CoBANK KNOWLEDGE EXCHANGE

March 2019

QUARTERLY U.S. RURAL ECONOMIC REVIEW

Agriculture Still Waiting for Relief

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.

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Key Points

- Trade negotiations with China will carry on at least through April, and perhaps into the summer. However, an agreement is in the interest of both the Xi and Trump administrations, so a deal is expected to be struck.
- The ratification of USMCA in Congress will be an uphill climb. If it is not approved by August, the deal may languish until after the 2020 U.S. elections.
- The global and U.S. economies are slowing, causing central banks to turn more dovish. The Federal Reserve is unlikely to raise rates in 2019, and is now fielding questions on whether a rate cut may become appropriate.
- Recent flooding in Nebraska and Iowa is threatening farm livelihoods, disrupting transportation, hurting ag retailers and processors, and will impact the country's 2019 corn/soybean acreage mix.
- Hog herd reductions in China resulting from African swine fever will boost China's pork imports in 2019. How much, from whom, and when are now the key questions.
- U.S. dairy supply appears to have stabilized and markets could improve in the second half of 2019.
- California is free of drought for the first time since 2011. Cool and wet conditions have been welcomed, but the rainfall has caused some trees to uproot and has increased the need for fungal controls.
- U.S. natural gas supply will outpace demand through 2019. This will limit upward price movements, furthering the retirement of coal-fired assets.
- The FCC's latest millimeter-wave spectrum auction began in mid-March. Cable operators are not among the 38 qualified applicants, perhaps indicating that they don't see fixed wireless as a threat to their cable broadband business.

Executive Summary

U.S. agriculture is poised for serious challenges for the remainder of 2019. Large grain and oilseed supplies, continuing increases in global animal protein and dairy production and major trade uncertainties will prevail for much of the year. At the same time, U.S. and global economic growth rates will slow. This will require

significant attention to marketing strategies, cost controls and balance sheet management throughout the food, fiber and agriculture supply chain.

Ongoing trade concerns will dominate market conditions in the near term with U.S.-China negotiations and the ratification of the USMCA remaining at the forefront. Financial conditions across commodities and regions will remain highly variable but the low level of farm income will force a continuing drawdown in working capital and significant increases in farm debt.

Global Economic Environment

The U.S., Europe and China constitute 47 percent of the world's gross domestic product on a purchasing power basis and all three are experiencing slower economic growth rates. World economic growth in 2017 and 2018 averaged around 3.8 percent. Over the next few years, world growth is likely to average in the 3 to 3.5 range with a broader range of downside risks than upside opportunities. A reduction in trade tensions would certainly be one of those upside possibilities. At the same time, options to respond to downside surprises are limited. Governments around the world have accumulated significant debt levels in recovering from the 2009 financial crisis and they have few options for fiscal stimulus. The major central banks have little stimulative policy options available at the current level of interest rates. The challenging political environment in virtually all of the advanced economies further complicates the outlook.

Key factors to watch:

- **Trade disputes.** The potential for ongoing and escalating trade disputes remains the major near term concern. The U.S. has indefinitely delayed the imposition of increased tariffs on China but the negotiations are ongoing. The meeting between President Trump and Chairman Xi to finalize an agreement is unlikely to be scheduled before early-to-mid April. In the interim, the existing tariffs and trade restrictions between the two countries remain in place.

  The USMCA agreement which replaces NAFTA also remains in transition. The three leaders have signed the agreement but the respective legislatures have not ratified the agreement. Mexico and Canada have both indicated that ratification of NAFTA's successor hinges in large part upon the U.S. lifting the Section 232 tariffs on imported steel and aluminum. The U.S. congress has not taken action on the USMCA and pressure is increasing for Congress to take it up by August or risk it being deferred until after the 2020 elections. The Democrat-led House is pushing for adjustments on labor, enforcement, and environmental policies before they will vote to approve the deal.

  U.S. trade discussions have been reopened with Europe and Japan but discussions regarding auto tariffs have generated increasing market concerns.

- **Economic momentum.** The U.S. economy lost significant growth momentum entering into 2019 with fourth quarter growth slowing to 2.6 percent and equity markets experiencing significant declines. While the equity market and consumer sentiment have rebounded in early 2019, the U.S. government shutdown that lasted through much of January will impact first quarter growth. The underlying growth rate for the economy remains in the 2-2.5 percent range with the potential for significant volatility in the quarter-to-quarter growth rates. The U.S. consumer

provides a strong foundation for future growth but trade uncertainties and slowing business investment will limit the growth potential. The housing sector continues to struggle with affordability issues as home prices edge higher.

- **China's growth.** China's economy continues to slow as reduced trade flows and the inability to stimulate domestic consumption limit growth potential. In 2018, the Chinese economy grew by 6.6 percent, the slowest growth since 1990. China will provide significant fiscal and monetary stimulus in 2019 in order to sustain a growth rate in the 6 to 6.5 range. A resolution of ongoing trade issues could provide a much needed boost to growth. This slowing growth rate will also impact a number of Asian economies with significant supply chain relationships with China.
- **The European economy.** Growth prospects in Europe for 2019 have declined significantly in recent months. The Eurozone growth in the fourth quarter of 2018 was only 1.2 percent above a year earlier. Uncertainties over Brexit, reduced trade flows to Asia and political turmoil in Germany, France and the U.K. have dampened any optimism for growth much beyond 1 percent.
- **Currency volatility.** The divergence in central bank polices will come to a halt in 2019 and will impact financial and currency markets. Weak growth in the Eurozone, the U.K. and Japan will limit their central bank actions for the foreseeable future. The U.S. Federal Reserve has also become more cautious due to weakening economic data, and is unlikely to alter rates through 2019. U.S. economic growth will remain stronger than other OECD countries, however, which will lend support to the U.S. dollar in currency markets.
- **Geopolitical disputes.** Geopolitical issues in North Korea, Russia, Syria and Iran will continue to add to global downside risks. U.S. negotiations with North Korea have stalled and the lack of any cohesive global leadership to deal with ongoing geopolitical disputes is one of the main threats to any renewed growth momentum.
- **Cyberterrorism.** Cyberterrorism is a significant factor to add to global risk. Global attacks against 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 slowed significantly in the fourth quarter with growth at a 2.6 percent annual rate compared to the 3-4 percent growth in the previous six months. The primary contributor to the slowing growth rate was virtually no change in business inventories. Consumer spending remained strong with significant increases in business investment offsetting the weakness in residential housing. Economic growth in 2019 is likely to average 2 to 2.5 percent with significant volatility in quarter to quarter growth. First quarter growth is particularly problematic due to the government shutdown through most of January and ongoing trade disruptions. But consumer spending appears to be on solid footing. Consumer debt to income is low, net worth is at record levels, job growth remains firm, the unemployment rate is below 4 percent and wage rates are increasing in excess of inflation. Business investment will likely remain weak until there is greater clarity regarding ongoing trade issues, including the possibility of U.S. auto tariffs. The housing sector will not contribute significantly to growth in 2019 as rising home prices and higher interest rates have affected affordability.

The Federal Reserve is likely to pause on further interest rate increases until after midyear when they can reassess the underlying strength in the economy. Inflationary pressures remained subdued with no upward pressure from energy prices and the increases in wage gains not yet translating into higher consumer prices. The remaining wildcard is the political environment in Washington, D.C. A divided Congress and an administration subject to significant legal inquiries must address a wide range of issues from debt ceilings to budget priorities over the next year and that could become a major distraction for economic growth.

U.S. Agricultural Markets

Commodity markets will remain focused on the potential for progress on the U.S.-China negotiations, the ratification of USMCA and the removal of the retaliatory actions stemming from the U.S. steel and aluminum tariffs. There remain adequate supplies of grain, fiber and oilseeds but a resolution of current trade disputes and global acreage shifts for the 2019 crop year may ease some downward price pressures. A slowing global economy may force the animal protein and dairy sectors to scale back planned production increases as the year unfolds.

Financial conditions in agriculture remain highly variable across commodities and regions but the sharp declines in farm income since 2014 have resulted in a significant reductions in working capital and a rising level of farm debt. Farm debt is projected to increase by nearly 24 percent from 2014 to 2019 with working capital declining by nearly 70 percent. Farm real estate values have remained firm despite the weakness in commodity prices and cash flow. The overall debt to asset ratio continues to rise but remains low by historical standards.

Grains, Oilseeds and Biofuels

While the U.S.-China trade dispute continues to be a key driver in soybean markets, other stories and data points have become increasingly relevant. This is certainly the case, even for soybeans, as South American soybean and corn production comes into focus.

