

FARMER  AC



THE FEED

by FARMER MAC

Perspectives on the Ag and Rural Economy

Weathering Uncertainty

SPRING
2022

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LETTER FROM THE CHIEF ECONOMIST

As the saying goes, “May you live in interesting times.” Whether you read that as a blessing or a curse, farmers, ranchers, and rural Americans are indeed living in interesting times. After the COVID-19 recession and economic boom, ag and rural communities experienced tight labor markets, higher prices for energy and goods, and a largely positive outlook for commodity prices. In February, the USDA released its first look at 2022, predicting a mix of better incomes paired with higher input costs. The report matched the mixed results we’ve grown used to in 2021: Sure, grain prices looked to hold well above profit breakevens, but fertilizer prices spiked in the fall. Sure, economic conditions looked to support specialty crops and protein prices, but good help was and is still hard to find and costs a lot more. Thus, the USDA’s first take on 2022 showed net cash farm incomes that looked a lot like those in 2021, with higher income from farm products and lower income from the government. In a word: steady.

We like steady! Steady is predictable. At these prices, steady makes money. Steady pays bills. Steady builds wealth. Wages are up in rural communities, unemployment is down, inflation is taking a big bite out of income, and people were holding their breath for higher interest rates, but overall, the rural economy was humming along as the calendar turned to 2022.

And then—Russia invaded Ukraine. Beyond the humanitarian devastation and strong emotions, markets reacted quickly and deeply to both the actions and sanctions arising from the war. Most agricultural commodity prices spiked to historically high levels. Both Russia and Ukraine are major wheat exporters, so the conflict sent winter and spring wheat to new highs (as of March 1, you could hedge winter wheat above \$9.50 per bushel out to March 2023). Ukraine is also a significant exporter of corn. Over 80% of their corn use is exported, and a big chunk of that is to China. As such, corn futures jumped up to \$7.25 per bushel. These are incredibly high numbers, driven up as traders start to worry that the U.S. may be the only game in town later this year.

While some producers welcome such commodity prices, there are many consequences to these trends. First, food price inflation is likely to take another upward turn, particularly in developing countries. Second, higher grain means higher feed costs, crimping the high hopes of better profitability in the protein sectors like cattle and dairy. Third, energy-related inputs are likely to cost even more than previously expected. And that’s saying something: in many places, fertilizer costs were already up 100-200% over 2021.



A lot will play out over the coming months, but to summarize where we are today: input price inflation is taking a toll on production costs; grain producers are likely to have a profitable year and continue to push up land values; the protein sector may struggle under higher costs and lower prices if international markets shun high-value products like beef; specialty crops producers may move sideways with higher costs but more domestic activity like travel and leisure; rural economies will grapple with another wave of inflation and labor shortages may push wages even higher; and the Fed may adjust its path of monetary policy normalization in reaction to the impact of war on international economies. This issue highlights the rising costs of inputs, which are undoubtedly top of mind as the ground thaws and spring takes shape. We hope you enjoy our takes and that you have a happy, hearty spring.

Best,



Jackson Takach, CFA
Chief Economist





RISING FARM INPUT COSTS TO PRESSURE PROFITS^{1, 2, 3, 4}

Farm expenses are rising across nearly all categories. Higher grain, fertilizer, energy, and labor prices are driving the trend, and the impacts of these increases will vary by operation and commodity type. The sector operating expense ratio is likely to increase back towards a historically high level, but firm commodity and food prices leave room for farm profits this year.



As the saying goes, it takes two to tango. Farm profitability is not only a function of market commodity and food prices but also the prices and costs of inputs needed to raise agricultural products. Individual expense line-items vary across operations, but the USDA provides helpful expense categories

that make it easy to track sector-level trends by expense item, including categories like feed, fertilizers, fuel, interest, labor, rent, and seed, to name a few. Total farm expenses tend to track very closely with farm incomes, as outputs from some farmers are the inputs for others (e.g., corn used for animal feed). There are also farm expenses

that lag behind a good or bad agricultural economy, such as seed, land, and machinery costs. These expenses tend to rise after a period of strong profits and then slowly drift down after a period of stagnant profits. Finally, some expenses are uncorrelated with the annual sector changes and somewhat beyond producers' control, such as interest, labor, and fuel costs. While every operation manages these expenses individually, the collective sector expense levels can indicate the overall amount of pressure farm profits may feel during the coming year.

The USDA released its first look at 2022 farm expenses this February, and not surprisingly, economists forecasted a significant rise in farm expenses. USDA

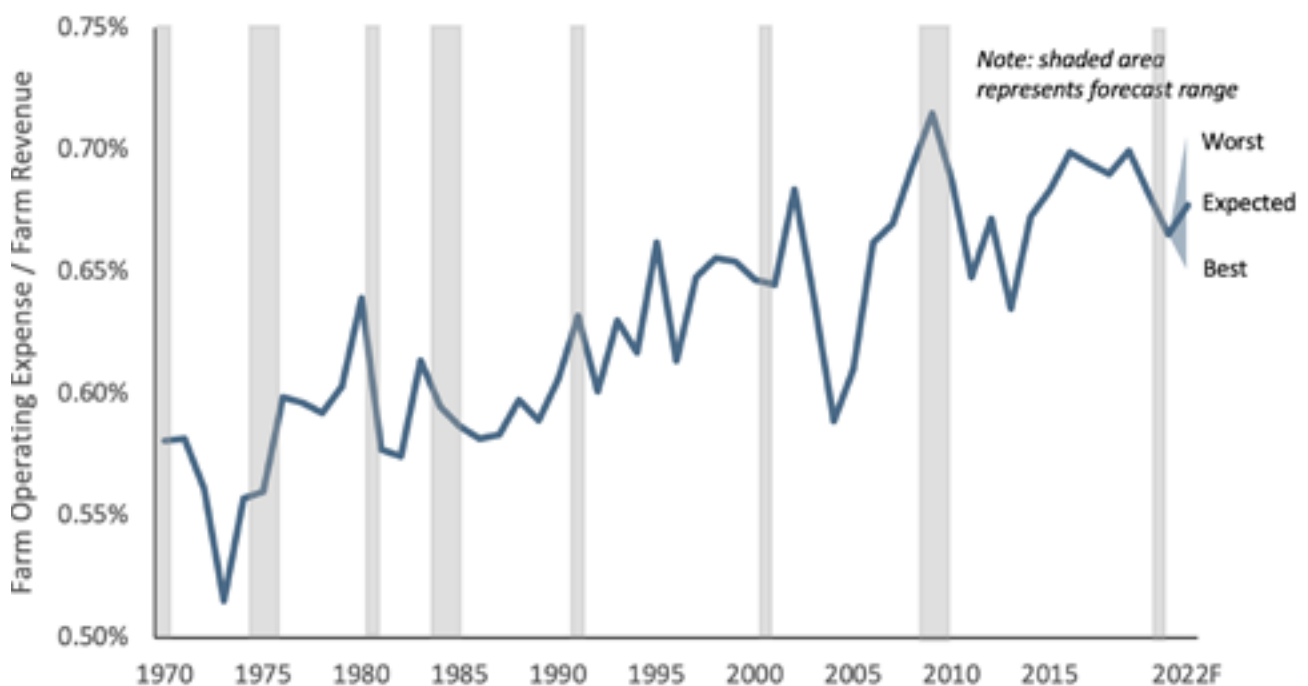
economists project increases in eight out of the ten major expense categories in 2022, including a 12% increase in fertilizer expenses, a 10% increase in interest expense, and a 7% increase in animal purchase expense. These projected increases reflect recent increases in energy costs, supply chain disruptions, rising interest rates, and higher feed grain prices. The only categories forecast to either remain stable or fall were seed expense and net rent to landlords, but these expenses are small relative to the other categories. In total, the USDA expects farmers to spend approximately 5% more in cash expenses in 2022 relative to 2021.





A good way to contextualize farm expenses is their level relative to income or the operating expense ratio. This metric shows how much of every farm dollar earned is lost to operating expense, and Figure 1 shows the historical trend of operating expense ratio from 1970 to 2022 forecast. Before the commodity price increases in 2021, the operating expense ratio was operating at a historically high level of 0.70. During the last supercycle, from 2012 to 2014, the ratio was below 0.65. Current estimates of 2021 operating expenses show a return near that level of profitability. But estimates of 2022 show a reversal back toward 0.70, and if expenses end up higher than USDA estimates (i.e., at a nintieith percentile historical increase) and commodity prices don't increase to match, the operating expense ratio could exceed 0.70 in 2022. Conversely, if commodity prices remain elevated and world supplies see continued disruption, the operating expense ratio may retract to super cycle-era levels.

Figure 1: Farm Sector Operating Expense Ratio

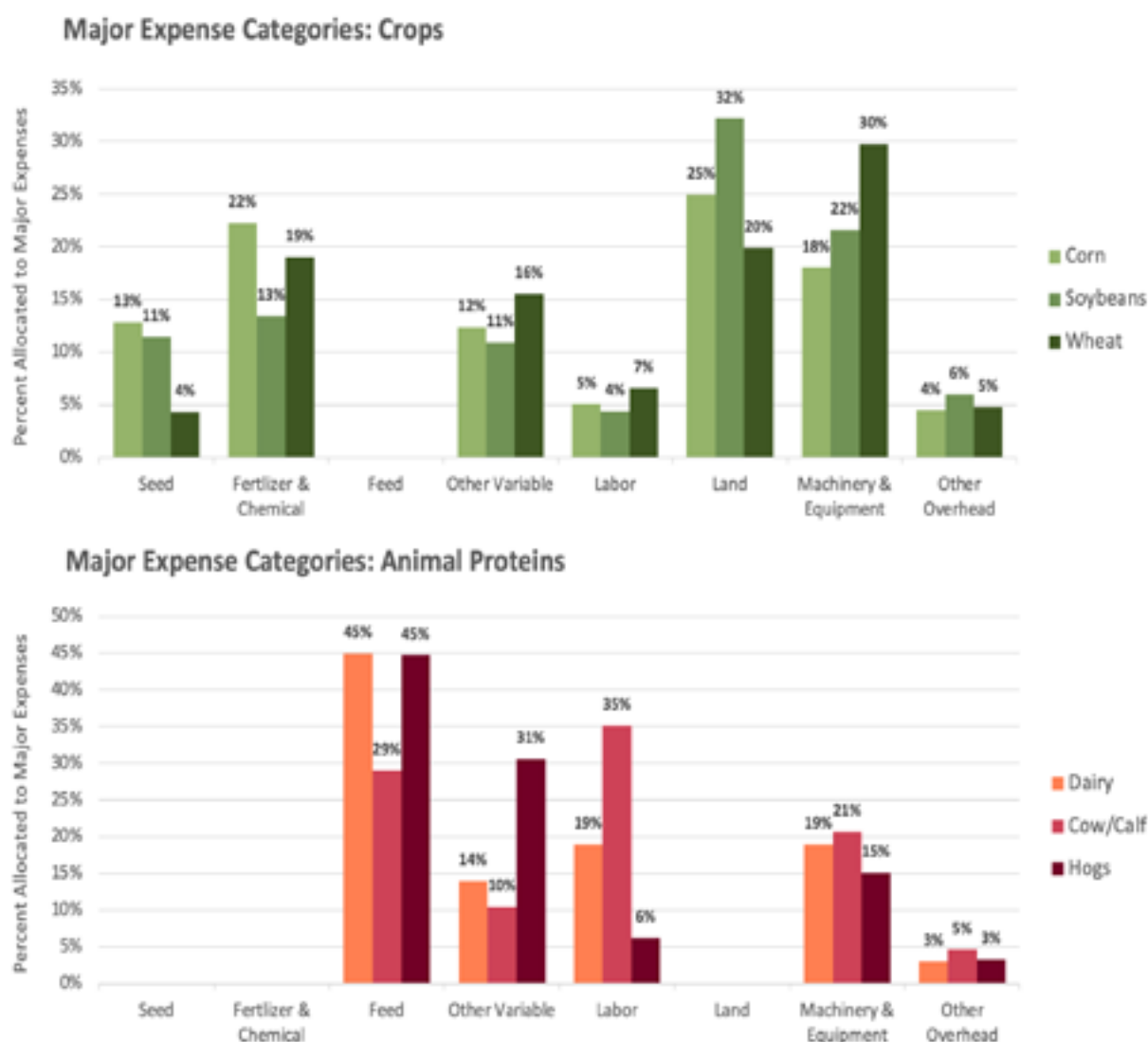


Source: USDA ERS Farm Income and Wealth Statistics, Author's Calculations

Different sectors will be impacted by different expense pressures. Figure 2 breaks down the major expense categories by the percentage of total production expenses for major crop and animal protein sectors. Corn, soybean, and wheat production have a high percentage of expenses in land, fertilizer, and machinery, so increases in any of those inputs will more adversely impact those sectors than others. Similarly, animal protein producers are highly exposed to feed, labor, and equipment expenses. According to data from Green Markets, fertilizer prices were up nearly 100% annually in December 2021 before

settling back down to 57% above 2021 levels in February 2022 (before the Russian military actions in Ukraine). These dramatic increases will impact corn and wheat producers the most, although higher land expenses could also pressure soybean producers. Dairy, cattle, and hog producers are grappling with a 13% increase in animal feed price indices between January 2021 and January 2022. Combined with a 4.5% increase in agricultural servicer workers' wages, animal protein producers of all sizes and scales are seeing expense levels rise at a rapid pace.

