KNOWLEDGE EXCHANGE

October 2018

QUARTERLY U.S. RURAL ECONOMIC REVIEW

Rising Output Compressing Agricultural Margins

This quarterly update is prepared by the Knowledge Exchange Division and covers the key industries served by CoBank, including the agricultural markets and the rural infrastructure industries.

Inside this Issue…

Key Points

- The escalating trade war with China is the leading risk for U.S. agriculture. Retaliatory actions taken by China and other trading partners have raised concerns of long lasting effects on agricultural supply chains. USDA assistance to farmers and ranchers suffering hardship from the trade war will have only a modest impact on farm financial conditions.
- Despite signs of slowing Chinese economic growth, the world economy continues to expand with momentum likely to continue through 2019. Sustained growth in emerging markets will support increasing demand for higher value products such as animal protein, dairy and specialty crops.
- The U.S. economy remains on strong footing with tax reform and increased government spending providing significant fiscal stimulus. Inflation remains subdued, but with labor markets tightening, the Federal Reserve is likely to maintain a steady path of increasing interest rates through 2019.
- Potentially record yields for U.S. corn, soybeans, and cotton are boosting supplies and limiting price improvement. Global wheat supply concerns have pushed prices higher amid production shortfalls in the EU and FSU regions.
- Record animal protein production and trade concerns continue to weigh on beef, poultry and pork markets. Domestic consumer demand remains stout for animal protein, but pork is experiencing the biggest jolt caused by trade disputes and oversupply.
- Dairy markets continue to show modest signs of improvement, though distress among producers remains, forcing some to exit the business.
- In August, the U.S. EPA proposed the Affordable Clean Energy (ACE) rule to sustain a trend of carbon dioxide (CO_2) emission reductions that began in 2005. The net effect of the ACE rule will have a minimal impact on CO_2 emissions for the electricity-generating sector.
- The FCC concluded the Connect America Fund II (CAF-II) reverse auction in August, which awarded $1.488 billion in funding over the next 10 years to expand rural broadband access in unserved areas across 45 states.

Executive Summary

Ongoing trade negotiations and disputes continue to be a disruptive factor in both the short-term and long-term outlook for U.S. agriculture and its farmer cooperatives.

Strong growth in the U.S. and global economies will support demand in the domestic and export markets through much of 2019. U.S. competitiveness is currently constrained by trade uncertainties and the elevated value of the U.S. dollar. At the same time, record U.S. yields for many of the major crop commodities are adding to supplies and limiting any significant farm price improvements over last year. The animal protein and dairy sectors continue to benefit from strong domestic demand but will need export growth to absorb their current pace of output expansion.

Net farm income will remain under downward pressure into 2019 as production expenses increase and revenue falls. While farm equity remains relatively stable, the decline in working capital and debt-to-income will increase financial pressures.

Global Economic Environment

The world economy continues to enjoy broad-based economic momentum that is likely to continue through 2019. With the U.S. growth rate at its strongest level since 2011, and China continuing to grow at around 6 percent per year, emerging markets have been bolstered by solid trade growth. Other advanced economies in Europe and Asia have steady growth supported by accommodative fiscal and monetary policies. Trade uncertainties and the lack of any cohesive global leadership to deal with ongoing geopolitical disputes are the main threats to the growth momentum.

Key factors to watch:

- **Trade disputes** – Continuing trade negotiations and potential trade disputes are the major concerns in the near-term. The U.S. imposition of tariffs and the retaliatory actions by trading partners such as China have created concerns for agricultural supply chains in both the near term and the long term. The Trump administration has started the clock for Congress to consider the U.S.-Mexico-Canada Agreement (USMCA) as a replacement for the existing NAFTA agreement. The USMCA must be ratified by the legislatures of the various countries and will not likely take effect until mid-2019. The reopening of trade discussions with Europe and Japan is a positive note. The greatest concern is that the trade dispute with China will escalate if the U.S. imposes additional tariffs in the near future.
- **Interest rate hike** – The U.S. economy is on solid footing with tax reform and increased government spending providing significant fiscal stimulus. Consumer spending remains strong and business investment should accelerate into 2019. The one

wildcard is how the economy will respond to the Federal Reserve commitment to moving interest rates higher. The potential drag on economic growth and equity markets will need to be watched carefully, particularly in late 2019.

- **Chinese economy** – Economic growth in China will likely continue to hover around 6 percent despite the ongoing trade dispute with the U.S. Much of the impact of reduced trade flows will be felt by other Asian economies that provide inputs to Chinese companies involved in trade. Declines in the value of China's currency have mitigated some of the tariff impacts.
- **European economic growth** – The major European economies are on a steady, albeit slow, growth path. The outcome of the Brexit negotiations in early 2019 will provide some insight into the future course of the European Union and the Eurozone. Debt and fiscal issues among many of the Eurozone countries, such as Italy, remain an ongoing concern.
- **Currency volatility** – The divergence in central bank policies is likely to widen into mid-2019 and result in continuing volatility in currency markets. The Federal Reserve raised rates in September and will likely do so again in December. If U.S. growth continues near 3 percent, interest rates will climb even higher in 2019. The European central bank and the Bank of England are likely on hold until mid-2019. This continuing policy divergence among central banks, coupled with strong U.S. growth, will support the value of the U.S. dollar for the foreseeable future. Any significant geopolitical turmoil could create additional safe haven demand for the U.S. dollar and push it higher.
- **Repayment complications** – Emerging markets will continue to benefit from a strong global economy and the resulting increases in trade flows. Still, some regions will experience problems associated with the volatility in currency markets. In countries with sharply deteriorating currencies, the ability to repay U.S. dollar denominated debt has deteriorated and been further complicated by rising interest rates.
- **Cyberterrorism** – Cyberterrorism is becoming a significant risk to add to the list of geopolitical risks. Global attacks against information, computer systems, computer programs, and data are occurring at an increasing rate in both the private and public sector and undermining public confidence.

U.S. Economic Environment

The U.S. economy grew at a more than 4 percent annualized rate in the second quarter of 2018, the strongest quarterly growth rate in four years. That growth momentum, driven in large part by tax reform and increased government spending, is expected to continue at a 3 percent rate well into 2019. It will also mean that the current business cycle, which began in the fourth quarter of 2007, has just become the longest for the U.S. since the end of World War II, at 129 consecutive months as of September 2018.

Strong consumer spending, which has supported the animal protein and dairy sectors, will continue to be fueled by rising incomes and job growth, low unemployment, and reduced debt levels. Rising interest rates may begin to temper demand growth for housing, autos, and other big-ticket items entering 2019.

The acceleration in corporate profits and business investment has been the catalyst pushing the economy out of the 2.25 percent average growth rate since the recession in 2009. Corporate profits in the second quarter were nearly 7 percent above year-ago levels with business investment up 8 percent. With significant liquidity on corporate balance sheets and large foreign profits likely to be repatriated in 2018-19, business investment should continue to increase.

Growth expectations will be tempered by:

- **Uncertainties in the trade sector** – Net trade is not a big component of overall U.S. economic growth, but it is significant to many sectors, including agriculture. Continuing trade disputes can impact consumer goods availability, business sentiment, and inflationary pressures.

- **Consumer and business sector responses to rising interest rates** – Inflation is now running near the Federal Reserve target level of 2 percent. Should inflation move substantively higher, the Federal Reserve could accelerate its tightening of monetary policy, which could slow economic growth.
- **Midterm congressional election outcomes** – The midterm elections will be politically divisive. The control of Congress will set the stage for policy actions over the next two years.

U.S. Agricultural Markets

Ongoing trade concerns and declining economic conditions in agriculture are dominating agricultural markets. Nearly 70 percent of U.S. agriculture exports are destined for countries with active trade negotiations and/or trade disputes. Agricultural markets will be pressured until these issues are resolved.

Potentially record U.S. yields for corn, soybeans, and cotton are boosting supplies and limiting any significant price improvement relative to last year. With the exception of soybeans, the global stocks of other major commodities are declining and continued strong global trade is supporting current price levels. Unfortunately, U.S. agriculture is competitively disadvantaged by the strong U.S. dollar as well as ongoing trade issues.

The soybean market has been significantly impacted by the trade dispute between the U.S. and China. China has slightly reduced import levels from a year earlier and is sourcing larger supplies from South America. The ongoing trade disputes, and the likely record 2018-19 world soybean crop, could push global stocks to record levels. The stocks-to-use ratio may reach the highest level since the mid-1980s.

Animal protein and dairy markets are also feeling the impact of trade issues, but the strength of domestic consumer demand has been a mitigating factor.

Without any significant improvement in farm prices in 2018, the financial condition of U.S. agriculture will continue to decline. Rising production expenses and stagnating gross revenues will contribute to a 5-10 percent decline in 2018 net farm income.

