



Economic
Research
Service

Situation and
Outlook

FDS-15a

January 14, 2015

Feed Outlook

Tom Capehart

tcapehart@ers.usda.gov

Edward Allen

ewallen@ers.usda.gov

Jennifer Bond

jkbond@ers.usda.gov

2014/15 Corn Production Estimated Lower, Sorghum Prices Soar

Feed Chart Gallery
will be updated on
January 16, 2015

Special Article:
Boutique Brews, Barley,
and the Balance Sheet

The next release is
February 12, 2015

Approved by the
World Agricultural
Outlook Board.

U.S. corn supplies for 2014/15 are projected 196 million bushels lower this month following reductions in estimated production and carryin. A 2.4-bushel-per-acre drop in the estimated national average yield reduces 2014 production by 192 million bushels, despite a slight increase in area harvested for corn. Lower projected ending stocks and prices reported to date support a 15-cent increase in the projected 2014/15 farm price range midpoint to \$3.65 per bushel.

The projected 2014/15 sorghum farm price range is up 30 cents at the midpoint to \$3.80 per bushel supported by surging exports. The marketing year average sorghum farm price last rose above that for corn in 2006/2007. For the 2014/15 marketing year, exports are projected to utilize fully 58 percent of total sorghum supplies, the largest share on record back to 1975/76.

Global coarse grain production for 2014/15 is projected down 3.0 million tons this month to 1,272.3 million. The decline in U.S. corn production drives the reduced global forecast and offsets gains projected for coarse grain production in the EU, corn production in India, and barley production in Ethiopia.

Recent *Feed Outlook* Special Articles

“Boutique Brews, Barley, and the Balance Sheet,” pdf pages 18-23 of the January 2015 *Feed Outlook* report (<http://www.ers.usda.gov/publications/fds-feed-outlook/fds-15a.aspx>).

“World Corn Use Expands Despite High Prices in 2012/13,” pdf pages 17-22 of the June 2013 *Feed Outlook* report (<http://www.ers.usda.gov/publications/fds-feed-outlook/fds-13f.aspx>).

“Animal Unit Calculations—First Projections for the 2013/14 Crop Year,” pdf pages 25-30 of the May 2013 *Feed Outlook* report (<http://www.ers.usda.gov/publications/fds-feed-outlook/fds-13e.aspx>).

Domestic Outlook

Forecast 2014/15 Corn Production Cut Nearly 200 Million Bushels

The January 12, 2015, National Agricultural Statistics Service (NASS) Crop Production Annual Summary report lowered estimated 2014/15 U.S. corn production by 192 million bushels to 14,216 million. Harvested corn area increased 39,000 acres, but that gain was overwhelmed by a 2.4-bushel-per-acre decline in yield. Even with the decline, yield and production are still at record-high levels.

Of the States included in the November crop estimate, 19 had lower production in the January estimate while 14 had acreage increases. The largest declines were seen in the Corn Belt and the Northern Plains, including Minnesota, Iowa, North Dakota, and South Dakota, while gains were seen in Missouri, Nebraska, Indiana, and Illinois.

Feed and Residual Use Declines

On a September-August marketing year basis for 2014/15, U.S. feed and residual use for the four feed grains plus wheat is projected to total 143.8 million tons, down 2.8 million tons from last month due to lower corn, barley, oats, and wheat offset partially by an increase in sorghum. This is up 9.3 million tons from the revised estimate of 134.5 million tons for 2013/14. Corn is expected to account for 93 percent of feed and residual use, compared with 95 percent last year. Feed and residual use was revised for barley for 2012/13 and 2013/14 to reflect updated food, seed, and industrial (FSI) use.

The projected index of grain-consuming animal units (GCAU) in 2014/15 is 91.0 million units, 0.3 million above last month and 0.6 million above last season's revised 90.4 million. Feed and residual per GCAU is estimated at 1.58 tons, up from 1.49 tons in 2013/14. For the major index components, GCAUs are increased for broilers, hogs, dairy cows, and layers and steady for most other categories.

Projected feed grain supplies for 2014/15 slipped 4.3 million metric tons this month to 414.4 million on lower corn production partially offset by an increase in the sorghum crop. Carryin is reduced with a downward revision to September 1 corn stocks. Corn production for 2013/14 is also revised lower, but the reduction is offset by lower estimated feed and residual use. Projected feed grain disappearance for 2014/15 is projected down 1.4 million tons to 363.6 million on reduced sorghum use for ethanol and lower expected feed and residual use for corn.

FSI Corn Use for Ethanol Increases

Projected corn FSI use for 2014/15 is raised 25 million bushels due to a larger corn grind, mostly a result of a cut in projected sorghum use for ethanol. In addition, Energy Information Administration weekly reports indicate increased production during the first quarter and through December, accounting for some of the increase in corn used for ethanol. First quarter 2014/15 high fructose corn syrup (HFCS), starch, and glucose and dextrose were adjusted to reflect November trade statistics, but marketing year projections were unchanged. Corn use for these products was revised slightly for 2013/14.

Feed and Residual Use Lowered

U.S. corn feed and residual use is projected to reach 5,275 million bushels for 2014/15, 100 million below last month's forecast. The reduction reflects the smaller production estimate as the forecast for total meat production is raised from last month on increased beef and poultry production, with poultry unchanged year-to-year. First quarter (September-November) feed and residual use is estimated at 2,198 million bushels based on the December 1 stocks. This compares with 2,312 million for first quarter 2013/14, when a larger share of new-crop corn was likely used before the September 1 start of the new corn marketing year.

Exports Steady

The 2014/15 U.S. corn export forecast is unchanged at 1,750 million bushels. At this level, exports would be 167 million bushels below 2013/14, as strong competition from Argentina and Brazil continue to limit U.S. shipments during the early months of the 2014/15 marketing year.

Projected total corn use for 2014/15 is reduced 75 million bushels as the decline in feed and residual is only partially offset by the increase in corn use for ethanol. Total use of 13,595 million bushels is 141 million above 2013/14.

The reductions in supply and use lower projected stocks 121 million bushels to 1,877 million. The resulting stocks-to-use ratio is 13.8 percent, up from 9.2 percent estimated for 2013/14.

Corn Price up 15 cents per Bushel

The forecast 2014/15 price received by farmers for corn is raised 15 cents per bushel on both the high and low ends of the range to \$3.35 and \$3.95 per bushel, for a midpoint price of \$3.65 per bushel. The value of the crop is estimated at \$51.9 billion, the lowest since 2009/10. Last season's price averaged \$4.46 per bushel for a total crop value of \$61.7 billion.

Sorghum Production, Exports Surge; Prices Rise Above Corn

Higher yields and harvested area combine to boost 2014/15 U.S. sorghum production 25 million bushels this month to 433 million. For the 2014/15 marketing year, farmers harvested an average of 67.6 bushels per acre; this compares to the November 1 forecast of 66.1 bushels per acre and the 5-year average of 60.9 bushels per acre. Notable changes from the November 1 yield forecast include the following: Kansas, up 3 bushels per acre as favorable weather just prior to harvest boosted yields; Nebraska, up 5 bushels per acre; Texas, up 1 bushel per acre; and Louisiana, down 7 bushels per acre.

NASS's January Crop Production Annual Summary indicates that 0.2 million more acres of sorghum were harvested, relative to the November forecast. Significant gains are noted for Colorado (up 30,000 acres), Kansas (up 50,000 acres), Nebraska (up 40,000 acres), and Texas (up 150,000 acres). These gains offset smaller declines in harvested area estimates for Mississippi, Missouri, New Mexico, and Oklahoma.

The latest NASS Grain Stocks report shows beginning stocks holding steady at 34 million bushels. On December 1, an estimated 229 million bushels were held both on and off farms. On the same date in 2013, 231 million bushels were held in all positions; in 2012, just 140 million bushels were stored on December 1. Ending stocks for 2014/15 are projected down by 5 million bushels to 32 million this month due to increased feed and residual disappearance and strong demand for sorghum by China.

Feed and residual use for 2014/15 is projected 25 million bushels higher based on first quarter (September-November) disappearance as indicated by the December 1 stocks. The pull of the lucrative export market is expected to reduce sorghum use for ethanol by 35 million bushels and is mostly offset by a 25-million-bushel increase in corn use for ethanol.

Sorghum exports are raised 40 million bushels this month to 270 million. The 17-percent increase is supported by trade data from the U.S. Census Bureau, which continue to demonstrate robust demand from China as well as periodic sorghum food aid shipments to Africa. Favorable relative prices and a lack of import quota constraints have sustained, and continue to drive, sorghum exports to China.

U.S. sorghum exports for 2014/15 are projected to be the highest since the 2007/08 marketing year when 277 million bushels were exported. In that same marketing year, sorghum exports utilized 52 percent of the 530 million bushels of estimated total sorghum supplies. For the 2014/15 crop year, exports are projected to utilize fully 58 percent of total sorghum supplies, the largest share on record back to 1975/76.

This month's 25-million-bushel increase in sorghum total supply is more than offset by a 30-million-bushel increase in total use. The revised supply-and-use outlook and prices reported to date warrant a significant 30-cent-per-bushel increase in the midpoint of the projected sorghum farm price range. The midpoint is now \$3.80 per bushel, 15 cents higher than the comparable price for corn. With these relative prices, at the farm gate, a bushel of sorghum is forecast to be worth 104.1 percent of the value of a bushel of corn. While uncommon, records indicate that the season average sorghum farm price has risen above corn 11 other times (in descending order: 1922/23, 1920/21, 1923/24, 1925/26, 1921/22, 1934/35, 2006/07, 1939/40, 1932/33, 1943/44, and 1937/38). Most recently, in 2006/07, the season-average sorghum price (\$3.29/bu.) was 8.2 percent higher than the season-average corn price (\$3.04/bu.).

