



QUARTERLY U.S. RURAL ECONOMIC REVIEW

Agriculture Contends with Large Supplies and Trade Uncertainties

December 2017

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

Inside this Issue...

Global Economic Environment 2
 U.S. Economic Environment 4
 U.S. Agricultural Markets 4
 Grains, Oilseeds, and Biofuels 5
 Farm Supply 8
 Animal Protein 9
 Dairy 12
 Other Crops 13
 Specialty Crops 14
 Infrastructure Industries 16
 Power and Energy 16
 Rural Water Systems 17
 Telecommunications 18

KEY POINTS:

- Uncertainties over U.S. trade policies have made some foreign buyers reexamine their supply chain dependency on U.S. products and provided an opportunity for U.S. competitors to aggressively pursue bilateral trade agreements.
- Farmer cooperatives are benefiting from large product movement as producers seek to maintain cash flow. But co-ops will be under increasing pressure to provide inputs, productivity enhancements, speed and space and risk management options at lower costs while assuming greater inventory risk.
- The abundance of grain supplies continues to aid end-users. Livestock producer margins are solidly in the black, dairy producers are expanding, and ethanol plants are able to manage through low ethanol prices.
- Total harvested U.S. rice acres hit a 30 year low in 2017. Heavy summer rains and damage from Hurricane Harvey led to a 20 percent contraction in the U.S. crop. In 2018, attractive prices should give a healthy boost to long grain acres in the Mid-South.
- Citrus greening and hurricane Irma slashed Florida’s non-Valencia orange and grapefruit crops by almost 40 percent. Current fresh orange and grapefruit shipping point prices are about 50 percent and 30 percent higher than last year, respectively.
- In 2018, the power generating industry is expected to roll out the most new capacity in a single year since 2003. The portfolio of new assets will be highly diverse, encompassing natural gas, solar and wind.
- The FCC has repealed net neutrality and transitioned regulatory oversight of the internet to the FTC. This highly controversial move could shift the playing field for internet service providers and content providers.

U.S. agriculture faces a challenging environment with large global supplies, near record global demand and significant competition from other suppliers. World inventories of major crops remain above historical averages, limiting the potential upside price movements. At the same time, global trade flows for most agricultural products are at record or near record levels amid intense global competition. The competitive position of U.S. exporters has been impacted by the value of the U.S. dollar and uncertainties regarding ongoing trade negotiations and potential trade disputes. The U.S. dollar has trended lower in 2017 but its value remains high relative to recent years and has made U.S. goods more expensive to foreign buyers. Uncertainties over U.S. trade policies have made foreign buyers reexamine their supply chain dependency on U.S. products and provided an opportunity for U.S. competitors to aggressively pursue bilateral trade agreements that may disadvantage U.S. exporters.

Producers have been reluctant sellers in this environment and are unlikely to turn aggressive in the near term unless weather related events undermine current production expectations in the Southern Hemisphere. This could add volatility to price movements in 2018 as the next crop year progresses. Despite a solid growth path for the world economy it seems unlikely that the demand side can be a driver of higher prices unless coupled with some deterioration in 2018 harvests. The animal protein and dairy sectors will continue their expansions in 2018 and their prices will be heavily linked to growth in the export market. Domestic markets for animal protein and dairy products will remain strong with U.S. economic growth providing continued gains in employment and consumer income.

U.S. net farm income has steadied in 2017 after declining nearly 50 percent from 2013 to 2016. The significant increases in farm income during the 2011-2015 period have buffered this transition to lower income levels but stress is apparent in many commodities and regions. Farmer cooperatives will benefit from larger product movement as producers seek to maintain cash flow but they will be under increasing pressure to provide inputs, productivity enhancements, speed and space and risk management options at lower costs while assuming greater inventory risk.



Global Economic Environment

Global economic growth has a broad base of support across the advanced economies and emerging markets. While political uncertainties remain high, global growth is likely to remain around the 3.5 percent long term average. U.S. growth continues to surprise to the upside and will gain support from the passage of tax reform. European growth has also improved and concerns over Brexit have subsided. However, the negotiations over the terms for the exit of Britain from the European Union must be completed by early 2019 and there remain significant differences. Growth in China remains in the 6-7 percent range but some slowdown can be expected in the near term as President Jinping attempts to address the rapid accumulation of debt in the private sector. The emerging markets, particularly in South America, are beginning to build growth momentum as they recover from recessionary pressures.

