

# Agriculture By the Numbers

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Brazil's Weather Impacts on U.S. Corn Prices

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Calf Backgrounding Potential with Record High but Volatile Prices

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## What is the economic potential for using soybean meal as a replacement source of fertilizer for commercial row crop agriculture?

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In previous articles, I have discussed the impending large-scale production of soybean meal that will be produced at two new soybean crush plants being built along the I94 corridor in North Dakota. In fact, one of the two plants—the Green Bison plant in Spiritwood—is operational. The other plant is under construction in Casselton and is expected to be operational sometime in 2024. Both plants combined are expected to produce about 2 million tons of soybean meal per year. As a result, much discussion is taking place surrounding ways to use it locally in place of loading it on trains and shipping it out of the state. Many of those discussions have focused on its potential use as a source of feed for various livestock operations, such as swine, dairy and poultry. However, over the past few months I have been getting questions about its potential use as a source of nitrogen (N) fertilizer for commercial agriculture in the state.

Because soybean meal has about 46% protein, it is a good source of N and has been used for a number of years by gardeners engaged in smaller scale production of fruits and vegetables. However, it has typically been too expensive relative to synthetic sources of N commonly used in commercial production. To understand the economic potential for commercial production, we conducted an economic analysis using current (November 2023) prices to understand better how soybean meal compares to synthetic sources of N commonly used by commercial farmers in North Dakota.

Table 1 reports prices (\$/ton, \$/pound of actual N and the relative breakeven price of soybean meal on a \$/ton basis) for alternative sources of N fertilizers. Prices for synthetic sources of N were obtained from DTN's website while the November price of soybean

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# What is the economic potential for using soybean meal as a replacement source of fertilizer for commercial row crop agriculture? — continued from page 1

**Table 1. Prices for Alternative Sources of Nitrogen Fertilizers**

Source of nitrogen*	Actual N (%/ton)	Price (\$/ton)	Actual N (pounds/ton)	Price of actual N (\$/pound)	Breakeven price of meal (\$/ton)
Anhydrous ammonia (NH <sub>3</sub> )	82%	830	1640	0.51	74.50
Urea	46%	573	920	0.62	91.68
Urea ammonium nitrate (UAN)	32%	415	640	0.65	95.45
Urea ammonium nitrate (UAN)	28%	360	560	0.64	94.63
Soybean meal**	7%	438	147.2	2.98	-

\* DTN, November 2023. Found at <https://www.dtnpf.com/agriculture/web/ag/crops/article/2023/11/15/fertilizer-prices-begin-november>

\*\* Livestock Marketing Information Center, November 2023. [www.lmic.org](http://www.lmic.org)

meal was obtained from the Livestock Marketing Information Center's website. Prices on a \$/ton basis were converted to a \$/pound of actual N basis based on the percentage of actual N contained in each ton (also reported in Table 1). Although anhydrous ammonia (NH<sub>3</sub>) is not used nearly as much in commercial agriculture, it is the cheapest source on a \$/pound of actual N basis, costing \$0.51/pound of N. This is so because a ton of NH<sub>3</sub> contains 82% actual N. In comparison, a ton of soybean meal only contains 7% actual N, or 147.2 pounds per ton, and costs \$2.98/pound of actual N.

The analysis reveals that for soybean meal to compete with NH<sub>3</sub> as a source of N for crop production it would have to be priced at \$74.50 per ton of product instead of \$438/ton, which seems unlikely. For N in the form of urea that has 46% actual N per ton, the breakeven price of soybean meal would need to be \$91.68 per ton of product. Breakeven prices for soybean meal would be higher for 32% and 28% solutions of liquid urea-ammonium nitrate (UAN). Unfortunately, soybean meal only contains about 1.5% phosphorus (P<sub>2</sub>O<sub>5</sub>) and 1% potassium (K<sub>2</sub>O), so the economics of using it for those nutrients are worse than its potential for replacing synthetic sources of N.

In cases where soybean meal is made from organically produced soybeans, markets for it as a source of N fertilizer in the production of small-scale fruits and vegetables might exist. In addition, markets may also exist for soybean meal as a source of N for turfgrass (often found on golf courses) and for commercial and residential lawns. However, the overall demand for this type of production would be small relative to the market for commercial crop production in North Dakota.

