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Feed Outlook: January 2022

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In this report:

U.S. Corn Supplies Boosted by Record Yield Reported for 2021/22

U.S. corn production is raised to 15,115 million bushels—a 7 percent increase from 2020/21 production. Total corn use is projected to be slightly higher than the USDA's December *World Agricultural Supply and Demand Estimates (WASDE)* report, with higher domestic use more-than-offsetting lower exports. Corn ending stocks in 2021/22 are projected to be higher than the December *WASDE* report, but the season-average farm price is forecast to remain unchanged at $5.45 per bushel.

Foreign corn production is reduced this month, with several partly offsetting changes. ***Ukrainian*** corn production and exports are boosted. Corn output in ***Brazil***, and to a lesser extent in ***Argentina***, is projected lower. However, these reductions are not expected to affect these countries' export potential. Corn exports for both Brazil and Argentina are projected higher this month. Projected ***U.S.*** corn exports for 2021/22 are reduced this month (despite higher projected output), due to increased competition from all three of its competitor countries—Brazil, Argentina, and Ukraine—combined with strong U.S. domestic demand for ethanol that is expected to pull corn away from exports.

The USDA's Economic Research Service (ERS) released updated cost and returns data for U.S. sorghum production in 2019 and 2020, based on updated survey data. Returns to growing sorghum have been relatively strong, particularly in 2020. Returns and the cost structure for producing sorghum could be important for future planting decisions for sorghum—relative to wheat, corn, and cotton, which are generally grown in the same regions of the country.

Approved by USDA's World Agricultural Outlook Board

Domestic Outlook

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Second-Largest U.S. Corn Crop Boosts Supplies for 2021/22

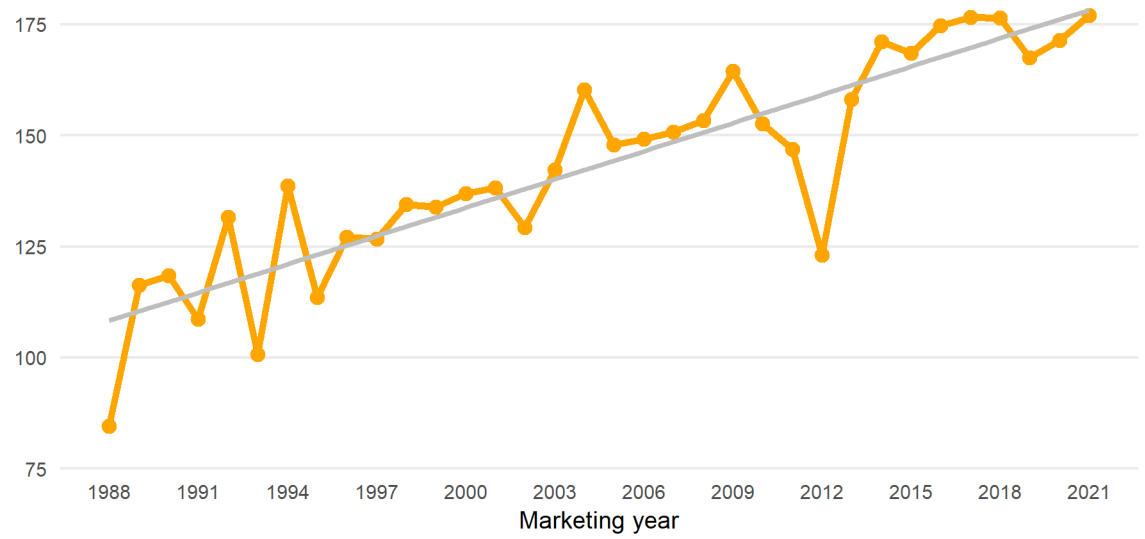
The USDA's January *World Agricultural Supply and Demand Estimates (WASDE)* report projects higher supplies in the U.S. corn market, along with slightly higher use. On January 12, 2022, the National Agricultural Statistics Service (NASS) released its *Crop Production 2021 Summary* report and the latest *Grain Stocks* report, with inventory data through December 1, 2021. Based on the data from the NASS reports, the January 2022 *WASDE* report projects total corn supplies for 2021/22 at 16,375 million bushels—52-million-bushels higher than the December projection. The change from the December *WASDE* report is primarily due to changes in the outlook for production, with a minor 1-million bushel adjustment to September 1 corn stocks.

The 2021/22 U.S. corn crop is projected to total 15,115 million bushels—a 53-million-bushel increase from the December projection. Larger production is due to higher projected area harvested—increasing from 85.1 million acres harvested in the December forecast to 85.4 million acres in January. The national yield for the crop remains unchanged at 177.0 bushels per acre. The 2021/22 corn crop represents a record yield (compared with the previous record of 176.6 bushels per acre in 2017/18) and the second-largest corn crop on record (behind the 2016/17 production of 15,148 million bushels).

Figure 1

Corn yields, United States, 1988 to 2021

Bushels per acre

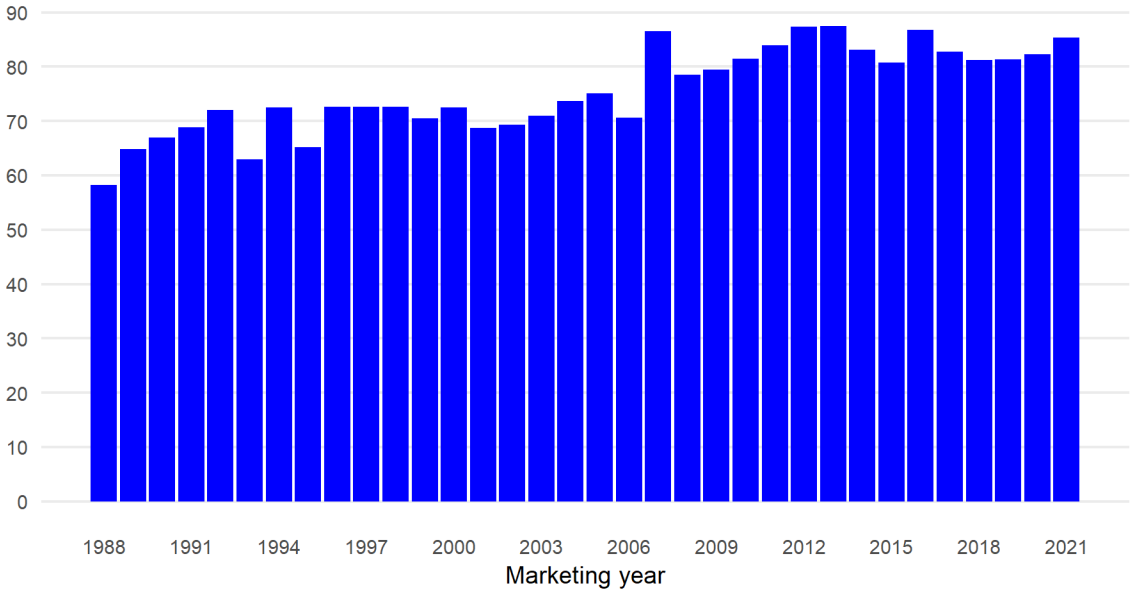


Source: USDA, National Agricultural Statistics Service.

Figure 2

Corn area harvested, United States, 1988 to 2021

Million acres



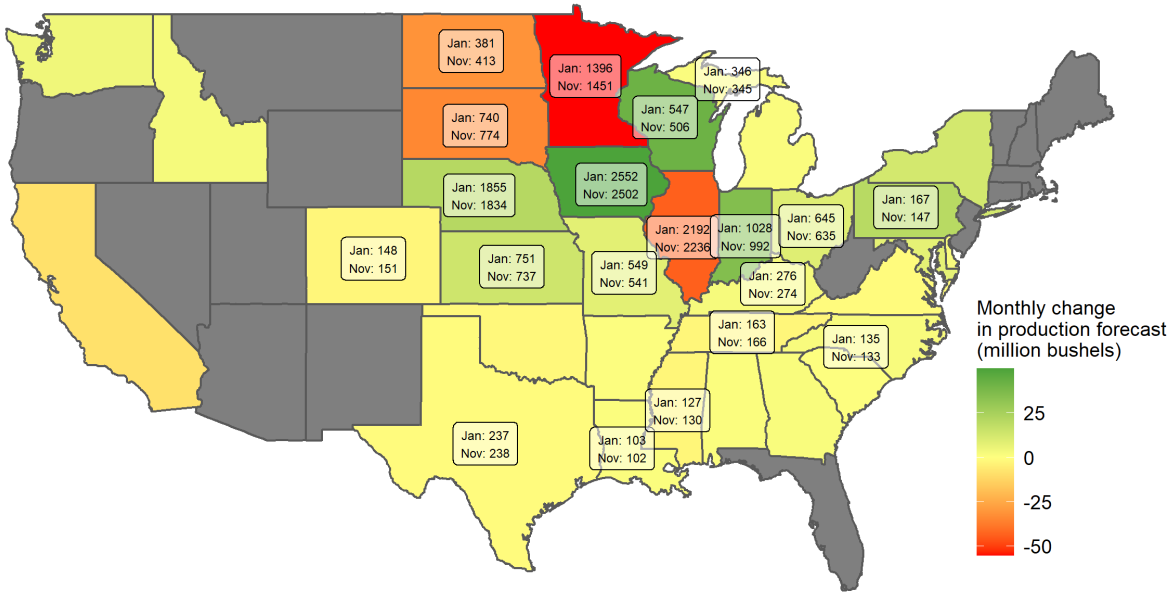
Source: USDA, National Agricultural Statistics Service.

At the State-level, compared with the previous NASS forecasts published in November, production reductions are seen in: Minnesota (down 55 million bushels), Illinois (down 44 million bushels), South Dakota (down 34 million bushel), and North Dakota (down 32 million bushels).

The decreases are more than offset by the raised production for many States, including: Iowa (raised 50 million bushels), Wisconsin (raised 39 million bushels), Indiana (raised 36 million bushels), and Nebraska (raised 21 million bushels).

Figure 3

U.S. corn production forecast and month-to-month change, million bushels, by State, 2021/22 crop marketing year



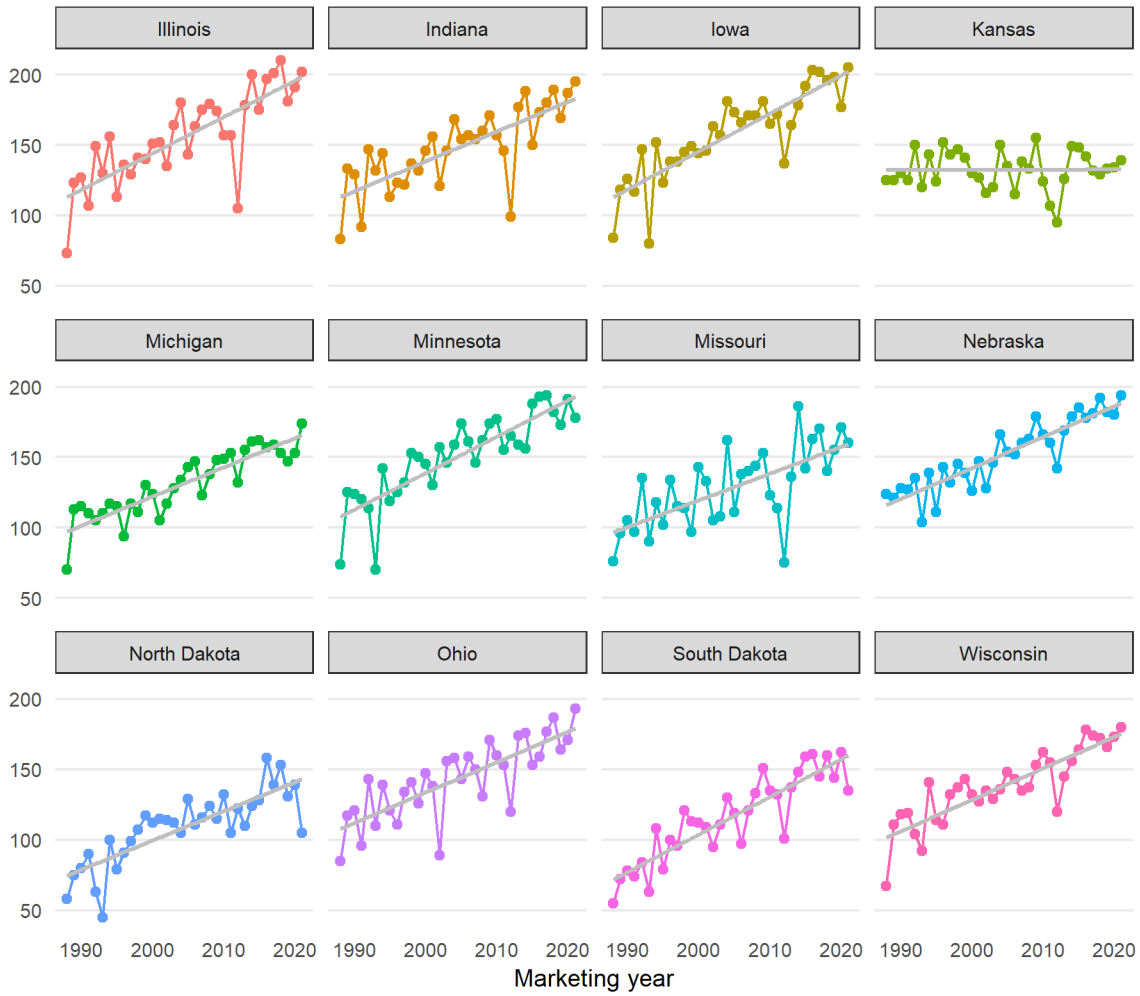
Source: USDA, National Agricultural Statistics Service.

While the national corn yield was a record, State-level corn yields illustrated that performance around the country varied. That variation appears to be strongly correlated with the general growing conditions that took place during 2021—with drought conditions largely in the Western-growing States and ample (and in places too much) precipitation in many of the Southern and Eastern States. Record corn yields are reported for Michigan, Ohio, Indiana, Iowa, Wisconsin, and Nebraska (which benefits from a significant amount of irrigated corn area). Yields in North Dakota, South Dakota, and Minnesota are reported to be significantly lower than the respective States' trend yield. Despite lower yields in North Dakota and South Dakota, higher harvested area resulted in more corn production on a year-over-year basis. Corn production was down from 2020/21 in Minnesota, Missouri, and Kansas, however.

Figure 4

Corn yields, by State, 1988 to 2021

Bushels per acre



Source: USDA, National Agricultural Statistics Service.

