

Ag Decision Maker

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UPDATES

The following [Information File and Decision Tools](#) have been updated on extension.iastate.edu/agdm:

A1-50 Important Crop Insurance Dates

A1-57 Delayed and Prevented Planting Evaluator (Decision Tool)

B2-50 Hedging of Livestock

B2-52 Livestock Options Market

C2-10 Cash Rental Rates for Iowa 2022 Survey

C2-11 Historical County Cropland Rental Rates

C2-75 Farmland Value Survey REALTORS® Land Institute

The following [Profitability Tools](#) have been updated on extension.iastate.edu/agdm/outlook.html:

A1-85 Corn Profitability

A1-86 Soybean Profitability

A2-11 Iowa Cash Corn and Soybean Prices

A2-15 Season Average Price Calculator

D1-10 Ethanol Profitability

D1-15 Biodiesel Profitability



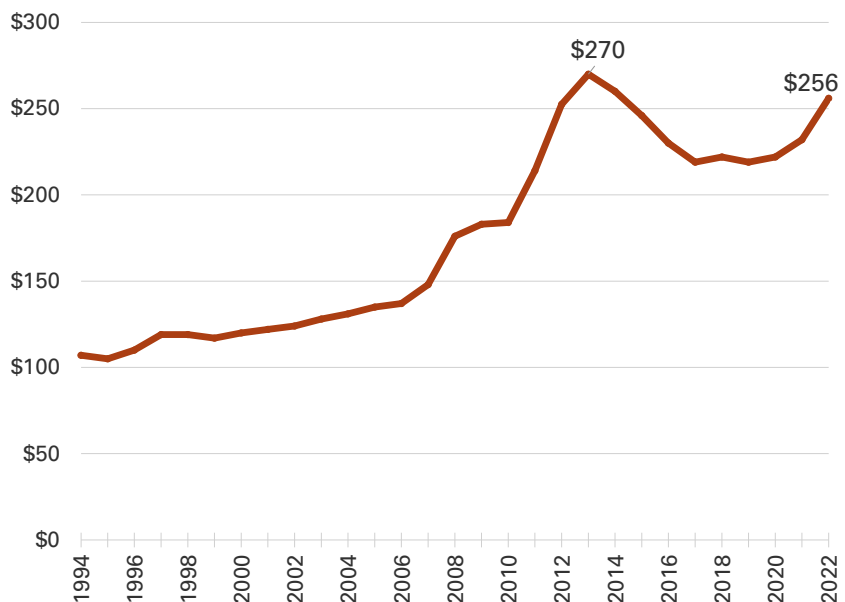
Highest increase in cash rental rates in a decade

By Alejandro Plastina, extension economist,
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The most recent annual survey of cash rental rates for Iowa farmland shows that rates increased, on average, by 10.3% in 2022 to \$256 per acre. This is the third consecutive and largest uptick in cash rents since 2013, when rents peaked at \$270 per acre—a level 5.5% higher in nominal terms than in 2022 (Figure 1). In comparison, nominal corn and soybean prices received by farmers in Iowa declined by 16 and 11%, respectively, since mid-2013.

Iowans supplied 1,401 usable responses about typical cash rental rates in their counties for land producing corn and soybeans, hay, oats and pasture. Of these, 43% came from farmers, 34% from landowners, 8% from professional farm managers and realtors, 8% from agricultural lenders, and 7% from other professions and respondents who chose not to report their status. Respondents indicated being familiar with a total of 1.5 million cash rented acres across the state.

Figure 1. Average cash rents in Iowa, in \$ per acre (nominal).



AgDM File C2-10, [Cash Rental Rates for Iowa 2022 Survey](#), www.extension.iastate.edu/agdm/wholefarm/pdf/c2-10.pdf, provides detailed results by county. There was considerable variability across counties in year-to-year changes, as is typical of survey data, but most Iowa counties experienced increases in average rents for land planted to corn and soybeans.

Besides typical rents for farm ground on corn and soybean tillable acres, the report also shows typical rents for alfalfa, grass hay, oats, pasture, corn stalk grazing, and hunting rights in each district.

Survey shows rent increases in all districts

The survey was carried out by Iowa State University Extension and Outreach. Statewide, reported rental rates for land planted to corn and soybeans were up from \$232 per acre last year to \$256 per acre in 2022, or 10.3%. This percentage increase is slightly less than one-third of the 32.9% increase in Iowa farmland values between March 2021 and March 2022 reported in surveys conducted by the Iowa REALTORS Land Institute and summarized in [AgDM File C2-75](#), www.extension.iastate.edu/agdm/wholefarm/pdf/c2-75.pdf.

Furthermore, the 15.3% increase in rental rates since 2020 is about half the increase experienced in average land values between November 2020 and November 2021

Figure 2. Annual percent change in cash rents and land values in Iowa.