The $5 billion in additional subsidies promised to producers under the Market Facilitation Program (MFP) will mitigate some 2018 of the farm income decline. The MFP was implemented to offset the impact of retaliatory tariffs by trade partners.

U.S. farm equity and the debt-to-asset ratio remain stable. Working capital will likely decline by over 20 percent, however. Also, the debt-to-income ratio will be at the highest level since 1984.

Grains, Oilseeds, and Biofuels

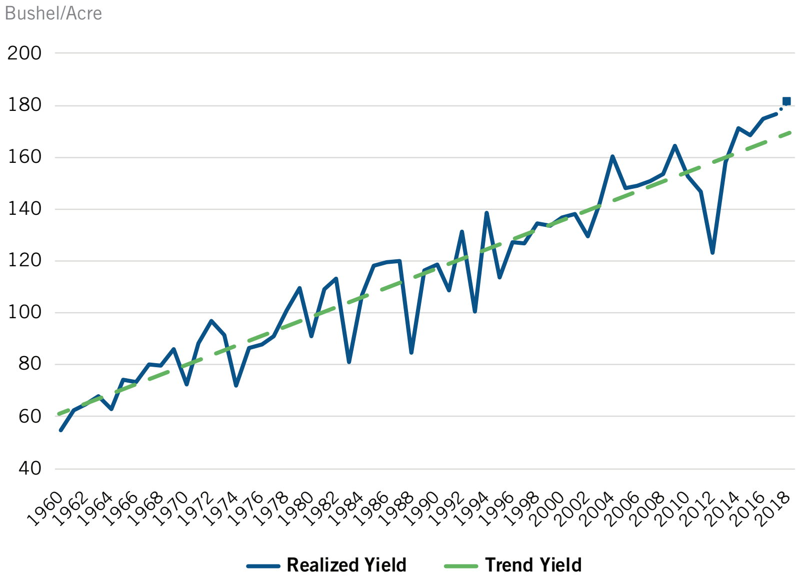
Trade talk dominated grain markets in the third quarter of 2018. The U.S.-China trade dispute remains unresolved with both sides seeming to entrench further. The short-term impacts from this trade dispute are immense for U.S. farmers and agribusinesses. The additional long-term impacts are expected to erode the U.S. export market share as China finds alternative sources of soybeans and other agricultural products. However, the newly agreed to USMCA reduces uncertainty for grain and biofuels exports to Mexico and Canada.

In addition to mounting trade concerns, excellent crop conditions have pummeled corn and soybean markets. In wheat, however, global supply concerns pushed prices higher amid supply shortfalls in the EU and Black Sea regions. Barring any trade dispute resolution, corn and soybean prices are expected to trade sideways or lower as harvest kicks into high gear.

Large fall crops this year will stretch capacity in key Midwest states. With soybean prices low and some elevators in the Northern Plains not bidding for soybeans, farmers may look to store more soybeans on-farm. As a result, elevators may see more corn this year at harvest than in previous years.

The ongoing trade disputes, particularly with China, will have outsized influence in the important fall shipping season and the total demand outlook for U.S. corn, soybeans, and wheat.

EXHIBIT 1: U.S. Corn Yield, Realized vs. Trend



Source: USDA-NASS; CoBank ACB

Corn

A large U.S. corn crop got even bigger in USDA's September crop report. The USDA now projects the national average corn yield above 181 bu/ac – a new record. *(See Exhibit 1.)* Almost the entire Corn Belt stretching from Ohio to South Dakota is expecting record yields. Going forward there is still much uncertainty, especially regarding USDA's implied record ear weight and a record number of ears/acre. However, with USDA projecting record yield for so many states, any decline in the months ahead will likely be small.

USDA's larger-than-expected production figure of 14.8 billion bushels continues to burden prices, which are unlikely to rebound much before harvest barring a catastrophic weather event impacting the Midwest. Corn demand, though, remains strong. All domestic uses are projected flat or higher year-over-year (YoY) in 2018/19, led by increases for feed and ethanol.

Despite trade conflicts, corn exports finished the 2017/18 marketing year strong, and current export sales commitments hint at the strong export pace continuing into the 2018/19 marketing year. The USMCA further encourages a bullish outlook on corn exports. The agreement will help stem the shift Mexico would have made to import more South American corn at the expense of U.S. exports to Mexico.

Economic turmoil in South America adds to the uncertainty of the global corn trade balance. Argentina's farmers are being forced to make planting decisions this upcoming quarter amid a financial meltdown in the country. The interest rate in Argentina is now 60 percent and the value of the Argentine peso has plummeted. These macroeconomic factors will filter into Argentine farmers' planting choices, but the net impact on acres is unclear.

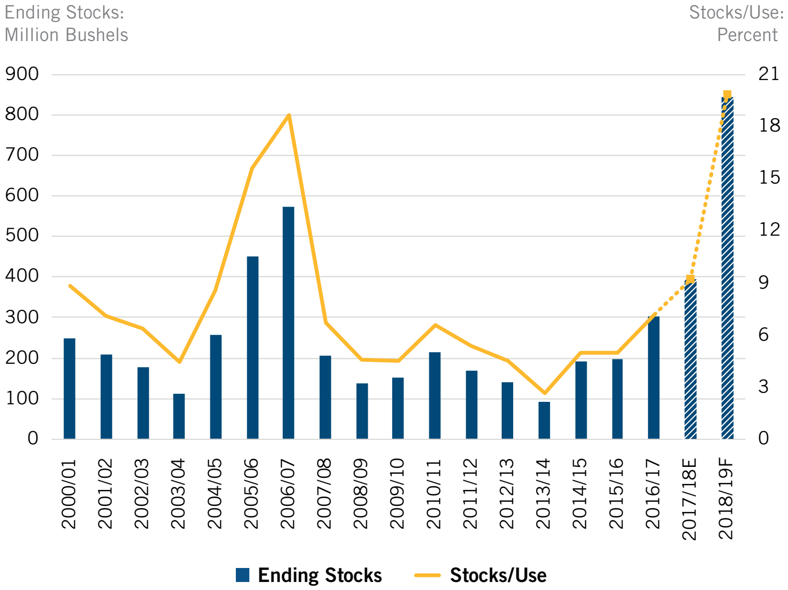
Argentina's extraordinary interest rate favors expanded soybean production because soybeans have lower planting costs. Additionally, export taxes have been imposed on corn and wheat, thereby reducing the incentive to plant corn. However, export taxes were simultaneously increased for soybeans and soybean products, shifting the incentive to increase corn acres. The next quarter will provide more clarity as Argentine farmers make their planting decisions.

Soybeans

U.S. soybean production is pegged to reach record levels this year on a record yield. This year's massive crop is arriving amidst ongoing trade disputes with China, the U.S.'s most important export destination, which is expected to send U.S. soybean ending stocks soaring for the 2018/19 marketing year. *(See Exhibit 2.)* Prices that dropped through the month of June remain very low. This pricing environment is largely a result of the trade dispute with China, but some of it is also due to the large crop.

The Northern Plains have been hit especially hard by the U.S.-China trade dispute, especially the Dakotas. Basis in the region has been in freefall because most of the soybeans in the region are destined for China via the Pacific Northwest (PNW). PNW soybean exporters have not had a bid for soybeans for quite some time.

EXHIBIT 2: U.S. Soybean Ending Stocks and Stocks/Use



Source: USDA-FAS; CoBank ACB

alternative oilseed meals will likely come from FSU-12 countries. DDGS will likely come as a by-product from increased ethanol production in China.

In total, China hopes these measures will reduce soybean demand by 12 million MT. China's Ministry of Agriculture announced that they expect to import only 83.5 million MT, more than 10 million MT lower than USDA's current estimate.

An outbreak of African Swine Fever in China will also reduce their soybean demand. However, it is unclear how big the outbreak will be and whether the current Chinese import estimates incorporate this outbreak. If China is forced to cull 5 percent of the pigs in country due to African Swine Fever, soybean demand could decline by 3 million MT.

Some elevators in North Dakota are also posting "no bids" for soybeans. Average September soybean basis in North Dakota was -$1.63, about 65 cents weaker than the 3-year average. Other areas of the U.S. have not been as hard hit. For example, the average September soybean basis in Iowa was -$0.90, less than 35 cents weaker than the 3-year average.

China's soybean strategy during the U.S.-China trade dispute is three-fold. First, China will buy as much non-U.S.-origin soybeans as possible. This will mostly come from Brazil and other South American countries, but some will also come from FSU-12 countries and Canada.

Second, China plans to draw down its soybean stocks. USDA estimates suggest China has around 2.5 months of supply at the beginning of the 2018/19 marketing year.

Third, China plans to change its animal feed rations. The average protein content in China's animal feed is high after years of increasing the soybean meal content in rations. Reducing protein in feed rations may now enable Chinese livestock and poultry feeders to reduce dependence on imported soybeans and soybean meal.