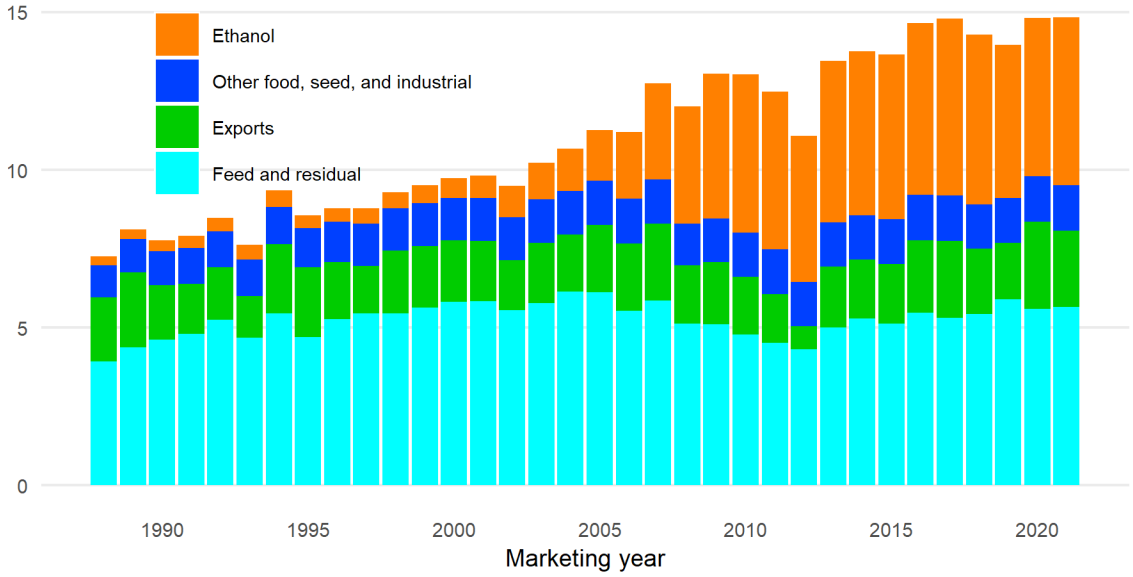
December 1 Corn Inventories Higher Than Previous Year, Feed and Residual Use Projections Unchanged

Total corn use for 2021/22 is projected at 14,835 million bushels—a 5-million-bushel increase from the December *WASDE* report, due to mostly offsetting changes between domestic use and exports. The current projection is slightly larger than 2020/21 total use, estimated at 14,821 million bushels. Both forecasts exceed the previous record-setting-use figure set in 2017/18 at 14,798 million bushels.

Figure 5

U.S. corn utilization

Billion bushels



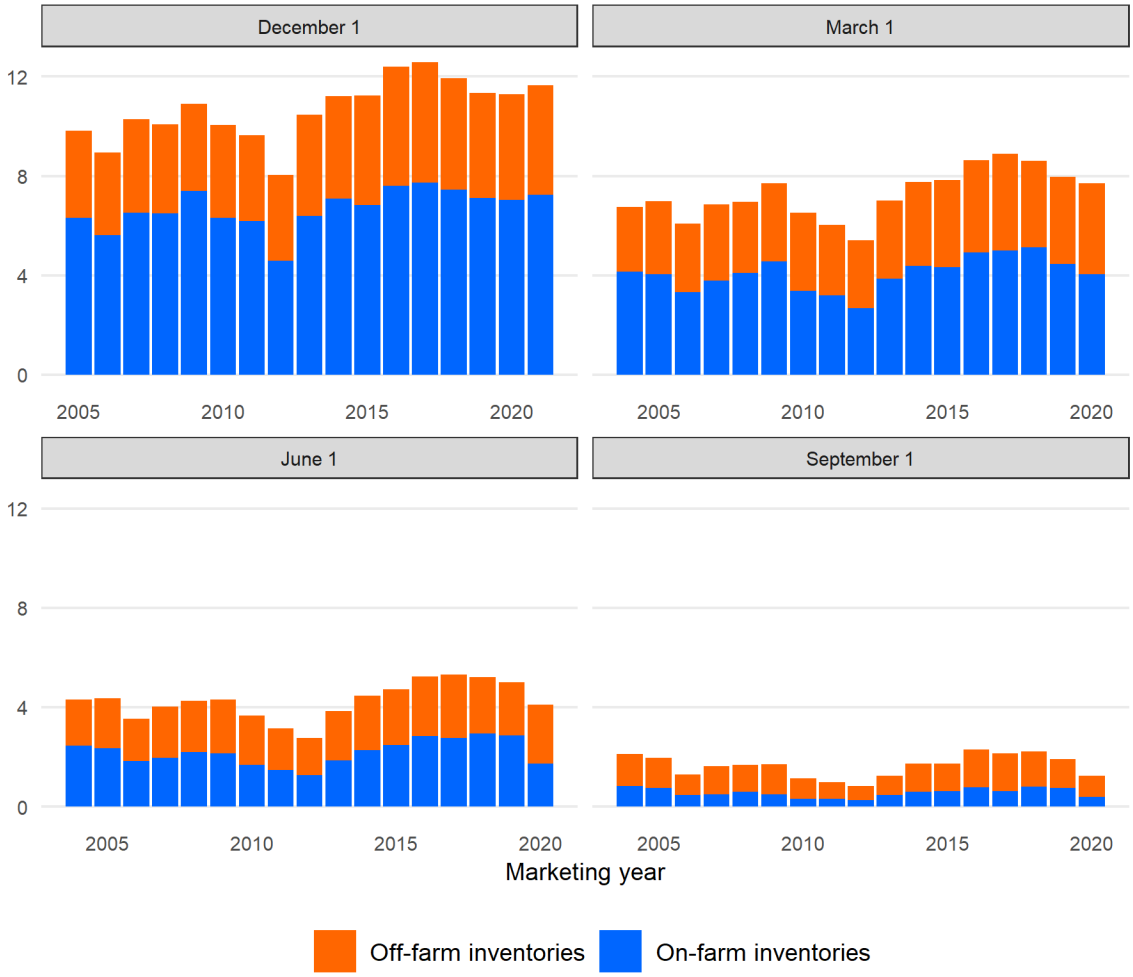
Note: 2020/21 is estimated, 2021/22 is projected.
Source: USDA, Economic Research Service.

Corn projected for feed and residual use in 2021/22 is currently 5,650 million bushels, unchanged from the December forecast. The latest *Grain Stocks* report release reported that December 1, 2021 corn inventories totaled 11,647 million bushels. This number is a 353-million-bushel increase from the December 1, 2020 inventories. The inventory estimate also results in disappearance of 2,584 million bushels from the market, due to feed and residual use during the first 3 months of 2021/22. This quarterly feed and residual use projection is 4-percent below the same period in 2020/21.

Figure 6

U.S. corn inventories, quarterly, on-farm versus off-farm

Billion bushels



Source: USDA, National Agricultural Statistics Service.

Food, Seed, and Industrial Use Raised for 2021/22

U.S. corn used for food, seed, and industrial use for 2021/22 is projected at 6,760 million bushels—an 80-million-bushel increase from the December forecast. The increase is mainly due to a 75-million-bushel increase in corn used for fuel ethanol, currently totaling 5,325 million bushels. In addition to higher fuel ethanol production, corn used for glucose and dextrose production is raised 5-million-bushels to 365 million bushels for 2021/22, based on the pace of use during the first 3 months of the marketing year.

According to NASS's latest data from its *Grain Crushings and Co-Products Production* report, 1,344 million bushels of corn was used for fuel ethanol in the first 3 months of 2021/22. This number was the highest first-quarter total since 2018/19 and a 6-percent increase from 2020/21.

The U.S. Department of Energy's Energy Information Administration (EIA) has been reporting strong weekly ethanol production totals since October 2021. This production is likely in response to healthy spot-price-margins for ethanol producers since the beginning of the current marketing year. Additionally, most recent trade data from the U.S. Bureau of the Census showed relatively strong levels of ethanol exports for November 2021, particularly to Canada and Brazil. The outlook for the remainder of 2021/22 is expected to largely hinge on the outlook for domestic motor gasoline market, which constitutes the overwhelming majority of U.S. ethanol use.

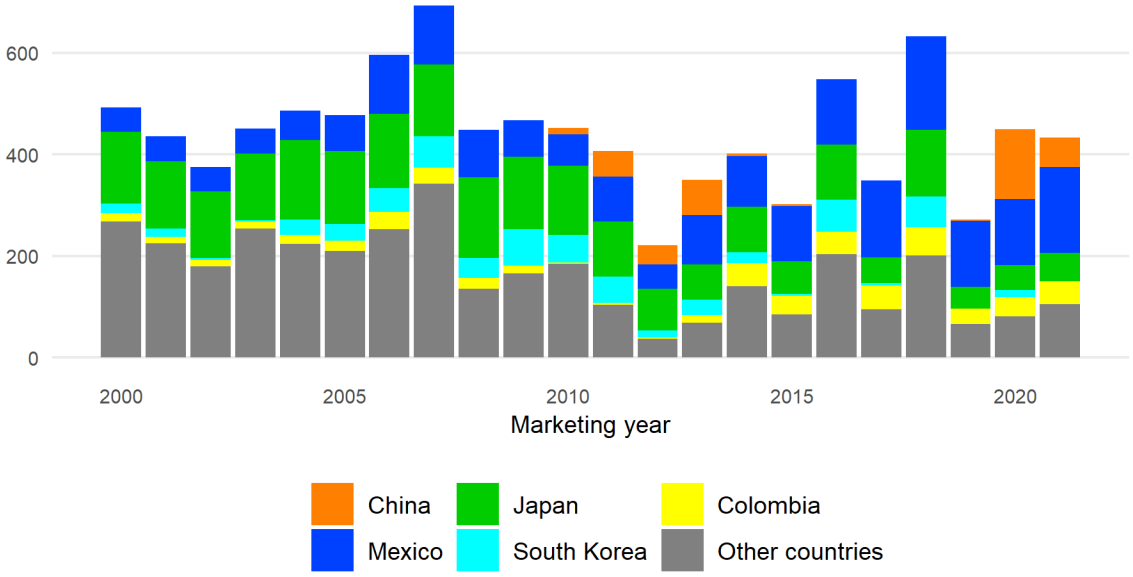
Corn Export Projections Lowered for 2021/22

U.S. corn exports are projected to total 2,425 million bushels for 2021/22, a 75-million-bushel reduction from the December projection. The reduction is primarily due to increased global competition expected for the current marketing year. In the first 3 months of the marketing year, U.S. corn exports totaled 433 million bushels, according to the U.S. Bureau of the Census. This marketing year's first-quarter exports were below 2020/21's levels of 449 million bushels. The current corn exports pace is still strong, by historical terms. Additionally, while 2020/21 corn exports were largely defined by a large amount of shipments to China, shipments in 2021/22 have been destined for a wider base of customers—in particular, more shipments to the North American markets of Mexico and Canada. Seasonally, corn export shipments are typically at their highest levels during the March-to-May quarter. As a result, future market events could have important implications for the outlook of U.S. corn exports. If realized, the current export forecast would represent the third-highest corn export total ever, behind 2020/21's record-setting exports and 2017/18's total of 2,437 million bushels.

Figure 7

U.S. corn exports, September through November marketing years 2000 to 2021

Million bushels



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

For more discussion on U.S. corn exports and global coarse grain trade, please see the International Outlook section of this report.

Corn Season-Average Farm Price Unchanged, Cash Markets Remain Strong

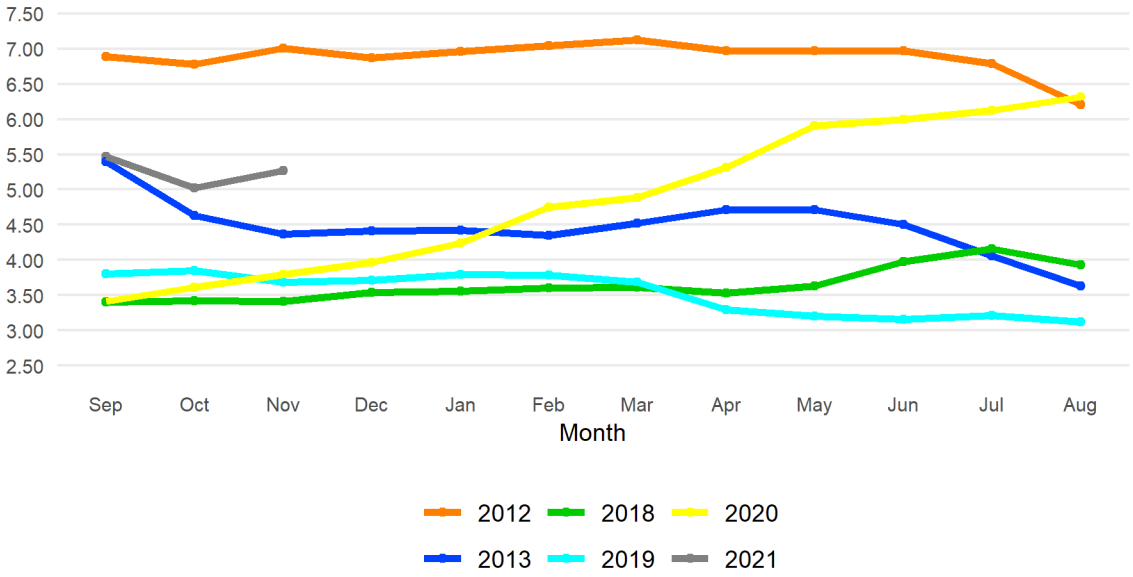
With additional supplies projected from higher production and largely offsetting changes to use, projected ending stocks for 2021/22 are increased from 1,493 million bushels to 1,540 million bushels. The current projections suggest a stocks-to-use ratio of 10.4 percent—higher than 2020/21's ratio of 8.3 percent, but still relatively tight by historical standards.

The season-average farm price is projected at $5.45 per bushel for 2021/22, unchanged from the December forecast. The November 2021 national average price received by producers totaled $5.27 per bushel, according to NASS's most recent *Agricultural Prices* report. Based on the 5-year average for marketing weights, the cumulative weighted price through the first 3 months of 2021/22 would be $5.22 per bushel. Cash and futures contract prices have continued to increase steadily since this year's harvest began in earnest in September. Historically, the majority of corn is marketed by producers between September and January. This means that monthly prices in the spring and summer will have less of an influence on the marketing year average than the prices reported up through January.

