Agriculture By the Numbers

May 2024

NDSU Extension Agribusiness and Applied Economics

Supply and Demand Fundamentals to Watch for Fall Calf Prices

Tim Petry, Livestock Marketing Specialist

As the 2023 beef calf crop marketing season winds down, focus now turns to factors affecting prices for the 2024 calf crop.

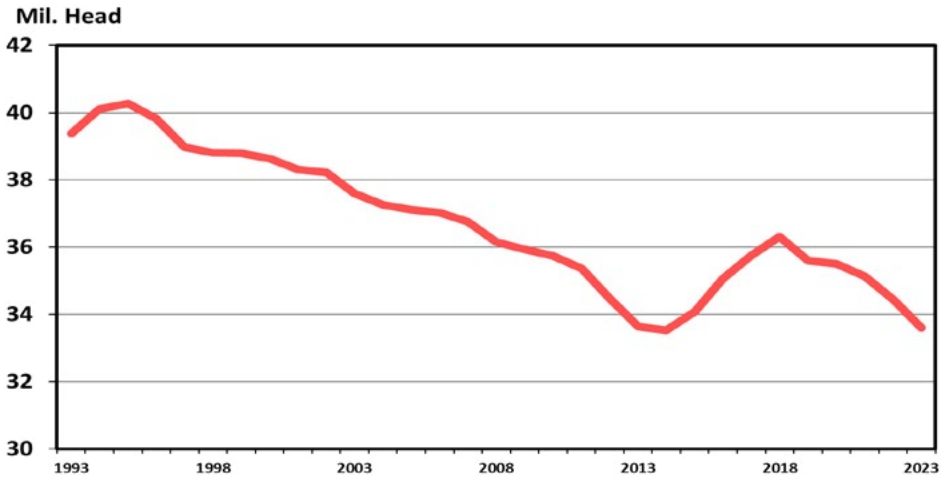
All market classes of beef cattle, except bred heifers and cows, were record high throughout 2023. That trend has continued in 2024, supported by short cattle supplies resulting from five straight years (2019-2023) of beef cow liquidation and good beef demand.

Many supply and demand fundamentals affect cattle prices.

The three most important factors to watch for fall calf prices are potential calf supplies, corn prices and fed cattle prices, especially the distant live cattle futures prices for contract months when the calves will ultimately reach slaughter weight.

The 2023 U.S. calf crop (includes beef and dairy calves) at 35.93 million head declined for five years and was the lowest since the 33.5 million head in 2014. The 2024 calf crop will be lower again because the Jan. 1 beef cow herd was down 2.5% and beef heifers expected to calve were down 1.9%.

Calf Crop (U.S., Annual)



Source: USDA NASS

Continued on page 2.

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Supply and Demand Fundamentals to Watch for Fall Calf Prices — continued from page 1

The first USDA National Agricultural Statistics Service (NASS) 2024 calf crop estimate is made in the July "Cattle" inventory report usually released the end of July. However, NASS recently announced it is discontinuing the July report due to budget constraints.

Hopefully, at the urging of cattle industry groups, NASS will reconsider. If they do not, the size of the 2024 calf crop will not be known until January 2025.

The supply of calves available for the fall marketing season will be affected by the number of beef heifer calves retained for replacement. Strong prices and improving moisture conditions in several important cattle-producing regions may result in more heifers retained for beef herd rebuilding.

Fall 2024 live cattle futures prices declined $15/hundredweight (cwt.) from mid-March to mid-April. The decline was largely due to High Pathogenic Avian Influenza (HPAI) virus detected in lactating dairy cattle. The virus in cattle has been renamed Bovine Influenza A Virus (BIAV).

Futures prices declined due to traders' uncertainty about how beef consumers may perceive the virus for beef products. To date, BIAV has not been detected in beef cattle.

Another factor causing both live cattle and feeder cattle futures prices to decline was escalating tensions between Iran and Israel with both firing retaliatory missiles.

Live cattle futures did rebound about $8/cwt. after mid-April.

The impact of BIAV, the U.S. economy and the Middle East war will be important beef demand factors to watch in coming months.

Fed cattle and calf prices remained at record-high levels during the futures market decline.