Barley Feed and Residual, Industrial Use Reduced

The 2014/15 estimate for U.S. barley production is unchanged from the NASS Small Grains Annual Summary released at the end of September. Total supplies are forecast at 294 million bushels, 7 percent below the 2013/14 estimate. Sizable year-to-year declines in harvested area are reported for North Dakota (down 185,000 acres), Idaho (down 110,000 acres), Montana (down 60,000 acres), and Washington (down 90,000). Several of these States experienced damaging wet weather just prior to harvest.

The NASS Grain Stocks report indicates that barley stored in all positions on December 1, 2014, was down 7 percent from a year prior at 157.7 million bushels, with 74.4 million stored onfarm and 83.3 million off-farm. At 26.5 million bushels, the September-November total use is down 15 percent from the same period in 2013. Beginning stocks (June 1) are revised upward 0.2 million bushels to 82.3 million.

Following updates to barley industrial use estimates, barley feed and residual figures for 2012/13, 2013/14, and 2014/15 are correspondingly revised this month to 66.2 million, 64.7 million, and 50.0 million bushels, respectively. For 2014/15, barley FSI use is reduced by 2.1 million bushels, while feed and residual is reduced by 10.0 million. Total use is adjusted downward by 12.1 million bushels to 211.9 million, a reduction of 21.8 million relative to 2013/14 estimates yet only 5.8 million below the 5-year average use. Ending stocks absorb the changes made to domestic use categories and supply and are revised upward by 12.4 million bushels.

The barley season-average midpoint farm price is raised 10 cents this month to \$5.25 per bushel. Minneapolis feed barley prices have been steadily gaining since hitting a low of \$2.28 per bushel in the first week of September, shortly after the feed barley market was inundated with rain-soaked grains from the Upper Midwest. Malt barley prices, also reported in Minneapolis, have held steady at \$7.35 per bushel since the second week of October. The barley price range is tightened this month; the high end of the range is increased 5 cents, and the low end of the range is raised 15 cents.

Barley Industrial Use Figures Updated

In recognition of changing brewing and malting industry dynamics, methods of estimating and projecting barley industrial use have been updated and applied to estimates dating back to the 2012/13 marketing year. Details of the methods applied and assumptions used to assess barley industrial use are available in the special article *Boutique Brews, Barley, and the Balance Sheet*.

Oats Feed and Residual Increased, Ending Stocks Lowered

The 2014/15 estimate for U.S. oats production is unchanged; the current crop year production is estimated at 69.7 million bushels, up 8 percent from the previous year, but still the fourth lowest on record behind the 2013/14 production estimate of 64.6 million bushels. Yields are up by 3.6 bushels per acre relative to the 64.1 bushels estimated for the previous year and above the 5-year average yield of 63.0 bushels per acre. Total harvested area is the fourth lowest estimate on record at 1.03 million acres, though it is slightly above last year's estimate of 1.01 million acres harvested.

The Grain Stocks report indicates that 62.2 million bushels were stored in all positions on December 1, 2014; up 29 percent from the previous year. Total use during September-November totaled 36.5 million bushels and compares to 43.5 million estimated for the same period in 2013. Beginning stocks for 2014/15 are reduced very slightly this month; projected ending stocks are also reduced slightly, fully reflecting the June 1 stocks revision.

With much of the oats crop marketed, no change in the projected season-average oats price is made this month. The 2014/15 midpoint farm price projection remains at \$3.25 per bushel and is equivalent to 89 percent of the corn price. The low end of the oats price range is raised by 5 cents to \$3.10 per bushel, and the high end is reduced 5 cents to \$3.40 per bushel.

Hay Production and Stocks Higher; Prices Lower in 2014

NASS's Crop Production: Annual Summary provides the first updates for U.S. hay production since the October 2014 forecast. All hay production for 2014 is up 4 percent from 2013 and estimated at 139.8 million tons. The revised 2014 figure is down 6 percent relative to the October 1 forecast and reflects a 0.13-ton-per-acre downward revision of the average yield estimate. The 2014 average all hay yield is estimated at 2.45 tons per acre, a 0.12-ton-per-acre increase over the 2013 figure. Improved alfalfa yields contribute to the year-to-year yield increase; however, persistent dry conditions in Western States, including California, Oregon, and Washington, resulted in yield and production declines.

The January Crop Production report indicates that hay stocks on farms totaled 92.1 million tons on December 1, 2014, up 3 percent from December 1, 2013. Good weather in centrally located States supported increased production and boosted local hay stocks. Nationally, disappearance from May 1, 2014, to December 1, 2014, totaled 66.9 million tons, a 12-percent increase over the 2013 estimate.

NASS's December Agricultural Prices report indicates slight, seasonal, declines for all categories of hay, relative to the November estimates. The preliminary December all hay price is \$159 per ton; alfalfa hay is \$182 per ton, and other hay is forecast at \$119 per ton. These prices compare to December 2013 per-ton estimates of \$163, \$186, and \$133, respectively. Improved production in most States served to soften prices in 2014; however, dry conditions affected production in California, Oregon, and Washington and led to increases in regional all hay and alfalfa hay prices.

World Coarse Grain Production Cut by U.S. Estimates

Global coarse grain production in 2014/15 is projected down 3.0 million tons this month to 1,272.3 million. Reduced estimated U.S. production drives the decline, with foreign production forecast up 1.3 million tons to 895.2 million. Foreign corn production is projected up 1.4 million tons to 627.0 million, mostly due to improved prospects for India.

India's 2014/15 corn production is increased 1.0 million tons to 22.0 million because area planted to winter, dry season corn (rabi) is larger than expected. Most of India's corn is grown during the kharif season of monsoon rains, but late rains reduced that crop. With reduced kharif production, corn prices in India have remained stronger than in other exporting countries. These corn prices and corn's yield potential have made corn a viable competitor for irrigated land during the rabi season. Total corn area is raised 5 percent this month to 9.0 million hectares.

EU 2014/15 coarse grain production is raised 0.4 million tons to 168.1 million, due to revisions to estimated production published by several countries. Most of the increase is for corn, up 0.4 million tons to 74.0 million. While France trimmed reported corn area and reduced reported production, that was more than offset by increased yields reported for Spain, Croatia, Hungary, and Bulgaria. Changes to reported production for other coarse grains are mostly offsetting with increases for mixed grain, barley, and sorghum but reductions for oats and rye.

Ethiopia's 2014/15 barley production prospects are increased 0.3 million tons to 2.1 million as area planted is reported higher. However, Brazil's sorghum area for both 2013/14 and 2014/15 are reduced, reflecting Ministry of Agriculture data, with 2013/14 production cut 0.5 million tons to 1.9 million and 2014/15 prospects trimmed 0.4 million to 2.0 million.

Global Beginning Stocks Trimmed, Tightening Coarse Grain Supplies

World coarse grain beginning stocks for 2014/15 are reduced 0.7 million tons this month to 208.8 million. Combined with this month's cut in production, world supplies are down 3.7 million tons to 1,481.1 million.

The largest cut in 2014/15 beginning stocks is for Argentina, down 0.5 million tons, as corn exports in the latter half of local marketing year 2013/14 are stronger than previously forecast. EU 2014/15 beginning stocks are trimmed 0.3 million tons this month due mostly to increased corn feed and residual use estimated for 2013/14. Brazil's coarse grain beginning stocks are reduced 0.2 million tons because of reduced 2013/14 sorghum production. There are also very small reductions in beginning stocks caused by modified 2013/14 coarse grain estimates for Colombia, China, Ghana, and Tunisia.

Increased coarse grain beginning stocks for 2014/15 are forecast for Australia, up 0.3 million tons, with a reduction in 2013/14 estimated barley exports. Ethiopia's barley stocks are up 0.1 million, supported by increased 2013/14 production. There is also a very small increase in Egypt's 2014/15 beginning stocks.

World Consumption Trimmed, With U.S. Drop Mostly Offset

Global coarse grain use in 2014/15 is projected down 0.4 million tons this month to 1,257.2 million. Increased projected foreign use is offsetting most of the 2.4-million-ton decline in forecast U.S. consumption. India's corn feed use is projected up 0.5 million tons this month, supported by increased production prospects. EU corn feed use is also increased 0.5 million tons due to increased production and projected imports. Canada's corn imports also support a 0.4-million-ton increase in feed use.

Ethiopia's corn production estimated for 2013/14 is up 0.8 million tons, supporting consumption increases of 0.5 million tons for both 2013/14 and 2014/15. Increased barley production projected for 2014/15 supports an increase in projected coarse grain use of 0.8 million tons to 14.1 million.

Ghana's corn consumption estimates for 2013/14 and projections for 2014/15 are shifted out of feed and residual use and into food, seed, and industrial use (FSI). This reflects most of the consumption being direct human food use. For 2012/13, feed is cut 1.1 million tons to 0.2 million, while FSI is increased 0.9 million to 1.6 million. For the 2013/14 projections, feed is cut 1.0 million tons to 0.2 million while FSI is increased 1.1 million to 1.7 million. Ghana's total corn use in 2014/15 is projected up 0.1 million tons to 1.9 million.

Turkey's projected corn feed use is cut 0.9 million tons, reducing total corn consumption to 6.4 million as import prospects are cut sharply. However, its poultry sector is expected to grow, and at the reduced level, 2014/15 corn feed use is still up more than 10 percent year-to-year.

Projected Global Ending Stocks Reduced

World coarse grain ending stocks for 2014/15 are projected down 3.3 million tons this month to 223.9 million, with most of the reduction in the United States. Foreign ending stocks are forecast down 0.3 million tons to 173.2 million. Foreign corn ending stocks are forecast unchanged this month at 141.5 million tons, with offsetting country adjustments.