Alternative protein sources include sunflower seed meal, rapeseed meal, and domestically-produced DDGS. The

While most market watchers are glued to news on U.S. soybean supplies and Chinese demand, soybean planting has started in South America. Both Argentina and Brazil are expected to increase production YoY.

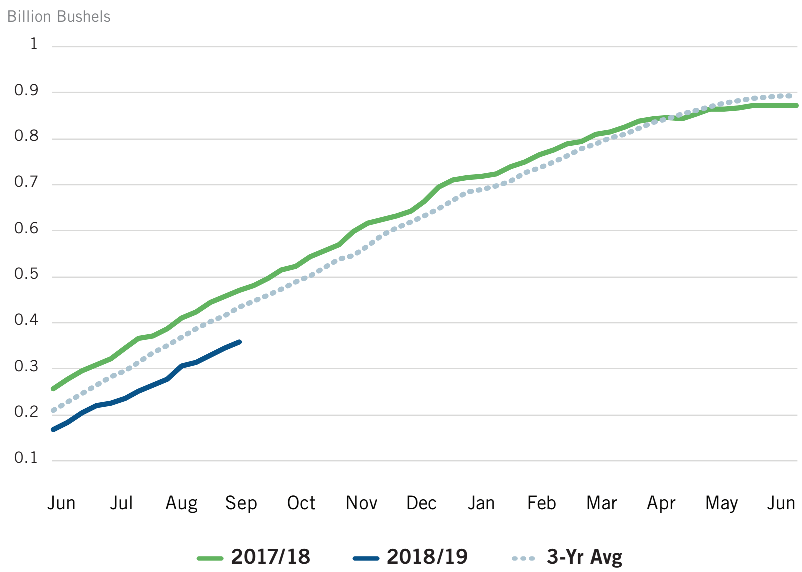
In Brazil, acreage will likely expand less than expected given the soybean market situation. The weak Brazilian real has increased the cost of production for Brazilian farmers because most farm inputs are imported. The trucker strike and resulting rise in freight rates have also reduced the incentive to aggressively expand acres in Brazil. However, initial estimates point to an expansion of around 3-4 percent.

Wheat

Hard Red Spring (HRS) wheat harvest is complete with production rebounding from last year's drought-hit crop and on expanded acres. The U.S. winter wheat harvest has wrapped up with Hard Red Winter (HRW) production faring better than initially feared following the driest winter on record in the Central and Southern Plains.

Outside the U.S., dry conditions have hampered wheat production in FSU-12 countries, the EU, and Australia. Global wheat production is forecast to decline over 25 million MT in 2018/19. As a result, the world ending

EXHIBIT 3: Total U.S. Export Commitments, All Wheat



Source: USDA-FAS; CoBank ACB

stocks-to-use ratio outside China is forecast to decline to its lowest level in more than 10 years in 2018/19.

This situation would indicate that the U.S. would have excellent export prospects. USDA forecasts U.S. exports to increase by 14 percent YoY. However, U.S. shipments and export sales this year have been abysmal. U.S. all wheat export commitments are approximately 20 percent lower YoY. *(See Exhibit 3.)* Only three years since 1990 have had lower YTD total export commitments at the end of September.

This situation bears careful watching. If exports maintain the current pace and domestic use does not soak up additional supplies, the U.S. could see ending stocks build to over 1.2 billion bushels – higher than the 2016/17 high water mark. This would send the ending stocks-use ratio to levels not seen since the 1980s at over 65 percent. This is an unlikely situation as exports are sure to recover later in the season – likely sometime after the first of the year. However, the prospect of higher YoY exports seems to be a stretch at this stage. Therefore, prices have significant downside risk going into next quarter.

Winter wheat planting is gaining speed across the plains with planted acreage expected to expand YoY. Additional rain at the end of the summer and into the start of the fall has helped build soil moisture in the Southern Plains, and the relative profitability of wheat to soybeans has greatly improved compared to last year. The first official estimates for U.S. winter wheat area are due in January 2019.

Ethanol

Ethanol has seen continued YoY production growth in the third quarter of 2018. Unfortunately, the ethanol industry also saw stocks remain elevated YoY in the same quarter. Particularly worrisome is that stocks trended higher counter-seasonally. *(See Exhibit 4.)* Stocks at the end of September were 9 percent higher YoY.

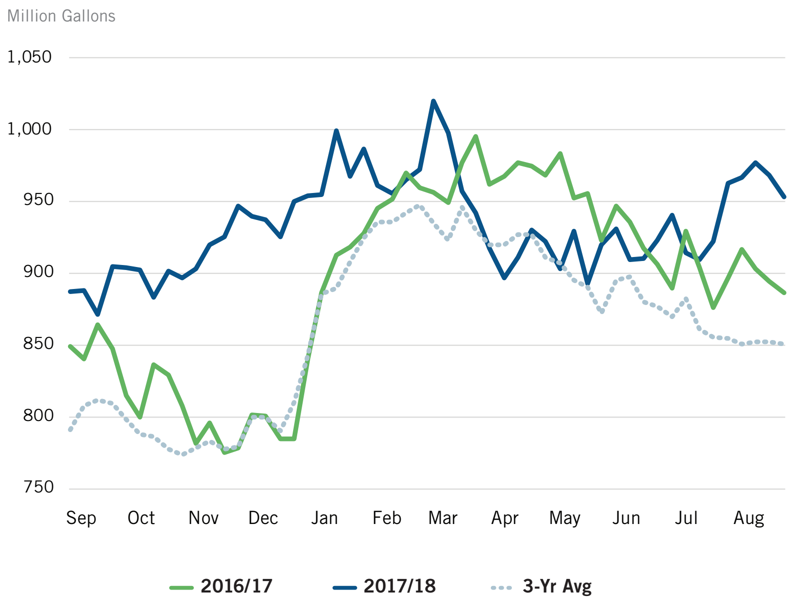
Rising stocks have put pressure on ethanol plant margins. Iowa State University's representative ethanol plant has had operating margins below capital costs (25 cents/gallon) for the last six weeks. The last week of September saw the average daily operating margin drop to just 4 cents/gallon. The current margin environment echoes the conditions of late 2014/15 and early 2015/16. If 2018/19 follows suit, margins could remain weak and under pressure through spring of 2019.

Things are not expected to improve for domestic demand. Domestic gasoline consumption will fall next quarter and drive down demand for ethanol blending. Exports remain the bright spot for ethanol demand. Ethanol exports have greatly improved YoY, but the hastened export pace relies heavily on Brazil maintaining its robust import pace with domestic production trailing growing demand.

On the policy front, the Renewable Fuel Standard (RFS) policy fight continues with small refinery exemptions remaining a major issue. Some researchers estimate that these exemptions have had a minimal impact because ethanol remains cheap compared to gasoline. As a result, blenders find it economically beneficial to blend up to 10 percent ethanol into gasoline.

However, FAPRI-MU has an alternative take. It has estimated the future impact on the ethanol industry if the implementation of small refinery exemptions were to continue using the most recent practices.

EXHIBIT 4: U.S. Ethanol Stocks



Source: EIA; CoBank ACB

They project that ethanol consumption could drop by an average of more than 750 million gallons per year and gross revenue for the ethanol industry would drop by $3.3 billion per year. The current RFS policy implementation poses a significant risk to ethanol plant profitability in the years ahead, especially in the context of already razor thin margins.

The Trump administration's announcement in early October to allow the expanded year-round use of E15, or fuel that contains 15 percent ethanol and 85 percent gasoline, would be a significant win for ethanol producers and U.S. corn growers if successfully implemented by summer 2019. The move, though, is expected to be challenged by environmental groups and oil-producing states.

Farm Supply

The current trade environment has caused headaches for agricultural retailers planning for next year. If crop prices stay at current levels, farmers will likely reduce soybean acres significantly. In turn, they will shift those acres to either corn or wheat. However, the relative profitability of these crops can change quickly in the event of trade resolution or even further escalation in the trade war.

As a result, agricultural retailers are struggling to plan purchases of fertilizer and crop protection products this fall. Additionally, farmers are less likely to pre-pay this year for crop inputs due to the uncertainty. This will put agricultural retailers and agronomy margins in a risky position over the next 6-9 months.

This uncertainty is coming at a time of higher fertilizer prices, YoY. *(See Exhibit 5.)* These prices are expected to remain firm through Q4 on fall fertilizer demand. This will certainly be the case for urea and ammonia if farmers plan for more corn acres in 2019.

The prices of crop protection products imported from China are also elevated. The price increases are not due to tariffs, though. China's EPA started enforcing environmental standards for manufacturing plants across the country late last year. Many crop protection manufacturers were hit with fines and forced to shut down, leading to lower product availability and higher prices.

