

# Ag Decision Maker

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## UPDATES

The following [Information Files](#) have been updated on [extension.iastate.edu/agdm](http://extension.iastate.edu/agdm):

C1-10 Iowa Farm Costs and Returns

C1-12 Liquidity Analysis of Iowa Farms: Record Net Farm Revenues Provide Cushion Against Market Risks

C2-11 Historical County Cropland Rental Rates

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

A1-10 Chad Hart's Latest Ag Outlook

A1-85 Corn Profitability

A1-86 Soybean Profitability

A2-11 Iowa Cash Corn and Soybean Prices

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D1-10 Ethanol Profitability

D1-15 Biodiesel Profitability



## Returns to farmland ownership in Iowa

By William Edwards, retired extension economist, Don Hofstrand, retired extension agriculture business specialist, Ann Johanns, extension program specialist, 515-337-2766 | [aholste@iastate.edu](mailto:aholste@iastate.edu)

Discussions frequently occur about owning Iowa farmland as an investment, and what the annual returns to land ownership have been over time. The returns can come in two forms: cash returns through rents and changes in equity through the rise and fall in market values. Total farmland return is the sum of these two.

The source of data for cash rents and farmland market values in the following analysis is the [USDA National Agricultural Statistics Service \(NASS\) data series](#), [www.nass.usda.gov/Statistics\\_by\\_State/Iowa/index.php](http://www.nass.usda.gov/Statistics_by_State/Iowa/index.php), data series for statewide whole farm rents and farmland market values in Iowa. Data in this series differ slightly from the Iowa State University Extension and Outreach cash rent and land value surveys.

### Cash returns

Whole farm cash rental rates are used to estimate the cash returns to farmland for each year. The rate of cash return (percent) is computed by dividing the

cash rental rate by the farmland market value in the same year.

The rates of cash return do not take into consideration land ownership costs such as property taxes, land improvements, conservation investments, liability insurance, or returns from farm production. These land ownership costs typically reduce the net returns to farmland by one to two percentage points.

### Increase (decrease) in value

The other form of return is the annual increase or decrease in the market value of farmland. This increase or decrease is computed as a percentage change in value from one year to the next.

### Results over the entire period

**Cash returns** - As shown in Table 1 and Figure 1 cash rental rates have generally trended up over the period. However, cash rental rates as a percentage of farmland market value have trended down. Rent as a percent



of land value averaged 7.7% in the first half of the data series (1970-1995), but only 4.4% during the 1996-2021 period. Since 2010, rent as a percent of land value has been steady, ranging from 3.0% to 3.9%. The average cash return over the entire period from 1970 to 2021 was 6.1%.

### Farmland market value

**change** - The returns due to changes in farmland market values have been much more volatile, especially in the early portion of the years analyzed. The annual percent change in farmland market value has ranged from a high of 36.8% in 1977 to a low of negative 28.1% in 1985. In the second half of the series, the highest annual percentage change was in 2011, at 24.4%. The low was in 2015, at negative 7.8%. Over the entire period, market value of farmland increased by an average of 6.7% per year. Note that the increase in farmland market value can only be financially realized if the land is sold.

**Total farmland returns** - The total return (annual cash return plus change in land value) averaged 12.7% per year. The boom and bust periods of the 1970s and 1980s still hold as the peak and valley in terms of percentage changes. The highest percent increase was in 1977, at 43.1%, while the biggest decrease of -19.1% came in 1985. The average total return from 2016 to 2020 was 1.5%, as land values declined from the record highs in 2013-2015. This trend changed course in 2021 with a 12.5% total return to land, very similar to the average over the entire period.

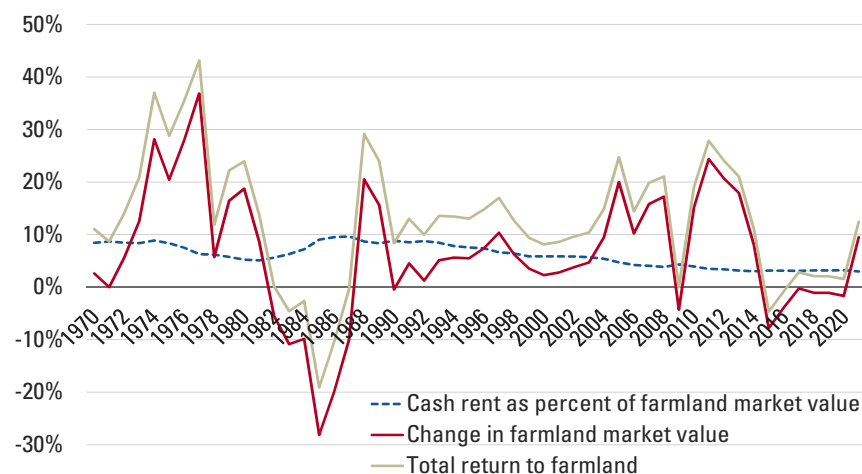
Figure 1 shows the volatility of the average returns from owning Iowa farmland since 1970. Rates of return have varied greatly during specific time periods.

### Returns adjusted for inflation

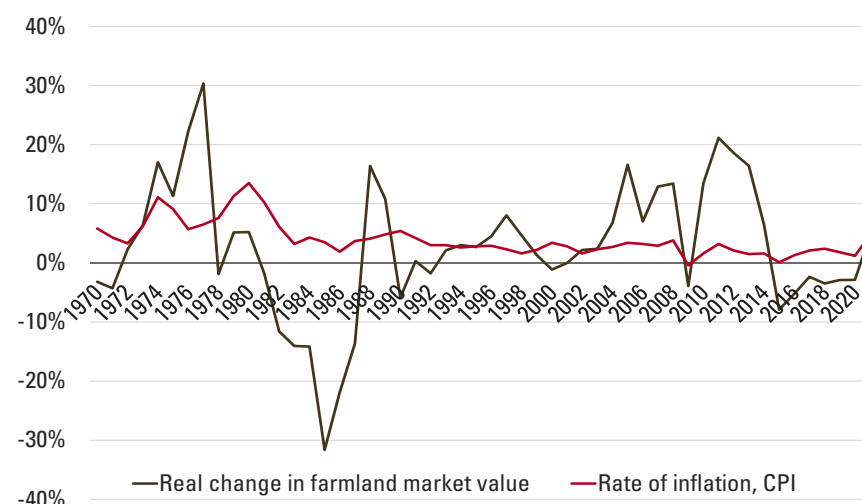
Like other prices, farmland values are affected by the rate of inflation in the United States economy. A “real” rate of return can be calculated by subtracting the change in the Consumer Price Index (CPI), a common measure of inflation, from the change in the average Iowa farmland market value each year. Table 2 shows these values from 1970 to 2021, based on the USDA NASS data series. Real changes in farmland values can be caused by factors such as rising or falling crop prices, changes in the cost of production inputs, improved production potential due to new technologies, and trends in weather patterns.