Figure 2: Expense Allocation by Crop and Protein Sector



Source: USDA Cost and Returns Data, Author's Calculations



Specialty crop producers are feeling the pressure as well, particularly on the cost of labor. Data from the U.S. Bureau of Labor Statistics show that agricultural unemployment rates are at their lowest levels in the 20 years the data has been released (see Figure 3). Low unemployment rates can mean there are more jobs available than workers to fill them, putting upward pressure on wages in those industries and areas. In states like California, where labor is the top expense line item, wage rates are rising even faster than the U.S. average. According to the USDA Farm Labor Survey, the average wage of California field workers increased 8.5% between October 2020 and October 2021.

Figure 3: January Agricultural Unemployment Rate (Seasonally Adjusted)



Source: Bureau of Labor Statistics, Author's Calculations

The combined effect of these expense increases is downward pressure on profitability across agricultural sectors. It does not guarantee losses, but a tighter budget gives producers fewer chances to make mistakes and still ink the profitability levels experienced in 2021. Researchers from Purdue University and the University of Illinois show lower expected returns

to crop producers in 2022, but the budgeted returns are still positive. Producers and lenders alike will need to approach the 2022 growing season with a careful eye to avoid buyers' and growers' remorse this year. Despite these challenges, commodity prices remain above breakeven levels for many, so profits can and will be inked by many.



RISING RETAIL PRICES MAY NOT IMPACT PRODUCER PROFITS

5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16

While Americans have seen a sharp rise in the cost of many foods over the last year, these increases mirror what consumers saw during the commodity supercycle. Americans often do not change their food buying habits in response to price changes, but increases in labor and energy costs in 2022 may cause headwinds for food away from the home and for proteins like beef.

Over the past year, Americans have noticed sharp increases in many prices at the grocery store. The USDA Economic Research Service (ERS) estimates that the consumer price index (CPI) for beef and veal rose 9.6% in 2020 and 9.3% in 2021. The rise in the price of meat has dominated coverage around food price inflation, but the broader picture is more muted. Fruits and vegetables, bakery products, fats and oils, and other non-

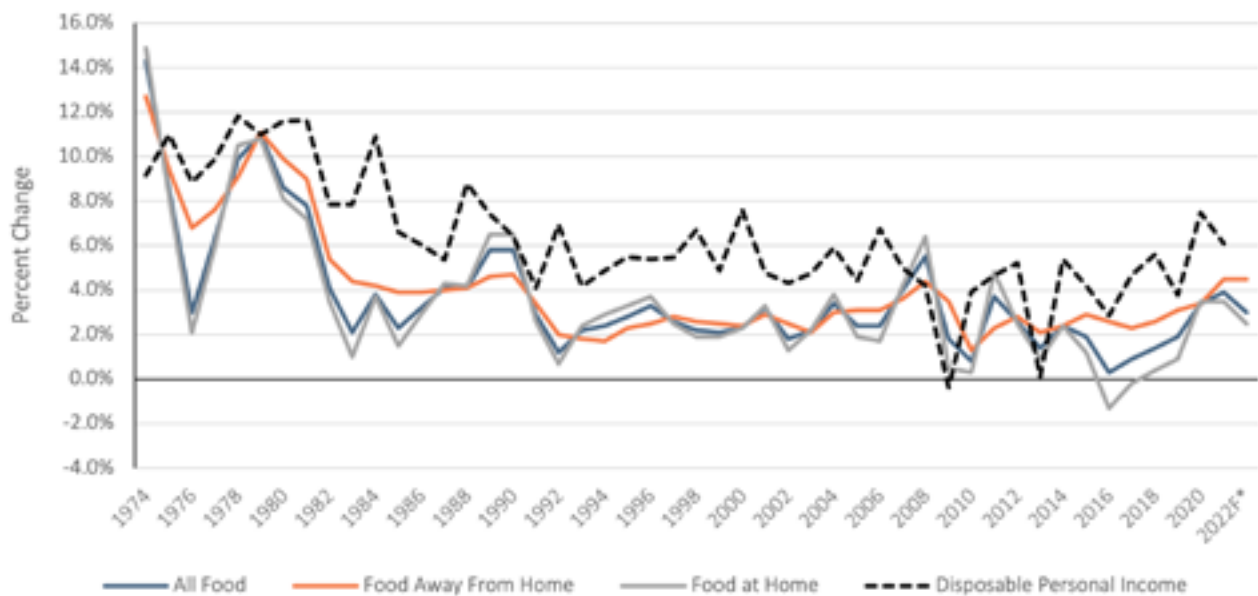
animal products showed growth that was closer to historic averages. Figure 4 shows the history and current 2022 projections for CPI growth for food in 2022. In historic terms, the recent growth in food costs is not unusual. Consumers saw a similar period of price growth across a wide range of commodities throughout the commodity supercycle, including double-digit annual growth for meats.



What matters more for consumers is the cost of food relative to income. Through 2020 and 2021, robust government support helped drive American disposable income higher, lessening the impact of price increases for food. However, recent evidence suggests that recent food price increases could be outpacing wage growth. Over the second half of 2021, the Bureau of Labor

Statistics estimated that the CPI for food grew faster than average hourly earnings five out of six months. This is also not something without recent historic comparison; food cost growth outpaced wage growth during the 2008 financial crisis, and even outpaced wage growth for 18 months during the early stage of the commodity supercycle.

Figure 4: Food Cost Growth Has Historically Lagged Income Growth, but Signs Point to a Reversal in 2022



Source: USDA ERS Food Price Outlook, U.S. Bureau of Economic Analysis Personal Income and Outlays

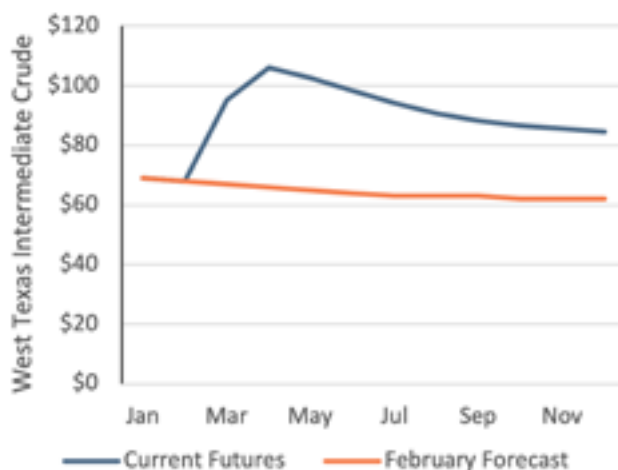


The question producers and lenders may be asking is whether they should anticipate more months of food price growth that eclipses wage growth. Farmers and ranchers have seen many input cost increases, as inputs like anhydrous ammonia are three times as expensive as they were in 2020. Indices for trucking costs are at historic levels. These and other sharp input cost increases seem to conflict with the relatively muted total increases in 2022 retail food price growth forecast by entities like the ERS. So, what does drive retail price increases?

Energy

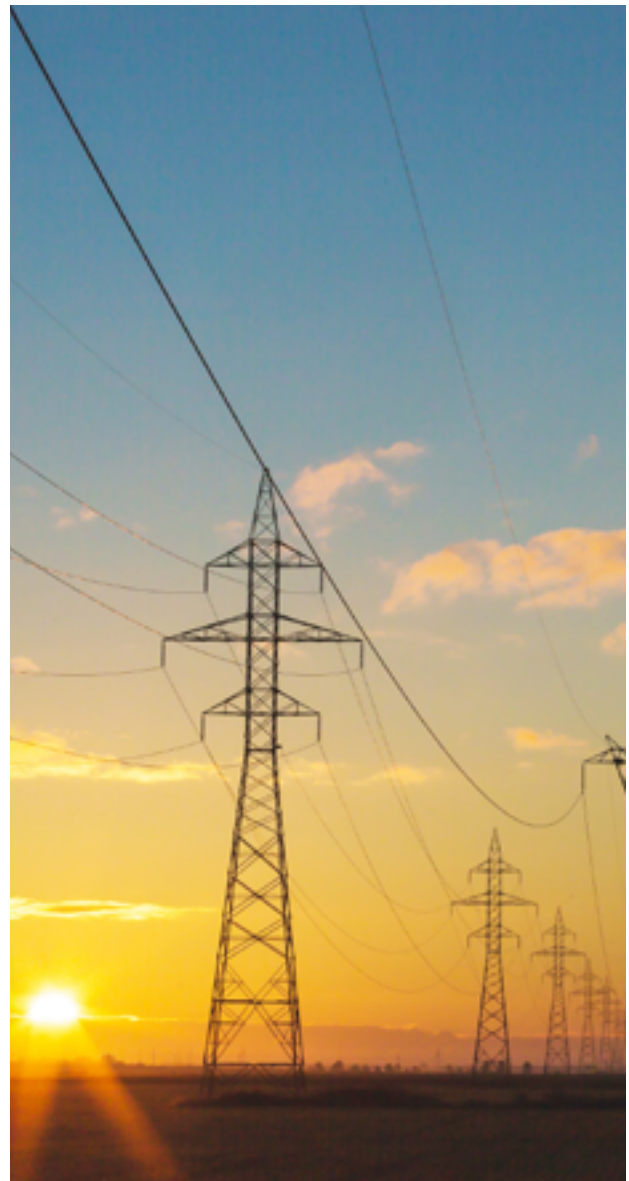
Literature on retail food prices finds that changes are often driven by energy-related impacts on commodity prices or higher energy costs in the food marketing system. These effects are generally more influential for food consumed at home than away from home. One analysis by the ERS found that a 10% increase in diesel prices was associated with a 2.0 to 2.8% increase in wholesale produce costs. The influence of energy is so extreme that, in their calculations of food price inflation, many of the USDA's CPI forecasts use energy prices as the only input.

Figure 5: Energy Costs Have Surged



Source: BarChart, EIA Short-Term Energy Outlook

The geopolitical events of early 2022 have made forecasting the net impact on retail activity difficult. An early 2022 February forecast by the U.S. Energy Information Administration forecast that energy prices would subside starting in Q1 2022 as global production of crude continued to rise. This is now out of alignment with current futures markets. Figure 5 shows the February EIA forecasts compared to the March 1 futures market for West Texas Intermediate crude oil. While there is still an unprecedented amount of uncertainty in the energy markets, the extreme increases in energy prices are likely to cause sharp upward revisions in CPI projections, especially for food consumed at home.



Labor

Despite the importance of energy in forecasting food price inflation, labor represents a far greater share of total retail food costs. Figure 6 shows the share of total costs by industry group for food consumed at and away from home in 2019. From this, we see that farming-related costs are a negligible portion of the total cost in food production and distribution. Even transportation-related costs make up a relatively small share of the total. Most of the costs fall during food processing or distribution to the consumer through retail outlets and food places like restaurants. The USDA estimates that in 2019, 45% of every dollar spent on food at home went towards salary and benefit costs, while 58% of food away from home did.

What this means for consumers is that changes in labor costs have a strong impact on what consumers pay at a grocery store or restaurant. In 2021, employment cost indexes found that compensation of food service workers rose 6.6% and 5.4% for retail workers like grocery store

personnel. However, the private sector anticipates lower wage cost increases in 2022. A January survey on salary and budgets by The Conference Board found that respondents anticipated a median total salary increase of 3.5% in 2022. While this is above historic averages, this more modest growth would mean less pressure coming from labor expenses.



Figure 6: Most Retail Food Costs in 2019 Stemmed From Labor, Not Production or Energy-Related Expenses



Source: USDA ERS Food Dollar Series. **"Other" includes advertising, legal, accounting, finance, insurance, and energy industry costs.

Elasticity

These factors tell us that retail food prices are likely to feel pressure in 2022, but they do not tell us how consumers will react. If food prices increase but consumers don't alter their purchasing behavior, the impact on producers will be muted. Prior analyses have found that periods of high commodity prices are correlated with lower meat consumption in the United States. But the magnitude of this response is important. If consumers do not substantially curtail their consumption in high price environments, then producers may see limited impacts on total sales.

