The Feed

Farmer Mac's Quarterly Perspective on Agriculture





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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. Please enjoy.

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A MESSAGE FROM CURT COVINGTON

Ag Economics 101

President John F. Kennedy was quoted as saying, "The farmer is the only man in our economy who buys everything at retail, sells everything at wholesale, and pays the freight both ways." There are several strains of truth behind that statement. In a world of uncertainties, here are a few realities farmers and their lenders are grappling with today.

Reality #1: Farmers are price takers, not price setters. Farmers across the U.S. spend three-quarters of the year and their entire bankroll starting, nurturing, and finally harvesting a crop just in time to face the possibility that they can't sell it for what they have in it! Can you imagine your favorite grocery store accepting bids on a loaf of bread? Unlikely. Farmers manage market risk every day, and it takes knowledgeable and pragmatic ag lenders to support farmers' decisions.

Reality #2: In more recent years, farmers have been contending with the market dynamics of having to invest money in a new crop each spring while at the same time being challenged to market last year's crop that is still in storage. In lenders' terminology: a lap-over crop cycle. To support the added financing pressures, ag lenders have been encouraging and educating their farm customers about the need for having a thoughtful and consistent crop marketing plan. Thankfully, farmers can rely on their ag lender to understand and support their financial needs.

Reality #3: Farmers are viewed by many in urban America as poor stewards of their assets. I'm not sure where that thought comes from, but it seems to me that if farmers were that bad at managing their vital natural resources, they'd all be broke by now. Farmers need to know that, if nothing else, their ag lender has their back!

Reality #4: Just when you think there's a ray of light at the end of the tunnel, the farmer gets gut-punched. Until recently, the dairy industry was encouraged by improving margins in 2019, but a recent report shows that spring weather conditions have "swamped" hay production and more than 20 percent of the corn and soybean crops was at risk of not being planted. So much for improving margins! The almond industry is reporting historic on-tree yields for the 2019 crop, which will likely put downward pressure on new and old crop prices.

Despite these challenging realities, farmers find ways to make ends meet in difficult times and farm lenders will be there to provide a sense of security and local economic stability throughout.

Wishing you and yours the very best this summer,





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FIVE FAST FACTS BURIED IN THE AG CENSUS (resource 1, 2, 3)

Figure 1: Number of Farms Reported by Size of Operation and Ag Census Year



The Ag Census takes place every five years and inventories America's diverse farming landscape.

According to Ag Census data, farm operations are getting larger and older, but there are also small farms and younger operators coming online.

Farm operators increasingly use renewable energy, actively serve in the military, and often have full-time employment off-farm.



In April, the USDA released the results of the 2017 Census of Agriculture, better known as the Ag Census. Every five years, through the Ag Census, the USDA inventories America's farmers, fishers, and ranchers, during which any operation that generates more than \$1,000 in annual revenues receives a 24-page questionnaire with hundreds of data points, recording everything from the number of farm operators involved in the business to the total interest expense for real estate. There are many useful and interesting questions asked and answered during the Ag Census; this article highlights a few of the ones the authors found interesting and compelling from the 2017 release.

There are more large farms in agriculture today, but there are also more small farms. The Ag Census supports the theme of continued farm consolidation, but the total number of farming operations is little changed. There were 67,000 fewer farm operations in 2017 compared to 2012; the decline in farming operations comes from the medium-sized farm grouping. There were nearly 3,000 more large farms (2,000 or more acres under management), and almost 50,000 more of the smallest farms (less than 10 acres under management). Figure 1 highlights the trend.

The average age of the farmer is increasing, but there are more young people involved in the farm operation. The average age of the principal farm operator was 59.4 in 2017, up from 57.5 in 2012. More than 66 percent of all principal operators are over the age of 55. That compares to 24 percent of the national workforce over the age of 20 that are over the age of 55. While the gradual aging of the farmer presents more than a few operational questions, the upshot is that more operations have younger farmers participating in the decision-making. The number of operations led by farmers under the age of 35 increased by almost 2,000 from 2012 to 2017. And the number of farmers under the age of 35 involved in the business increased by just under 27,000 during the same timeframe. More involvement of younger producers will be critical to transitioning farms in the coming years.