EU coarse grain ending stocks are up 0.6 million tons to 16.5 million, with increased corn imports and production outpacing increased feed consumption. EU mixed grain stocks are up 0.1 million tons, and barley stocks are up slightly, but rye, oats, and sorghum are each reduced fractionally.

India's corn stocks are projected up 0.5 million tons to 1.0 million, supported by increased production prospects. However, Argentina's 2014/15 beginning and ending stocks are reduced 0.5 million tons this month because of increased 2013/14 corn exports. Ethiopia's corn stocks are projected down 0.2 million tons as increased consumption whittles down the stocks accumulated due to large production in 2013/14. Turkey's corn stock prospects are trimmed 0.2 million tons as consumption prospects are reduced by less than the cut in projected imports. Increased corn consumption trims ending stocks prospects 0.1 million tons each for Canada and Ghana.

Brazil's sorghum stocks are forecast down 0.3 million tons this month due to production reductions for both 2013/14 and 2014/15. Other changes to projected 2014/15 ending stocks are small and mostly offsetting.

U.S. Sorghum Export Prospects Explode Higher

U.S. October-September 2014/15 sorghum exports are projected up 1.0 million tons this month to 6.8 million (up 40 million bushels to 270 million for the September-August local marketing year) based on the pace of sales and shipments to China. U.S. sorghum is attractive to feed compounders in China because feed grain prices are high in China, sorghum can be imported without import quota (unlike corn), and border authorities in China do not appear to be finding reasons to reject sorghum shipments.

Census sorghum exports for October-November 2014 reached 1.2 million tons, up from 0.4 million a year earlier. December export inspections reached 0.9 million tons, far above 0.2 million a year ago. As of January 1, 2015, outstanding export sales of sorghum reached 3.4 million tons, up from 2.0 million the previous year. China and "unknown destination" account for 95 percent of the outstanding sales. The size of the U.S. sorghum crop and stocks appears to be the main factor limiting U.S. sorghum sales to China.

China's sorghum imports are projected up 1.2 million tons to 6.2 million. China's sorghum imports are projected to account for more than two-thirds of world sorghum trade in 2014/15, up from practically zero just 3 years ago. China is paying a premium to corn for sorghum, limiting sorghum purchases by most other importers. Japan's sorghum imports are forecast down 0.2 million tons this month to 1.0 million, the lowest since 1963/64. Botswana's 2014/15 sorghum import forecast is cut in half to 25,000 tons, but U.S. imports are increased slightly, reflecting the small amount of imports reported to date. Brazil's sorghum export prospects are doubled to 10,000 tons.

World Corn Trade, U.S. Exports Unchanged This Month

World corn trade in 2014/15 is projected at 114.8 million tons, unchanged this month. U.S. corn exports are forecast at 44.5 million tons, down 12 percent from the previous trade year. Census exports for October-November 2014 reached 6.3 million tons, down modestly from 6.8 million a year earlier. December grain inspections were sluggish at 2.8 million tons, down from 3.3 million a year ago. As of January 1, 2015, outstanding sales of corn reached 14.7 million tons, down 2.0 million from the previous year. In coming months, U.S. sales and shipments are expected to increase partly due to reduced competition from Brazil, where port capacity will be increasingly devoted to soybean shipping.

Corn import projection changes for 2014/15 include a 1.0-million-ton increase in EU imports to 7.0 million, based on the pace of import licenses and Ukraine's access to the EU. This increase is offset by a 1.0-million-ton reduction to 1.5 million in corn imports forecast for Turkey, an import level still sufficient to sustain growth in poultry production. Canada's corn imports are increased 0.3 million tons to 1.0 million based on the fast pace of recent shipments and sales.

World Barley Trade Nudged Up

Global barley trade is increased 0.3 million tons this month to 22.1 million. Export prospects are up 0.2 million tons to 4.5 million for Australia and are up 0.1 million tons to 0.5 million for Kazakhstan, based on the pace of sales and availability of barley. Barley imports are increased 0.2 million tons each for Iran and Tunisia, based on the recent pace.

Contacts and Links

Contact Information

Thomas Capehart (domestic), (202)-694-5313, tcaphart@ers.usda.gov
Edward Allen (international), (202)-694-5288, ewallen@ers.usda.gov
Jennifer Bond, (economist), (202)-694-5326, jkbond@ers.usda.gov
Verna Daniels (Web publishing), (202)-694-5301, vblake@ers.usda.gov

Subscription Information

Subscribe to ERS e-mail notification service at <http://www.ers.usda.gov/subscribe-to-ers-e-newsletters.aspx> 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)

To order printed copies of the five field crop newsletters—cotton and wool, feed, rice, oil crops, and wheat—as a series, specify series SUB-COR-4043

Feed Monthly Tables, (<http://www.ers.usda.gov/publications/fds-feed-outlook/>)
Feed Chart Gallery, (<http://www.ers.usda.gov/data-products/chart-gallery.aspx>)

Data

Feed Grains Database

(<http://ers.usda.gov/data-products/feed-grains-database.aspx>) is a queryable database that contains monthly, quarterly, and annual data on prices, supply, and use of corn and other feed grains. This includes data published in the monthly Feed Outlook and the annual Feed Yearbook reports.

Related Websites

Feed Outlook

(<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1273>
WASDE)

(<http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1194>)

Grain Circular

(<http://www.fas.usda.gov/grain/Current/default.asp>)

World Agricultural Production

(http://www.fas.usda.gov/wap_arc.asp)

Corn Briefing Room

(<http://ers.usda.gov/topics/crops/corn.aspx>)

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, etc.) 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.

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/subscribe-to-ers-e-newsletters.aspx> 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.

Tables

Table 1--Feed grains: U.S. quarterly supply and disappearance (million bushels), 1/14/2015

| Commodity, market year, and quarter 1/ | | | Beginning stocks | Production | Imports | Total supply | Food, seed, and industrial use | Feed and residual use | Exports | Total disappear- ance | Ending stocks | Farm price 2/ (dollars per bushel) | |
|---|---------|---------|---------------------|------------|---------|-----------------|---|-----------------------------|---------|-----------------------------|------------------|--|------|
| Corn | 2011/12 | Sep-Nov | 1,128 | 12,314 | 4 | 13,446 | 1,611 | 1,782 | 406 | 3,799 | 9,647 | 5.87 | |
| | | Dec-Feb | 9,647 | | 4 | 9,651 | 1,636 | 1,547 | 444 | 3,627 | 6,023 | 6.06 | |
| | | Mar-May | 6,023 | | 11 | 6,034 | 1,625 | 861 | 400 | 2,886 | 3,148 | 6.34 | |
| | | Jun-Aug | 3,148 | | 11 | 3,159 | 1,549 | 330 | 291 | 2,170 | 989 | 7.02 | |
| | | Mkt yr | 1,128 | 12,314 | 29 | 13,471 | 6,421 | 4,520 | 1,541 | 12,482 | 989 | 6.22 | |
| | 2012/13 | Sep-Nov | 989 | 10,755 | 35 | 11,779 | 1,466 | 2,060 | 221 | 3,746 | 8,033 | 6.87 | |
| | | Dec-Feb | 8,033 | | 45 | 8,078 | 1,430 | 1,087 | 161 | 2,678 | 5,400 | 6.95 | |
| | | Mar-May | 5,400 | | 40 | 5,440 | 1,567 | 921 | 186 | 2,674 | 2,766 | 7.04 | |
| | | Jun-Aug | 2,766 | | 40 | 2,806 | 1,575 | 247 | 162 | 1,985 | 821 | 6.67 | |
| | | Mkt yr | 989 | 10,755 | 160 | 11,904 | 6,038 | 4,315 | 730 | 11,083 | 821 | 6.89 | |
| | 2013/14 | Sep-Nov | 821 | 13,829 | 15 | 14,665 | 1,550 | 2,312 | 350 | 4,212 | 10,453 | 4.66 | |
| | | Dec-Feb | 10,453 | | 7 | 10,459 | 1,605 | 1,453 | 393 | 3,451 | 7,008 | 4.40 | |
| | | Mar-May | 7,008 | | 9 | 7,017 | 1,668 | 859 | 637 | 3,165 | 3,852 | 4.63 | |
| | | Jun-Aug | 3,852 | | 6 | 3,858 | 1,678 | 411 | 537 | 2,626 | 1,232 | 4.06 | |
| | | Mkt yr | 821 | 13,829 | 36 | 14,686 | 6,501 | 5,036 | 1,917 | 13,454 | 1,232 | 4.46 | |
| | 2014/15 | Sep-Nov | 1,232 | 14,216 | 5 | 15,452 | 1,644 | 2,198 | 408 | 4,250 | 11,203 | 3.55 | |
| | | Mkt yr | 1,232 | 14,216 | 25 | 15,472 | 6,570 | 5,275 | 1,750 | 13,595 | 1,877 | 3.35-3.95 | |
| | Sorghum | 2011/12 | Sep-Nov | 27.45 | 212.99 | 0.00 | 240.44 | 24.50 | 42.88 | 22.11 | 89.49 | 150.95 | 5.98 |
| | | | Dec-Feb | 150.95 | | 0.05 | 151.00 | 25.51 | 5.66 | 11.76 | 42.93 | 108.07 | 5.97 |
| | | | Mar-May | 108.07 | | 0.05 | 108.12 | 26.51 | 15.35 | 7.73 | 49.59 | 58.53 | 6.00 |
| Jun-Aug | | | 58.53 | | 0.01 | 58.53 | 8.47 | 5.29 | 21.81 | 35.58 | 22.95 | 6.02 | |
| Mkt yr | | | 27.45 | 212.99 | 0.11 | 240.55 | 85.00 | 69.19 | 63.41 | 217.60 | 22.95 | 5.99 | |
| 2012/13 | | Sep-Nov | 22.95 | 247.74 | 1.09 | 271.78 | 24.92 | 79.68 | 27.34 | 131.94 | 139.85 | 6.86 | |
| | | Dec-Feb | 139.85 | | 0.06 | 139.91 | 24.92 | 4.31 | 19.15 | 48.37 | 91.54 | 6.76 | |
| | | Mar-May | 91.54 | | 5.52 | 97.06 | 25.86 | 16.51 | 13.58 | 55.95 | 41.11 | 6.67 | |
| | | Jun-Aug | 41.11 | | 2.91 | 44.01 | 19.55 | -6.91 | 16.22 | 28.86 | 15.15 | 5.30 | |
| | | Mkt yr | 22.95 | 247.74 | 9.57 | 280.27 | 95.24 | 93.59 | 76.29 | 265.11 | 15.15 | 6.33 | |
| 2013/14 | | Sep-Nov | 15.15 | 392.33 | 0.01 | 407.49 | 45.00 | 97.71 | 33.39 | 176.10 | 231.39 | 4.28 | |
| | | Dec-Feb | 231.39 | | 0.01 | 231.40 | 10.00 | 1.92 | 43.74 | 55.67 | 175.73 | 4.22 | |
| | | Mar-May | 175.73 | | 0.01 | 175.74 | 12.00 | 4.91 | 66.41 | 83.32 | 92.42 | 4.68 | |
| | | Jun-Aug | 92.42 | | 0.07 | 92.49 | 3.00 | -12.78 | 68.24 | 58.46 | 34.03 | 4.11 | |
| | | Mkt yr | 15.15 | 392.33 | 0.09 | 407.57 | 70.00 | 91.76 | 211.78 | 373.54 | 34.03 | 4.28 | |
| 2014/15 | | Sep-Nov | 34.03 | 432.58 | 0.21 | 466.82 | 28.00 | 126.28 | 83.45 | 237.73 | 229.09 | 3.62 | |
| | | Mkt yr | 34.03 | 432.58 | 0.21 | 466.82 | 45.00 | 120.00 | 270.00 | 435.00 | 31.82 | 3.50-4.10 | |