The elasticity of food in America—the change in how much of a food consumers buy in response to a change in price—is a topic with a long body of research. In general, there is a broad consensus that most food consumption in the U.S. is not responsive to price increases (though there are differences across food groups). Figure 7 shows the mean elasticity and confidence intervals for select food groups from a meta-analysis of this research. The analysis suggests that a 10% increase in the cost of food away from home would lead to an 8.1% decline in the quantity of that food consumed. Conversely, it suggests that a 10% increase in the cost of eggs will only lead to a 2.7% decline in consumption. In general, beef and food away from home are more responsive to prices, while staple goods respond less to price changes.

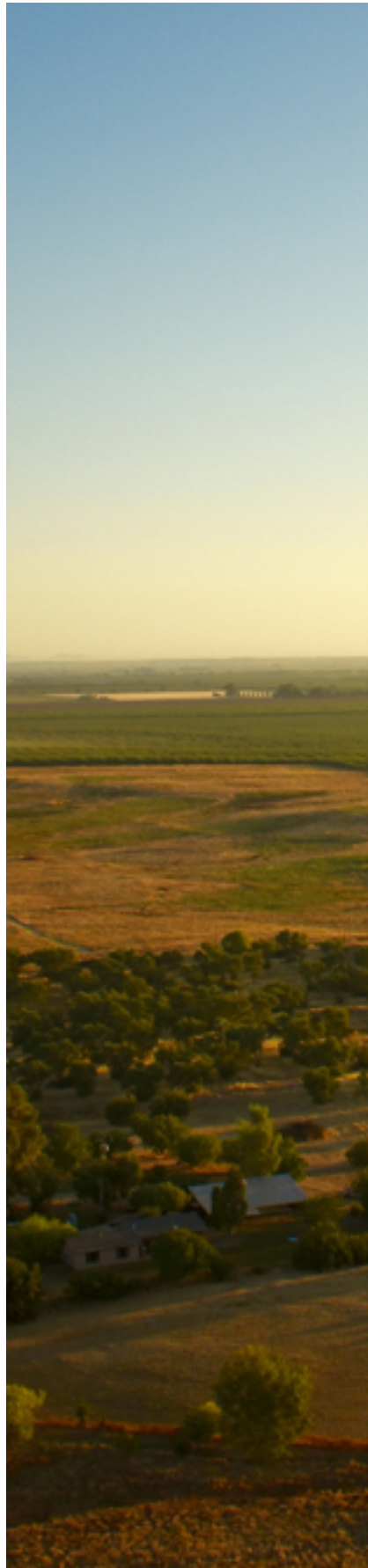
Figure 7: Meat and Food Away From Home Are More Responsive to Price Changes Than Other Foods



Source: Andreyeva T, Long MW, Brownell KD. The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food. *Am J Public Health*. 2010;100(2):216-222.

While rising food costs are an important consideration for Americans, they may not be as relevant to American producers. Current projections are that food price inflation will be elevated, but in line with prior periods of food price growth. Costs of production that occur on the farm are often a negligible portion of total food costs, and projected increases in farm expenses

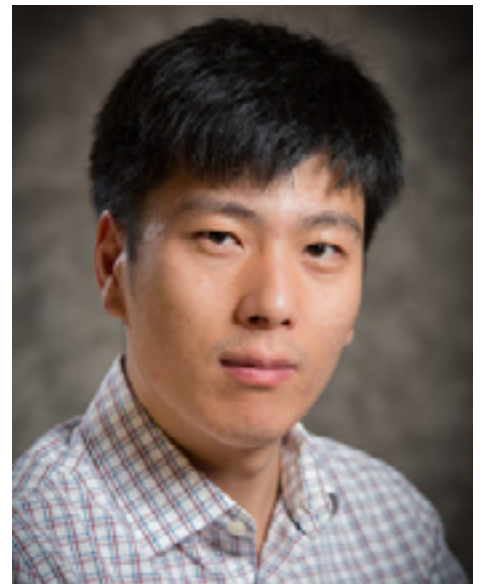
in 2022 are unlikely to have material impacts on consumer decision-making. Retail prices will be more sensitive to changes in energy and labor costs, but those price changes tend to have muted impacts on Americans' buying behavior. Buying a steak sandwich might feel like a luxury purchase in 2022, but the net effect to farmers and ranchers is likely far less than the price hikes suggest.



INTERVIEW:

FARMLAND VALUES IN A RISING RATE ENVIRONMENT

Editor's note: Dr. Wendong Zhang is an associate professor within the Department of Economics at Iowa State University. He is the leading researcher of the Iowa Land Value Survey, the Iowa Farmland Ownership and Tenure Survey, and has written extensively about the forces that influence agricultural land values. We sat down to discuss how potential interest rate increases from the Federal Reserve could influence agricultural land markets in the coming years. The interview has been edited for grammar and clarity.



FARMER MAC: Do you expect farmland values to change in 2022 because of increases in the Federal Reserve's interest rates?

Dr. Zhang: There are definitely downward pressures because of interest rate hikes. Farmland value roughly can be thought of as income divided by interest rate. Our model shows that the downward pressure imposed through the projected three hikes this year probably won't be enough to offset all the substantial cuts over the last few years, especially the March 2020 rate cuts. For the monetary policy we are likely to see, the interest rate environment in 2022 is still a net supporting environment. But this support may not be as strong as it would have been without rate hikes, and we probably will see downward pressure starting late 2023.

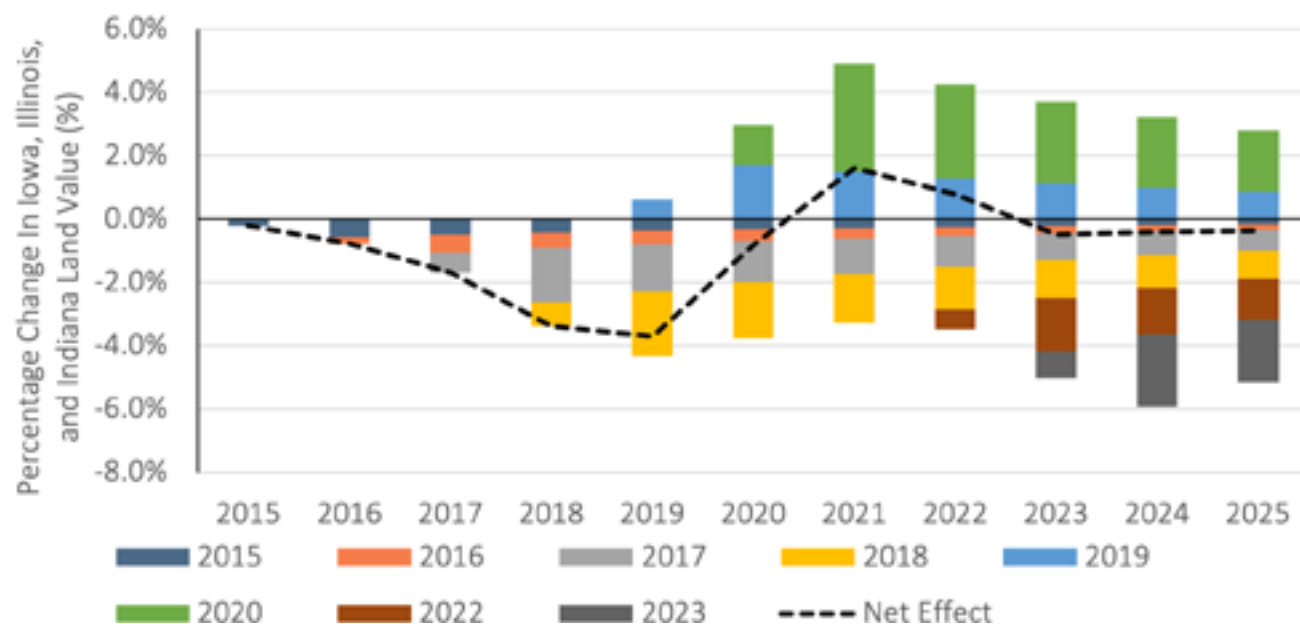


How long after the last rate hike do you think it would take for producers to feel the full brunt of that on their land values?

Our model projects three hikes in 2022 and four more in 2023; we foresee modest downward pressure in 2023, with more in 2024 and 2025. The bigger question is agricultural incomes. When we are looking at incomes for 2022, we do predict that projected income will decline compared to 2021, especially if there are rising input costs and if ad hoc government aid slows down. Looking at the export market, there are some headwinds, especially those coming from China. So, there are some downward pressures, but we still anticipate significant profitability margins, especially if the growers take advantage of before-harvest marketing opportunities. If you look at the Iowa Land Value Survey, a lot of the respondents are expecting around 10% growth this year. But yes, the interest rate hikes definitely impose downward pressure, in two ways: they raise the cost of financing, and they make other investment alternatives, like bonds, a little more attractive due to their higher rate of return.



Figure 8: Interest Rate Hikes in 2022 Will Not Be Enough To Offset the 2020 Cuts, but Seven or More Rate Hikes Would Lead to Negative Pressures by 2023



Source: Dr. Wendong Zhang, Iowa State University Department of Economics



Given typical fluctuations in agricultural incomes: over the next five years, will monetary policy or will agricultural incomes have a bigger influence on total land value growth or decline?

Currently, interest rates are still very low, and even with the high inflation we're experiencing now, all the signals from the Federal Reserve seem to show that they are taking a slower and modest hike pace. Fluctuation in farm incomes probably will play a bigger role. In general, when there is a 10% change in gross income, you will see the farmland market move four or five percent in the same direction over the following two years. Suppose we see an increase in farming income of 20%. Then, two years later, we'll see about a 10% increase in land values. Another interesting point looking at this is that the farmland supply is tight,

but farmland of different quality and land with alternative characteristics could fare differently. So, I would expect the higher quality land will hold fairly strong and probably show strengths while non-tillable land, especially if lacking hunting and recreational potential, probably will feel more downward pressure.

Are the changes in land values from agricultural income over the last two years greater than potential impacts from the proposed interest rate hikes in your model?

In the immediate short term, this is probably true. We're seeing farm income starting to show significant increases since 2020, but land markets didn't respond drastically until the middle of 2021. That's a lagged response to the income surge, but we anticipate those gains to be capitalized into 2022 land values. Monetary policy is very important, but it takes over a decade to be fully absorbed in the market. It's often the unexpected, drastic move that will cause significant movement in the real estate market.

Why is it that monetary policy takes so long to be absorbed in farmland markets?

It's not the case that everyone goes out to get a farmland loan at the same time, so you don't feel the rate changes immediately. You don't necessarily feel even the rent changes because those are negotiated only once or twice a year. You could also have a flex lease or some other arrangement that takes some time to be fully absorbed into the market. In general, monetary policy will need a long time to be realized in competing asset returns to be fully felt by the general economy and the agricultural economy.



Your previous work shows that some states, like Illinois, Indiana, and Iowa, absorb changes in monetary policy more quickly than some other regions. What drives differences in how quickly regions respond to interest rate changes?

As I mentioned before, we think of land values as income divided by interest rate. The

relative significance of the interest rate is different. If you're looking at the Dakotas, whether you have energy development potential matters a lot. If you're in the western U.S. and have water rates, that will be much more important than monetary policy movement. When you have more sources of income beyond just crop income it's harder for producers and investors to figure out how much these effects should be in the market. If we look at the states you mention, the more significant impact is because when people think about farmland, they think

about these states. When you have less complicated income sources, the capitalization is easy to think about. When you have diverse values coming from urbanization, energy, water rights, and other factors (like pasture or recreational potential), that makes it harder to figure out exactly how much should be reflected in values.

Does that mean that farming-dependent counties will see changes in monetary policy absorbed more quickly into farmland values?¹



Not necessarily. For my dissertation, I looked at western Ohio farmland values, so we looked to see how urban influence impacted nearby farm values. You see that nonfarm factors, such as urban influence, matter a lot. During the 2007 residential housing market bust, the farmland market dropped significantly for these para-urban parcels. This wasn't because their productivity value dropped, but because their urban premiums were cut in half. So, to the extent that the residential housing market responds quicker to interest rate hikes, that will be reflected in nearby farmland parcels where a portion of their value is due to urban premiums.

¹ The USDA Economic Research Service defines a farming-dependent county as a non-metropolitan county where either at least 15% of average annual labor and proprietors' earnings came from farming, or where at least 15% of employed residents worked in farm occupations.

Is there anything that you think is missing or under-covered from the national conversation around farmland values?