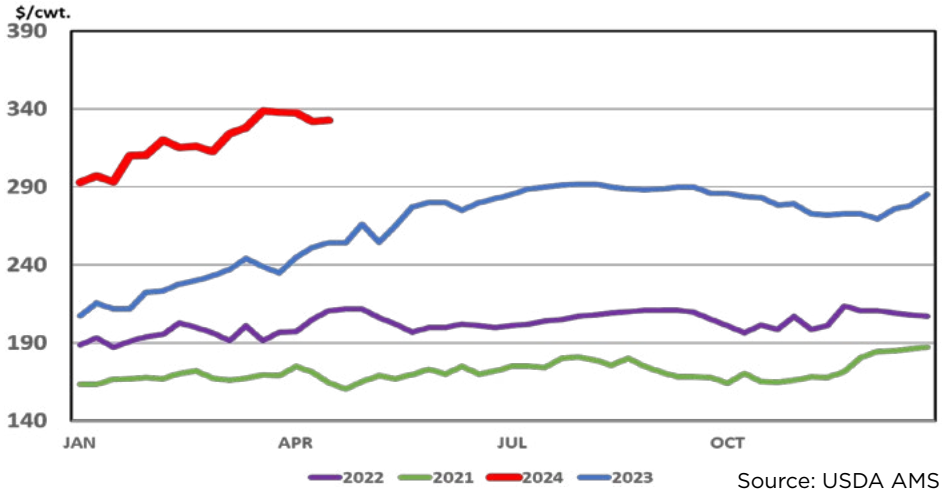
Fed cattle prices have experienced some seasonal weakness, pressured by a counter-seasonal increase in steer dressed weights and increased heifer slaughter. Cattle have been staying in feedlots longer due in part to high prices and shorter supplies of feeder cattle. More heifers are on feed due to drought, causing fewer potential replacement heifers to be bred.

The 2023 U.S. corn crop at 15.34 billion bushels was record high. Corn producers planted 94.6 million acres and the record high yield per acre at 177.3 bushels per acre resulted in large production.

Correspondingly, the 2023 national average corn price received by farmers declined from $6.54 per bushel (bu.) in 2022 to $4.70/bu. in 2023.

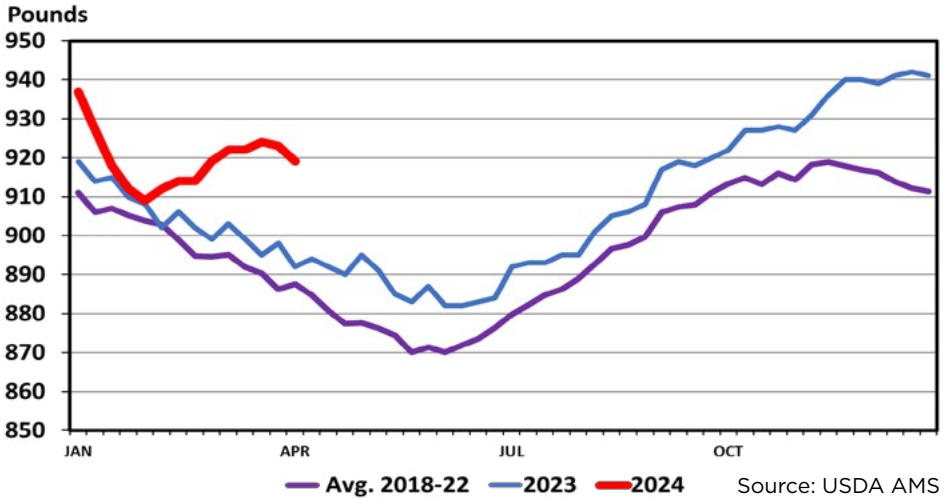
Continued on page 3.

Medium and Large #1 Steer Calf Prices
550-600 Pounds, N.D., Weekly



Source: USDA AMS

Steer Dressed Weight
Federally Inspected, Weekly



Source: USDA AMS

Supply and Demand Fundamentals to Watch for Fall Calf Prices — continued from page 2

A 10 cent/bu. change in corn prices usually results in a $1/cwt. change in fall calf prices in the opposite direction. So, declining corn prices have supported record-high calf prices.

Looking ahead to the potential 2024 corn crop, NASS released the "Prospective Plantings" report on March 28, 2024.

The report indicated that U.S. corn producers intend to plant 90 million corn acres in 2024, down 4.6 million acres from last year. North Dakota corn producers plan to plant 3.8 million acres compared to 4.05 million last year.

The May 10 USDA "World Agricultural Supply and Demand Estimates" report will be important because that will be USDA's first estimate of 2024 corn production and expected price. It will be available at www.usda.gov/oce/commodity/wasde.

The western Corn Belt is experiencing drought conditions, particularly in Iowa (the leading corn- producing state), southern Minnesota and eastern Nebraska. 76% of Iowa is experiencing drought conditions. USDA estimates that 23% of U.S. corn production is within an area experiencing drought.