Brazil's soybean harvest is near completion, and its soybean exports in January and February were the highest in several years. This is thanks to strong demand from China.

Corn markets are also watching Brazil's second corn crop, or safrinha, which has been planted at a blazing pace. It accounts for around 70-75 percent of the country's total corn production.

Next quarter, much of the focus domestically will center on flood recovery efforts in the Western Corn Belt and farmer planting decisions. Infrastructure and agricultural damage, particularly in Nebraska, has been monumental, and recovery efforts will take months in some areas. Total flooding damage is expected to exceed $3 billion in Nebraska and Iowa, and business interruption impacts for agribusiness will soar into the hundreds of millions. Some flooding is expected to last into May, and is bound to impact spring planting decisions. The USDA released 2019 baseline projections for corn (92 million acres), soybeans (85 million acres), but those figures are likely to shift somewhat in favor of soybeans as flooded areas delay planting. Updated estimates will come on March 29 with USDA's Prospective Plantings report.

Corn

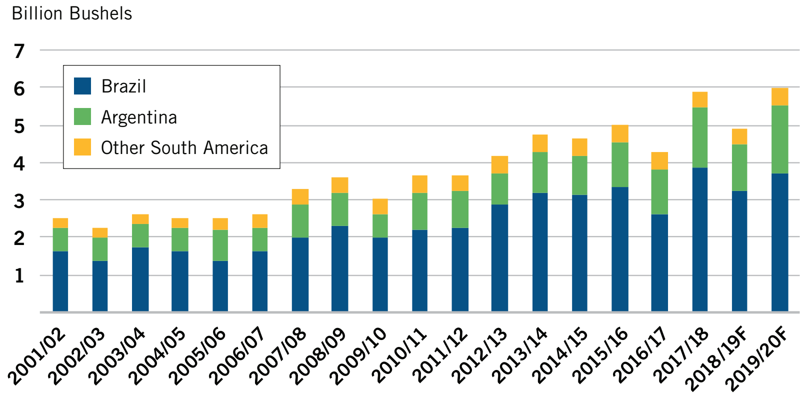
Domestic corn demand has been sluggish due to ethanol's margin struggles. Corn use in this category fell by around 2 percent in the most recent USDA report. Corn feed and residual demand also recently declined. Corn stocks were higher than expected in the February grain stocks report. The use decline comes despite the continued growth in animal protein supplies. Looking forward, ethanol will remain a weak spot, but feed demand should remain strong.

Roughly three-quarters of U.S. corn and soybeans in storage are in states around the upper Mississippi – Missouri river basins. Some unknown share of these bushels has been damaged and will be unavailable to the market.

Corn exports remain strong, but total export numbers are expected to decline YoY. Year-to-date export commitments are slightly behind (over 5 percent below) year-ago levels.

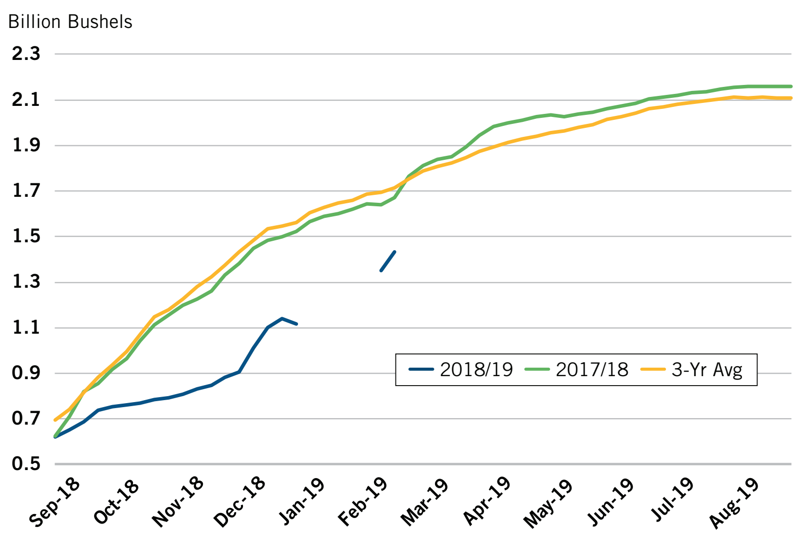
South America's corn crop will rebound from last year's drought-hit crop *(Exhibit 1)*. Brazil has been able to aggressively plant its safrinha corn crop after an early soybean harvest. This supports large production forecasts because it gives the crop more time to develop before the dry season hits. While the good precipitation seen in Brazil since January supports corn at this early stage, weather in April and May will be the key determinant in the crop's size.

EXHIBIT 1: South American Corn Production



Source: USDA-FAS

EXHIBIT 2: U.S. Export Commitments, Soybeans



Source: USDA-FAS

USDA's 2019 baseline acreage estimate is pegged at 92 million acres, a year-over-year increase of around 3 million acres. Assuming trend yield (170 bushels per acre) and relatively flat consumption of 14.9 billion bushels, ending stocks could jump by 740 million bushels. This would push the stocks-use ratio to 17.3 percent, up from 12.4 percent.

With good South American corn production and a potentially large shift to corn in the U.S. in 2019, corn prices may see sagging values. Spring weather will be a key determinant. A late spring will push acres out of corn and into soybeans. Moreover, any acres still in the air may shift to soybeans and out of corn as markets react to the South American crop and U.S.-China trade deal progress.

Soybeans

The US-China trade dispute is starting to ease. As a result of the progress made in recent talks, the Trump administration has delayed imposing additional tariffs on Chinese products. Throughout the talks, China has reportedly pledged to buy soybeans and other agricultural products. Markets are waiting for confirmations of these purchases through official USDA export sales reports.

While soybean exports continue to lag behind last year *(Exhibit 2)*, domestic demand remains robust. U.S. crush has hit monthly records for 12 consecutive months. With two new plants coming online by the end of 2019 and with crush margins at elevated levels, this robust domestic consumption will likely continue for several months.

Brazil's soybean harvest is wrapping up with good, but not record, production. Dry weather last quarter sapped the top-end potential out of much of the crop.

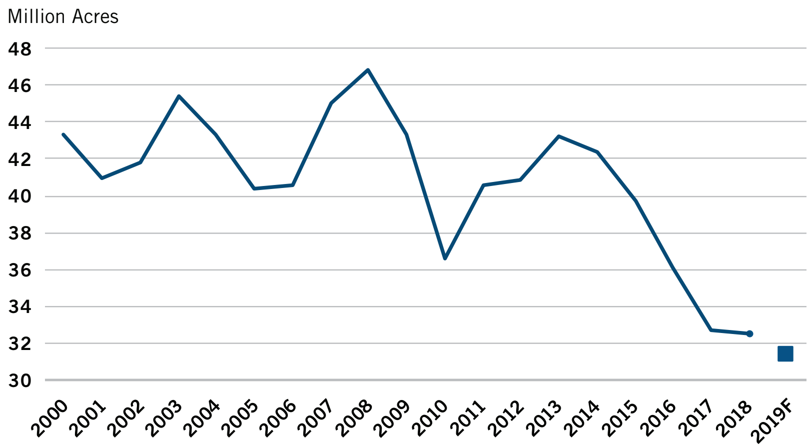
Soybean production for all of South America will likely be higher as Argentina's crop returns to normal levels. The country's crop was hit by extremely dry weather last year.

Early exports in January and February have been strong out of South America. This puts pressure on U.S. exports as the U.S. marketing year moves into its second half.

Soybean acres in 2019 could be as low as 85 million acres, according to USDA baseline projections. For many farmers in the heart of the Corn Belt, rotations determined by agronomic best practices will likely limit the number of acres shifting out of soybeans and into corn.

In other regions that have larger swing acres, including North and South Dakota, there will likely be more of a shift out of soybeans. However, it is hard to find several

EXHIBIT 3: Winter Wheat, Area Planted



Source: USDA-NASS

The outlook for 2019 final acreage and production in the U.S. is uncertain *(Exhibit 3)*. The Southern Plains region was plagued with poor planting weather that limited acreage. However, this moisture and continued precipitation throughout the winter has provided plenty of moisture at the start of spring. In parts of the SRW wheat belt, poor snow cover may have caused some winterkill on top of too much moisture in the fall. The first estimates of the next production year will not arrive until May when USDA provides its first projections for the next marketing year in its World Agricultural Supply and Demand Estimates report.

million acres in this region that will make this switch. Additionally, soybean returns in 2019 may still compete with corn and other crops at current price levels in these areas. The USDA Prospective Plantings report will provide the first official insights into the new crop's acreage mix.