Figure 2 shows that during the 1970s the rate of inflation in the United States ranged from 5-13%. This, coupled with sharply higher grain prices, caused farmland values to soar. In the early 1980s,

**Figure 1. Returns to farmland ownership in Iowa**



**Figure 2. Real change in Iowa farmland values (adjusted for inflation)**



**Table 1. Returns to Iowa farmland ownership per year (per acre).**

	Year	Whole farm cash rent, \$/acre	Farmland market value, \$/acre	Cash rent as percent of farmland market value	Percentage change in farmland market value	Total percentage return to farmland
Farm boom	1970	\$33	\$392	8.4%	2.6%	11.0%
	1971	34	392	8.7%	0.0%	8.7%
	1972	35	414	8.5%	5.6%	14.1%
	1973	39	466	8.4%	12.6%	20.9%
	1974	53	597	8.9%	28.1%	37.0%
	1975	60	719	8.3%	20.4%	28.8%
	1976	69	920	7.5%	28.0%	35.5%
	1977	79	1,259	6.3%	36.8%	43.1%
	1978	82	1,331	6.2%	5.7%	11.9%
	1979	89	1,550	5.7%	16.5%	22.2%
	1980	96	1,840	5.2%	18.7%	23.9%
Farm crisis	1981	102	1,999	5.1%	8.6%	13.7%
	1982	106	1,889	5.6%	-5.5%	0.1%
	1983	106	1,684	6.3%	-10.9%	-4.6%
	1984	109	1,518	7.2%	-9.9%	-2.7%
	1985	98	1,091	9.0%	-28.1%	-19.1%
	1986	83	873	9.5%	-20.0%	-10.5%
Recovery	1987	76	786	9.6%	-10.0%	-0.3%
	1988	82	947	8.7%	20.5%	29.2%
	1989	91	1,095	8.3%	15.6%	24.0%
	1990	96	1,090	8.8%	-0.5%	8.4%
	1991	97	1,139	8.5%	4.5%	13.0%
	1992	101	1,153	8.8%	1.2%	10.0%
	1993	102	1,212	8.4%	5.1%	13.5%
	1994	100	1,280	7.8%	5.6%	13.4%
	1995	102	1,350	7.6%	5.5%	13.0%
	1996	107	1,450	7.4%	7.4%	14.8%
	1997	106	1,600	6.6%	10.3%	17.0%
	1998	109	1,700	6.4%	6.3%	12.7%
	1999	103	1,760	5.8%	3.5%	9.4%
	2000	105	1,800	5.8%	2.3%	8.1%
	2001	108	1,850	5.8%	2.8%	8.6%
Ethanol boom	2002	112	1,920	5.8%	3.8%	9.6%
	2003	114	2,010	5.7%	4.7%	10.4%
	2004	119	2,200	5.4%	9.5%	14.9%
	2005	124	2,640	4.7%	20.0%	24.7%
	2006	122	2,910	4.2%	10.2%	14.4%
	2007	136	3,370	4.0%	15.8%	19.8%
	2008	152	3,950	3.8%	17.2%	21.1%
	2009	163	3,780	4.3%	-4.3%	0.0%
	2010	170	4,350	3.9%	15.1%	19.0%
Stable period	2011	187	5,410	3.5%	24.4%	27.8%
	2012	222	6,530	3.4%	20.7%	24.1%
	2013	242	7,700	3.1%	17.9%	21.1%
	2014	250	8,320	3.0%	8.1%	11.1%
	2015	242	7,670	3.2%	-7.8%	-4.7%
	2016	229	7,370	3.1%	-3.9%	-0.8%
	2017	228	7,350	3.1%	-0.3%	2.8%
	2018	230	7,270	3.2%	-1.1%	2.1%
Current	2019	227	7,190	3.2%	-1.1%	2.1%
	2020	226	7,070	3.2%	-1.7%	1.5%
Average	2021	230	7,740	3.0%	9.5%	12.5%
		\$124	\$2,806	6.1%	6.7%	12.7%

Source: USDA National Agricultural Statistics Service

Beginning in 1999, cash rental rates are averages of cropland and pasture rents.

the Federal Reserve Board curbed inflation by raising interest rates. Many farmland purchases had been made with variable rate financing, and loan servicing requirements rose rapidly. The combination of forced land sales, lower general inflation and several years of unfavorable production weather caused farmland values to decline rapidly, resulting in negative real changes in farmland values from 1981 through 1987. During the ethanol boom of 2004 through 2013, real values rose by double digit percentages in seven out of 10 years. This was followed by a retrenchment period in which real changes were negative for six consecutive years.

Over the entire period of 1970 through 2021, the nominal farmland values changed by an annual average of 6.7%. However, the average annual rate of inflation was 4.0%, leaving a real change in farmland values of 2.7%. Combining this with the 6.1% average return from cash rent gives an average annual total return to farmland ownership of 8.8%, adjusted for inflation, which compares favorably with many alternative investments.

## Results by financial period

Figure 1 illustrates the volatility of the average returns from owning Iowa farmland since 1970. Rates of return have varied greatly during specific time periods. The rates of return for six specific time periods are shown in Table 3. These include the farm boom period, farm crisis period, recovery period, ethanol boom period, the stable period and the current period.

**Farmland boom period** - During the farmland boom period of 1970 through 1981, farmland values increased rapidly (15.3% on average), providing an average total return of 22.6%.