Table 1--Feed grains: U.S. quarterly supply and disappearance, cont. (million bushels), 1/14/2015

| Commodity, market year, and quarter 1/ | | Beginning stocks | Production | Imports | Total supply | Food, seed, and industrial use | Feed and residual use | Exports | Total disappearance | Ending stocks | Farm price 2/ (dollars per bushel) | | |
|--|---------|------------------|------------|---------|--------------|--------------------------------|-----------------------|---------|---------------------|---------------|------------------------------------|-----------|------|
| Barley | 2011/12 | Jun-Aug | 89 | 155 | 1 | 245 | 41 | 25 | 3 | 70 | 175 | 5.14 | |
| | | Sep-Nov | 175 | | 4 | 179 | 39 | -2 | 3 | 40 | 138 | 5.46 | |
| | | Dec-Feb | 138 | | 7 | 145 | 38 | 12 | 1 | 51 | 94 | 5.44 | |
| | | Mar-May | 94 | | 5 | 99 | 37 | 1 | 1 | 39 | 60 | 5.52 | |
| | | Mkt yr | 89 | 155 | 16 | 260 | 155 | 37 | 9 | 200 | 60 | 5.35 | |
| | 2012/13 | Jun-Aug | 60 | 219 | 5 | 284 | 38 | 45 | 3 | 86 | 198 | 6.40 | |
| | | Sep-Nov | 198 | | 6 | 204 | 36 | 6 | 3 | 46 | 158 | 6.46 | |
| | | Dec-Feb | 158 | | 6 | 164 | 35 | 11 | 1 | 47 | 117 | 6.44 | |
| | | Mar-May | 117 | | 6 | 123 | 38 | 3 | 1 | 42 | 80 | 6.42 | |
| | | Mkt yr | 60 | 219 | 23 | 302 | 147 | 66 | 9 | 222 | 80 | 6.43 | |
| | 2013/14 | Jun-Aug | 80 | 217 | 2 | 299 | 40 | 61 | 3 | 103 | 196 | 6.22 | |
| | | Sep-Nov | 196 | | 5 | 201 | 39 | -11 | 3 | 31 | 169 | 5.98 | |
| | | Dec-Feb | 169 | | 4 | 173 | 37 | 10 | 4 | 52 | 122 | 6.03 | |
| | | Mar-May | 122 | | 8 | 129 | 38 | 5 | 4 | 47 | 82 | 5.93 | |
| | | Mkt yr | 80 | 217 | 19 | 316 | 155 | 65 | 14 | 234 | 82 | 6.06 | |
| | 2014/15 | Jun-Aug | 82 | 177 | 7 | 266 | 39 | 43 | 4 | 86 | 180 | 5.67 | |
| | | Sep-Nov | 180 | | 4 | 184 | 38 | -16 | 4 | 27 | 158 | 5.12 | |
| | | Mkt yr | 82 | 177 | 35 | 294 | 152 | 50 | 10 | 212 | 82 | 5.00-5.50 | |
| | Oats | 2011/12 | Jun-Aug | 68 | 50 | 18 | 136 | 17 | 40 | 1 | 58 | 78 | 3.27 |
| | | | Sep-Nov | 78 | | 36 | 114 | 18 | 16 | 1 | 35 | 79 | 3.62 |
| Dec-Feb | | | 79 | | 24 | 103 | 17 | 11 | 0 | 28 | 75 | 3.53 | |
| Mar-May | | | 75 | | 16 | 91 | 24 | 12 | 0 | 36 | 55 | 3.95 | |
| Mkt yr | | | 68 | 50 | 94 | 212 | 76 | 78 | 2 | 157 | 55 | 3.49 | |
| 2012/13 | | Jun-Aug | 55 | 61 | 29 | 146 | 17 | 43 | 0 | 61 | 85 | 3.76 | |
| | | Sep-Nov | 85 | | 27 | 112 | 18 | 21 | 0 | 39 | 73 | 3.84 | |
| | | Dec-Feb | 73 | | 17 | 90 | 17 | 20 | 0 | 38 | 53 | 4.02 | |
| | | Mar-May | 53 | | 20 | 72 | 24 | 12 | 0 | 36 | 36 | 4.35 | |
| | | Mkt yr | 55 | 61 | 93 | 209 | 76 | 96 | 1 | 173 | 36 | 3.89 | |
| 2013/14 | | Jun-Aug | 36 | 65 | 17 | 118 | 17 | 37 | 0 | 55 | 63 | 3.72 | |
| | | Sep-Nov | 63 | | 28 | 92 | 18 | 25 | 1 | 43 | 48 | 3.56 | |
| | | Dec-Feb | 48 | | 20 | 68 | 16 | 16 | 0 | 33 | 35 | 3.71 | |
| | | Mar-May | 35 | | 32 | 67 | 24 | 19 | 0 | 43 | 25 | 4.03 | |
| | | Mkt yr | 36 | 65 | 97 | 198 | 75 | 97 | 2 | 173 | 25 | 3.75 | |
| 2014/15 | | Jun-Aug | 25 | 70 | 27 | 121 | 18 | 29 | 0 | 47 | 74 | 3.38 | |
| | | Sep-Nov | 74 | | 24 | 99 | 18 | 18 | 0 | 37 | 62 | 3.13 | |
| | | Mkt yr | 25 | 70 | 100 | 194 | 77 | 85 | 2 | 164 | 30 | 3.10-3.40 | |

Latest market year is projected; previous market year is estimated. Totals may not add due to rounding.

1/ Corn and sorghum, September 1-August 31 marketing year; Barley and oats, June 1-May 31 marketing year.

2/ Average price received by farmers based on monthly price weighted by monthly marketings. For the latest market year, quarterly prices are calculated by using the current monthly prices weighted by the monthly marketings for those months for the previous 5 years divided by the sum of marketings for those months.

Source: USDA, World Agricultural Outlook Board, World Agricultural Supply and Demand Estimates and supporting materials.

Data run: 1/13/2015

Table 2--Feed and residual use of wheat and coarse grains, 1/14/2015

| Market year and quarter 1/ | Corn (million metric tons) | Sorghum (million metric tons) | Barley (million metric tons) | Oats (million metric tons) | Feed grains (million metric tons) | Wheat (million metric tons) | Energy feeds (million metric tons) | Grain consuming animal units (millions) | Energy feeds per grain consuming animal unit |
|----------------------------|----------------------------|-------------------------------|------------------------------|----------------------------|-----------------------------------|-----------------------------|------------------------------------|---|--|
| 2012/13 Q1 Sep-Nov | 52.3 | 2.0 | 0.1 | 0.4 | 54.8 | -0.6 | 54.2 | | |
| Q2 Dec-Feb | 27.6 | 0.1 | 0.3 | 0.3 | 28.3 | 0.2 | 28.6 | | |
| Q3 Mar-May | 23.4 | 0.4 | 0.1 | 0.2 | 24.1 | -0.5 | 23.6 | | |
| Q4 Jun-Aug | 6.3 | -0.2 | 1.3 | 0.6 | 8.0 | 11.5 | 19.5 | | |
| MY Sep-Aug | 109.6 | 2.4 | 1.8 | 1.5 | 115.3 | 10.6 | 125.9 | 92.3 | 1.4 |
| 2013/14 Q1 Sep-Nov | 58.7 | 2.5 | -0.2 | 0.4 | 61.4 | -4.6 | 56.8 | | |
| Q2 Dec-Feb | 36.9 | 0.0 | 0.2 | 0.3 | 37.5 | -0.0 | 37.5 | | |
| Q3 Mar-May | 21.8 | 0.1 | 0.1 | 0.4 | 22.4 | -0.7 | 21.7 | | |
| Q4 Jun-Aug | 10.4 | -0.3 | 0.9 | 0.5 | 11.6 | 7.0 | 18.5 | | |
| MY Sep-Aug | 127.9 | 2.3 | 1.0 | 1.6 | 132.9 | 1.6 | 134.5 | 90.4 | 1.5 |
| 2014/15 Q1 Sep-Nov | 55.8 | 3.2 | -0.3 | 0.3 | 59.0 | -2.5 | 56.5 | | |
| MY Sep-Aug | 134.0 | 3.0 | 1.0 | 1.7 | 139.7 | 4.1 | 143.8 | 91.0 | 1.6 |

1/ Corn and sorghum, September 1-August 31 marketing year; Barley and oats, June 1-May 31 marketing year.

