	207,103	187,880	320,021	246,845	2,620,099
2008/09	404,024	277,159	254,279	242,504	156,084	294,097	339,521	322,635	206,062	303,000	166,168	117,179	3,082,710
2009/10	310,818	212,671	176,867	200,004	138,923	233,431	244,169	220,568	226,562	314,751	462,398	577,922	3,319,083
2010/11	294,265	284,986	197,786	173,914	300,412	379,863	278,763	470,022	314,565	253,033	286,753	503,922	3,738,285
2011/12	435,587	185,319	309,038	244,077	243,399	291,556	321,689	341,344	356,428	249,773	263,408	390,444	3,632,063
2012/13	182,362	275,471	259,073	195,923									912,828
B = SMD: Imports by sugar processors and refiners who report to SMD													
2007/08	194,592	214,694	205,748	169,895	168,061	123,786	168,314	194,610	229,753	144,675	255,507	136,027	2,205,662
2008/09	193,838	190,357	212,415	122,328	204,869	171,488	241,240	213,636	213,215	224,681	107,601	186,027	2,281,695
2009/10	237,448	144,984	113,131	152,411	152,199	172,653	175,372	191,495	171,586	227,509	374,074	391,736	2,504,598
2010/11	252,663	148,886	142,616	215,396	188,198	289,163	204,567	357,284	271,661	127,728	254,212	302,297	2,754,671
2011/12	236,622	234,841	214,682	218,452	151,746	229,950	268,829	219,386	198,839	228,953	190,317	251,830	2,644,447
2012/13	102,157	147,367	246,136	123,711									619,371
C = A - B: Imports by SMD nonreporters													
2007/08	-3,768	-5,268	-11,154	-20,575	35,070	47,618	125,685	50,942	-22,650	43,205	64,514	110,818	414,437
2008/09	210,186	86,802	41,864	120,176	-48,785	122,609	98,281	108,999	-7,153	78,319	58,567	-68,848	801,015
2009/10	73,370	67,687	63,736	47,593	-13,276	60,778	68,797	29,073	54,976	87,242	88,324	186,186	814,485
2010/11	41,602	136,100	55,170	-41,482	112,214	90,700	74,196	112,738	42,904	125,305	32,541	201,625	983,614
2011/12	198,965	-49,522	94,356	25,625	91,653	61,606	52,860	121,958	157,589	20,820	73,091	138,614	987,616
2012/13	80,205	128,104	12,937	72,212									293,458

Source: U.S. Dept. of Agriculture: Farm Service Agency, Sugar Monthly Import and Re-Export Data Report Archives; U.S. Dept. of Agriculture, Farm Service Agency, Sweetener Market Data (SMD).

Table A-4 – U.S. Census Bureau sugar imports, by SMD reporters and non-reporters, as estimated by Sugar and Sweetener Outlook.