The plurality of farm operators works more than 200 days per year off the farm. While roughly 39 percent of all farm operators report working no days of the year off-farm, more than 40 percent reported working 200 days or more in off-farm employment (see Figure 2). Larger operations have fewer operators working off-farm; the inflection



point for the farm being able to sustain more of the individuals operating it is around \$250,000 in annual revenues. But even in the largest revenue group - operations with more than \$1 million in annual revenue - approximately 19 percent of operators work at least 20 days a year off-farm. According to the U.S. Bureau of Labor Statistics, only 4.9 percent of all workers held two or more jobs in 2017.

Almost 1 in 15 farms used some form of renewable energy source in 2017. More than 133,000 farms generated some form of renewable energy on their properties in 2017, an increase of 130 percent from 2012. The bulk of farm renewable energy came from solar panels (90,142 operations), but there was also a large increase in wind and geothermal sources. The percentage of farms utilizing renewable energy increased from 2.7 percent in 2012 to 6.5 percent by 2017, a 2.5-fold increase in the utilization rate. Proof positive that America's farmers are willing participants in green technology.

Nearly 11 percent of farm operators have served or are currently serving the armed forces. About one out of every nine farmers has served their country through military service. That compares to a rate of 7.4 percent for all Americans. Not that the patriotism of the American farmer was ever in question, but the 2017 Ag Census certainly highlighted the strong commitment of the farming community to the safety and security of our nation.

THE 2017 AG CENSUS AND LAND VALUES (resource 4, 5)

Key Highlights

The USDA estimates average land values in two surveys, the annual June Area Survey and the five-year Census of Agriculture (Ag Census).

After the USDA compiled the results of the 2017 Ag Census, it revised the 2018 average land value estimate down by 1.3 percent (\$40 per acre).

Ag Census land value revisions can be significant at the state level, and individuals and institutions that benchmark to USDA values should consider maintaining a confidence interval around the annual publication.

BACKGROUND. Each year, the USDA National Agricultural Statistics Service (NASS) surveys farmers and ranchers to estimate the market value changes of farm real estate values in the June Area Survey. NASS researchers personally interview more than 35,000 farmers and ranchers across the country to estimate changes in farm real estate across the contiguous 48 states and in different farm types. The USDA publishes the results from the survey each August, and the average land value per acre is widely cited by agricultural and popular media. Many researchers in ag finance also use the state-level land value estimates to benchmark changes in loan collateral and appraisals. For example, the national average farm real estate value (including buildings) published by the USDA in August 2018 was \$3,140 per acre, a \$60-peracre value increase from 2017.



Figure 3: USDA Farm Real Estate Value Revisions by Year Relative to Each Ag Census

Source: Historical NASS June Area Survey Results

Every five years, the USDA performs the Census of Agriculture (Ag Census). During this process, USDA researchers send a questionnaire to more than 3 million registered and potential farmers and ranchers across the country. The 2017 Ag Census response rate was 71.5 percent, bringing in data on more than 2.1 million farm operators. One of the sections on the 24-page questionnaire asks for information on the market value of real estate and buildings. The depth of the survey allows the USDA to provide much tighter confidence intervals around average land value estimates, and it had enough responses to estimate averages down the county-level.

Because these two surveys are different in nature and coverage, the results can differ. The Ag Census is more

statistically robust, so the USDA rebases the annual land value estimates to the Ag Census results. When the rebase occurs, the USDA then revises the affected five years (specifically, the three years prior to the Census year, the Census year, and one year after) of June Area Survey average land values to align with the Ag Census averages. Both the state-level and the national-level land value adjustments can be significant, and the remainder of this article looks at the most recent Ag Census land value revisions at both levels.