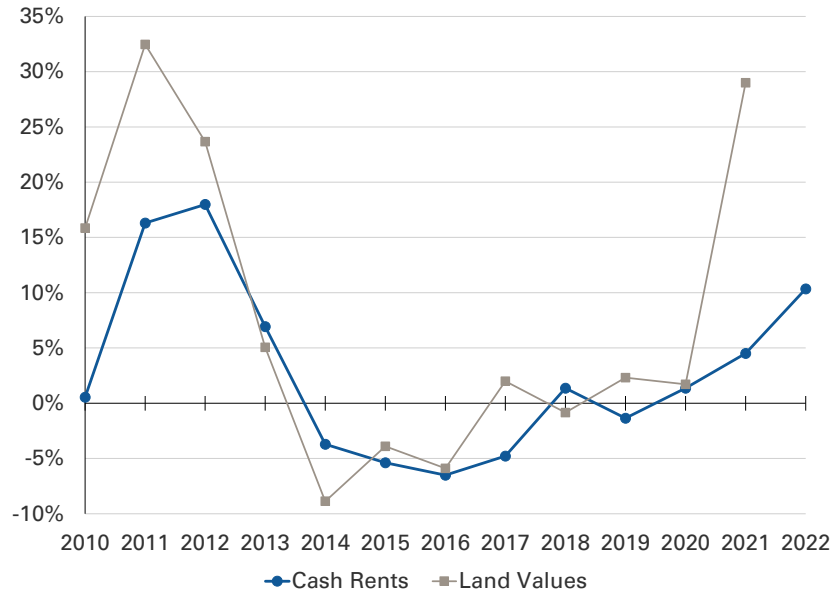
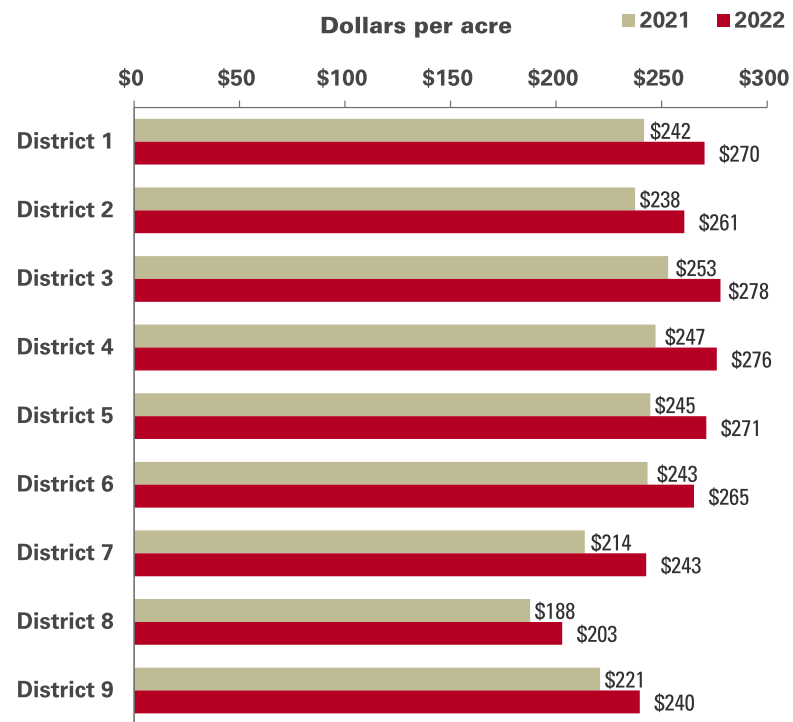


Figure 3. Average cash rents by Crop Reporting District, dollars per acre.



(Figure 2), and reported in the Iowa Land Value Survey, [AgDM File C2-70](#), www.extension.iastate.edu/agdm/wholefarm/pdf/c2-70.pdf.

Different regions experienced different increases in cash rents: from 8% in Crop Reporting District (CRD) 8 to 13.6% in CRD 7 (Figure 3). All CRDs experienced at least a \$15 increase in average rents, and Western Districts (1, 4, and 7) saw their average rents increase by \$29 per acre, or \$7 more than in the Central and Eastern Districts.

Percent increases in rent similar across land qualities

All land qualities have seen their average cash rents increase by similar percentages. High quality land experienced an 11.2% increase, from \$267 per acre in 2021 to \$297 in 2022.

Medium quality land experienced a 9.4% increase, from \$233 per acre in 2021 to \$255 in 2022.

Low quality land experienced a 10.2% increase, from \$197 per acre in 2021 to \$217 in 2022.

Setting rents for next year

Survey information can serve as a reference point for negotiating an appropriate rental rate for next year. However, rents for individual farms should be based on productivity, ease of farming, fertility, drainage, local price patterns, longevity of the lease, conservation practices, and possible services performed by the tenant.

Three major factors with the potential to influence future cash rents are crop prices, government payments, and land values. Corn and soybean prices received in Iowa peaked in August 2012 at \$7.90 and \$16.80 per bushel, respectively. In March 2022, corn and soybean prices received by farmers in Iowa averaged \$6.59 and \$15.00 per bushel still 16% and 11% lower, respectively, than in August 2012 (Figure 4). The United States Department of Agriculture (USDA) projected in February 2022 average corn and soybean prices at \$4.80 and \$10.50 per bushel, respectively.

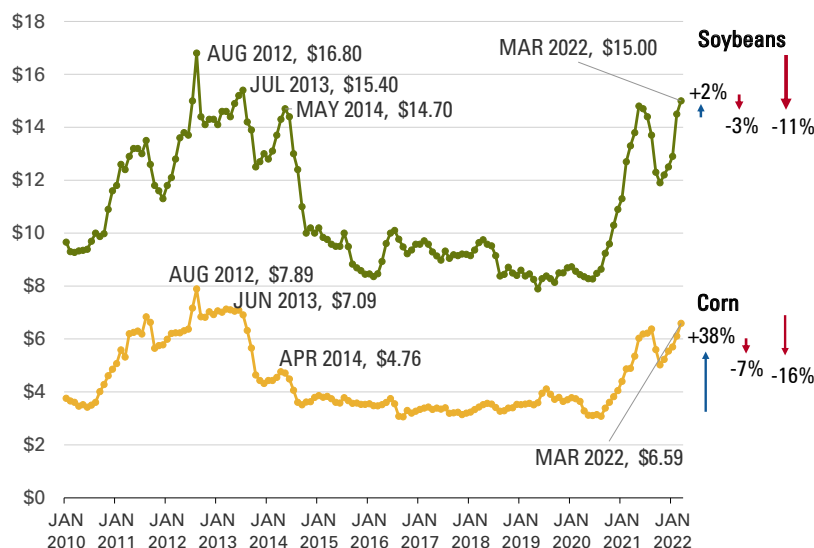
Recent futures prices from the CME Group fluctuate around \$6.50 for the December 2023 corn contract and \$13.90 for the November 2023 soybeans contract. These lower projected prices, along with input inflation, would negatively affect net farm income and put downward pressure on cash rents. In February 2022, the Economic Research Service forecast a 4.5% reduction in net farm income between 2021 and 2022.