**Table 2. Real changes in farmland market values per year, %.**

Year	Change in farmland market value	Rate of inflation, CPI	Real change in farmland market value
1970	2.6%	5.8%	-3.2%
1971	0.0%	4.3%	-4.3%
1972	5.6%	3.3%	2.3%
1973	12.6%	6.2%	6.4%
1974	28.1%	11.1%	17.0%
1975	20.4%	9.1%	11.3%
1976	28.0%	5.7%	22.3%
1977	36.8%	6.5%	30.3%
1978	5.7%	7.6%	-1.9%
1979	16.5%	11.3%	5.2%
1980	18.7%	13.5%	5.2%
1981	8.6%	10.3%	-1.7%
1982	-5.5%	6.1%	-11.6%
1983	-10.9%	3.2%	-14.1%
1984	-9.9%	4.3%	-14.2%
1985	-28.1%	3.5%	-31.6%
1986	-20.0%	1.9%	-21.9%
1987	-10.0%	3.7%	-13.7%
1988	20.5%	4.1%	16.4%
1989	15.6%	4.8%	10.8%
1990	-0.5%	5.4%	-5.9%
1991	4.5%	4.2%	0.3%
1992	1.2%	3.0%	-1.8%
1993	5.1%	3.0%	2.1%
1994	5.6%	2.6%	3.0%
1995	5.5%	2.8%	2.7%
1996	7.4%	2.9%	4.5%
1997	10.3%	2.3%	8.0%
1998	6.3%	1.6%	4.7%
1999	3.5%	2.2%	1.3%
2000	2.3%	3.4%	-1.1%
2001	2.8%	2.8%	0.0%
2002	3.8%	1.6%	2.2%
2003	4.7%	2.3%	2.4%
2004	9.5%	2.7%	6.8%
2005	20.0%	3.4%	16.6%
2006	10.2%	3.2%	7.0%
2007	15.8%	2.9%	12.9%
2008	17.2%	3.8%	13.4%
2009	-4.3%	-0.4%	-3.9%
2010	15.1%	1.6%	13.5%
2011	24.4%	3.2%	21.2%
2012	20.7%	2.1%	18.6%
2013	17.9%	1.5%	16.4%
2014	8.1%	1.6%	6.5%
2015	-7.8%	0.1%	-7.9%
2016	-3.9%	1.3%	-5.2%
2017	-0.3%	2.1%	-2.4%
2018	-1.1%	2.4%	-3.5%
2019	-1.1%	1.8%	-2.9%
2020	-1.7%	1.2%	-2.9%
2021	9.5%	4.7%	4.8%
Average	6.7%	4.0%	2.7%

Cash rental rates and farmland market values for the decade before 1970 were very stable but started their rapid rise in 1973 when grain shortages and increased export sales pushed prices to very high levels. High rates of inflation in the general US economy also contributed to rising agricultural prices and land values.

**Farm crisis period** – During the farm financial crisis years of 1982 through 1987, crop prices declined and interest rates rose significantly. The market value of farmland declined rapidly – an average of 14.0% per year. Cash returns as a percent of land values actually increased during this period because land values dropped faster than rental rates. However, the farmland market value declines more than offset cash rent returns, and the average total return was a negative 6.2%.

**Recovery period** – From 1988 to 2003, farmland market values and cash rental rates were less volatile and resumed their upward trend, although at a slower rate than during the boom period. The average total rate of return during this period was 13.4%, similar to the average over the entire period from 1970 to 2021.

**Ethanol boom period** – From the beginning of the ethanol boom period of 2004 to 2013, farmland market values and cash rental rates increased rapidly, including a “mini-boom” from 2011 to 2013. Farmland market value increased an average of 14.6% per year over this period. Because farmland values increased faster than cash rental rates,

**Table 3. Returns to Iowa farmland by time period.**

Time period	Cash rent as percent of farmland market value	Percentage change in farmland market value	Total percentage return
Farm boom -- 1970-1981	7.3%	15.3%	22.6%
Farm crisis -- 1982-1987	7.9%	-14.0%	-6.2%
Recovery -- 1988-2003	7.3%	6.2%	13.4%
Ethanol boom -- 2004-2013	4.0%	14.6%	18.7%
Stable -- 2014-2020	3.1%	-1.1%	2.0%
Current -- 2021	3.0%	9.5%	12.5%
First half -- 1970-1995	7.7%	6.0%	13.8%
Second half -- 1996-2021	4.4%	7.3%	11.7%
Entire period -- 1970-2021	6.1%	6.7%	12.7%

cash rental rates as a percent of farmland value dropped to an average of only 4.0%. Total returns averaged 18.7% annually.

**Stable period** – From 2014 to 2020, farmland market values and cash rental rates stabilized somewhat compared to previous periods. Following the ethanol boom period, farmland market value declined for six straight years, though only moderately after 2016. Cash rent as a percent of market value was the lowest it has been over the entire time frame, averaging just 3.1% during the seven-year period. However, interest rates in general in the United States were under 5% during this period, still making farmland an attractive investment. Land values declined at a yearly average rate of 1.1%, making the average total return for this time period 2.0%.

**Current period** – Tight supply and demand conditions for the major grains and oilseeds resulted in sharp price increases in 2021. These were quickly bid into farmland sales, causing a rise of 9.5% in the average land value. Preliminary signs point to this trend accelerating in

2022. The average cash rental rate reported in 2021 showed only a modest increase, but a continued upward adjustment is expected for 2022, fueled by tight grain supplies resulting in even higher grain and oilseed prices worldwide.

**Entire period** – From 1970 to the present time, farmland has yielded an average annual return of 12.7%, of which farmland market value increases accounted for 6.7% and cash rental rates 6.1%.

### Results by farmland purchase date

Long-term rates of return on farmland investments can vary greatly, depending on when the farmland was purchased. In Table 4, farmland is assumed to be purchased at five different time-periods: the beginning of the boom period (1970), the beginning of the crisis period (1982), the beginning of the recovery period (1988), the beginning of the ethanol boom (2004), and the beginning of the stable period (2014). The rates of return for each of these five investment periods are shown in Table 4.



**Beginning of the farm boom period (1970 to 2021)** – A typical Iowa farmland purchase price in 1970 would have been \$392 per acre. The value of the farmland 51 years later, in 2021, was \$7,740, for an increase of 1,874% or 37% per year. The average gross cash rent return over the period was 32%. This was computed by dividing the cash rental rate for each year by the 1970 original purchase price of \$392. The return ranged from 8% in the year of purchase in 1970 to a high of 64% in 2014.