NATIONAL LAND VALUE ADJUSTMENT. The 2017 Ag Census land value revisions were quite modest in comparison to the prior two Ag Census revisions. The 2018 average farm real estate values were revised down by 1.3 percent, from \$3,140 per acre in the June Area Survey to \$3,100 per acre using the revised Ag Census data. Based on an estimated 900 million acres of farm real estate, those revisions translate to a drop of \$36 billion in the value of farm real estate assets. The path of annual revisions for the 2017 Ag Census is presented in Figure 3; the years leading up to 2017 had only minor revisions (less than 1 percent).

Figure 3 also demonstrates that the 2017 revisions were small relative to the prior two Ag Censuses. In 2008, the USDA revised land values downward by 7.7 percent, translating to a drop of just under \$166 billion in farm real estate value. Similarly, the USDA revised their 2013 June Area Survey results downward by 5.9 percent, an implied loss of over \$155 billion in farm real estate value. During these prior two periods, land values were rapidly appreciating because of an extended agricultural economic expansion. In contrast, land value appreciation slowed considerably during the 2017 Ag Census years, which likely created less survey error across the survey populations.

STATE-LEVEL REVISIONS. While the 2018 national average farm real estate value revision was modest, there was a wide dispersion of revisions by state. The largest downward revisions were geographically scattered but included Iowa, Oklahoma, Texas, Washington, Nevada, and Arizona, each declining approximately 10 percent with the revised survey results. Iowa had the largest peracre value 2018 revision, with values dropping \$810 per acre between the June Area Survey and the Ag Census. However, many states experienced an upward revision in land values. States along the Eastern Seaboard, in particular, saw positive bumps to average farm real estate values, likely related to improvements in the residential housing markets and increasing urbanization into traditionally ag-producing areas.

These revisions likely have some implications for the agricultural finance and investment sectors (including some implications for farmers and ranchers themselves). The USDA land value averages provide one of the longest-running and most-trusted publicly available benchmarks for farmland real estate value. As such, many institutions with financial interests in farmland values use the USDA average land values to evaluate collateral or land holding returns. At a national level, a 1.6 percent downward revision is unlikely to materially alter return expectations. However, a 10 percent downward revision at a state level would likely be more material than for any financial benchmarks linked to the land value series. Conversely, a lower land value provides more opportunity for operator return on assets. While the revisions to land values are unlikely to change behavior in the short run, they are an important reminder that the USDA land value series are survey-driven, and they should be considered with a context of survey error in mind. During periods of rapidly-rising land values, individuals benchmarking asset values to USDA numbers may want to consider a confidence interval of 8 percent. During periods of stable or declining values, a smaller confidence interval of 2 percent would be appropriate.

Figure 4: 2018 Farm Real Estate State Revisions from 2017 Ag Census





PLANT-BASED PROTEINS: OPPORTUNITIES AND THREATS

Key Highlights

(resource 6, 7, 8)

Plant-based proteins are experiencing continued growth in both supply and demand.

Animal protein producers face the greatest threat from this trend, but many consumers are treating plant-based proteins as a supplement to animal protein, not a full replacement.

Increases in the food category lead to increases in demand for certain crops such as peas, soybeans, and oilseeds.

Consumer demand is an ever-changing force. Buyers may demand product diversity, year-round availability, foods that are organic, or free of attributes, or full of attributes; the global food shopper is a fickle creature that can make keeping up difficult. Staying ahead of this ever-changing customer demand is particularly tricky for agricultural producers, many of whom are producing inputs at the early stages of the food supply chain. The resulting mismatch between food supply and food demand is akin to the bullwhip effect in inventory management: small amounts of movement in consumer demand can lead to increasinglylarger variability and uncertainty down the food supply chain like a wave in a flicked bullwhip moving from the handle to the tip. By the time the motion gets to the end of the whip, it is fast moving and possibly painful to anything that gets in its way!