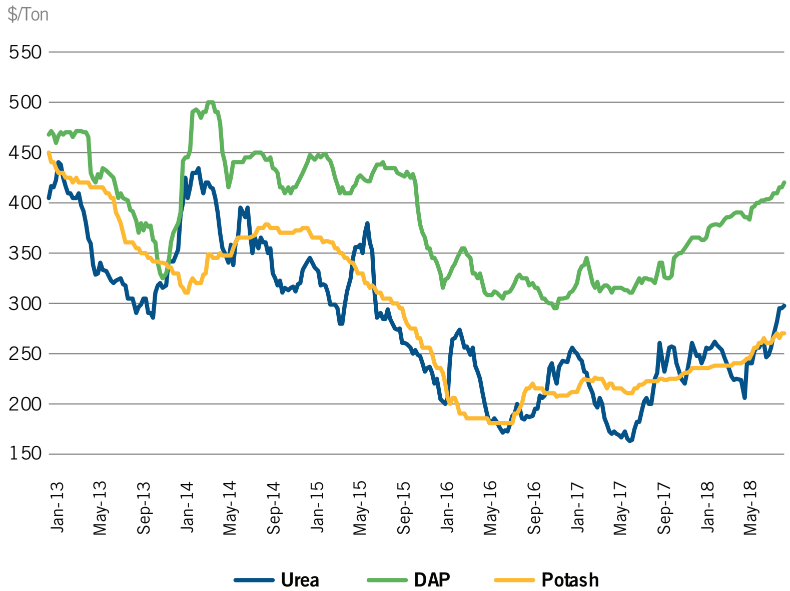
This environmental crackdown has reduced the supply of basic chemicals like glyphosate coming from China. The price impact was limited last year due to the timing of plant shutdowns. However, because supplies remain tight, prices for these basic chemicals will impact crop protection product prices this year. In turn, agricultural retailers will face margin compression on crop protection sales.

Animal Protein

The effects of burdensome domestic supply growth and trade disputes with some of the U.S. protein sector's most important customers became increasingly clear during the third quarter.

Production growth ramped up during the quarter as compared to second quarter levels, increasing by 2.5 percent versus the previous period's 3.2 percent. However, the rate of exports slowed significantly after growing by seven percent in the second quarter. This is largely the result of new and higher retaliatory tariffs on U.S. pork and beef by Mexico and China.

EXHIBIT 5: Fertilizer FOB Prices, U.S. Gulf



Source: Bloomberg

At the mid-point of 2018:

- **Pork** – Hog producer margins were negative and a futures curve indicated that would continue.
- **Beef** – Cattle feeding remained challenged.
- **Poultry** – Chicken margins had compressed to about half of what they were a year earlier.

The recently signed trade pact between the U.S., Mexico and Canada is a positive sign, but the U.S. tariffs on steel and aluminum imports will keep retaliatory duties on U.S. pork and beef in place. Signs that the U.S. economy is strengthening have positive implications for domestic protein consumption. The increase in U.S. consumer spending power will encourage Americans to purchase more meat in the coming months.

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Pork

Pork is experiencing the biggest jolt caused by trade disputes and price pressure due to oversupply.

While export volume held steady in July, it came at the cost of lower prices. Hog prices are currently 35 percent below last year's levels. *(See Exhibit 6.)*

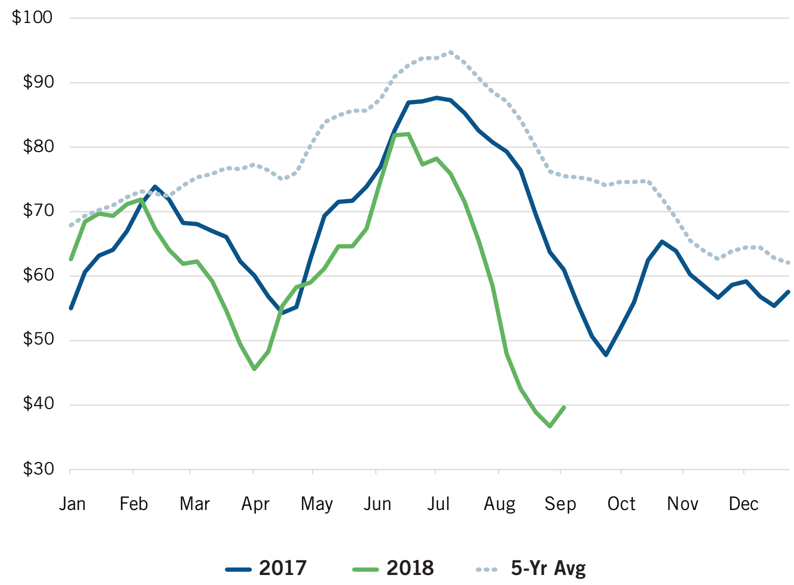
Slightly higher feed costs combined with price pressure will make the second half of 2018 one of the most difficult periods U.S. hog producers have experienced in a number of years. It's estimated the production side of the pork sector could lose over $1 billion in the last six months of this year alone.

Exports account for approximately 25 percent of U.S. pork production. Through August U.S. pork producers exported six percent more than during the same period of 2017. At the same time, production increased 3.5 percent. Export gains are continuing to blunt the price impact of the increased supply. The outbreak of African Swine Fever in China, and more recently in southern Belgium, is injecting some optimism into the U.S. hog outlook for 2019.

Two export markets have been key to this year's growth:

- **South Korea** – Nearly two-thirds of the growth in exports has been driven by increased shipments to South Korea. Shipments are currently up 42 percent this year. The ability for the U.S. to send pork butts duty-free into the Korean market has been a key driver. Today, the U.S. accounts for approximately 40 percent of the Korean pork import market.
- **Mexico** – Mexico is the dominant market for U.S. pork exports, accounting for about one-third of foreign sales. Even though Mexico ratcheted up its tariffs on U.S. pork in early July, export volumes held steady albeit at lower prices. The late-August announcement of agreement on terms for a new

EXHIBIT 6: Iowa - Minnesota Hog Carcass Base Price



Source: USDA-AMS

trade deal between the U.S. and Mexico is a positive sign for the U.S. pork sector long term. However, with no definitive end to the current level of tariffs, there remains a cloud over U.S. pork exports to this priority market in the short term.

Pork supplies are expected to remain above prior-year levels. Supply growth is expected to accelerate from the 3.5 percent growth in the first half of the year. Indications from the USDA Hogs and Pigs report, along with some of the processing plant disruptions during the third quarter, reflect a significant increase in pork processing in the fourth quarter. Supplies may be up as much as 5 percent versus 2017.

In total, 2018 pork production is expected to increase by 4 percent, which will be the largest increase of the three major proteins. Supply growth will slow dramatically in 2019 as the impact of poor hog production margins and tighter packer profitability take their toll.

Beef

The U.S. beef sector had a very strong first half of 2018, despite some very real headwinds. These include:

- 5 percent average annual production growth over the last two years.
- Severe drought across the four corners states through Texas.
- Hay prices that are now 50 percent higher than 18 months ago.
- Increasing competition from larger supplies of pork and chicken.

Prices – Steer prices have been relatively flat since the May sell-off and are now closely in line with levels this time last year. Heading into fall, the question is whether prices will hold steady and find support through the fall or take another leg lower as the industry experienced in October 2016.

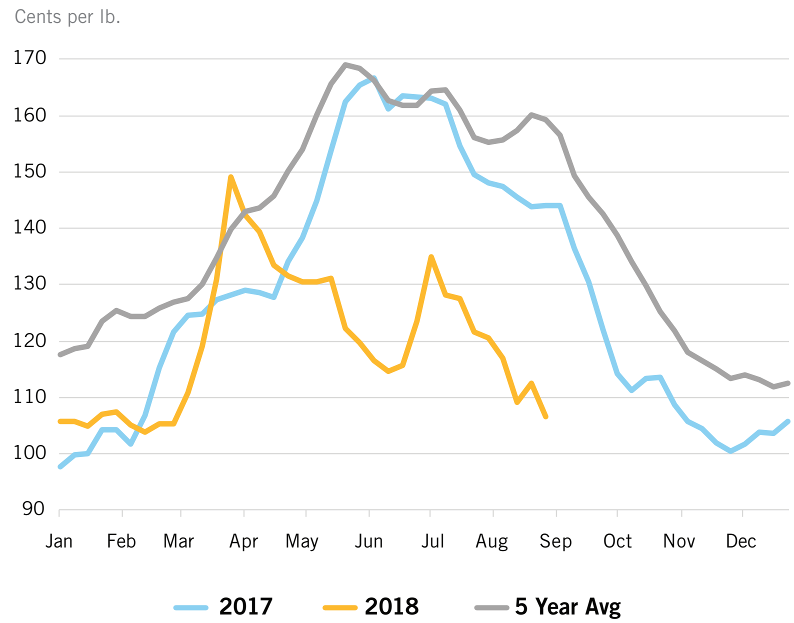
Exports – Trade was the bright spot for the U.S. beef sector in the first half of 2018. Volume increased 14 percent through August, driven by growth in shipments to Korea, Japan, and Taiwan.