Source: USDA, World Agricultural Outlook Board, World Agricultural Supply and Demand Estimates and supporting materials.

Table 3--Cash feed grain prices, 1/14/2015

| Mkt year and month 1/ | Corn, No. 2 yellow, Central IL (dollars per bushel) | | | Corn, No. 2 yellow, Gulf ports, LA (dollars per bushel) | | | Sorghum, No. 2 yellow, Gulf ports, LA (dollars per cwt) | | |
|-----------------------|--|---------|---------|---|---------|---------|---|---------|---------|
| | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 |
| Sep | 7.70 | 4.78 | 3.16 | 8.15 | 5.27 | 4.14 | 12.97 | 9.84 | 7.91 |
| Oct | 7.48 | 4.20 | 3.09 | 8.16 | 5.13 | 4.15 | 13.20 | 9.31 | 8.52 |
| Nov | 7.39 | 4.10 | 3.45 | 8.18 | 5.06 | 4.54 | 13.10 | 8.86 | 9.04 |
| Dec | 7.23 | 4.13 | 3.75 | 7.85 | 5.06 | 4.55 | 13.14 | 9.34 | 9.85 |
| Jan | 7.17 | 4.13 | | 7.70 | 5.03 | | 13.13 | 9.77 | |
| Feb | 7.15 | 4.33 | | 7.70 | 5.32 | | 13.12 | 10.16 | |
| Mar | 7.33 | 4.64 | | 7.85 | 5.65 | | 13.32 | 10.57 | |
| Apr | 6.57 | 4.98 | | 7.11 | 5.65 | | 12.18 | | |
| May | 6.83 | 4.72 | | 7.50 | 5.51 | | 12.42 | | |
| Jun | 6.94 | 4.37 | | 7.58 | 5.14 | | | | |
| Jul | 6.61 | 3.74 | | 7.10 | 4.64 | | | | |
| Aug | 5.98 | 3.59 | | 6.07 | 4.48 | | 10.01 | 8.41 | |
| Mkt year | 7.03 | 4.31 | | 7.58 | 5.16 | | 12.66 | 9.53 | |
| | Barley, No. 2 feed, Minneapolis, MN (dollars per bushel) | | | Barley, No. 3 malting, Minneapolis, MN (dollars per bushel) | | | Oats, No. 2 white heavy, Minneapolis, MN (dollars per bushel) | | |
| | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 |
| Jun | 5.15 | 5.01 | 3.49 | 7.03 | 6.88 | 5.71 | 3.37 | 4.21 | 3.88 |
| Jul | 5.52 | 4.66 | 3.01 | 6.89 | 6.79 | 5.62 | 3.95 | 3.84 | 3.85 |
| Aug | 5.78 | 4.03 | 2.58 | 6.95 | 5.88 | 5.79 | 3.99 | 3.78 | 3.83 |
| Sep | 5.58 | 3.48 | 2.30 | 6.99 | 5.41 | 5.98 | 3.89 | 3.40 | 3.86 |
| Oct | 5.51 | 3.39 | 2.44 | 7.11 | 5.50 | 7.28 | 3.98 | 3.57 | 3.68 |
| Nov | 5.49 | 3.46 | 2.48 | 7.23 | 5.46 | 7.35 | 3.85 | 3.79 | 3.53 |
| Dec | 5.29 | 3.52 | 2.68 | 7.22 | 5.77 | 7.35 | 3.94 | 3.80 | 3.49 |
| Jan | 5.08 | 3.65 | | 7.09 | 5.72 | | 3.79 | 4.30 | |
| Feb | 5.16 | 3.70 | | 7.04 | 5.64 | | 4.07 | 4.64 | |
| Mar | 5.22 | 3.87 | | 6.87 | 5.97 | | 4.26 | 4.66 | |
| Apr | 5.00 | 3.95 | | 6.51 | 6.24 | | 4.13 | 4.58 | |
| May | 5.04 | 3.96 | | 6.70 | 6.10 | | 3.99 | 4.03 | |
| Mkt year | 5.32 | 3.89 | | 6.97 | 5.95 | | 3.93 | 4.05 | |

1/ Corn and sorghum, September 1-August 31 marketing year; Barley and oats, June 1-May 31 marketing year. Simple average of monthly prices for the marketing year.

Source: USDA, Agricultural Marketing Service, <http://marketnews.usda.gov/portal/fg>.

Data run: 1/13/2015

Table 4--Selected feed and feed byproduct prices (dollars per ton), 1/14/2015

| Mkt year and month 1/ | Soybean meal, high protein, Central Illinois, IL | | | Cottonseed meal, 41% solvent, Memphis, TN | | | Corn gluten feed, 21% protein, Midwest | | | Corn gluten meal, 60% protein, Midwest | | | |
|-----------------------|--|---------|---------|---|---------|---------|--|---------|---------|---|---------|---------|---------|
| | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 | |
| Oct | 488.46 | 443.63 | 381.50 | 343.00 | 355.00 | 346.88 | 226.50 | 157.50 | 90.13 | 753.50 | 601.25 | 549.38 | |
| Nov | 466.16 | 451.13 | 441.40 | 376.88 | 345.00 | 313.13 | 209.75 | 158.38 | 105.13 | 716.25 | 631.25 | 581.88 | |
| Dec | 460.09 | 498.31 | 431.74 | 345.00 | 401.88 | 334.38 | 203.34 | 168.00 | 143.00 | 673.34 | 638.13 | 613.50 | |
| Jan | 431.39 | 479.54 | | 327.50 | 378.34 | | 204.10 | 165.00 | | 599.50 | 625.00 | | |
| Feb | 440.67 | 509.25 | | 279.38 | 388.75 | | 209.88 | 167.50 | | 584.38 | 668.13 | | |
| Mar | 437.33 | 497.82 | | 301.88 | 401.25 | | 204.13 | 177.63 | | 581.88 | 744.38 | | |
| Apr | 422.07 | 514.01 | | 314.50 | 405.50 | | 176.70 | 166.60 | | 540.50 | 784.00 | | |
| May | 465.72 | 519.38 | | 311.88 | 416.88 | | 157.25 | 157.00 | | 480.63 | 761.25 | | |
| Jun | 496.78 | 501.72 | | 329.38 | 412.50 | | 151.00 | 131.88 | | 550.00 | 694.50 | | |
| Jul | 544.59 | 450.79 | | 344.50 | 359.50 | | 140.60 | 113.70 | | 591.00 | 574.00 | | |
| Aug | 464.91 | 490.33 | | 330.00 | 310.00 | | 123.13 | 109.25 | | 565.63 | 572.88 | | |
| Sep | 500.39 | 525.72 | | 374.38 | 360.63 | | 135.50 | 98.70 | | 573.75 | 587.50 | | |
| Mkt yr | 468.21 | 490.13 | | 331.52 | 377.93 | | 178.49 | 147.59 | | 600.86 | 656.86 | | |
| | Meat and bone meal, Central US | | | Distillers dried grains, Central Illinois, IL | | | Wheat middlings, Kansas City, MO | | | Alfalfa hay, weighted-average farm price 2/ | | | |
| | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 | 2012/13 | 2013/14 | 2014/15 | 2011/12 | 2012/13 | 2013/14 | 2014/15 |
| Oct | 463.59 | 385.53 | 385.00 | 278.00 | 216.50 | 96.00 | 208.57 | 153.37 | 111.48 | 204.00 | 212.00 | 193.00 | 194.00 |
| Nov | 380.38 | 410.95 | 383.79 | 259.00 | 217.13 | 113.13 | 193.60 | 138.69 | 106.87 | 193.00 | 215.00 | 188.00 | 184.00 |
| Dec | 320.42 | 459.57 | 424.22 | 261.67 | 220.50 | 159.30 | 217.37 | 198.00 | 135.83 | 195.00 | 217.00 | 186.00 | 182.00 |
| Jan | 338.16 | 456.88 | | 264.90 | 200.00 | | 196.38 | 151.62 | | 193.00 | 217.00 | 186.00 | |
| Feb | 410.39 | 438.75 | | 271.13 | 214.38 | | 197.47 | 150.24 | | 194.00 | 218.00 | 190.00 | |
| Mar | 474.92 | 501.25 | | 270.88 | 245.00 | | 196.93 | 156.62 | | 200.00 | 219.00 | 193.00 | |
| Apr | 424.37 | 560.00 | | 242.40 | 243.50 | | 183.64 | 133.38 | | 210.00 | 213.00 | 207.00 | |
| May | 387.05 | 516.25 | | 229.00 | 222.75 | | 138.75 | 131.07 | | 215.00 | 219.00 | 225.00 | |
| Jun | 413.74 | 506.88 | | 235.88 | 184.50 | | 147.13 | 102.43 | | 205.00 | 218.00 | 222.00 | |
| Jul | 481.53 | 489.83 | | 240.20 | 148.00 | | 138.30 | 70.36 | | 203.00 | 206.00 | 216.00 | |
| Aug | 461.38 | 464.37 | | 232.13 | 116.88 | | 120.91 | 81.24 | | 203.00 | 199.00 | 209.00 | |
| Sep | 450.82 | 435.00 | | 230.13 | 123.00 | | 140.35 | 106.62 | | 206.00 | 194.00 | 197.00 | |
| Mkt yr | 417.23 | 468.77 | | 251.27 | 196.01 | | 173.28 | 131.14 | | 196.00 | 211.00 | 199.00 | |

1/ October 1-September 30 except for hay. Simple average of monthly prices for the marketing year except for hay.