A major factor considered by landowners when negotiating cash rents is the return on their farmland investment. Figure 5 shows the evolution of the ratio of average cash rents to average land values in Iowa. It suggests that the average return on investment for landowners who cash rent their land to operators has followed a declining trend since the early 1990s, stabilizing at around 3% after 2010, but dropping

to 2.4% in 2021. Although this ratio does not measure net returns to land because ownership costs (such as real estate taxes, maintenance, and repairs, etc.) are not considered in its calculation, it suggests that landowners will likely be reticent to accept lower cash rents in the future unless land values decline or stagnate. However, Iowa farmland values increased by 14.1% between September 2021 and March 2022 (REALTORS Land Institute). Furthermore, increasing interest rates to curtail inflationary risks will result in higher opportunity costs for landowners and added pressure to ask for higher rents.

Due to a time lag between when cash rent negotiations begin in Iowa (late August), and the time when the Iowa State University Cash Rental Rates for Iowa Survey is implemented (March-April), the typical cash rents reported in the survey

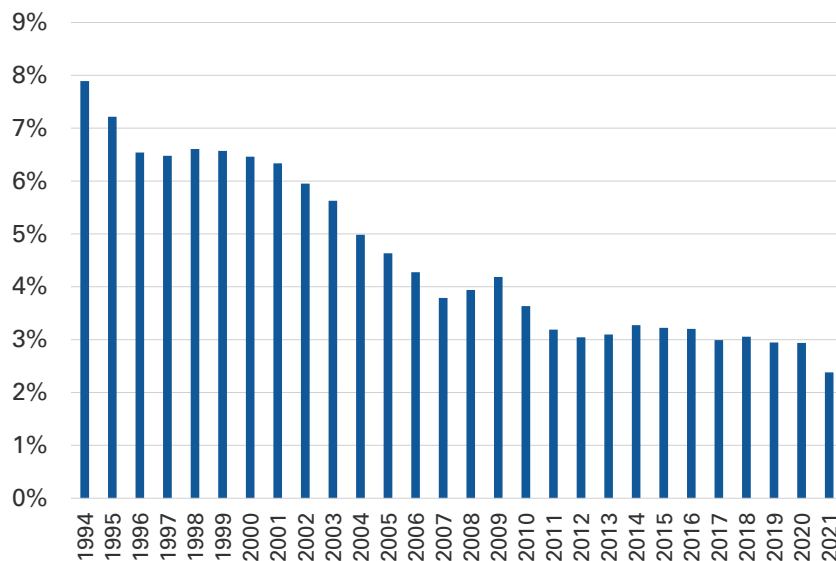
Figure 4. Prices received in Iowa for corn and soybeans, dollar per bushel.



Source: A. Plastina's calculations based on USDA National Agriculture Statistics Service data

reflect the economic conditions during the months of July and August of the previous year through February of the current year. The survey has historically been implemented at the same time each year to avoid interfering with cash rent negotiations or re-negotiations. However, in times of drastic changes in crop prices, input costs, and other economic variables between summer and the following spring (such as the 10% and 17% increases observed in the corn and soybean prices used to calculate revenue guarantees in crop insurance between October 2021 and March 2022), the reported cash rents might feel out of date. It must be emphasized that the goal of the survey is to estimate the average going rate for renting farmland in the same season when the survey takes place, and not to project the rate for the following season.

Figure 5. Ratio of average cash rental rate to average land value in Iowa, 1994-2021.



Source: A. Plastina's calculations based on Iowa State University Farmland Value Surveys and Cash Rental Rates for Iowa Surveys

Other resources available for estimating cash rents include the AgDM Information Files C2-20, [Computing a Cropland Cash Rental Rate](https://extension.iastate.edu/agdm/wholefarm/html/c2-20.html), extension.iastate.edu/agdm/wholefarm/html/c2-20.html; C2-23, [Computing a Pasture Rental Rate](https://extension.iastate.edu/agdm/wholefarm/html/c2-23.html), extension.iastate.edu/agdm/wholefarm/html/c2-23.html; and C2-21, [Flexible Farm Lease Agreements](https://extension.iastate.edu/agdm/wholefarm/pdf/c2-21.pdf), extension.iastate.edu/agdm/wholefarm/pdf/c2-21.pdf. All of these fact sheets, and more, are on the [Ag Decision Maker Leasing page](https://extension.iastate.edu/agdm/wdleasing.html), extension.iastate.edu/agdm/wdleasing.html, and include decision tools (electronic spreadsheets) to help analyze individual leasing situations. An online tool to visualize the cash rents by land quality in each county by year, and compare trends in cash rents for a county versus its CRD and the state average is available on the [Center for Agricultural and Rural Development website](https://card.iastate.edu/tools/ag-risk/cash-rental-rates), card.iastate.edu/tools/ag-risk/cash-rental-rates.

For questions regarding the cash rent survey, contact the authors. For leasing questions in general, contact the [farm management field specialist](https://www.extension.iastate.edu/ag/farm-management) in your area, www.extension.iastate.edu/ag/farm-management. Farmland Leasing and Management Workshops, facilitated by ISU Extension farm management field specialists in July and August each year, are an additional opportunity to learn more on leasing trends and topics impacting farmland owners and tenants.



Detailing the supply curve for beef

By Lee Schulz, extension livestock economist
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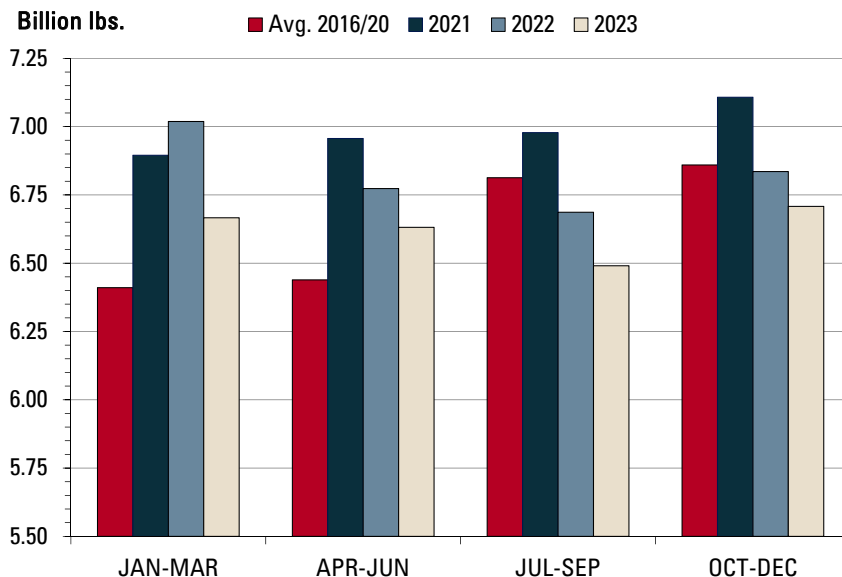
Demand factors are very strong and certainly play a big role in driving stronger cattle prices. Supply side factors are also supportive, and are changing.