We've noticed in the recent land value surge is not only due to producers; it's also due to investors. How the interest rates affect returns on alternative assets such as stock and bonds will affect the demand from investors for farmland. The more direct and volatile impact of interest rate changes on stocks and bonds could have unique pressures on investor interest for farmland. Another thing impacting investor influence is state-level variations in corporate land ownership. There are state-level variations in foreign land ownership and registration requirements. These variations can help explain why certain regions have more investor activity than others. It's also important to understand that these investors view land as part of an investment portfolio in addition to the agricultural returns. In the Midwest, a quarter to a third of land is bought by these types of buyers. This is a broad definition that includes people like retired farmers. In the Iowa Land Ownership Survey, 19% of these individuals owned the land for long-term investment, 29% for family and sentimental reasons, and about half owned for its agricultural income.



Second, another astonishing statistic from the survey is that 81 to 82% of the land in Iowa is fully paid for. A lot of the lenders who went through the 1980 farm crisis have started to worry about the farmland market collapsing. The current signal doesn't point to this alarming future, in

part because the interest rate levels are still low and the steps indicated now are not as drastic as in the 1980s. On top of that, the sector overall is far less leveraged compared to the late 70s and early 80s. On a broad spectrum, I think it's way less risky compared to what we saw during the 1980s.

FARM INTEREST EXPENSE EXPECTED TO MODERATELY RISE

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Farm interest expense remains at a healthy level relative to farm earnings. It would take significant declines in farm income or significant increases in interest rates or debt levels to systemically stress farm financials.

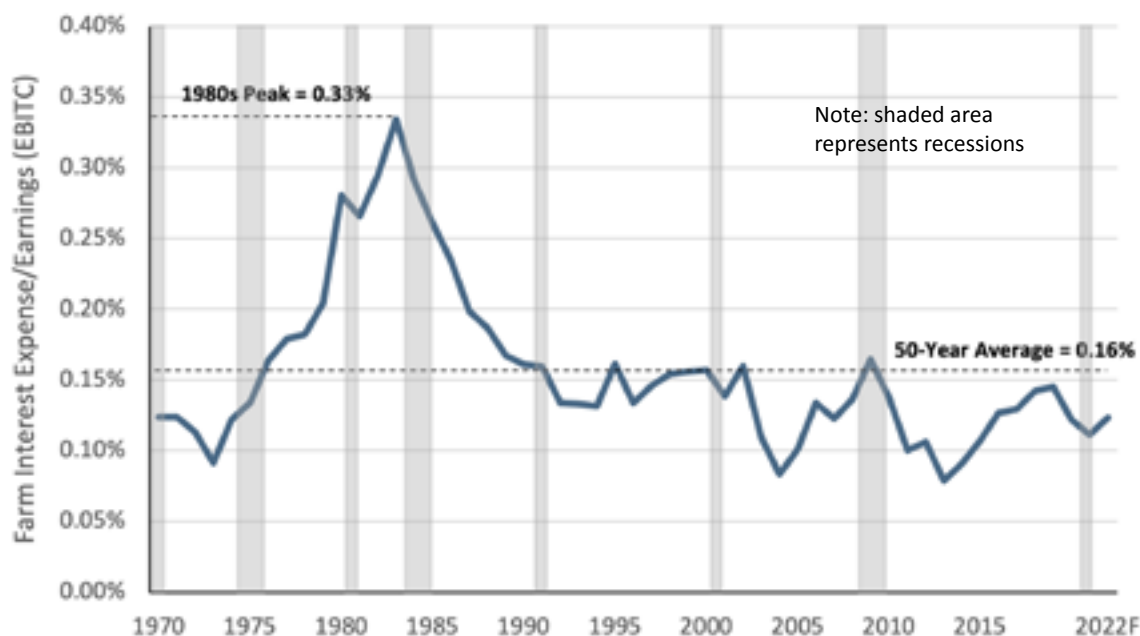
Of all farm expenses, interest on debt is far from the top of the list. Many producers carry little or no financial leverage, reducing the average farm sector interest expense to just over 5% of total production expenses. But, as any student of agricultural finance knows, excessive leverage and interest rate risk can weigh down the farm economy to the brink of disaster. The 1980s farm financial crisis may be 40 years in the rearview, but its memory still echoes across the rural landscape. As the Federal Reserve considers the future of U.S. monetary policy and the cost of agricultural production continues to rise, sector interest rate risk is once again becoming a talking point among analysts and economists.

Fortunately, the U.S. ag sector is entering 2022 with a strong financial footing. According to the USDA's farm income and wealth data series,

farmers are expected to pay just under \$23 billion in interest expense in 2022 on \$467 billion in total farm debt. In total, the USDA forecasts the farm sector to take home \$186 billion in earnings before interest, taxes, and capital expenditures (EBITC). Thus, sector interest expense represents only 12% of total earnings, a very manageable level and below the 50-year average of 16% (see Figure 9). Current levels pale in comparison to the 1980s peak of 33%, when variable interest rate loans dominated balance sheets, interest rates skyrocketed in response to the 1970s stagflation, and farm income plummeted following the collapse of grain prices in 1980. While operations with debt routinely operate between 0.35 and 0.45 interest to EBITC, a value of 0.20 for the overall sector is a healthy threshold. If the sector interest to EBITC ratio stays below 0.20, a repeat of the 1980s farm financial crisis is unlikely.



Figure 9: Farm Interest Expense to Earnings Before Interest, Taxes, and Capex



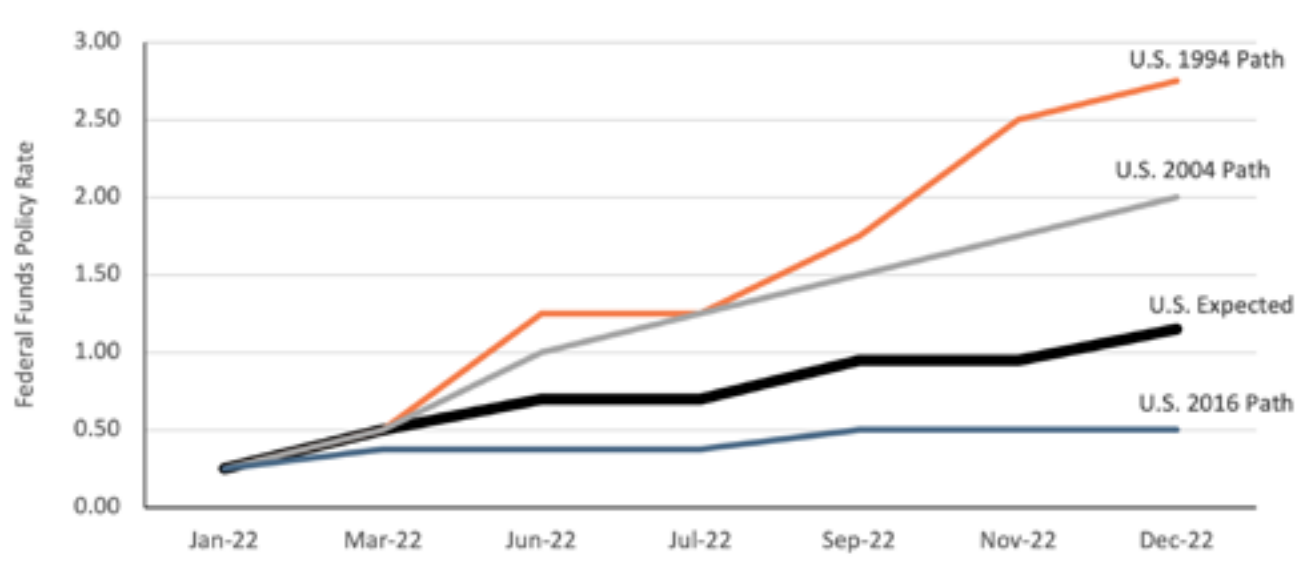
Source: USDA ERS Farm Income and Wealth Statistics, Author's Calculations

The logical next question is, “What could push the ratio up above that threshold?” Stress-testing the three components of the ratio (earnings, interest rates, and debt levels), it is exceedingly difficult to breach the threshold with any single variable. For example, leaving earnings and debt levels alone, it would take a 300 basis point increase in farmer-paid interest rates to shift the interest expense high enough to create systemic financial strain. As Figure 10 demonstrates, even with an aggressive rate policy correction, the U.S. Federal Reserve is unlikely to raise short-term rates by more than 250 basis points. Paths charted by the U.S. Fed in 1994 and 2004 showed 300 basis points of tightening, but the increases were spread over multiple years, giving borrowers time to lock in interest rates and mitigate future increases. Additionally, more farm

debt is secured by real estate today than in the 1970s, when many operators used variable- and adjustable-rate products on real estate loans to manage and mitigate interest rate risk. Similarly, farm net cash income would need to fall by 38% to put the sector at risk. Even with higher production expenses, we are unlikely to see this level of earnings degradation. Only in 2002 was farm earning power at that level; not even during the 1980s did farm earnings hit the level that would be required to push the interest to EBITC ratio to 0.20 today. Finally, debt levels would have to rise by a massive 62% to push interest expenses at these rates. Even assuming a 125 basis point increase in average farm rates, debt levels would have to rise by 30% to push into caution levels.



Figure 10: Farm Interest Expense to Earnings Before Interest, Taxes, and Capex

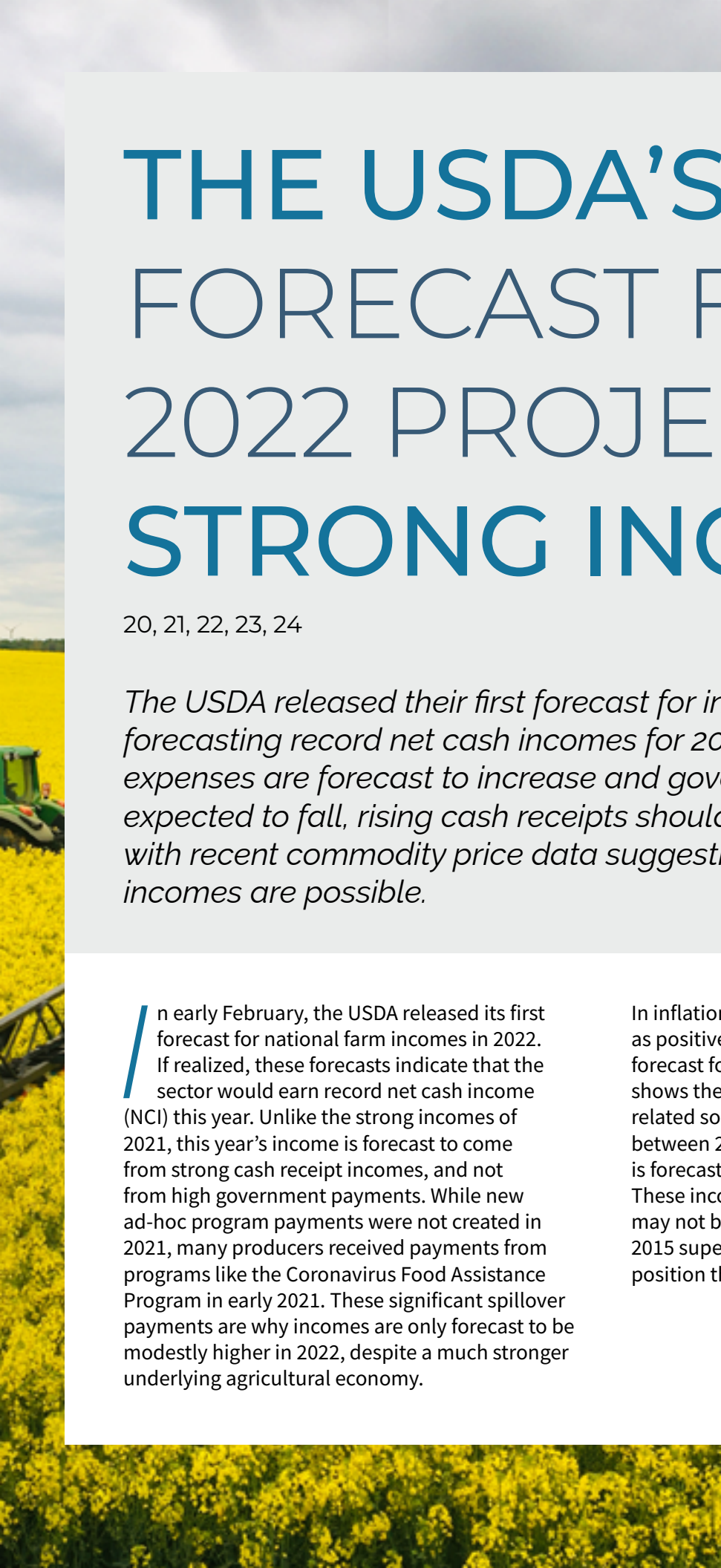


Source: Bloomberg Survey of Economists, Feb 22; FRB of St. Louis FRED Database

It may be difficult to shock any single component of interest-to-EBITC enough to create strain, but if all components move against the sector, the ratio can rise quickly. For example, a 10% decline in net cash income combined with a 125 basis point increase in rates and a 15% increase in debt loans would be enough to push the sector to 0.20.