Wheat

Wheat use is chugging along domestically. Halfway through the crop's marketing year, wheat ground for flour was approximately in line with USDA's expectations. Current use is lagging behind UDSA's total year estimate by less than 5 percent.

Wheat demand is relatively strong on the export front. Export commitments for 2019 are just ahead of year-ago levels. Soft red winter (SRW) has been the star variety with hard red winter (HRW) being the laggard. SRW export commitments are about 30 percent above 2018 levels. In contrast, HRW export commitments are behind last year's commitments by approximately 15 percent.

Recent talk has centered on the strong production that is expected later this year from Europe and Russia. The winter wheat crop in this part of the world is expected to rebound from last year's drought-hit production levels. This news, combined with recent, slower demand in export markets, has eased wheat prices around the globe. The U.S.'s wheat prices are following suit. Global production and softer export demand will continue to play an important role in domestic wheat prices in 2019.

The poor planting conditions for winter wheat may have shifted some acres back to corn and soybeans in the Southern Plains and eastern Midwest. Hard red spring (HRS) wheat acreage potential in the Northern Plains has grown as soybean prices were hammered by the U.S.-China trade dispute.

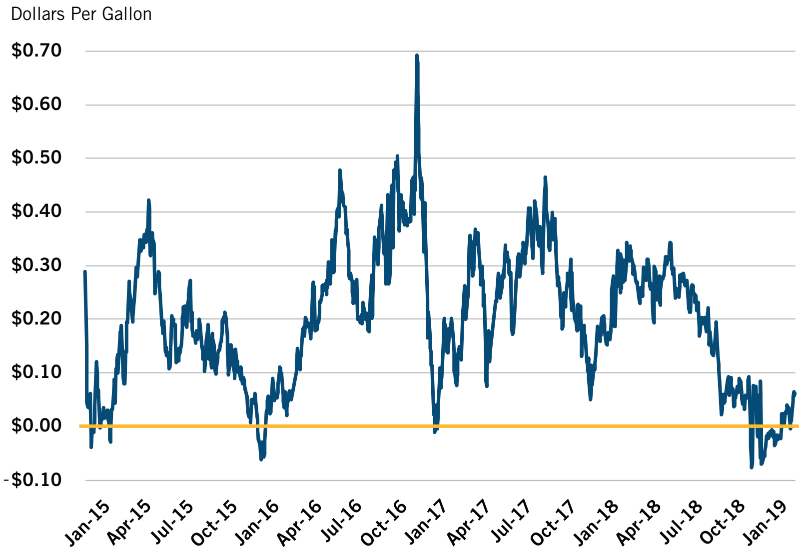
As the trade dispute seems to be improving, corn and soybeans likely pencil out for many farmers in areas of the Northern Plains, especially in eastern parts of North Dakota, South Dakota, and western Minnesota. In western areas of the Dakotas, HRS acres may increase more. Small grains, peas, lentils, and even dry beans in some areas will also be in the mix, competing for the marginal acre.

Ethanol

One out of five gallons of ethanol produced in the U.S. has been impacted by the recent flooding in Nebraska. Ethanol plant damage and farmers' inability to deliver corn have slowed plants to a halt. Plants are also having difficulty delivering finished ethanol to the market due to damaged rail cars and tracks. Less ethanol production also means less distillers grains for local animal feed.

Industry-wide, ethanol producer margins have improved slightly from lows during the winter *(Exhibit 4)*. Supply and demand have been better balanced mostly from a reduction in supply.

EXHIBIT 4: ISU Ethanol Plant Operating Margin



Source: ISU-CARD

Domestic ethanol production is below year-ago levels, but ethanol stocks remain stubbornly high. Stocks have not followed the typical seasonal increase from September through early spring. As a result, current stocks are only slightly higher than year-ago levels despite starting the marketing year nearly 75 million gallons above last year.

Marketing year-to-date exports continue to exceed year-ago levels. Current exports are approximately 20 percent higher year-over-year. A growing global economy, albeit at a slower pace, will support ethanol export growth. Additionally, should the U.S.-China trade dispute resolve, ethanol will likely benefit as China ramps up to meet its E10 goal in 2020.

Year-round E15 rule implementation is reported to be on-track for the 2019 summer driving season starting June 1. The EPA has submitted the proposed rule and scheduled hearings to receive public comment. The new E15 proposal will allow for the sale of gasoline with 15 percent ethanol year-round. It had been previously limited to non-summer months.

Year-round E15 sales will support domestic ethanol demand, but the potential is likely limited. An additional component of the new rule limits who can trade RINs which largely takes out speculative trading. This latter, RIN-trading component was advocated for by refiners.

Lower gasoline prices will support summer driving, so ethanol demand should be strong this summer. This could help pull ethanol margins up from current levels through the third quarter of 2019. However, we may see a repeat of last year's low margins if additional demand, especially through exports, does not emerge by the end of 2019.

Farm Supply

A poor fall season and a slow, wet start to spring in the Midwest present significant concerns for the farm supply sector.

The weak fall agronomy season has done two things:

1. **Pushed a significant amount of fall fieldwork (e.g., tillage, fall burndown, and fertilizer applications) into the spring.** This puts ag retailers and farmers at risk of incurring higher expenses without increasing margins. These higher costs could come in the form of additional equipment rentals, increased overtime hours, additional seasonal labor, etc.
2. **Delayed farmer decisions.** Seed and fertilizer decisions are the most significant. Without knowing what farmers will plant or what their fertilizer plan will be, ag retailers are at an elevated risk of having too much or too little inventory of a product. Ag retailers who find themselves in this position may see higher costs through changes in inventory value or by purchasing product at prices higher than they can sell it.

Fertilizer prices have largely declined from recent highs. Urea and DAP (diammonium phosphate) prices in New Orleans are now approximately 20 percent below highs set last fall. However, potash prices remain robust on tighter supplies. The typical seasonal uptick in demand should increase these prices in the spring. The concern for farm supply retailers is over the "last" tons of fertilizer

purchased at relatively high prices last fall. If prices do not increase sufficiently, that portion of inventory may need to be sold below cost this spring.

A mandate requiring marine ship operators to significantly reduce sulfur emissions by 2020 is raising concern about diesel fuel price increases next year.

Operators must retrofit ships with scrubbers or change fuels to comply with the law. Since diesel is an acceptable alternative fuel, demand for it will likely surge and push prices higher.

Underscoring the magnitude of this potential shift, one analyst remarked at a recent biofuel conference that he doesn't see how the U.S. avoids a recession due to this change. While the U.S. Energy Information Administration is more moderate in its price outlook, there is agreement that a shift is coming. It will likely have major impacts on ag retailers that supply diesel fuel in the years ahead.

Animal Protein

The growth in animal protein supply ended 2018 below our estimates. This was primarily driven by a slowdown in chicken production in the fourth quarter when weak prices affected producer profitability.

Overall, animal protein production increased by 2.5 percent in 2018. Each major protein grew between 2 and 3 percent during the year. Pork led the way with nearly 3 percent growth, followed by beef at 2.5 percent and chicken at just over 2 percent. In 2019, the production story is expected to be much the same: Pork will increase by 3 percent, beef up 2 percent and chicken by 1.5 percent.

While supply growth isn't expected to change from 2018 levels, the demand environment, both domestically and internationally, has much more uncertainty.

U.S. per capita animal protein consumption has risen by 9 percent since 2014. It is expected to increase another 1 percent in 2019. While 1 percent may not sound like much, it will be coming at a time when per capita consumption will be testing the record peak set in 2006 prior to the Great Recession and the volatile grain markets of the last decade. Price weakness in chicken and pork is reflective of the fatigue occurring in U.S. consumers, which will likely only be made more difficult in 2019 as supply continues to climb.

Trade has been, and will likely continue to be, the wild card for animal protein markets.