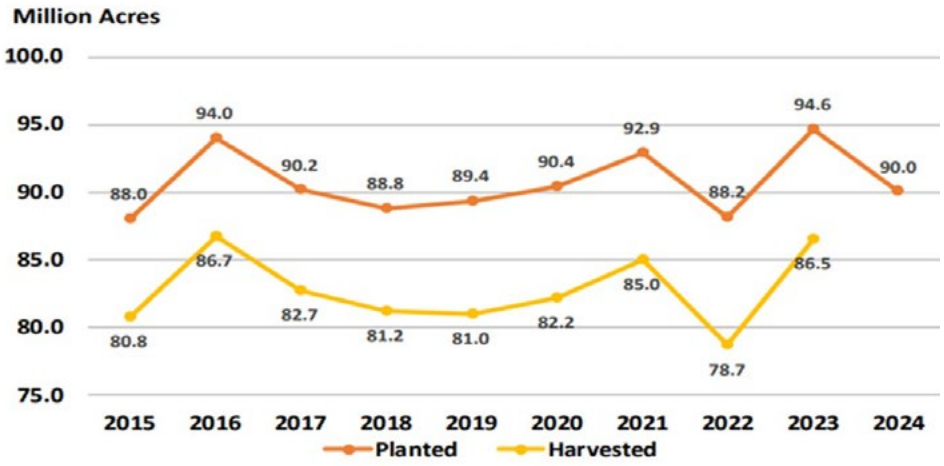
Corn-planting progress, final planted acres, crop development and expected yield information, along with a dynamic corn export market, may cause significant corn price volatility this spring and summer.

The declining beef cow herd and calf crops will mean fewer cattle marketed and declining beef production in 2024 and likely in future years. That will be supportive to cattle prices.

However, enhanced price volatility and risk, especially on a seasonal basis, will likely continue. Drought conditions linger in some areas, the potential size of the 2024 corn crop is unknown, domestic and export beef demand face headwinds, and geopolitical tensions continue around the world.

During the increasing phase of the cattle price cycle, the best price risk management strategies set a floor price but leave the top side open for higher prices. The best marketing 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.

Prospective Plantings — Corn Acres, United States

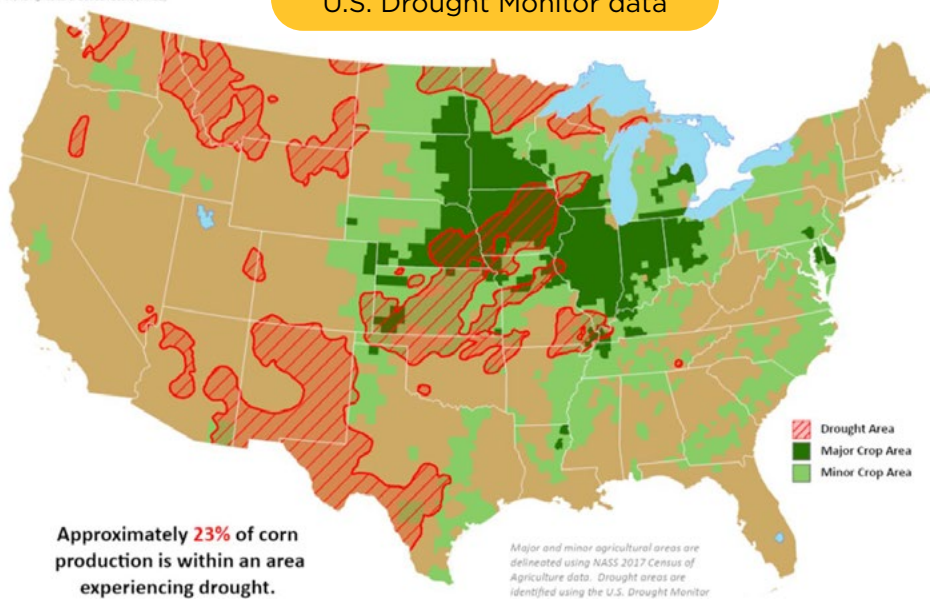


United States Department of Agriculture
National Agricultural Statistics Service

March 28, 2024

Corn Areas in Drought

Reflects April 23, 2024
U.S. Drought Monitor data



Can U.S. Soy Meal Exports Keep Pace with Production?

Frayne Olson, Extension Crop Economist/Marketing Specialist

The expansion of U.S. soybean crushing capacity is raising questions about domestic and export demand for U.S. soy meal. Soybean crushing capacity in the U.S. has been steadily growing for about 10 years. The increase in demand for renewable diesel and biodiesel has impacted soybean oil prices, resulting in stronger profit margins for soybean crushing facilities. Existing facilities are adding processing capacity, and new plants are being built.