Figure 8

Price received for corn, monthly

U.S. Dollars per bushel



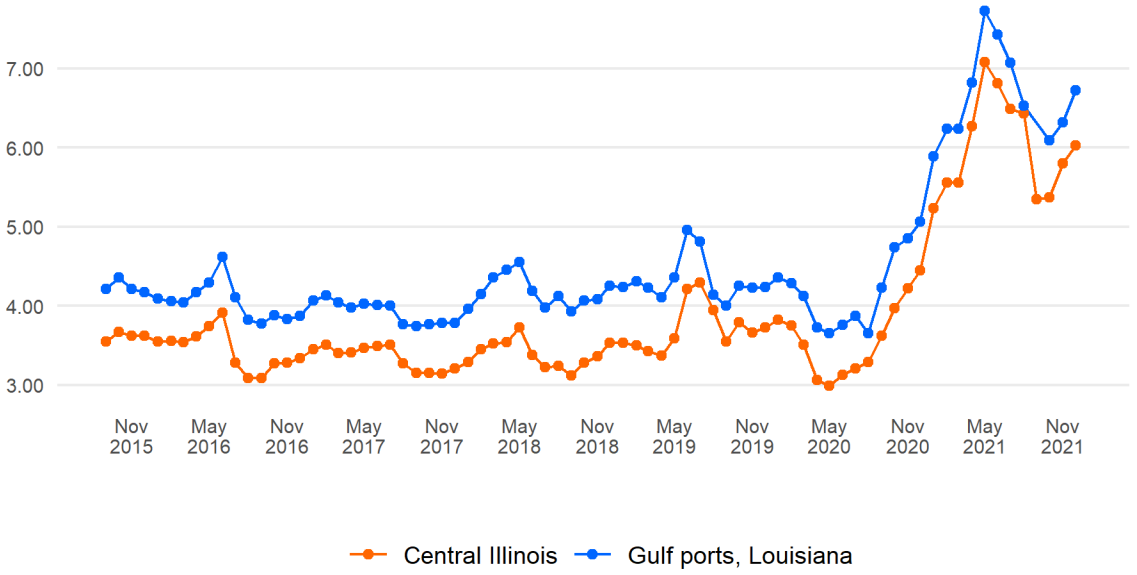
Source: USDA, National Agricultural Statistics Service.

Spot cash prices for corn continued to trend upward throughout the United States in December 2021 and remain well above the price levels reported during 2020/21. The Central Illinois average cash price was $6.03 for the month, compared with $5.80 in November 2021 and $4.45 in December 2020. Likewise, in the Gulf export terminal markets, spot cash prices were $6.72 in December 2021, compared with $6.32 in November and $5.06 in December 2020.

Figure 9

U.S. cash-market prices for corn, monthly average

U.S. Dollars per bushel



Source: USDA, Agricultural Marketing Service.

Basis levels (the difference between local cash prices and futures contract prices) reported by the USDA's Agricultural Marketing Service (AMS), have been historically strong in several markets in the Western Corn Belt and Southern Plains. Conversely, basis levels appear to be at or below historical averages in the Eastern part of the country, such as in Central Illinois and at Ohio River barge markets. This level is likely largely due to local production conditions, with this year's lower-yielding areas having tighter supplies and stronger prices than areas with relatively better yields. The strong basis in the Western Corn Belt (an important livestock and ethanol-producing region) and Southern Plains (a significant cattle-feeding market) also suggests that local corn users are trying to draw corn from other regions of the country, rather than allowing it to sit in storage or move it to export terminals.

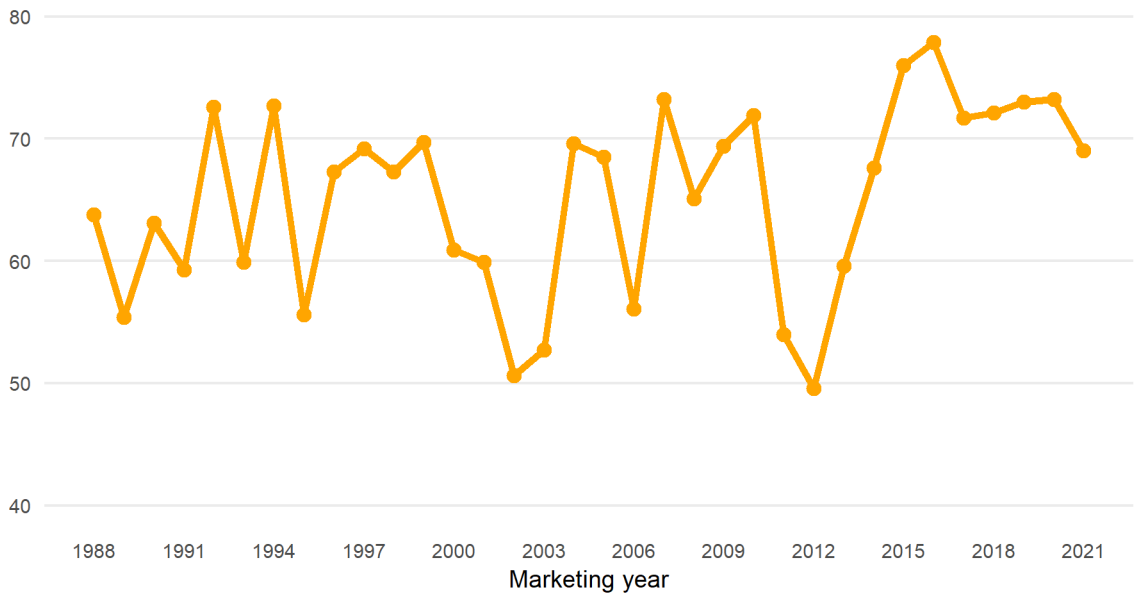
Sorghum Production Revised Down Due to Lower Yield

The January *WASDE* reports that sorghum production for 2021/2022 is reduced to 448 million bushels, down 23 million bushels from December. The decrease in production comes mostly from a reduction in the national average yield to 69 bushels per acre, according to the NASS January *Crop Production Summary* report.

Figure 10

Sorghum yields, United States, 1988 to 2021

Bushels per acre

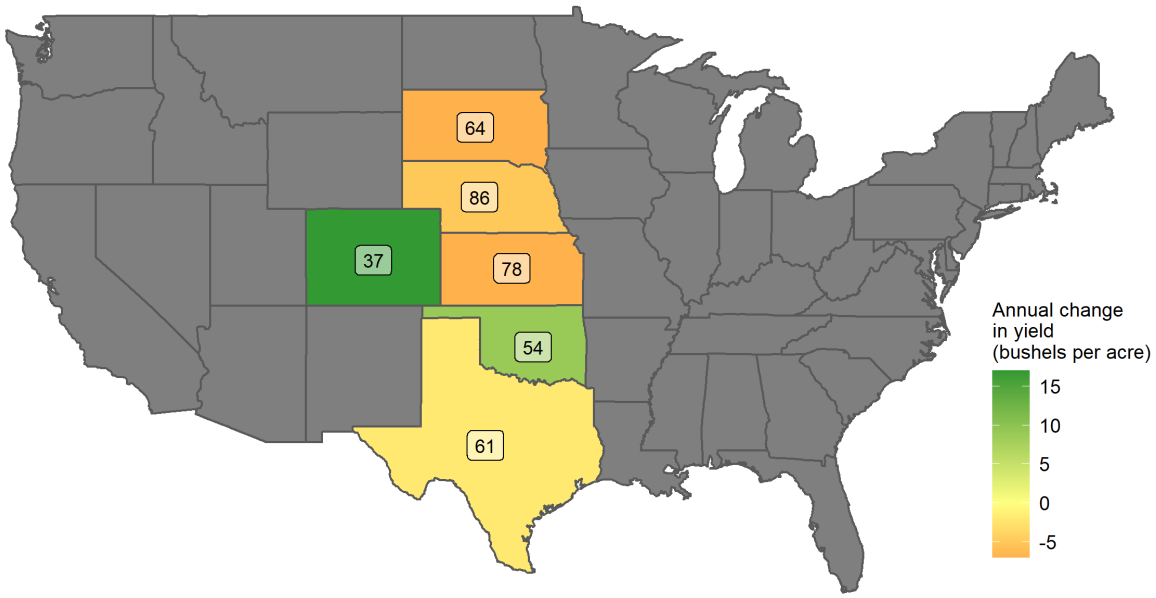


Source: USDA, National Agricultural Statistics Service.

By State, Kansas and South Dakota have the largest year-over-year reduction in yield from 2020/21 to 2021/22, with 7 bushels per acre each. Colorado and Oklahoma saw an increase in yield estimates of 17 and 9 bushels per acre, respectively.

Figure 11

U.S. 2021/22 sorghum yields and annual change from 2020/21, bushels per acre



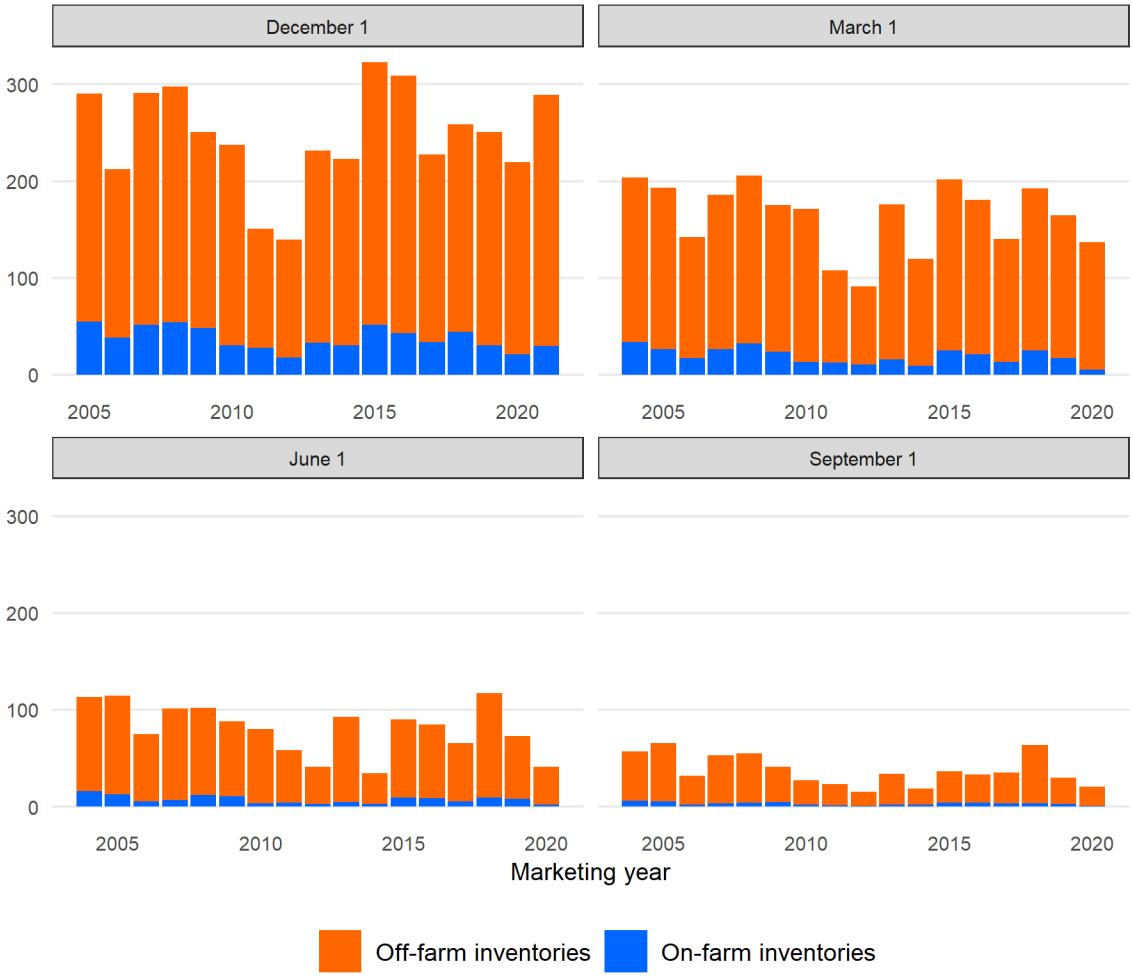
Source: USDA, National Agricultural Statistics Service.

According to the latest NASS *Grain Stocks* report, December 1, 2021 sorghum inventories totaled 289 million bushels, up 32 percent from the same period in marketing year 2020/2021; a reflection of higher year-over-year sorghum production.

Figure 12

U.S. sorghum inventories, quarterly, on-farm versus off-farm

Million bushels



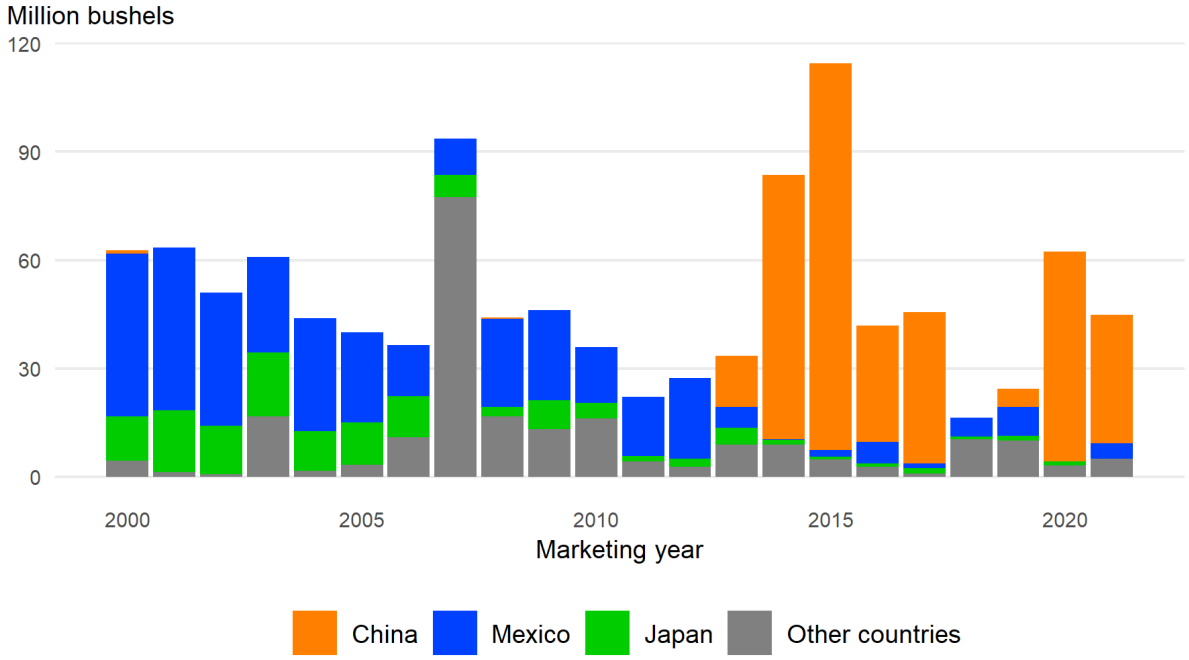
Source: USDA, National Agricultural Statistics Service.

