



December 2019

QUARTERLY U.S. RURAL ECONOMIC REVIEW

Trade Resolutions Boost Optimism for a New Year

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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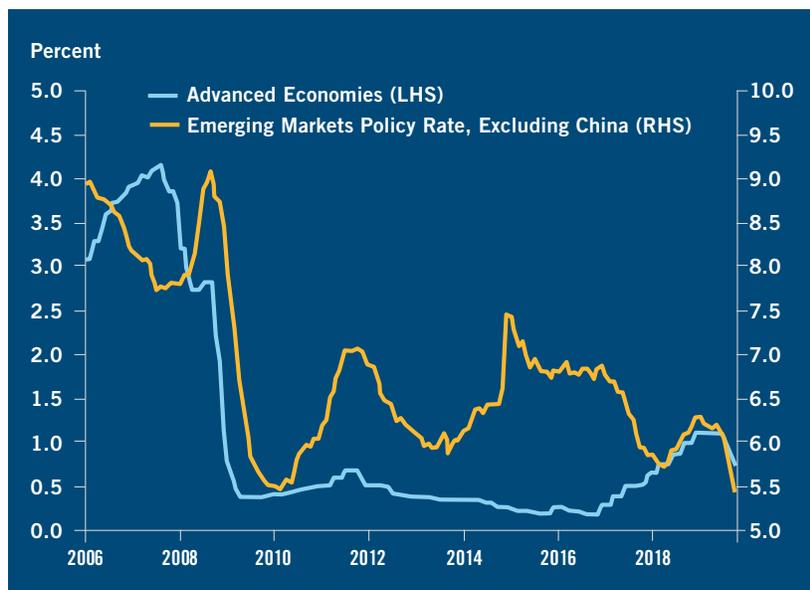
Key Points

- A busy December in Washington has yielded progress or resolution on many issues: the U.S.-China “phase one” deal, USMCA, ag labor reform, and a federal spending bill. These will benefit the U.S. economy and agriculture more than most industries.
- The world’s central banks have been doing battle with a slowing global economy by reducing interest rates. Those efforts should create a soft landing in Q1 2020.
- The U.S. economy will enter 2020 on firm footing. But cost cutting by corporations is expected to drag on the labor market and consumer spending as the year goes on.
- A challenging fall harvest in the heartland and slow grain exports will give way to increased plantings for corn and soybeans in 2020. Optimism over the phase one China deal should benefit producers, input suppliers, and exporters alike.
- The animal protein sector stands to benefit from the phase one China deal and the persistence of African Swine Fever across many parts of Asia and eastern Europe. Exports will continue to climb as market conditions remain positive.
- Milk prices should remain above year-ago levels in 2020, providing some relief to a hard-hit industry.
- The FCC is requiring telecom operators to rip and replace equipment from manufacturers named on the national security threat list. This will keep operators in a holding pattern, loath to incur costs for network support and maintenance.
- Persistent weakness in natural gas prices contributed to the closing of nine coal-fired generating plants in Q4 2019. Natural gas prices are forecast to rise in 2020.

Executive Summary

The fourth quarter is ending with much more optimism on trade and the economy compared to how it began. Washington has put together a year-end blitz on trade and immigration reform, setting up 2020 to start with a limited U.S.-China trade deal and ratification of USMCA. Ag labor reform has also cleared the House and has potential to become law in Q1 2020. All three policies would be significant milestones for the U.S. economy, rural economy, and the agricultural sector.

EXHIBIT 1: Central Bank Policy Rates



Source: Oxford Economics

The grain, pork, dairy, specialty crop, and biofuel sectors have all been hurt by trade tensions with China. Reports indicate that China has agreed to purchase \$40 billion annually of U.S. agricultural goods. This would be an additional \$16 billion above the established benchmark of \$24 billion exported in 2017. This commitment has yet to be confirmed by China, but if proven true, the benefit to U.S. agriculture would be widespread as soybeans would account for only a small portion of the increase. Improved agricultural exports would go a long way to bring balance back to these markets.

The rural telecom industry is experiencing the outcome of China tensions in a very different way. Rural operators face tight budgets and an uncertain future as they prepare to rip and replace banned network equipment from China.

Global Economic Environment

There is no shortage of factors weighing on the global economy heading into 2020. Weaknesses in trade, manufacturing, and business investment are all acting as a drag on global growth. The world GDP growth rate is forecast to fall for the second consecutive year in 2020 to a range of 2.5% to 3%.

But the world's central banks are not standing idly by. Similar to the Federal Reserve, many of the advanced economy central banks acted in 2019 to stem the decline by lowering policy interest rates (*Exhibit 1*). In GDP-weighted terms, the share of advanced economies that cut rates in 2019 is the highest since the financial crisis. The size of these rate declines was modest in comparison at 40 basis points, but the action will support an ailing global economy in early 2020.

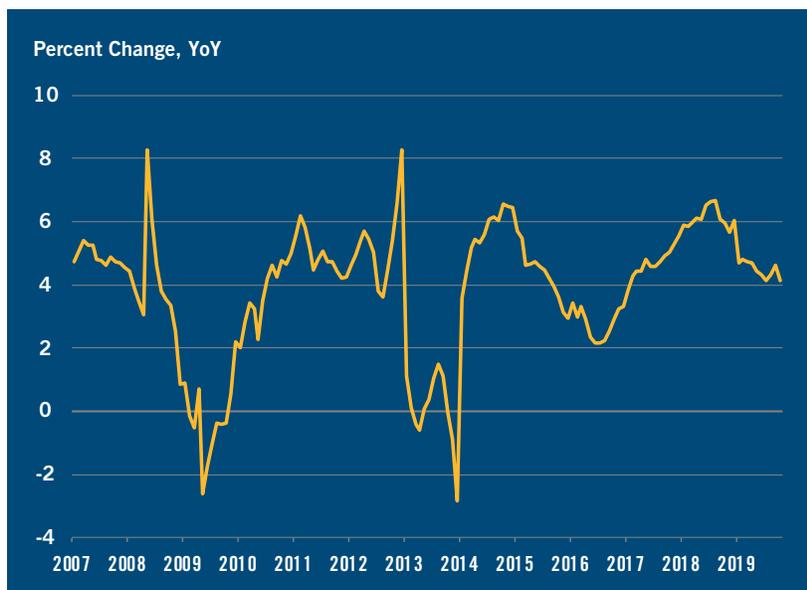
China and other emerging markets have also done their monetary part to quell the slowdown. China has pulled multiple monetary levers, including cutting minimum bank reserve requirements five times since 2018. And the aggregate policy rate for non-China emerging economies is now below its global financial crisis low.

Research tells us that interest rate reductions deliver less stimulative punch when they start from a low level. Nevertheless, the rate cuts will serve as a stabilizing force and should help to put a floor beneath global growth in Q1.

Reducing the temperature on U.S.-China trade tensions could also help global trade. The preliminary phase one trade deal in process would leave many of the tariffs and counter-tariffs in place between the two economic powers. But it would add some level of certainty to businesses that are looking to invest. Details of the deal are still scant at the time of writing, but we expect the grain, animal protein, and dairy sectors to be the biggest winners from the limited agreement.

Resolution on the USMCA deal will also deliver a collective sigh of relief for many businesses across North America. The U.S. dairy sector stands to gain in its trade with Canada, and the U.S. auto parts industry should see significant benefits. Other sectors, however, will see the deal as insurance against a possible devastating withdrawal from NAFTA without a replacement. The deal should be ratified in January.

EXHIBIT 2: U.S. Disposable Personal Income



Source: St. Louis Federal Reserve

U.S. Economic Environment

The U.S. economy continues to hum along, benefiting from the Fed's three rate cuts earlier in the year. The unemployment rate remains at a 50-year low, wages have been comfortably outpacing inflation, consumer spending is strong, and the wealth effect of record-highs in equity markets and strong housing prices all contribute to a healthy economy.

The current strength of the economy, however, is precarious in the sense that it is almost entirely dependent on consumers. Businesses have not been investing in capital goods, and corporate revenue growth has slowed while labor costs continue to climb higher. A recent CNBC Global CFO Council survey¹ indicates that 60% of large global corporation CFOs expect head count at their companies to fall in 2020. A survey conducted by Duke University's Fuqua School of Business² confirmed that this pessimism is consistent at top ranks of domestic companies, as well. The survey reveals that more than half of the 434 CFOs expect a U.S. recession by Q4 2020, and roughly 60% of companies are preparing for recession by cutting costs and shoring up their balance sheets. Whether or not these CFOs are right, their perspective and actions will have an impact on the economy.

A softer labor market would cap wage gains near current levels or below, causing consumers to pull back on spending (*Exhibit 2*). We don't expect this to be a sudden move downward, but a gradual softening in Q1 and beyond. This effect will likely limit 2020 U.S. economic growth between 1.75% and 2%. Even at this reduced growth rate, the U.S. will remain the fastest-growing advanced economy, and therefore the U.S. dollar should remain elevated near current levels. At this growth rate, we also do not foresee another Fed rate cut in 2020. But if conditions darken considerably, the Fed will act.

On the positive side, Washington policymakers have been busy in December.