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total
<u>Short tons, tel quel</u>													
D = Total sugar imports: U.S. Census Bureau.													
2007/08	220,770	172,585	183,571	153,582	193,351	141,521	280,237	230,982	158,966	234,352	310,746	234,958	2,515,621
2008/09	340,550	273,205	290,631	198,383	209,235	256,616	294,096	346,889	177,951	283,098	172,791	121,571	2,965,016
2009/10	301,808	209,729	165,638	182,885	193,739	220,203	219,656	190,256	232,467	294,464	458,210	546,832	3,215,886
2010/11	232,926	253,967	187,614	259,635	263,405	359,790	280,379	433,558	315,285	239,697	340,951	357,843	3,525,050
2011/12	465,679	259,273	238,115	319,201	199,996	244,762	343,197	335,722	338,051	218,174	265,727	350,638	3,578,534
2012/13	204,623	276,384	239,038	231,285									951,329
E = Sugar imports by sugar processors and refiners who report to SMD, estimated by Sugar and Sweetener Outlook from U.S. Census imports													
2007/08	181,254	129,571	164,289	131,589	162,075	105,571	244,008	167,126	114,691	182,726	196,373	112,219	1,891,493
2008/09	181,507	152,338	198,466	117,153	142,732	191,024	211,227	199,734	101,108	199,712	101,951	76,041	1,872,993
2009/10	252,130	157,656	132,769	141,756	157,581	176,058	171,328	135,277	164,346	229,966	337,435	409,440	2,465,743
2010/11	143,733	164,856	113,779	175,196	187,900	253,605	175,016	326,135	212,261	156,443	227,527	243,187	2,379,638
2011/12	301,338	173,020	162,073	239,371	138,157	152,990	252,084	234,656	266,747	143,955	197,853	102,979	2,365,223
2012/13	113,398	200,310	175,353	160,146									649,206
F = D - E: Imports by SMD nonreporters, estimated by Sugar and Sweetener Outlook													
2007/08	39,516	43,015	19,282	21,993	31,276	35,949	36,228	63,856	44,275	51,625	114,373	122,739	624,128
2008/09	159,043	120,867	92,166	81,230	66,503	65,592	82,869	147,156	76,843	83,386	70,840	45,530	1,092,024
2009/10	49,678	52,073	32,869	41,129	36,158	44,145	48,328	54,979	68,121	64,498	120,775	137,391	750,144
2010/11	89,193	89,111	73,834	84,440	75,505	106,185	105,363	107,423	103,024	83,254	113,424	114,656	1,145,412
2011/12	164,341	86,253	76,042	79,829	61,838	91,772	91,113	101,065	71,304	74,218	67,874	247,659	1,213,311
2012/13	91,225	76,074	63,685	71,139									302,123
G = 100*F/D: Imports by SMD nonreporters, estimated by Sugar and Sweetener Outlook, as percentage of total imports													
2007/08	17.9	24.9	10.5	14.3	16.2	25.4	12.9	27.6	27.9	22.0	36.8	52.2	24.8
2008/09	46.7	44.2	31.7	40.9	31.8	25.6	28.2	42.4	43.2	29.5	41.0	37.5	36.8
2009/10	16.5	24.8	19.8	22.5	18.7	20.0	22.0	28.9	29.3	21.9	26.4	25.1	23.3
2010/11	38.3	35.1	39.4	32.5	28.7	29.5	37.6	24.8	32.7	34.7	33.3	32.0	32.5
2011/12	35.3	33.3	31.9	25.0	30.9	37.5	26.5	30.1	21.1	34.0	25.5	70.6	33.9
2012/13	44.6	27.5	26.6	30.8									31.8

Source: U.S. Census Bureau; Economic Research Service, Sugar and Sweetener Outlook.

Table A-5 collects and reports monthly nonreporter import data in a single location. The top panel shows SMD nonreporter data from table A-3. The middle panel shows FAS sugar imports, raw value, multiplied by the corresponding nonreporter share coefficients from table A-4. The bottom panel shows the nonreporter imports from the U.S. Census from table A-4 converted into raw value by multiplying by 1.07. Fiscal year totals are shown in the second-to-last right-hand column. The FAS and U.S. Census totals are generally higher than the current SMD series. This seems especially true in the first 2 years, where the totals are 42 to 60 percent higher. The third year, FY 2010, shows rough equivalence, but totals for FY 2011 and FY 2012 are between 23 and 31 percent higher.

The right-hand column shows the implied method used for estimating total sugar deliveries (i.e., the sum of beet sugar deliveries from processors, cane sugar deliveries from processors and refiners, and refined sugar nonreporter imports). Total delivery estimates using FAS and U.S. Census nonreporter import deliveries show very similar results, and both provide higher delivery totals than SMD of between 2.1 and 3.5 percent for all years except FY 2010. All FY 2010 results are close to each other.