Sorghum Feed and Residual and Exports Projections Lowered for 2021/22

Sorghum feed and residual use for 2021/22 is reduced 10 million bushels to 115 million, due to reduced supplies available. Projected sorghum exports are lowered by 10 million bushels to 310 million bushels, as year-to-date sorghum exports and inspections trail the high levels observed September through November in marketing year 2020/21. The outlook for global demand for sorghum remains strong, supporting the annual increase projected in exports for 2021/22.

Figure 13

U.S. sorghum exports, September through November marketing years 2000 to 2021



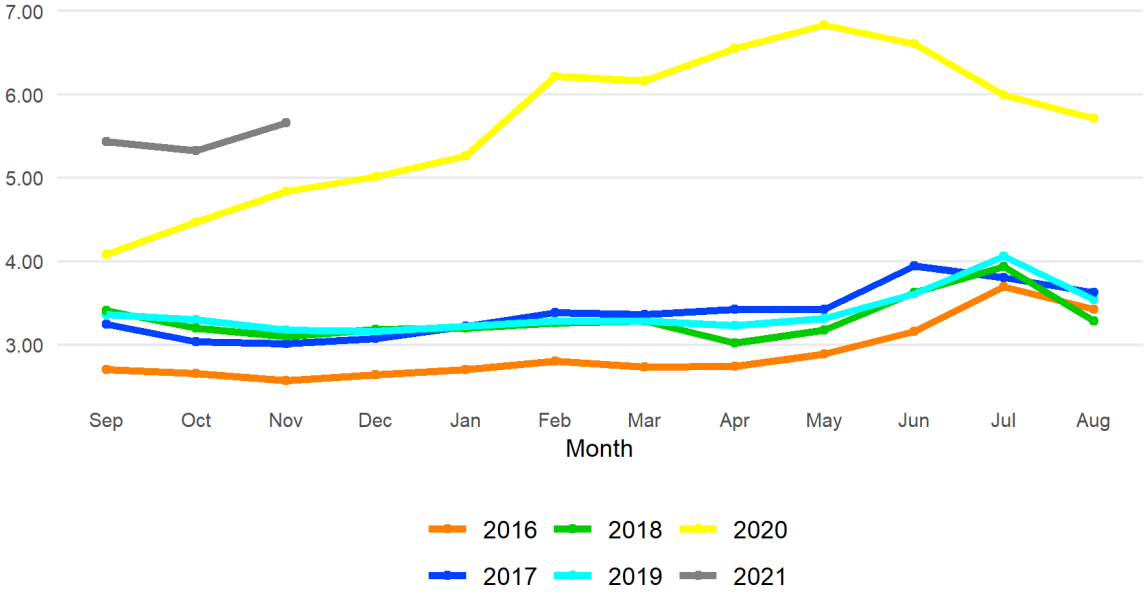
Source: U.S. Department of Commerce, Bureau of the Census.

Decreased sorghum use is only partially offset by lower supplies, reducing U.S. sorghum ending stocks for 2021/22 by 3 million bushels to 33 million bushels. The season-average farm price for 2021/2022 is projected at $5.45 per bushel, unchanged from December *WASDE* report. NASS's latest *Agricultural Prices* report shows the national farm price received for sorghum increased to $5.66 per bushel in November 2021, compared with $5.33 per bushel in October and consistent with the current market conditions of low supply that reflect in sorghum higher prices.

Figure 14

Price received for sorghum, monthly

U.S. Dollars per bushel



Source: USDA, National Agricultural Statistics Service.

Barley Imports Raised for 2021/22

U.S. barely production remains unchanged for 2021/22, projected at 71 million bushels—a substantially lower amount due to drought conditions in key-growing regions in the Northern Plains during the summer of 2021. U.S. barley imports are raised 2-million-bushels to a projected total of 9 million, however, based on a strong pace of imports seen in the September-to-November quarter. Total supplies are projected at 198 million bushels—a 2-million-bushel increase from the December projection, but still substantially lower than the previous year's total of 258 million bushels.

Barley feed and residual use is raised 5-million-bushels to 15 million, due to the increased supply projections and the pace of barley disappearance reflected in the *Grain Stocks* report through December 1. Food, seed, and industrial use remains unchanged at 115 million bushels. Ending stocks for 2021/22 are projected to be 57 million bushels—a 3-million-bushel decrease from the December projection. The season-average farm price for 2021/22 is projected at $5.15 per bushel; unchanged from the December forecast, but still elevated from the 2020/21 price of $4.75.

Oat Season-Average Price Raised for 2021/22 on Continued Strong Farm and Cash Prices Reported

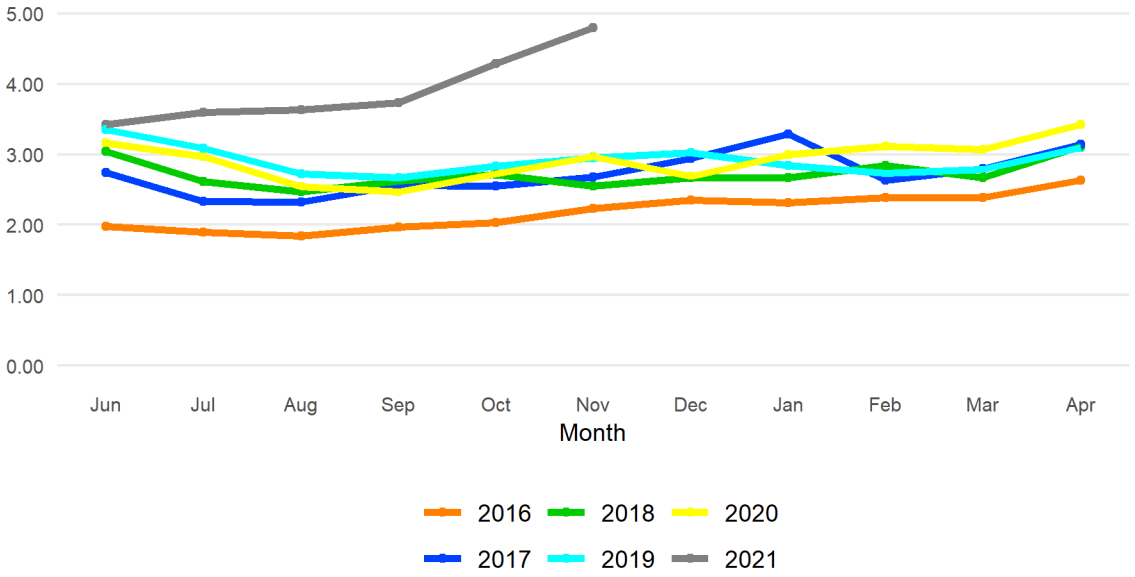
The U.S. oat supply and use outlook for 2021/22 remains unchanged in January, relative to the December projections. Production for 2021/22 remains projected at 40 million bushels. Total supplies are projected at 155 million bushels. Supplies are down sharply from 2020/21. This reduction is due to poor production conditions in both the United States and Canada during the summer of 2021, hampering both U.S. production and imports—as Canada provides most foreign-produced oats to the U.S. market. Oat use remains unchanged from December's projections. For 2021/22, total oat-use projections of 127 million bushels compare with 150 million bushels used in 2020/21—the sharp decline reflecting tight North American supplies.

The season-average farm price of oats for 2021/22 is raised $0.10 per bushel to $3.80, based on the pace of prices received by farmers through November. Cash prices for oats have also continued to increase, far exceeding record levels. It is expected that producers have marketed the majority of their 2021/22 oat production in the first half of the marketing year (beginning June 1), however. This means that subsequently reported prices received will have less influence on the annual season-average price.

Figure 15

Price received for oats, monthly

U.S. Dollars per bushel



Source: USDA, National Agricultural Statistics Service.

Total Grain Feed and Residual Use Projected Lower for 2021/22

Total feed grain and wheat feed and residual use is projected to be 149.6 million metric tons (MT) in 2021/22. This number is virtually unchanged from the updated 2020/21 estimate of 149.6 million MT, as well. Lower feed and residual use projected for wheat in the January *WASDE* report lowers the overall available supplies for grains as livestock feed.

Grain-Consuming Animal Units (GCAU) for 2021/22 are projected to be 100.7 million units, compared with 101.4 million units estimated for 2020/21. The annual reduction is primarily the result of lower units associated with hogs and beef cattle. Poultry units partially offset the annual decline. While GCAUs are forecast to be in decline since reaching a peak of 101.7 million units in 2019/20, the current 2021/22 forecast is still larger than all years prior to 2018/19.

International Outlook

Olga Liefert

World Coarse Grain Production Prospects Reduced

Global coarse grain production for 2021/22 is projected lower this month at 1,500.1 million tons, down 1.6 million. Higher estimated U.S. output partly offsets a decline in foreign coarse grain production, forecast down 2.4 million tons to 1,101.3 million.

World corn production is projected down 1.8 million tons from last month's forecast. With corn output in the United States up 1.4 million tons, foreign corn production is lowered by 3.1 million tons this month, with several partly offsetting changes.

The largest increase for foreign corn production this month is for ***Ukraine***, an increase of 2.0 million tons to 42.0 million, a record-high output by a wide margin. The increase is based on corn yield estimates reported by the State Statistical Service of Ukraine. Weather conditions in Ukraine throughout the growing period were not universally favorable. However, while the regions in the south and east of the country suffered from dryness and heat, the northwestern part of Ukraine enjoyed excellent corn-growing conditions, pushing yields to unprecedented highs for the non-GMO non-irrigated corn.

Hot and dry weather stressed corn yields in southern ***Brazil***, particularly in the two states that produce first-crop corn—the western part of Parana (where most corn is grown) and Rio Grande do Sul, that combined, normally produce about one-third of the country's first-crop corn. A large share of the first-crop corn in these states is now going through the reproductive stage of crop development and is vulnerable to heat and lack of moisture. The region has gone through the driest 2 months (November and December) in 30 years, the lack of precipitation being further exacerbated by the heat. The Vegetation Health Index (VHI) (a proxy that is used to estimate crop condition and illustrates the severity of drought, based on the vegetation health and the influence of temperature on plant conditions) is recorded at the lowest level in many years. The assessment of the first-crop corn conditions has been worsening, with the share of crops rated "good" steeply declining. The first-corn crop represents only about a quarter of Brazilian total corn output, with the rest being produced as a second-crop (safrinha) corn and is usually planted after the soybean harvest in January-March. Corn prices are running high in Brazil and are expected to boost safrinha corn area by a non-trivial amount relative to last year. Area and yield assumptions for safrinha corn are unchanged this month. This month, all-crop corn yields

for 2021/22 are projected 2.5 percent lower than a month ago, with corn production down 3.0 million tons to a still record-high of 115.0 million tons, and 28.0 million tons ahead of last year.

The same weather that hurt Brazil's South affected parts of ***Argentina***, where corn output is now reduced by 0.5 million tons to 54.0 million. Two months ago, in October 2021, the projection for Argentine corn was increased resulting from higher projected area, while this month persistent dryness is projected to limit yields prospects of the early-planted corn. The dryness and heat occurred throughout the critical stages of the reproductive period of crop development in parts of the main corn-growing regions of the eastern areas of the country—Santa Fe, Entre Rios, and northern Buenos Aires. However, the share of early-planted corn is expected to be lower than average this year. Late-planted corn (that is still being planted) could compensate for the potential yield losses in early-planted corn. Consequently, with the larger share of late-planted corn, precipitation through the end of January and February will be critical for the crop. The current yield forecast assumes normal weather going forward. The projected corn production is still the highest on record.

Paraguay, a country sandwiched between Brazil's South and the Argentine North-East, is experiencing the same heat and dryness. Corn output is projected down this month, reducing production by 0.3 million tons to 4.0 million, or by 7 percent.

Based on the recent release of the ***China's*** Rural Statistical Yearbook, the estimates for barley, millet, and sorghum for the 3 prior years (2018–2020) are revised this month with higher barley and millet production and lower sorghum output. The projections for the current 2021/22 crop year are adjusted accordingly (see table A2).

Russia's statistical agency published preliminary production numbers for 2021/22, revising the previous projections, based on harvest data from the Ministry of Agriculture. Increased barley yields more than offset a reduction in harvested area, boosting production. Rye and oats area and yields are reduced. There is also a small increase in millet production (see table A2).

In addition to the countries mentioned above, a number of production changes are made this month for the 2021/22 crop year, across countries and commodities. Changes in global, foreign, and U.S coarse grain production (by type of grain) are shown in table A1, while by country and by crop changes are presented in table A2. For visual display of the changes in corn production, see map A below the tables.

Table A1 - World and U.S. coarse grain production at a glance (2021/22), January 2022					
	Region or country	Production	Change from previous month[1]	YoY Change[2]	Comments
		Million tons			
Coarse grain production (total)					
↓	**World**	**1,500.1**	**-1.6**	**+66.2**	
↓	**Foreign**	**1101.3**	**-2.4**	**+40.4**	Partly offsetting changes are made for a number of countries and commodities. See table A2.
↑	**United States**	**398.7**	**+0.8**	**+25.8**	See section on U.S. domestic output.
World production of coarse grains by type of grain					
CORN					
↓	**World**	**1,207.0**	**-1.8**	**+84.1**	
↓	**Foreign**	**823.0**	**-3.1**	**+58.6**	Reductions in Argentina, Brazil, Paraguay, the European Union, Mexico, and Kenya more than offset higher Ukrainian production. See Table A2.
↑	**United States**	**383.9**	**+1.4**	**25.5**	See section on U.S. domestic output.
BARLEY					
↑	**World**	**147.1**	**+1.5**	**-13.5**	
↑	**Foreign**	**144.5**	**+1.5**	**-11.9**	Higher projected output in China and Russia. See table A2.
	United States	**2.6**	**No change**	**-1.6**	See section on U.S. domestic output.
SORGHUM					
↓	**World**	**65.1**	**-1.2**	**+3.3**	
↓	**Foreign**	**53.7**	**-0.6**	**+1.4**	Lower output projected for China. See table A2.
↓	**United States**	**11.4**	**-0.6**	**+1.9**	See section on U.S. domestic output.
OATS					
↓	**World**	**22.7**	**-0.4**	**-2.8**	
↓	**Foreign**	**22.1**	**-0.4**	**-2.4**	Lower production is projected for Russia. See table A2.
	United States	**0.6**	**No change**	**-0.4**	See section on U.S. domestic output.
RYE					
↓	**World**	**12.6**	**-0.3**	**-1.7**	
↓	**Foreign**	**12.3**	**-0.3**	**-1.7**	Higher production projected for Russia. See table A2.
	United States	**0.2**	**No change**	**Fractional**	See section on U.S. domestic output.
MILLET					
↑	**World/Foreign**	**30.2**	**+0.5**	**-2.8**	Higher production projected for China and Russia. See table A2.