Please feel free to contact me with any questions at [jon.biermacher@ndsu.edu](mailto:jon.biermacher@ndsu.edu).

# Brazil's Weather Impacts on U.S. Corn Prices

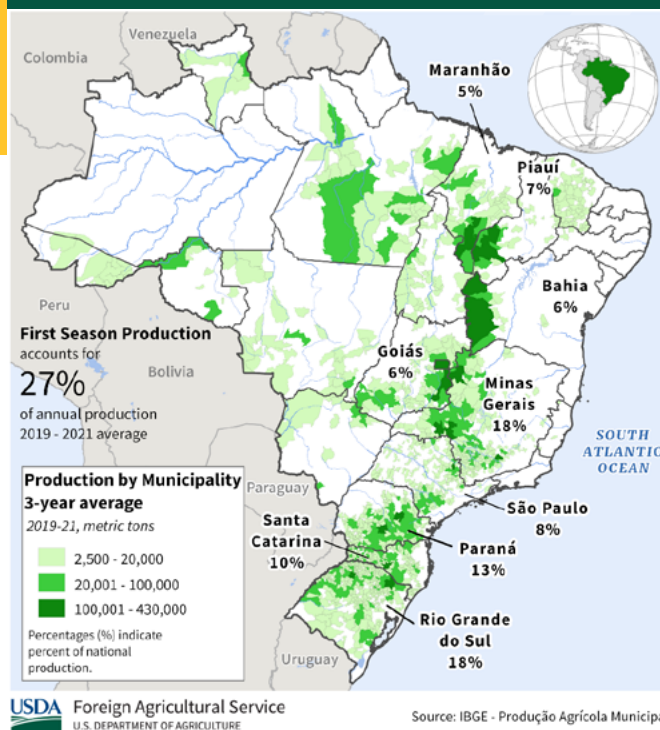
Frayne Olson, Extension Crop Economist/Marketing Specialist

Typically, when farm managers hear about the crop market impacts of Brazilian weather, they think about soybean prices. However, Brazilian corn production has grown over the past 15 years to a point where Brazil has surpassed the U.S. as the largest corn exporter in the world. China, as well as other corn-importing countries, now has the ability to order large shipments of corn from the U.S., Brazil, Argentina and Ukraine. As a result, the weather and growing conditions in Brazil also impact the U.S. corn markets.

Brazil is unique because it produces two distinct corn crops each year. The “first season” corn crop is primarily produced in central and southern Brazil. It has a planting and harvest cycle similar to Brazilian soybean production. Based on the USDA estimates, the first crop corn production accounts for about 27% of their total corn production. Figure 1 shows a map of the first-crop corn production regions. Figure 2 shows the crop production calendar for the major crops grown in Brazil, including first-season corn.

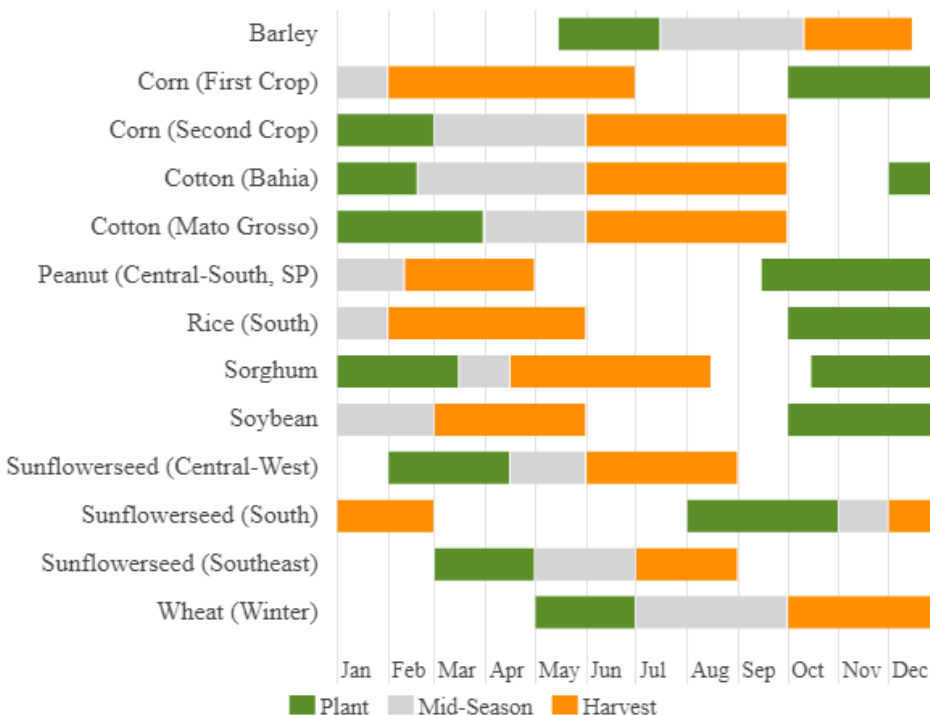
The “second season” corn crop is often referred to as the Safrinha crop. The Safrinha crop is primarily grown in central and northern Brazil. Planting usually begins right after soybeans have been harvested, which provides double-cropping opportunities if soybean harvest is not delayed and there is enough soil moisture for good corn emergence. The Safrinha crop accounts for about 73% of Brazil's total corn production, based on USDA estimates. Figure 3 shows the main growing regions for second-season corn. And, Figure 2 shows the typical planting, crop development and harvest seasons for Brazil's major crops, including second-crop corn.