Table A-5 -- Alternative estimates of sugar imports by SMD nonreporters, and implications for sugar consumption, 2012/13

	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Total Non-reporter imports	Total deliveries for human consumption 1/
<u>Short tons, raw value</u>														
SMD current = C														
2007/08	-3,768	-5,268	-11,154	-20,575	35,070	47,618	125,685	50,942	-22,650	43,205	64,514	110,818	414,437	10,394,327
2008/09	210,186	86,802	41,864	120,176	-48,785	122,609	98,281	108,999	-7,153	78,319	58,567	-68,848	801,015	10,512,414
2009/10	73,370	67,687	63,736	47,593	-13,276	60,778	68,797	29,073	54,976	87,242	88,324	186,186	814,485	10,916,598
2010/11	41,602	136,100	55,170	-41,482	112,214	90,700	74,196	112,738	42,904	125,305	32,541	201,625	983,614	11,192,757
2011/12	198,965	-49,522	94,356	25,625	91,653	61,606	52,860	121,958	157,589	20,820	73,091	138,614	987,616	11,140,792
2012/13	80,205	128,104	12,937	72,212									293,458	293,458
ERS share coefficients applied to FAS sugar import estimate = .01*G*A														
2007/08	34,156	52,197	20,439	21,383	32,858	43,540	38,007	67,884	57,683	41,388	117,787	128,948	656,270	10,636,160
2008/09	188,686	122,616	80,638	99,296	49,610	75,172	95,669	136,867	88,982	89,248	68,125	43,885	1,138,792	10,850,191
2009/10	51,161	52,803	35,097	44,979	25,928	46,797	53,721	63,738	66,391	68,941	121,879	145,203	776,638	10,878,751
2010/11	112,681	99,995	77,837	56,561	86,113	112,110	104,756	116,457	102,789	87,886	95,394	161,461	1,214,040	11,423,183
2011/12	153,722	61,651	98,691	61,042	75,259	109,317	85,403	102,758	75,181	84,968	67,282	275,775	1,251,047	11,404,223
2012/13	81,301	75,823	69,023	60,262									286,408	286,408
ERS share coefficients applied to U.S. Census sugar import estimate, converted to raw value = 1.07*F														
2007/08	42,282	46,026	20,631	23,532	33,466	38,465	38,764	68,326	47,375	55,239	122,379	131,331	667,817	10,647,707
2008/09	170,176	129,328	98,617	86,916	71,159	70,183	88,670	157,456	82,222	89,223	75,799	48,717	1,168,465	10,879,864
2009/10	53,155	55,718	35,170	44,008	38,689	47,235	51,711	58,827	72,889	69,013	129,230	147,009	802,654	10,904,767
2010/11	95,436	95,349	79,003	90,351	80,790	113,618	112,739	114,942	110,236	89,082	121,364	122,682	1,225,590	11,434,733
2011/12	175,845	92,291	81,365	85,418	66,167	98,196	97,491	108,140	76,296	79,414	72,625	264,995	1,298,243	11,451,419
2012/13	97,611	81,399	68,143	76,119									323,272	323,272

1/ SMD beet sugar deliveries + SMD cane processor/refiner deliveries + total non-reporter imports.

Source: U.S. Census Bureau; Economic Research Service, *Sugar and Sweetener Outlook*.

## SSO Analysis of SMD Import Data: Method

The SSO believes that the SMD estimate of direct consumption imports going to SMD nonreporters is underestimated and biased. In the discussion above, it has been hypothesized that there are mismatches in the recording of the months in which imported sugar enters into the United States and in the raw sugar conversion factors. A mathematical expression for this relationship for sugar imported by refiners who all report to SMD (SMD\_reporter) with respect to the same data reported by FAS (FAS\_reporter) is:

$$\text{SMD\_reporter} = \alpha_1 * \beta * \text{FAS\_reporter} + \alpha_2 * \beta * \text{FAS\_reporter}(-1: \text{previous month})$$

The  $\alpha_1$  is the share of FAS imports in one month recorded as a SMD import in the same month. The  $\alpha_2$  is the share of FAS sugar from the previous month reported by SMD as an entry. If there were no issue with the raw sugar conversion factor, then we would expect the sum of the  $\alpha_i$  to equal 1. If there were no timing issues (as assumed in the SMD approach), then  $\alpha_1$  would have a value close to 1.0, and  $\alpha_2$  would have a value indistinguishable from zero. The  $\beta$  coefficient makes the adjustment for differing methods of conversion to raw value. Because the SSO maintains that the CBP/FAS method involves a lower upward adjustment from actual weight to raw value, it is expected that the value  $\beta$  is greater than 1.00.