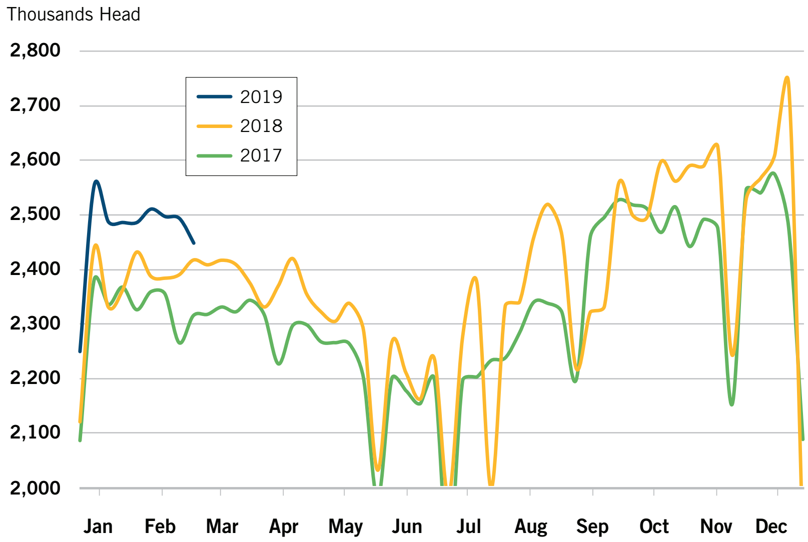
The U.S. has been engaged in trade negotiations in the last year with many of its most important export customers, including Mexico, Canada, China, Korea, and Japan. Despite this uncertainty, the competitiveness of U.S. animal protein drove strong export growth of 5 percent in 2018, including 10 percent growth in beef.

For 2019, the trade negotiations with China and Japan will most likely be the two markets that swing export opportunities for U.S. animal protein. However, the USMCA trade agreement with Mexico and Canada is yet to be ratified. If the agreement is not ratified, it could impair trade flows with these important markets.

Pork

Trade has always been at the forefront of priorities for the U.S. pork sector since domestic consumption has been range-bound between 46 and 52 pounds per person for many decades. 2019 looks to exemplify that dynamic as the pork sector is in a period where exports could climb or fall by a significant degree this year.

EXHIBIT 5: Weekly Hog Slaughter



Source: LMIC

Potential trade partners affecting the supply and demand dynamics for U.S. pork in 2019 are:

The spread of African Swine Fever (ASF) has driven massive losses in their hog herd. This will almost surely drive increased pork imports by the second half of 2019.

The outbreak has been in the headlines since August of last year, and since then over a million pigs have been lost. This may sound like a massive number, but it likely accounts for only a small portion of the losses that have gone unreported. The question at this point isn't if China will increase its pork imports but by how much and from who? The European Union, Canada, and Brazil will be at the top of the list, however the hole in China's pork supply is so large that it seems unlikely that these markets can fill it without the U.S. In addition, the contentious trade negotiations between the U.S. and China come at a time when the two countries are in a mutually beneficial position to resume the trade flow of U.S. pork to China.

Supplies of U.S. pork through the first two months of the year indicate an optimistic outlook of increased trade with China. Hog slaughter is up about 4 percent, but that rate of growth looks to slow this spring *(Exhibit 5).* However, overall pork production is still expected to increase by 3 percent in 2019. If the trade opportunity does materialize and in a major way, 2019 could be a very good year for the sector. Without it, the prospects for hog prices at profitable levels for producers seems unlikely.

Japan has signed trade agreements with the European Union and Canada that will greatly hurt the competitiveness of U.S. pork exports.

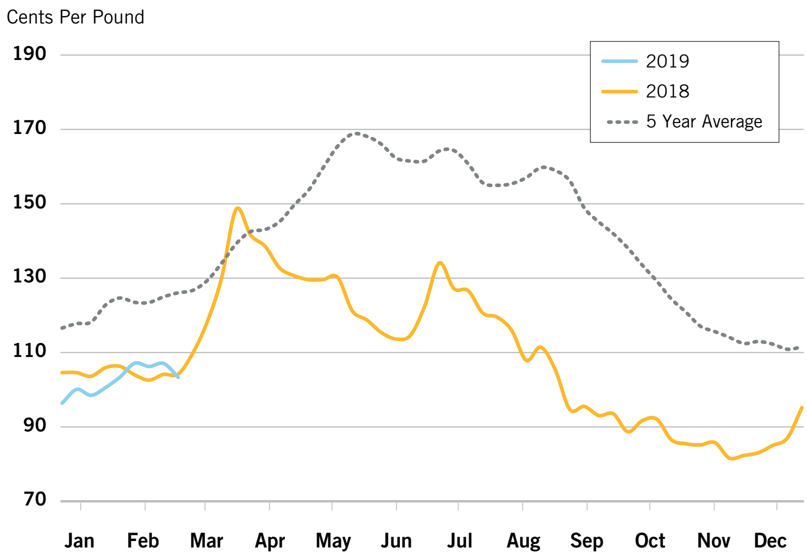
In 2018, South Korea increased its imports of U.S. pork by 40 percent, offsetting key U.S. export losses to China and helping overall pork exports grow by nearly 4 percent. This is a market where the free trade agreement between the U.S. and Korea, known as KORUS, helped improve competitiveness and access for U.S. pork. This is what is going to happen in 2019, but not for the U.S. Instead, the U.S.'s primary competitors in the global pork trade – the European Union and Canada – stand to benefit from new trade pacts with Japan.

Japan accounts for one in five pounds of U.S. pork exports and an even higher level on a value basis. In fact, it is the number one market for pork exports by value. As the EU and Canada begin to enjoy better trade access with Japan, it will hurt U.S. trade flows to this critical market. The U.S. has been clear that it is interested in addressing a number of trade issues with Japan, but pork (and agriculture in general) is not as high of a priority as manufacturing and auto issues.

Chicken

The U.S. chicken sector is in the midst of a building boom that started in 2018 and will continue through the spring of 2020. Though six or seven new chicken plants will be built by the time this growth cycle has concluded, producers are looking at prices and profitability to determine supply rather than letting the new capacity drive growth.

EXHIBIT 6: Boneless Skinless Breast Price



Source: LMIC

Boneless skinless chicken breast prices fell to 83 cents per pound last November, bringing profitability for many producers – especially those in the big bird deboning segment – in to negative territory. Production growth has since slowed significantly and is largely flat with last year through the first two months of 2019. As a result, chicken breast prices have climbed to nearly $1.10 *(Exhibit 6).*

Two of the six new plants started processing chickens during the first quarter of 2019. A third plant will come online late in the third quarter. It will take nearly a year for these new plants to reach capacity but, when they do, they will combine to add approximately 3 percent to U.S. chicken capacity.

Given the rational supply response of the industry to low prices the last six months, it is unlikely that this increase in capacity will result in an equal level of production growth. Legacy plants will likely slow production to help bring supply and demand back in to balance. Chicken production is expected to increase by 1.5 percent in 2019, which is down from 2.2 percent in 2018.

U.S. chicken exports have climbed in the last few years, including nearly 4 percent growth in 2016. Still, chicken has struggled to keep up with the export growth of pork and beef.

The competition in the global chicken trade has been strong, largely from increased availability and competitiveness of Brazilian chicken. The U.S. could see a boost in exports in 2019 if China reopens to U.S. exports (banned since the outbreak of high path avian influenza in 2015). China's consumers are trading into chicken from pork due to the outbreak of ASF, so chicken prices and demand are on the rise.

Beef

The U.S. beef sector continues to reflect a good balance between supply and demand. This is expected to continue through 2019.

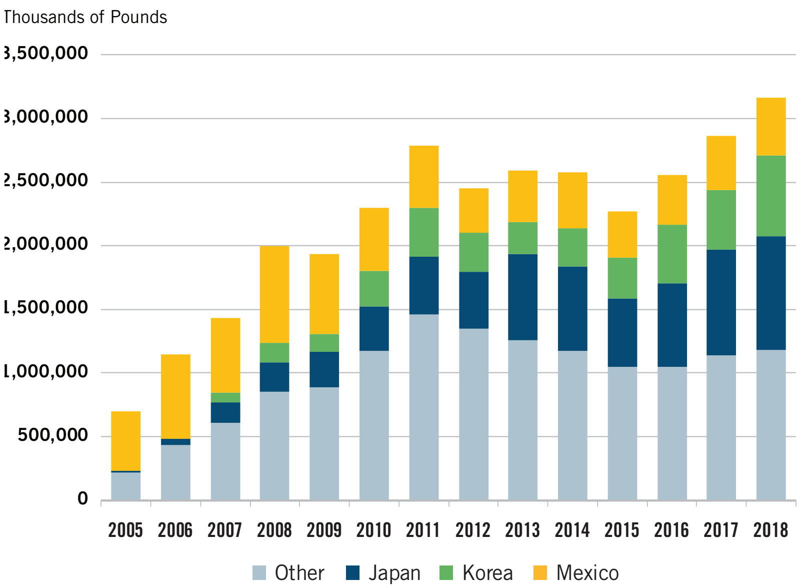
Beef production grew by 2.6 percent in 2018, but that was matched with a 10 percent increase in exports. As a result, domestic availability of beef was flat while supplies of pork and poultry climbed by 1.3 and 1.4 percent, respectively. This favorable competitive environment for beef, along with strong income growth in the U.S., has helped retail beef prices reach all-time premiums over pork and poultry.