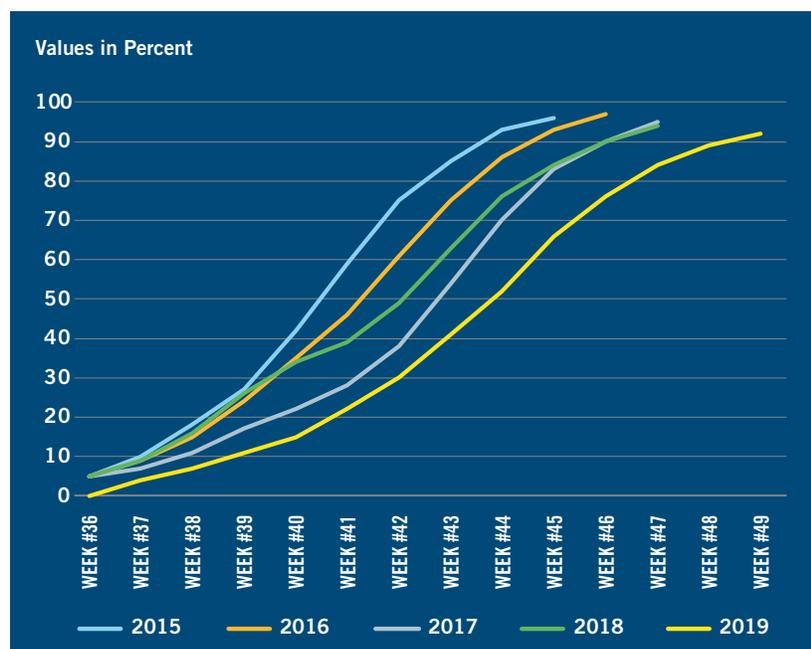
They have worked to avoid a government shutdown, have made progress on ag labor reform, come to resolution on USMCA, and agreed to a limited trade deal in principle with China. These actions remove some uncertainty heading into 2020, and will support growth, especially for the agricultural sectors.

U.S. Agricultural Markets

Inclement weather complicated the 2019 fall harvest across the U.S., causing wide-ranging implications for crop prices, basis, and crop quality. After wet weather delayed planting in the spring, drought and heat stressed crops through the summer. Early frosts nipped maturing plants in the fall, and wet and snowy weather has stalled harvest. Fields across the northern Plains remain unharvested heading into the new year. Despite the extreme weather and price volatility, corn and soybean prices ended nearly unchanged for the quarter. Wheat, rice, cotton, and sugar prices ended the quarter higher on concerns over smaller U.S. harvests and an improved export pace.

Cattle and dairy prices, meanwhile, forged significant recoveries last quarter with live cattle futures reaching new highs over \$126 per cwt on strong domestic demand – a stark turnaround after cattle prices plunged to around \$105 per cwt following the August fire of the

EXHIBIT 3: Corn Harvest Progress



Source: USDA-NASS downloaded 12/11/2019

Tyson Foods plant in Holcomb, Kansas. Dairy markets also made steep gains as Class III milk futures climbed 11% last quarter amid culling of the U.S. cow herd and limited growth in total milk supplies. Lean hog futures slid lower through the quarter, though, worn down by record hog supplies and slow progress in the U.S.-China trade negotiations – despite strong Chinese purchases of U.S. pork amid China’s ongoing struggles to contain African Swine Fever (ASF).

The announced phase one trade deal with China removes some uncertainty for agricultural producers and exporters. But it will take time to learn the full details of the deal and even longer to see how agricultural trade will change under the new deal. We expect China to continue to issue more tariff exemptions to its agricultural importers, making purchases of U.S. goods more cost effective.

The farm financial outlook, though, improved last quarter with USDA raising its estimate of total U.S. net farm income for 2019 to \$92.5 billion due largely to a substantial increase in government support. USDA issued a second payment through the Market Facilitation Program in November, “aimed at assisting farmers

suffering from damage due to unjustified trade retaliation by foreign nations” with a third tranche possibly due in January 2020 if conditions warrant, according to USDA.³

Grains, Oilseeds, and Biofuel

Volatile weather, trade tensions, and a strong U.S. dollar were the key themes impacting U.S. grain and oilseed exports and production in the fourth quarter. Corn and soybean prices weakened while wheat prices rose as USDA’s resurvey of certain spring wheat crops led to a downward revision in production.

Fall crop progress was negatively impacted by cold and wet weather, especially in the northern Plains region where fields still remain unharvested. North Dakota was the main trouble spot with just 36% of the corn harvest completed as of early December

vs. 95% typically. South Dakota’s progress was better but still slow at 80% vs. 98% on average. Slow corn harvest and expectations of reduced yield contributed to a tightening of basis in those regions (*Exhibit 3*). The new federal spending will contribute an extra \$1.5 billion in disaster relief to crop farmers affected by severe weather in 2019, providing some relief.

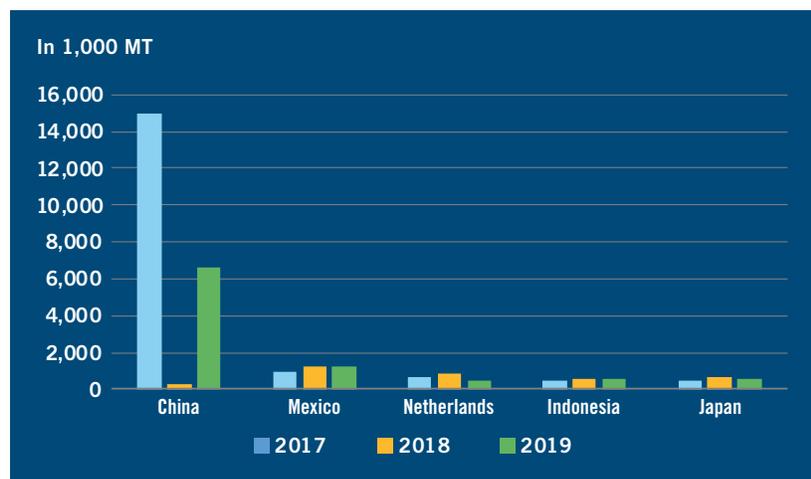
Given the quality concerns of this year’s harvest and the substantial amount of grain still in the field, we are bracing for continued downward revisions on final production, yield, and ending stock numbers for corn and soybeans. If the corn crop comes in materially short of current USDA estimates, futures could theoretically rise toward the psychologically important level of \$4 per bushel. In such a scenario, “bad news could be good news” as farmers may have an opportunity to sell corn at a more attractive price, thereby making more bushels available to end users.

Corn

Grain elevators are holding corn to capture carry, but still struggling to acquire ownership from slow farmer selling and harvest delays.

EXHIBIT 4: U.S. Soybean Accumulated Exports by Marketing Year

Periods ended 11/28/2019, 11/28/2018 and 11/23/2017



Source: USDA-FAS downloaded 12/10/2019

Propane surfaced as a logistical operating challenge during the quarter as grain dealers and elevators in certain areas were unable to acquire enough propane for grain drying, an important consideration given this year's extremely wet harvest. Iowa was especially hard hit as elevators were forced to source propane fuel from other states, as allocations were prioritized for home heating. The short-term impact will be higher costs and lower margins for affected elevators.

Central Illinois corn basis remained tight into the fourth quarter, and as of early December, corn carry was running at 3 cents/bushel/month compared to a high of 5 cents in May 2019 and a low of 1.5 cents in June 2019. USDA's latest estimate for the U.S. corn crop calls for 13.7 billion bushels of production and a yield of 167 bushels per acre, a decrease relative to prior estimates of 13.8 and 168.2, respectively noted in our last report, and a decrease relative to the 2018 final figures of 14.4 and 176.4, respectively. Given the delayed wet harvest and erosion in quality, we are bracing for further downward revisions in corn crop production and yield in the January report. Looking out to 2020, USDA and other forecasts call for roughly 4 million more corn acres, to a total of 94 million planted acres.

U.S. corn exports were down 54% year-over-year (YoY) for the period Sept. 1 to Dec. 12 according to the USDA-ERS report.⁴ The phase one trade deal with China should be positive for the commodity, given that China needs to

import more corn as poultry feed to meet the growing demand for poultry as ASF has decimated hog herds and driven up the price of pork. China also needs more corn to satisfy its ethanol program. (According to Bloomberg, China's E10 program requires 18 million metric tons [MMTs] of ethanol per year or 50 MMTs of corn.) Partially offsetting this, Brazil is also expanding its corn acreage and remains a formidable competitor. However, Brazil's domestic corn demand appears to be rising due to increases in corn-based ethanol production and feed demand from local livestock producers who are increasing production in response to China's rising demand for meat.