**Beginning of the farm crisis period (1982 to 2021)** – The average farmland purchase in 1982 was \$1,889 per acre. The value 39 years later in 2021 was 310% higher than the 1981 value, for an average increase of 8% per year. The average cash rent rate of return over the period was also 8%. The highest cash rental rate of return was 13%, in 2014, when cash rental rates averaged \$250 per acre.

**Beginning of the recovery period (1988 to 2021)** – In 1988, the average farmland market value was \$947 per acre. The market value in 2021, 33 years

later, was \$7,740, for an increase of 717% or 22% per year. The average cash rental rate of return over the period was 16%.

**Beginning of ethanol boom period (2004 to 2021)** – The rapid expansion of the corn ethanol industry beginning around 2004 pushed both farmland market values and cash rental rates upward. The average market value of a farmland purchase in 2004 was \$2,200. The value in 2021, 17 years later increased 252% or 15% per year. The average cash rental rate of return over the period was 9%.

**Stable period (2014 to 2021)** – Contrary to every other period shown, the stable period shows why timing and length of investment in farmland are crucial factors. In 2014, the average acre of Iowa farmland was valued at \$8,320 per acre. The value seven years later was \$7,740, for a decrease of 7%, or negative 1.0% per year. Average gross cash returns over the period were much lower than in the other time frames, at 3%.

**Current Period (2021)** – We are only a little over one year into the current period, but it appears

to be a period of higher farmland market values and cash rental rates.

### Summary

Over the years, investments in farmland have yielded a very competitive rate of return. However, just over half of the returns have come from appreciation in land values, which can be highly unpredictable, and are realized only from the sale of the investment. Moreover, when investments are liquidated, gains in value may be diminished by tax obligations.

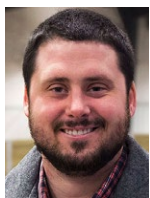
Next month's AgDM newsletter will include an article focused on how the returns from an investment in Iowa farmland at various points in time compare to an investment in the stock market. The last version of this analysis can be found in the [Ag Decision Maker newsletter archives](http://www.extension.iastate.edu/agdm/articles/zhang/ZhaJul19.html), [www.extension.iastate.edu/agdm/articles/zhang/ZhaJul19.html](http://www.extension.iastate.edu/agdm/articles/zhang/ZhaJul19.html).

Note: This article is an update of previous versions, which appeared in the May 2010 and June 2018 Ag Decision Maker Newsletters.

**Table 4. Returns to farmland ownership in Iowa by purchase date.**

Ownership period	Initial farmland market value	2021 farmland market value	Percent change in farmland market value	Average change per year	Average cash rent as percent of initial farmland market value <sup>1</sup>
Beginning of boom period to present (1970 - 2021)	\$392	\$7,740	1874%	37%	32%
Beginning of crisis period to present (1982 - 2021)	1,889	7,740	310%	8%	8%
Beginning of recovery period to present (1988 - 2021)	947	7,740	717%	22%	16%
Beginning of ethanol boom to present (2004 - 2021)	2,200	7,740	252%	15%	9%
Beginning of stable period to present (2014 - 2021)	8,320	7,740	-7%	-1%	3%

<sup>1</sup> The cash return per year is computed by dividing the cash rental rate for each year by the initial farmland market value.



## Many factors could support, derail cattle inventory trends

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USDA's Cattle inventory report showed Iowa's cattle herd grew more than 4% in 2021. Iowa bucked the national trend. The US all cattle and calves inventory shrank 2%.

Iowa's inventory of beef cows, milk cows, bulls, replacement heifers, and other steers and heifers on January 1, 2022 totaled 3.85 million head. That was up 150,000 head from January 1, 2021.

A 65,000 head surge in Iowa beef cows drove the total Iowa inventory higher. Iowa boasts 3.1% of the nation's beef cows. This is up from 2.8% a year earlier.

### Expansion drivers

Producers have many ways to boost beef cow numbers. Some are retaining additional heifers from within the herd, culling fewer cows than typical, and buying breeding stock. Producers can grow herds faster by buying bred females. With this, some relocation of beef cows can occur.

Deciding whether to expand cow herds is more challenging and more complicated. A few considerations include availability of pasture and price of feedstuffs, land values and rental rates, expected cattle prices, herd productivity, and personal reasons. Some of these take more precedent than others

in some places and in some years. The old adage of "Ya gotta feed 'um to breed 'um" rings true.

Predicting aggregate cattle inventory numbers and potential price changes is complex. Many micro-decisions by many individual producers result in aggregate impacts.

### Iowa ducks drought impact

States south and west of Iowa saw large reductions in beef cow inventories from January 1, 2021 to January 1, 2022. South Dakota lost 189,000 beef cows. Missouri had 94,000 head fewer. Nebraska dipped 48,000 beef cows. North Dakota lost 20,000 beef cows. At the same time Iowa and Minnesota added 65,000 and 25,000 beef cows, respectively.

Certainly, drought contributed to falling beef cow numbers in some states. December 1, 2021 hay stocks in North and South Dakota were down 43% from a year earlier. On the other hand, Iowa's December 1, 2021 hay stock was up 28% year over year. And, even with much higher cattle inventories in Iowa in 2022, Iowa's May 1, 2022 hay stock was 67% above May 1, 2021 and the highest since 2009.

### Multiple sources of growth

All told, the data and circumstances suggest that

Iowa is growing the beef cow herd from within as well as because of what other states have had to do. The target population for the January Cattle inventory survey conducted by USDA's National Agricultural Statistics Service is all agricultural establishments with one or more head of cattle on the land operated. So they are asking producers, "How many beef cows do you have at your location regardless of ownership?"

Stories abound of ranches elsewhere forced to sell off parts of their herds because of drought. Some cows went to an exceptionally strong cull cow market. Others went to where pastures hadn't dried up. Some producers paid to place cows on other farms that had forage.

Pasture availability drives regional differences within Iowa. Iowa's South Central District (Appanoose, Clarke, Decatur, Lucas, Madison, Marion, Monroe, Ringgold, Union, Warren, and Wayne) has 16.0% of the state's beef cow herd (Figure 1). Iowa's North Central District (Butler, Cerro Gordo, Floyd, Franklin, Hancock, Humboldt, Kossuth, Mitchell, Winnebago, Worth, and Wright) has just 2.7% of Iowa's beef cows.

### Competition for grazing could rise

Lack of snow cover in Iowa last December allowed livestock to continue grazing on corn stalks. Little supplemental hay was needed. This helped boost beef cow stocking capacity in Iowa and helped hold down costs.