China increased its import tariff on U.S. beef to 37 percent effective July 6, triggering a slow-down in market growth with this key trade partner. This status is likely to persist until the trade dispute can be resolved.

While China has not yet superseded the U.S. as the world's biggest beef importer, its appetite is growing. The country increased its beef imports by a third in the first half of 2018. This market and Hong Kong are priority markets for long-term export growth.

Packers – Ample cattle supplies and a healthy demand from consumers both domestically and abroad are contributing to strong packer margins. Margins may set a record in 2018, thanks to exports climbing well ahead of last year during the first two quarters and expectations for continued growth of fed cattle supplies. This should keep packer demand for cattle robust through the fall and throughout 2019.

EXHIBIT 7: Boneless Skinless Chicken Breast Prices



Source: USDA-AMS

Trends – The July 1 cattle inventory report as well as more recent cattle-on-feed reports indicate the industry is reaching the top of the cattle cycle. Heifer retention for herd expansion was down 2.1 percent as of July 1. Heifers climbed to 37 percent of cattle on feed for July.

With minimal growth in cattle weights this year and going forward, the rate of beef production growth in the U.S. is projected to be 2-3 percent in 2019. This is down from 3.5 percent this year and close to 4 percent growth in 2017.

Poultry

The supply picture for the U.S. chicken sector has been uneventful. Chicken has paled in comparison to the growth of its protein competitors. Production through the first half of the year was up just 2 percent, compared to hikes of 3.5 percent for pork and 4 percent for beef.

Prices – The poultry price trend has been very weak. Primary chicken cuts are down 25–35 percent versus this time last year. This indicates pressure in both the domestic and international markets. *(See Exhibit 7.)*

This summer's price trend looks to continue as new chicken processing complexes are scheduled to open in 2018 and 2019. One new complex ramped up production in August, which should lift supply growth in the back half of 2018 to 3 percent and annual growth to 2.5 percent.

Domestic demand – Boneless skinless breast prices are 26 percent below last year, and wings are down by one-third compared to 2017. This domestic side weakness is largely driven by competition and a strengthening economy.

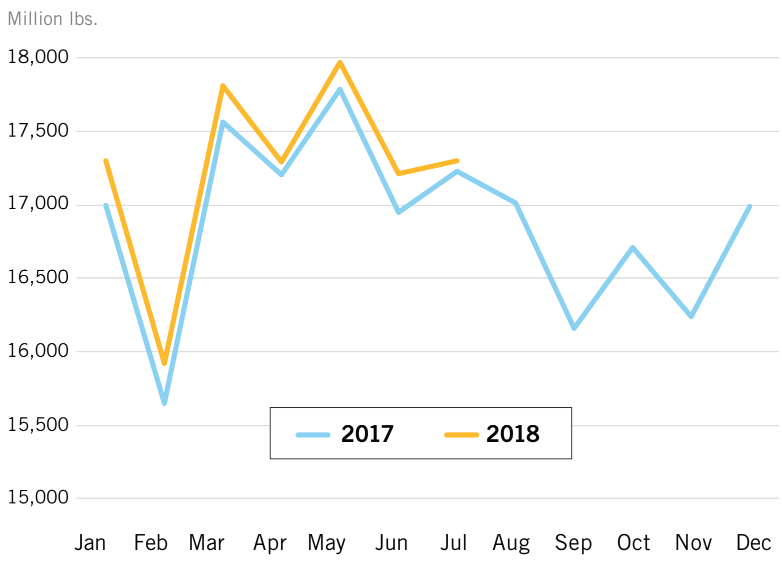
Trends – As the U.S. economy grew slowly out of the Great Recession over the last decade, the chicken sector enjoyed a good position in terms of supply and pricing. Meanwhile, pork and beef struggled in both areas. This put chicken in a sweet spot for retail featuring. This year, those positions are reversed as pork, and especially beef, are getting significantly more attention in the retail meat case.

Margins – U.S. poultry producer margins are down about 40 percent versus last summer. Margins have gone from "great" to "ok," but with chicken prices seasonally taking a leg lower in the fall and winter, even tighter margins are expected.

Exports – Chicken exports have risen in 2018. This is largely in line with production at 3.0 percent through August, though at significantly lower prices. Leg quarter prices climbed through April in sync with the seasonal trend. An unusual counter-seasonal move downward started in May, with prices falling from 40 cents per pound to near 30 cents per pound currently.

Unlike pork and beef (to a lesser degree), poultry hasn't been directly impacted by the U.S. trade disputes with Mexico and Canada. The trend in leg quarter prices coincides with the ban that the EU put on 20 of Brazil's major chicken complexes in response to the "Operation Carne Fraca" investigations in that country. In addition, as pork has been negatively impacted by trade tariffs, this could have also put pressure on leg quarter prices this summer.

EXHIBIT 8: U.S. Milk Production, 23 Major States



Source: USDA-NASS

Dairy

Dairy markets are continuing to show modest signs of improvement, though the distress many producers are feeling is real. That distress is appearing in the form of farms exiting and a plateau in the national herd size.

While production is expected to continue to grow, it will be at a much slower pace than the past several years. *(See Exhibit 8.)* Future growth will be driven by efficiencies in milk produced per cow rather than an increase in the number of cows.

In some areas of the country, the slower rate of production is not enough to provide relief in the form of higher prices and improved margins. Efforts on the part of some producer groups to investigate supply management in various forms have been developing. It's unclear what will come of these efforts, but they highlight a division between small farms, which are struggling disproportionately due to their higher cost-structures, and larger farms, which are enjoying significant economies of scale and continuing to seek expansion opportunities.

Joint venture – Relief for the Michigan milk shed is on the horizon. The location for the long-anticipated joint venture between Glanbia, Dairy Farmers of America and Select Milk Producers was recently announced. The new cheese and whey plant to be built in St. Johns, Michigan, is expected to help relieve the surplus milk situation the region has been facing. Plans call for the new plant to open in 2020.

Prices climbing – Of the four products which drive dairy prices, the commodity products (nonfat dry milk and whey) have been showing strength while the consumer products (cheese and butter) have been choppier. As fall approaches and holiday season orders are placed and filled, butter and cheese should get a lift from heavier retail promotions.

Trade disruptions – Domestic and world demand for U.S. dairy commodities have shown signs of strength, but disruptions to trade will have a more measurable impact the longer they last.

Trade partners of interest to the U.S. dairy industry:

- **Mexico** – Retaliatory tariffs on cheese remain in place for the time being with hopes that an agreement will be signed soon.
- **China** – China and the U.S. continue to trade whey, with both sides of the trade absorbing some of the tariffs. If the situation persists or worsens, some of that market could be lost.

Despite the tariffs, prices have been climbing since the beginning of the year. They should continue to do so into 2019. No breakout moves beyond the current range of $16 to $18 per hundredweight are expected in the all-milk price. Increases will be driven by a slowdown in production. Any sudden price surge, though, will be quickly tempered by a lingering appetite among some producers for expansion.

Other Crops

Cotton

The cotton harvest is looking better than initially expected. Yield is expected to come in at a record high of 911 pounds per acre.

The dry start to the season, particularly in Texas, has improved some. However, Texas still has a high abandonment level of 42 percent. The Arkansas and Tennessee regions got off to a comparatively smoother start, but late wet weather there, as well as Hurricane Florence in North Carolina, have had a negative impact on the quality of open cotton that had not yet been harvested.

Exports – The market continues to be driven by strong demand. Exports are anticipated to be 15.5 million bales, a slight decrease from last year. Domestic use is expected at 3.4 million, which is a slight increase over the previous year.

Trade disruptions with China continue in the form of retaliatory tariffs. The U.S. is a major supplier of cotton to China, and a prolonged heightened tariff environment would be detrimental. China currently accounts for over 20 percent of unshipped commitments.

Rice

The rice harvest is underway, delayed somewhat in the Delta region due to wet weather. Weather has generally been favorable throughout the growing season. Planted acreage increased in all rice regions and substantially in some, particularly Arkansas. These factors should combine for big increases in the 2018 harvest.

U.S. production is up while there are slight decreases in production in China and India, the world's largest producers. In total, global production is expected to be down slightly. Total supplies will be at record levels, however, due to a large carry-in.

Exports – Exports are still facing challenges in the important markets of Mexico and other Central American destinations, which make up around 60 percent of total U.S. rice exports. Steeply discounted product and improving quality from South American producers – rather than tariffs – could limit exports. The U.S. remains the dominant supplier for now, but it is losing market share.

Imports – At the same time, U.S. growers are facing market pressure from imported rice. Imports are growing and expected to reach a record high in 2018.