Soybeans

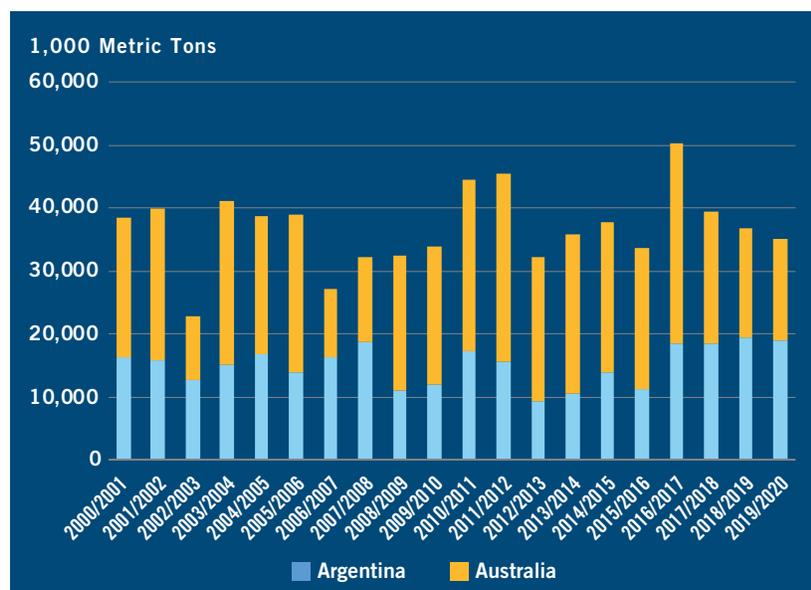
Farmers were more eager sellers this fall with soybeans being sold quickly, in some cases as the beans literally crossed the scales. While soybean basis is tighter than prior years, grain handlers are acquiring soybeans more easily than corn.

USDA's latest estimates for the U.S. soybean crop calls for production of 3.6 billion bushels with a yield of 46.9 bushels per acre, down sharply from last year's crop of 4.4 billion bushels with a yield of 50.6 bushels per acre.

The trade front, though, has been a major headwind for soybean's supply chain. China's imports of U.S. soybeans fell 11% YoY in October following an 8% decrease during the first nine months of 2019 (*Exhibit 4*).⁵ The industry is hoping that the phase one deal translates into a quick pick up in export sales before Brazil typically takes over the export market in February-March.

Soybean prices peaked early in the quarter as China resumed buying after waiving tariffs of certain U.S. agriculture products including soybeans. However, prices subsequently declined through November as trade delays continued. Aside from trade tensions and tariffs, two key risks weigh on U.S. soybean exports to that region. First, core demand is down and will remain so until China rebuilds its hog population decimated by ASF in 2019. Second, Brazil's dominant position as the

EXHIBIT 5: Southern Hemisphere Wheat Production



Source: USDA-FAS downloaded on 12/10/2019.

leading soybean exporter to China is unlikely to fade and may strengthen further depending on the outcome of a somewhat obscure trade provision called China Decree 177.

Decree 177, which is set to expire in December, is a non-tariff trade barrier whereby U.S. soybean exports could be held to a higher soybean quality standard compared to Brazil and Argentina. If the current agreement with China is extended for two years, then soybean export activity will theoretically be uninterrupted while USDA develops a long-term multi-pronged strategy that addresses plant health concerns, best practices, and communication/deployment/monitoring strategies. If the decree expires, China could have the power to reject certain U.S. soybeans on the basis of quality. Given the phase one deal, we don't expect Decree 177 to be a problem.

Wheat

Winter wheat planting was nearly completed last quarter, but with farmers on the Plains struggling with dry planting conditions and farmers in certain regions of the Midwest battling wet field conditions in early fall. U.S. winter wheat planting was 95% complete as of early December, in line with the five year average. Key states

seeing below average crop emergence included Colorado, Kansas, and Michigan due to dry soils, and Montana due to cold and wet soil. USDA's latest wheat conditions report has shown incremental weakness, with both hard red winter (HRW) and soft red winter (SRW) below the five-year average. USDA will release its first estimate on winter wheat acreage in January with total winter wheat acreage widely expected to drop again to historic lows.

Due to significant late season precipitation, USDA resurveyed acreage and yields for other spring wheat and durum, and in its Nov. 9 report made a downward revision to estimated 2019 spring wheat production. Similar to the corn and soybean crop situation, deep snow and freezing

temperatures in the northern Plains halted the harvest in states producing durum, hard red spring and other spring wheat varieties and raised concerns over quality issues of harvested grain.

USDA's 42-million-bushel YoY reduction for the all-wheat crop leaves total production at 1.92 billion bushels for 2019. These latest crop estimates reflect an average U.S. wheat yield of 51.7 bushels per acre, compared to 47.6 bushels per acre for 2018.

Globally, recent production cuts in Argentina and Australia due to dry conditions are more than offset by an improved outlook for the Russia and the European Union. Still, the smaller Southern Hemisphere crop, particularly in Australia, will support U.S. wheat's export program into Southeast Asia. Combined wheat production in Australia and Argentina remains below the high water mark set in 2016 (*Exhibit 5*). USDA estimates the EU, meanwhile, will produce approximately 15 million metric tons more for the 2019-20 crop year relative to 2018-19.

Ethanol and biodiesel

The quarter started off with initial angst related to the recent small refinery exemptions and forthcoming decisions by EPA about future biofuel levels under the

Renewable Fuel Standard for 2020 and 2021. The ethanol complex experienced significant volatility in the fourth quarter. Higher gasoline prices led to improved margins in November⁶ before profitability fell to multi-month lows in December. December will be the 16th consecutive month of negative margins for the industry. Output gradually rebounded during the December quarter, averaging 1,000+ barrels per day (bpd) for the week ended Nov. 15, after reaching a 42-monthly low of 943 bpd for the week ended Sept. 20 (*Exhibit 6*).

We are closely monitoring China's E10 ethanol mandate as it impacts global corn prices in general and U.S. corn production in particular. The China-U.S. phase one agreement could be positive for U.S. corn exports and help tighten prices as USDA believes declining Chinese stocks will cause China's ethanol blend to fall short of its 10% target. A longer-term unknown is China's desire to eventually produce biofuels made from sources other than food crop (such as algal biomass). While such next-generation sources are being researched, there is currently a lack of commercial production at scale, thus alleviating another short-term threat for corn. However, reduced global demand for ethanol due to increasing adoption of electric vehicles is a critical trend that we continue to monitor.

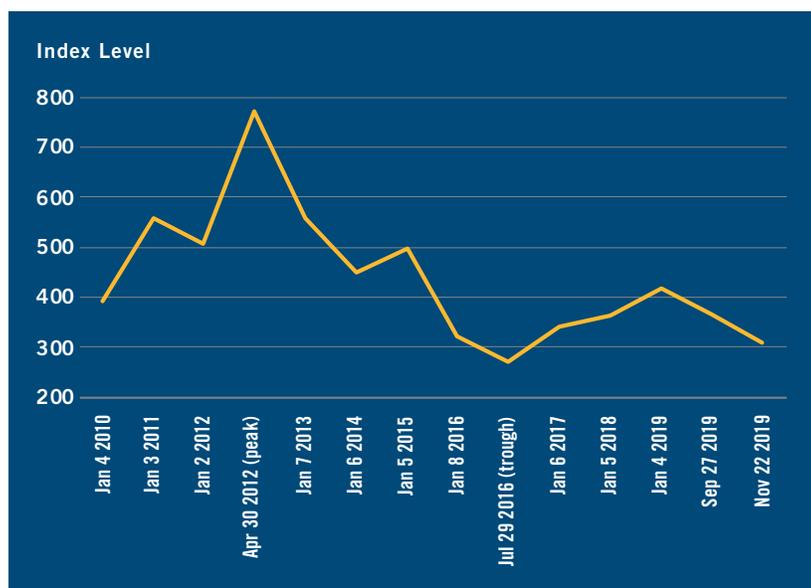
The biodiesel industry got some welcome news in mid-December when the \$1-per-gallon biodiesel producer credit was included in the federal spending bill. The credit expired at the end of 2017, and the reinstated credit will be retroactive through early 2018 and extend through 2022.

EXHIBIT 6: U.S. Fuel Ethanol Annual Production Change



Source: Energy Information Administration (EIA) and Gro Intelligence.

EXHIBIT 7: Green Markets North America Fertilizer Price Index

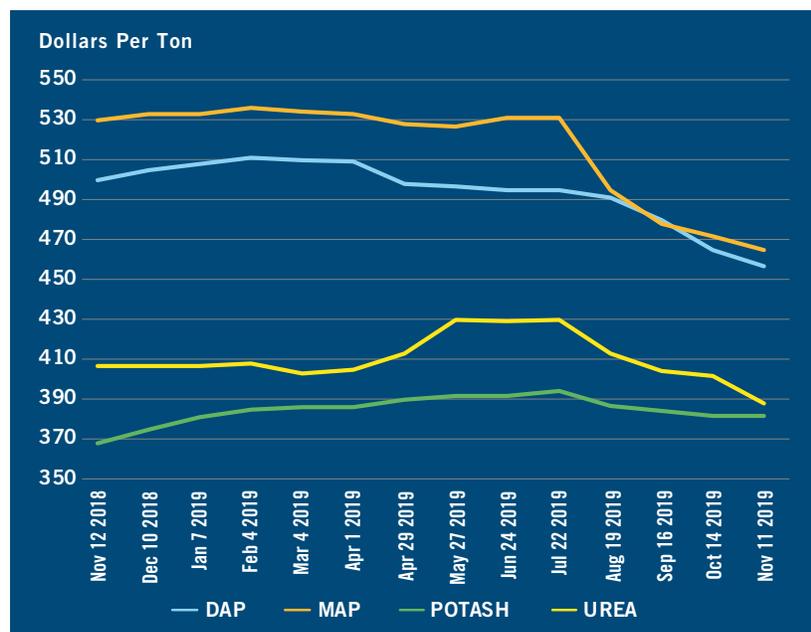


Source: Green Markets and Bloomberg LLP

Farm Supply

The late and slow harvest, coupled with cold weather, has reduced fall applications of nutrients and crop protection chemicals. It's also curtailed other post-harvest field activities. This is all causing input inventories to build.