The rise of plant-based proteins is a good example of changing consumer demands. The milk aisle is littered

Figure 5: Beyond Meat Stock Price History (NASDAQ: BYND)



with nondairy drink alternatives made from almonds, soy, coconuts, oats, peas, and many other ingredients. The freezer section is increasingly filled with meat alternatives like veggie burgers, crumbles, sausages, and patties. Morningstar Farms has been marketing vegetable-based protein patties for more than 40 years, and while at one time they had little competition, today they face increasing interest in the space. And investors are clamoring for access to the increasing demand. When Beyond Meat, a major producer of plant-based protein products, launched their stock initial public offering, the stock debuted at \$46 per share. Within two months, the stock was trading at \$150 per share, and at one point, touched \$200 per share (see Figure 5). The increasing interest in meat and dairy alternatives seems to have a focused path of disruption: the livestock and dairy industries.

But before we begin unpacking the meat industry, the rise of plant-based proteins creates some real opportunities for food producers. Even though consumers are demanding more plant-based protein products, most are not giving up on animal proteins, merely supplementing. According to a recent plant-based protein demand report from Mintel, more than 40 percent of consumers view plantbased proteins as healthier than meat-based products. In the same report, the authors conclude that many meateaters will remain carnivorous but will rotate through protein alternatives for taste and health. Furthermore, more demand for plant-based proteins will create more demand for plants. Common ingredients for plant-based protein products include nuts, soy protein, pea protein, rice protein, and various plant-based oils like canola, coconut, and sunflower. These crops become increasingly valuable as demand builds for the category. As reported in Bloomberg news, farmers are already increasing acres planted to yellow peas, once considered a specialty crop. Although disruption can be uncomfortable, it is better to grab onto the handle of the whip than to try and catch the tip.

PERSPECTIVE ON THE USDA'S INITIAL FARM INCOME PROJECTIONS

(resource 9, 10, 11)

Key Highlights

USDA initial net cash income forecasts tend to be conservative, averaging 10.6 percent lower than the final historical estimate.

The USDA forecasts for net farm income tend to be more accurate than for net cash income, with an average forecast variance of 9.1 percent below the final historical estimate.

USDA's initial estimates accurately predict directional change in the agricultural economy, particularly for economic downturns.

Forecasting a complex, multifaceted economic series is an incredibly challenging undertaking, one that the USDA takes on several times per year in issuing its farm income projections. Over the last few years, the USDA has revised its farm income numbers higher by several billion dollars once actual historical data became available. This revision has led to increased interest in the movement of these income forecasts as the market unfolds throughout the year. Since the USDA only publishes information on its past forecasts for the past several years, The Feed's authors have compiled a dataset of previous USDA forecasts from historical publications and internet archives going back to 1992. Because of the USDA's February release of its first 2019 income forecast, this article will provide some perspective on the historical accuracy of the USDA's initial February net cash income (NCI) and net farm income (NFI) projections for the year.

Figure 6: Net Cash Income and Net Farm Income Forecast Variance, 1992-2017



An analysis of the data supports a similar conclusion to research conducted by University of Illinois economists, who found that the USDA's initial NFI projection has frequently under-predicted the actual level of net farm income. To provide a standard scale, Figure 6 presents the calculated forecast variance from the USDA's NCI and NFI forecasts as a percentage of the current value for each historical year. Because a positive forecast error signals an initial prediction that was lower than the USDA's final estimate once actual data became available, the data suggests that the USDA's initial income projections for both series tend to be too low. Over the 26 years of forecasts from 1992 to 2017, the USDA's initial NCI projection under-predicted the actual outcome 24 times, while its NFI forecast was too low 19 times. Statistical tests of the USDA's initial NCI and NFI projections from 1992-2017 suggest that both income measures tend to be conservative, and can be used to provide an estimate of the typical range of the average percentage forecast error for each series. Specifically, the USDA's 1992-2017 initial NCI forecast under-predicted actual NCI by roughly 10.6 percent, while the NFI forecast under-predicted actual NFI by 9.1 percent. If past trends hold, the USDA's current NCI and NFI forecasts would be expected to be revised upward as more is learned about conditions in the ag economy in 2019. If past variances hold in 2019, the USDA may revise its final NCI and NFI levels in future releases to between \$99 and \$112 billion and \$69 to \$81 billion, respectively.