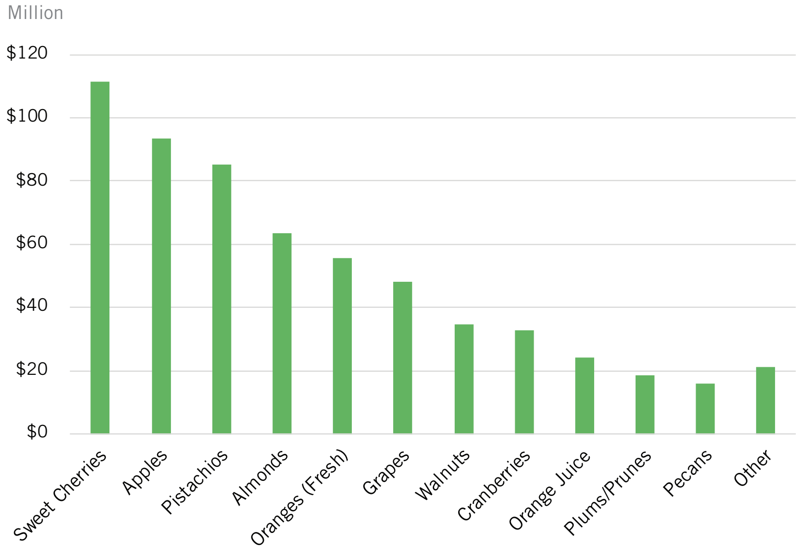
Expectations are for season-average prices to be down slightly in 2018-19, which will be needed to make rice more competitive globally. Long-grain will experience more of a drop in price than short.

Sugar

The U.S. sugar balance sheet will tighten in 2018/19. Sugar beet production will increase YoY, but a drop in imports will more than offset the increase in domestic output, dragging down total supplies.

Beet yields are expected to reach record highs and sucrose extraction rates will be higher than previous years. The pace of deliveries from beet processors is just off last year's record high thanks to improvements in infrastructure for storing and slicing beets, and price competitiveness with cane sugar.

EXHIBIT 9: USDA Fruit and Nut Purchases for Trade-Damage Relief



Source: USDA

While growers of major agricultural commodities like soybeans participated in USDA's $12 billion relief trade package, specialty crops growers did not benefit from the cash distribution. Rather, USDA earmarked about $600 million in fruit and nut purchases to help U.S. specialty crops growers who have been hurt mostly by Chinese tariffs, but also by new tariffs imposed on U.S. fruit and nut products in India, Mexico, the EU, and Turkey. Sweet cherries topped the USDA list of specialty crops purchases at $111.5 million with the food to be distributed to USDA nutrition assistance programs in participating states. *(See Exhibit 9.)* The total amount of USDA's fruit and nut purchases, though, remains well-below the estimated economic impact of the trade war.

Cane production is slated to dip slightly despite a significant increase in acres planted in Louisiana. Yields will decline from last year's near-record, reducing overall output. Cane food and beverage deliveries will rise about 1 percent in 2018.

Specialty Crops

Trade concerns again dominated the specialty crops sector in Q3 amid rising uncertainty over NAFTA and concern about diminishing exports to China and the EU. With Chinese tariffs on U.S. fruits, nuts and other specialty crops now between 50 and 60 percent, growers in the U.S. are increasingly concerned about a protracted trade war reducing market share in the long run.

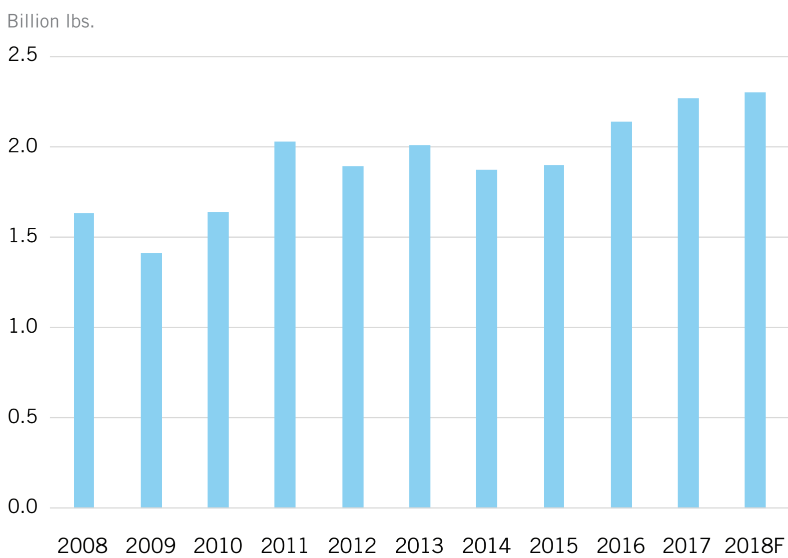
According to an economic analysis completed in August at the University of California-Davis, the total cost of the trade war on U.S. fruit and tree nut industries could tally up to $3.34 billion per year as a result of China's retaliatory tariffs on U.S. agricultural commodities. The study estimated trade losses on 10 commodities in the specialty crops sector, including almonds, pecans, pistachios, walnuts, apples, oranges, raisins, sour cherries, sweet cherries and table grapes.

California growers are also facing new threats of reduced water availability for irrigation. The California State Water Resources Control Board moved forward in July with a proposal to force tributaries in the San Joaquin Valley to implement a 30 to 50 percent unimpaired flow standard – more than double the current unimpaired rate – for fish and wildlife protection and salinity control. More than 1,000 farmers protested on the state capital in August in response to the proposal. California and the U.S. Southwest, meanwhile, remain in a drought with the precipitation in the 2017-18 water year coming in just below average.

Tree Nuts

This year's almond crop is expected to mark a new all-time high this fall at 2.45 billion pounds. *(See Exhibit 10.)* Concerns over losses due to freezing temperatures during almond bloom early in the season have largely abated with yields expected to come in above the 5-year average. Bearing acres are estimated to have reached another all-time high this year at just over 1 million acres.

EXHIBIT 10: U.S. Almond Production



Source: USDA-NASS

The hefty almond harvest resulting from record acreage and above-average yields comes at a time when exports to key markets like China and Turkey are uncertain due to retaliatory tariffs on U.S. almonds. China and Turkey both increased tariffs on U.S. almonds to 50 percent, up from 10 percent and 15 percent, respectively. India, the top export destination for U.S. almonds, also increased import duties. Weakening currencies in China, Turkey, India, and other markets also threaten to slow U.S. almond export volumes in the weeks and months ahead.

Production of other nuts including walnuts, pistachios and pecans, are also expected to be higher YoY. The California walnut crop is estimated to be 10 percent larger YoY at 690,000 tons with yield showing a slight improvement and bearing acreage reaching a new record, according to USDA.

Like almonds, the big walnut crop is arriving amid higher tariffs to key markets. In India, import duties on U.S. tariffs increased to 120 percent, up 20 percent in response to steel and aluminum tariffs. Ample supplies and anemic export markets are expected to halt plans for grove expansions and incentivize growers to diversify into new markets and value-added products.

Grapes

California's grape crop that is currently being harvested is widely expected to be an improvement in both productivity and quality compared to last year. Total grape production is figured to be up 4 percent YoY at 7.7 million tons, according to USDA's latest projection, with wine, raisin and table grape production each rising over 2017's harvest. *(See Exhibit 11.)* Grape prices are widely reported to be unchanged from last year.

Wine grape quality in Napa and Sonoma is reported to be exceptional, thanks to milder temperatures from June through August and ample moisture in the spring. Smoke from the wildfires that ravaged the region this summer is reported to have had little impact on quality.

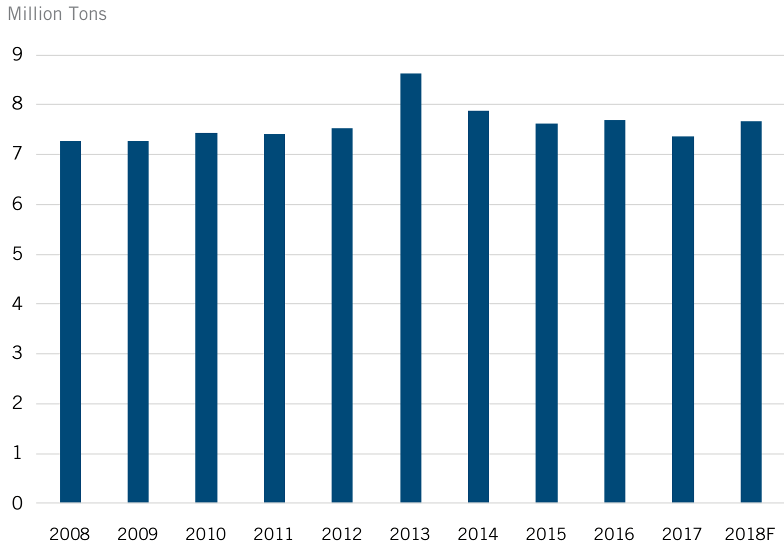
Labor shortages again have been widely reported. Many California grape growers have resorted to hiring full-time workers rather than seasonal workers. More growers are reportedly relying on the H2A agricultural work visa program to source workers, but are eyeing mechanization as a long-term solution to the persistent labor shortage.