While that scenario is a very bleak and unlikely one for producers, it's not out of the realm of possibility. Operators and lenders must continue to be vigilant with interest rate risk management, and locking in today's low interest rates to protect against future increases might be a good strategy to protect lenders' and borrowers' balance sheets.





THE USDA'S FIRST FORECAST FOR 2022 PROJECTS STRONG INCOMES

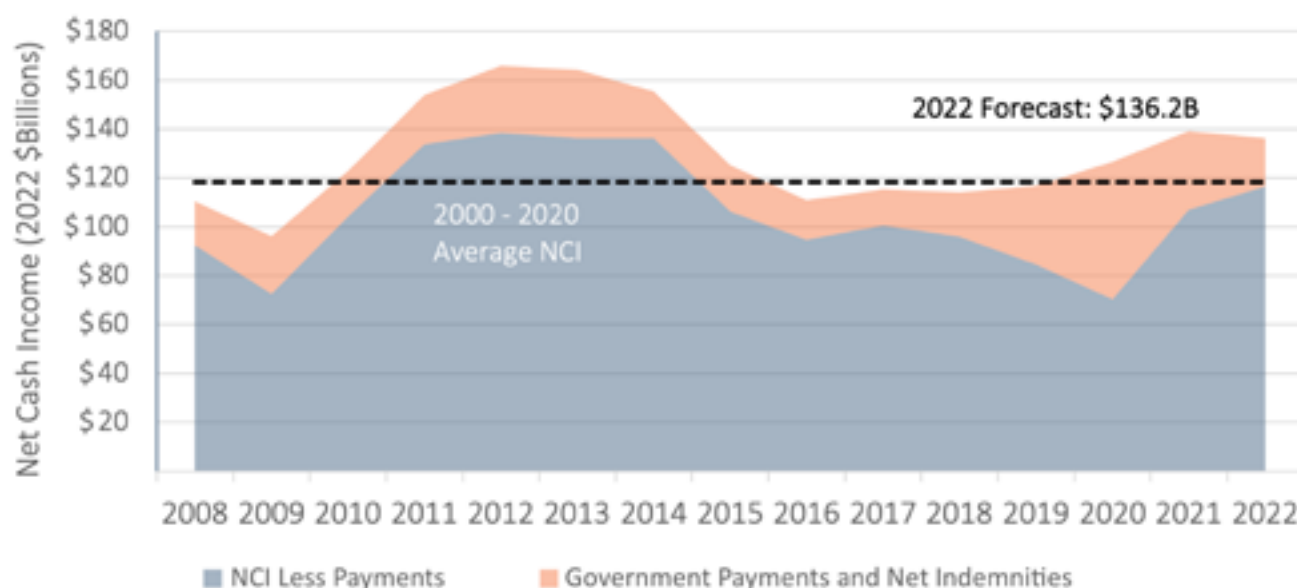
20, 21, 22, 23, 24

The USDA released their first forecast for incomes in February, forecasting record net cash incomes for 2022. While production expenses are forecast to increase and government payments are expected to fall, rising cash receipts should offset those changes, with recent commodity price data suggesting that even stronger incomes are possible.

In early February, the USDA released its first forecast for national farm incomes in 2022. If realized, these forecasts indicate that the sector would earn record net cash income (NCI) this year. Unlike the strong incomes of 2021, this year's income is forecast to come from strong cash receipt incomes, and not from high government payments. While new ad-hoc program payments were not created in 2021, many producers received payments from programs like the Coronavirus Food Assistance Program in early 2021. These significant spillover payments are why incomes are only forecast to be modestly higher in 2022, despite a much stronger underlying agricultural economy.

In inflation-adjusted terms, the release was not as positive, but still painted a picture of a strong forecast for agricultural incomes in 2022. Figure 11 shows the breakout of income from government-related sources and farming-related income between 2008 and the 2022 forecast. NCI in 2022 is forecast to be 15% above its average since 2000. These incomes are suggestive of an economy that may not be matching the peaks of the 2011 to 2015 supercycle, but that likely is in a far better position than it was over the last several years.

Figure 11: Underlying Agricultural Sector Health is Forecast at Its Strongest Point Since the Last Supercycle



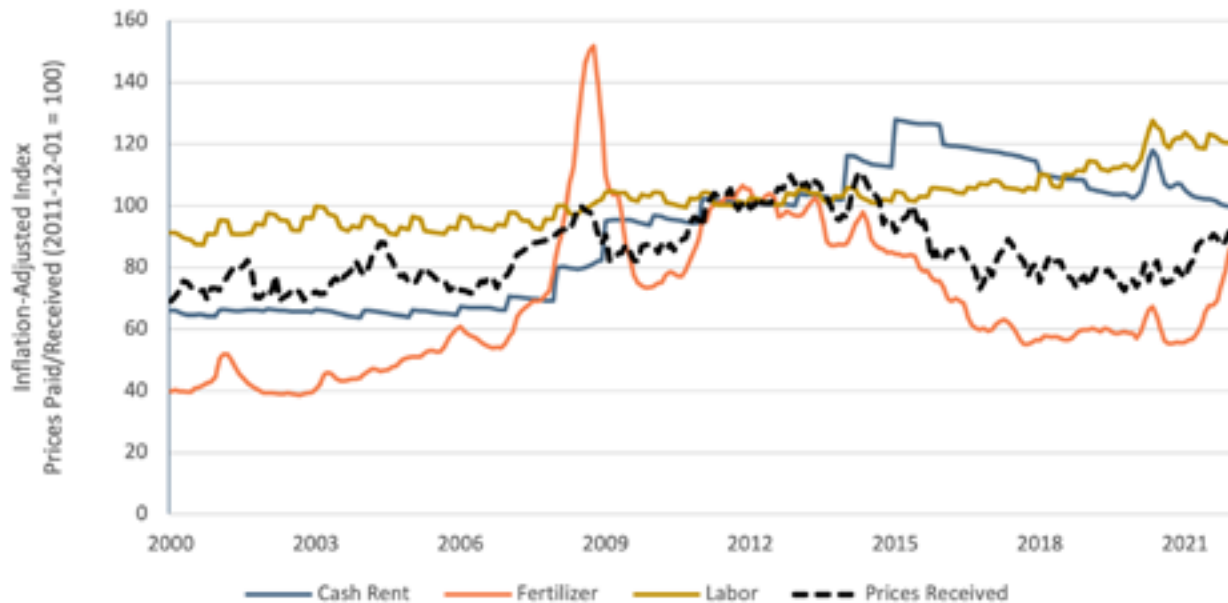
Source: USDA ERS Farm Income and Wealth Statistics

Despite this positive news, some of the immediate coverage of the USDA's release had a bearish sentiment. There were some questions around whether the USDA forecasts accurately captured the rapidly changing costs observed within the last part of 2021 and first part of 2022. Producers in some regions have seen prices for certain fertilizers rise to almost triple prior year costs, while animal producers have seen feed costs that could eliminate profitability despite the high farm prices received. Meanwhile, geopolitical tensions have led to sharp increases in energy costs and have placed even greater strain on feed costs. In other words, there have been many recent changes to farm expenses that could lead to a potential underestimation of farm expenses in the first USDA forecast. However, there are also reasons to believe that the final 2022 figures could be even higher than this robust first forecast.

Production Expenses

One missing component from the current discussion around production expenses is the historic context for prices paid. Figure 12 shows select indices for prices paid and received by producers, using the same inflation-adjustment technique used by the Farm Income and Wealth Statistics. While the USDA National Agricultural Statistics Service (NASS) has observed a sharp rise in fertilizer costs through December 2021, costs in real terms are still below the 2011 – 2015 supercycle era. Fertilizer prices have historically been aligned with prices received, something that is also true for other farm-origin expenses like feed and seed. What this means for the USDA's forecast is that a rise in estimates for farm origin expenses is likely to be accompanied by an offsetting rise in cash receipts.

Figure 12: The USDA's December Data Show Manufactured Input Expenses Below Supercycle Peaks, Though Further Increases Are Expected



Source: USDA NASS Prices Paid Survey and Indexes

Recent evidence does find producers paying more for fertilizers than even supercycle peaks. The USDA Agricultural Marketing Service's (AMS) production cost reports for Illinois in late February have seen average bids for anhydrous ammonia at a record \$1,500 per ton, though some fertilizer indices remain below supercycle peaks. Recent energy price spikes may also concern producers looking at rising prices for farm diesel. However, even these recent rises do not significantly exceed the supercycle input prices, and in some cases are still below supercycle peaks. During the height of the supercycle, inflation-adjusted anhydrous prices were as high as \$1,200 per ton. Diesel prices during the supercycle were well above today's level in inflation-adjusted terms. These inputs may continue to climb, depending on what happens with major fertilizer and energy exporters in 2022. However, cost and returns reports suggest that these high input prices will diminish, but not eliminate, profitability for cash grain producers in the 2022/23 crop marketing year.

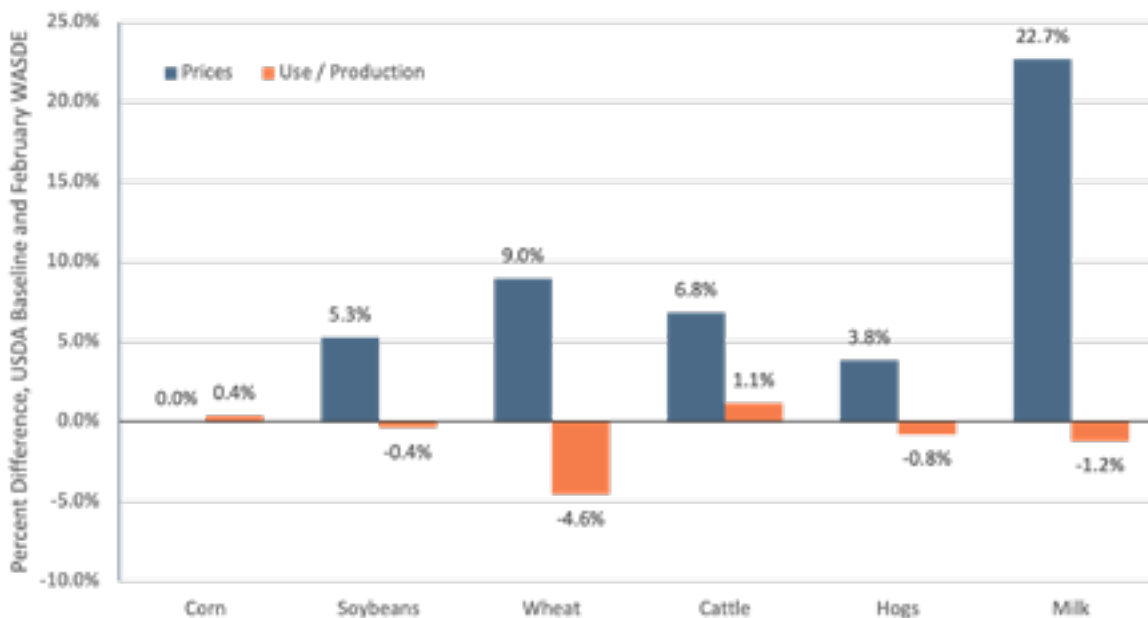
Other production expenses that are less aligned with the agricultural cycle may be more cause for concern. Expenses like labor are challenging because they have shown consistent appreciation that does not correspond with agricultural cycles. For example, labor prices at the end of 2019 were on average 20% above their 2011 levels, while commodity prices were still well below those supercycle peaks. This has downstream impacts on other costs, such as storage and transportation. Some costs, like cash rents, also take years to be factored into farm expenses, as these costs react slower than prices received. In 2015, the NASS index for cash rents hit a high mark, even as the farm economy showed signs of slowing. Cash rents data also are updated once yearly, and a sharp rise in cash rents for this growing season might not have been captured in the USDA's latest forecast for this year.

Cash Receipts

Still, it's possible to tell a more bullish story for farm incomes in 2022. While production expenses are rising, so are market prices. The USDA's forecast for 2022 includes some non-public data, but many data points for the forecast

can be found in the USDA's baseline projections from late December 2021. Figure 13 shows the difference in prices and production between the USDA's baseline projection and the February World Agricultural Supply and Demand Estimates (WASDE). For almost all commodities, season average prices for 2022 were raised, while there were no limited forecast changes to production.

Figure 13: Prices in the February WASDE Were Far Higher Than the Inputs That May Have Been Used for the USDA's Income Forecasts.