Table A-6 details the steps in deriving a relationship between SMD's estimate of nonreporter imports (SMD\_nonreporter) and that of the FAS data (FAS\_nonreporter). If there were no timing mismatch issue ( $\alpha_2 = 0$ ) and no raw conversion issue ( $\beta = 1.00$ ), then both estimates would be the same.

Table A-6 -- Derivation of model equation

---

	$\alpha_i$ - share coefficient
	$\beta$ - raw equivalent conversion coefficient: test whether = 1
Given:	$\text{SMD\_reporter} = \alpha_1 * \beta * \text{FAS\_reporter} + \alpha_2 * \beta * \text{FAS\_reporter}(-1)$
Goal:	Derive estimation equation for SMD_nonreporter that is consistent with SMD_reporter equation
#1	$\text{SMD\_nonreporter} = \text{SMD\_total} - \text{SMD\_reporter}$
#2	$\text{SMD\_total} = \beta * \text{FAS\_total}$
#3	$\text{SMD\_nonreporter} = \beta * \text{FAS\_total} - \text{SMD\_reporter}$
#4	$\text{FAS\_total} = \text{FAS\_reporter} + \text{FAS\_nonreporter}$
#5	$\text{SMD\_nonreporter} = \beta * \text{FAS\_reporter} + \beta * \text{FAS\_nonreporter} - \text{SMD\_reporter}$
#6	$\text{SMD\_nonreporter} = \beta * \text{FAS\_reporter} + \beta * \text{FAS\_nonreporter} - \alpha_1 * \beta * \text{FAS\_reporter} - \alpha_2 * \beta * \text{FAS\_reporter}(-1)$
#7	$\text{SMD\_nonreporter} = \beta * (\text{FAS\_reporter} * (1 - \alpha_1) - \alpha_2 * \text{FAS\_reporter}(-1)) + \beta * \text{FAS\_nonreporter}$
#8	$\alpha_1 + \alpha_2 = 1 \rightarrow \alpha_2 = 1 - \alpha_1$
#9	$\text{SMD\_non\_reporter} = \beta * \alpha_2 * (\text{FAS\_reporter} - \text{FAS\_reporter}(-1)) + \beta * \text{FAS\_nonreporter}$

---

Source: Economic Research Service, *Sugar and Sweetener Outlook*.

Table A-7 details model estimates based on the hypothesized relationships in table A-6. The two-equation “Alternative” approach is the one used in the models for estimation. Because the model is non-linear, the goal of the estimation is to find a minimum value of  $\beta$  such that it cannot be rejected so that  $\alpha_1 + \alpha_2 = 1$ . Also, the hypothesis that  $\alpha_2$  is greater than zero is tested, as is whether  $\alpha_2$  from the first equation (reporter) is equal to  $\alpha_{12}$  from the second equation (nonreporter).

A second equation (SSO approach) is estimated and tested in the same manner. The difference is that the SSO uses sugar imports reported by the U.S. Census. (Therefore, we have Census\_reporter and Census\_reporter(-1) as independent variables.) These imports are actual weight—that is, not adjusted for reporting in raw value equivalence. It is expected the value of  $\beta$  will be greater than the value from the “Alternative” model. The  $\alpha_i$  relationships should be close to those of the “Alternative” approach.