In this environment the central banks will be cautious in making adjustments to monetary policy but they will likely continue to reduce monetary accommodation across the world in 2018. There remains significant political uncertainty in many regions and the continuing trend toward nationalism and rising protectionist sentiment cannot be ignored.

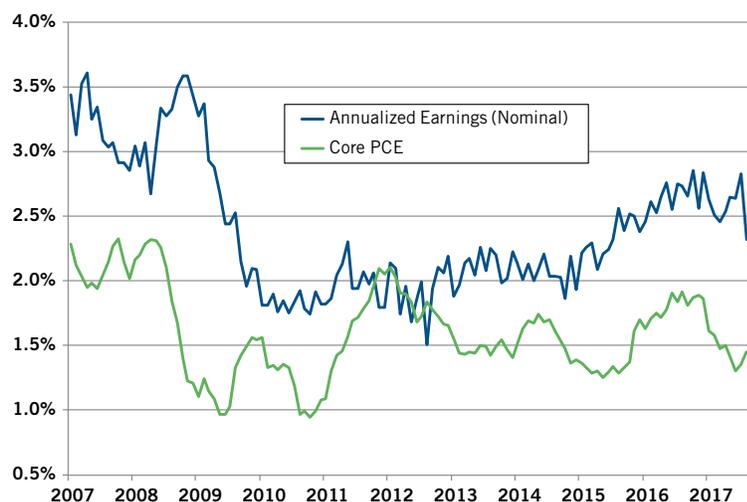
Key factors include:

- The U.S. economy has outperformed expectations over the past year and the passage of tax reform will likely provide an added boost, particularly to business sentiment. Consumer demand remains resilient and will continue to provide a foundation for growth around 2.5 percent. This will provide support to the global economy.** However, significant political uncertainty remains since 2018 is a congressional election year and midterm elections are not generally favorable for the party occupying the white house. Significant policy issues, particularly on the trade side, remain unresolved and will be in play during the election season.
- The outlook for Europe has improved but Brexit still remains on the table and the leadership in Germany, France and the U.K. is not on solid footing.** Legislative elections in Germany and the U.K. have undermined the strength of Chancellor Merkel and Prime Minister May. Without strong allies French President Macron may have difficulty in pursuing agenda to strengthen EU integration.
- The U.S. Federal Reserve will continue to reduce its accommodative monetary policies while trying to avoid slowing the economic recovery.** The U.S. Federal Reserve demonstrated its continued willingness to raise rates in December, and reemphasized its commitment to steadily normalize rates through 2018 if economic growth remains on track. Unwinding of the balance sheet is underway and will continue well into the next decade. The Bank of England has increased its policy rate by a quarter point, removing the reduction it put in place following the Brexit vote. The European Central bank is slowing its monthly purchases in its quantitative easing program. Further removal of monetary accommodation across the world is likely in 2018.
- The value of the U.S. dollar has declined by nearly 10 percent since January 2017 and is likely to trend lower in 2018 as other world economies accelerate.** As central bank policies become more aligned and relative growth rates narrow we may see further but limited easing in the value of the dollar. However, if U.S. growth or the pace of rate increases exceeds expectations, the dollar could spring back to life.

“*Further removal of monetary accommodation across the world is likely in 2018.*”

- China poses one of the greater uncertainties in the year ahead. The 19th National Congress in October consolidated political control under President Xi Jinping and reaffirm a commitment to address the debt overhang in the private sector and move the economy toward a “quality of growth” phase.** This may require a slowing in growth in the near term if they decide to delay some fiscal adjustments. However, they remain committed to doubling 2010 GDP by 2020 and that will require more fiscal stimulus over the next three years. The attempts to build global supply chains through the One Belt One Road initiative will be a centerpiece of establishing China in the global arena.
- Some of the political and economic concerns over the Brexit negotiations have diminished but risk will remain as the terms of the exit are negotiated.** Political support for Prime Minister May has declined and the rhetoric around the negotiations has been more tempered from both sides. There could be leadership changes in the U.K. while the leadership in Germany remains steadfastly supportive of the EU commitments. Leadership in France will face a test with labor reforms over the next few months.
- Emerging and developing economies have gained momentum and are benefitting from, and spurring, increased demand for commodities.** Crude oil and industrial metal prices have bounced back, reflecting increased economic activity throughout the world, and further supporting some developing economies.
- Geopolitical risks remain high with potential issues in North Korea, Syria and Venezuela in particular.** Additionally, the rising anti-globalization trend and efforts to adopt protectionist policies may fuel continued political unrest.