**Figure 1 – Brazil's First-Season Corn Production**



**Figure 2 – Brazil's Crop Production Calendar**

## Brazil – Crop Calendar



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USDA Crop Explorer

# Brazil's Weather Impacts on U.S. Corn Prices

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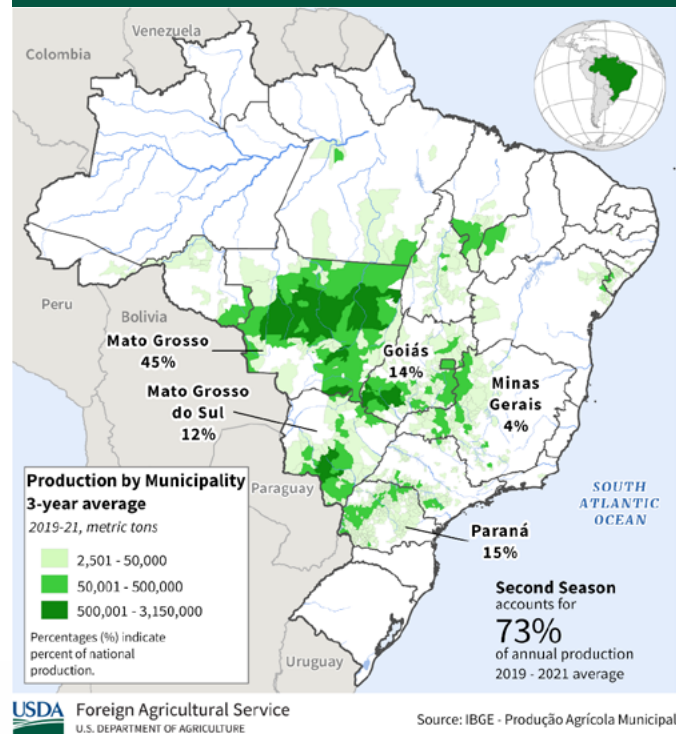
Both first- and second-crop corn production can be exported, but the logistics for second-crop corn are more complicated because of the longer distances to export facilities. Thus, a larger portion of the second-crop corn is used for domestic consumption.

Because first-crop corn and soybeans have similar planting and harvest cycles, like the U.S., weather and growing conditions will impact yield potential in similar ways. However, because the Safrinha crop is planted and harvested later and accounts for the largest amount of corn production, determining the impact of growing-season weather on total corn production is more complicated.

In addition, second-crop corn harvest usually begins in June, just ahead of the U.S. corn harvest, which typically begins in October. As noted above, Safrinha corn is planted after the soybeans have been harvested. This means a significant delay in soybean harvest may impact the yield potential for late-planted corn and reduce the amount of second-crop corn plantings. Drought conditions during soybean harvest in the north may also increase the risk of poor corn emergence and impact yield potential.

Even though understanding the implications of weather conditions on Brazilian corn production is more complicated, understanding the core differences between first-crop and second-crop corn production can pay dividends in more effective marketing plans. The key is to understand the difference in time and growing regions.