WEATHER

(resource 12. 13)

Key Highlights

Record levels of precipitation over the winter and spring have caused flooding in rivers, streams, and fields throughout the Midwest. Conditions will gradually improve over the summer, but for many agricultural producers, it will be too little, too late.

> Robust precipitation has caused a very limited amount of drought conditions throughout the country.

The winter-through-early-summer of 2019 has proven to be among the wettest in recorded history throughout much of the country (See Figure 7). This precipitation has resulted in devastating flooding throughout many of the river systems in the middle of the country, and the continued deluges have caused many fields to be too wet to plant. The quantity and widespread geographic coverage of this precipitation are also evident in the drought monitor (see Figure 8), as that map shows one of the lowest amounts of drought coverage observed.

Due to the extreme levels of precipitation, soil moisture levels remain very high relative to normal throughout the Southern Plains and Midwest. This elevated amount of soil moisture will likely cause temperatures throughout the Midwest to remain temperate through the remainder of the summer. Over the summer, the axis of above-normal

The winter-through-early-summer of 2019 has proven precipitation is anticipated to shift west toward the Rocky Mountain states.

California and the West Coast will likely remain seasonally warm and dry over the summer. However, precipitation was quite robust over the winter, which greatly improved the capacity levels of most reservoirs and improved irrigation water allocations. A negative aspect to the high levels of winter precipitation could mean another busy fire season, as vegetation and undergrowth that bloomed due to the winter moisture may dry out and fuel fires by late summer.

The Southeast and East Coast may find the summer to be slightly warmer than normal, with seasonal amounts of precipitation.



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HOGS

(resource 14, 15, 16

Key Highlights

Hog numbers and pork supplies are increasing rapidly.

Pork demand strengthened in the first half of 2019, boosted by African Swine Fever outbreaks in foreign markets and the reduction of retaliatory tariffs in Mexico.

Hog prices rebounded in the second quarter of 2019, and they look to hold for the remainder of the year.

A winter pig crop that wound up slightly smaller than As has been widely reported in the pork industry, a major earlier intentions implied, combined with reduced producer threat in the swine industry is African Swine Fever (ASF). intentions for March-May farrowings, suggests a somewhat- So far this disease, which is highly contagious and has no lower second-half 2019 pork production than previously cure, has spread to every province in China, Vietnam, forecast. Nevertheless, the numbers are expected to be large Mongolia, and Cambodia, with some believing it has also - third-quarter production is expected to be just under 6.7 spread to North Korea. billion pounds, about 6 percent higher than a year earlier. Fourth-quarter production is forecast at about 7 billion March hog prices reacted sharply to the severity of the ASF pounds, 3 percent above year-earlier production levels.

pork cuts in July 2018. China began retaliatory tariffs on U.S. just over \$53 per cwt. pork and pork offals in April 2018. Since early July, increased Chinese tariff rates faced by U.S. pork products have been as An analysis from Rabobank projects that up to 200 million aluminum tariffs on Mexican imports.

Figure 11: National Base Lean Hog Prices



damage in China and to the possible re-emergence of China as an important buyer of U.S pork. Prices of live equivalent The summary of January exports suggests that U.S. pork 51-52 percent lean hogs began March 2019 at \$36.68 per exports may continue to face trade impediments in 2019, hundred weight (cwt) and finished the month at \$54,58 per some of which began in 2018, and others more recently. cwt, an increase of almost 49 percent. Prices have held up Mexico imposed a 20 percent retaliatory tariff on imported through the end of June, closing the month at an average of

high as 78 percent. Hog producers caught one lucky break in pigs could be culled or could die of illness in China because of trade – Mexico removed their retaliatory tariffs on U.S. pork the country's outbreaks. Thus far, the disease has not reached in late May, following the resolution of the U.S. steel and the U.S. However, some feel it may inevitably arrive. Major steps are being taken to try to stop it from entering the U.S.

- including the National Pork Producers Council canceling the 2019 World Pork Expo, which would have drawn 20,000 visitors from around the world to Des Moines. Iowa.