EXHIBIT 1: Annualized Private Earnings and Core Inflation



Source: St. Louis Federal Reserve

U.S. Economic Environment

U.S. economic growth has surprised on the upside while the pace of inflation has surprised on the downside. The past two quarters have recorded growth rates of 3 percent or higher at an annual rate as consumer spending and business investment have boosted growth. At the same time inflation as measured by the personal consumption deflator has remained below 1.5 percent. (See Exhibit 1.) The unemployment rate has declined toward 4 percent with wage growth continuing at just over 2 percent. Consumer net worth is at record levels with the debt to income ratio at the lowest level since 2001. Corporate profits reached a record high in the third quarter and business optimism remains high. This growth momentum in the U.S. economy will continue into 2018, particularly if tax reform provides additional stimulus that would coincide with the efforts by the Federal Reserve to reduce monetary accommodation. We will continue to see volatility in the quarter-to-quarter growth rates but the underlying growth remains around 2.5 percent.

The biggest challenge in 2018 will be the political uncertainties that revolve around trade actions and the ability of Congress and the administration to resolve issues on immigration, infrastructure investment and other issues with Congressional elections scheduled in November 2018. Midterm elections are not generally favorable for the party occupying the White House and

control of the House of Representatives may be in play. Renegotiation of trade agreements such as NAFTA and trade issues with China and other trading partners could impact trade flows, particularly for agriculture.

U.S. AGRICULTURAL MARKETS

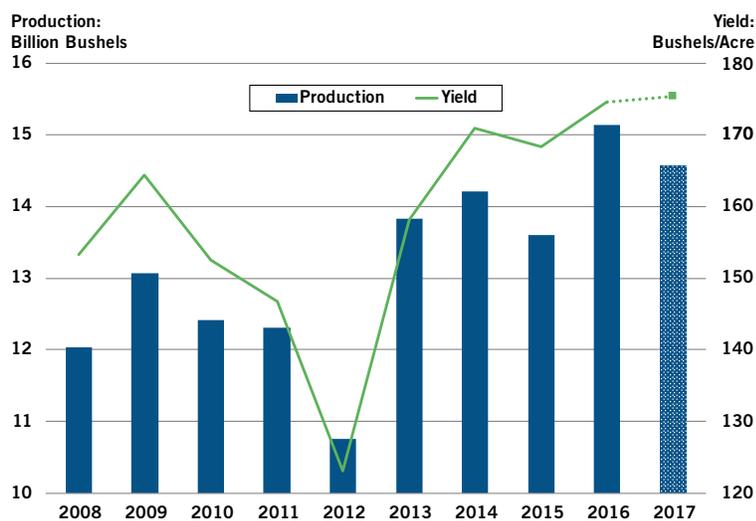
U.S. agriculture must confront significant competitive challenges in the global market despite record or near record world trade levels for most commodities. Large harvests by major non-U.S. exporters and a strong U.S. dollar have resulted in large competitive supplies. At the same time, uncertainties over U.S. trade policies are encouraging many countries to reexamine and potentially diversify their supply chain arrangements.

The strength of the global economy will be supportive of prices in the commodity sector but the large available supplies will limit the upside potential for sales and prices. Production variability in South America could offer near-term pricing opportunities, but only a major cut to yield expectations would change the direction of the market.

The animal protein and dairy industries will continue to benefit from a strong domestic economy, but the export market has become increasingly important as an outlet for the expanding production base. With virtually every segment of the industry expanding production in 2018 the price outlook hinges on the ability to develop and expand export markets. The NAFTA negotiations will be strategically important for the industry since Mexico has traditionally been the number one market for both the animal protein and dairy industries.

Production agriculture and producers will be aggressively seeking options to reduce costs and/or exploit marketing opportunities. This will also put pressure on farmer cooperatives to assist in that effort. The ratio of farm income to assets is approaching the low levels experienced in the 1980s. And the debt to income level has increased steadily in recent years, remaining elevated. However, the value of farm assets (comprised largely of real estate) has not declined despite the drops in income, and the debt to asset ratio remains strong. There is significant variability in economic conditions

EXHIBIT 2: Corn Production and Yield



Source: USDA-NASS

across commodities and regions, and the areas of greatest potential stress are in the Upper Midwest and Corn Belt.