A growth in crushing capacity results in larger supplies of both soy oil and soy meal. The growing demand for soy oil from the biofuels sector is expected to keep pace with the expanding crush capacity, but where will the additional soy meal go?

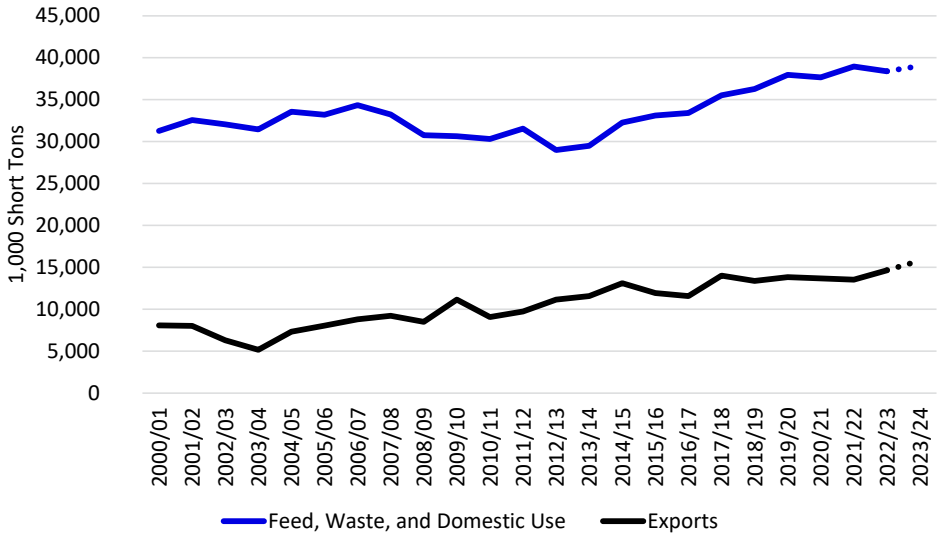
Figure 1 shows the historical use for U.S. soy meal. The dashed line segment is the current USDA forecast for the 2023/24 marketing year. Note that Feed, Waste, and Domestic Use is the largest consumption category for soy meal. Domestic livestock feed accounts for most of this category. The amount of soy meal used for livestock feed has been growing over the past several years but may not be able to keep pace with the expansion of crushing capacity. Increasing export sales is the most likely solution.

Historically, 20% to 28% of all U.S. soy meal is exported. The Philippines is typically the largest buyer of U.S. soy meal and cake products, followed by Mexico, Colombia and Canada. Table 1 shows the historic and current soy meal and cake exports by country.

The U.S. must compete with other soy meal exporting countries. Argentina is normally the largest soy meal exporting country, followed by Brazil, the U.S., Paraguay and Bolivia. Argentina's whole soybean export levels are usually very small because their government's export tax system

Continued on page 5.

Figure 1 – Historic U.S. Soybean Meal Use.



USDA World Agricultural Supply and Demand Estimates, April 11, 2024, and USDA Production, Supply, and Distribution online database.

Table 1 – Historic U.S. Soy Meal and Cake Exports by Country (1,000 Metric Tons)

	Annual Export Sales				Year-to-Date Export Commitments	
Country	2019/20	2020/21	2021/22	2022/23	2022/23 (04-20-23)	2023/24 (04-18-24)
Philippines	2,401.1	2,118.0	2,225.0	2,077.7	1,615.9	2,070.9
Mexico	1,648.8	1,771.0	1,608.2	1,434.7	1,071.5	1,601.2
Colombia	1,363.2	975.7	1,639.4	1,427.7	1,074.4	834.0
Canada	1,126.0	1,153.4	1,106.5	985.6	725.2	906.1
Ecuador	523.3	664.3	781.3	788.1	703.5	570.1
Dominican Republic	478.8	487.9	446.4	519.0	394.7	348.4
ROW	4,277.1	4,364.4	3,894.3	5,224.6	3,977.8	4,693.7
Total	11,818.3	11,534.7	11,701.1	12,457.4	9,563.0	11,024.4

USDA Export Sales Report, April 18, 2024, and USDA Marketing Year Rankings Report.

Can U.S. Soy Meal Exports Keep Pace with Production? – continued from page 4

encourages exporting processed products, like soy oil and soy meal, over whole soybeans. Argentina's soy meal exports during the 2021/22 and 2022/23 marketing years were cut substantially because of drought conditions that reduced the country's soybean production. Figure 2 shows the historic soy meal exports for the top five exporting countries.