The 2017 Census of Agriculture recorded 2,360,349 acres of pastureland in Iowa (Figure 2). That works out to about 2.6 acres per cow-calf pair.

If producers keep growing Iowa beef cow numbers, pasture acres per cow would drop. Iowa cow-calf producers would become more vulnerable to weather challenges, such as drought. Even if weather cooperates some producers may trim use of high-priced fertilizer, which could lower stocking rates and cows per acre.

High crop prices always have potential to rob land from cattle. Changing from cattle to crop production can occur in one season. The reverse is harder and takes more time.

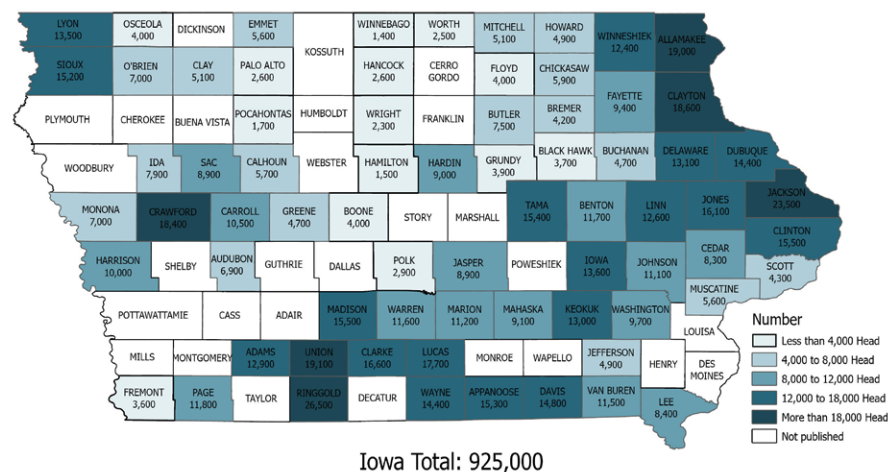
Ultimately, cattle need land. Land is a precious and pricey commodity.

### Iowa has some big beef cattle counties

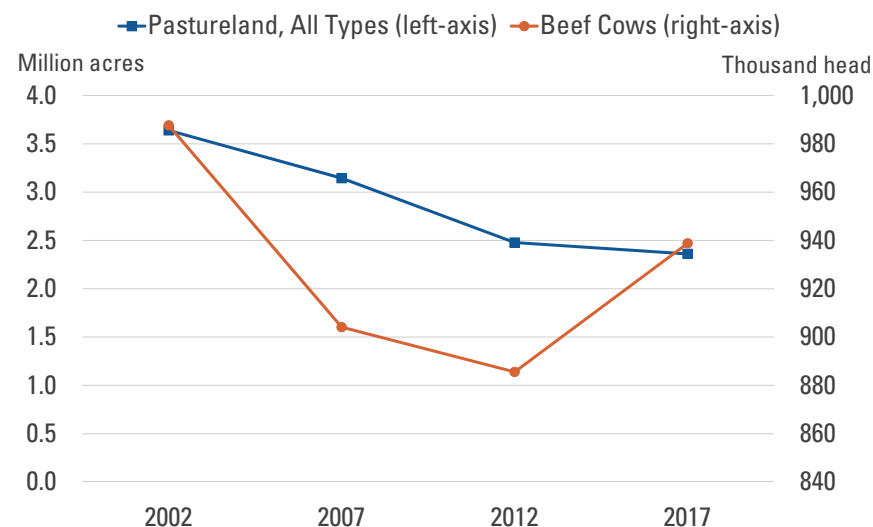
USDA's National Agricultural Statistics Service recently released its January 1, 2022 county-level estimates of all cattle and calves, beef cows that have calved, and milk cows that have calved.

Iowa ranks tenth in beef cow inventory. Seven Iowa counties make the top-100 list of America's

**Figure 1. Beef cows that have calved, January 1, 2022. Data source: USDA-NASS. Not published: Information withheld to avoid disclosing data for individual operations.**



**Figure 2. Iowa pastureland and beef cow inventory. Data source: USDA-NASS, Census of Agriculture.**



leading beef cow counties. Ranking number 64 is Ringgold County with 26,500 beef cows. Ringgold County is tied with eight counties spanning from California to two counties in Nebraska, two counties in Oklahoma, and one county in Oregon, Tennessee, and Texas. The list has many ties. Jackson County is tied for 70th with 23,500 beef cows. Union (T-85), Allamakee (T-86), Clayton (T-89), Crawford (T-91), and Lucas (T-98) round out the top-100 list.

Iowa's 3.85 million cattle and calves make Iowa the seventh-largest state by total cattle inventory. While Iowa is home to just 4.2% of the nation's cattle, Iowa boasts four of the top-50 total cattle inventory counties. The size of the cattle feeding industry is a driver of the all cattle and calves inventory. This is especially the case in Iowa where 30% of the total cattle inventory on January 1, 2022 were cattle on feed. Only Colorado, Kansas, and Nebraska have higher percentages. Nationally cattle in feedlots run only 16% of the total cattle inventory.



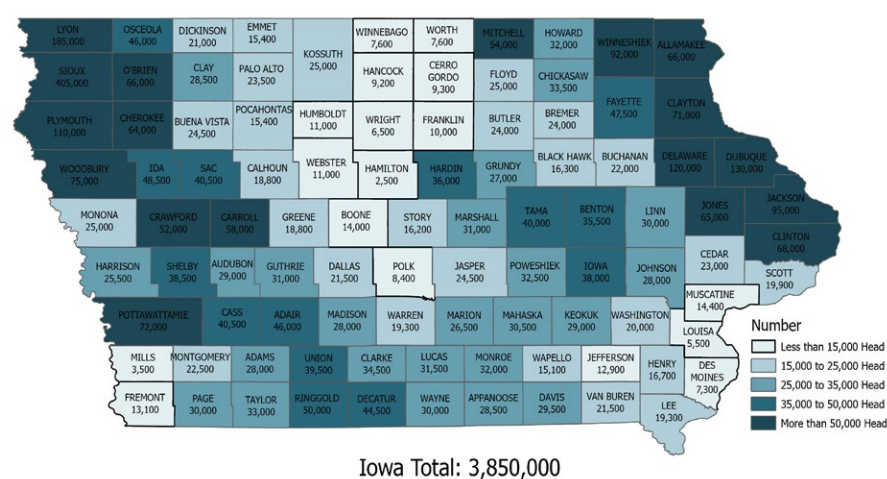
Coming in tied for 48th in total cattle inventory across all 3,007 US counties is Plymouth County, Iowa, home to 110,000 cattle. Dubuque County is tied for 43rd with 130,000 cattle, and Lyon County is tied for 32nd with 185,000 cattle.