Source: USDA Baseline Projections, USDA February WASDE. Crops refer to the 21/22 CMY season-average-price and total use. Animal proteins refer to calendar year 2022 and total production.



Even these strong price gains are underselling the potential cash receipts producers could see in 2022. The USDA's February WASDE estimated a season average price for wheat of \$7.30. With May futures contracts exceeding \$10.00 as of early March, the final season average price is likely to far exceed even the strong February numbers. While farmers are unlikely to capture the full value of these price increases due to rising input costs, the price increases provide a substantial buffer to increases in labor, fuel, and fertilizer.

The net effect of these findings is that it is reasonable to assume that the net cash income projections for 2022 will hold, and there are reasons to believe that the final figure could be even higher. Research on the accuracy of the income projections has found that the USDA's

first forecast for net cash income is, on average, 11% below its final estimate. While the study found that the first forecast has historically underestimated production expenses by 1.4% on average, this was more than offset by average underestimation in crop and livestock receipts of between 3% and 4%. There are many signals that this year could follow the same pattern. Incomes are not reliant on government support, and prices have risen since the USDA's first estimate. Meanwhile, indications show that most expense increases should be offset by rising cash receipts. While the uncertainty caused by geopolitical tensions could strain profitability in unanticipated ways, it is also possible that farmers will look back on 2022 as one of their strongest years in recent memory.







LA NIÑA TO DRIVE WEATHER FOR EARLY 2022 GROWING SEASON

25, 26, 27, 28

La Niña conditions are likely to drive weather patterns through May, leading to wetter conditions in the Northwest and Midwest and drier conditions across the South. Longer term projections forecast dryer than usual conditions across the Plains states and in parts of the Rocky Mountains.

La Niña conditions continue to dominate near-term weather outlooks, with the National Weather Service Climate Prediction Center estimating that it will persist through May before transitioning to a neutral weather pattern. Current estimates suggest that the pattern will retain its current strength through May, rather than subsiding gradually. Near-term outlooks continue to reflect this pattern; wetter than normal conditions in the Pacific Northwest and around the Great Lakes, colder than normal temperatures in the northern Plains states, and drier conditions across the Southwest.

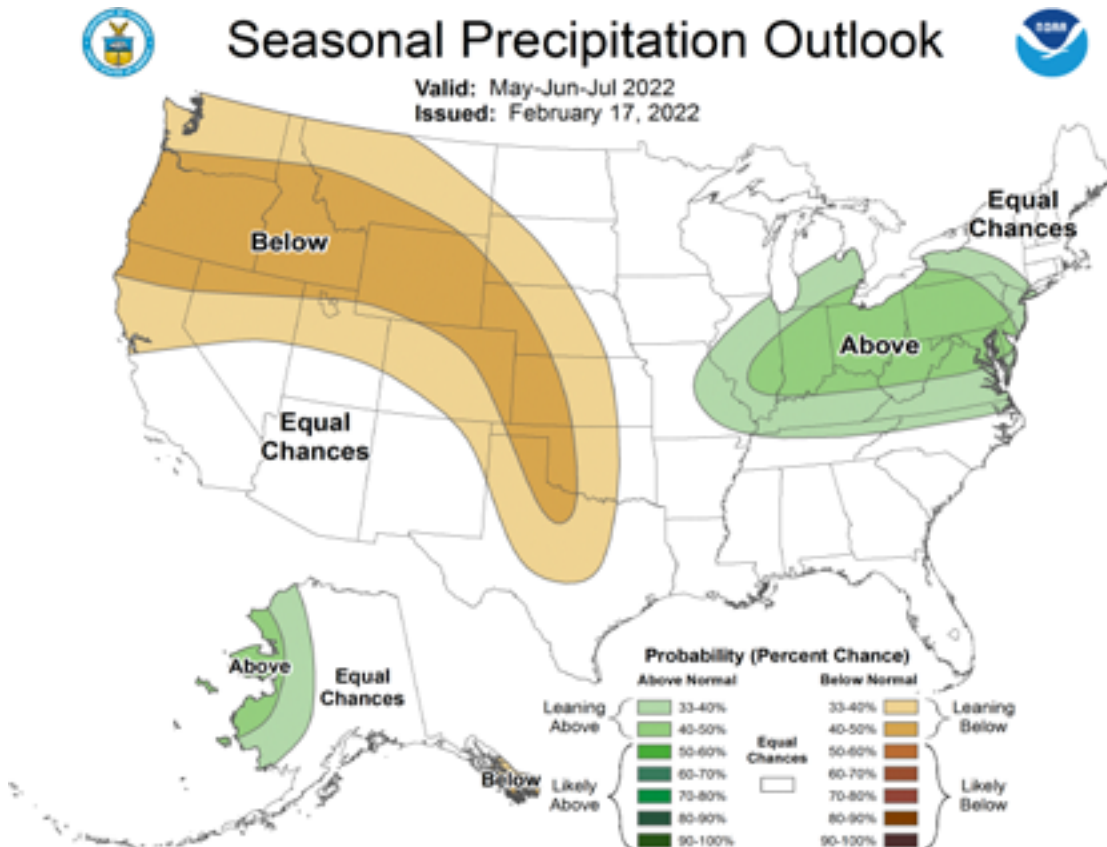
However, the longer-term outlook paints a picture that could compound drought issues in parts of the Pacific Northwest and Plains regions. While the La Niña pattern has led to minor improvements in soil moisture and pasture conditions in the Pacific Northwest, many of these states still face

considerable drought. Winter snow is a critical source of water in California, and December featured record-breaking snows; however, January and February were among the least snowy months in California's history. As a result, a promising start to the water year will likely finish with below-normal moisture, which will exacerbate the longer-term drought conditions during the summer. The NASS February report for Montana indicated that 75% of farmland was short or very short. Further east, in states like South Dakota, drought conditions are leading to 15% or greater declines in forage production. States in the southern Plains are observing abnormally dry conditions, even if topsoil conditions suggest adequate water. Current projections for the growing season indicate that these states could see below-average precipitation through the summer, compounding the challenges they already face.

The flip side of this issue is being faced by some states in the eastern Corn Belt and South. At the end of February, more than half of farmland topsoil in Ohio and Indiana had a water surplus. The La Niña pattern has led to a mild winter in parts of the south that has helped jump-start growing conditions. But the pattern is also likely to continue to lead to wetter conditions throughout

the region, which may have implications for springtime fieldwork. Hazard predictions suggest heavy precipitation is possible throughout the South and Appalachian regions, with flooding possible along the Wabash river watershed and portions of the Mississippi River bordering Missouri and Arkansas.

Figure 14: Dry Periods Are Probable Through the Plains, Northern Rockies Starting This Spring



Source: NOAA National Weather Service Climate Prediction Center

Temperature predictions for the 2022 early growing season show less regional variation. Following the breakup of the La Niña pattern, temperatures are likely to be above normal across most growing regions. Temperature anomalies are likeliest in the Southwest, where hot weather may exacerbate drought conditions, while the Pacific Northwest may see fewer anomalies. Recent forecasts have raised the likelihood of higher temperatures across the Rio Grande Valley and northern Plains states.

In general, producers can expect weather to be slightly atypical to start the growing season, almost regardless of region. The likelihood of severe weather events across the Pacific Northwest and Corn Belt may be elevated in the near term. Flooding maybe more likely in some northern regions, while drought conditions may be exacerbated across the South. Current projections suggest drought impacts will be centered on cattle and winter wheat regions, suggesting additional weather-related strain for those commodities.

DISRUPTION IN BLACK SEA PRODUCTION COULD INFLUENCE U.S. GRAIN PRODUCERS

29, 30, 31, 32

Ukraine and Russia are major exporters of corn and wheat. Conflict in the region could reshape global grain trade in the short term. Producers and lenders will react to changing demand signals and rising fertilizer costs as a result.



Often called the “Breadbasket of Europe,” the fertile soils to the northeast of the Black Sea, spanning much of Ukraine and into Russia, make for incredibly productive farmland. According to data from the United Nations and The World Bank, Ukraine boasts over 100 million acres of production agriculture, and agriculture generates over 9% of the country’s gross domestic product each year. The Russian Federation is also an active participant in global food production, with more

than 532 million acres of agricultural land, over 300 million of which is arable. As Figure 15 shows, the U.S. has a large comparative advantage for corn production, but Ukraine’s production has been making strides in export markets. The Black Sea region is highly productive for wheat, with Russian wheat production nearly 70% higher than U.S. production. Ukrainian producers maintain astonishingly high yields, producing only 25% less than the U.S., but on 50% less land.

Figure 15: Corn and Wheat Statistics by Country

COMMODITY	STATISTIC	UNITED STATES	UKRAINE	RUSSIA
Corn	Area Harvested (acres)	85,387	13,097	6,919
	Yield (bu/acre)	177	126	85
	% Exported (4-yr Avg.)	16%	81%	28%
	Top Trading Partner	Mexico	China	Iran
Wheat	Area Harvested (acres)	37,162	18,286	68,201
	Yield (bu/acre)	48	66	41
	% Exported (4-yr Avg.)	45%	69%	47%
	Top Trading Partner	Mexico	Egypt	Egypt



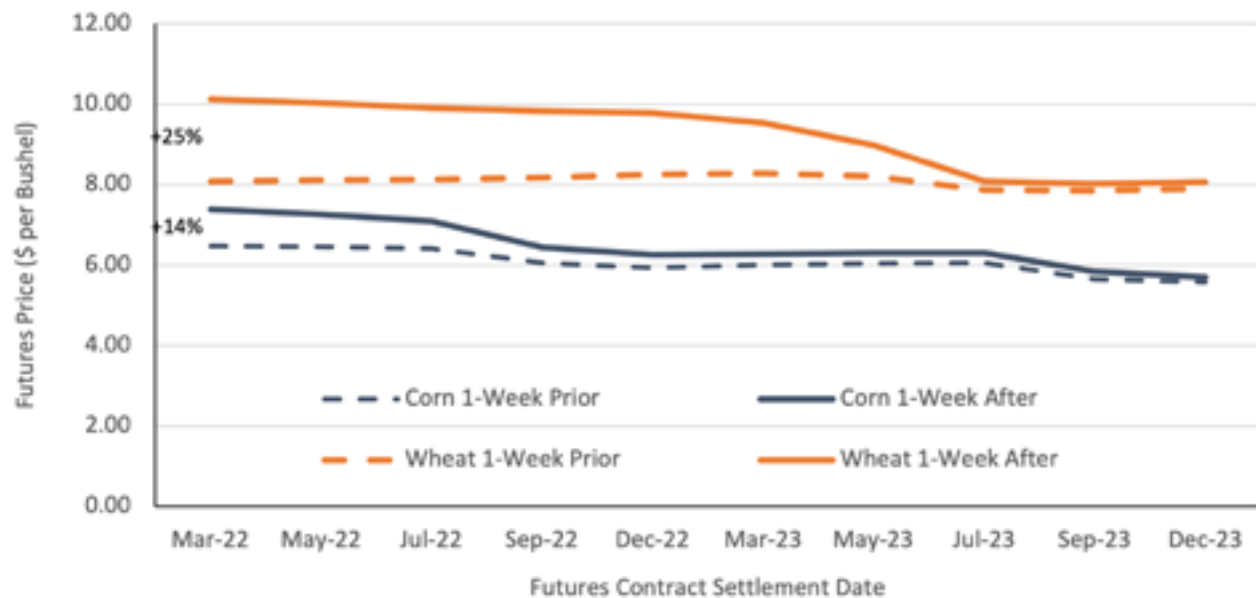
Source: USDA Foreign Agricultural Service, PSD Data; United Nations Comtrade Database

In March, global markets were trying to assess the Russian-Ukrainian conflict’s damage to global grain supplies. Because of Ukraine’s efficiency in wheat production and Russia’s high volume of wheat exports, wheat futures prices jumped by 25% after Russia invaded Ukraine. This increase was notable across futures contracts into early 2023, likely a function of traders’ interpretations of the immediate impacts of damage to the winter wheat crop in Ukraine but also the potential for a longer sanction period from western economies against Russia. Corn prices

also substantially increased, as China is a major buyer of Ukrainian corn. U.S. producers sell a high percentage of corn and wheat exports to neighboring Mexico, whereas the Black Sea regional trading partners are China, Egypt, and Iran. The U.S. may witness some redrawing of trade lines in 2022 if global commodity flows are disrupted. This disruption is also highly likely to exacerbate rising global food prices, pushing against in-flight economic recoveries and increasing inflationary pressures.