EXHIBIT 8: Dry Fertilizer Price Comparison



Source: DTN / Progressive Farmer

Fertilizer

Fall fertilizer season, which includes ammonia applications for next year's corn crop and certain wheat crops, was cut short due to cold and wet weather, an unfortunate ending to an already disrupted crop season. One bright spot is that fertilizer is now more affordable, as benchmark wholesale prices for key nutrients like urea and phosphorus have declined at a greater rate compared to corn and soybean prices since the end of 2018. In the fourth quarter alone, nutrient prices on Green Markets North American Fertilizer Index⁷ have eased by about 15% (*Exhibit 7*).

Nitrogen (N)

Global ammonia prices have rebounded from recent lows, due to unplanned production outages and incremental improvements in demand. However U.S. urea prices have come under pressure. Looking beyond the fourth quarter, the industry expects to see an uptick in seasonal nitrogen demand due to more planned corn acreage in both the U.S. and Brazil. An interesting situation has emerged for propane and deliveries of anhydrous ammonia. A large portion of this year's Midwestern crop was harvested wet and requires extra propane-powered drying. However, propane supplies are prioritized for

residential heating. With allocations for agriculture low in certain regions, truck deliveries of residential propane will be the priority throughout the winter, crowding out deliveries of anhydrous ammonia at least temporarily. Delayed ammonia deliveries would translate to delayed spring applications for this important nutrient.

Phosphorous (P)

Recent reports⁸ from the publicly traded fertilizer companies indicate that dry phosphate fertilizer prices remain under pressure. This comes as a result from the combination of robust exports from China, increased supply due to higher production in Saudi Arabia and Morocco, and low raw material costs which allow producers to sell cheaper. Liquid fertilizer

prices are more stable in the context of an overall competitive marketplace.

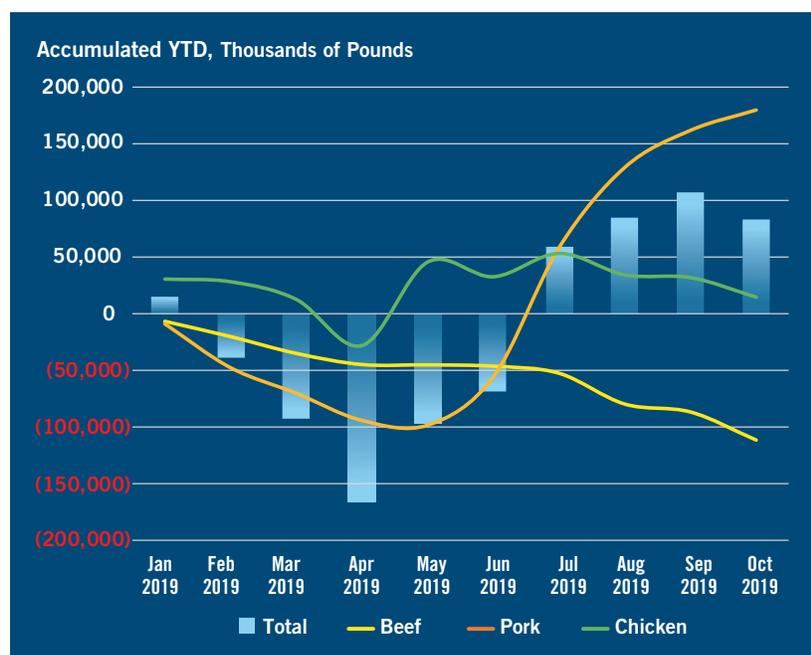
Potash (K)

After declining earlier in the year, potash pricing has been firmer compared to urea and phosphorous (*Exhibit 8*) as several major players – Nutrien, Mosaic, Uralkali and K+S – cut production by roughly 3% of industry capacity. Further tightening may result from Nutrien's decision to temporarily idle its largest potash production mine located in Rocanville, Saskatchewan, for at least two weeks in December due to the CN Railroad strike. The strike has created a bottleneck in shipping potash out of Canpotex's western Canada facility. Canpotex is a potash logistical company jointly owned by Nutrien and Mosaic.

Seed and Crop Protection

Beyond complicating fertilizer purchases and late fall applications, the late, wet – and in several cases, delayed – harvest impacted fall crop protection applications. Given that channel inventory levels were already elevated because growers missed spring 2019 applications, farm supply companies likely experienced continued inventory build during 4Q 2019. The

EXHIBIT 9: U.S. Animal Protein Exports



Source: USDA ERS

implication is that suppliers may need to reduce prices and/or provide growers with incentive discounts to clear the decks into the 2020 planting seasons. That said, our market expectations of a meaningful expansion of domestic corn and soybean acreage in 2020 would support much higher demand for seed and crop protection inputs in 2020.

Animal Protein⁹

The U.S. animal protein sector continues to fare well through 2019 with positive margins for most producers and processors. An August fire at a major beef processing facility pressured margins for cattle producers and feeders this quarter but the industry managed through the logistical reshuffling very well. As the plant comes back on line in December, leverage in the beef sector has returned to previous levels and industry attention has shifted back to trade.

There are a few good reasons to be optimistic about U.S. animal protein exports next year. Exports so far this year have been sluggish, increasing only modestly despite strong growth in pork exports to China (*Exhibit 9*). Lower beef exports and sluggish chicken

exports have meant overall protein exports increased just 1% through September.

The recently announced U.S.-Japan trade agreement will put U.S. pork and beef exports on a level playing field with CPTPP member countries. Without this agreement, pork and beef exports to Japan have struggled. The trade agreement with our largest agricultural partners, Mexico and Canada, will finally see resolution with the Congressional approval of NAFTA's replacement, USMCA. While the USMCA agreement is unlikely to significantly impact animal protein trade, it does ensure that animal protein exports can continue uninterrupted to our most critical region, North America.

Finally, the recently announced U.S.-China phase one trade agreement could mean a major boost for U.S. beef, pork, and chicken producers. The loss of over half of China's hog herd is also driving increased imports of beef and chicken by China, which is improving U.S. competitiveness – but not major shipments to China quite yet. This may change in 2020 now that China has ended its five-year ban on U.S. chicken and approved over 170 chicken plants for exports.

Supply growth was expected to slow this year but failed to do so. Animal protein supply will likely increase 2.5% in 2019 and that rate is expected to be matched next year as well. The U.S. per capita consumption in 2019 will set a new record and climb further next year, barring a major shift in export growth.

Beef

The U.S. cattle and beef sector managed through what was a volatile third quarter primarily driven by the fire at the Tyson Foods plant in Holcomb, Kansas. Despite this large disruption in fed cattle capacity that some had felt was at the level of a “black swan” event, the industry managed through. Other plants made up for the lost capacity with Saturday slaughter and incurred extra transportation and overtime costs.

For August and most of September, the shift in leverage in favor of the packer due to the plant fire pushed cash margins for cow-calf operators and feeders deeper in to the red – but pushed margins for packers to record highs (*Exhibit 10*). At points in mid-August, beef packing margins climbed to \$500 per head but those levels were short lived as the plant comes back on line in December. With plans for the Kansas plant to be at full capacity by early January, fed processing capacity will be back to normal.

The outlook for the cattle and beef sector is bright for 2020 with strong domestic and international demand coupled with minimal supply growth. The current estimates range from 2% growth down to just over flat. We expect beef supply growth to be 1%, which is largely in line with 2019 growth and also well below the growth of pork and chicken in 2020.

Beef demand domestically is quite strong with the premium of beef over pork and chicken looking to set a new record high in 2019. This demand will be helped by international demand led by China's protein shortfall caused by the outbreak of ASF.

With a more normal weather environment in 2020, the U.S. cattle and beef supply chain will likely have a solid year with decent margins throughout the supply chain.