## Huge economic impact

One county in Iowa cracks the nation's top ten counties in total cattle numbers. Coming in at number nine is Sioux County, Iowa home to 405,000 cattle (Figure 3). Only 15,200 head are beef cows and 36,500 head are milk cows, which is the largest county dairy cow inventory in the state. The 2020 census tallied 35,872 people in Sioux County. Cattle outnumber people by more than 11 to one. Sioux County has more cattle than 10 US states including West Virginia, South Carolina, Vermont, Maryland, Hawaii, Maine, Connecticut, Massachusetts, New Hampshire, New Jersey, Alaska, Delaware, and Rhode Island.

A study on the [Economic Importance of Iowa's Beef Industry](https://store.extension.iastate.edu/product/15403.pdf), store.extension.iastate.edu/product/15403.pdf, found that Sioux County accounts for 12% of the total economic contribution (jobs, labor income, value added, and output) of cattle production in Iowa. The next highest is Lyon County at 5% and then Dubuque County at 3%.

**Figure 3. Total cattle inventory, January 1, 2022. Data source: USDA-NASS.**



## USDA protects confidentiality

Some county-level data does not meet publication standards but is published in an “Other counties” estimate or represents zero. The all cattle and calves inventory is printed for every county in Iowa but there are 28 counties where a beef cow inventory and 51 counties where a milk cow inventory is not provided.

Some county-level estimates are withheld to avoid disclosing data for individual operations. For example, the January 1, 2022 all cattle and calves inventory for Story County, Iowa was 16,200 head. A January 1, 2022 beef cow inventory was not reported for Story County. Similarly, a milk cow inventory was withheld for Story County. Story County's beef cow and milk cow numbers are included

in the *Other counties* estimate of 239,100 head and 34,300 head, respectively. The last Census of Agriculture in 2017 said Story County had 126 beef cow operations and 2 milk cow operations. Similar to now, the beef cow and milk cow inventories were withheld at that time to avoid disclosing data for individual operations.

Cattle inventory estimates for Iowa counties in 2021-2022 are available from the USDA National Agricultural Statistics Service Iowa Field Office [County Estimates webpage](http://www.nass.usda.gov/Statistics_by_State/Iowa/Publications/County_Estimates/index.php), [www.nass.usda.gov/Statistics\\_by\\_State/Iowa/Publications/County\\_Estimates/index.php](http://www.nass.usda.gov/Statistics_by_State/Iowa/Publications/County_Estimates/index.php). Historical and current estimates are also available from [USDA's Quick Stats database](http://quickstats.nass.usda.gov/), [quickstats.nass.usda.gov/](http://quickstats.nass.usda.gov/), and can be viewed or downloaded in a spreadsheet.



## Are volcanic eruptions warming the earth?

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.

How do we know the carbon dioxide emissions that are driving the greenhouse effect are coming from the burning fossil fuels and not some natural source?

During major volcanic eruptions, huge amounts of volcanic gas, aerosol droplets, and ash are pumped into the atmosphere. Much of the volcanic gas is carbon dioxide. Although it has been proposed by some that volcanic emissions of carbon dioxide are large enough to play a significant role in the warming of the earth, scientific studies do not support this claim.

According to the US Geological Survey, the world's volcanoes generate about 200 million tons of carbon dioxide annually. While this is a large amount of carbon dioxide, it is only about 1% of the amount emitted by human activities. Volcanoes emit *millions* of tons per year, humans emit *billions* of tons per year. It is not volcanoes that are bringing massive amounts of fossilized carbon to the surface of the Earth. Instead, it is oil wells and coal mines.

For example, in 1980, Mount St. Helens in the state of Washington erupted releasing millions of tons of carbon dioxide into



the atmosphere in nine hours. While this is a massive release of carbon dioxide, it did not exceed the amount of carbon dioxide released from human activities during the same nine-hour period. In addition, human emissions are on-going, day-after-day and month-after-month while volcanic eruptions the size of Mount St. Helens are infrequent.

Another impact of volcanic eruptions is a cooling effect. In addition to large amounts of carbon dioxide, large amounts of sulfur dioxide are also released into the atmosphere. The sulfur dioxide converts to sulfuric acid which forms sulfate particles (aerosols). These aerosols reflect sunlight back into space, cooling the earth's lower atmosphere. Although these sulfate aerosols can

cause a considerable amount of cooling, they stay in the atmosphere for only a couple of years before being washed out by precipitation. By comparison, carbon dioxide stays in the atmosphere for over a hundred years.

Several eruptions over the past century have caused a cooling effect for one or more years. Probably the biggest emitter of sulfur dioxide was the **Laki** fissure eruption in Iceland which erupted violently over an eight-month period between June 1783 and February 1784. It emitted an estimated 120 million tons of sulfur dioxide. The cooling caused crop failures in Europe.

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



## Statewide farmland leasing and management workshops address factors impacting 2023 farmland leases

By Ann Johanns, extension program specialist, 515-337-2766 | [aholste@iastate.edu](mailto:aholste@iastate.edu)

Iowa State University Extension and Outreach will host multiple farmland leasing workshops during July and August. The annual meetings address questions that land owners, tenants or other interested individuals have about leasing farmland.

Core components of the 2022 program include discussion on land values and cash rent trends, legal updates that impact farm leases and land ownership, communication between rental parties, implementing conservation practices in leases, and cybersecurity tips for farm business operations.

The two to three-hour workshop is designed to assist landowners, tenants and other agri-business professionals with current issues related to farmland ownership, management and leasing arrangements. Comments from past participants share the value of the materials provided and depth of information covered in the short program.