Grains, Oilseeds, and Biofuels

The size of the recent U.S. corn and soybean harvests surprised the market given this year's less-than-ideal growing conditions. Domestic demand growth from the livestock and biofuels sectors will help draw down supplies, as will improved exports. However, the impressive demand will not be enough to shrink stocks.

In South America, a second year of bumper corn and soybean crops will cap any potential price rallies and hamper U.S. export prospects. However, La Niña has begun, and is projected to last for several months, bringing hot, dry weather to Southern Brazil and Argentina.

The abundance of supplies continues to aid end-users. Livestock producer margins are solidly in the black, and ethanol plants are able to manage through low ethanol prices. Biofuel policy has become clearer with the recent Renewable Fuel Standard (RFS) ruling, but the imposition of an ethanol import tariff in Brazil is keeping U.S. producers on edge.

Acreage adjustments going into 2018 will play an important role for the farm supply sector this winter and spring. Wheat acres are projected to decline slightly as winter wheat prices remain below breakeven in many areas of the Southern Plains. USDA's Long

Term Projections peg planted area for corn and soybeans at 91 million acres each. An increase in acres equates to higher volume sales for agricultural retailers improved throughput for grain elevators.

Corn

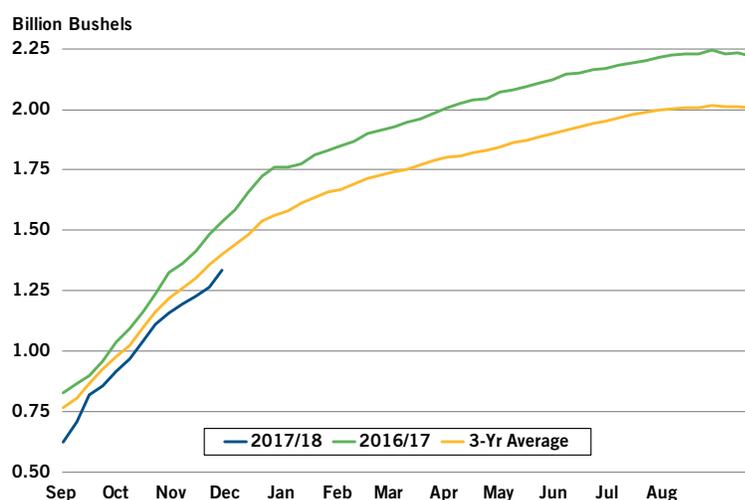
Another large corn crop has come off the fields this fall. 2017 U.S. corn production is projected to be the second largest on record at 14.58 billion bushels thanks to a projected record yield of 175.4 bu/ac. (See Exhibit 2.) Futures markets are responding to the large harvest with significant carry that has hovered around 4 cents/bushel/month.

South American crop development will determine the level of price movement through the winter months. Brazil's Safrinha corn crop will likely be planted later than usual in 2018, increasing the risk that it will be stressed by hot and dry weather during pollination. Additionally, La Niña, which is typically warm and dry for Argentina and southern Brazil, is expected to last through the key development months for full-season corn. Poor weather and a smaller crop would significantly reduce corn stocks in Brazil and improve U.S. exports going into the latter-half of 2018.

The demand side of the ledger for corn has remained a bright note domestically. Projected demand in the U.S. is seen expanding still further in the livestock and ethanol sectors as end users take advantage of cheap supplies and expanded production. Feed consuming animal units continue to rise with cattle, poultry, and hog numbers increasing nationwide, and ethanol producers continue to expand production capacity. Domestic feed in particular is poised to be the major growth opportunity through the next quarter. Ethanol usage is expected to increase only marginally in 2018.

U.S. corn exports, meanwhile, are expected to return to levels similar to the 3-year average following last year's 9-year high. U.S. exporters are encountering greater competition in large part due to Brazil's record large 2017 crop. Competition from FSU-12 countries will also be substantial. The CME Group's listing of a new Black Sea corn contract reflects the region's ever-growing importance.

EXHIBIT 3: Total Export Commitments, Soybeans



Source: USDA-FAS

Soybeans

The U.S. soybean crop harvested this fall is figured to be yet another all-time record. USDA yield estimates have remained stubbornly high despite expectations of lower yields in parts of the Midwest. This level of production is outpacing record demand and putting pressure on prices going into winter. Demand will be record high in the U.S. and globally, but stocks will grow here at home while they shrink abroad.