**Figure 3 – Brazil's Second-Season Corn Production**



# Average Yearly Interest Expenses per Farm Could Exceed \$100,000 for 2024

Bryon Parman, Extension Agricultural Finance Specialist

The rate of inflation in the U.S. has made headlines since 2021, peaking in summer 2022, and has since declined as we close out 2023. The U.S. Federal Reserve has stated that the target inflation rate for headline inflation in the country is 2%. With the latest inflation data coming in for November 2023, the headline inflation (Figure 1) rate has dropped to 3.1%, off significantly from the June 2022 high water mark of 8.9% but still above the Federal Reserve's target. Much of the decline in inflation has come from the significant decline in energy prices, which are included in headline inflation. On the other hand, core inflation, which takes volatile food and energy prices out of the calculation, has been a bit sticky with the November report showing it remaining at 4%.

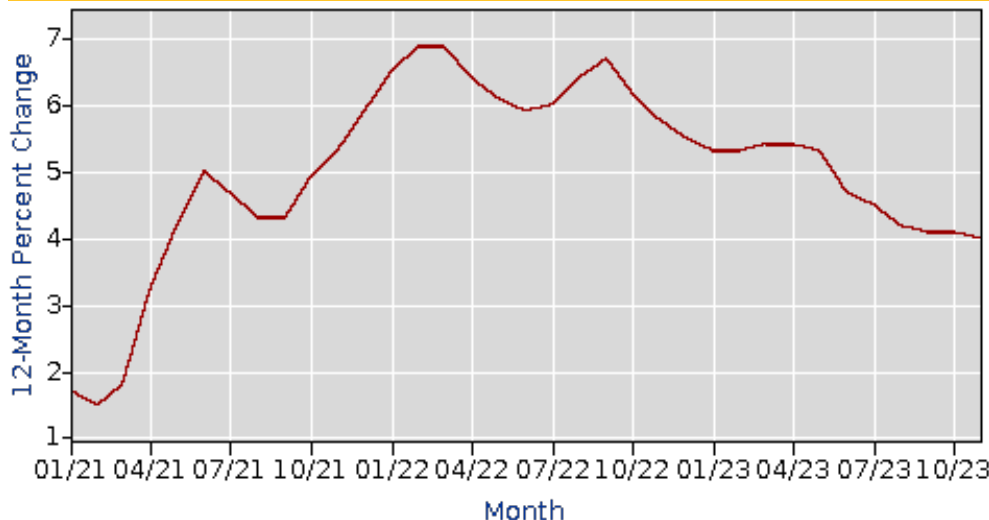
In response, the Federal Reserve has increased the federal funds rate, which influences the consumer interest rate, raising it to the highest it has been in decades. This has had a dramatic impact on the interest rates being offered to not only consumers but businesses as well, including

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**Figure 1: The U.S. Bureau of Labor Statistics 12-Month Percent Change in Consumer Prices - All Items**



**Figure 2: The U.S. Bureau of Labor Statistics 12-Month Percent Change in Consumer Prices - Excluding Food and Energy**



# Average Yearly Interest Expenses per Farm Could Exceed \$100,000 for 2024 — continued from page 5

agricultural producers. The chart shown is from the Minneapolis Federal Reserve representing the ninth district, which includes Minnesota, Montana, North Dakota, South Dakota and Wisconsin. The table shows quarterly interest rates for the district for operating loans, machinery loans and real estate loans from the fourth quarter of 2021 through the third quarter of 2023.

The table shows that all three loan-term types have seen interest rates nearly double over the span of two years. While this monthly newsletter has written about the potential impacts on land values in the future, most of the farmland that has been sold in the last five years included an interest rate much lower than it is now and is therefore not an issue for those previous buyers. However, equipment loans are much shorter, and equipment needs to be replaced periodically. Also, operating loans are typically renewed yearly. Therefore, the rates on machinery and operating loans are of great importance heading into 2024. Additionally, as production costs have increased remarkably over the last two years, the amount of borrowed funds for some producers has increased as well to pay yearly operating costs. Figure 3 shows the yearly interest expense for North Dakota farms in the North Dakota Farm Business Management Program from 1999 to 2022. Data for each year represent the previous production year, i.e., 2022 shows 2021's expense and 2020 shows 2019's expense.