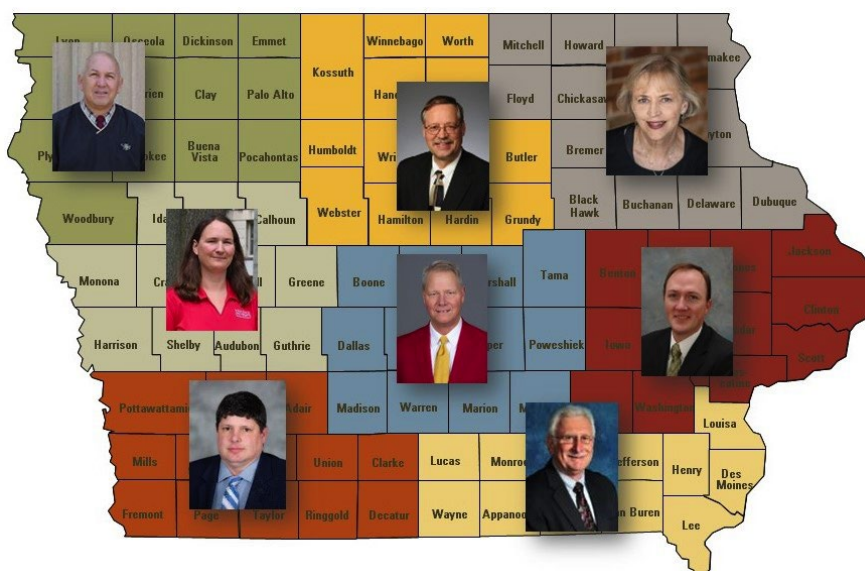
A 100-page workbook is compiled for the programs, with resources regarding land leasing agreements such as surveys, example lease agreements and termination forms, along with many other publications.

### Attend a local leasing meeting

The leasing meetings being held across Iowa are facilitated by ISU Extension and Outreach farm management specialists. A listing of ISU Extension and Outreach county offices hosting meetings, along with details on virtual options, are available online through the [Ag Decision Maker website](http://www.extension.iastate.edu/agdm/info/meetings.html), [www.extension.iastate.edu/agdm/info/meetings.html](http://www.extension.iastate.edu/agdm/info/meetings.html).

To register, contact the local ISU Extension and Outreach county office hosting the event.

Pre-registration is encouraged as an additional \$5 fee may be added if registering less than two calendar days before the meeting date. The [Ag Decision Maker leasing section](http://www.extension.iastate.edu/agdm/wdleasing.html), [www.extension.iastate.edu/agdm/wdleasing.html](http://www.extension.iastate.edu/agdm/wdleasing.html), also provides useful materials for improving lease agreements, information on various types of leases, lease forms and newly updated Decision Tools.





## Strength in international sales

By Chad Hart, extension crop market economist, 515-294-9911 | [chart@iastate.edu](mailto:chart@iastate.edu)

With the vast majority of the spring crops now planted, the markets are turning their focus to the weekly crop development and conditions for supply news and the weekly export sales reports for demand news.

**USDA's Crop Progress reports**, <https://usda.library.cornell.edu/concern/publications/8336h188j>, summarize observer ratings on the condition of the crops once they emerge from the soil. The condition reports started in early June for corn and mid-June for soybeans. Every Monday morning, roughly 3,600 cropping experts across the nation rate the crops in their region on a "very poor" to "excellent" scale. The early ratings show that while there may be concerns about the timeliness of the crops, the condition of the crops is very good. Seventy-three percent of the nation's corn crop was rated "good" to "excellent" with the first rating, which was one point higher than the initial rating of the 2021 crop. The next week, the "good" to "excellent" percentage shifted to 72%, 4 points higher than 2021. For soybeans, the initial "good" to "excellent" rating stands at 70%, 8 points higher than 2021. In general, the crops are looking good across the nation, despite the planting delays and the drought in the West.

While there is not a lot of data to pore through yet on the supply side, the weekly export sales reports provide more information on the early signals for international sales and shipments. For example, the export reports are currently tracking sales agreements for the 2021, 2022, and 2023 corn and soybean crops. So we can see the international interest in our crops up to two years before harvest. With the higher prices corn and soybeans are capturing over the past 18 months, there has been some concern that international sales would fall off. Looking back at historical price surges, it is the export line that tends to shrink the most quickly. But the data thus far highlight that we aren't seeing any significant export issues currently. Figures 1 and 2 display the advance export sales patterns for soybeans and corn over the past few years. The graphs contain the data for the 2020 and 2021 crops, along with the sales thus far for the 2022 crop and the 5-year average (2017-2021) pattern for export sales. The lines for each year basically start at the beginning of the calendar year the crop was planted and harvested, so the sales represented are being made either before the crop is planted or during the growing season.

As Figure 1 shows, soybean prices are being supported by very strong export demand at the moment. Even with the near doubling of prices over the past two years, the quantity of soybeans being purchased internationally has continued to rise. Advance sales for the 2022 crop jumped ahead the 5-year average in early January and have continued to build a positive gap over the 5-year average ever since. The current run of advance sales passed the 2021 pace in early February and, again, has extended the lead since then. Currently, nearly 500 million bushels of soybeans are already spoken for as exports out of the 2022 crop. Usually, we hit that level sometime in August, just before harvest. As the figure shows, the pace of advance soybean export sales tends to increase over the coming months, providing some underlying support for the soybean market over the next few months.

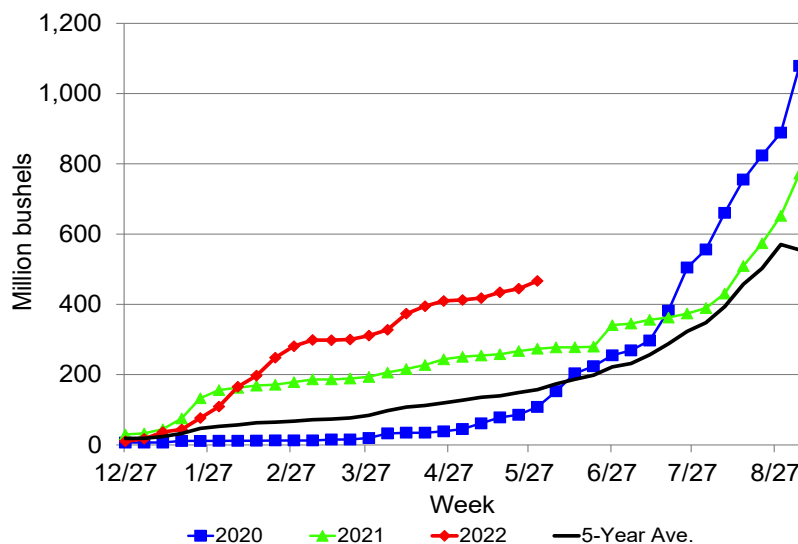
The data for corn are not nearly as supportive, but the export sales pace is still above average. For the last two years, any large adjustments in the flow of corn advance sales have come about as China repositions itself in the global feed complex. China has become a major corn destination since 2020 and when China moves in the corn market, it is