Pork

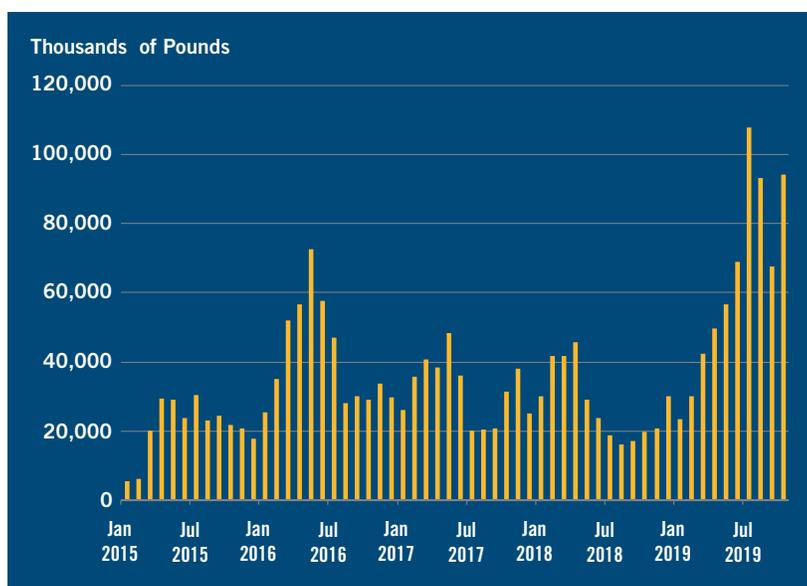
The U.S. pork sector has been whipsawed by trade prospects stemming from the spread of ASF in China and other parts of Asia. Unlike the first half of 2019, U.S. pork exports to China are finally starting to materialize in a major way with shipments in the third quarter reaching 122,000 tons versus just 24,000 tons in the same quarter last year (*Exhibit 11*). This helped to allow overall pork exports to

EXHIBIT 10: Estimated Beef Packer Margin



Source: USDA ERS; CoBank Estimates

EXHIBIT 11: U.S. Pork Exports to Mainland China



Source: USDA-ERS

increase by 17% in the quarter and the expectations are for even greater shipments in the fourth quarter.

Despite this very strong level of export performance, producer profitability averaged just \$15 per head in the third quarter and with only modestly positive margins

EXHIBIT 12: Chicken Leg Quarter Prices



Source: USDA-AMS

expected for the fourth quarter. This rather disappointing level of profitability, in light of the robust exports, is largely due to the fact that pork production increased more than exports. As a result, U.S. domestic disappearance increased by a healthy 4.2%, putting pressure on prices. In fact, this implies the average American consumed 12.8 pounds of pork in the third quarter – the highest level since 2002 – and prevented prices from reflecting the robust exports during the quarter.

Production growth is expected to continue in the fourth quarter and likely through 2020 as well. With today's hog futures reflecting good margins for hog producers, the expectation will be for continued growth next year. We expect production to increase between 4% and 4.5% for 2019 and between 3% and 4% for 2020.

Exports will again be key to industry profitability in 2020 as has been the case this year. Exports to China and other Asian markets suffering from ASF will command most of the headlines but there are also export opportunities to Japan following the ratification of the U.S.-Japan trade agreement. This will bring the U.S. in line with the tariff levels of CPTPP countries and greatly improve U.S. pork export competitiveness with this key pork customer.

Chicken

Chicken prices and producer profitability reflected the impact of the opening of three new plants in 2019. Prices had fared much better than expected through the first half of 2019, allowing producers to realize good margins after a very challenging end to 2018.

The additional capacity as these new plants started to ramp up production weighed heavily on chicken prices. Since mid-year, chicken breast prices have declined over 20%, leg quarters by 25% and wings by 9%. This rate of decline is greater than seasonal averages especially for leg quarters which had been a bright spot in 2019 (*Exhibit 12*).

Supply growth driven by new capacity will increase chicken production by 2.5% in 2019 and we expect a similar level of growth in 2020. With growing expectations of an economic recession in the U.S. in the next 12 to 24 months, a more challenging economic environment could help chicken prices next year.

Overall chicken exports have been mostly flat in 2019 with growth in shipments to Mexico, the Caribbean, and Eastern Europe being offset by declines in exports to Angola, Canada, and Iraq. The export outlook got a boost in November when China announced that it would end its five-year ban on U.S. chicken imports. This was a preliminary concession by China in the lead up to the phase one agreement. The renewed trade flow could bring a meaningful boost to prices at a time when new chicken capacity continues to come online and per capita protein consumption sets new highs.

Dairy

The U.S. dairy sector remains in a state of transition. The first part of 2019 was marked by high dairy cow culling evidenced by significant YoY growth in dairy cow slaughter. For the year, national milk output increased only slightly YoY as cow numbers continued slipping through June. September and October were the first

months to show the U.S. adding cows in response to higher milk prices. The national herd reached 9.327 million head, still 0.4% below a year ago. Dairy cow slaughter will end the year between 2% and 4% above a year ago.

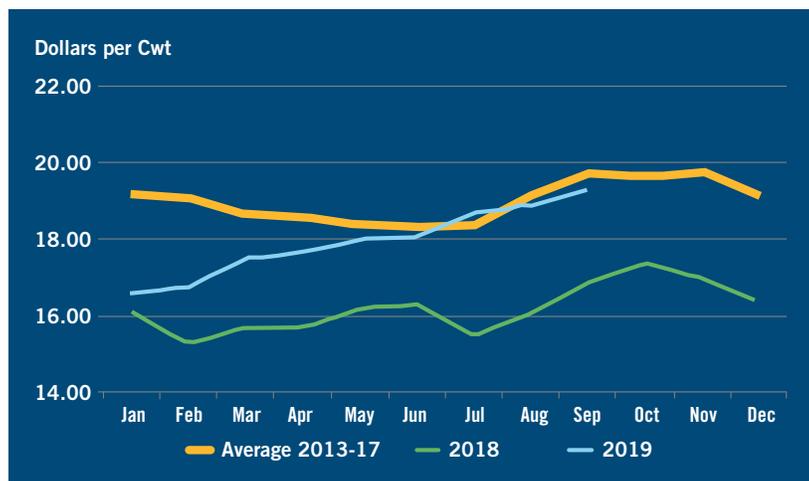
Lower milk production in the first half of the year set the stage for increasingly higher prices. The national All Milk price began the year at \$16.60 per cwt and will stretch to over \$20 per cwt by the end of the year (*Exhibit 13*). However, while milk prices have posted a strong recovery, dairy producers are juggling higher feed costs. Corn prices rose 7% over the 2018-2019 marketing year, while national soybean meal prices are estimated to have fallen by nearly 11%. Alfalfa supplies are still tight and prices remained similar to last year. The combination of rising milk prices and mixed feed prices resulted in better margins on an annual basis, although most of the gains were made in the second half of 2019.

Domestic demand for value-added products soared in 2019. Higher cheese prices were the main driver behind the All Milk prices received by producers reaching \$20 per cwt. Block cheese prices rose to \$2 per pound – the highest since 2014 (*Exhibit 14*). Domestic disappearance of American-type cheeses (cheddar, Colby, Monterey, and Jack) through September averaged 4.5 million pounds per month higher than in 2018. Exports for cheese through September were also stronger, up 3.2% YoY.

The higher demand for Class III milk by cheese processors has tipped the Class III to Class IV price spread in Class III's favor. Class III is now \$2.67 per cwt higher than Class IV.

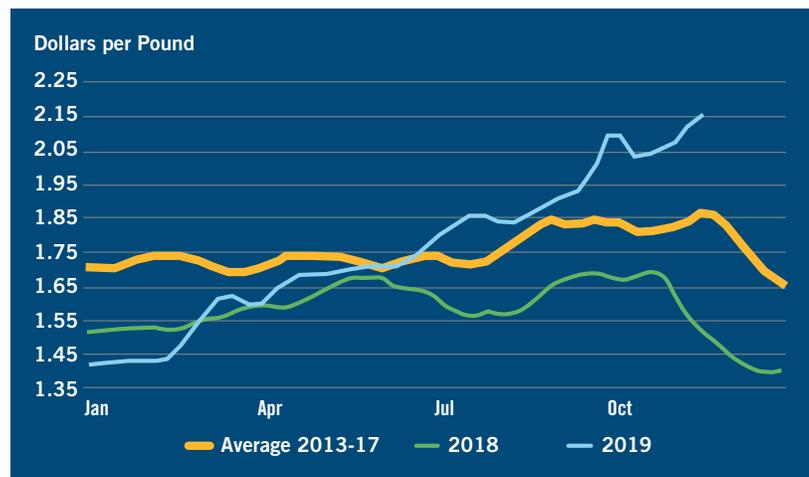
Although Class IV milk prices have not seen the gains that Class III had, it too posted gains in 2019. Class III milk price started the year at \$13.96 per cwt and was

EXHIBIT 13: All Milk Price U.S., Monthly



Source: USDA-NASS

EXHIBIT 14: Cheddar Cheese Prices 40 pound block, U.S. Weekly

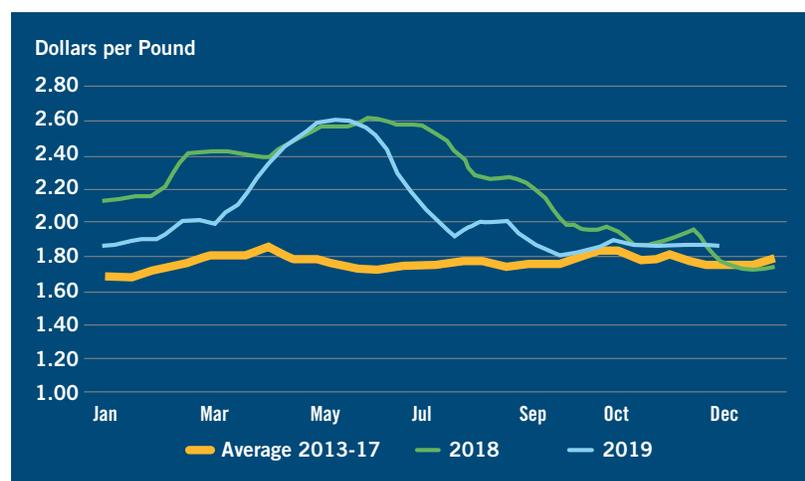


Source: USDA-NASS

\$19.40 per cwt in mid-December. In contrast, Class IV started 2019 at \$15.48 per cwt and in mid-December settled at \$16.73 per cwt.