Source: USDA, Agricultural Marketing Service, <http://marketnews.usda.gov/portal/ig>, and USDA, National Agricultural Statistics Service, http://www.nass.usda.gov/Data_and_Statistics/Quick_Stats/index.asp.

Table 5--Corn: Food, seed, and industrial use (million bushels), 1/14/2015

| Mkt year and qtr 1/ | | High-fructose corn syrup (HFCS) | Glucose and dextrose | Starch | Alcohol for fuel | Alcohol for beverages and manufacturing | Cereals and other products | Seed | Total food, seed, and industrial use |
|---------------------|------------|---------------------------------|----------------------|--------|------------------|---|----------------------------|-------|--------------------------------------|
| | | | | | | | | | |
| | Q2 Dec-Feb | 113.44 | 66.78 | 59.16 | 1,105.06 | 35.86 | 49.56 | 0.00 | 1,429.86 |
| | Q3 Mar-May | 126.39 | 76.87 | 63.03 | 1,191.16 | 37.51 | 50.04 | 22.37 | 1,567.37 |
| | Q4 Jun-Aug | 128.59 | 77.92 | 63.22 | 1,220.52 | 32.42 | 50.14 | 2.22 | 1,575.01 |
| | MY Sep-Aug | 491.49 | 291.92 | 249.39 | 4,641.13 | 140.00 | 199.42 | 24.58 | 6,037.92 |
| 2013/14 | Q1 Sep-Nov | 113.44 | 74.07 | 62.57 | 1,215.75 | 34.33 | 49.96 | 0.00 | 1,550.11 |
| | Q2 Dec-Feb | 109.97 | 72.84 | 60.47 | 1,275.53 | 35.97 | 49.82 | 0.00 | 1,604.60 |
| | Q3 Mar-May | 125.62 | 79.17 | 50.83 | 1,302.66 | 37.62 | 50.33 | 21.92 | 1,668.15 |
| | Q4 Jun-Aug | 128.53 | 80.89 | 44.85 | 1,339.78 | 32.51 | 50.41 | 1.08 | 1,678.05 |
| | MY Sep-Aug | 477.56 | 306.97 | 218.73 | 5,133.72 | 140.43 | 200.51 | 23.00 | 6,500.91 |
| 2014/15 | Q1 Sep-Nov | 115.54 | 74.62 | 62.33 | 1,308.96 | 33.97 | 48.35 | 0.00 | 1,643.77 |
| | MY Sep-Aug | 490.00 | 290.00 | 250.00 | 5,175.00 | 141.71 | 200.07 | 23.22 | 6,570.00 |

1/ September-August. Latest data may be preliminary or projected.

Source: Calculated by USDA, Economic Research Service.

Date run: 1/13/2015

Table 6--Wholesale corn milling product and byproduct prices, 1/14/2015

| Mkt year and month 1/ | Corn meal, yellow, Chicago, IL (dollars per cwt) | | Corn meal, yellow, New York, NY (dollars per cwt) | | Corn starch, Midwest 3/ (dollars per cwt) | | Dextrose, Midwest (cents per pound) | | High-fructose corn syrup (42%), Midwest (cents per pound) | |
|-----------------------|---|---------|--|---------|--|---------|--|---------|--|---------|
| | 2013/14 | 2014/15 | 2013/14 | 2014/15 | 2013/14 | 2014/15 | 2013/14 | 2014/15 | 2013/14 | 2014/15 |
| | Sep | 27.17 | 17.32 | 28.82 | 18.99 | 21.04 | 14.14 | 35.35 | 34.50 | 25.88 |
| Oct | 26.47 | 17.44 | 28.10 | 19.11 | 18.55 | 13.30 | 35.35 | 34.50 | 25.88 | 21.25 |
| Nov | 26.22 | 18.44 | 27.95 | 20.14 | 15.64 | 12.91 | 34.10 | 34.50 | 24.38 | 21.25 |
| Dec | 26.26 | | 27.89 | | 14.98 | 13.90 | 32.85 | | 22.88 | |
| Jan | 24.69 | | 26.44 | | 14.41 | | 29.62 | | 20.79 | |
| Feb | 21.66 | | 23.36 | | 14.44 | | 30.50 | | 21.25 | |
| Mar | 21.50 | | 23.24 | | 14.68 | | 30.50 | | 21.25 | |
| Apr | 21.08 | | 22.75 | | 14.98 | | 30.50 | | 21.25 | |
| May | 20.21 | | 21.88 | | 15.64 | | 30.50 | | 21.25 | |
| Jun | 19.92 | | 21.59 | | 15.88 | | 32.17 | | 21.25 | |
| Jul | 18.56 | | 20.23 | | 15.49 | | 34.50 | | 21.25 | |
| Aug | 18.09 | | 19.76 | | 14.86 | | 34.50 | | 21.25 | |
| Mkt year 2/ | 22.65 | | 24.33 | | 15.88 | | 32.54 | | 22.38 | |

1/ September-August. Latest month is preliminary.

2/ Simple average of monthly prices for the marketing year.

3/ Bulk-industrial, unmodified.

Source: Milling and Baking News, except for corn starch which is from private industry.

Date run: 1/13/2015

Table 7--U.S. feed grain imports by selected sources (1,000 metric tons) 1/, 1/14/2015

| Import and country/region | ----- 2012/13 ----- | | ----- 2013/14 ----- | | 2014/15 | |
|---------------------------|---------------------|---------|---------------------|---------|---------|-----|
| | Mkt year | Jun-Nov | Mkt year | Jun-Nov | Jun-Nov | |
| Oats | Canada | 1,591 | 966 | 1,505 | 740 | 839 |
| | Sweden | 8 | | 99 | 0 | 0 |
| | Australia (No | 2 | 1 | 5 | 2 | 3 |
| | All other countries | 0 | 0 | 67 | 39 | 42 |
| | Total 2/ | 1,601 | 967 | 1,676 | 781 | 884 |
| Malting barley | Canada | 342 | 178 | 242 | 80 | 168 |
| | All other countries | 0 | 0 | | | 0 |
| | Total 2/ | 342 | 178 | 242 | 80 | 168 |
| Other barley 3/ | Canada | 161 | 67 | 162 | 67 | 80 |
| | All other countries | 4 | 1 | 4 | 1 | 1 |
| | Total 2/ | 165 | 69 | 166 | 68 | 81 |

1/ Grain only. Market year (June-May) and market year to date.

2/ Totals may not add due to rounding.

3/ Grain for purposes other than malting, such as feed and seed use.

Source: U.S. Department of Commerce, Bureau of the Census, Foreign Trade Statistics.

Date run: 1/13/2015

Table 8--U.S. feed grain exports by selected destinations (1,000 metric tons) 1/, 1/14/2015

| Export and country/region | | ----- 2012/13 ----- | | ----- 2013/14 ----- | | 2014/15 |
|---------------------------|---------------------|---------------------|---------|---------------------|---------|---------|
| | | Mkt year | Sep-Nov | Mkt year | Sep-Nov | Sep-Nov |
| Corn | Japan | 6,865 | 2,075 | 11,844 | 1,749 | 2,327 |
| | Mexico | 4,581 | 1,237 | 10,463 | 2,459 | 2,580 |
| | China (Mainland) | 2,390 | 946 | 2,736 | 1,790 | 106 |
| | Venezuela | 1,070 | 237 | 1,128 | 236 | 338 |
| | China (Taiwan) | 530 | 145 | 1,792 | 301 | 163 |
| | Canada | 468 | 93 | 481 | 99 | 488 |
| | South Korea | 451 | 349 | 4,973 | 772 | 552 |
| | Saudi Arabia | 346 | 68 | 1,031 | 68 | 140 |
| | Cuba | 274 | 89 | 137 | | |
| | Jamaica | 243 | 61 | 283 | 44 | 68 |
| | Guatemala | 220 | 56 | 753 | 146 | 209 |
| | Honduras | 206 | 23 | 359 | 64 | 107 |
| | Colombia | 155 | 76 | 3,459 | 404 | 1,148 |
| | El Salvador | 142 | 36 | 409 | 94 | 156 |
| | Panama | 130 | 23 | 333 | 73 | 141 |
| | Costa Rica | 122 | 28 | 593 | 76 | 213 |
| | Trinidad And Tobago | 81 | 14 | 86 | 25 | 17 |
| | Dominican Republic | 59 | 7 | 596 | 54 | 78 |
| | Nicaragua | 38 | 13 | 121 | 11 | 51 |
| | Sub-Saharan Africa | 29 | 1 | 35 | 2 | 1 |
| | Barbados | 24 | 3 | 35 | 10 | 6 |
| Guyana | 20 | | 24 | 5 | | |
| European Union-27 | 20 | 2 | 1,263 | 64 | 76 | |
| Hong Kong | 15 | 3 | 23 | 4 | 7 | |
| Other Europe | 9 | 3 | 0.043 | 0.021 | 0.051 | |
| All other countries | 56 | 21 | 5,747 | 348 | 1,396 | |
| Total 2/ | 18,545 | 5,610 | 48,703 | 8,897 | 10,368 | |
| Sorghum | Mexico | 1,448 | 566 | 251 | 146 | 6 |
| | Japan | 209 | 59 | 293 | 115 | 31 |
| | Sub-Saharan Africa | 184 | 68 | 443 | 226 | 224 |
| | European Union-27 | 81 | 0.749 | 25 | 0.020 | 0.018 |
| | All other countries | 15 | 2 | 4,367 | 360 | 1,859 |
| | Total 2/ | 1,938 | 695 | 5,380 | 848 | 2,120 |
| | | ----- 2012/13 ----- | | ----- 2013/14 ----- | | 2014/15 |
| | | Mkt year | Jun-Nov | Mkt year | Jun-Nov | Jun-Nov |
| Barley | Japan | 70 | 59 | 169 | 39 | 55 |
| | Saudi Arabia | 59 | 59 | 0.093 | | 0.023 |
| | Mexico | 31 | 24 | 93 | 51 | 42 |
| | South Korea | 9 | 3 | 8 | 5 | 3 |
| | All other countries | 23 | 5 | 41 | 32 | 60 |
| | Total 2/ | 193 | 149 | 311 | 128 | 160 |

1/ Grain only. Market year (September-August for corn and sorghum, June-May for barley) and market year to date.