[1]Change from previous month. [2]YoY: year-over-year changes. [3] Totals may not add due to rounding.

For changes and notes by country, see table A2.

Source: USDA, Foreign Agricultural Service, *Production, Supply and Distribution* database.

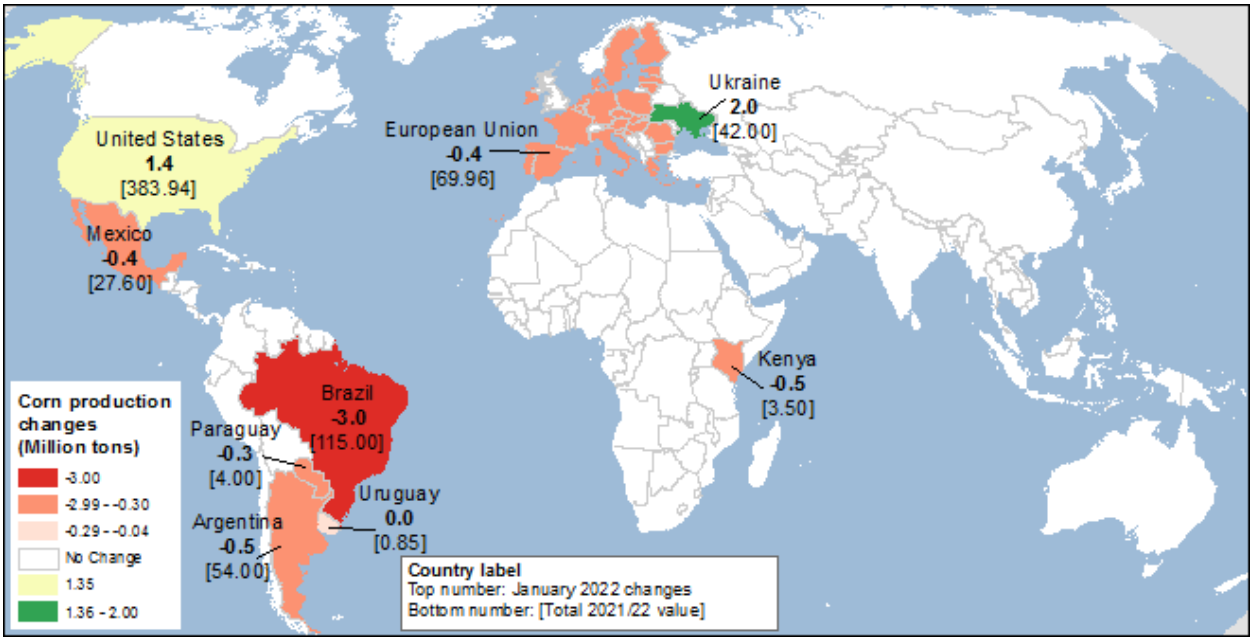
Table A2 - Coarse grain foreign production for 2021/22 at a glance, January 2022						
	Type of crop	Crop year	Production	Change in forecast[1]	YoY[2] change	Comments
			Million tons			
Coarse grain production by country and by type of grain						
			UKRAINE			
↑	**Corn**	*Oct-Sep*	**42.0**	**+2.0**	**+11.7**	A preliminary harvest report by the Ukrainian Statistical Agency suggests higher corn yields. Final report is expected to be published in March 2022 (see the report text).
			BRAZIL			
↓	**Corn**	*Mar-Feb*	**115.0**	**-3.0**	**+28.0**	Dry and hot conditions in the Southern states of Brazil reduced corn yields for the first-season crop. Year-over-year expansion of second-crop corn area keeps projected total corn output at a record-high (see the report text).
			ARGENTINA			
↓	**Corn**	*Mar-Feb*	**54.0**	**-0.5**	**+3.5**	Dry conditions in some key early corn-producing regions are expected to reduce yields and production (see report text).
			PARAGUAY			
↓	**Corn**	*Jun-May*	**4.0**	**-0.3**	**+0.8**	Paraguay is located west of the Southern states of Brazil and to the north of Argentina. A sizeable share of its corn is affected by the dryness and high temperatures experienced by its two neighbors.
			EUROPEAN UNIION			
↓	**Corn**	*Oct-Sep*	**70.0**	**-0.4**	**+2.9**	Harvest results indicate lower area and production in **France**, partly offset by an increase in **Austria**.
			MEXICO			
↓	**Corn**	*Oct-Sep*	**27.6**	**-0.4**	**+0.3**	Corn area is revised slightly down, based on official government reports.
			KENYA			
↓	**Corn**	*Jul-Jun*	**3.5**	**-0.5**	**-0.5**	Drought conditions over the eastern Horn of Africa reduced vegetation health and lowered corn yields in Kenya.
			CHINA			
↑	**Barley**	*Oct-Sep*	**2.0**	**+1.1**	**Fractional**	Projections for 2021/22 are revised higher, based on the latest information from China's Rural Statistical Yearbook for several previous years. Barley area and yield are increased this month for 2018-2020 and for 2021/22.
↑	**Millet**	*Oct-Sep*	**2.7**	**+0.4**	**-0.1**	Projections for 2021/22 are revised higher, based on the latest information from China's Rural Statistical Yearbook for several previous years. Millet estimates are increased this month for 2018-20 and 2021/22.
↓	**Sorghum**	*Oct-Sep*	**3.0**	**-0.6**	**Fractional**	Projections for 2021/22 are revised lower, based on the latest information from China's Rural Statistical Yearbook for several previous years. Sorghum estimates are reduced this month for 2018-2020 and for 2021/22.
			RUSSIA			
↑	**Barley**	*Jul-Jun*	**17.5**	**+0.5**	**-3.1**	Preliminary harvest results issued by the Russian Statistical Agency ROSSTAT with lower area, but higher yields.
↓	**Oats**	*Jul-Jun*	**3.8**	**-0.4**	**-0.4**	Preliminary harvest results issued by the Russian Statistical Agency ROSSTAT, with both area and yield projected lower.
↓	**Rye**	*Jul-Jun*	**1.7**	**-0.3**	**-0.7**	Preliminary harvest results issued by the Russian Statistical Agency ROSSTAT, area and yield projected lower.

[1]Change from previous month. Smaller changes are made for several countries, see map A for changes in ***corn***.

[2]YoY: year-over-year changes.

Source: USDA, Foreign Agricultural Service, *Production, Supply and Distribution* database.

Map A – Corn production changes for 2021/22, January 2022



Source: USDA, Foreign Agricultural Service, *Production, Supply, and Distribution* database.

U.S. Corn Export Prospects Reduced as Competition from Ukraine, Brazil, and Argentina Grows

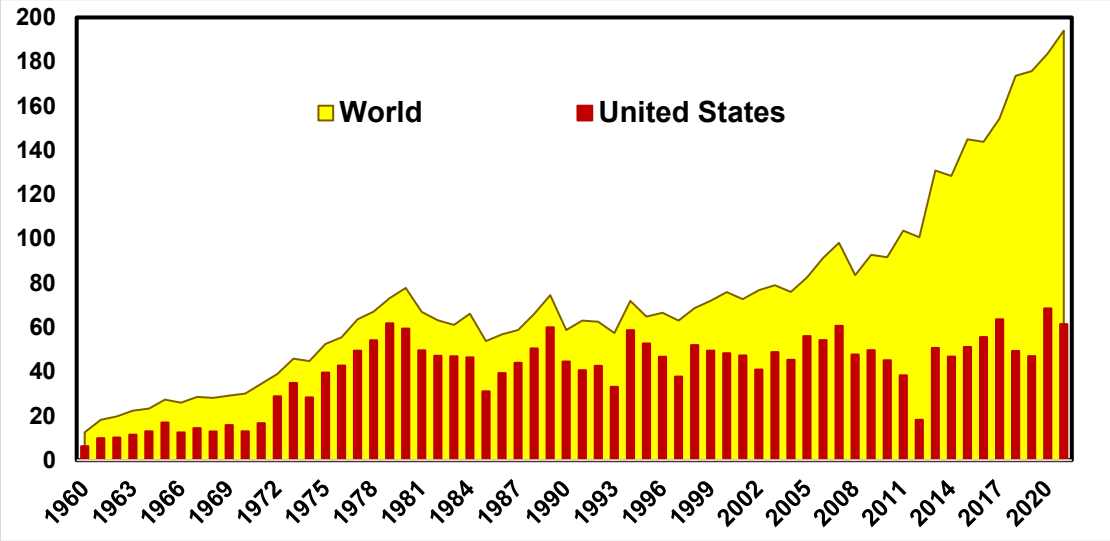
World 2021/22 **corn** trade for the October-September international trade year is projected up 1.3 million tons this month to 194.0 million, a rise of 10.3 million tons from the previous year.

Projected ***U.S.*** corn exports for 2021/22 are reduced this month, despite modestly higher projected output, due to increased competition from the major competitor countries—***Brazil***, ***Argentina***, and ***Ukraine***—combined with a strong U.S. domestic demand for ethanol that pulls corn away from exports (for a discussion on higher ethanol consumption, see the domestic section of the report). U.S. corn exports are projected down 1.5 million tons this month for the October-September international trade year to 61.5 million tons (down 75 million bushels to 2,425 million bushels for the September-August local marketing year). A reduction in U.S. exports is projected for this month, despite increased global corn trade. Although the United States continues to be (by far) the world's top corn producer and exporter, U.S. shares in both world output and exports have been declining. U.S. market share in global corn exports went from 80 percent up until the mid-1990s, to just above 30 percent recently (see figure 16). Competition from Brazil, Argentina, and Ukraine is driving down the U.S. corn export share as the higher surplus-generating grain production in these countries has reduced the U.S. share in global output. Since 2010, these three countries have captured a major share in the continuous

growth in world corn trade, that is driven by rising consumer incomes and demand for livestock products that require feed for expanding livestock herds.

The U.S. global market share has become highly dependent on the crop size and price-competitiveness of these three countries, as larger crops and the depreciation of their currencies against the U.S. dollar boost these countries' price competitiveness, that tends to limit U.S. exports. In 2021/22, the combined corn output for Brazil, Argentina, and Ukraine is projected to be 41.2 million tons higher than last year, while corn output in the United States is up year over year by 25.5 million. The currencies of all three U.S. competitor countries have depreciated since November 2021.

Figure 16
U.S share in global corn trade
Million tons



Source: USDA, Foreign Agricultural Service, *Production, Supply, and Distribution* database.

In the last 2 months (November and December), the pace of Brazilian corn exports accelerated, partially making up for the lackluster performance earlier in 2021. The ship lineup data (vessels that are scheduled to ship in the near future) suggest that January exports will be also above average. Despite the 2020/21 mediocre corn harvest, Brazil does not appear to be short of exportable corn supplies, exhibiting a high pace of exports in the tail end of the local crop season, before the start of the new corn harvest. Corn exports are expected to dwindle in February and revive in June-September 2022, with the harvest of second-crop corn. The higher recent pace of shipments boosts Brazilian corn exports by 1.0 million tons for both the local March-February 2020/21 (to 19.5 million tons) and the October-September trade year of 2021/22 (to 31.0 million tons).

Exports for ***Brazil*** are projected higher, despite a 3.0-million-ton reduction in its corn output this month. The reason is that the Brazilian corn economy has two essentially separate regions: The South, with a large and well-developed livestock sector, with feeding supplies coming from local (or imported—when local supplies are inadequate) corn; and the export-oriented Center-West, where most of the second-crop corn is produced. Although corn output is reduced for Brazil's South, the projections for the Center-West remain unchanged, as planting of second-crop corn has not yet started, thus, expectations of Brazilian export potential are unchanged relative to last month. However, because of lower first-crop corn production, Brazil will need additional corn for its livestock before the safrinha corn in the South comes up in July. The vast distances in Brazil and sometimes inadequate transportation system between the two regions, make it economically unviable to move corn from the Center-West to the South. Hence, the reduction in output is expected to boost the country's corn import demand up 0.3 million tons to 3.0 million. Brazil's South imports corn mainly from Paraguay and Argentina.

Argentina's corn exports are forecast up 1.0 million tons this month for both the local March-February 2020/21 (to 39.5 million) and the October-September trade year of 2021/22 (to 41.5 million). Argentina's corn prices are currently the most competitive in the world and are expected to remain as such for at least several more months. Exports are projected higher, despite a small production reduction this month, as corn sales and shipments picked up in recent weeks. However, until the new crop harvest becomes available (mostly in April), corn exports will be constrained by old crop supplies.

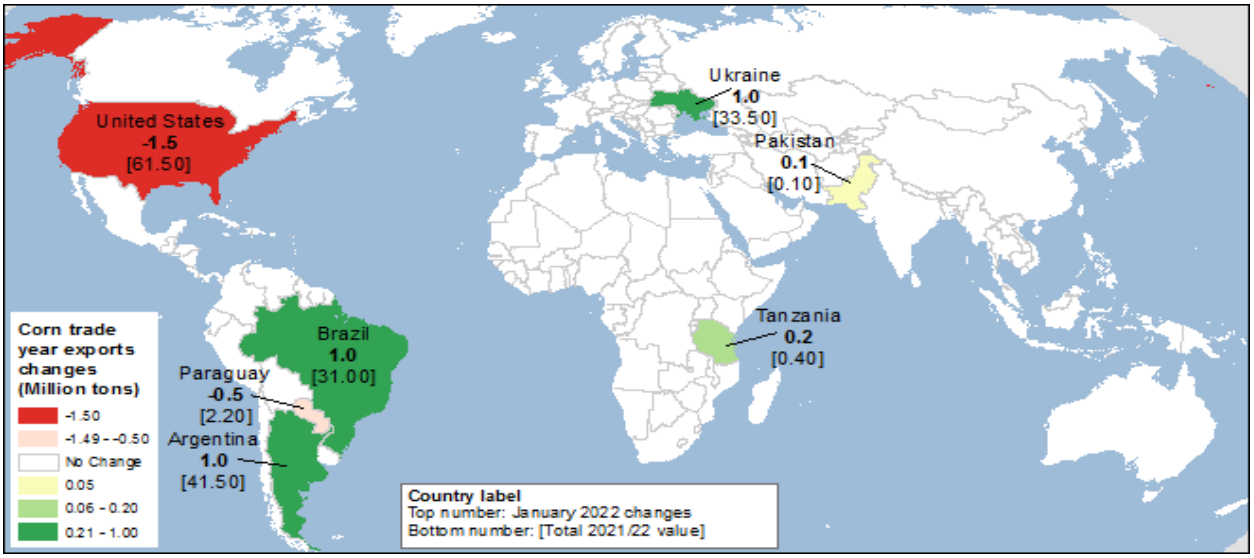
Corn supplies are projected higher this month in ***Ukraine***, and 1.0 million tons of additional corn is expected to be shipped out, with exports reaching 33.5 million tons, on par with Brazil. Ukrainian corn exports in December 2021—according to port data—exceeded 5.0 million tons, indicating an all-time monthly record and a million tons higher than the previous record in December 2019.