Figure 16: Corn and Wheat Futures Curves (Pre/Post Russian Invasion)



Source: CME Group, Agricultural Commodity Futures Prices



U.S. producers are faced with some interesting choices this spring with all this information. Relative grain commodity prices may heavily influence planting decisions in 2022, with acres potentially oscillating between spring wheat, corn, and soybeans. Complicating this decision are the availability, cost, and application needs for fertilizers and soil nutrients by the different commodities. International sanctions against Russia in February and March drove up energy prices, agitating an already-tight fertilizer market. Lenders may see additional operating line activity as these prices remain high and coops struggle to meet input demand in March and April.



DAIRY PROFITABILITY STRESSED DESPITE STRONG PRICES

33, 34, 35, 36, 37

Milk futures have risen to near-record levels, but dairy producers shouldn't expect the high profits of late 2014. Rising feed costs will consume most of the additional revenue generated by high prices, and rising costs for other inputs, like labor and fuel, will only compound the problem.

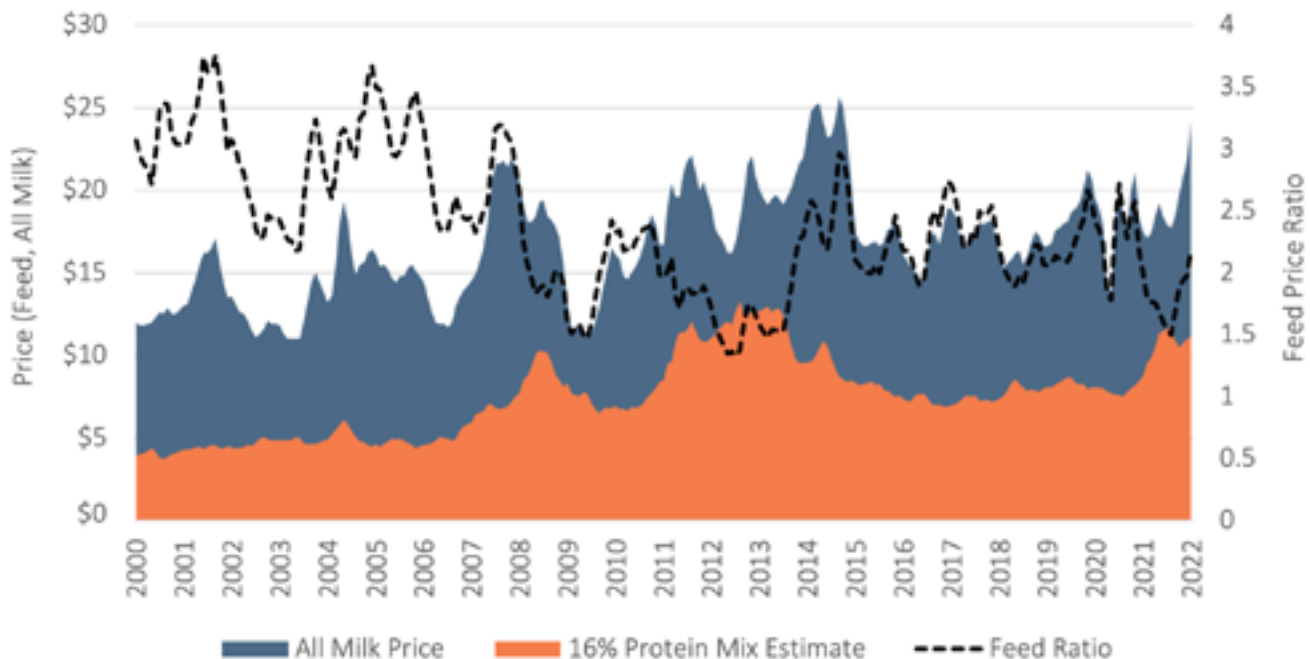
Over the last several months, dairy producers have seen a tale of two markets. As of the beginning of March, early 2022 futures contracts for class III milk were almost 50% above 5-year values. In 2021, the U.S. exported a record value of dairy products, herd sizes fell, and inventories of solids like butter and cheese fell precipitously. The USDA Economic Research Service (ERS) forecasts that dairy producers will see nominal record net incomes in 2022, given the current price environment. However, producers were also met with some of the highest prices for feed in history, and prices for other inputs, like labor and energy, saw significant cost increases. This rising expense environment has been suggested as a leading

cause for why herd growth has been limited, despite positive market signs.

For producers and lenders, the dairy markets of 2022 are best thought of in terms of profitability, not price. According to the 2020 USDA Agricultural Resource Management Survey (ARMS), the typical dairy business spent 75% of its gross revenue on operating expenses. This was the highest measure of any commodity measured in the survey, and it shows that dairy farms are uniquely susceptible to production cost increases. As feed costs represent almost half of all expenses for a typical dairy, the rise in feed costs represents a significant threat to profitability.

Figure 17 shows one common measure of how feed costs impact dairy profitability: the milk-to-feed price ratio. While recent milk prices are nearing heights set during the commodity supercycle, profitability as measured by this metric remains lower than it was through the majority of 2015 – 2019, which were years in which the sector struggled. Futures data suggest even more headwinds in the coming months, as corn and soybean futures surge while dairy has seen only modest gains. While no futures market exists for alfalfa, bids data point to strong price growth. In late February, California bids for supreme quality alfalfa were as high as \$380 per ton.

Figure 17: Dairy Profitability Remains Lower Despite Recent Price Increases



Source: USDA NASS Quickstats

The challenge for dairy producers is that feed expenses are only one aspect of the potential profitability concerns in 2022. According to the USDA ARMS, 12.5% of a typical dairy's expenses were for labor costs in 2020. To date, labor costs increases have matched average national wage growth, with average farm labor wages rising from \$15.87 to \$16.59 between October 2020 and 2021. Current projections for national wage growth in 2022 are for less than 2021 levels. If farm labor continues to follow national trends, this implies that wage growth pressure for dairies in 2022 will be like the prior year.

There are several other costs that dairies are exposed to, although to a lesser degree. Many dairies grow their feed, meaning that surges in costs like fertilizers are relevant to many dairies. Energy costs also are a small but important part of dairy income statements, meaning that recent cost increases may further chip into profitability. In short, the caution dairy producers have exhibited in recent months is well deserved. Strong prices and robust exports are positive signs, but the rising expense environment can quickly eat into producers' bottom lines.

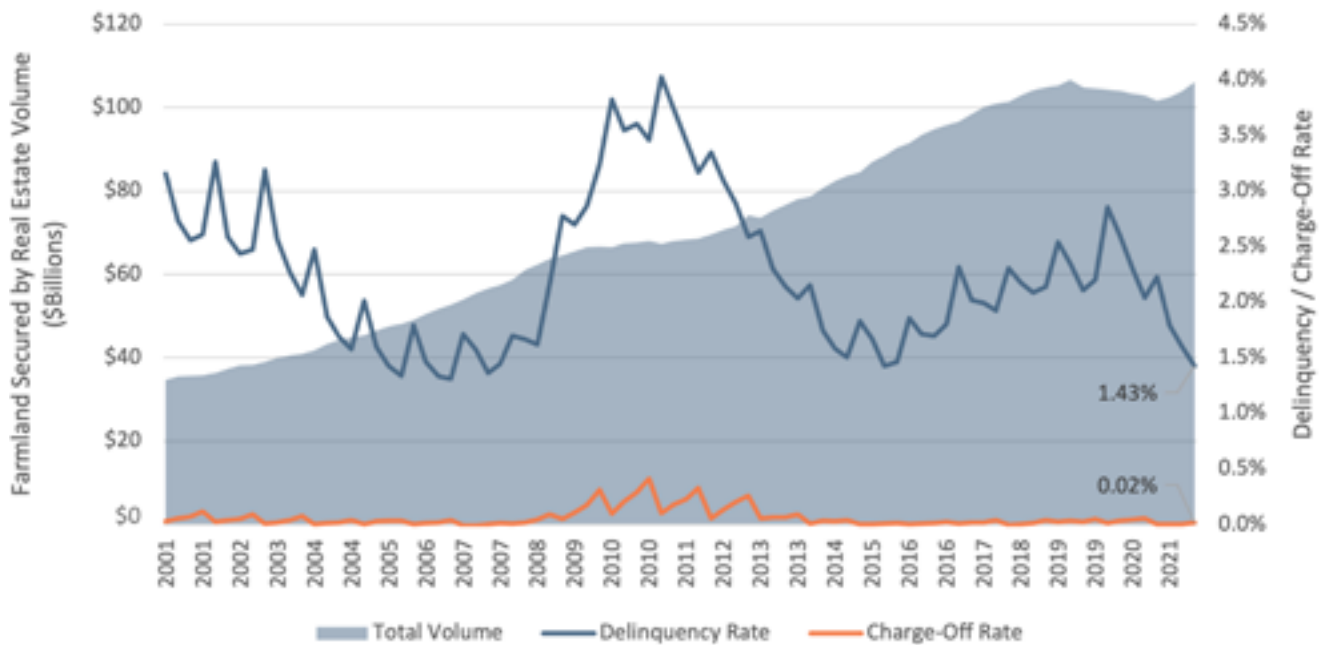
AGRICULTURAL COMMERCIAL BANKS END 2021 ON A STRONG FOOTING

38, 39, 40

Agricultural commercial banks have seen sharp declines in farmland delinquency rates over the last year, even as volumes begin to rise. The number of agricultural banks being acquired has slowed during this period of stronger credit health, though there is some regional variation due in part to local land value growth and regional commodity mixes.

With the release of the Q4 commercial bank call reports in February, we can begin to assess how strong the agricultural economy looked at the end of 2021 from the perspectives of agricultural lenders. Figure 18 shows the total volume and delinquency rates for all loans secured by farmland. Two trends are immediately apparent. The overall strain on agricultural lenders, as measured by delinquencies and charge-offs, is the lowest it has been since the tail end of the 2011–2015 supercycle, and total volumes are nearing the peak set in Q2 2019. The market has begun to resemble that robust period when rising land values and strong farm incomes led to solid credit health across the sector.

Figure 18: Real Estate Volumes Once Again Begin To Climb As Sector Credit Health Continues To Improve



Source: FFIEC Call Report Data

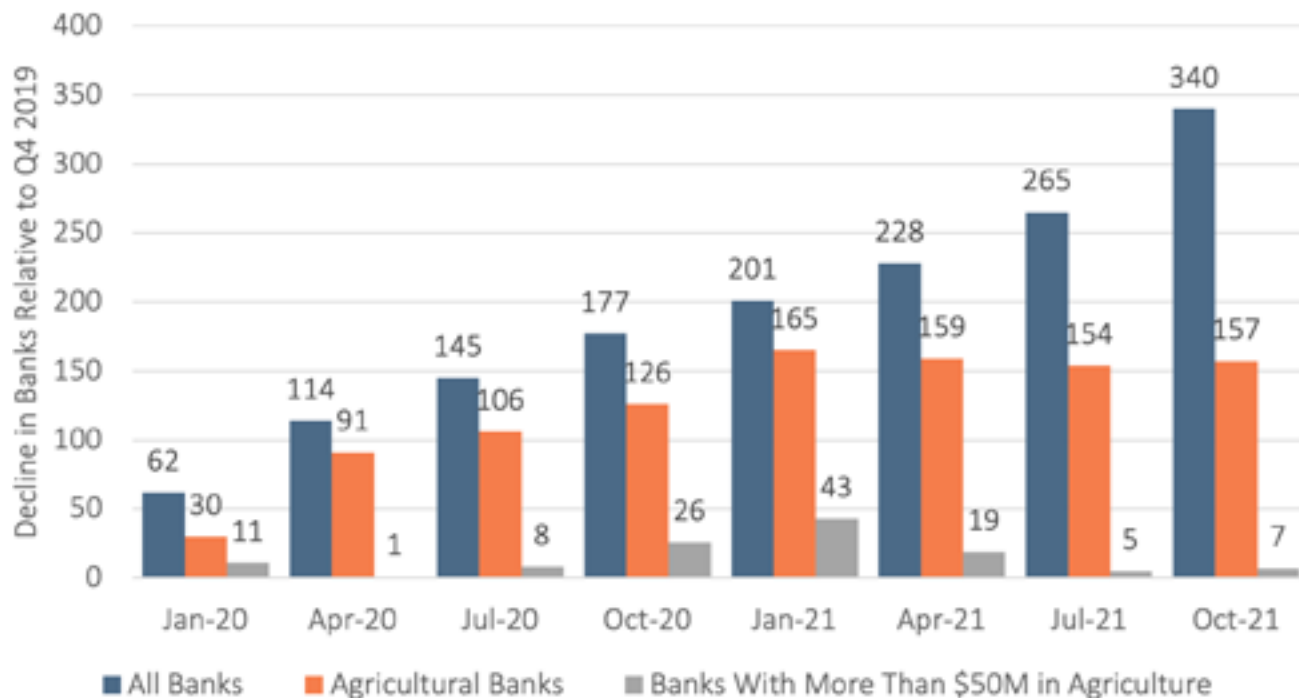
Mergers and Acquisitions

This credit health may be behind a decline in merger and acquisition activity among banks involved in agricultural lending. Figure 19 shows the decline in commercial banks and banks involved in agriculture relative to Q4 2019. As of Q4 2021, the FDIC reported that there were 1,121 “agricultural banks” with at least 25% of loan volume coming from farm production or farmland loans. This represents a steep decline from the 1,278 agricultural banks that were reported in Q4 2019. However, the decline in this metric occurred almost entirely in 2020, as agricultural banks saw

periods of high delinquency rates and declining volumes. Through 2021, the number of banks considered “ag banks” increased, even as merger and acquisition activity continued across all commercial banks.