Citrus

Florida citrus production is expected to rebound this season after suffering massive losses from Hurricane Irma last year. Private estimates put the forthcoming Florida orange crop at 71 million to 77 million boxes, well above last season's harvest of 46 million boxes.

While Florida so far has averted hurricane damage this year, growers will be keeping a close eye on hurricane developments off the coast of Africa in the months ahead as harvest gains momentum in October. The citrus greening disease, though, remains a constant pressure on productivity despite the recovery in total production.

EXHIBIT 11: U.S. Grape Production



Source: USDA-NASS

The proposed rule is expected to sustain a trend of carbon dioxide (CO_2) emission reductions that began in 2005. *(See Exhibit 12.)* Low natural gas prices and expansion of renewable energy will continue to pressure coal-fired generation. Even with improved heat rates[1] under the ACE rule, coal retirements will persist.

Retirements – Through the first six months of 2018, roughly 10.5 gigawatts (GW) of coal-fired generating capacity was retired. This is the second-highest level of retirements through the first half of any year on record. Only 2015, the year when compliance with strict environmental controls went into effect, had more retirements.

Despite spikes in extreme heat during the summer, California citrus growers are expecting a healthy crop this fall for all fruits, including navel oranges, grapefruit, lemons and mandarins. The California citrus harvest, though, will likely be arriving amid trade war escalation with China. California citrus is particularly vulnerable to losing market share in China to South Australian citrus. The recently enacted free trade agreement between China and Australia has reduced the tariff on Australian oranges to 6.1 percent, just as U.S. tariffs have increased.

Infrastructure Industries

Power and Energy

In August, the U.S. Environmental Protection Agency (EPA) proposed the Affordable Clean Energy (ACE) Rule, which features more narrowly focused guidelines for improving efficiency at existing coal plants. The ACE rule would replace the 2015 Clean Power Plan.

The addition of new gas, wind, and solar projects will continue to squeeze coal-fired generation out of the supply stack. Currently under construction:

- 30 GW of natural gas capacity
- 11.9 GW of wind capacity
- 4.4 GW of solar capacity

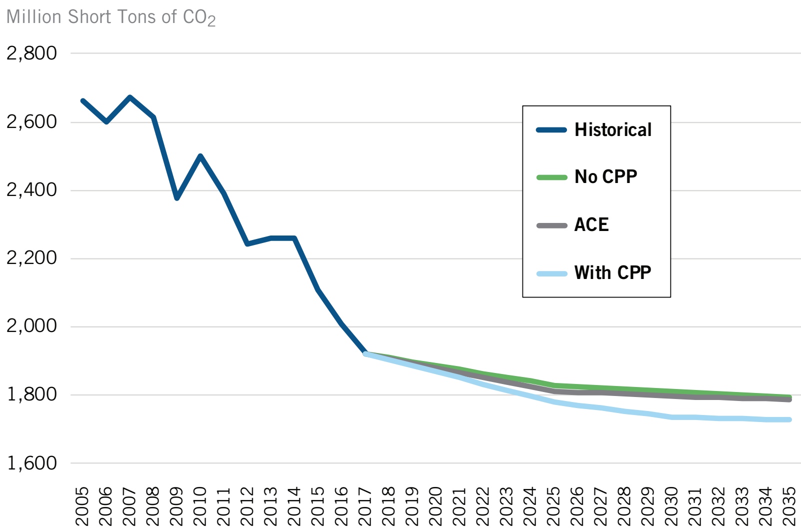
Recent power contracts for wind are around \$20 per megawatt-hour (\$/MWh). Solar contracts are averaging \$30/MWh. The contracts indicate new renewable projects are at or below the operating costs of most coal-fired plants, which average \$35/MWh.

Reducing emissions – Heat-rate efficiency improvements are central to the rule. It stipulates that the best method for reducing emissions at individual fossil fuel steam plants is heat rate improvements of 0.1–2.9 percent.

The heat content of coal is in the range of 8,000-12,000 Btu per pound, and the cost of coal ranges from 70¢ to \$3 per million Btus (MMBtu). Fuel is by far the

[1]Heat rate: The amount of heat, typically in British thermal units (Btu), needed to generate 1 kilowatt-hour (kWh) of electricity. In a coal-fired power plant, heat rate is the inverse of plant efficiency. In this sense, heat rate is comparable to a golf score: Lower is better.

EXHIBIT 12: Electric Sector CO_2 Emissions



Note: ACE CO_2 emissions assume 4.5% heat rate improvement at $50/kW.

Source: EIA August 2018 Monthly Energy Review, EPA Regulatory Impact Analysis for ACE

Analysis from the EPA shows the ACE rule will not really achieve any more reductions in CO_2 emissions by 2035 than the continuum of the historical trends since 2005.

The proposed ACE rule provides a temporary reprieve for owners of coal plants by stipulating a narrow focus on improving hourly CO_2 emissions. Coal generation from individual plants could increase under the rule due to improved efficiency and lower operating costs.

But even with a reduction in operating costs, coal plants will struggle to compete with new natural gas and renewable generation. As a result, the ACE plan is unlikely to have a material impact on future CO_2 emissions from the power sector, and provides very little long-term support for coal-fired generation.

largest expense item for coal-fired plants, representing about 55-75 percent of total plant expenses. Reducing a power plant's heat rate can significantly lower fuel consumption and costs. For example, a 1 percent heat rate reduction could save about $700,000 in annual fuel costs for a typical 500 megawatt (MW) plant operating at 80 percent capacity factor and burning $2/MMBtu bituminous coal.

Generators – Higher efficiency and lower costs will likely result in individual coal plants being dispatched more. As capacity factors increase, annual emissions from coal-fired plants are also likely to rise.

Heat rate improvements do not increase emissions on a pound per hour basis. The ACE rule proposes to measure emissions from plants on an hourly basis.

Heat rate improvements for individual plants will increase emissions on a ton per year basis. This increase will be offset by accelerating growth in zero-carbon generation that systematically displaces coal.

The net effect of the ACE rule will have a minimal impact on CO_2 emissions for the electricity-generating sector.

Rural Water Systems

Algal blooms continue to plague both large and small water systems in the U.S. In response, the federal government is expanding efforts to monitor and control nutrient loads in watersheds across the country. Advancements in water quality monitoring technology are key in deploying scalable and affordable methods for tracking and reducing nutrient loads in U.S. watersheds.

The USDA works with producers in targeted watersheds to implement conservation practices that prevent runoff of sediment and nutrient, which degrade water quality. For example, the Mississippi River basin has reduced nitrogen and sediment loading to the Gulf of Mexico by 28 percent, relative to what would have occurred without any conservation efforts.

To maintain this progress, the USDA plans to extend the Mississippi River Basin Healthy Watershed Initiative and the National Water Quality Initiative (NWQI) by five years, to 2023. The agency will also expand the NWQI beyond water bodies designated as impaired under the Clean Water Act. The initiative will now cover a broader group of water bodies, particularly those that provide drinking water.

Traditional monitoring techniques often involve sending crews out to collect samples from the field, and testing those samples in a lab. These methods are time-consuming and result in fewer samples.

Successful management of nutrient loads across more watersheds requires a high-tech solution. The water industry is moving towards advanced nutrient monitoring systems that use multiple sensors and unique software to display real-time data on a web-based platform. The leading systems cost around $10,000, making them affordable relative to traditional methods and scalable.

Data collected through these systems is critical to developing collaborative solutions that reduce nutrient loading across the U.S. For example, the Department of Agriculture and Rural Development in Michigan is experimenting with smart systems that retain water in tile drains and allow nutrient-rich water to percolate back into fields. These systems have the potential to reduce nutrient loading and simultaneously increase crop yields.

Advanced nutrient monitoring systems that provide real-time data can confirm if new solutions are actually working. This will benefit all stakeholders. Farmers who see lower nutrient runoff, and experience higher crop yields, are more likely to adopt new on-field nutrient management strategies. Proven strategies could be scaled if downstream users are willing to provide matching funds and invest in solutions that protect their own clean water interests, while also reducing or eliminating the cost of treating an algal bloom.

The water industry strives to be more resilient by protecting valuable sources of supply. Advancement in water monitoring technology is critical to this goal. Scalable and reliable technology is key to meeting increased regulatory oversight and developing collaborative solutions that reduce nutrient runoff.

Telecommunications

CAF-II Reverse Auction Summary

The FCC concluded the Connect America Fund II (CAF-II) reverse auction on August 21, 2018. The reverse auction awarded $1.488 billion in funding over the next ten years to expand rural broadband access in unserved areas across 45 states. The FCC allocated $1.98 billion for the auction from rejected Connect America Funds originally offered to price cap carriers in 2015 for 20 states.