Exports are projected to decline in ***Paraguay***, reflecting a 7-percent corn production cut. Although Paraguay usually exports to a broad array of countries, its main destination is Brazil, where 50 percent of its corn exports go under normal conditions. Since September 2021, the pace of shipments slowed down substantially, but exports to Brazil were only slightly affected, as Brazil became Paraguay's only export destination. ***Tanzania*** is projected to export more non-GMO corn to Kenya, where drought reduced its corn supplies.

In addition to higher projected imports for ***Brazil*** discussed above, corn imports are also projected higher for ***Canada***, based on high commitments data. ***Mexican*** corn imports are also

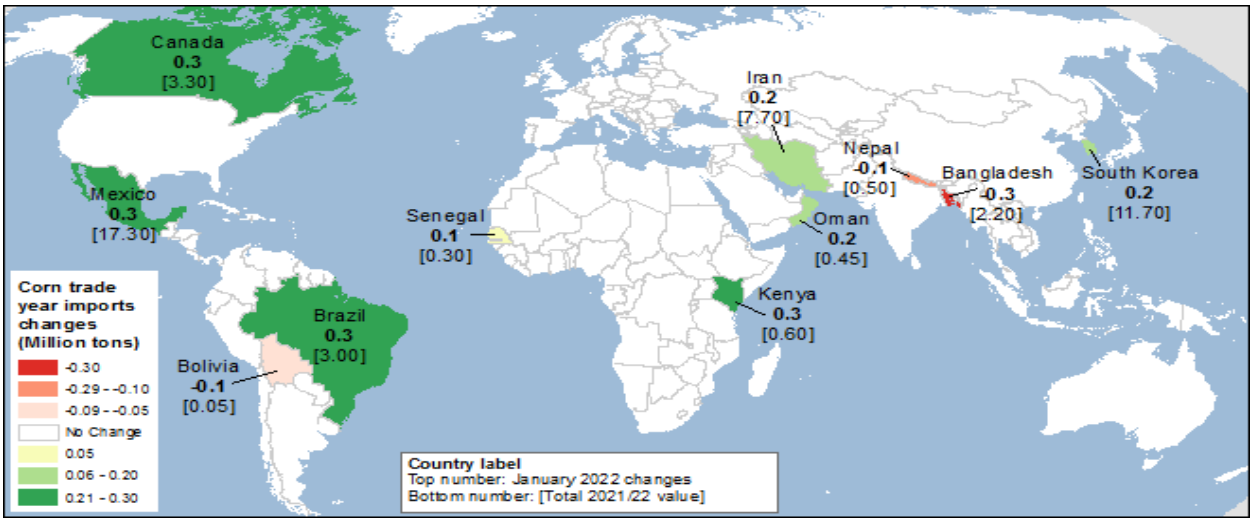
up, reflecting the pace of sales of yellow corn (while the country itself produces mainly white corn). Corn imports are adjusted down for ***Bangladesh*** for both 2020/21 and 2021/22. Higher corn imports are also projected for ***Iran***, a top export market for Brazil, where exports are projected higher this month. With lower projected corn output, imports are projected up in ***Kenya***. The country import duty was cut for non-GMO corn, which it is expected to source mainly from Tanzania. For a visual display of the changes in corn international trade year exports and imports, see maps B and C below.

Map B – Corn trade year (TY) exports changes for 2021/22, January 2022



Source: USDA, Foreign Agricultural Service, *Production, Supply, and Distribution* database.

Map C – Corn trade year (TY) imports changes for 2021/22, January 2022



Source: USDA, Foreign Agricultural Service, *Production, Supply, and Distribution* database.

Sorghum global exports are unchanged this month, with two offsetting changes: Lower ***U.S.*** and higher ***Australian*** exports. The current pace of sales suggests a 0.3-million-ton reduction in

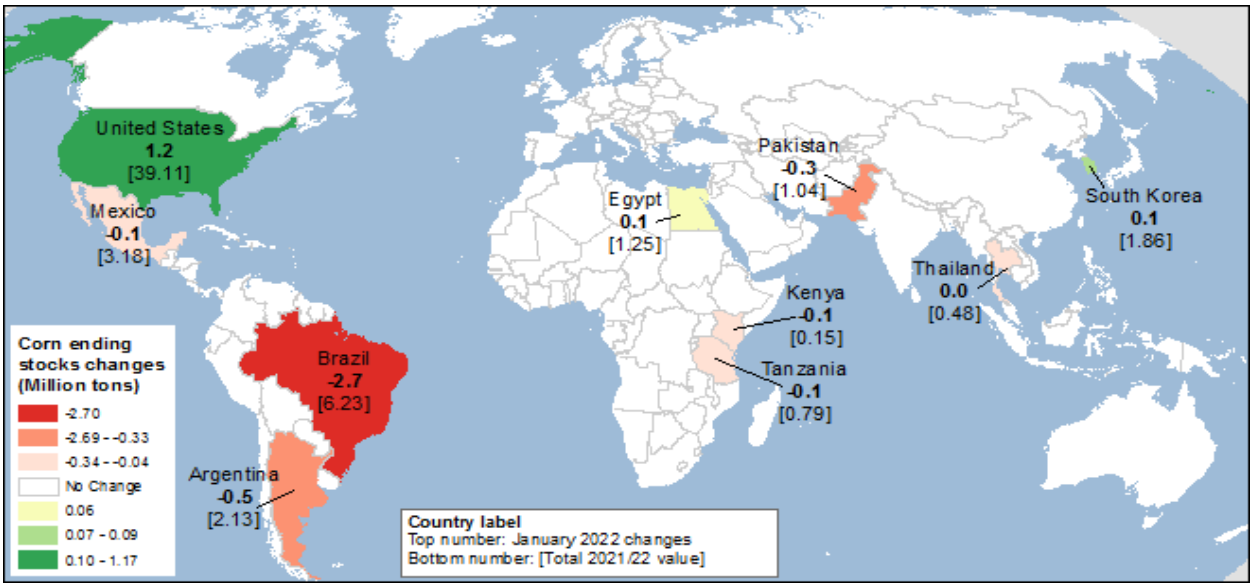
the U.S. shipments to China, down to 8.0 million. Australia makes up for this change by increasing its sorghum exports to China by the same amount, to reach 1.3 million tons. Chinese sorghum imports are left unchanged this month.

Corn Stocks Projected Down

Foreign feed use prospects for **2021/22** are marginally up this month. Increased corn output in Ukraine boosts its feed and residual prospects. With higher projected corn imports, Canadian feed use is also up. Partly offsetting are reductions for Argentina and the European Union (lower corn crop) and for Bangladesh (lower imports). Forecast feed use for the previous crop year **2020/21** is reduced 1.8 million tons this month, with Brazil and Argentina accounting for most of the decline. Higher exports by Brazil and Argentina for the March-February marketing year 2020/21 (that appear as 2021/22 imports in importing countries) are expected to reduce feed and residual use in these countries in 2020/21.

Global corn stocks took a 2.5-million-ton reduction this month at 303.1 million, roughly 11 million tons higher than a year ago, but with a slightly lower stocks-to-use ratio of 25.3 percent. Foreign corn stocks are projected down 3.7 million tons this month. The largest reduction is made for Brazil, down 2.7 million tons, as its production reduction is mostly absorbed by stocks. The new projection for Brazilian stocks is close to the level observed in the last 3 years. See a visual display of this month's country changes in corn ending stocks in map D.

Map D – Corn ending stocks changes for 2021/22, January 2022



Source: USDA, Foreign Agricultural Service, *Production, Supply, and Distribution* database.

Special Article: Sorghum Costs and Returns with an Emphasis on Rising Fertilizer Costs

Amy Boline
Angelica Williams

2020 Sorghum Costs and Returns Update

On October 1, 2021, USDA's Economic Research Service (ERS) released its latest cost and return estimates for sorghum. This article summarizes these sorghum costs of production data, with a brief summary of sorghum cost of production compared to other crops found in the same growing regions. Fertilizer costs are included in the analysis, as fertilizer is an important input in the cost of production (of sorghum) that has been trending up.

The ERS *Commodity Costs and Returns Data* are updated twice per year for 12 major field crop and livestock commodities. These estimates use data retrieved from the most recent crop or livestock-specific Agricultural Resource Management Survey (ARMS) surveys, with commodity-specific surveys being rotated on 4–8-year cycles. The costs reported include only production costs, excluding marketing and storage. The income reported includes income directly received from the sale of the crop and from any secondary products being harvested during the harvest period, excluding any government payments or marketing loans received. Between survey years, the estimates are updated using annual price and acreage estimates and USDA's National Agricultural Statistics Service (NASS) input price indices.

The most recent sorghum survey was conducted for crop year 2019. The 2019 data were summarized for the year 2019, then updated to reflect 2020 costs and returns. The previous sorghum ARMS survey year, prior to 2019, was 2011; 2011 data were used to estimate all production costs and returns from 2011 to 2018. Along with national estimates, the sorghum production costs and returns (per planted acre data) include estimates for the Prairie Gateway and Fruitful Rim regions, which are the major sorghum-producing regions in the United States. For sorghum, the Fruitful Rim region is made up predominantly of southern Texas—while the Prairie Gateway region includes North and Central Texas, Eastern Colorado, Oklahoma, Kansas, and Southern Nebraska. Historical data are also available for other regions.

The value of the primary product, sorghum grain, is calculated by multiplying yield by price. The values of secondary products, sorghum silage and grazing, are added to determine the total gross value of production. Nationally, 2020 produced the highest gross value of production for

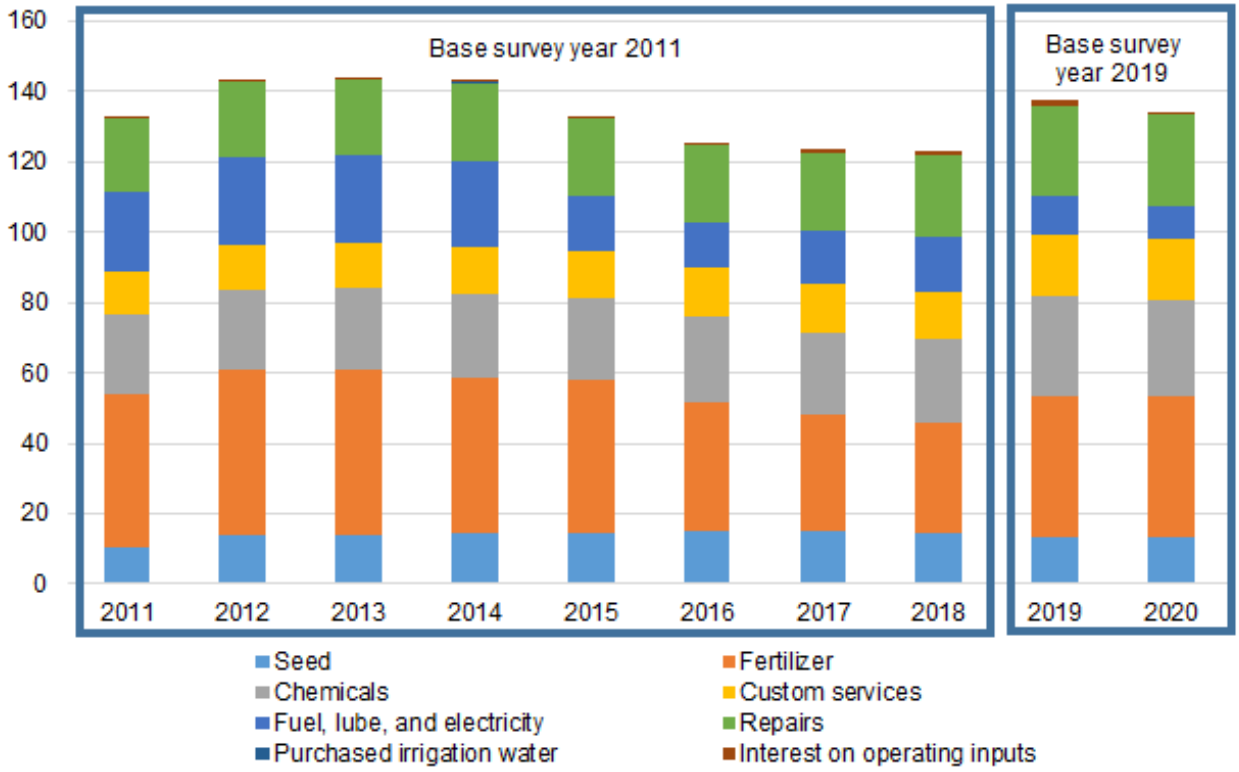
sorghum per acre, compared to prior years going back to 1995, aided by strong export demand and higher prices. Although sorghum yield remained relatively constant from 2019 to 2020, average harvest price increased from $3.32 per bushel to $4.36. Relatively high prices, comparable to 2020, were last seen in 2011 to 2013. However, in those years, sorghum yields were substantially lower than 2020.

There are two cost categories in the cost of production data products: Operating costs and allocated overhead costs. Operating costs include: Seed, fertilizer, chemicals, custom services, fuel, lube and electricity, repairs, purchased irrigation water, and interest on operating inputs. Figure SA1 shows the past 10 years of national operating costs for sorghum. Historically, the largest operating expenses for sorghum have been fertilizer, repairs, and chemicals—with fertilizer being the highest expense in each of the last 10 years. Total operating costs nationally saw a small decrease, from $137.34 per acre in 2019 to $133.92 per acre in 2020. The lowest operating costs in the past 10 years were from 2016 to 2018. The largest increases in operating costs (from the 2018 indexed values to the updated 2019 survey year estimates) were for fertilizer, chemicals, and custom services. On the other hand, fuel costs decreased each year from 2018 to 2020. A substantial decrease in fuel costs over the past 10 years can be seen in figure SA1, while the largest individual operating cost is fertilizer. Because 97 percent of total reporting sorghum fields were not irrigated, the share of operating costs attributed to purchased irrigation water is very small.