Monthly hog prices in 2019 had lagged year-earlier prices until mid-March before heading higher and pushing the month's price to an average of \$42.46 per cwt. Although this was almost 7 percent below a year ago, prices for the first week in April averaged almost \$60 per cwt, about 45 percent above the same period in 2018. Information regarding ASF impacts on Chinese pork production will likely influence U.S. hog prices for at least the balance of 2019, as market players balance expectations for increased exports against expectations for U.S. production and domestic demand. For the second quarter of 2019, hog prices are expected to average \$58 per cwt. Third-quarter prices are likely to be slightly higher, at \$60 per cwt. Fourth-quarter 2019 hog prices are expected to fall seasonally to average \$53 per cwt. The average for 2019, \$54 per cwt, is about the same as the average price in 2018.

CORN AND SOYBEANS

(resource 17, 18, 19, 20)

Key Highlights

Corn crop expectations were lowered in June due to poor planting conditions throughout May and early June.

Soybean planting expectations are holding steady but may too drop if conditions do not improve.

Lower production expectations for both grain commodities raised price outlooks for the 2019 crop with corn up \$0.50 per bushel and soybeans up \$0.15 per bushel.

What a difference a day makes. After the USDA published its updated World Agricultural Supply and Demand Estimate (WASDE) on June 11, the markets quickly adjusted to the downward revision in corn planted acres and expected yield. The June WASDE report was considered bullish for corn prices as compared to the May report and trade estimates. The USDA significantly decreased U.S. corn ending stocks by 33 percent due to a 1.4-billionbushel reduction in expected corn production. The world ending stocks are projected to increase just under 4 percent, primarily due to continued favorable yields in Brazil and Argentina. Consequently, nearby corn futures spiked that day, jumping more than \$0.25 per bushel within an hour of the WASDE release.

The USDA projects steady U.S. and global soybean ending stocks in 2020. The June WASDE forecasts a 2 percent decline in U.S. ending stocks from 2019 due to an anticipated rebound in soybean trade later in the year. The world ending stocks look to change by less than half a percent with increases in supply offset by increases in

Figure 9: Corn and Soybean Percent Planted by June 9, Ranked by Year



demand for soybean oil and meal. It appeared the market had priced in most of the bearish news in May after dropping close to \$1.00 per bushel and touching contract lows for November 2019 soybean futures. Nearby soybean prices moved little after the WASDE release.

The weather has not been favorable for planting this spring in the U.S., which has brought a lot of uncertainty in the market as to what the production in the U.S. will be in 2019. As shown in Figure 9, the unplanted U.S. corn crop has never been this high for early June, and it's the fourth worst June for unplanted soybeans. The USDA estimates that 89.8 million acres of corn and 84.6 million acres of soybeans will be planted for this crop year. Those levels represent a nearly three-million acre drop in expected corn planted acreage from the May report.

Farmers made some difficult decisions with their federal crop insurance options in early June. With steadilydecreasing yield potential for corn after May 20, preventive planting provisions may be the best option for some producers, especially those that have incurred few input costs. This situation is further complicated by not being eligible to receive any part of the newly-announced Market Facilitation Program payments if they do not plant a crop. Many may be forced to switch to an alternative crop, especially if they are cash renting the ground and have applied fertilizer.

Prices rebounded sharply in May and June. Through mid-June, corn futures rose by more than 25 percent and soybeans were up by over 10 percent, bouncing off ten-year lows. With the prospects of possibly more acres switching to soybeans in the Midwest over the next two to three weeks, corn may have more upside potential, with limited increases for soybeans. The focus will eventually shift to the condition of the crop, which is not off to a good start with just over 60 percent of the corn emerged versus the 95 percent five-year average, while 35 percent of the soybeans have emerged versus a 75 percent five-year average. The USDA raised projected farm-price for corn to \$3.80 per bushel, and for soybeans to \$8.25 per bushel, in the June WASDE.



(resource 21, 22, 23)

Key Highlights

Milk prices are up in the first half of 2019, driven by increased demand and reduced foreign production.

Increased feed costs are dampening improvements in dairy profitability.