Export butter demand struggled in 2019 but domestic demand was very strong, with domestic disappearance averaging 1.3 million pounds higher than 2018 through the first nine months of the year. Although butter prices are still high by historical standards, the trend has been lower in 2019. The U.S. weekly average butter price reported by USDA-AMS reached as high as \$2.41 per pound in July, but since that week has fallen sharply. Mid-December wholesale butter prices were averaging

EXHIBIT 15: Oceania Butter Biweekly



Source: USDA-AMS

below \$1.95 per pound. Butter production is down 0.5% year-to-date in 2019, but cold storage inventories have climbed above the prior year since July. Although cold storage levels are not considered burdensome, the price impact on higher domestic demand appears to be primarily driven by smaller export figures.

Butter exports are down 42% so far this year. Mexico and Canada are the two primary markets for U.S. butter exports. Mexico this year is off 72% of last year's volume while Canada is down 42%. Together they account for more than 11,000 metric tons lost compared to last year in the January through September timeframe. U.S. butter prices have been notably higher than competitors'. Both Oceania and Western Europe are reporting FOB prices that calculate to less than \$1.90 per pound in U.S. dollars since August (Exhibit 15). With the signing of TPP, Canada and Mexico consumers will have better access to Australian and New Zealand brands through larger quotas. The USMCA will finally see resolution with Congressional approval. However, even with this agreement, U.S. exporters could face steeper competition in these two key markets.

The fourth quarter of 2019 is one of the highest consumption periods in the year for butter and cheese. These holiday season trends support a further rise in milk prices to close out the year. However, with domestic consumption being the primary driver, milk prices are likely sensitive to slower macroeconomic activity.

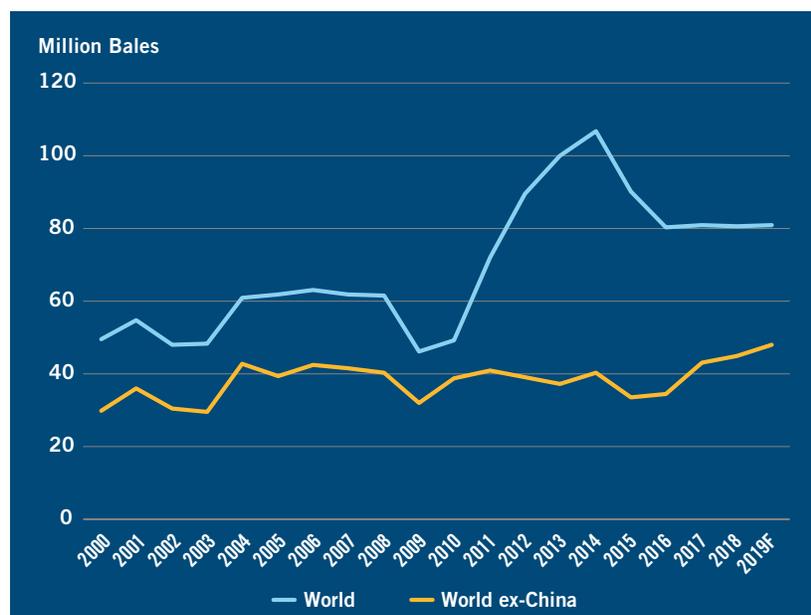
The rapid rise in milk prices, gaining 10.9% YoY in October, will be a driving force to add more cows to the herd. The last two months have shown small gains, 5,000 head each, to the total U.S. sector. Dairy replacement prices are already climbing. After bottoming in 2019, the third quarter showed the highest dairy replacement price nationally in more than a year. The Jan. 1, 2020, cattle inventory report will provide a better indication for what to expect out of growing dairy cow numbers. Dairy heifers held for replacement were below a year ago in July. Expect dairy heifer supplies to tighten further as a result of the higher milk prices.

The increased use of sexed semen could help speed up heifer replacement growth, but in the near-term, dairy heifer replacement prices are expected to increase.

The dairy industry is facing a new world with the signing of TPP, with the U.S. on the outside looking in. U.S. competitors now have improved access to the Pacific Rim. This year exports were largely mixed; butter and concentrates were down, as were whey and yogurt products. While the U.S.-Japan agreement provided similar access to the Japanese market for beef and pork, some dairy products were left on the sidelines, namely butter and skim milk powder. However, cheese, one of the largest U.S. dairy exports to Japan, will see the same benefits as TPP partners. The world dairy stage may see a bit of reshuffling over the next couple of years in the wake of new trade deals, a resolution with China, and new suppliers potentially emerging (India).

U. S. milk prices in 2020 are expected to be above a year ago, in part restrained by available heifer supply limiting rapid expansion in the short term. Domestic consumption is expected to underpin the demand for dairy products, and is dependent on continued positive GDP growth. On the producer margin side, feed costs are expected to come down in 2020 with additional corn and soybean acres coming into production and normal yields continuing to support alfalfa availability and lower prices. The improved feed and milk price outlook will bolster dairy profit margins next year.

EXHIBIT 16: World Cotton Ending Stocks



Source: USDA-FAS, U.S. Export Sales for Week Ending August. 29, 2019

Other Crops

Cotton

U.S. cotton growers are ending the 2019 calendar year on a positive note. Cotton prices have recovered off of contract lows following a complicated growing season wrought with volatile weather.

The persistently wet spring weather that inhibited cotton planting was followed by an extended period of drought and intense summer heat that stressed young cotton plants and negatively impacted yields and quality. Micronaire, which is a measure of fiber fineness and maturity, was higher than preferred in drought-affected regions and resulted in quality discounts for growers. This fall, farmers struggled with more weather complications during harvest, particularly in the U.S. Southwest where wet and humid conditions prolonged harvest progress and further reduced crop yields. USDA now estimates this year's average U.S. cotton yield at 799 pounds per acre, down from last year's yield of 864 pounds per acre.

Cotton prices last quarter recovered off contract lows as the market dialed in a smaller-than-expected U.S. cotton crop with nearby futures trading around 65 cents

per pound in early December, up from a low of 58 cents per pound in September. The shrink in the estimate of the total U.S. harvest, though, still leaves production well over last year and competing in a global surplus. Total U.S. cotton production is estimated at 20.8 million bales – up nearly 13% from last year after U.S. farmers shifted acreage to cotton in response to high cotton prices and low grain prices seen earlier this year.

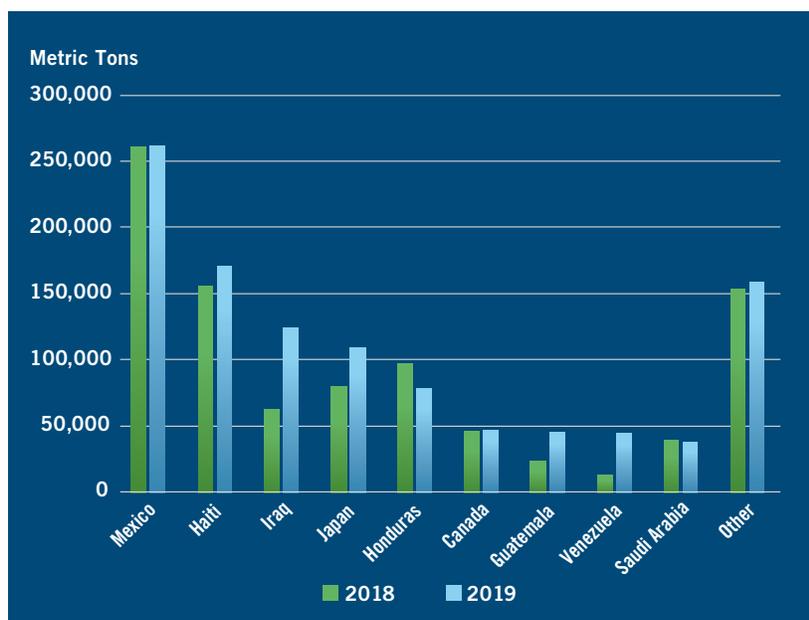
Despite the market rally last quarter, cotton prices remain below the breakeven cost of production for many U.S. cotton growers as the surplus of exportable cotton supplies in the U.S. competes in a saturated global market. World cotton production outside China for the 2019-20 crop year is forecasted to be the second-highest on

record, with the world stocks-to-use ratio excluding China now figured to be the highest since 2011 (*Exhibit 16*). USDA forecasts tradable supplies of cotton outside China at the end of the crop year at a record 50.4 million bales, thanks mostly to significant increases in India and the U.S. The global surplus of cotton remains a concern for farmers making planting decisions for next spring.

With enlarged exportable supplies and lower prices, overseas buyers have responded with more aggressive purchases. Total U.S. upland cotton shipments for the current crop year are running 15% ahead of last year's pace¹⁰ as major buyers like Vietnam, Indonesia, Bangladesh, Turkey, and Pakistan each taking more U.S. cotton than last year. China has also purchased some U.S. cotton despite a 25% tariff. However, U.S. cotton exports to China – the world's top cotton buyer – are still well below previous years as Brazil devours more market share. The phase one deal between the U.S. and China should help to clear U.S. cotton inventories and improve the profit outlook for U.S. cotton growers in 2020.