Commercial beef production in the first three months of 2022 increased 1.8% compared to the same period last year but is forecasted to decrease 1.7% overall in 2022 compared to 2021 (Figure 1). Forecasts call for a 3.0% year-over-year decline in beef production in 2023.

As background, aggregate supply in the beef market represents the amount all beef producers are willing to sell over a range of prices during any given time period. At the individual level, a beef producer may be willing to sell a particular quantity as long as the market price is equal to or greater than the cost of producing that quantity. The market supply is then the total of the quantities that all individual beef producers choose to bring to market at various price levels. As a result of this process, the fed cattle supply is a set of price-quantity pairs that represent the number of fed cattle that producers are willing and able to supply to the market at alternative prices.

The market sends price signals up and down the chain to drive both quantity supplied and quantity demanded. The supply

Figure 1. Quarterly US commercial beef production Data source: USDA-NASS, Forecasts by LMIC.



of fed cattle drives wholesale and retail supplies of beef. Feeder cattle supply drives the supply of fed cattle. The supply of calves drives the supply of feeder cattle. Likewise, domestic and export consumer demand drives demand for wholesale beef. Wholesale beef demand drives demand for fed cattle, and so on.

Understand price-quantity relationships

Calf prices some years are \$170 per cwt and some years are \$250 per cwt. In a \$170 market, some producers receive \$160 and others \$180. In a \$250 market, some producers receive \$240 and others \$260. Why? A high price level for calves results from supplies that are too small relative to the demand for calves.

Calf prices can vary above and below the market price level for many reasons. For cow-calf producers, the factors that can affect the quantity of calves on the market include the size of the cow herd and calving rate, cost of buying or raising replacement heifers, interest rates, and the availability and cost of feed and forage. The factors that affect the number and willingness of backgrounders and feedlots to buy calves include the characteristics of the calves, the time and place calves are marketed, the price of feed and the expected price of fed cattle which provides prospects for profitability. Those relationships are the basis for sets of price-quantity pairs within that market.

Similarly, the costs of slaughtering, processing, transporting, packaging beef and required profits determine sets of price-quantity pairs that packers are willing and able to offer to fed cattle producers and also ask from wholesale beef buyers. Costs of retailing and food service prep and required returns of those firms are then added to wholesale values to determine a set of price-quantity pairs that grocers, restaurants and others are willing and able to offer at alternative prices to consumers.

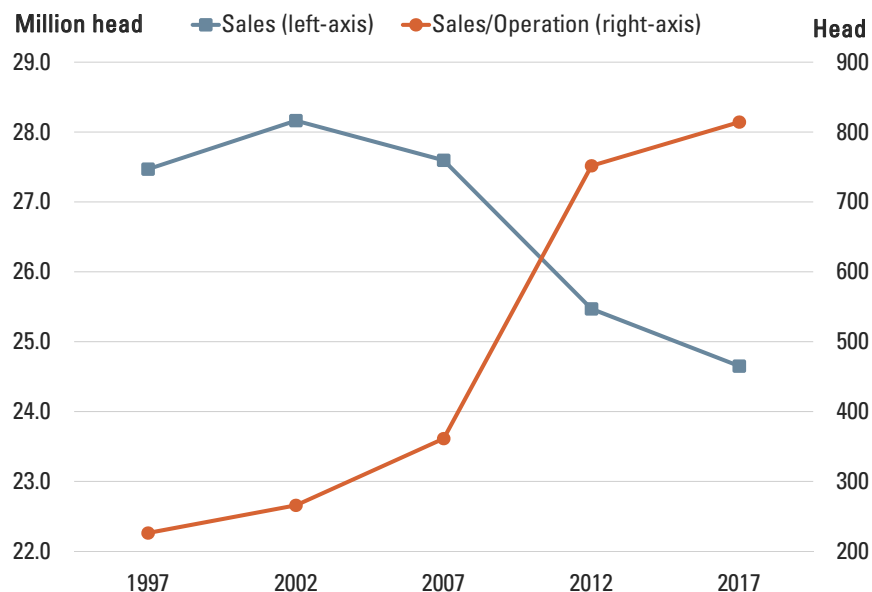
The aggregate supply of beef can be represented graphically as an upward sloping curve, or line, with price on the vertical axis and quantity on the horizontal axis. An increase in price will encourage producers to market more beef. That is, the relationship between price and supply is positive.

Several factors influence production actions of beef producers. These include the price of beef, the number of firms producing beef, technological advances, the price of inputs, the price of other products that could be produced, and unpredictable events such as weather.

Shifts in supply

Beef supply shifts occur because of a change in at least one of the supply influencing factors, excluding the price of beef itself. Moving from a pair with lower price and lower quantity on the supply curve, to a pair with higher

Figure 2. US cattle on feed sales and average sales per operation. Data source: USDA-NASS, Census of Agriculture.



price and higher quantity is a quantity response driven solely by the change in price. That is a change in quantity supplied. It is not a change in supply. A supply shift is a movement of the entire supply curve to the left or right at all price levels.

The number of beef producers affects the beef supply in the same way as the number of consumers affects beef demand. The more operations producing, the greater and more competitive the supply. The opposite also applies. Fewer operations usually produce a smaller supply. The size of production is not strictly the number of operations, but also the size of those operations.

The number of US feedlots has been declining over time. But the fed cattle supply has not changed as much. Nationally, the number of feedlots declined 75% from 1997 to 2017, but fed cattle sales declined by only 10%

over that period (Figure 2). The average annual sales rose from 226 head to 814 head per feedlot. Meanwhile in Iowa, the number of feedlots declined 59% from 1997 to 2017, but fed cattle sales climbed 28% over that 20-year period. In Iowa, the average sales per feedlot rose from 125 head to 393 head.