A second way to measure impact to the sector is through the number of entities with sizable agricultural portfolios, even if that portfolio is small relative to their total size. By this measure, the number of commercial banks with at least \$50 million in agricultural loans is largely unchanged from 827 in Q4 2019; compared to 822 as of Q4 2021.

Figure 19: The Number of Agricultural Banks Stabilized in 2021, Though the Total Number of Commercial Banks Continued To Fall



Source: Federal Reserve Bank of Kansas City Commercial Call Report Data; FFIEC Call Reports

The true impact on agricultural banks may be even less than what these data suggest. The sharp rise in Q2 2020 may be obscured by reporting of Paycheck Protection Program loans. These volumes may have caused some institutions to fall below the threshold of what defines an “agricultural bank,” despite not reducing their overall agricultural lending activity. According to the FDIC’s Business Combination data on merger and acquisition activity, 83 agricultural banks were acquired between January 2020 and December 2021—less than half the number shown above. This means that roughly half of the reduction in the number of agricultural banks between the end of 2019 and 2021 was driven by banks that fell below the 25% threshold, and not due to failures or acquisitions.

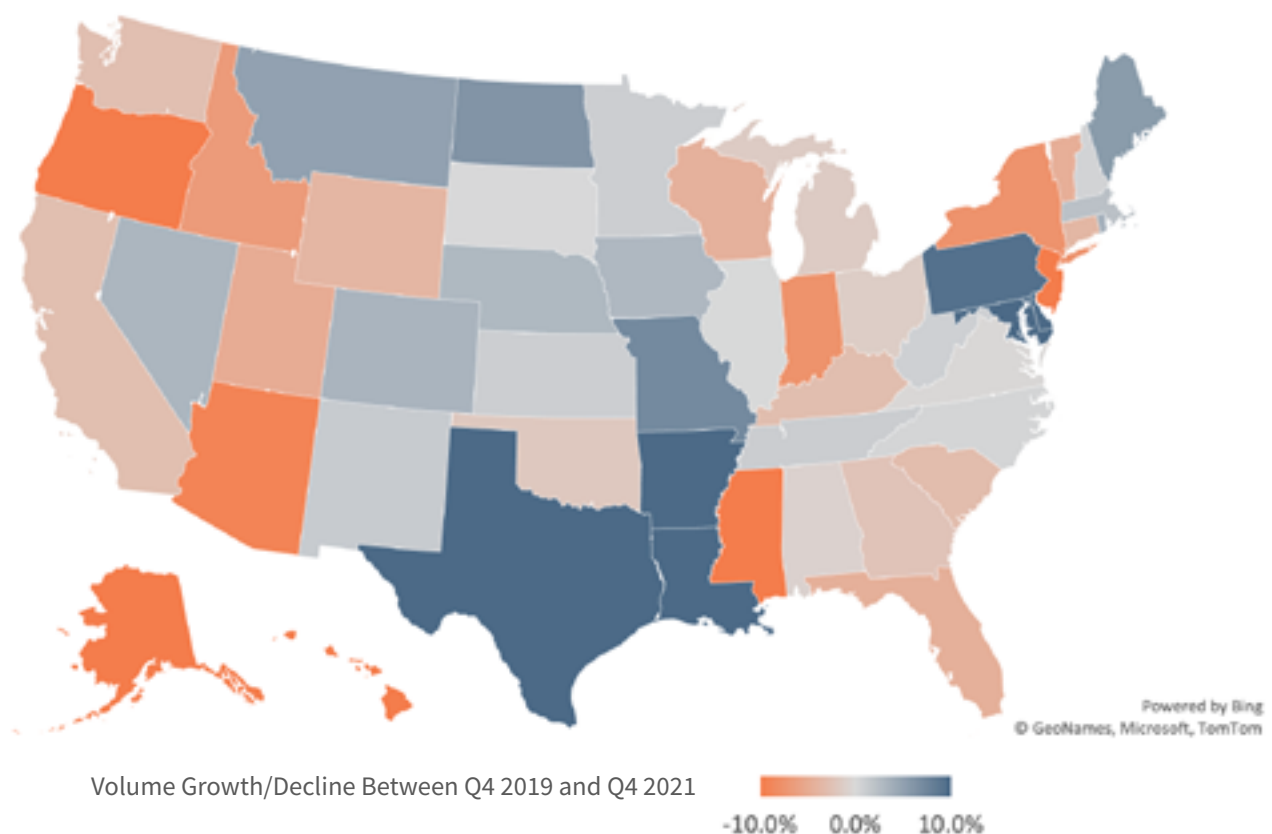
This still indicates that around 6% of all agricultural banks were acquired over the last two years. The FDIC observed no failures over that time. In almost all cases, banks that acquired agricultural banks had significant agricultural portfolios themselves. 80 of the 83 acquisitions were by institutions with at least 5% of total loans and leases in agriculture. Many of the acquisitions also occurred among smaller institutions. 60 of the acquisitions were to institutions with less than \$1 billion in assets under management. The most common type of entity to purchase an agricultural bank over this time was a small bank with at least 25% of their loans in agriculture. For all mergers and acquisitions over this period, more than 80% of acquiring institutions were headquartered in the same state as the entity being acquired, with almost a third headquartered in the same county.

Volume Changes

While total real estate volumes grew 1.5% between Q4 2019 and Q4 2021, there is evidence that there was some regional variation in how loan volumes grew or contracted. Figure 20 shows a map of estimated loan volume growth across states, which we obtained by distributing commercial banks' agricultural volumes across the counties it operates in. This is an imperfect measure, but it can help show regional patterns and trends that are not immediately apparent. As this is for commercial banking only, it does not factor in loan volumes through the Farm Credit System, nontraditional lenders, or other sources.

First, the growth of loan volumes in these periods is loosely correlated with growth in land value growth over the last year. Much of the Southeast has experienced loan volume declines, which was also the region with the slowest land value growth estimated by NASS. Volume growth was positive in the Midwest and northern Plains states, where some of the fastest land value growth was observed over the prior two-year period. The West Coast bucks this trend, with falling estimates for volumes despite some of the fastest land value growth. One potential explanation is merger and acquisition activity, as these regions saw some of the sharpest reductions in the number of unique commercial banks with agricultural portfolios. The Southeast and West are also areas where competition from entities other than commercial banks is rising, which may be leading to variations in volumes.

Figure 20: Real Estate Volume Growth Between Q4 2019 and Q4 2021 May Have Been Driven by Land Value Growth

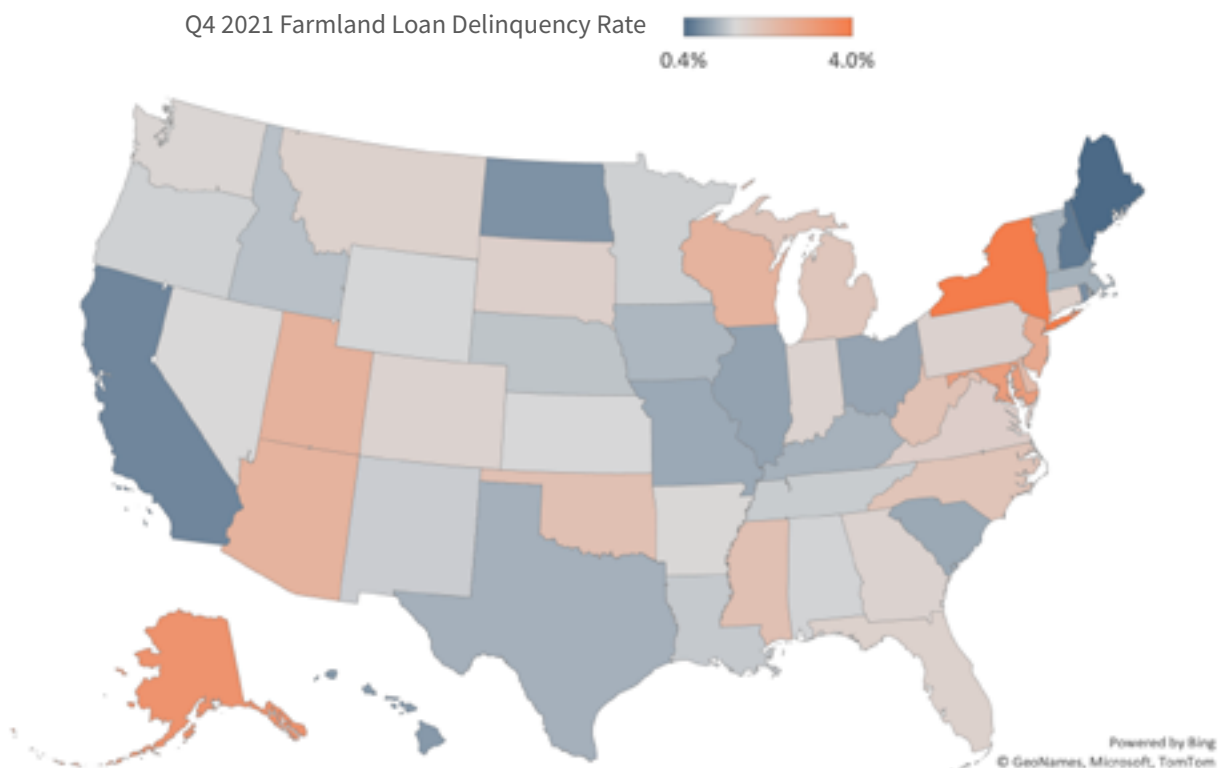


Source: Farmer Mac calculations

If a similar approach is used to distribute real estate delinquencies, as shown in Figure 21, patterns emerge that may be explained largely by commodity prices or profitability. States in the Midwest that are highly reliant on corn and soybean sales saw lower than average delinquency rates. Conversely, states with high

reliance on dairy incomes saw higher than average delinquency rates, which may be driven by tight profitability margins in the sector. Not all areas follow this trend; the California commodity mix was under some of the most duress in 2021, but local loan performance was likely better than most of the country.

Figure 21: State-Level Commercial Bank Delinquency Rates in Q4 2021 Were Likely Driven by Local Commodity Mixes



Source: Farmer Mac calculations

While there are minor regional variations, the commercial banks that support agriculture are in a strong position. Volume growth is a welcome sign after the first true period of contraction in decades. Delinquency rates are near multi-decade lows. Merger and acquisition activity of agricultural commercial banks continues, but often to commercial banks who are local are also

interested in agriculture. The one potential risk is that many areas haven't seen loan volume growth despite the period of low-interest rates and higher land value growth. While it is unclear whether this is driven by competition or loan demand, it is something worth watching as we enter a rising rate environment.

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Jackson Takach, Chief Economist, is a Kentucky native whose strong ties to agriculture began while growing up in the small farming town of Scottsville. He has since dedicated a career to agricultural finance where he can combine his passion for rural America with his natural curiosity of the world and his strong (and perhaps unrealistic) desire to explain how we interact within it. He joined the Farmer Mac team in 2005, and has worked in the research, credit, and underwriting departments. Today, his focus at Farmer Mac currently includes quantitative analysis of credit, interest rate, and other marketbased risks, as well as monitoring conditions of the agricultural economy, operational information systems analysis, and statistical programming. He holds a Bachelor's degree in economics from Centre College, a Master's degree in agricultural economics from Purdue University, and a Master's of Business Administration from Indiana University's Kelley School of Business.



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ABOUT THE FEED

The Feed is a quarterly economic outlook for current events and market conditions within agriculture.

The report is broad-based, covers multiple regions and commodities and incorporates data and analysis from numerous sources to present a mosaic of the leading industry information, with a focus on the latest information from the United States Department of Agriculture and their Economic Research Service.

There are several regularly included sections like weather and major industry segments, but the authors rotate through other industries and topics as they become relevant in the seasonal agricultural cycle. Where the report adds value to readers is through its unique synthesis of these multiple sources into a single succinct report.

We hope you've enjoyed this issue.

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