Figure SA1

Sorghum operating costs: 10 year summary

U.S. dollars per acre



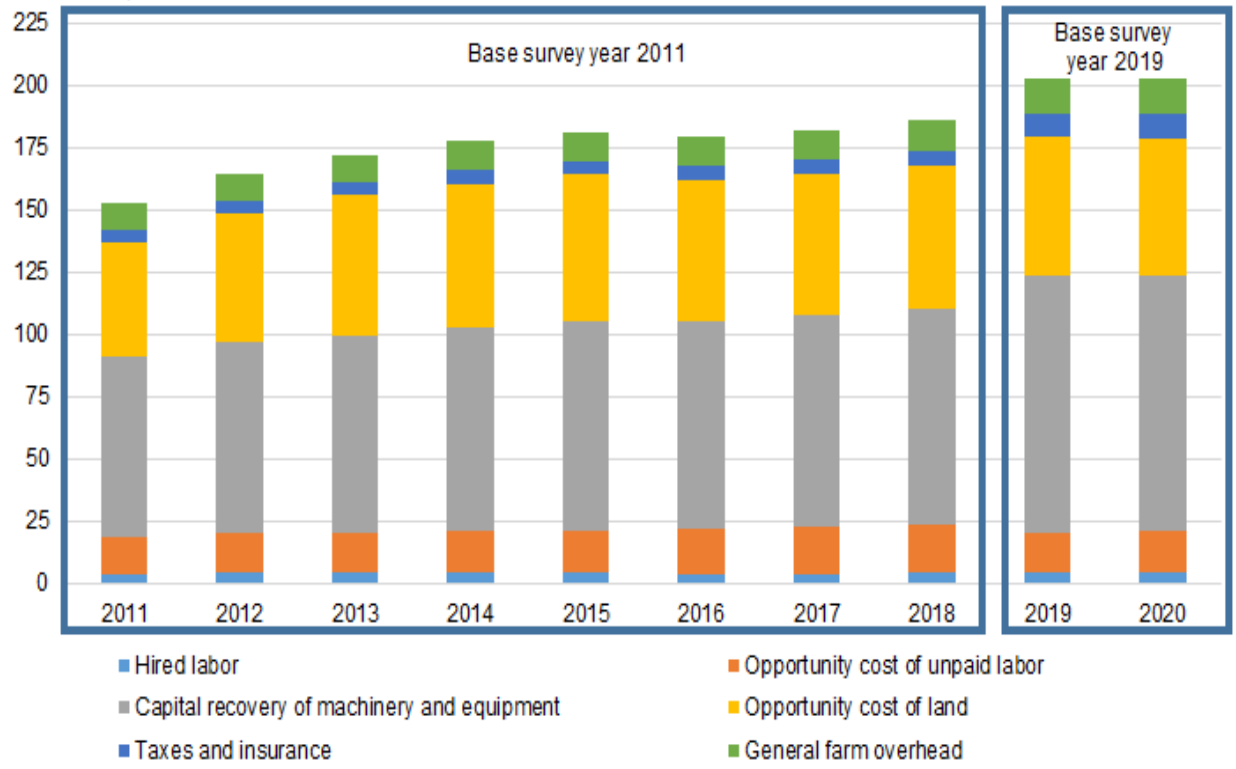
Source: USDA, Economic Research Service, Agricultural Resource Management Survey.

The other cost category—allocated overhead costs—includes: Hired labor, opportunity costs of unpaid labor, capital recovery of machinery and equipment (depreciation measure), opportunity cost of land, taxes and insurance, and general farm overhead. These costs are the ownership and opportunity costs associated with raising a crop. Referring to figure SA2, the allocated overhead measures that changed the most from 2018 (to the new 2019 base survey) include an increase in capital recovery of machinery and equipment and a decrease in opportunity costs of unpaid labor. Compared to the 2011 base-year survey, capital recovery costs increased from $72.41 per acre to $102.38 in 2020. Unpaid labor costs increased slightly from $15.66 in 2011 to $16.59 in 2020. Hired labor also increased from $3.21 in 2011 to $4.22 in 2020. The national average total allocated overhead costs increased from $185.89 per acre in 2018 to $202.97 in 2019 and remained relatively constant into 2020 at $202.87. The opportunity cost of land increased $10 per acre from 2011 to $55.77 in 2020.

Figure SA2

Sorghum allocated overhead costs: 10 year summary

U.S. dollars per acre



Source: USDA, Economic Research Service, Agricultural Resource Management Survey.

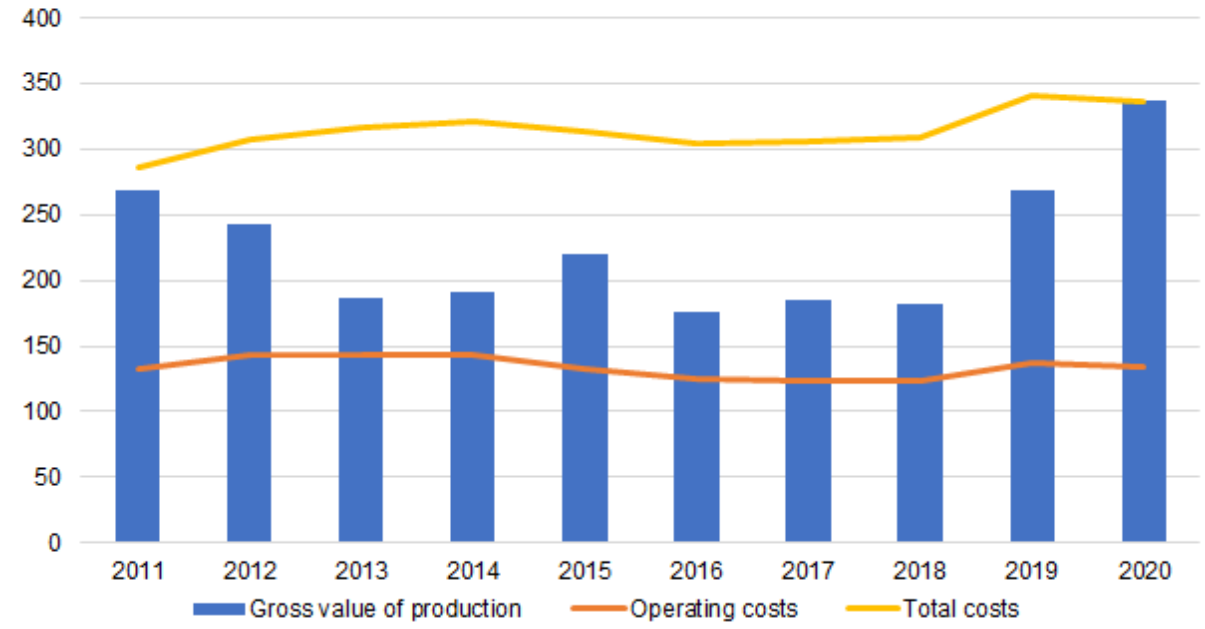
Figure SA3 presents a visualization of the total costs and returns for sorghum. Nationally, total estimated costs for sorghum were $308.98 per acre in 2018, increasing to $340.31 per acre in 2019, and decreasing slightly to $336.79 per acre in 2020. The gross value of production increased from 2018 to 2020, resulting in a value of production (less operating costs) of $203.72 in 2020. However, when considering value of production (less total costs, including allocated overhead costs), the data indicate that 2020 saw (for the first time in 20 years) that value of production exceeded total costs, on average. For sorghum, operations cover operating costs on average, but not all allocated overhead costs in most years. It is important to remember that this visualization represents the national average—some producers have higher costs, and some have lower—and does not include marketing profit or government payment income. The cost and return estimates use the gross value of production, meaning the returns account for yield sold at the harvest price. Commodity producers may utilize marketing contracts instead of selling across the scale at harvest, sometimes resulting in a higher price received. The allocated overhead costs of production may not reflect actual cash outflows and some are better thought of as opportunity costs of operating. For example, a farmer may own the machinery and land, in which case the farmer has no actual cash costs per acre. So, a negative value of production

(less total costs) can indicate that producers might have a positive cash flow but are not covering all economic costs associated with crop production. Additionally, most farms are systems with multiple enterprises or production systems that work together, rather than relying on the profitability of a single commodity. A farm with a negative value of production (less total costs on one crop) may continue to produce said crop to maintain a proper cropping rotation, soil health, or simply because the equipment required is already on the farm.

Figure SA3

Costs and returns of U.S. grain sorghum production, 2011 to 2020

U.S. dollars per acre

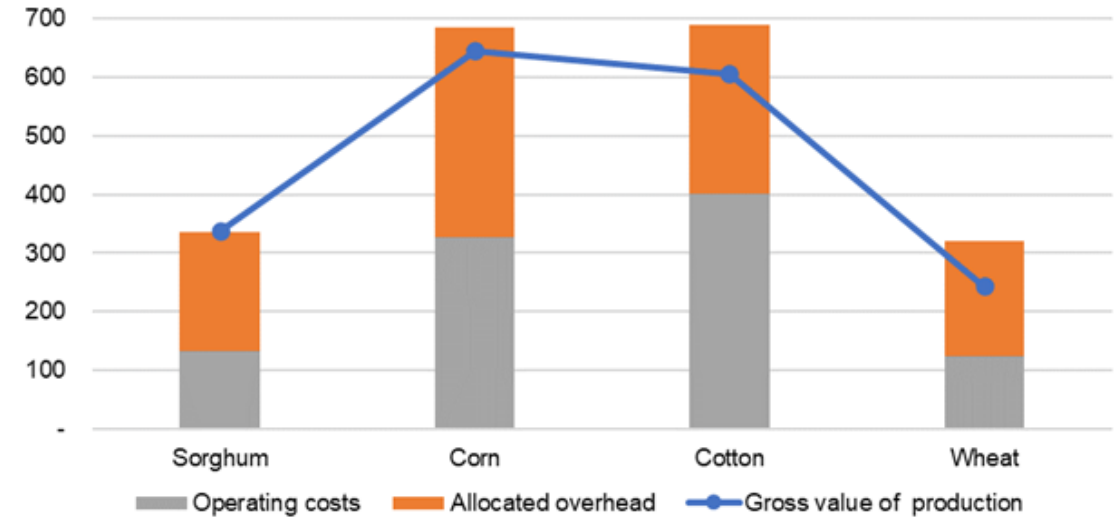


Source: USDA, Economic Research Service, Agricultural Resource Management Survey.

When reviewing costs and returns for sorghum, it is useful to compare costs and returns across commodities in the same growing regions. Figure SA4 displays the total costs and gross value of production in 2020 across sorghum, corn, cotton, and wheat—major row crops that are also commonly grown in the Prairie Gateway and Fruitful Rim regions. As seen below, average producers of each crop covered operating costs for the year. However, sorghum was the only crop of the four to also cover the allocated overhead costs in 2020, mainly due to the large sorghum price increase in 2020. Although wheat had a similar level of expenses as sorghum, wheat prices and consequently revenue, were not high enough in 2020 to cover all costs. The profitability seen in the 2020 sorghum crop (as illustrated in figure SA4) is likely a significant factor in why sorghum planted area expanded at a higher rate in 2021 than corn, cotton, or wheat. Although there are many factors that go into a planting decision (such as crop rotations and equipment access and availability), high sorghum prices in 2020 (paired with the relatively

low cost of production) seem to have made sorghum a competitive and attractive option in 2021. According to NASS, planted acreage for sorghum increased 25 percent from 2020 to 2021, while corn acres increased 3 percent. During the same time period, wheat-planted acreage increased 5 percent and cotton acres decreased 8 percent.

Figure SA4
U.S. 2020: Cross commodity costs and returns
U.S. dollars per acre



Source: USDA, Economic Research Service, Agricultural Resource Management Survey.

Rising Fertilizer Costs Drive Sorghum Production Costs Higher

The updated Costs and Returns data for 2019 and 2020 provide useful insight for the outlook of sorghum production and markets, particularly as rising fertilizer costs have become an important factor in upcoming planting decisions. Sorghum's lower seed costs, increased flexibility in the timing of planting, and lower fertilizer requirements contribute to sorghum's appeal as a lower-risk, more flexible alternative to other crops grown in the same regions. While sorghum's fertilizer requirements are lower relative to corn or cotton, fertilizer is still a major component of sorghum's production costs. According to the 2020 sorghum cost of production estimates, the use of fertilizer in sorghum production accounts for 30 percent of the total operating costs—followed by chemicals (27 percent) and repairs (26 percent).

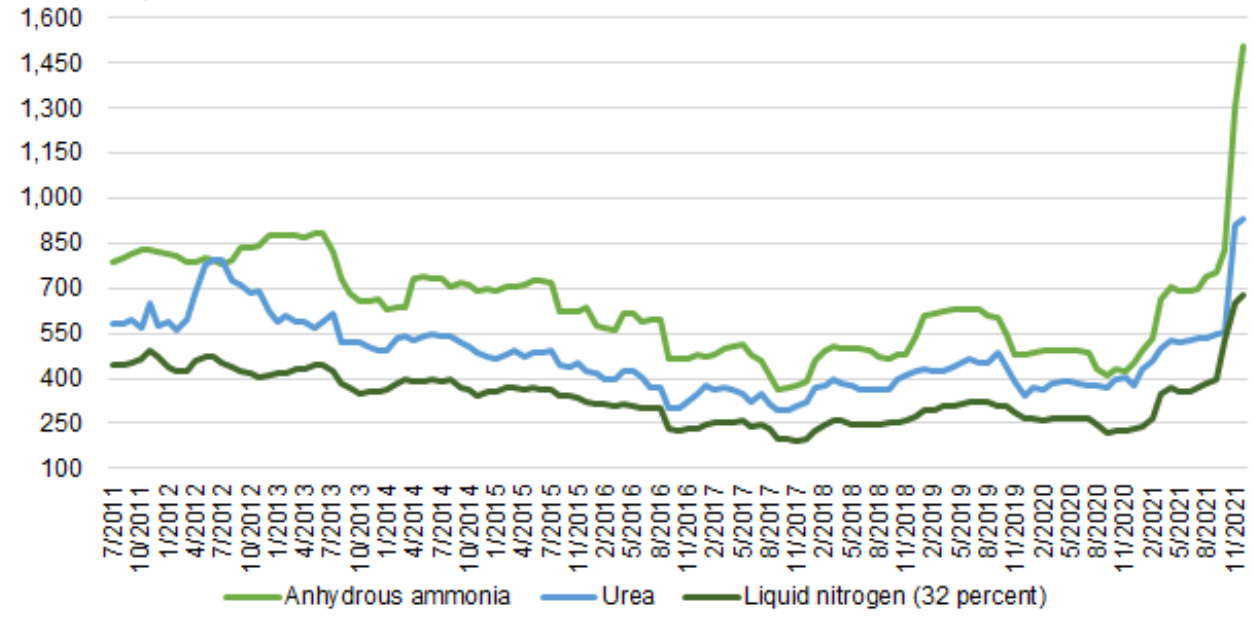
Fertilizer costs have increased throughout 2021, particularly over the last 6 months. Figure SA5 charts spot fertilizer prices reported in Iowa over a 10-year period, as published by the USDA's Agricultural Marketing Service (AMS). Anhydrous ammonia, considered a critical component for

most crops, has seen the steepest cost increase from year to year, with an increase from the December 2020 monthly average of $449.1 per ton to $1506 in December 2021, a 235 percent annual increase. Liquid Nitrogen (32 percent) had a cost increase from the December 2020 monthly average of $232 per ton to the latest reported price in December 2021 of $677.5 per ton, representing a 192 percent annual increase (figure SA6).