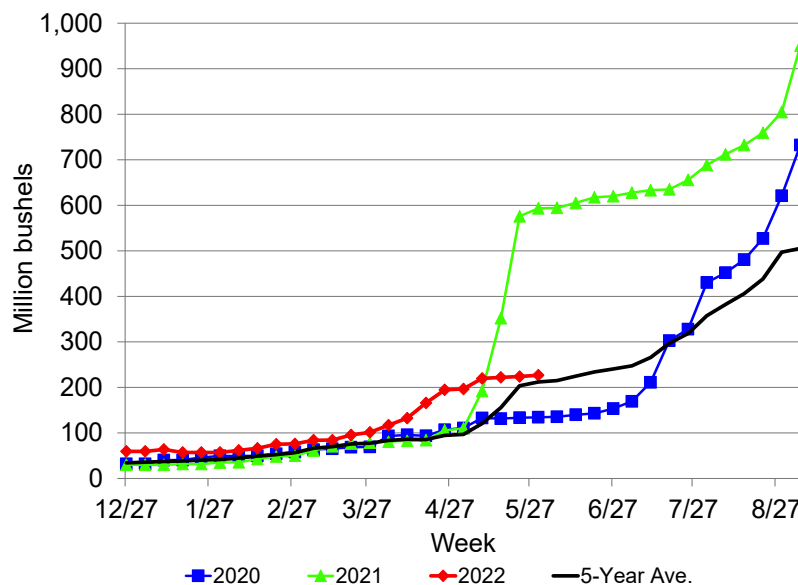
noticeable. For example, in 2020, China made two early sets of corn purchases, one in mid-July and the other in mid-August. But the largest spike in advance corn sales came in 2021, when over the course of a three-week span in May, China led a flurry of advance corn purchases, adding 500 million bushels to the export sales total. The advance sales for this year had been running ahead of the average and 2021 pace until May. Now, the sales pace is well below last year's, but still slightly above the 5-year average. While China is currently the top purchaser in those advance sales (roughly half of the total), they haven't made the large purchases as they did for the last two years. As was the case with soybeans, the trend moving forward is for an increasing pace of sales as harvest approaches.

A portion of the export strength is being driven by the concerns around and impacts from the Russian-Ukrainian war. The conflict is limiting the flow of crops from storage in the Black Sea region, hampering harvest of fall-seeded crops (mainly winter wheat), and severely restricting planting efforts for spring-seeded crops. Thus, the war has created significant concerns about global crop supplies. That uncertainty has translated into significantly higher crop prices, along with increasing price volatility. Figure 3 displays the relative price moves for November and

**Figure 1. US soybean advance export sales. Source: USDA-FAS.**



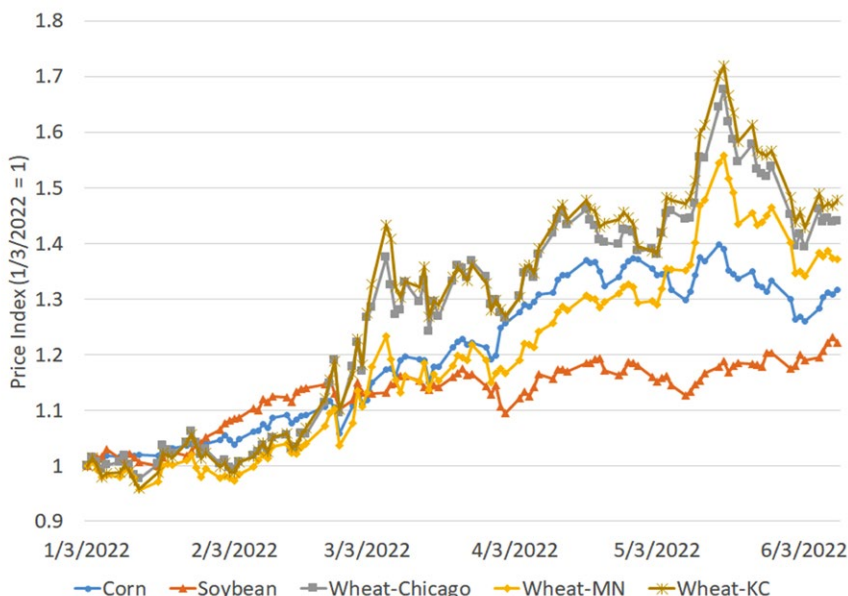
**Figure 2. US corn advance export sales. Source: USDA-FAS.**



December futures on corn, soybeans, and wheat. Here, all of the crop prices are indexed to a value of 1 at the beginning of the year. The Chicago and Kansas City futures trace winter wheat pricing, while the Minneapolis futures outline spring wheat pricing. As the figure shows, all of the crops were seeing steady to rising prices during the first couple of months in 2022. But the price increases, and price volatility, really took off with the start of the war. Rumors about the ability of Ukrainian farmers to work, whether caring for and harvesting wheat or planting corn, or the flow of potential exports, as the United Nations has met with Russia and Ukraine to try to find an agreement that would allow crop supplies to be marketed, have flung the markets in both directions.

Currently, wheat prices are 35-50% higher than at the beginning of the year. Corn prices have risen 30%, while soybean prices have increased by 22%. And while most crop prices are no longer at their peak (with the possible exception of soybeans), the advance export pace has set a foundation for maintaining relatively stronger than usual prices throughout the rest of the year. USDA's full projections for the 2022 crops have soybean exports exceeding 2021 levels, with corn exports falling only 50 million bushels of 2021 levels. USDA is expecting international demand to remain robust over the course of the next 12-15 months, despite the heightened pricing.

**Figure 3. Price indices of November and December futures. Sources: CME and MGEX.**



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

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**Ag Decision Maker** is written by extension ag economists and compiled by Ann Johanns, extension program specialist, [aholste@iastate.edu](mailto:aholste@iastate.edu).

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