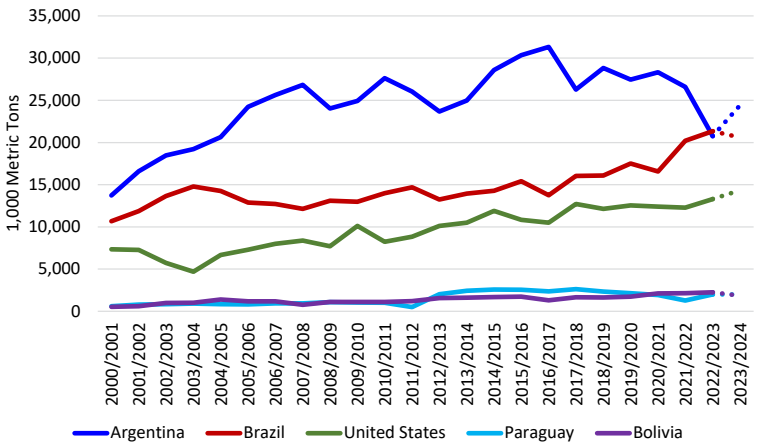
Global trade for whole soybeans and soy products, like soy meal and oil, are very price competitive. Figure 4 shows the historic soy meal export prices for the major ports in Argentina, Brazil and the U.S. Note that U.S. soy meal port prices tend to be higher than for Argentina or Brazil. Differences in transportation costs from the respective export facilities to the importing country's ports can explain part of the differences.

Figure 5 shows the historic soy meal import levels for the top seven importing countries. The European Union (EU) is the largest soy meal importing region. Indonesia is the largest importer for a single country. Also, note that the USDA started tracking soy meal exports to the United Kingdom in the 2016/17 marketing year when the United Kingdom voted to leave the EU.

While the levels of soy meal imports by the EU have been slowly decreasing over the past several years, the imports by Indonesia, Vietnam, Thailand, the Philippines and Mexico have been steadily increasing. These countries have relatively young and growing populations. While their economies are small when compared to the U.S. or EU, they are also growing quickly. As personal incomes grow, individual diets tend to transition from vegetable-based protein to animal-based protein. Increases in animal agriculture usually lead to increased feed demand. Some of that increased feed demand may be filled by imported soy meal.

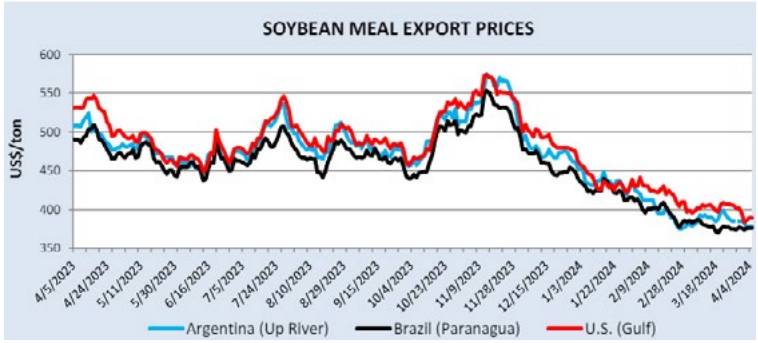
It is still unclear whether the increase in potential global demand for soy meal will grow faster or slower than the exportable supplies. The key will be to watch the relative growth rates of exports and imports. Will the growing demand for soy meal from developing economies exceed the growth in exports from the U.S., Argentina and Brazil? The answer to this question will have a significant impact on global soy meal prices and the role that U.S. exports can play in soy meal trade.

Figure 2 – Historic Soy Meal Export Levels for the Top Five Exporting Countries.



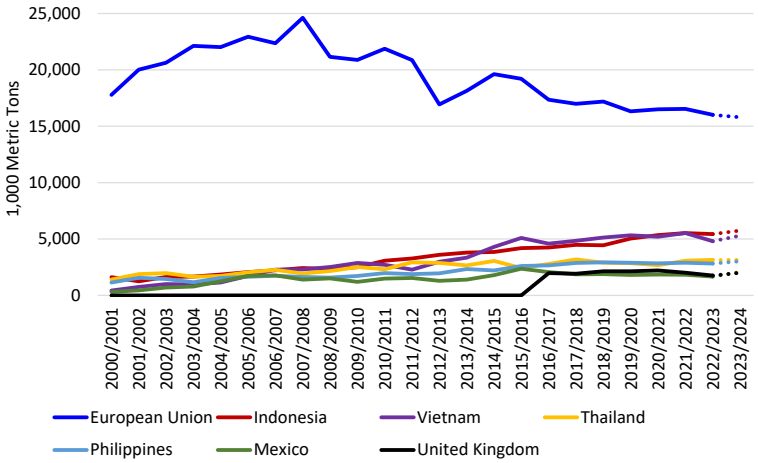
USDA World Agricultural Supply and Demand Estimates, April 11, 2024, and USDA Production, Supply, and Distribution online database.