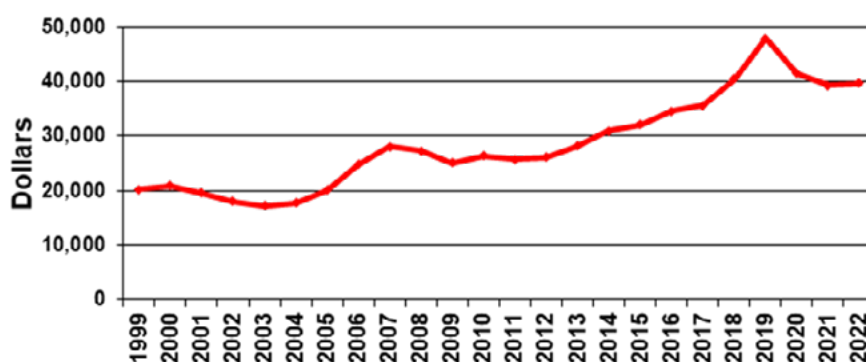
Though interest rates remained low from 2012 to 2018, the interest expense per farm within the data set increased from around \$25,000 per farm to \$40,000 per farm. Most of the increase in this case came from the amounts borrowed. As for the most recent year in the data, when interest rates on operating loans and machinery loans was between 3.75% and 4%, the yearly interest expense averaged \$40,000 per farm, which was off the 2019 high when interest rates were a bit higher and the yearly interest expense was around \$48,000.

While the 2023 data has not been finalized yet, interest rates on machinery loans was over 7.5% in the spring, and operating loan rates were over 8%.

## Agricultural interest rates from the Federal Reserve Bank of Minneapolis' quarterly survey of agricultural credit conditions

		Operating		Machinery		Real estate	
		Fixed	Var.	Fixed	Var.	Fixed	Var.
Q4-21	January	4.7	4.4	4.5	4.3	4.3	4.1
Q1-22	April	4.7	4.6	4.7	4.5	4.5	4.3
Q2-22	July	5.5	5.4	5.5	5.3	5.4	5.1
Q3-22	October	6.5	6.3	6.2	6.1	5.9	5.8
Q4-22	January	7.7	7.6	7.3	7.3	7.0	7.0
Q1-23	April	8.1	8.0	7.6	7.6	7.3	7.4
Q2-23	July	8.5	8.5	7.9	8.0	7.5	7.5
Q3-23	October	8.8	8.7	8.3	8.2	7.9	7.9

Figure 3: Average Total Interest Expense per Farm



However, 2021 and 2022 were very strong net farm income years, and many producers likely did not need to borrow as much for yearly operating or machinery purchases heading into 2023. This will likely help keep the overall interest expense per farm down in 2023. However, the 2023 production year will not be as economically strong as the previous two years as the interest rates remain high, as do production costs. This implies there will be strong demand for operating and machinery loans in 2024. Therefore, while 2023 will likely see an increase in interest expenses per farm over 2022 due to considerably higher rates, the big jump will occur in 2024 where we will not be coming off a record net farm income year and loan demand will be much higher, possibly exceeding \$100,000 per farm on average.



# Calf Backgrounding Potential with Record High but Volatile Prices

Tim Petry, Extension Livestock Marketing Specialist

Many North Dakota cattle producers typically background steer and heifer calves as a value-added enterprise.

This fall, calf and feeder cattle prices were record high, which begs the question whether backgrounding programs have the potential to be profitable for this year's calf crop. That question is even more pertinent due to the feeder cattle and live cattle futures market price volatility that has occurred since mid-September.

Every year the question of backgrounding profitability can be answered with a yes, no or maybe and be correct. Each cattle producer's cost structure and feed availability is different, so carefully computing expected costs and expected returns with input from lenders is important.

In general, the cattle market usually rewards backgrounding enterprises since commercial feedlots prefer to purchase over 750 lb. feeder cattle rather than 400 to 600 lb. calves.

Corn prices are typically lower in North Dakota than in Iowa, southern Minnesota, southern South Dakota, and Nebraska where many cattle feedlots are located. Coupled with about a \$2 per bushel decline in corn prices from last year favors Northern Plains backgrounding value-added enterprises.