The growth in U.S. beef exports has been unbelievable. Since 2015, beef exports are up 40 percent, helping to offset the rebound in the U.S. cow herd from the droughts of five years ago. Even though beef production has increased by 13 percent over that time, international markets have consumed nearly one in three of those pounds.

Growth was largely driven by increased shipments to Japan and South Korea. They accounted for nearly half of U.S. beef exports in 2018 *(Exhibit 7).* Going forward, Korea is expected to remain a positive driver for U.S. beef exports. The U.S. position in Japan is under threat, however.

The weather conditions in most of the feeding regions have shifted from too dry to too wet over the last year. Winter weather and very muddy conditions are impacting feedyard profitability, and weights are coming down.

EXHIBIT 7: U.S. Beef Exports



Source: LMIC

Beef production looks to be flat compared to first quarter 2018, but the improved feed prices and availability will keep supply on the rise for the remainder of 2019. Annual beef supply is expected to increase by 2 percent, which will likely be matched by an even greater level of export growth.

The beef industry does face the risk of a U.S. recession in late 2019 or 2020. Domestic demand has been very strong recently and for the last few years. U.S. consumers are benefitting from good economic growth and more money in their pocket after the tax cuts of 2018. This has brought beef prices at retail to historic premiums over pork and poultry, which will test consumers if the U.S. economy begins to slow.

Dairy

Milk production in the U.S. totaled 217.5 billion pounds in 2018, a 0.9 percent increase from 2017. This represents a lower-than-normal annual increase – about 1.5 percent is typical. The increase in production was driven by an additional 250 pounds of milk per cow in 2018, which offset a decrease of 49,000 cows from the national herd.

Extreme winter conditions and storms in the Northwest and upper Midwest have created regional challenges to milk production in the first quarter of 2019. Heavy loads of snow collapsed barn roofs in Minnesota and impacted the ability of milk trucks to make pickups at many farms. A blizzard in the Northwest killed over 1,700 cows.

A slower growth rate in milk production translates into less excess milk being dried into powder. Production of nonfat dry milk and skim milk powder were down a combined 3.3 percent in 2018 compared to 2017.

Powder production in the EU is down as well. What had been significant intervention stocks of skim milk powder are being rapidly sold, but there is still some uncertainty about where it has gone and where it might reappear.

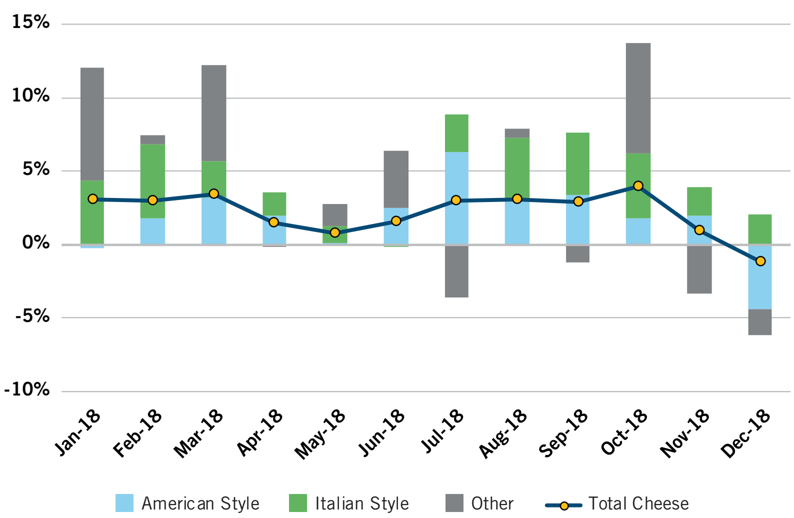
The reduced supply is supportive of prices, which climbed above $1 per pound of nonfat dry milk early in the year. This higher price level has been met with resistance on the demand side and exports to Mexico have showed signs of slowing.

Cheese production fell slightly in December compared to a year earlier *(Exhibit 8)*. Prices for 40-pound block cheddar are currently in the $1.60 per pound range. They spent most of last year in this range until falling into the $1.30s in December amidst national media coverage of record-high inventory levels.

Inventory levels heading into the beginning of 2019 are about 5 percent higher than last year, but domestic demand is showing signs of strength. Still, it will take the help of exports to drive down the inventories and give prices hope of breaking out of the current range.

Relatively low cheese and whey prices, which drive the class III milk price, will be offset somewhat by higher powder prices and stable butter prices, which drive class IV. The combined effect on farm milk prices will lead to continued prices in the current range.

EXHIBIT 8: U.S. Cheese Production - YoY Percent Change



Source: USDA-NASS, CoBank

If tariffs and trade disruptions are resolved and exports improve, there is optimism that the second half of the year could show some improvement. The net result should be prices about $1 to $1.50 per hundredweight higher in 2019 than they were in 2018.

Other Crops

Cotton

Last year, cotton prices in relation to corn and soy were favorable for devoting acres to cotton. However, the strong plantings failed to come to fruition along most of the cotton belt. This was due to a combination of early drought and late heavy rains around harvest, along with severe hurricane damage in the Southeast.

Despite a 10 percent increase in planted acres for 2018/19 compared to a year earlier, harvested acres dropped by 5 percent. Much better soil moisture conditions in the beginning of this season, however, should set up the crop for less abandonment. An increase in production is expected for the 2019/20 season.

Chinese tariffs on U.S. cotton are one of the biggest wild cards on the demand side. Global cotton stocks are building, but it is likely that China will be in a position to buy as their reserve stocks decline.

In recent years, China has sourced most of its cotton from the U.S., Australia, and Brazil. The U.S. will likely lose market share to its competitors as long as the tariffs are in place.

Exports to other regions are expected to be strong. If the Chinese trade situation is resolved soon, exports could grow substantially in the 2019 marketing year.

Rice

Production for 2018/19 is expected to be up 26 percent from the previous year. Long-grain rice acreage was up in all states, but most of the increase came from Arkansas, which increased its acreage by 25 percent. Medium and short grain acreage is up nearly 20 percent from a year earlier.

The total supply situation is made even heavier by a 6 percent increase in imports. Much of the increased imports are a result of the return of China to the Puerto Rican market after nearly a decade.

Exports are expected to pick up in the 2018/19 marketing year. This is primarily due to more opportunities to recapture markets in Latin America, which had faced heightened competition in recent years from South American suppliers.

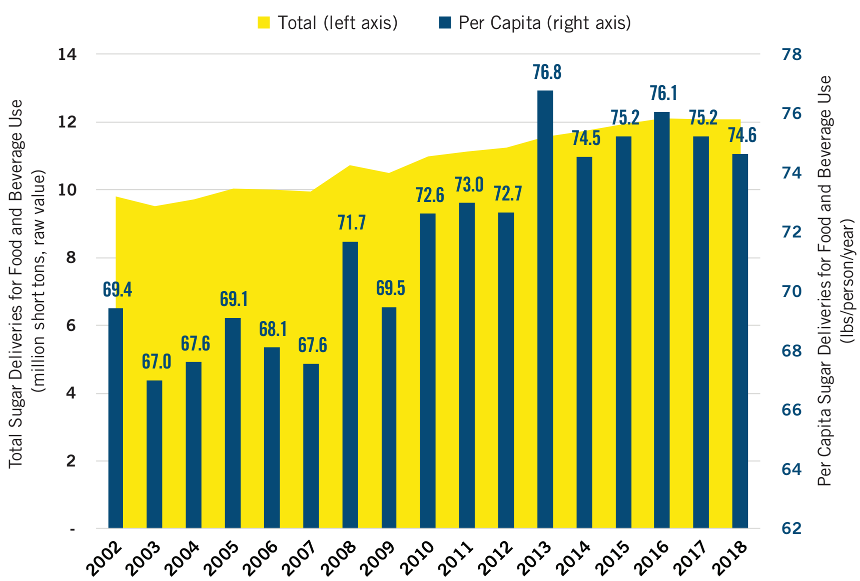
Still, the heavy supply situation should lead to a 60 percent increase in ending stocks for 2018/19 compared to the previous year. This will put downward pressure on prices.