Figure 4 – Historic Soy Meal Export Prices.



USDA Oilseeds: World Markets and Trade, April 11, 2024.

Figure 5 – Historic Soy Meal Import Levels for the Top Seven Importing Countries.



USDA World Agricultural Supply and Demand Estimates, April 11, 2024, and USDA Production, Supply, and Distribution online database.

Is the Value of Swine Manure High Enough to Encourage Investment in a Large Modern Confined Finishing Operation?

Jon T. Biermacher, Professor of Practice and Extension Livestock Development Specialist

Over the past few months, I have been asked several times whether the manure value of swine finishing operations in the form of nutrient content (%N, %P and %K) is enough to justify the investment in swine finishing operations. To address this question, I evaluated the relative total value of swine manure compared to commercial sources of N, P and K fertilizers for varying combinations of farm size (acres/farm) and yield goals for a typical corn-soybean farm where swine manure is applied to corn acres following a soybean crop. I used the swine manure calculator developed by Extension economists at Iowa State University. The calculator was designed so decision-makers (crop and livestock farmers) can determine the quantity and value of swine manure in terms of the potential replacement, or partial replacement, of commercial sources of N, P and K fertilizers typically applied to row crops, such as corn, soybeans and wheat, on their farms. The calculator is an easy-to-use interactive Excel-based decision tool that integrates agronomic, biological, engineering and economic information together so the user can ascertain the value of manure from their own hog facility or from a neighboring facility. You can access the calculator for free at www.extension.iastate.edu/agdm/livestock/xls/b1-65manurecalculator.xlsx.

For this analysis, information provided by production scientists at Iowa State University for a 2,400-head finishing barn was used to calculate the value of manure on a typical Iowa corn-soybean farm. It was assumed the 2,400-head finishing barn will operate 350 days per year and produce one gallon of manure per head per day. Based on nutrient testing, the manure from this barn has 50, 35 and 25 pounds of N, P and K per 1,000 gallons of manure with 90% of the N, 100% of the P and 100% of the K available for plant growth. It was also assumed that the previous soybean crop provided a 50-pound-per-acre credit. Also, the calculator used January 2024 prices for N, P and K nutrients of $0.60, $0.58 and $0.43 per pound of actual nutrients for each. An application cost of manure of $0.017 per gallon of manure was used in the analysis.

The calculator was used to determine the relative value of manure compared to commercial fertilizer sources on a $/acre and $/farm basis for two different farm sizes (1,000 and 3,000 total acres of cropland) and three alternative corn yield targets, including 100, 150 and 200 bushels per acre. In total, there were six farm size (acres) and corn yield target (bushels/acre) production scenarios. It was further assumed that each farm would have 50% of acres in corn following soybean in a typical corn-soybean rotation (e.g., for a 3,000-acre farm, 1,500 acres would be in corn following soybeans). Only corn acres following soybeans received swine manure.

The results of the analysis are reported in Table 1. Without access to manure, the total cost of commercial fertilizer ranged from $216/acre ($323,310/farm) to $111/acre ($55,424/farm) from the largest farm/highest yield target scenario (SC1) to the smallest farm/lowest yield target scenario (SC6). This is because more acres with greater yields require more total fertilizer, hence higher total costs. The same pattern holds true for the cost of manure both at the $/acre level and at the $/farm level. The calculator calculates the value of manure as the difference between the cost of commercial fertilizers applied and the cost of the manure applied. The value of manure ranged from $128/acre for the largest farm/highest yield target (SC1) to $64/acre for the smallest farm/lowest target yield scenario

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Is the Value of Swine Manure High Enough to Encourage Investment in a Large Modern Confined Finishing Operation? – continued from page 6

(SC6). This result is tied directly to the total annual supply of nutrient from a single 2,400-head finishing barn, which is equal to 840,000 gallons per year. Due to this limitation, the number of corn acres that are required to support one year's worth of nutrients from the 2,400-head barn increases from 186 acres for the largest farm/highest yield target scenario (SC1) to 536 acres for the smallest farm/lowest yield target scenario (SC6). This makes sense because farms with fewer acres and lower yields require less of the scarce nutrients from the manure. As a result, the value of the manure ($/farm) increases as the farm size and yield targets decrease. Another interesting result is the number of finishing barns needed to support all corn acres on the farm. The largest farm/highest yield target scenario (SC1) will require about eight 2,400-head finishing barns to supply most of the nutrient needs from manure. In contrast, the smallest farm/lowest yield target scenario (SC6) only requires about a single barn to replace the commercial sources of fertilizers with manure.