Technology boosts supply

Technology is an important factor in supply. It has contributed greatly to the ability of producers to produce more with less. Genetic, nutrition, and animal health advances, to name a few, have improved animal performance. This can be seen in steer carcass weights that have risen 165 pounds or 22% from 1990 to 2021. Technology has lowered costs, so at each price producers offer more production for sale. Adoption of technology remains a prime factor shifting the supply curve rapidly outward, or limiting backward shifts.

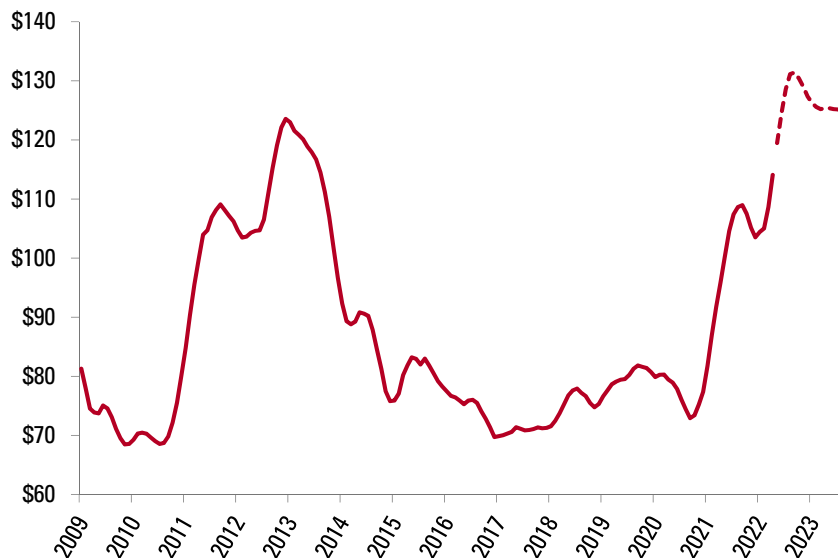
The price of inputs can also change the position of the supply curve. If the price of inputs declines, producers can generate more output with no change in the cost of production. Conversely, if input prices rise, producers may produce less to hold the line on production costs. For example, if the price of corn rises, producers will either feed less corn, or up their total expenditure on corn.

Feedlot cost of gain is projected to be 57% higher in 2022 than it was a mere two years ago in 2020 (Figure 3). Rising feed costs may affect cattle weights. As cattle weights rise, cattle eat more feed per pound of gain. Producers looking to minimize feed costs might sell at lower weights, which would reduce beef supplies. Producers would need to weigh this proposition against the increased revenue from selling cattle at higher prices.

Factor in prices of alternatives

The price of alternative products acts on supply in a way similar to how the price of substitutes and complements act on demand. In particular, if the price of a substitute product changes, producers may switch their production decisions. In crop production, this switch can be fairly pragmatic. For example, the Russian invasion of Ukraine is disrupting world wheat supplies, which may entice US farmers to grow more wheat and less corn. The reverse can be

Figure 3. Iowa feedlot estimated closeouts, Feeding costs per cwt, Yearling steers. Data Source: ISU Extension and Outreach Estimated Livestock Returns. \$/live cwt



the case, too. Many crops are at prices that compete for acres.

In animal agriculture, the switch isn't as simple. Switching from cattle to hogs, for example, is a completely different production system with different marketing considerations. Livestock producers do not switch, or add or subtract, enterprises based on changes in annual prices. These are multi-year, possibly multi-generation decisions.

Bottom line impact

Even after all production inputs have been employed random influences on beef supply continue. Weather is one. I think it was Drew Carey on *Whose Line Is It Anyway* that said, "Welcome to the Midwest, where the weather is unpredictable and the forecast doesn't matter."

Shifts in supply due to weather can be short-term such as severe winter weather that prevents travel, and may close

a packing plant or auction barn for a day or two and thereby shift the supply of cattle and beef. These shifts are typically balanced out in a matter of days or weeks depending on the disruption.

Building drought impacts and limited forage prospects have short- and long-term implications for supply. Initially, producers send more cows and heifers to slaughter which increases the beef supply. But this liquidation eventually leads to tighter supplies going forward.

If supply decreases and demand stays the same, the equilibrium price will rise. If supply decreases and demand increases, price will increase. If supply decreases and demand decreases, price could increase, it could decrease, or it could stay the same. What happens to price depends on how much supply and demand shifts.



Will an agricultural carbon market ever develop?

By Alejandro Plastina, extension economist, 515-294-6160 | plastina@iastate.edu

The focus of my 2021 Farm Foundation Agricultural Economics Fellowship was on agricultural carbon markets. Concurrently, I collaborated with a team of Iowa State University researchers tasked with assessing the science gaps that must be addressed to foster a viable carbon market in Iowa. The following article combines information from the [2022 Farm Foundation Issue Report](https://d2fxn1d7fsdeeo.cloudfront.net/farmfoundation.com/wp-content/uploads/2022/05/05134305/FAF9017-01_Ag-Econ_issue_v2FINAL.pdf), https://d2fxn1d7fsdeeo.cloudfront.net/farmfoundation.com/wp-content/uploads/2022/05/05134305/FAF9017-01_Ag-Econ_issue_v2FINAL.pdf, and the Iowa State University report, [Carbon Science for Carbon Markets: Emerging Opportunities in Iowa](https://store.extension.iastate.edu/product/16214), store.extension.iastate.edu/product/16214. It provides an overview of what I consider the most pressing challenges for agricultural carbon markets, and a few major steps to address them.

The rise of several carbon programs (such as Agoro Carbon, Bayer Carbon, Indigo Ag, Nori, and the Soil and Water Outcomes Fund), and companies that verify, buy and sell credits, is indicative of a strong corporate demand for agricultural carbon credits. However, there are no clear signals that the volume of agricultural credit generation is

increasing in a meaningful way, or that prices for agricultural carbon credits are increasing or can be expected to increase in the future. Uncertainty on the potential demand for carbon credits in the short and medium term increases perceived risks for farmers, who are typically required to sign multi-year contracts to enroll in carbon farming programs.