Figure SA5

Iowa fertilizer prices over time

U.S. dollars per ton

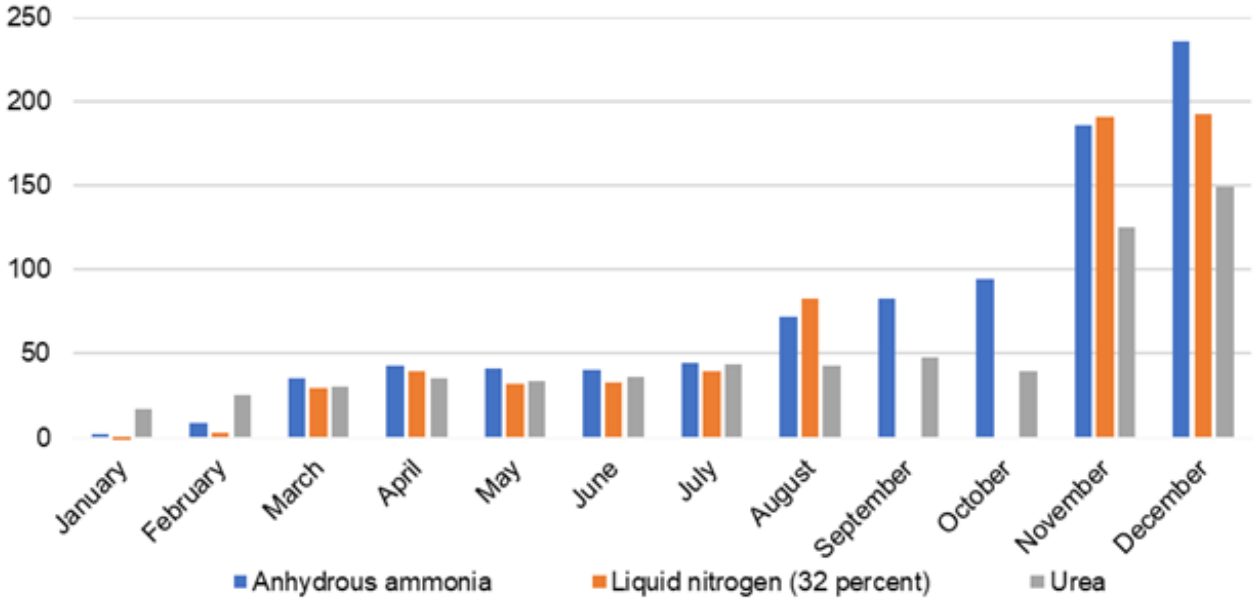


Source: USDA, Agricultural Marketing Service.

Figure SA6

Year-over-year percentage change in fertilizer prices: 2020 versus 2021

Percentage change



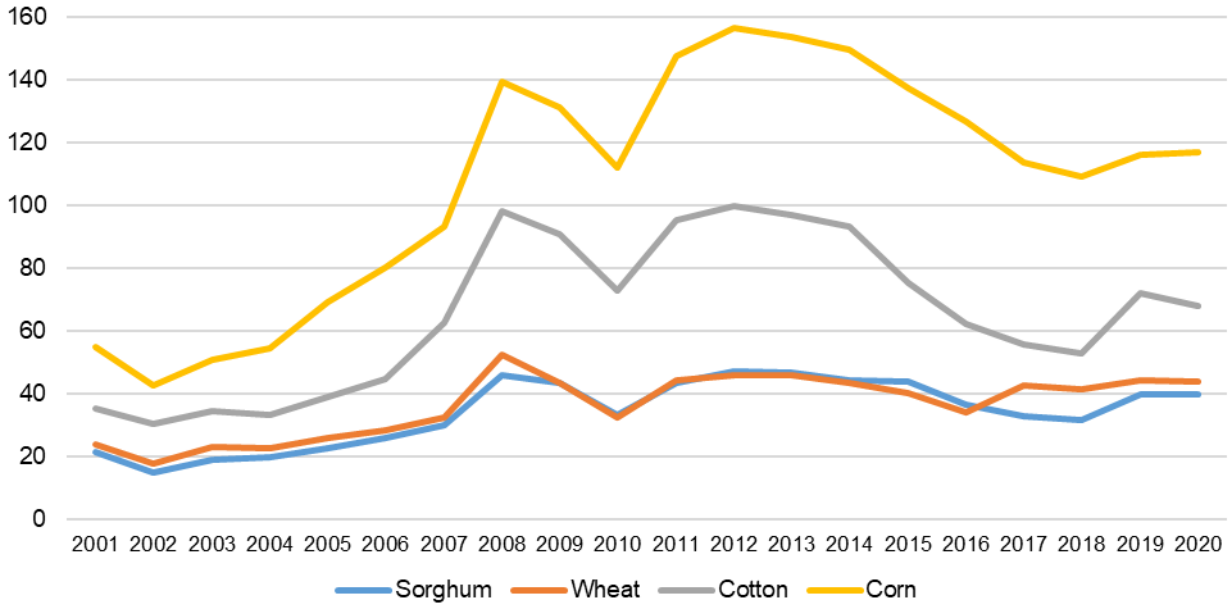
Source: USDA, Agricultural Marketing Service.

These 2021 fertilizer spot-market prices are expected to result in higher fertilizer costs for sorghum producers in 2022. Figure SA7 displays the sorghum fertilizer cost per acre over the past 20 years for four commodities as a comparison measure. According to the Commodity Costs and Returns data—when comparing fertilizer costs relative to other commodities typically grown in major sorghum-producing regions (figure SA7)—sorghum has the lowest estimated per acre fertilizer cost ($39.80 in 2020), while corn has the highest ($116.91 in 2020). The Commodity Costs and Returns data products will be updated to add 2021 data on May 2, 2022.

Figure SA7

Fertilizer costs per acre: 20 year summary

U.S. dollars per acre



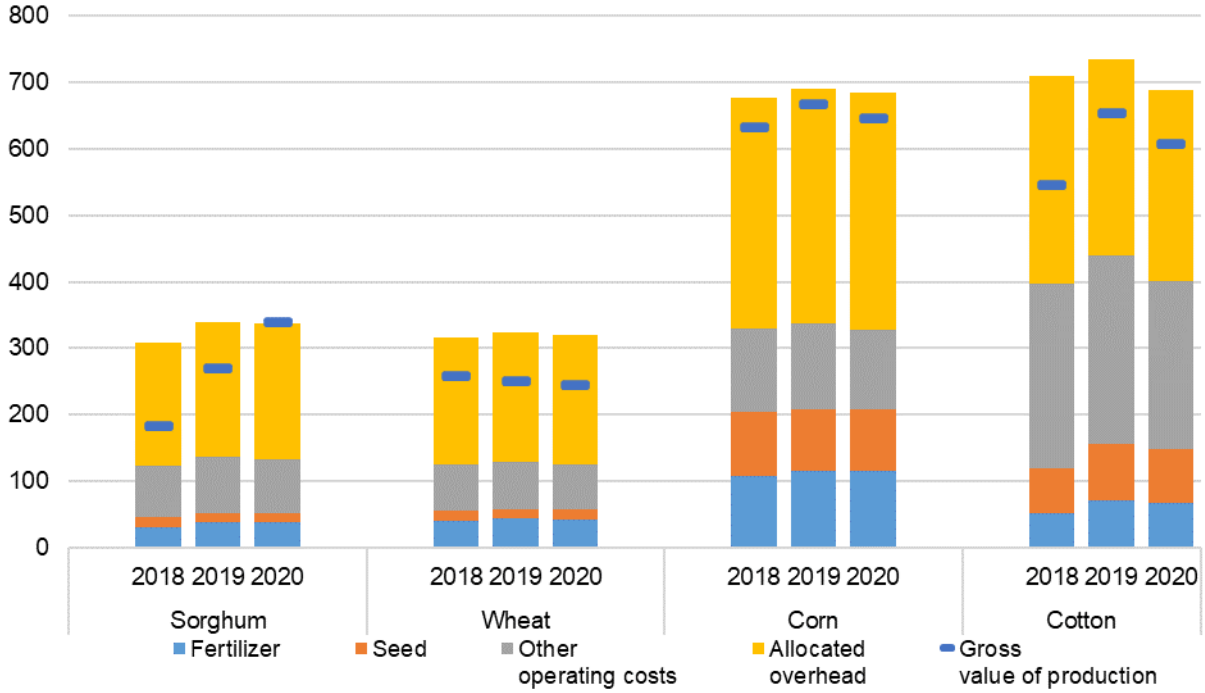
Source: USDA, Economic Research Service, Agricultural Resource Management Survey.

The higher cost of fertilizer is expected to impact the cost structures for all commodities, which has implications for producer planting decisions. Sorghum operating costs are most comparable to wheat operating costs, although the fertilizer portion is higher for wheat, amounting to $44 per acre in 2020 (figure SA7). Cotton operating costs are the highest of these four crops (figure SA8), with the second highest fertilizer cost per acre at $68.15 in 2020. This number is $48.76 per acre less than corn, but $28.35 per acre more than sorghum (figure SA7). Sustained higher fertilizer prices may increase sorghum's competitiveness relative to other crops if other input costs and crop prices remain similar.

Figure SA8

Cross commodity: 3 year summary, total costs and returns

U.S. dollars per acre



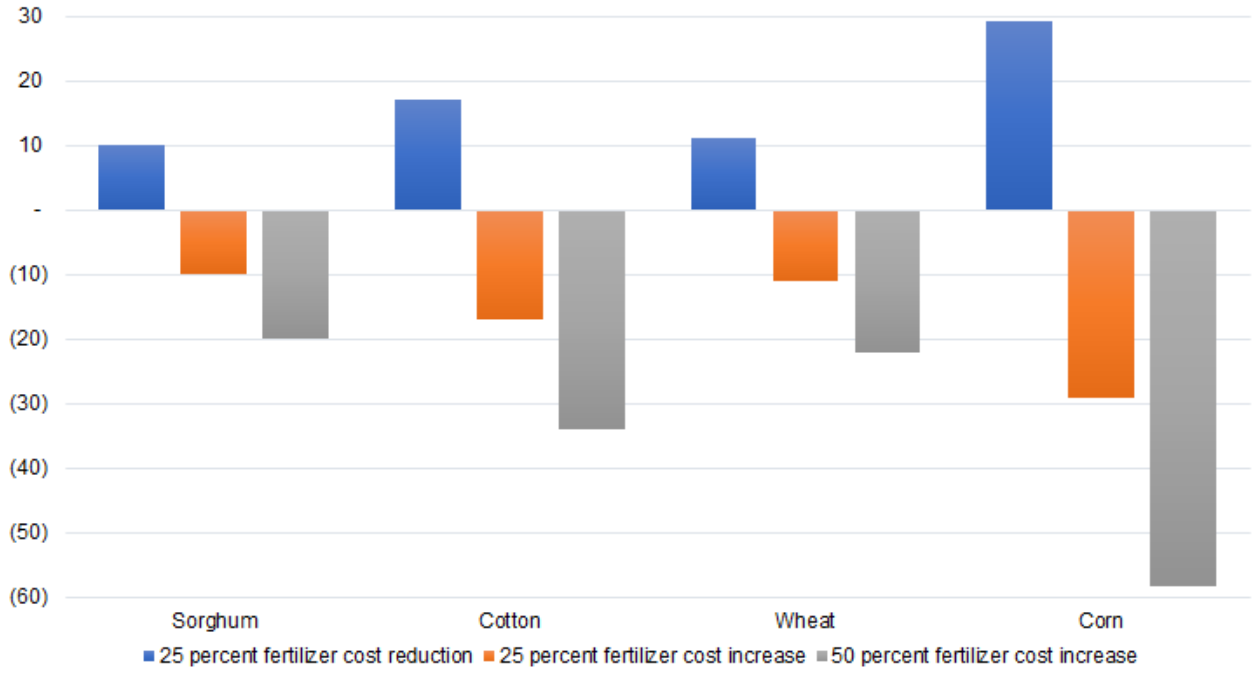
Source: USDA, Economic Research Service, Agricultural Resource Management Survey

To illustrate the impact that fertilizer costs could have on producers' profitability, we conduct a sensitivity analysis using the latest 2020 sorghum costs and returns, released on October 1, 2021, as a base for comparison. The sensitivity analysis assumes fertilizer use remains constant as prices fluctuate. Referring to figure SA9, a 25 percent increase in fertilizer prices results in: A decrease of $9.95 per acre in value of production (less operating costs) for sorghum in the United States, a $17.63 decrease in per acre value of production (less operating costs) for cotton, a $11 decrease in per acre value of production (less operating costs) for wheat, and $29.23 decrease in per acre in value of production (less operating costs) for corn. Profit margins for sorghum are impacted less than those for corn, wheat, or cotton by changes in fertilizer costs in the sensitivity analysis. Although corn, sorghum and fertilizer prices can be correlated, we hold other factors constant for the purposes of this analytical exercise. Especially compared with another feed grain, a change in fertilizer costs would impact the profitability of corn at a greater level than that of sorghum. For example, a 50 percent increase in fertilizer costs would increase sorghum operating costs by $19.90, while the same percentage increase would increase corn operating costs by $58.50.

Figure SA9

U.S. Sensitivity analysis of changes in fertilizer costs on value of production less operating costs per acre

U.S. dollars per acre



Source: USDA, Economic Research Service, Agricultural Resource Management Survey.

Looking forward, returns undoubtedly will be affected by the higher sorghum grain prices, as well as the projected fertilizer cost increases for 2022. The ERS Commodity Cost and Returns data products for 12 commodities (including sorghum) can be found on the USDA, ERS website. The data can be used to better understand cross commodity comparisons and trends affecting producers at national and regional U.S. levels. The latest estimates were updated on October 1, 2021, and the next publishing date (where the data products will reflect 2021 estimates) will be May 5, 2022.

Commodity Costs and Returns Data can be found at: https://www.ers.usda.gov/data-products/commodity-costs-and-returns/

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