2/ Totals may not add due to rounding.

Source: U.S. Department of Commerce, Bureau of the Census, Foreign Trade Statistics.

Date run: 1/13/2015



Economic
Research
Service

Situation and
Outlook

FDS-15a-SA

January 14, 2015

Feed Outlook: Special Article

Boutique Brews, Barley, and the Balance Sheet:

Changes in malt barley industrial use require an updated forecasting approach

Jennifer Bond, jkbond@ers.usda.gov
Tom Capehart, tcapehart@ers.usda.gov
Edward Allen, ewallen@ers.usda.gov
Gene Kim, Gene.Kim@fas.usda.gov

Approved by the
World Agricultural
Outlook Board

With nearly 1,955 new craft breweries opening in the last 10 years and annual growth in beer sales of slightly more than 10 percent during the same period, it is not hard to argue that the American craft beer segment is experiencing a renaissance (Watson, 2014).¹ Today, more than 3,150 micro and craft breweries are operating in the United States and brewery counts are at the highest level in 125 years (Brewers Association, 2014; Watson, 2014).

Previous methods of estimating barley use for malting and brewing or “industrial” purposes have relied on the historical relationship between malt barley use for lager-style beer production. However, craft style beers require proportionally more malt per barrel of beer brewed. In fact, industry sources indicate that, on average, craft-style beers use between three and seven times the amount of malt per barrel as is required to brew a comparable volume of the ubiquitous, American light lager or “noncraft” beer (Brophy, 2013; Watson, 2013). Because of these significantly different malt barley needs, growth in both total and proportional volume production of craft beer necessitates an update in barley industrial use estimation methods.

¹ The Brewers Association defines a craft brewery as small, independent, and traditional: annual volume of production is less than 6 million barrels; less than 25 percent of the craft brewery is owned or controlled by an alcoholic beverage industry member that is not itself a craft brewer; and the craft brewery produces beers whose flavor is derived from traditional or innovative brewing ingredients and their fermentation.

Divergent Production, Sales Trends

Between 1993 and 2013, craft brewers' volume of production increased ninefold, and annual volume production growth averaged nearly 14 percent. In contrast, the volume of noncraft beer brewed in the United States has decreased by about 0.6 percent per year since 1993. Craft beer sales totaled \$5.7 billion in 2007 and nearly tripled to \$14.3 billion by 2013 (Brewers Association, 2014). In 2013, total beer volume sales in the United States declined 1.9 percent, while the craft segment grew by 18 percent in volume and 20 percent in sales. Despite these impressive figures, craft breweries still account for a comparatively small proportion of U.S. beer sales. In 2014, all craft breweries combined to produce 15.6 million barrels, while total U.S. beer production topped 191.6 million barrels, giving craft production a 7.8 percent share of total production.

The Malty Consequences

The overall volume of beer produced in the United States declined from 202.6 million barrels in 1993 to 191.6 million in 2013, a 5.4 percent overall drop. More striking is that over the same 20-year period, use of malt and malt extract by U.S. brewers decreased by 17.8 percent, reflecting improved production efficiencies at larger brewing houses and a proportional increase in light beer production.²

While aggregate production declines are still expected, the outlook for industrial malt use and, by association, malt barley demand is not necessarily grim. Craft beer production typically requires three to seven times the amount of malt and malt products typically used to brew noncraft beer. Therefore, growth in the craft beer sector could have a relatively greater impact on malt demand than a similar-sized decrease in noncraft volume. Given an average annual growth of nearly 14 percent in volume over the past 20 years, the craft beer renaissance has already offset some declines in noncraft demand for malt and malt products. If current trends continue, expanded craft production and the corresponding demand for malt and malt products has the potential to fully offset declining noncraft use and potentially reverse declines in industrial use for malt and, by extension, domestic malt barley.

Data, Methods, and Key Assumptions

Previous sections describe the changes that have taken place in the beer marketplace and some of the underlying characteristics of both the craft and noncraft beer segments. To determine how these translate to updated barley industrial use calculations, a number of relationships were quantified using various data sources and insights from subject area experts. Data for aggregate production and ingredient use is provided by the U.S. Department of the Treasury, Alcohol and Tobacco Tax and Trade Bureau (TTB). Data on craft production and ingredient usage patterns are provided by the Brewers Association and a variety of malting, spirits, and brewing industry experts. Trade data are sourced from the U.S. Census Bureau and downloaded from USDA's Foreign Agricultural Service Global Agricultural Trade System database.

Malt Conversions

The TTB monthly Beer Statistical Report aggregates use of malt barley and malt products into a single category, necessitating the use of expert judgment to determine the typical usage shares of malt and the various malt products (including extracts: dry, crystal, liquid). Extract use is estimated between 2 and 10 percent, with consensus nearing 5 percent of the category total; malt thus accounts for the vast majority, 95 percent, of aggregate category volume (Watson, 2014; Hansen, 2014; Germershausen, 2014).

Variations in barley type (two-row vs. six-row), quality, and malting methods affect the rate of conversion between comparable units of barley malt. Noting this, on average, 1.3 pounds of malt barley are required to produce 1 pound of malted barley. Malt extracts are concentrated and require relatively more malt barley per unit. Using Smith's

²Calories are reduced in light beers, in part by cutting back on the amount of malt used in the brewing process.

(2008) conversions, it is estimated that 1.76 pounds of malt barley are required per pound of liquid extract; 2.22 pounds are required per pound of dry extract. Used in equivalent proportions, approximately 2 pounds of malt barley are required to produce an average pound of extract. Taking proportions and conversion factors together, each pound of malt and malt products described in the TTB reports accounts for approximately 1.33 pounds of malt barley (Heisel, 2014).

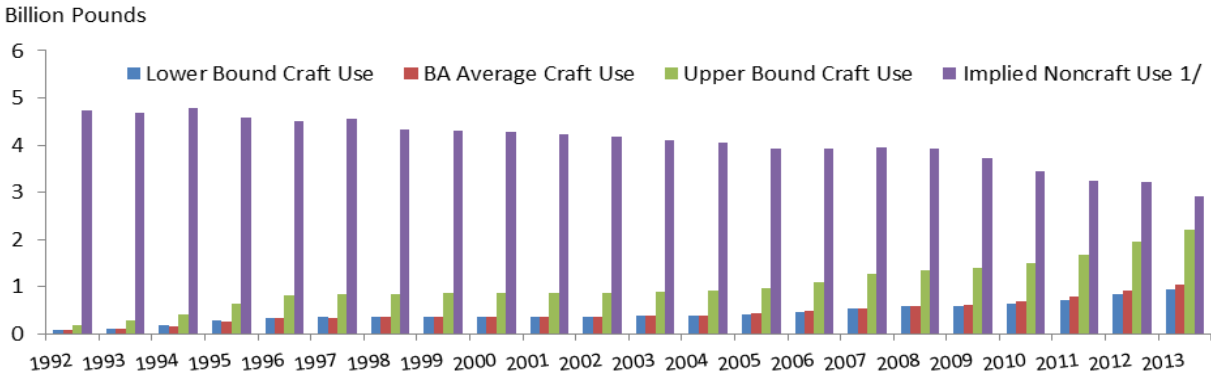
Prior to converting the category to commercial brewers’ use of malt barley, wheat-based malt use must be taken into account and deducted from the aggregate category. Bob Hansen of Briess Malt and Ingredient Company notes that some of the bestselling craft-style beers contain a significant amount of wheat; Amy Germershausen of MaltEurop estimates that between 5 and 10 percent of the malt and malt products noted in the TTB reports are in fact wheat based and not barley based. For the purpose of this report, a conservative 5 percent of malt and malt products ingredients are deducted from the total to account for wheat-based malt use.

Per Barrel Use

Noncraft and craft beer recipes tend to differ considerably in ingredient needs. Most noncraft production is pale, lightly hopped, lager-style pale beer. In contrast, Briggs et al. (2004) note that “many new small (craft) breweries have been set up and these make a wide variety of beers based on styles from around the world.” Most relevant to this discussion is the tendency for significantly higher use of malt and malt products in craft-style beer recipes. A 2012 Brewers Association survey found that brewpubs and craft brewers used, on average, 68.7 pounds of base malt and specialty malt per barrel.³ Recipe variations, as well as production inefficiencies, likely contribute to the comparably high level of malt use in craft production.