Since changing farming practices is costly to farmers, fair compensation will be needed to induce widespread participation in agricultural carbon programs. Not only would prices for carbon credits received by farmers have to cover all extra costs, but also provide a sufficient buffer to deal with multiple risks as described later.

The current lack of standards and proliferation of intrinsically different agricultural carbon programs results in the co-existence of various measuring, reporting, and verification (MRV) systems. Large fixed costs for the carbon farming industry and limited enrollment result in suboptimal scales of operations and large unit costs per agricultural carbon credit. In addition, farmers struggle to identify the most suitable carbon program for their own situation because it is

impossible to assess the relative number of carbon credits that one change in practices in one farm can generate across carbon programs.

Even after choosing a particular carbon program, farmers face high uncertainty in the projected volume of carbon credits that can be produced in their farms due to the coarseness of the estimates from existing models, which were developed to analyze regional rather than farm-level changes in carbon emissions. Since contracts are signed based on the projected volume of carbon credits, but paid on the actual volume of credits generated, uncertainty in projected volumes translates directly into uncertainty in revenues for farmers.

Additional uncertainty stems from the quantification of actual or realized carbon removal or emission avoidance, which can entail costly processes. On the one hand, soil tests can produce more accurate measurements than remote sensing, but they are cost-prohibitive on a large scale. On the other hand, remote sensing technologies could be less expensive but produce very uncertain estimates of actual changes in greenhouse gas (GHG) emissions at the farm-level scale. A lack of scientific consensus on the linkages between soil dynamics,

agricultural practices, and GHG dynamics at the farm level makes the coordination of multiple technologies to measure the actual production of carbon credits very challenging and can undermine the viability of an agricultural carbon market.

Carbon programs are currently dependent on angel investors and venture capital to finance their operations, and do not derive profits from selling carbon credits. Eventually, carbon programs will have to cover operating costs and generate profits from the sale of credits. That could generate sizable wedges between prices paid by consumers and prices received by farmers.

Finally, agriculture is one of many potential sources of carbon credits. Buyers will consider the quality, price, and availability of carbon credits from competing sources such as forestry, industrial carbon sequestration, and international agriculture when making purchase decisions. Strategic consideration of competition and market structure in the supply side of the market is necessary to foster an agricultural carbon market.

In order to address the challenges described here, efforts must be devoted to:

- Fill the science gaps generating uncertainty in the production of agricultural carbon credits.
- Increase the transparency of the carbon farming industry and improve the credibility of agricultural carbon credits to at least a level comparable to that of carbon credits from forestry and renewable energy.
- Develop and enforce minimum standards for carbon credits, promote economies of scale in the MRV system, and let the market define premiums and discounts with respect to the standard.
- Develop a suite of tools to manage production, price, and legal risks for participating farmers, including:
 - Templates with suggested language to add to contractual agreements to protect the balance of powers between carbon programs, farmers, and credit buyers.
 - Insurance policies for agricultural carbon production. Hybrid compensation systems with a minimum payment to enhance program participation plus performance-based premiums.
 - Protocols for stacking payments from carbon programs (focused on GHGs), and environmental services beyond carbon (water quality and quantity, biodiversity, etc.).
 - Protocols for non-additional practices, since eventually all practices considered additional today will become the norm and therefore non-additional at the end of carbon farming contracts.

More information is available at [Carbon and Greenhouse Gas Research and Resources](https://card.iastate.edu/climate), card.iastate.edu/climate, and [Current Issues](https://go.iastate.edu/BTGKOP), <https://go.iastate.edu/BTGKOP>



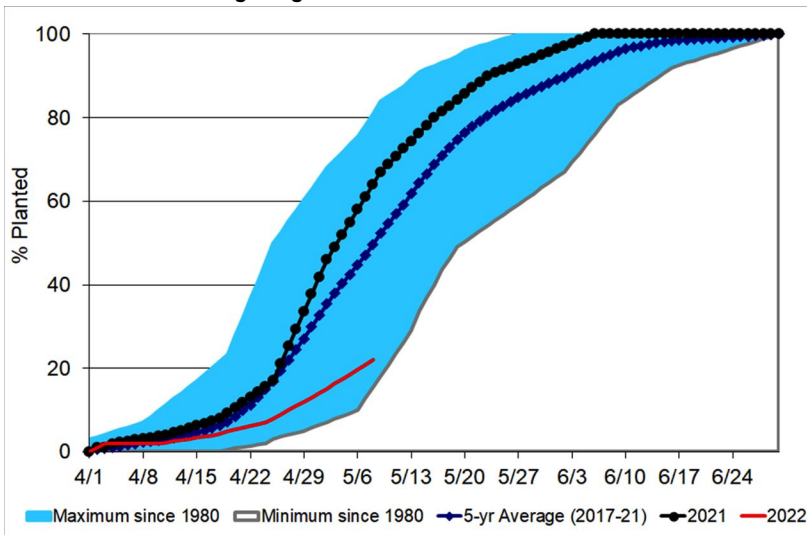
Early adjustments

By Chad Hart, extension crop market economist
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The May World Ag Supply and Demand Estimates (WASDE) report always provides the first major update for the corn and soybean crops once planting begins, as the data for the new crop year is not added to the tables until May. This year, there are several factors greatly influencing the potential supply and demand for the crops, which have made USDA's job more challenging and heightened the trade's interest in the early numbers. Typically, with the May report, USDA sticks with the acreage estimates from the March Prospective Plantings report and the trend yield released at the Ag Outlook Forum in February. Thus, the May report is mostly about the usage projection changes since the Ag Outlook Forum, as the supply adjustments are well telegraphed. However, this year is not a typical year.

The first major shift was a downgrade in the national projected corn yield due to the delayed planting thus far. At the Ag Outlook Forum in February, USDA announced a weather-adjusted trend yield of 181 bushels per acre for corn. In the May WASDE, that yield slipped to 177 bushels per acre. The four bushel drop is based on the significant delays seen in planting across the nation, mainly being driven by wet conditions in the Corn Belt and

Figure 1. US Corn Planting Progress. Source: USDA-NASS.