Several exciting trends in dairy demand deliver a brighter outlook for sector demand growth.

CURRENT MARKET CONDITIONS. The dairy industry continues to be burdened with an oversupply of milk, which is impacting prices. The Class III futures price forecast for the year is \$15.90 per cwt. Slaughter rates are up from 2018, but this positive indicator is offset by a significant supply of high-producing heifers. Milk production per cow averaged 1,996 pounds in April, 19 pounds above April 2018. The U.S. dairy herd has been holding steady after decreasing early in the year. Milk prices have improved since 2018, with the June 2019 Class III milk price at \$16.27 per cwt, which is an improvement of \$0.92 over March 2019. While this is positive, profitability remains tight for many operations.

Exports continue to be impacted by trade issues with China. In recent years, China has been the leading destination for U.S. exports of whey products. According to Chinese import data, China's February 2019 imports of whey products from the world were 66 million pounds, 42 million pounds off from January 2019, and 16 million pounds below February 2018. In February, whey product imports from the United States made up 32.6 percent of China's total whey product imports, down from 58.5 percent in February 2018. This decrease is thought to be a result of tariffs as well as African Swine Fever, as whey products are a common component in hog feed in China.

Overall, U.S. demand is steady. A possible bright spot is a potential increase in U.S. demand for ghee, a type of clarified butter popular in Indian cuisine that is lactose and casein free, making it easier to digest for some adults. It can be used as a substitute for olive oil. The industry is constantly looking for novel uses for milk products to increase demand in the U.S. market. Another positive for the industry was the May removal of Mexican retaliatory tariffs targeting U.S. dairy. The value of dairy product exports to Mexico jumped 20 percent between April and May, an 11 percent gain over May 2018. Finally, foreign production is down in 2019, particularly in Oceania, one of the largest competitors for U.S. dairy exports. The positive-demand story should help push mailbox milk prices north of \$19.00 per cwt by the end of 2019. Feed prices were relatively reasonable for the first half of 2019, but they are worsening. Corn and soybean meal prices were relatively flat in early 2019, and hay supplies began the year more-than adequate. Changes in feed prices can typically help mitigate any changes in the mailbox milk price. However, the excess moisture in the Corn Belt has limited feed production of all types, from new crop corn and soybeans to quality hay and alfalfa. As Figure 12 shows, the ratio of milk price to feed costs has improved over 2018, but the industry has not yet recovered to the 15-year average feed ratio. The higher feed costs are limiting the profitability upside for producers in a rising price environment.

NEW OPPORTUNITIES FOR DAIRY PRODUCERS. There is no magic bullet on the horizon for a market-challenged industry. As the U.S. dairy sector has experience in the past, a shakeout will continue in the dairy sector until markets stabilize and until supply and demand moves towards equilibrium. Despite the ups and downs in the dairy market, there is some light in the tunnel (and it's not a train!).





In December 2018, President Trump signed into law the 2018 Farm Bill, legislation that provides increased support, certainty, and stability to farmers and ranchers from coast to coast. Included in the Farm Bill is the Dairy Margin Coverage program (DMC). The DMC replaces the USDA Milk Margin Protection Program (MPP) which was part of the 2014 Farm Bill. Like the MPP, the DMC is a voluntary sign-up program but is viewed by most in the dairy industry as a better program on a few accounts. First, margin coverage options are expanded. MPP had coverage ranging from \$4.00 to \$8.00 per cwt; the DMC offers coverage from \$4.00 to \$9.50 per cwt. Second, the amount of coverage has expanded from 25-90 percent of production history to 5-95 percent. Third, unlike MPP, the DMC offers a broader set of coverage options for larger producers who produce more than five million pounds annually. Fourth, but perhaps most important, the DMC encourages dairy farmers to develop and stick with

long-term price risk management strategies. The DMC offers a noticeable reduction in premiums for all coverage levels, and if producers choose to lock in coverage levels until 2023, they will receive a 25 percent discount on top of their reduced DMC premiums.