A total of 103 carriers won funding and will bring broadband to 713,176 locations across 45 states. A total of 220 carriers qualified to participate in the auction. The biggest winner was AMG Investment Group LLC, which took in $281 million to serve over 100K locations across 6 states. The smallest winner was Halstad Telephone Company, which took in $19K to serve 7 locations in 1 state. Of the 103 winning bids, 40 won less than $1 million each.

Rounding out the top five, Wisper ISP won $220 million to serve 80K locations across 6 states; a group of 21 co-ops named the Rural Electric Cooperative Consortium won $186 million to serve 66K locations across 8 states; Viasat Inc. won $122 million to serve 190K locations across 20 states; and California Internet L.P. won $87 million to serve close to 12K locations across 2 states.

The state of Missouri won the most funding, with 11 bidders sharing $254 million to expand broadband in the state. South Carolina won the least, with one bidder winning $233K. Several eligible states won no funding, including Connecticut, New Hampshire, and Vermont.

Among larger carriers, Verizon secured $9.4 million, but Frontier only won $51,000. Both Cox and Windstream qualified as eligible bidders but did not win any funding. Regional cable MSO Midcontinent won $38.9 million. Midcontinent plans to use the funding to support both fixed wireless and FTTP (fiber to the premises) projects.

The majority of CAF-II auction proceeds will fund projects that feature three main access technologies – fixed wireless, FTTP, and satellite broadband. The latter comes courtesy of Viasat's winning bid alone. Viasat operates the Exede satellite broadband service.

While it is too early to determine the success or effectiveness of this rural broadband funding program, it is worth noting a significant improvement for rural broadband policy from this approach, at least on paper for now. Bidders have committed to deliver service of at least 25 Mbps to over 99 percent of these locations, with 53 percent set to receive 100 Mbps. The original CAF funding from which these auction proceeds originate only called for 10 Mbps service. Bidders have committed to bring gigabit capability to 19 percent of these locations. Winning bidders must offer both voice and broadband service and must agree to cover 40 percent of the required locations by the end of year three, with 100 percent covered by the end of year six.

"The successful conclusion of this first-of-its kind auction is great news for the residents of these rural communities, who will finally be able to share in the 21st-century digital opportunities that broadband provides," said FCC Chairman Ajit Pai in an FCC press release. "By tapping the mechanisms of the marketplace, the Phase II auction served as the most appropriate and cost-effective way to allocate funding for broadband in these unserved communities, bringing the highest-quality broadband services to the most consumers at the lowest cost to the ratepayer."

Winning bidders have a series of forms and deadlines to meet, including becoming eligible telecommunications carriers (ETCs) as defined by the FCC. Form 683 letter of credit commitment letters and detailed technology and system design descriptions are due to the FCC by November 5th. Some bidders will have to submit audited financial statements to the FCC by February 25, 2019.

This reverse auction experiment for the USF/CAF program could have implications for future government sponsored rural broadband funding programs. Should the "paper success" prove to deliver effective real-world outcomes, future programs may move toward the reverse auction model.

In some ways, this movement is already happening. Advanced planning for a separate second reverse auction for the forthcoming $4.53 billion Mobility Fund Phase II auction to target the rural expansion of 4G LTE coverage is well underway. Additionally, FCC Commissioner Michael O'Rielly advocated in a September 10, 2018 letter to the USDA for the disbursement of $600 million in the RUS e-connectivity program through a reverse auction.

5G Update

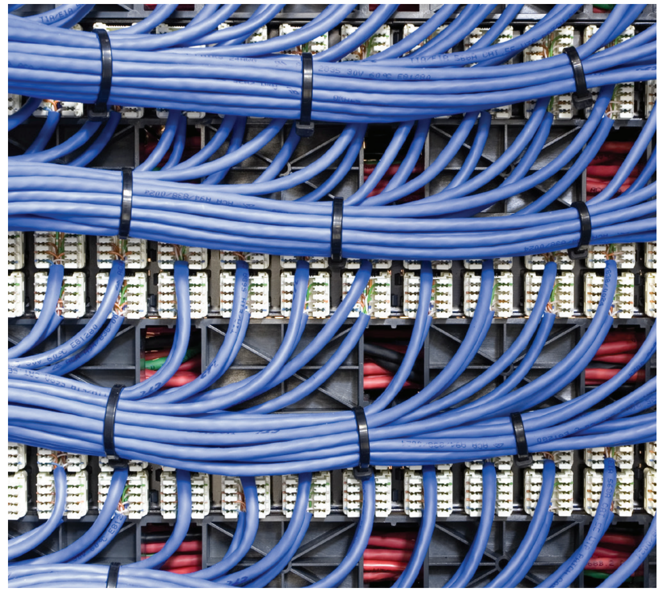
Next generation 5G mobile broadband momentum is building, with both Verizon and AT&T promising deployments in calendar year 2018. Initial Verizon 5G efforts will focus on a fixed wireless residential broadband service, delivering gigabit capable broadband, with a 300 Mbps tier offered at $50/month to existing Verizon wireless subscribers. Non-Verizon wireless customers can get the same service for $70/month. This fixed wireless service is branded as Verizon 5G Home and will initially be available in Houston, Indianapolis, Los Angeles, and Sacramento beginning October 1, 2018. Verizon says it will eventually bring Verizon 5G Home service to 30 million locations in markets where it currently does not provide Fios FTTP service. Verizon mobile 5G will launch some time in 2019.

AT&T is promising a mobile 5G launch in 2018 across 12 markets, although their initial 5G service will feature a "MiFi" type hotspot device allowing smartphones and other devices to connect to their 5G service through Wi-Fi. Limited quantity 5G capable smartphones aren't expected until 2019, with widespread availability not expected until 2020 or later.

The vast majority of 5G momentum is occurring outside of rural markets. At least 5G as it's defined by industry standards body 3GPP. There are numerous wireless efforts taking place in rural markets that label themselves as 5G from a marketing and branding perspective, but standards-based 5G is the domain of urban markets for now and for the foreseeable future.

Initial standards-based 5G technology is primarily focused on high-bandwidth spectrum, or millimeter wave, for now. In the U.S., the initial focus is 28 GHz or higher, which provides very-high bandwidth capability, but at very short distance. These characteristics require the deployment of fiber-fed small cells for adequate coverage and thus demand high density or urban markets to be economically viable.

Considering there is still significant rural territory in the U.S. lacking 4G LTE coverage, we can assume a similar



or potentially slower path for 5G. As the 5G standard propagates down into lower and mid-band spectrum, more rural applications will emerge. Rural 5G will follow a similar pattern to previous generations with pockets of density and interstate highway corridors seeing deployments initially.

Rural FTTP Trends

There is a range of rural fiber broadband activity to track, boosted in part by rural broadband funding programs. According to a Broadband Communities provider database, over 1,000 rural providers offer fiber broadband services today. Additionally, research sponsored by the Fiber Broadband Association reveals that fiber connected homes have moved into second place for broadband connectivity market share in the U.S., behind cable company HFC (hybrid fiber coaxial) connections, and ahead of DSL connections.

This research conducted by RVA reveals that fiber now passes 34.5 million homes in the U.S. and is connected to 15.4 million. In 2017 alone, small rural providers marketed FTTP to over 1.2 million homes and FTTP penetration of homes with Internet is 16 percent in zip codes where density is 0 to 74 homes per square mile. According to a recent NTCA -The Rural Broadband

Association study, rural America FTTP connectivity varies from 82 percent of K-12 schools, 76 percent of hospitals and medical clinics, and 64 percent of public libraries.

Beyond these existing fiber broadband investments, the just concluded CAF-II reverse auction will fund a variety of FTTP projects for telcos and electric cooperatives. Well over $330 million of CAF-II reverse auction funding has been committed to rural fiber broadband projects. According to NRECA, $225 million of this total will fund FTTP projects for 35 electric cooperatives across the country.

A recent study by CostQuest Associates, Rural Broadband Economics: A Review of Rural Subsidies, pegged the total cost to adequately bring fiber broadband to rural America at $61 billion. This was based on a cost per home of $17,415 for low density markets of 2 per square mile. The cost per home drops to $4,597 at 8 homes per square mile. ■

This quarterly update is prepared by the Knowledge Exchange Division and covers the key industries served by CoBank, including the agricultural markets and the rural infrastructure industries. Analysts at Plus One Strategic Communications LLC prepared the overview of the communications industry.

Terry Barr
Senior Director, Knowledge Exchange

Tanner Ehmke
Manager, Knowledge Exchange

Taylor Gunn
Lead Economist, Power, Energy, and Water

Daniel Kowalski
Vice President, Knowledge Exchange

Ben Laine
Senior Economist, Dairy Processing and Production

Will Sawyer
Lead Economist, Animal Protein

Will Secor
Economist, Grain and Farm Supply

CoBank's Knowledge Exchange Division welcomes readers' comments and suggestions.
Please send them to KEDRESEARCH@cobank.com.