Sugar

Final 2017/18 sugar production estimates have been increased since fall reports, leading to an upward revision in 2018/19 beginning stocks.

Based on the latest USDA ERS report, 2018/19 cane sugar production is estimated to hit a record 4.1 million tons raw value (3 percent increase over 2018). Beet sugar production is estimated to be down 7 percent. These will combine for a net decrease in total sugar production of 3 percent.

EXHIBIT 9: Sugar Deliveries for Food and Beverage Use



Sources: Sweeteners Market Data, Farm Service Agency, and U.S Census Bureau

While it is too early to tell for sure, there are concerns regarding the quality of the beet sugar, given the extreme temperature fluctuations experienced this winter. Such concerns are not included in the most recent ERS beet sugar projections. Thus, the reduction in beet sugar could be greater than the projected 7 percent.

Growth in ERS domestic sugar use for 2018/19 is up slightly (just under 1 percent). This is driven mostly by population growth. While per capita consumption of caloric sweeteners has been declining since 2000, refined sugar consumption was increasing until recently.

Per capita refined sugar consumption has now declined for the second consecutive year *(Exhibit 9)*. While this could be a reflection of shifting consumer preferences, ERS warns that short-term sugar market trends "can be fickle." Another potential factor behind the declining consumption data is an increase in sugar-containing product imports.

Last fall, there were concerns that low world prices could make U.S. imports (under the high tariff rates) potentially economical. These concerns have largely abated, and the ERS import projections for 2018/19 are down 6 percent relative to 2017/18. This is the lowest level since 2007/08.

Reduced production and imports, alongside sluggish domestic demand, brings the projected 2018/19 stocks-to-use ratio down from 16.1 percent in 2017/18 to 14.6 percent. This will help keep refined sugar prices relatively firm (as they have been so far this crop year).

Specialty Crops

Cold and wet weather conditions in California have delayed harvest for a number of crops. Meanwhile, Florida has been able to capitalize on more favorable conditions.

The precipitation is generally welcomed in California and bodes well for production expectations across a wide number of crops. Yet, the rainfall is also causing challenges in some areas – trees have been uprooted and additional fungal controls are needed.

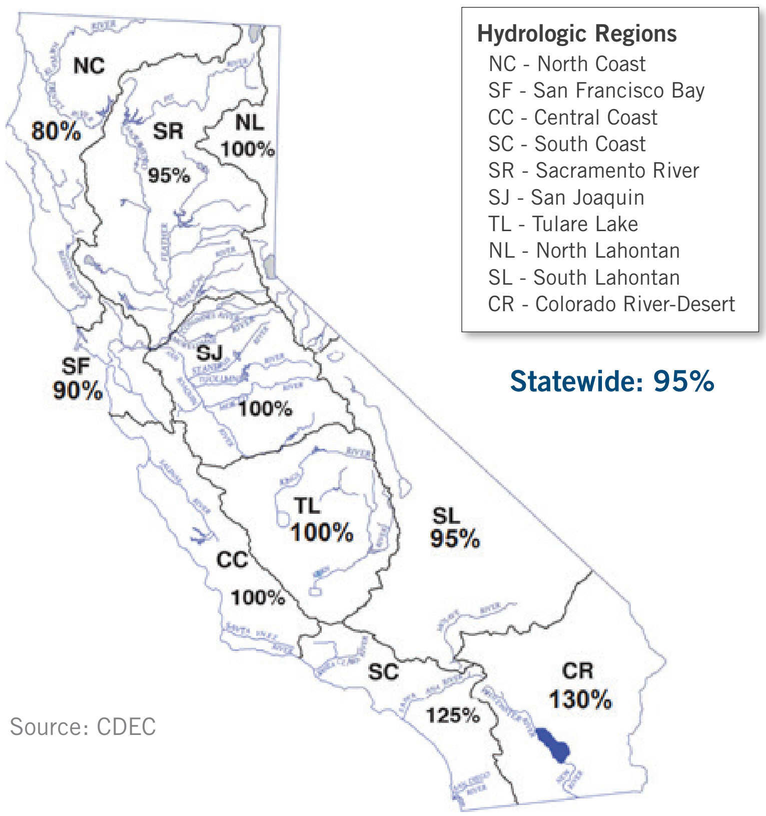
As of Feb. 1, snowpack was 110 percent of normal, while water year (starts Oct. 1) and precipitation was 95 percent of normal. This is up 25 percent and 60 percent, respectively, from last year *(Exhibit 10)*.

Tree Nuts

Almonds. Year-to-date almond shipments (August through January) are 1 percent below last year, according to the California Almond Board. But the pace picked up in January and the gap has been narrowing. Domestic shipments are up 3.5 percent, while exports are down 3.1 percent due primarily to a reduction in the in-shell market.

To help reduce the impacts of retaliatory tariffs, the almond industry has received $6.9 million of the total $200 million in funds directed to the Agricultural Trade Promotion Program. Blue Diamond received a little over $3.7 million of the total almond allocation.

EXHIBIT 10: California Precipitation (Percent of Average)



Source: CDEC

Pecans. The industry is selling conservatively and stocking up in anticipation of tight supplies this year. This comes after the 2018 harvest was significantly reduced by damages from Hurricane Michael and flooding in Texas and Oklahoma. Furthermore, hurricane-damaged pecan trees are expected to have long-term impacts on pecan acreage and production. Shellers are responding by purchasing record volumes from Mexico, but supplies are still expected to come up short of demand.

Prices have not yet risen substantially – perhaps because they have been under pressure by subdued trade markets resulting from the retaliatory tariffs. However, prices can be expected to rise throughout 2019 as limited supplies meet the growing demand.

Pistachios. Global pistachio production for 2018/19 is expected to rebound, reaching record consumption of 743 thousand metric tons, according to the USDA Foreign Agricultural Service forecast. The U.S. is expected to gain substantial market share at the expense of Iran, which has been negatively impacted by weather.

Grapes

Due to the prolonged government shutdown, the California Grape Crush and Acreage reports typically released in mid-February will be released April 10 and 19, respectively. The preliminary crush report was cancelled. As such, this grape market update was heavily reliant on presentations from the January 2019 Unified Wine and Grape Symposium.

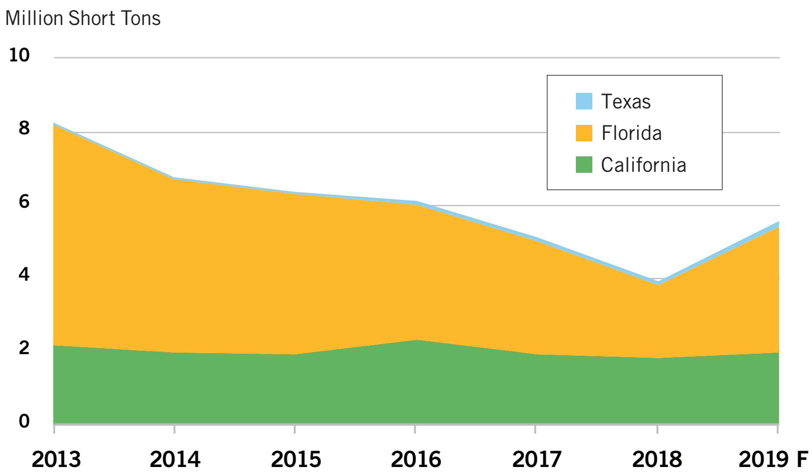
2018 was a big year for wine grape production. Bulk wine stocks are up, particularly for cabernet sauvignon and chardonnay. Meanwhile, global and domestic consumption of wine is slowing, and import competition continues to challenge domestic suppliers' U.S. market shares.

Going forward, this supply and demand situation will likely keep prices soft. There have even been reports of some producers running harvesters with no gondola through their vineyards solely to maintain vine health while there is no market for their grapes.

This supply and demand imbalance is not likely to resolve in the next couple of years as non-bearing acreage comes into production. Over the longer term, marginal acreage growth is expected. Allied Grape growers projected a mere 3,000 (0.5 percent) bearing acre increase in California for wine-type grapes between 2018 and 2021.

Despite a dreary outlook, the industry remains relatively robust. There are opportunities within the industry to innovate and grow. For instance, there has been increased interest in cannabis-infused wine and beverages. Some of the large wine companies are making notable investments in this area.