There are also several new trends that could drive future production and consumption of dairy products, such as:

- **Digestive wellness:** Dairy is said to be one of the best vehicles for carrying probiotics into the body, with the global market expected to reach \$73 billion by 2024.
- **Dairy proteins:** According to Gail Sabatura of AMCO Proteins, whey protein, the protein found in dairy, has a 10-year CAGR of 7.5% and the market shows no signs of slowing down.

- **Flavor experimentation:** A recent report by NZMP (a global dairy juggernaut; Fonterra's ingredient brand) was indicative of exploratory consumption as global changes like multiculturalism are opening new possibilities for dairy. Alcohol-infused ice creams, flavored butter, and spicy marinated cheese are just a handful of the types of flavor experimentation we have seen in the dairy industry so far this year.
- **Reducing sugars:** Delivering products with maximum taste but minimum guilt is set to be a challenge for dairy companies to meet the demands of increasingly health-conscious consumers.

So, while the dairy sector has many challenges ahead, there are also numerous exciting trends to watch that offer new sources for demand growth. Renewed demand is just the kind of boost a struggling industry needs to reinvigorate and reinvent itself.



ANALYST'S CORNER: FARM LOAN PREPAYMENTS

Key Highlights

Farm loan prepayments affect relationship management, not just balance sheet management.

Refinancing incentive (i.e., lower rate environment) and loan seasoning are two of the largest influencers of borrower prepayment.

Machine learning prepayment analytics boost lenders' ability to efficiently manage relationships and provide additional value to their producers.

With extended periods of relatively-lower commodity prices seen in the ag economy and a kinked yield curve in financial markets, farm loan prepayments are an important risk to monitor not only from a lender's revenue perspective but also from a relationship perspective.

What are the effects of prepayments? While higher prepayment rate environments can be a boon for both lenders and producers, low prepayment rate environments can make it more difficult for lenders to proactively identify producers that could benefit from refinancing into a new loan. Not being able to identify these producers in either environment can lead to detrimental outcomes for lenders through lost relationships, lost fee income, or unexpected funding effects for loans on their balance sheet. These also affect producers who may miss opportunities to maintain liquidity or to make capital investments by leveraging lower cost loans. Farm prepayment research is relatively limited, and existing models typically focus on predicting portfoliolevel prepayment rates for mortgage-backed securities or analyzing funding needs. Predicting exact producers that are most likely to pay off their loan early is a more difficult task, and one that is not well-suited for these types of models. For example, a portfolio-level prepayment model may predict a 5 percent annualized conditional prepayment rate (CPR), which means approximately 5 percent of the principal in the portfolio pays down quicker than scheduled each year. The loans comprising the principal paydown, however, are not necessarily identified, and thus that data may not be useful in the context of relationship management.

What indicates prepayment risk? Despite the limited research on loan-level farm loan prepayments, some common threads emerge for indicators of prepayments across multiple asset classes. Two of these are refinancing incentive and seasoning. When a borrower's note rate is higher than current market rates for similar loan products, the borrower has the incentive to pay less interest by refinancing to the lower rate. In early 2019, rates seemed to be heading higher, but by mid-year, market rates were significantly lower than in late 2018. This recent drop gives borrowers more room to experience prepayment incentive.

For seasoning, loans that are earlier in the amortization schedule also tend to prepay more often since there is more benefit to be gained from even small rate changes on longterm notes. In economist-speak, the opportunity cost of not refinancing is higher. While this is intuitive on average and relatively easy to calculate, there may be many loans that meet these criteria in lenders' portfolios.

Large improvements in computing power in the past several years have led to increased use of machine learning (ML) models to examine hundreds of variables simultaneously, and even to leverage predictive interactions between variables that may not be easy to identify otherwise. In the context of farm loan prepayments, a loan originated in a higher credit spread environment that has an approaching rate reset date with a high margin relative to current market rates is indicative of higher prepayment risk. Other indicators may be historical payment performance, changes in commodity prices, and even volatility in swap rates. Identifying variable interactions like these combined with other indicators can vastly narrow the scope of loans to review.



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