Despite continual growth in Chinese demand, U.S. soybean exports are off to a slow start for the newly harvested crop with total export commitments only reaching 85 percent of year-ago levels. (See Exhibit 3.) Brazil continues to fill shipments to China long after its export window typically closes. Brazilian producers finally loosened their grip on the record crop, incentivized by a weakening real.

Additionally, China has delayed issuing safety certificates for GM soybeans that could be slowing purchases for all soybeans, not just from the U.S. However, exports should pick up for the U.S. in late 2017 into 2018. China is expected to import 97.0 million metric tons (MMTs) in 2017/18, up from 93.5 MMTs in 2016-17.

The domestic crush will also rise in 2018, driven by rising feed usage and growing demand for soybean oil in biodiesel production. Soybean oil prices are

projected to average well above last year, in stark contrast to expectations for falling prices of soybeans and soybean meal.

Like corn, the focus in the soybean market is shifting to Brazilian and Argentinian weather and production. Soybean production in Argentina is projected slightly lower year-over-year (YoY) as producers shift acres to corn due to the Macri administration's decision to eliminate an export tax on corn but maintain the soybean export tax. La Niña also poses a significant production risk for South America.

Wheat

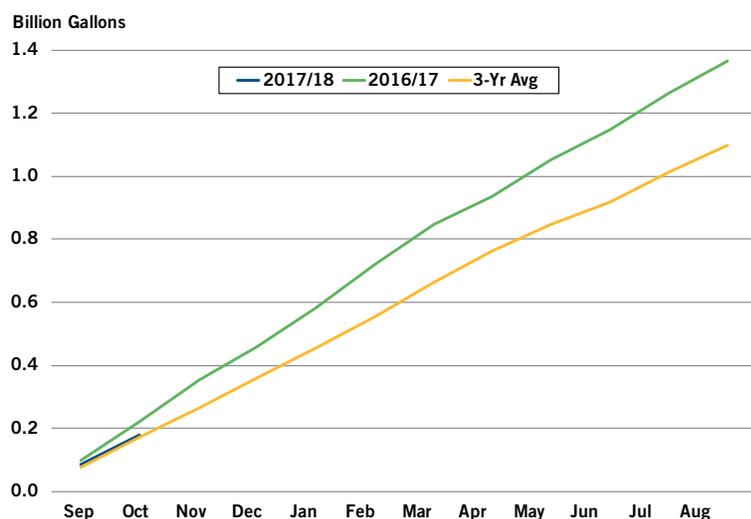
Wheat was the bright spot this quarter as the USDA projected higher export use for 2017/18, and the USDA September Stocks report showed the largest YoY reduction in U.S. wheat stocks since 2010-11. Globally, stocks outside China are also projected to fall for the third consecutive year. While the outlook is improving, and global demand continues to set new records, the worldwide abundance of wheat remains burdensome.

Amidst ample global inventories, the futures carry for most wheat varieties is substantial, and offers solid returns to storage for most elevators. The carry for hard-red winter (HRW) and soft-red winter (SRW) wheat from December to March or May is around 6 cents/bu/month, while the hard-red spring (HRS) wheat carry is around 4 cents/bu/month to May.

Farmers with high-protein wheat benefited from significant price premiums this year – if elevators offered to pay premiums on protein. The significant price premium HRS maintains over HRW or SRW (currently over \$2/bu) reflects the huge demand for protein and the abundant supply of lower-protein wheat varieties. HRS wheat is the only variety projected to benefit from an increase in domestic use in 2017/18. Globally, high protein wheat is also constrained as major high-protein wheat producing areas like Canada and Australia were hit with drought.

U.S. exports have been surprisingly strong given the remarkable increase in Russian wheat production and export capabilities. U.S. exporters are capitalizing on

EXHIBIT 4: Ethanol Exports



Source: USDA-FAS

opportunities from increasing demand in Asia and lower production in Australia, Canada and Argentina. The share of exports going to East and Southeast Asia last year accounted for nearly 38 percent of U.S. shipments, up from 32 percent in 2006/07, while exports to the Middle East and North Africa declined from 17 percent to 10 percent during the same period. As a further sign of this shift, U.S. Wheat Associates closed its Cairo, Egypt office in December.