Applying the Brewers Association Benchmarking Survey estimate of per barrel malt and malt product needs to craft production implies total craft demand of 1.051 billion pounds of malt and malt products in 2013. Subtracting this figure from total reported malt and malt products and dividing by numbers of noncraft barrels produced implies noncraft use for 2013 of 16.47 pounds per barrel, or rather, craft needs are approximately 4.17 times noncraft usage. Assuming stable per barrel craft demand for malt and malt product allows the calculation of historic total craft malt and malt product usage based on volume production. Craft and noncraft malt use over time can be compared as a function of lower and upper bound estimates of craft use and an average of 68.7 pounds per craft barrel to arrive at an estimate of noncraft use.

Figure 1: Malt and Malt Product Use Comparison: Craft vs. Non-Craft



1/Implied Craft use is determined as the residual of total malt and malt products usage less craft use based on Brewers Association average per barrel usage estimates.

Sources: U.S. Department of the Treasury, Alcohol and Tobacco Tax and Trade Bureau; US

³ The Brewers Association includes more than 2,362 U.S. brewery members representing the vast majority of craft beer volume produced in the United States (as of 9/30/2014).

Figure 1 illustrates the divergent trends in malt and malt product use over time. Generally speaking, noncraft use declined between 1992 and 2013. In contrast, as craft volume has grown, so, too, has the absolute and relative use of malt and malt products by the craft industry. In 1992, craft use accounted for just 1.7 percent of total malt and malt product usage by U.S. brewers. By 2013, craft brewers utilized 26.6 percent of total malt and malt products, assuming the average per-barrel estimate reported by the Brewers Association (Watson, 2014). Once total malt and malt product usage by category is determined, all production uses can be converted to barley bushel terms.

Spirits Sector

The use of malt barley and barley in the production of spirits augments beer-focused estimates of barley industrial use. Malt and malt barley is primarily used in the production of malt whiskey, though other malt liquors also require varying amounts of malted barley. TTB reports do not provide disaggregated estimates of liquor-specific ingredients use. In 2013, U.S. production was estimated at 211.3 million gallons of all types of whiskey, accounting for 0.086 percent of total U.S. non-beer or wine alcohol production. Spirits industry professionals provided a confidential estimate of malt barley use for spirits production. This figure was compared to a MaltEurop-sourced estimate of 75,000 metric tons of malted barley sales to distillers. From these data points, demand for malt barley for use in spirits production is estimated at 3.95 million bushels in 2012, 4.21 million in 2013, and 4.48 million in 2014.

Homebrewers

In November 2013, the American Homebrewers Association (AHA) released the results of its nationwide survey of homebrewers. The AHA survey found that there are an estimated 1.2 million homebrewers in the United States who collectively produced more than 2 million barrels of beer (Brewers Association, 2013). This is a small, though nontrivial, proportion of all beer brewed in the United States (approximately 1 percent). Notably, estimates of homebrewer production and ingredient use are not captured by the TTB monthly brewing statistics. Furthermore, the typical homebrewer is thought to be less efficient and more likely to use malt extract and a greater proportion of imported ingredients than the typical craft brewer. Estimates of homebrewer domestic malt use range from 1 to 3 percent of total commercial brewer use (as reported by TTB), depending on assumptions of relative efficiency and use of malt to malt extracts. The more conservative 1 percent augmentation to total ingredients use is applied here and serves to increase total malt and malt products use by 40.5 million pounds or the equivalent of 1.13 million bushels of malt barley in 2014.

Malted Barley Exports

Demand for exported U.S. malt barley has generally grown in recent years and is largely concurrent with the expansion of the craft beer segment. While these markets operate largely independently of each other, changes in both markets affect estimates of barley industrial use. In 2013, aggregate U.S. malt exports totaled 351,492 metric tons, up from just 75,892 metric tons in 2003. Since peaking in 2008, malt exports have declined some while still remaining well above pre-2003 levels. Post-2003, exports to Mexico surged and have supported observed increases in exports of primarily unroasted malt. Exports of roasted malt posted significant gains starting in 2005 but have fluctuated significantly in the years since and account for a relatively small proportion of total volume exports (4.42 percent in 2013). Malt extracts represent just 0.80 percent of U.S. volume exports in 2013. When converted to a barley bushel equivalent, U.S. exports of malt and malt products require the use of 21.32 million bushels of malt barley in 2013 and are forecast to use 22.03 million bushels in 2014.

Updated Food Seed and Industrial Figures

Revised industrial use estimates are paired with food and seed use projections to create the aggregate food, seed, and industrial (FSI) use estimates that are reported in USDA's monthly World Supply and Demand Estimates report and the Feed Grains Outlook. The three main components of FSI, including the revised industrial use figures, are displayed in table 1 and compared with previous FSI estimates. Barley seed and food estimates are unchanged.

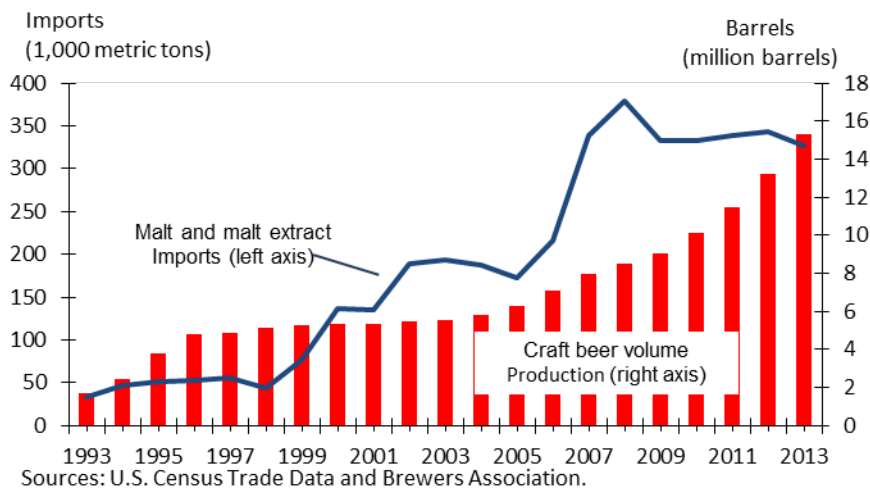
| Table 1: Barley FSI components and comparison | | | | | |
|---|------|------|--------------------|-------------|--------------|
| Crop year | Seed | Food | Revised industrial | Revised FSI | Previous FSI |
| -----Million Bushels----- | | | | | |
| 2012/13 | 5.79 | 6.89 | 134.14 | 146.81 | 155.00 |
| 2013/14 | 6.30 | 6.93 | 141.40 | 154.63 | 155.00 |
| 2014/15 | 6.00 | 6.98 | 138.87 | 151.85 | 154.00 |

Source: USDA, Economic Research Service and USDA, World Agricultural Outlook Board, *World Supply and Demand Estimates*.

The revised estimates are quite close to the previous FSI calculations; the average difference is just 2.3 percent, or 3.5 million bushels. While the revised figures are very comparable with the previous estimates, the component parts of industrial use are now estimated with greater precision and will better reflect changes in the contributing markets, including exports, imports, spirits, homebrewing, and the craft sector.

Forward-looking estimates of barley industrial use will be enhanced through the disaggregation of the category into craft and noncraft, spirits, home brew, and export use. Each market has unique characteristics and requires regular monitoring to update key assumptions and use projections. How these estimates of domestic industrial use will ultimately translate to changes in domestic production remains to be answered. One area of particular interest is the interplay between craft beer growth and the use of imported malt and malt products. U.S. imports of malt have grown significantly over the last 20 years and in concert with the growth of the craft beer segment. In 1992, just 9,850 metric tons of malt and malt extract were imported into the United States; in 2012, more than 342,000 metric tons were imported.

Figure 2: Domestic craft beer volume production and malt imports



When compared with total U.S. malt and malt product needs, imports appear to account for a proportionally small volume of total domestic supply. However, the Brewers Association estimates that craft brewers use between 50 and 75 percent of the volume of malt and malt product imports. Because the craft beer segment is itself relatively small, a significant proportion of craft malt needs are being met by imported malt products. The significant use of imported malt reduces the expected impact of continued craft volume growth on domestic barley production.

References

- Brewers Association. 2014. Accessible at: <http://www.brewersassociation.org/>
- Brewers Association. 2013. “Who is the American Home Brewer”? Accessible at: http://www.brewersassociation.org/wp-content/uploads/2014/06/aha-infographic_HR.jpg
- Briggs, D.E., C.A. Boulton, P.A. Brookes, and R. Stevens. 2014. *Brewing Science and Practice*. Woodhead Publishing Limited.
- Brophy, Michael. 2013. Beer Institute. Personal Communication.
- Germershausen, Amy. 2014. MaltEurop. Personal Communication.
- Hansen, Bob. 2014. Briess Malt & Ingredients Co. Personal Communication.
- Heissel, Scott. 2014. American Malting Barley Association Inc. Personal Communication.
- Smith, B. 2008. “Converting All Grain Recipes to Malt Extract.” Beersmith Home Brewing Blog. Accessible at: <http://beersmith.com/blog/2008/06/03/converting-all-grain-recipes-to-malt-extract/>
- United States Brewers Association, *1979 Brewers Almanac*, Washington, DC: 12-13. Accessible at: <http://www.beerinstitute.org/mobile/page/brewers-almanac/br#/mobile/page/brewers-almanac/br>
- U.S. Department of Agriculture, Economic Research Service. *Feed Outlook*. 2014. Accessible at: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1273>
- U.S. Department of Agriculture, World Agricultural Outlook Board. *World Agricultural Supply and Demand Estimates*. 2014. Accessible at: <http://www.usda.gov/oce/commodity/wasde/index.htm>
- Watson, Bart. 2013 and 2014. Brewers Association. Personal Communications.