For a 3,000-acre corn-soybean farm in rotation that has the potential to produce 150 bushels of corn per year (SC3), the value of the manure is expected to offset about 11% of the total cost of the commercial fertilizers typically used on corn on such a farm. Currently, the investment cost of a large (2,400-head) modern confined hog finishing operation (buildings, equipment and machinery) is somewhere in the neighborhood of $1.25 million. A value of manure equal to $27,000 per year is, of course, a significant positive economic benefit to the corn-soybean farm; however, potential investors should consider the overall expected return on investment to a finishing operation in addition to this value before making the final decision to invest. For someone wanting to have enough swine manure to completely eliminate commercial sources of fertilizer for their 3,000-acre corn-soybean farm that produces an average of 150 bushels per year, that person would need six 2,400-head finishing barns, which would have initial investment costs exceeding $7 million.

Please feel free to send me your questions at jon.biermacher@ndsu.edu.

Table 1. Value of Manure from a 2,400-Head Hog Finishing Operation Relative to Commercial Fertlizers for Corn-Soybean Farms that Vary in Size (acres) and Expected Yield Targets (bushels/acre)

	Farm size (acres)/Yield target (bushels/acre) scenario					
Variable of Interest	SC1	SC2	SC3	SC4	SC5	SC6
Farm size (total acres)	3000	1000	3000	1000	3000	1000
Percent acres in corn	0.5	0.5	0.5	0.5	0.5	0.5
Corn acres	1500	500	1500	500	1500	500
Corn yield target (bushel/acre)	200	200	150	150	100	100
Legume (soybean) credit (lbs/acre)	50	50	50	50	50	50
Manure application rate (gallons/acre)	4500	4500	3033	3033	1566	1566
Corn acres required per 2,400-hd facility	186.69	186.69	276.96	276.96	536.32	536.32
Cost of commercial fertilzer ($/acre)	215.54	215.54	163.19	163.19	110.85	110.85
Cost of commercial fertilizer ($/farm)	323,310	107,770	244,785	81,595	166,275	55,425
Cost of manure plus supplement ($/acre)	88.02	88.02	65.42	65.42	47.03	47.03
Cost of manure plus supplement ($/farm)	132,030	44,010	98,130	32,710	70,545	23,515
Value of manure ($/acre)	127.52	127.52	97.77	97.77	63.82	63.82
Value of manure ($/farm)	23,807	23,807	27,078	27,078	34,228	34,228
Barns needed to support all corn acres	8.03	2.68	5.42	1.81	2.80	0.93
Value of manure (% of total fertilizer cost for corn)	7.36%	22.09%	11.06%	33.19%	20.59%	61.76%

Note: analysis assumes corn following soybeans.

The Final Closeout 2023 Farm Financial Scorecard for North Dakota

Bryon Parman, Agricultural Finance Specialist

In 1989, the Farm Financial Standards Council was created in response to the farm debt crisis of the mid-1980s to develop standardized Financial Guidelines for Agriculture. The metrics and benchmarks have evolved over time where additional ratios have been added or updated. Also, when deemed appropriate, some benchmarks have been removed with the hope of developing a concise yet informative description of a farm's relative financial performance. At the time of this article's writing, there are 17 ratios that are used to evaluate liquidity, solvency, profitability, repayment capacity and financial efficiency.

The Farm Financial Scorecard was created to categorize each ratio and provide clear standardized benchmarks for evaluation. Each ratio has thresholds for being either in a strong position (green), stable position (yellow) or vulnerable position (red) depending on how they compare to the established benchmarks. The ratio analysis usually doesn't tell what the exact financial issue might be but rather informs the evaluator that there might be an issue and provides a direction for further analysis (Figure 1).

Each year, the North Dakota Farm Management Education Program in association with the North Dakota Department of Career and Technical Education (www.ndfarmmanagement.com) combines farm financial information providing regional and statewide data and analysis. The 2023 data was recently published and is online at www.ndfarmmanagement.com/resources. While the books produced include four distinct regions as well as a statewide average book, it may also be useful to compare farms in the Red River Valley to those out of the Red River Valley using the farm financial scorecard ratios.