Further tightening of the U.S. wheat balance sheet is expected in the year ahead with winter wheat plantings estimated to be down another 5 percent YoY. Winter wheat planting started slow this fall with rain delaying fieldwork in the Southern Plains. The delayed planting and current dry weather in the Southern Plains have many worried about crop conditions going into the winter. USDA estimates that 20 percent of winter wheat acres are struggling through drought, which may have a big impact on HRW wheat yields at harvest. While reduced production may help balance supply and demand and support prices, this reduction in volume could hurt elevators and regional producers. If the drought persists, it may also push growers to graze out wheat completely – a decision that will be made during the spring when cattle numbers rise again.

Biofuels

Ethanol margins remain compressed due to low ethanol prices and ethanol stocks that have averaged 10 percent above year-ago levels. Stocks continue to rise on increasing production and lower-than expected demand growth. Cheap corn prices will likely continue incentivizing increased production into 2018, adding still more supply to growing inventories.

Ethanol exports will be the big opportunity in 2018. However, ethanol exports for the 2017/18 marketing year are down year-over-year. (See Exhibit 4.) Risks remain in key export markets. The full impact of the Brazilian import tariff that went into effect in August is still unknown. Despite the import tariff on U.S.

exports to Brazil, the U.S. is expected to export around 450 million gallons next year (down from an estimated 475 million gallons in 2017). Brazil's production capacity will fall short of local demand, sustaining a need for ethanol imports. Additionally, export opportunities with China and the EU are expected to improve. China's import tariffs on ethanol remain in place, but China has also established an E-10 mandate that will be enforced by 2020. The EU will remove anti-dumping duties on U.S. ethanol imports by February 2018. Both China and the EU will remain small importers in the short-term, but may help boost prices on the margin.

Ethanol producers have found relief in rising DDGS prices with Vietnam having re-opened its market to U.S. imports. The first shipments of U.S. DDGS arrived in Vietnam in mid-November. Additionally, China has reduced the import duties on U.S. DDGS, but significant anti-dumping duties over 50 percent remain. The improvements in China and other markets remain incremental.

Political uncertainty in Washington, D.C. continues to be the biggest risk for ethanol producers. Earlier this year, EPA initially proposed to reduce the advanced mandate because anti-dumping duties on biodiesel from Argentina and the Philippines would have effectively cut-off imports from these countries. Without these imports, EPA questioned whether the advanced

biofuel mandate could be met in 2018. The U.S. biofuel industry eventually won the round with the final RFS advanced-fuel mandate remaining at the current level. However, the fight continues as oil state senators, led by Senator Ted Cruz, have retaliated by holding up USDA confirmation votes in the senate. With the RFS still being hotly debated in Washington, policy risk will remain elevated for ethanol producers.

Farm Supply

The projected decline in winter wheat area will likely translate into a drop in spring side-dress applications in the Southern and Central Plains. Spring wheat acres, meanwhile, are expected to be higher on better profitability amid stronger demand and shorter supplies for the higher protein wheat. USDA's latest long-term projections call for a slight increase in corn and soybean acres – welcome news for ag retailers across the Midwest. However, financial pressures from low commodity prices will continue to incentivize farmers to seek ways to trim input costs and shop outside their local service area.

Fertilizer

Fertilizer prices continued to improve in the fourth quarter of 2017 from mid-summer lows. In New Orleans, prices of urea, DAP and potash have trended upward from fall of 2016 to at or above year-ago levels. However, anhydrous ammonia in the Midwest remains depressed with prices 10-20 percent lower YoY. Prices have generally improved thanks to a typical seasonal pattern of fall strength and growing international demand. Supply controls have also played their part with Mosaic announcing that they will idle their plant in Plant City, FL. Improving prices will reward those who are managing fertilizer well as they capitalize on improvements in inventory values.

The Potash-Agrium merger is expected to close this upcoming quarter. Unlike mergers in the seed and chemical industry, this merger has a vertical component because Agrium owns one of the largest ag retailers in the U.S., Crop Production Services (CPS). The additional scale from the combined fertilizer manufacturers will likely provide CPS with lower-cost fertilizer. This also reduces

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the number of fertilizer distributors in the market. Both of these results will put pressure on fertilizer margins for non-CPS farm supply companies going forward.