Northern Plains, despite the continuing drought in the West. As of May 8, 22% of the US corn crop was planted. That is 28% behind the five-year average (typically by May 8, half of the corn crop is planted) and 42% behind last year. Since 1980, only four years recorded slower planting progress, 1983, 1984, 1993, and 2013. In all four of those years, the final national yield fell below trend. Given this data and the potential for more precipitation throughout the rest of the month, USDA made the early adjustment to corn yields. This change in yield takes roughly 325 million bushels off of expected production.

While corn did see additional supply adjustments, soybeans held to the normal pattern with the yield remaining at the Ag Outlook Forum number of 51.5 bushels per acre. Soybean

planting has also been delayed by the soggy conditions, but the gap is less pronounced. As of May 8, 12% of the US soybean crop has been planted. That is 12% behind the five-year average and 19% behind last year. The five "most similar" years in terms of planting progress up to this point are: 2002, 2003, 2007, 2009, and 2014. The national yield was below trend in three of those years and above in the other two, providing USDA some support to stay with their trend yield.

The second major update impacted the global balance as USDA updated its global production numbers, including those for Ukraine. Despite the war in the country, Ukrainian farmers are forging ahead with spring planting. The war and occupation are impacting some major production areas, but official Ukrainian reports

and satellite imagery shows significant movement in crop fields. Figure 3 displays USDA's updated projections for three of Ukraine's major crops: sunflower, wheat, and corn. The vast majority of Ukraine's wheat crop was planted last fall, so the reduction is due to the combination of winter weather and the military advances across the fields. The sunflower and corn crops are being planted now, so the reductions reflect the loss of plantings due to the war. As the graphic shows, Ukrainian production will be down 35-55% this coming year, further tightening global supplies in these markets and supporting a continued reliance on US supplies for exports.

These data changes led to some significant shifts in the crop balance sheets. The corn projections in February pointed to an over 15 billion bushel corn crop. The May numbers come in with production just below 14.5 billion bushels (Table 1). The 780 million bushel decline in expected production has been offset by some sizable cuts in corn usage. Comparing the 2022 estimates to the 2021 estimates, feed and residual usage is down 275 million bushels and exports are off by 100 million, while ethanol usage is steady. Compared to the Ag Outlook Forum estimates, feed and residual usage is down 300 million bushels and ethanol is down 25 million, while exports are up 50 million. The war in Ukraine is creating a few more opportunities for exports, despite higher prices. The price run that

Figure 2. US Soybean Planting Progress. Source: USDA-NASS.

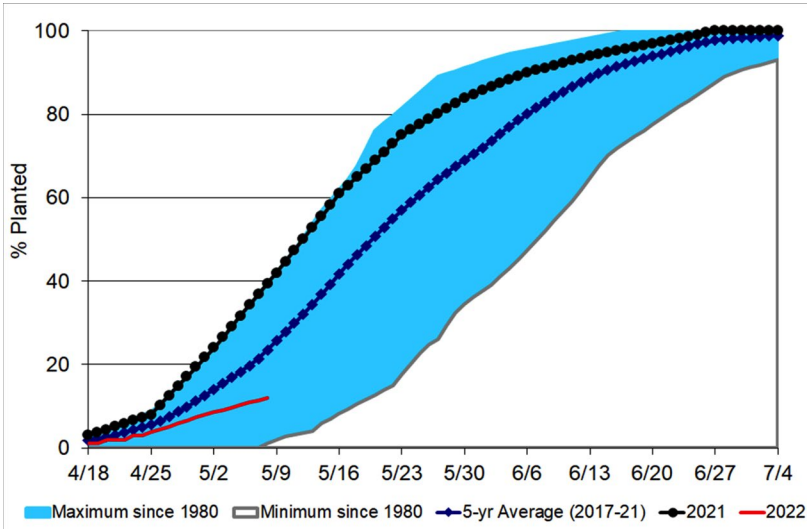
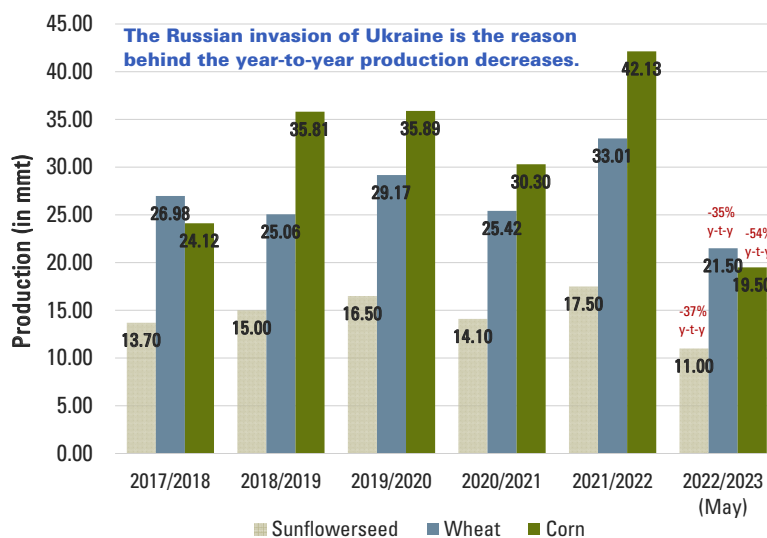


Figure 3. Projected Ukrainian Production. Source: USDA-WAQB.



started in the summer of 2020 continues to pressure USDA to raise its season-average price estimates. For the 2021 crop, the current season-average price estimate is \$5.90 per bushel, up 45 cents over the past three months. But the sharpest price increase is for the 2022 crop. At the Ag Outlook Forum, the estimate was \$5 per bushel. Now, it's \$6.75, with the futures market pointing even higher.