EXHIBIT 17: U.S. All-Rice Exports

Market Year – Aug. 1-July 31



Source: USDA-NASS

Rice

The combination of a smaller-than-expected U.S. rice crop and a swift export pace continued to lift U.S. rice prices last quarter. Nearby rough rice futures climbed above \$12.50 per cwt as of early December, up about 9% since late October.

Lower yields across the Delta region and mid-South became apparent as harvest trudged through wet and humid conditions this fall. Wet planting conditions and intense summer heat resulted in disappointing yields, particularly in Arkansas and Louisiana. USDA now figures the national average rice yield at 7,587 pounds per acre, down 1.4% YoY.

The U.S. long-grain rice crop, which is the predominate variety grown in the Delta region and mid-South, is seen falling sharply to 127.1 million cwt, down 22.5% YoY, from a steep drop in acreage and lower yields. The combined medium- and short-grain rice crops grown predominately in California are estimated to be 60.9 million cwt, up 1% YoY.

U.S. rice exports, meanwhile, have surged over last year's pace despite the decline in this year's production. So far this 2019-20 marketing year beginning Aug. 1, all-rice accumulated exports are 16% greater than last year, with top markets Mexico, Haiti, Iraq, and Japan each buying more rice than last year (*Exhibit 17*). Giving another boost to U.S. rice exports was the trade agreement in November between the U.S. and South Korea that allows for 132,000 tons of U.S. rice exports into Korea each year. The quota is the highest level of market access for rice the U.S. has had into the Korean market.

The strong export momentum for U.S. rice, though, belies the competitive global market saturated with ample rice supplies.

USDA currently figures global rice ending stocks at 177 MMTs, up 2.1% YoY. India, the world's top rice exporter, is currently forecast to produce a stout 115 MMTs, down only marginally from last year's record crop.

Rice markets outside the U.S. have been softer with export prices in India falling to five-year lows due to trade uncertainty in the key export market of sub-Saharan Africa. In October, the Nigerian government closed all of its land borders to the movement of goods to curb the smuggling of rice and subsidized fuel, with the borders expected to be closed until at least Jan. 31, 2020. U.S. rice exports to Nigeria, though, are minimal, thereby limiting the impact on U.S. rice growers.

Sugar

Domestic sugar production is down sharply for 2019-20, and imports will surge to a 39-year high to cover the shortfall. The short crop is largely due to poor weather in the Red River Valley, which has cut sugar beet output by 12% YoY.

The cold, wet fall in many sugar beet production areas drastically slowed the pace of harvest this year, leaving major portions of the crop unharvested. Current

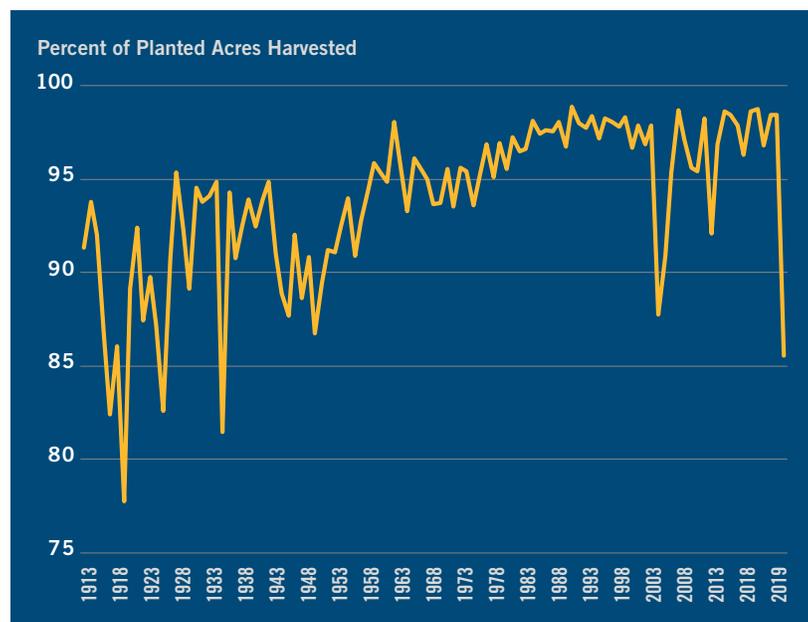
USDA-NASS forecasts for sugar beet harvested acres imply the lowest level of percent harvested since 1934, coming in at a projected 86% of planted acres (*Exhibits 18*). However, this is a national average and some areas have experienced even greater losses.

Thus far in the early part of the 2019-20 marketing year, some sugar suppliers have struggled to make good on contracts with food manufacturers. An increase in raw sugar imports, mostly from Mexico, will shore up supply in Q1 2020. Those supplies have been slow to arrive because Mexico's harvest has been slower than normal.

In early December, a significant change was made to U.S. sugar policy. Insufficient reporting and documentation at the Department of Commerce enabled CSC Sugar L.L.C. to prevail in a lawsuit related to the amended Mexico-U.S. suspension agreement established in 2017. As a result, the 2017 policy amendment has been terminated by the DOC, and U.S. imports from Mexico will now be regulated by the policy that was established in 2014. This will have an impact on reference prices and the mix of raw/refined sugar that can be shipped into the U.S. The impact will likely be negligible this year given the need for more sugar from Mexico.

Meanwhile, sugar consumption continues to weaken. The pace of sugar deliveries to the food and beverage market continues to slip, despite promising signs during the first half of 2019. Weakness in Brazil's currency also remains a persistent headwind to U.S. sugar exports with the Brazilian real at a four-year low. USDA currently forecasts sugar exports for the current marketing year at 35,000 short tons, unchanged from last year's pace but nearly 80% lower than the amount of U.S. sugar exported in the 2017-18 crop year.

EXHIBIT 18: Percent of Sugarbeet Crop Harvested



Source: USDA-NASS

EXHIBIT 19: Tree Nut Exports

2018-19 vs 2017-18

	Volume*	Value
Almonds	-0.9%	0.1%
Pecans	-14%	-28%
Walnuts	6%	-21%
Pistachios	22%	24%

* Shelled weight equivalent basis - August - July

Source: U.S. Customs (via Global Trade Tracker)

Specialty Crops

Tree Nuts

Almonds: While final production numbers are not yet out, industry expectations for the 2019 harvest remain around 2.4 billion pounds.¹¹ While this is up from the July USDA-NASS estimate of 2.2 billion pounds, it has remained in the ballpark of industry expectations. However, there has been a great deal of reported yield variation, between both northern and southern production regions as well as eastern and western regions.¹² Meanwhile, demand and prices remain strong. Year-to-date exports are up almost 7% over year ago levels,¹³ (*Exhibit 19*) with October shipments posting a historic high for any month in California history.¹⁴



Grapes

Wine Grapes: Fears regarding fire and frost impacts on the grape harvest have largely abated. According to Ciatti's November California report, wine grape yields are expected to be average and quality is generally good in all areas.¹⁵ However, sluggish domestic and global demand along with high inventories and limited tank capacity have led to the rejection of shipments for smoke taint, mildew, and other imperfections as buyers are being very selective. The struggle to find buyers, combined with depressed prices, mean the volume of grapes left unharvested could reach the high levels seen in the early 2000s. Growers in some areas report intentions to pull out vineyards if they don't have contracts by January of 2020.¹⁶

Raisin Grapes: Already high raisin inventories are likely to climb even higher. While production is expected to hold relatively stable this year, increased supply from Thompson seedless are expected as they struggle to find a home in other end markets.¹⁷

Table Grapes: While below expectations earlier in the season, 2019 table grape production is expected to hold relatively stable.¹⁸

Citrus

Oranges: Early USDA-NASS forecasts for 2019-20 total orange production are on par with 2018,¹⁹ which is above hurricane-impacted 2017 levels, and further strengthens the argument that the downward trend

caused by citrus greening may be weakening. On the sales side, fresh orange shipments are down almost 50% year-to-date (August-October).²⁰

Grapefruit: Based on early USDA-NASS forecasts, 2019-20 grapefruit production is expected to be up 5% over 2018-19.²¹

Other Fruits and Vegetables

Tomatoes: The volley continues. On May 7, 2019, the U.S. withdrew from the 2013 Suspension Agreement on Fresh Tomatoes from Mexico. As a result, a 17.6% tariff was placed on Mexican tomato imports and the U.S. Department of Commerce resumed its antidumping investigations. After many months of back and forth negotiations, a new draft agreement was reached on Aug. 20 and signed on Sept. 19. However, on Oct. 11, the Florida Tomato Exchange filed a request to continue the antidumping investigation that was halted by the agreement. Both sides debated before the International Trade Commission (ITC) on Oct. 25 with the ITC ruling unanimously on Nov. 22 that dumped Mexican tomatoes threaten the U.S. tomato industry. Mexican tomatoes were found by ITC to have been sold at 21% less than fair market value. As a result of the ruling, the suspension agreement with Mexican tomato growers will remain in place.²²