Table A-7 -- Estimating nonreporter imports: econometric approaches

Definition

$\alpha_i$  - share coefficient

$\beta$  - raw equivalent conversion coefficient: test whether = 1.00

Current SMD approach

$\alpha_1 = 1; \alpha_2 = 0; \alpha_{12} = 0; \beta = 1$

SMD\_reporter = FAS\_reporter

SMD\_nonreporter = FAS\_total - SMD\_reporter

Alternative approach

Select minimum  $\beta$  such that  $\alpha_1 + \alpha_2 = 1, \alpha_2 = \alpha_{12}$ .

SMD\_reporter =  $\alpha_1 * \beta * \text{FAS\_reporter} + \alpha_2 * \beta * \text{FAS\_reporter}(-1)$

SMD\_non\_reporter =  $\beta * \alpha_{12} * (\text{FAS\_reporter} - \text{FAS\_reporter}(-1)) + \beta * \text{FAS\_nonreporter}$

Sugar and Sweetener Outlook approach

$\beta = 1.07, \alpha_1 + \alpha_2 = 1, \alpha_2 = \alpha_{12}$ .

SMD\_reporter =  $\alpha_1 * \beta * \text{Census\_reporter} + \alpha_2 * \beta * \text{Census\_reporter}(-1)$

SMD\_non\_reporter =  $\beta * \alpha_{12} * (\text{Census\_reporter} - \text{Census\_reporter}(-1)) + \beta * \text{Census\_nonreporter}$

---

Source: Economic Research Service, *Sugar and Sweetener Outlook*.

## SSO Analysis of SMD Import Data: Results

Table A-8 shows estimation results for the “Alternative” modeling approach. First, the lag coefficient  $\alpha_2$  is statistically greater than zero, and its value in the first equation ( $\alpha_2$ ) is indistinguishable from its value in the second equation ( $\alpha_{12}$ ). The smallest value of  $\beta$  that establishes the statistical significance of  $\alpha_1 + \alpha_2 = 1$  is 1.0395. This value is greater than the value of 1.0000 that would result if the raw value weight conversions were the same.

Table A-9 shows the results of using actual weight U.S. Census sugar import data. Conclusions emanating from the interpretation of the  $\alpha_i$  coefficients are the same as in the “Alternative” case. The difference, as expected, is that the minimum  $\beta$  value is higher: 1.0635 compared with 1.0395.

Table A-8 – Alternative approach: econometric results 1/

Two-equation model: select minimum  $\beta$  such that Table A-6 (null hypothesis below) conditions are met. 2/

Eq. no. 1:  $SMD\_REPORTER = C(1)*1.0395*FAS\_REPORTER + C(2)*1.0395*FAS\_REPORTER(-1)$

Eq. no. 2:  $SMD\_NONREPORTER = C(12)*1.0395*(FAS\_REPORTER-FAS\_REPORTER(-1)) + C(13)*1.0395*FAS\_NONREPORTER$

	Coefficient	Std. Error	t-Statistic
C(1)	0.6801	0.0526	12.9404
C(2)	0.3263	0.0540	6.0377
C(12)	0.3260	0.0536	6.0802
C(13)	1.0051	0.0219	45.8605

Equation:  $SMD\_REPORTER = C(1)*1.0395*FAS\_REPORTER + C(2)*1.0395*FAS\_REPORTER(-1)$

R-squared	0.5043	Mean dependent var	203,005
Adjusted R-squared	0.4963	S.D. dependent var	59,913
S.E. of regression	42,519		
Durbin-Watson stat	2.2429		

Equation:  $SMD\_NONREPORTER = C(12)*1.0395*(FAS\_REPORTER-FAS\_REPORTER(-1)) + C(13)*1.0395*FAS\_NONREPORTER$

R-squared	0.5771	Mean dependent var	77,474
Adjusted R-squared	0.5702	S.D. dependent var	65,371
S.E. of regression	42,857		
Durbin-Watson stat	2.2345		

Null Hypothesis:  $C(1)+C(2)=1, C(2)=C(12), C(13)=1$

Test Statistic	Value	df	Probability
Chi-square	5.9874	3	0.1122

1/ Regression method: Seemingly Unrelated Regression; Sample period: Oct. 2007 through Feb. 2013 = 64 observations.