Upon examination, the financial ratios were not as strong following 2023 as they were following 2022 due to a large drop in net farm income. In fact, average net farm income within the data set fell by nearly 68%. However, 2022 was the best year on record in North Dakota and net farm income still averaged over $139,000 per farm. 2023 net farm income was essentially as good or better than any single year from 2014 to 2019. The primary reasons for the drop in net income were a significant drop in crop commodity prices while production costs remained historically elevated. Of primary concern from the numbers are the profitability ratios. Despite a net farm income of over $139,000 per farm, the profitability ratios for the non-Red River Valley all fell into the vulnerable zone (Figure 2) along with the operating profit margin for farms in the Red River Valley. In fact, the rate of return on equity (ROE) dropped below the rate of return on assets (ROA) in 2023 on average outside the Red River Valley due to a large number of farms having substantial negative net farm incomes. The last time ROE was lower than ROA in North Dakota statewide was 2019 when net farm income was on average $77,158 vs. $139,000 in 2023. Even when combining the two regions, ROE and ROA remained inverted in 2023.

Implications of the profitability ratios being so low despite net incomes being moderately below the 10-year average are that a large share of farms had negative net farm incomes inverting ROE vs. ROA and farm asset prices or farm capital costs have grown to the point that well-above-average net farm incomes are necessary to make those investments profitable. Additionally, larger cash reserves carried over from 2022 into 2023 have kept liquidity ratios strong and are helping support repayment capacity ratios. With net farm incomes projected lower in 2024 compared to 2023 by the USDA, there exists a real possibility that the rates of returns on assets and equity could be at or below zero, which hasn't happened since 2015.

Figure 1 can be found on page 9.
Figure 2 can be found on page 10.

The Final Closeout 2023 Farm Financial Scorecard for North Dakota — continued from page 9

Figure 1: The Farm Financial Scorecard

Farm Financial Scorecard

Using Recommended Measures from the Farm Financial Standards Council (FFSC)

Year: 20__

	Your Farm:	Vulnerable		Strong	Desire Trend
Liquidity					
Current Ratio	___.___	1.3	2.0		↑
Working Capital as % of Gross Revenue	____%	10%	30%		↑
*Working Capital as % of Operating Expense**	____%	20%	40%		↑
Solvency					
Debt-to-Asset Ratio	____%	60%	30%		↓
*Equity-to-Asset Ratio**	____%	40%	70%		↑
*Debt-to-Equity Ratio**	___.___	1.5	0.43		↓
Profitability					
Rate of Return on Assets	____%	4%	8%		↑
Rate of Return on Equity	____%	3%	10%		↑
Operating Profit Margin Ratio	____%	15%	25%		↑
Asset Turnover Ratio	____%	30%	45%		↑
Repayment Capacity					
Debt Coverage Ratio	___.___	1.25	1.75		↑
Replacement Coverage Ratio	___.___	1.1	1.5		↑
*Term Debt & Finance Lease Coverage Ratio**	___.___	1.25	1.75		↑
Financial Efficiency					
Operating Expense Ratio	____%	80%	60%		↓
Depreciation Expense Ratio	____%	10%	5%		↓
Interest Expense Ratio	____%	10%	5%		↓
Net Farm Income Ratio	____%	10%	20%		↑

Farm Financial Scorecard available online from the University of Minnesota, Center for Farm Financial Management. Initial development with The University of Vermont Extension.

Continued on page 10.

The Final Closeout 2023 Farm Financial Scorecard for North Dakota — continued from page 9

Figure 2: Farm Financial Scorecard Ratios for Red River Valley vs. Non-Red River Valley Farms in North Dakota 2023

	Red River Valley	Non-Red River Valley
Current Ratio	2.23	2.07
Working Capital to Gross Revenue	43.4%	49.2%
Working Capital to Operating Expense	58.7%	64.3%
Debt-to-Asset Ratio	39%	31%
Equity-to-Asset Ratio	60%	69%
Debt-to-Equity Ratio	0.68	0.45
Rate of Return on Farm Assets	6.1%	2.9%
Rate of Return on Farm Equity	7.4%	1.7%
Operating Profit Margin	15%	8.5%
Asset-Turnover Rate	40.8%	27.8%
(Total) Debt Coverage Ratio	2.16	1.5
Replacement Margin Coverage Ratio	1.57	1.04
Term Debt	2.34	1.66
Operating Expense Ratio	73.8%	76.5%
Depreciation Expense Ratio	5.2%	8.2%
Interest Expense Ratio	3.8%	5.0%
Net Farm Income Ratio	17.2%	11.4%