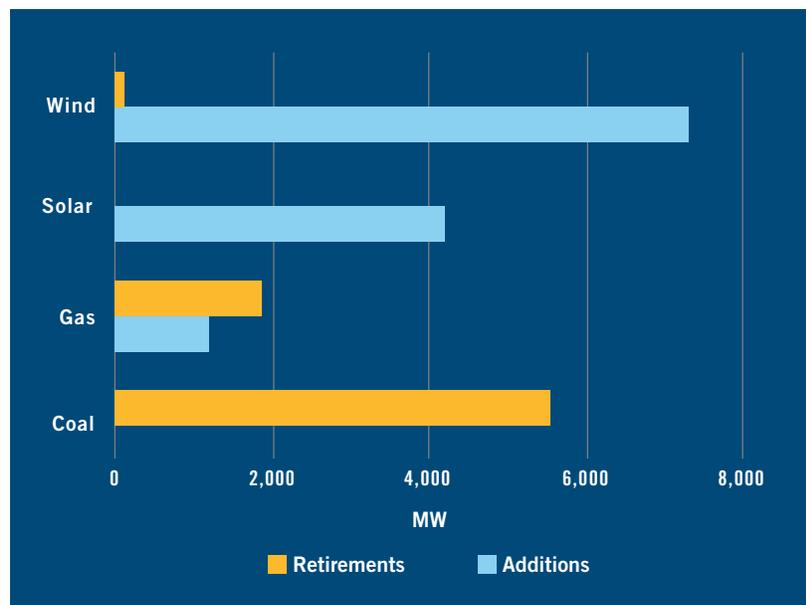
Infrastructure Industries

Power and Energy

Natural Gas Supply Surges, Driving Prices Lower

Despite relatively low spot prices throughout the year, U.S. dry natural gas production in 2019 is projected to exceed 2018 totals by 10%, reaching 92.1 billion cubic feet per day (Bcf/d).²³ Average Henry Hub spot pricing was just \$2.48/MMBtu in October-November of 2019, a drop of 16% compared to the same period in 2017, and 33% less than the same period in 2018. Compared to the overall average for the same periods for the past five years (2014-18), the most recent Henry Hub spot price is discounted by \$0.68/MMBtu.²⁴

EXHIBIT 20: Q4 2019 U.S. Generating Capacity Additions and Retirements



Source: S&P Global Market Intelligence

Despite forecasts of robust domestic demand, growth in U.S. dry natural gas production is projected to moderate significantly in 2020 as the exploration and production cycle responds to H2 2018 market gas prices. However, 2020 average Henry Hub spot price projections differ widely across prominent forecasting shops. For instance, IHS Markit projects the 2020 average Henry Hub spot prices to be \$1.92/MMBtu, markedly lower than the average forecast of \$2.75/MMBtu.²⁵

Quarterly Generating Capacity Additions

In Q4 2019, over 12,870 MW of primarily renewable generating capacity came online across the U.S. (*Exhibit 20*). Over 7,300 MW of wind capacity spread across 18 states came online in this time period with the greatest amounts of new capacity added in Texas (2,000 MW), Illinois (920 MW), and South Dakota (910 MW). The following five wind projects were the largest to come online in the quarter:²⁶

- 450 MW High Lonesome Wind Power facility in Texas (Enel Green Power);
- 400 MW Orient Wind Farm in Indiana (Orient Green Power Co.);

- 340 MW Palo Alto Wind Energy Project in Indiana (Invenergy);
- 330 MW Mesa Canyons Wind in New Mexico (Pattern Development); and
- 310 MW Crocker Wind Farm in South Dakota (Geronimo Energy).

Nearly 4,220 MW of solar power generating capacity came online across 28 states in the same timeframe with the greatest amounts of new capacity added in Texas (1,040 MW), California (870 MW), and Georgia (660 MW). The following five solar projects were the largest to come online in the quarter:²⁷

- 250 MW Phoebe Energy Project in Texas (Innergex);
- 240 MW Misae Project in Texas (LAE American Energy);
- 200 MW Roadrunner Solar Project (aka Queen Solar) in Texas (Enel Green Power);
- 200 MW Wright Solar Park in California (Frontier Renewables) contracted to Peninsula Clean Energy, a community choice aggregator; and
- 170 MW Naval Air Station Lemoore Solar (Recurrent Energy).

Just 1,190 MW of natural gas-fired generating capacity came online across seven states in Q4 2019, with the 585 MW Asheville CC being the largest.

Quarterly Generating Capacity Retirements

In Q4 2019, approximately 7,565 MW of primarily fossil-fired generating capacity retired across 10 states. Of the 5,575 MW of coal-fired generating capacity that went offline, the largest single retirement was the remaining 1,500 MW of Navajo Generating Station (the first 750 MW retired in Q3 2019) in Arizona. Impressively low natural gas prices in and around the Marcellus and Utica shale basins contributed to the retirement of four of Illinois' coal-fired generators (worth 2,000 MW combined) while Pennsylvania's 830 MW Bruce Mansfield coal-fired power generator also ceased operation.



Rural Water Systems

The many symptoms of aging water infrastructures continue to burden water utilities across the nation. Financially-challenged communities are grappling with the resulting health concerns and significant amounts of non-revenue water (NRW). High incidences of NRW – water that has been produced and is “lost” before it reaches the customer – forces utilities to address infrastructure failures instead of making the many other capital improvements that they know are necessary. This drain on resources is only becoming more acute as utilities face ever stricter regulations and public concern regarding resource conservation.

Fortunately, advancements in data analysis are enabling utilities to predict with some accuracy which pieces of aging infrastructure are most likely to fail.

Utilities are increasingly using machine learning to remotely evaluate the integrity of underground and/or distant infrastructure, including water pipes. Large systems, such as East Bay Municipal Utility District (EBMUD) are using machine learning software to assign risk-of-failure probabilities to individual pipes, which then informs their preventative maintenance efforts. The software employed by EBMUD predicts pipeline breaks by estimating correlation among factors such as pipe age, material, break history, soil chemistry, air and water temperatures, and proximity to

other infrastructure, among other variables. The utility is finding that the software is remarkably accurate in predicting pipe failures.²⁸

Of course, the use of machine learning is not relegated to leak detection. A group of volunteer computer scientists at the Georgia Institute of Technology, University of Michigan, and Brigham Young University demonstrated the tool’s value in predicting with 70% accuracy which homes in Flint, Michigan, had lead pipes – a momentous achievement given the city’s limited recordkeeping on pipelines across the city.²⁹ By contrast, when the machine learning method was not used, the success rate fell to just 15%.³⁰

Telecommunications

USF ban on Chinese-made Telecom Equipment

The Federal Communications Commission (FCC) made its final ruling against Chinese manufacturers ZTE and Huawei, both of which are deemed a “national security threat.” According to the order,³¹ the commission “has barred use of its \$8.5 billion a year Universal Service Fund (USF) to purchase equipment and services from companies that pose a national security threat.” Also, in an accompanying Notice of Proposed Rule Making (NPRM), the FCC is requiring companies that have such equipment in their networks rip and replace it with equipment from “covered companies.”

This order places significant operational and financial burdens on affected rural operators who rely on USF support to run their telecom networks. Many of these networks are in high-cost, sparsely populated areas. Without USF support, it’s conceivable that some operators will not be able to sustain operations at current levels. This could mean network outages for customers in markets where there is only one service provider. Making matter worse, because the NPRM requires operators to rip and replace Chinese-made equipment, operators will be loath to spend any money to support their networks. If they eventually need to rip and replace the equipment, there is zero incentive to spend any money adding capacity/fixing network issues.



This entire process puts affected operators, who rely on USF support, in a holding pattern until everything gets resolved. This is problematic for operators and their customers in high-cost areas where communication options are limited.

Rural broadband funding

The mid-December federal spending bill includes an additional \$555 million for the deployment of rural broadband. The funds will be allocated to the USDA in a third tranche of funding for the ReConnect program which was created in 2018.

Sprint-T-Mobile merger

As Sprint and T-Mobile work towards consummating their merger, some states remain in the way and are headed to court as a result. As of this writing, New York and California are leading the charge³² to block the merger before a judge in Manhattan Federal Court.

Initially, over 20 state attorneys general filed suit to block the deal. Since then, several states have dropped out as the new T-Mobile has committed to network 5G coverage milestones, many of which are in rural America.³³ For example, the state of Texas now supports the merger after T-Mobile committed to providing “5G wireless broadband coverage to areas where most Texans live” and across most rural parts of the state over the next three years.”

For those states going to trial, their primary concern is anti-trust in nature. Despite Sprint’s merger divestitures that will create a new fourth player – Dish Networks – the states are concerned about rising prices for consumers.

The new T-Mobile’s commitment to expediting its 5G rural network build plan is an important development for these markets. New technologies like precision agriculture need a high-speed wireless connection to work. Given the fact that 19 million residents in rural America lack broadband access, these commitments could make a profound impact in rural America.

Conversely, they could also become a competitive headwind for small rural wireless operators if the new T-Mobile decides to overbuild existing markets. While this is certainly a possibility, T-Mobile could also enter into strategic relationships and/or new roaming agreements with rural operators instead. This could blunt the impact to incumbent operators. ■

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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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**CoBank's Knowledge Exchange Division welcomes readers' comments and suggestions.
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