EXHIBIT 11: Orange Production



Source: USDA-NASS

Citrus

Similar to early season fall reports, USDA crop reports are showing a good year for citrus production. Yields are up, droppage estimates are low, the rate of acreage declines have slowed relative to previous years, and good quality is being reported. However, Florida reports are showing fruit size for both oranges and grapefruit to be smaller than the last couple years.

USDA projects 2018/19 U.S. orange production will be up 41 percent over last year (with Florida up 71 percent). Grapefruit production forecasts are up 29 percent (with Florida up 55 percent). While this increase seems large relative to the hurricane-impacted 2017/18 season, these projections put total citrus production for the season up roughly 4 percent over 2016/17 *(Exhibit 11)*.

While reports are generally positive at this time, impacts of recent low temperatures in California are being monitored. Some current reports note that the cooler temperatures are expected to improve fruit quality.

January and February orange prices declined amid increased production expectations. Prices are expected to strengthen slightly throughout the season. However, if production expectations are realized, season average prices are expected to be lower than last year and more in line with 2016/17 prices.

Strawberries

February rains and cooler temperatures have set the California strawberry crop up for a good spring harvest. However, the weather has limited harvest volumes and quality in the short-term, particularly during the high Valentine's Day demand and the peak price season.

Florida also had weather challenges leading into the big seasonal demand pull, but not to the same extent as California. One large Florida based producer says that the weather has probably caused production to be 20 percent below normal. Nonetheless, the relative advantage has allowed Florida producers to better capitalize on the stronger seasonal prices.

Going forward, the industry is expecting strong production, which will push prices back in line with seasonal norms.

Infrastructure Industries

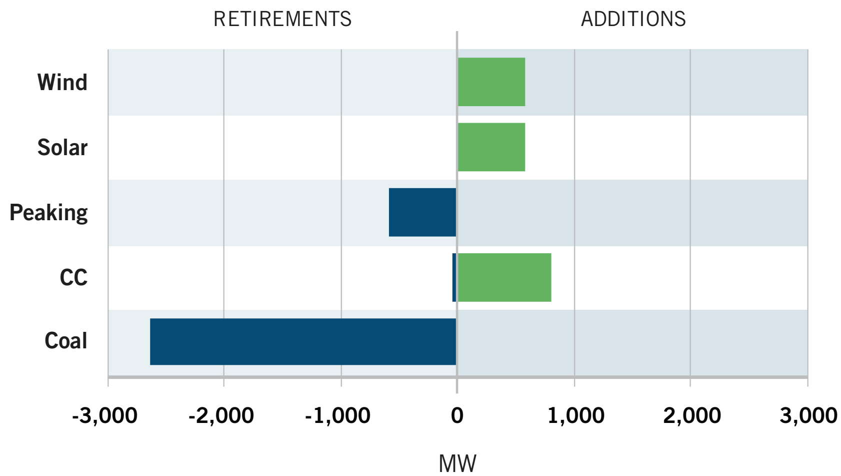
Power and Energy

Natural Gas Supply to Outpace Rising Demand

Growth in the U.S. supply of natural gas is projected to outpace rising domestic and international demand through 2019. This abundance should keep the average 2019 Henry Hub price at or below $3.10/MMBtu, a slight decrease from 2018. If this pricing is realized, natural gas-fired generators across the country will continue to displace their coal-fired competitors, forcing further capacity retirements.

Although total 2018 U.S. dry natural gas production rose 13 percent to reach a record 83.4 Bcf/d, drillers in 2019 are on track to exceed that amount by nearly 9 percent, reaching 90.7 Bcf/d. However, much of the incremental gas supply in 2019 will depend on the completion of new takeaway capacity. Specifically, the Atlantic Coast and Mountain Valley pipelines are projected to enable approximately 5.5 Bcf/d of new gas

EXHIBIT 12: Changes in Generating Capacity, Q1 2019



Source: S&P Global, CoBank

MW of solar capacity, continuing the growth in non-hydro renewables driven in part by state-level policy.

With the completion of the 806 MW Lackawanna Energy Center CC in Pennsylvania, PJM saw the U.S.' only significant addition of new thermal generating capacity in the first quarter of 2019. Thus continues PJM's extraordinary buildout of new gas-fired capacity, which in 2018 totaled 10 GW – far exceeding that of the rest of the country combined.

Of the 3,200 MW of generating capacity that was retired in the first quarter of 2019, 585 MW was gas-fired peaking capacity split between Arizona and Texas while 45 MW of CC capacity was retired in Louisiana. Over 2,600 MW of the retirements were coal-fired units located primarily in PJM *(Exhibit 12)*. After PJM saw more power generated from natural gas than coal in 2018 – an historic first – the outlook for coal-fired generation in the country's largest power market continues to dim.

Due to a significant amount of capacity additions and retirements anticipated over the next three quarters, natural gas-fired generation is projected to supply 37 percent of total U.S. electricity demand in 2019, a 2 percent rise over 2018. Conversely, coal-fired generation's market share is project to decline by 12 percent to less than 25 percent.

supply from the Appalachian Shale, while the Gulf Coast Express, Roadrunner Gas Transmission, and Pecos Trail pipelines will afford an additional 5 Bcf/d of supply from the Permian Basin.

Despite high gas demand during the 2018/2019 winter heating season, supply growth in the remainder of 2019 is projected to replenish the U.S. gas inventory from its current 15-year low to within 5 percent of its five-year average. If realized, the robust inventory will somewhat blunt potential increases in gas prices, such as the $4.45/MMBtu average Henry Hub spot pricing observed from mid-November to mid-December 2018.

Continued Displacement of Coal

The first quarter of 2019 saw continued buildout of non-hydro renewable and combined cycle (CC) capacity, as well as significant retirements of coal-fired capacity. Driven by highly advantageous gas prices, sustained development of CC capacity in PJM continues to intensify economic pressure on the market's coal-fired generation, further eroding coal's share of the U.S. utility-scale power generation market. As a result, coal is projected to fuel less than 25 percent of the country's power generation in 2019 – its lowest share since 1949.

Over 1,900 MW of new utility-scale generating capacity came online in the U.S. in the first quarter of 2019, of which solar and wind capacity together comprised nearly 1,200 MW (nameplate). Florida alone gained 465

Rural Water Systems

Federal Funding Opportunity

The recently passed Farm Bill provides significant new funding opportunities to support rural water utilities' efforts to protect sources of drinking water. The law reauthorizes the Regional Conservation Partnership Program (RCPP) and allocates $4 billion over the next 10 years for qualifying projects.

Since its creation in 2014, the RCPP has been overseen by the USDA's Natural Resources Conservation Service (NRCS), which has used the program to incentivize

water utilities, agricultural producers, universities, and others to collaboratively enhance water conservation efforts at the regional or watershed scale.

With a budget of $1.2 billion for FY 2015-2018, the RCPP has partially funded hundreds of competitively chosen projects aimed at improving water quality across the country, including approximately 91 projects in FY 2018. However, the RCPP has consistently been oversubscribed. In the last four fiscal years, only one in five applications for RCPP support were selected for funding.

Motivation for the increased RCPP funding centers on the health and economic impacts of contaminant runoff from improperly managed agricultural operations, among other sources. Of primary concern are phosphorus, various nitrogen-based compounds and other manure-related toxins that have been shown to negatively impact human health when present at certain levels in drinking water. Given EPA estimates that 30 percent of U.S. streams have high levels of such pollutants, the need for increased conservation project funding is immense and immediate.

Per the updated Farm Bill, 10 percent of the NRCS conservation funding will be directed to source water protection over the next 10 years. This allocation equates to approximately $400 million annually. While this investment will be nowhere near sufficient to address the looming and extraordinary cost of modernizing the nation's broader water infrastructure, the increased funding is likely to afford communities across rural America significant health benefits.

In recent years, water utilities across the country have partnered with farmers, state environmental protection agencies, and the NRCS on an array of RCPP-funded projects. Two such efforts are briefly discussed here.