2/  $C(1) = \alpha_1, C(2) = \alpha_2, C(12) = \alpha_{12}$ .

In its proposal to track sugar deliveries using Census import data, SSO proposed using a raw sugar conversion factor of 1.07. This is close to the minimum of 1.0635. Using the coefficient valued at 1.07 allows all the statistically confirmed relationships involving all the  $\alpha_i$ .

In spite of these confirmation results, it is important to note that the variance-reducing explanatory power of the equations in both Alternative and SSO models is not all that high. The statistical parameter that captures this relationship is the adjusted R-squared. The R-squared of the four estimated equations falls between 0.4936 and 0.5771. This means that only about half of variability with respect to differences with the SMD approach is being explained. There are other factors about which our knowledge is lacking.

**Conclusions**

This analysis has shown that SMD estimates of sugar imports by SMD nonreporters are biased and underreported. It is not clear what should be done about the problem, other than being aware of it. The SSO will continue its import analysis and use the implications for forecasting U.S. sugar demand.

It is important to note that this analysis probably has minimal bearing on forecasting found in the World Agricultural Supply and Demand Estimates (WASDE). Having recognized this problem and others in SMD reporting several years ago, the Interagency Commodity Estimates Committee for sugar (ICEC) decided to replace sugar deliveries for human consumption with domestic sugar use. Domestic sugar use is total use (total supply less ending stocks) less exports. This includes deliveries for human use and all other miscellaneous factors. Miscellaneous factors include differences in import reporting sources (especially relevant for this analysis), refining losses, inventory adjustments, and intra-industry sugar transfers.

Table A-9 – Sugar and Sweetener Outlook approach: econometric results 1/

Two-equation model: select minimum  $\beta$  such that Table A-6 (null hypothesis below) conditions are met. 2/

Eq. no. 1:  $SMD\_REPORTER = C(1)*1.0635*CENSUS\_REPORTER + C(2)*1.0635*CENSUS\_REPORTER(-1)$   
 Eq. no. 2:  $SMD\_NONREPORTER = C(12)*1.0635*(CENSUS\_REPORTER-CENSUS\_REPORTER(-1)) + C(13)*1.0635*CENSUS\_NONREPORTER$

	Coefficient	Std. Error	t-Statistic
C(1)	0.7029	0.0629	11.1681
C(2)	0.3104	0.0629	4.9329
C(12)	0.3067	0.0613	5.0066
C(13)	0.9889	0.0176	56.0971

Equation:  $SMD\_REPORTER = C(1)*1.0635*CENSUS\_REPORTER + C(2)*1.0635*CENSUS\_REPORTER(-1)$

R-squared	0.5245	Mean dependent var	203,426
Adjusted R-squared	0.5168	S.D. dependent var	60,298
S.E. of regression	41,917		
Durbin-Watson stat	2.2908		

Equation:  $SMD\_NONREPORTER = C(12)*1.0635*(CENSUS\_REPORTER-CENSUS\_REPORTER(-1)) + C(13)*1.0635*CENSUS\_NONREPORTER$

R-squared	0.5018	Mean dependent var	77,333
Adjusted R-squared	0.4936	S.D. dependent var	58,608
S.E. of regression	41,706		
Durbin-Watson stat	2.2978		

Null Hypothesis:  $C(1)+C(2)=1, C(2)=C(12), C(13)=1$

Test Statistic	Value	df	Probability
Chi-square	5.9044	3	0.1164

1/ Regression method: Seemingly Unrelated Regression; Sample period: Oct. 2007 through Feb. 2013 = 64 observations.

2/  $C(1) = \alpha_1, C(2) = \alpha_2, C(12) = \alpha_{12}$ .