For soybeans (Table 2), the price outlook is similar, but the pathway there was vastly different. Exports from the 2021 crop continue to exceed expectations, leading to smaller ending stocks. While the 2021-22 season-average price estimate has not moved from \$13.25 per bushel over the past few months, the price is \$2.45 higher than the previous year. The acreage that moved away from corn in 2022 landed in soybeans. The shift added roughly 150 million bushels to projected production. But usage remains strong. Compared to 2021, domestic crush is up 40 million bushels and exports are up 60 million. Compared to the Ag Outlook Forum numbers, domestic

Table 1. US Corn Supply and Usage. Source: USDA-WAOB.

Marketing Year (2021 = 9/1/21 to 8/31/22)		2018	2019	2020	2021	2022
Area Planted	(million acres)	88.9	89.7	90.7	93.4	89.5
Yield	(bushels/acre)	176.4	167.5	171.4	177.0	177.0
Production	(million bushels)	14,340	13,620	14,111	15,115	14,460
Beginning Stocks	(million bushels)	2,140	2,221	1,919	1,235	1,440
Imports	(million bushels)	28	42	24	25	25
Total Supply	(million bushels)	16,509	15,883	16,055	16,375	15,925
Feed and Residual	(million bushels)	5,429	5,900	5,598	5,625	5,350
Ethanol	(million bushels)	5,378	4,857	5,033	5,375	5,375
Food, Seed, and Other	(million bushels)	1,425	1,429	1,437	1,435	1,440
Exports	(million bushels)	2,066	1,777	2,753	2,500	2,400
Total Use	(million bushels)	14,288	13,963	14,821	14,935	14,565
Ending Stocks	(million bushels)	2,221	1,919	1,235	1,440	1,360
Season-Average Price	(\$/bushels)	3.61	3.56	4.53	5.90	6.75

Table 2. US Soybean Supply and Usage (Source: USDA-WAOB).

Marketing Year (2021 = 9/1/21 to 8/31/22)		2018	2019	2020	2021	2022
Area Planted	(million acres)	89.2	76.1	83.4	87.2	91.0
Yield	(bushels/acre)	50.6	47.4	51.0	51.4	51.5
Production	(million bushels)	4,428	3,552	4,216	4,435	4,640
Beginning Stocks	(million bushels)	438	909	525	257	235
Imports	(million bushels)	14	15	20	15	15
Total Supply	(million bushels)	4,880	4,476	4,761	4,707	4,890
Crush	(million bushels)	2,092	2,165	2,141	2,215	2,255
Seed and Residual	(million bushels)	127	108	102	118	125
Exports	(million bushels)	1,752	1,679	2,261	2,140	2,200
Total Use	(million bushels)	3,971	3,952	4,504	4,472	4,580
Ending Stocks	(million bushels)	909	525	257	235	310
Season-Average Price	(\$/bushels)	8.48	8.57	10.80	13.25	14.40

crush is up 5 million and exports are up 50 million. The export growth is somewhat surprising given the jump in the season-average price estimate for 2022 to \$14.40 per bushel, up \$1.65 from February. However, the limited supplies of vegetable oils, especially sunflower oil from Ukraine, are supporting additional exports from the US. The futures markets have been fairly bullish on the outlook for 2022, as futures-based season-average price estimates have

been building over the course of the year. As of May 15, futures-based estimates were over \$7 per bushel for corn and over \$14.50 per bushel for soybeans. Producers are staring at some of the best prices they have ever seen for harvest delivery, which helps allay the pressures of higher input costs. Corn futures will be highly sensitive to supply concerns right now, with planting progress over the next couple of weeks being the key statistic, looking for the potential for additional cuts in yield.

Soybean futures, on the other hand, will be more responsive to usage concerns. Over the past few years, the export swings in China have dominated the market. While the outlook is for growth, concerns about COVID shutdowns in China have created some volatility in the past few weeks.

Listen to the [May 2022 Crop Market Outlook video](https://youtu.be/2l3ewm9Mdzg), <https://youtu.be/2l3ewm9Mdzg>, for further insight on outlook for this month.



Is the sun causing the earth to warm?

By Don Hofstrand, retired agricultural business specialist

Reviewed by Eugene Takle, retired professor emeritus, Iowa State University

This article is part of our series focused on the causes and consequences of a warming planet.

Is the sun causing the earth to warm? It would seem logical. The sun is the fundamental source of energy that creates heat on our planet. An increase or decrease in the sun's output could cause the earth's temperature to rise or fall.

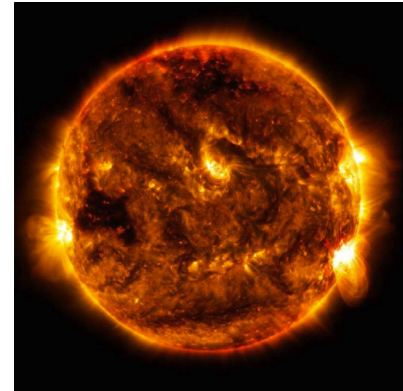
Scientists believe that changes in the sun's output may have impacted the earth's temperature in the past. For example, studies have found that a decrease in solar output is likely to have caused the Little Ice Age between 1650 and 1850.

But studies of the current warming trend have found no similar relationship. The sun's energy, received at the top

of earth's atmosphere, has followed a natural 11-year cycle of small ups and downs but with no long-term net increase or decrease. By comparison, global temperature has risen significantly.

Moreover, if the warming of the earth is caused by an increase in the output of the sun, then the entire atmosphere should be warming. This would include the lower atmosphere (troposphere) as well as the upper atmosphere (stratosphere). However, scientific studies have found that, while the lower atmosphere is warming, the upper atmosphere is actually cooling.

This phenomenon indicates that more heat is being trapped in the lower atmosphere and less heat is reaching the



Source: NASA's Solar Dynamics Observatory

upper atmosphere. So, today's warming is not caused by more heat overall but more heat being trapped next to the earth's surface. Hence, the greenhouse effect is causing the warming.

See the [Ag Decision Maker website](https://www.extension.iastate.edu/agdm/energy.html#climate), [extension.iastate.edu/agdm/energy.html#climate](https://www.extension.iastate.edu/agdm/energy.html#climate), for more from this series.

Ag Decision Maker is written by extension ag economists and compiled by Ann Johanns, extension program specialist, aholste@iastate.edu.

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