Popo Agie River Watershed Health Project

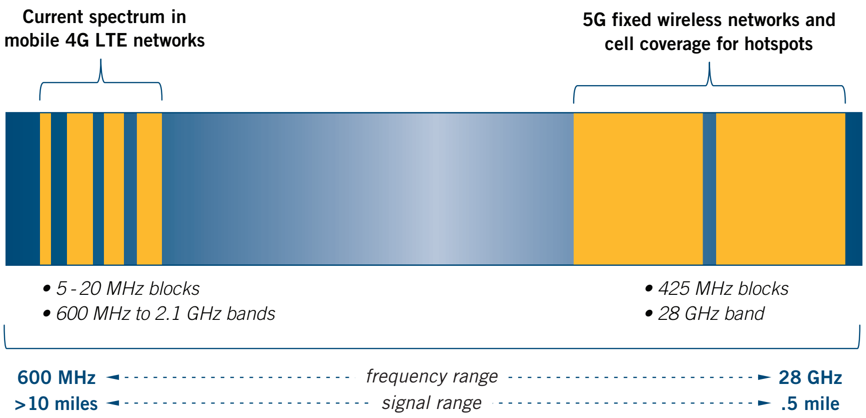
Working with the Wyoming Dept. of Environmental Quality, Northern Arapaho and Eastern Shoshone Tribes and other groups, the Popo Agie Conservation District (PACD) is utilizing $1.2 million in RCPP funds to enhance the quality and quantity of water provided to residents of Lander, Wyoming and its surrounding areas. The PACD and its partners are matching the RCPP funding to carry out a five-year plan to address manure-related E. coli contamination through stream restoration, irrigation infrastructure improvement, and other means. In addition to improving the region's drinking water, the PACD aims to deliver cleaner and more abundant water for agricultural irrigation, fisheries, recreation, stock water, and wildlife habitat.

Otter Lake Source Water Protection Project

In mid-2018, the Otter Lake Water Commission (OLWC) partnered with the Illinois Corn Growers Association, Illinois Environmental Protection Agency, NRCS, and others to initiate a ten-year project to enhance drinking water quality for its 19,000 rural residents. The project was motivated by prolonged pollution in Otter Lake and its 12,897-acre watershed, with the lake exhibiting significant phosphorus impairment in most sampling conducted since 2010. Nutrient-induced algae blooms and mercury contamination have also impacted the area, though they have been of secondary concern. After creating a watershed implementation plan, the OLWC and its many partners have begun targeting the areas of greatest impairment with technical and financial support from various partners, including approximately $833,000 from the RCPP.

With the significant increase the RCPP's funding, many more such projects are sure to get underway in the coming months and years.

EXHIBIT 13: Spectrum Chart – Larger Blocks Equal Faster Data Speeds



Source: S&P Global, CoBank

It is also believed that Verizon secured a large number of licenses. Since they are the largest holder of 28GHz spectrum, acquiring additional licenses would help the telecommunications company provide broader 28GHz coverage.

The next millimeter-wave auction (Auction 102–24GHz) began in mid-March. It should generate significantly higher bids because the licenses are PEA based. These larger coverage areas should attract deep-pocketed national operators. Also, Auction 102 will cover several major metropolitan areas that were excluded from Auction 101. This, too, should drive higher valuations in Auction 102.

Thirty-eight applicants qualified for the auction. Interestingly, cable operators appear to be a no-show. This suggests they are not concerned about the competitive threat fixed wireless represents to their cable broadband business.

Telecommunications

Spectrum

Millimeter-wave auctions. The Federal Communication Commission's (FCC) first millimeter-wave spectrum auction ended in January and raised $702 million, a far cry from the $44 billion raised during the AWS-3 auction in 2015.

Dubbed Auction 101, 3,072 licenses in the 28GHz band were offered. The spectrum has poor propagation characteristics, which limits its application. However, it offers a tremendous amount of capacity, which is needed for fixed wireless networks. Wireless operators see fixed wireless as a viable alternative to fixed broadband (fiber-to-the-home, DSL, hybrid fiber/coax), so they are interested in acquiring millimeter-wave spectrum.

The 3,072 spectrum licenses were made available in county-size geographic areas versus partial economic areas (PEA) *(Exhibit 13)*. County-sized areas are much smaller than PEAs, making Auction 101 more suited to regional operators who service small coverage areas. The FCC has not released the winning bidders' identities, but given the county-sized licenses, it stands to reason that rural operators were active bidders.

Fiber consolidation. Infrastructure funds and strategic investors have been aggressively acquiring private fiber assets. In first quarter 2019, we saw a continuation of this trend *(Exhibit 14)*.

Macquarie Infrastructure Partners, in conjunction with Uniti, announced an agreement to acquire Bluebird Network. And it's not just private companies that are attracting investor attention. In early February, there were reports that Zayo rejected a bid of about $30 per share from Blackstone. Based on where private fiber valuations currently stand, it's not surprising that Zayo rejected what appears to be a low-bid offer.

On the strategic buyer acquisition front, regional communications provider Hargray announced an agreement to acquire Dark Fiber Systems, a dark fiber provider in Jacksonville, Florida. This follows the company's January announcement of an agreement to acquire USA Communications' Alabama assets.

EXHIBIT 14: Fiber M&A Transactions

Announcement Date	Buyer	Target
January 15, 2019	Macquarie Infrastructure Partners/Uniti	Bluebird Network
April 18, 2018	EQT Infrastructure	Spirit Communications
February 21, 2018	Antin Infrastructure Partners	FirstLight Fiber
July 18, 2017	Crown Castle	Lightower
August 17, 2017	Verizon Comm.	WideOpenWest
April 17, 2017	Crown Castle	Wilcon Holdings LLC
April 13, 2017	Windstream	Broadview Network
April 10, 2017	Uniti Group	Southern Light
March 1, 2017	Zayo Group Holdings	Electric Lightwave
February 23, 2017	Uniti Group	Hunt Telecom
February 20, 2017	EQT Infrastructure	Lumos Networks
December 5, 2016	Consolidated Comm.	FairPoint Comm.
November 7, 2016	Windstream	EarthLink
October 31, 2016	CenturyLink	Level 3 Comm.
June 20, 2016	CS&L	Tower Cloud
February 1, 2016	Verizon Comm.	XO Communications
January 7, 2016	CS&L	PEG Bandwidth
November 1, 2016	Crown Castle	FiberNet Holdings LLC
April 30, 2015	Crown Castle	Quanta Fiber / Sunesys
April 27, 2015	Lightower Fiber Networks	Fibertech Networks, LLC

Source: S&P Global and CoBank

There has been a significant amount of domestic and foreign capital flowing into infrastructure funds, many of which are specifically targeting fiber assets. The reasons investors like fiber assets:

- Underlying demand drivers for data from emerging technologies and applications such as 5G, internet of things (IoT), augmented/virtual reality, and data centers.
- Revenue predictability is attractive. Enterprise fiber agreements are long-term in nature and with credit-worthy customers.

Rural broadband. C Spire announced the formation of a consortium including Microsoft, Airspan, Nokia, and Siklu that is focused on improving broadband access to rural America. Little was shared regarding network strategies, but the company did say that "real-world test beds" will be established in Mississippi and Alabama. Nearly a third of rural residents in these markets have no access to basic broadband. The consortium will begin testing and sharing their results over an 18-month period.

Through its Airband initiative, Microsoft is assembling an ecosystem of hardware manufacturers, chipset companies, and service providers to expand broadband availability in rural America using TV White Space (unused TV channels between the active ones in the VHF and UHF spectrum). These investments seem to indicate that white space spectrum will play a central role in how the consortium expands broadband coverage.

Regulatory

USDA ReConnect. The USDA announced that it has extended the application deadline for the ReConnect pilot program. The first application is now not due until May 31, 2019 (the previous deadline was in April).

This delay will give potential applicants more time to evaluate technical assistance from the Rural Utilities Service (RUS) staff and its partners. According to the USDA, "We've seen such strong interest in ReConnect from rural telecommunications providers and utility cooperatives, that we want to be sure there's enough time for them to put solid applications together for these innovative funding opportunities."

The USDA's new ReConnect Program aims to connect rural areas that have insufficient broadband coverage. Through this program, the USDA is making available approximately $200 million for grants, $200 million for loan and grant combinations, and $200 million for low-interest loans.

Chinese ban. As U.S. and Chinese officials work towards ending the current trade war, the rhetoric out of Washington is causing some angst with rural telecom operators who have Chinese-made equipment in their networks. According to recent reports, the administration is considering issuing an executive order that would ban U.S. companies from buying Chinese telecom equipment. Such an order would cost rural telecom operators between $800 million and $1 billion, according to estimates from the Rural Wireless Association.

Even if the government limits the ban to future equipment purchases (no rip and replace requirement), U.S. telecom companies impacted will still need to replace their legacy Chinese equipment to ensure network continuity. This will put a considerable amount of stress on rural carrier operations.

The idea of an executive ban has been rumored for several weeks. It's likely a leverage tactic that U.S. representatives are using as part of the larger trade deal with China. Since there appears to be some optimism that a deal is within reach, this rumored ban could end up being a moot point.

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.

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