For example, the recent weekly average corn price in Omaha, Neb., was \$4.71 per bushel compared to some North Dakota ethanol plants offering corn bids of \$4.00/bu. And North Dakota has a variety of roughages, silage and co-product feeds from grain and oilseed processing plants that work well in backgrounding rations.

The most recent USDA Agricultural Marketing Service (AMS) North Dakota Weekly Auction Summary report showed a wide range in ND calf prices. The report is available weekly at <https://mymarketnews.ams.usda.gov/viewReport/2100>

For example, 550- to 600-pound medium and large #1 steer prices ranged from \$254 per hundredweight (cwt.) to \$285.50/cwt. with a \$272.90 average.

So, from a backgrounding profitability standpoint, it may be advantageous to consider feeding average- and below-average-priced steers to add value in a backgrounding program.

Heifer calf prices are discounted relative to their steer counterparts. The North Dakota AMS report showed 500-550 lb. heifers bringing from \$249/cwt. to \$274.50/cwt. and averaging \$260.45/cwt., \$31.61/cwt. less than 500-550 lb. steers that averaged

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# Calf Backgrounding Potential with Record High but Volatile Prices — continued from page 7

\$292.11/cwt. Heifers gain in price relative to steers with 850 to 900 lb. heifers at close to the same price, especially replacement-quality heifers. Many heifers are backgrounded each year in North Dakota, and budgets show that has potential again this year.

Retaining heifers provides marketing flexibility. They can be marketed in the spring as feeder cattle or kept and bred in the summer depending on weather and market conditions. And ND-developed replacement heifers are in demand not only in ND, but in other states as well due to the high quality.

Widespread drought in the major cow-calf states from Texas to North Dakota caused beef cow herd liquidation for four straight years. On January 1, 2023, the U.S. beef cow herd at 28.92 million head was lower than the 28.96 million head at the last cyclical low in 2014, the last time when cattle prices were record high.

It is very likely that beef cow liquidation occurred again in 2023.

Cattle prices are at record levels and are increasing cyclically. So, there is interest in beef cow herd rebuilding where moisture conditions favor it. In late fall 2022, 76% of beef cows were located in drought areas. However, drought conditions have improved in some regions with 37% of beef cows now in drought. If U.S. moisture conditions continue to improve, beef replacement heifers will be in high demand to rebuild the herd.

The ND AMS market report showed a \$10-\$15 per hundredweight premium for replacement quality heifers.

The NDSU Extension Agribusiness livestock economics website has an example budget for backgrounding steer calves. It is available at [www.ndsu.edu/agriculture/ag-hub/ag-topics/livestock/tools/backgrounding-550-lb-steers](http://www.ndsu.edu/agriculture/ag-hub/ag-topics/livestock/tools/backgrounding-550-lb-steers).

The spreadsheet can be downloaded for cattle producers to enter expected costs and expected

prices. The example budget indicates a potential profit for backgrounding calves.

The NDSU Extension livestock team conducted a backgrounding webinar on Nov. 28. It was recorded and is available at [www.ndsu.edu/agriculture/ag-hub/ag-topics/livestock/beef](http://www.ndsu.edu/agriculture/ag-hub/ag-topics/livestock/beef).

During the webinar, I presented a market outlook and price risk management session. Bryon Parman, Extension ag finance specialist, discussed budgets for different market classes of cattle; Karl Hoppe, Extension livestock systems specialist at the Carrington Research Extension Center, discussed rations, feed costs and cost of gain; Zac Carlson, Extension beef cattle specialist, covered what implants to use; and Dr. Gerald Stokka, Extension veterinarian, explained calf health and vaccination protocols.

A Federal Drug Administration rule concerning the use of cattle growth-promoting implant protocols became effective on July 1, 2023. So, watch Zac Carlson's webinar and consult with your veterinarian before implanting cattle in a backgrounding program.

The recent volatility in the cattle futures market exemplifies the need to consider price risk management strategies in backgrounding programs.

During the increasing phase of the cattle price cycle, the best price risk strategies set a floor price but leave the top side open for higher prices. The best tools for doing that are futures market options and USDA Livestock Risk Protection (LRP) insurance. LRP has been improved in the last couple years and has become a popular risk management tool with cattle producers.

LRP contracts purchased in December 2023 mature three months later in March 2024. So, LRP is not available for backgrounded cattle marketed in January and February.