Seed and Crop Protectants

Consolidation in the seed and crop protectant sector has been active of late. BASF purchased assets from Bayer, including its glufosinate-aluminum business and its North American soybean, cotton and canola seed lines in a preemptive move to satisfy anti-trust regulators. BASF was the last major company to only supply chemicals, and this purchase moves them solidly into the seed business. The sale will preserve some choice in the market, but consolidation in these sectors remains a risk for retailers who face suppliers with more market power.

The Chinese chemicals supply chain is facing supply shortages due to a crackdown on traditional smokestack manufacturing by the Chinese government. Around half of U.S. agricultural chemicals are sourced from China, raising logistical and supply concerns, especially for off-patent chemicals. This shortfall is pushing prices higher. Glyphosate prices in China are up 50 percent YoY, and imidacloprid has more than doubled from year-ago prices. This may not impact U.S. retailers this winter, but the developing situation may affect the U.S. going into the 2018 growing season. Retailers are likely to feel pressure from both ends of the supply chain. The supply shortage will push prices up at the manufacturer level, while the farmer will continue to pressure retailers to keep prices low.

According to the University of Missouri, more than 2,700 dicamba-related claims of crop damage from spray drift or volatilization have thus far been reported across the U.S. Estimates indicate that approximately 3.6 million acres of soybeans (4 percent of planted acres) were

impacted. BASF maintains that most soybeans damaged by dicamba over the summer did not impact yield. Some anecdotal evidence supports this, while other evidence does not. The industry and academics are still not sure and do not agree on whether off-target-movement of dicamba is related to the chemistry of the products or related to application-specific issues. Regardless, the EPA has released final label changes for next season, while Arkansas banned dicamba spraying after April 15, and Missouri banned spraying after June 1 and July 15 depending on the farm's location. The difficulty for applicators may not be in following the new labels, but finding time to spray fields in such narrow windows without being off-label. Using four years of data from the Iowa State Research Farm, researchers found that there were on average only 5 hours per day in late-May and 9 hours per day in mid-June to legally spray dicamba under the new EPA label.

Spraying dicamba for customers may be an opportunity for custom applicators – if they can execute. The applicator can step into a trusted advisor role by being able to educate the grower and perform a valuable and potentially complicated service for them. The risk remains in the execution. If the ag retailer makes an error, they may face costly damage claims and litigation as insurance is not interested in covering claims without clear causation linked to a specific application event.

Animal Protein

Expansion in the livestock and poultry sectors continues. The overall meat volume produced in the U.S. is the major concern moving into 2018. A growing dependence on the global market not only creates opportunities for U.S. producers but also heightens the risk of a domestic oversupply situation.

Total meat and poultry supplies are on pace to grow 2.5 percent in 2017, followed by a similar YoY increase in 2018. Export demand has been robust in 2017, capping domestic per capita supply growth at less than 1 percent. Current forecasts call for a slight uptick in total meat and poultry per capita supply growth of near 1.5 percent in 2018. While the industry is in full expansion mode, even slight increases in per capita availability can have



a ripple effect on prices. Strong domestic and global demand is expected to continue through 2018. However, demand levels are more difficult to predict than supply expectations, leaving the industry open to potential surprises in either direction.

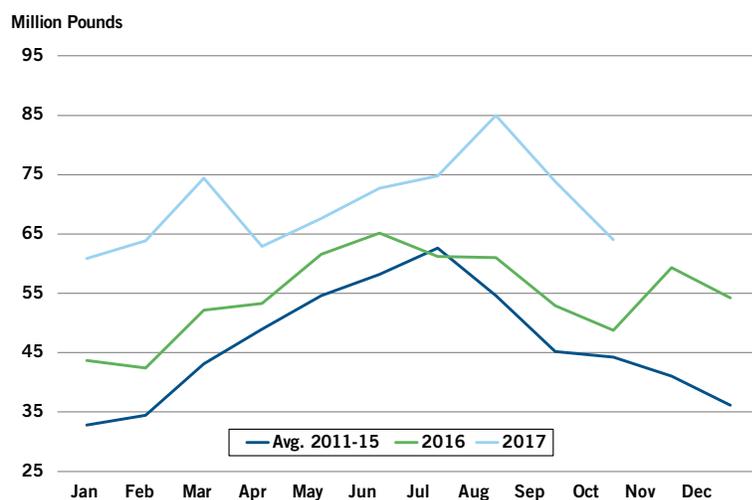
Beef

Despite downward price pressure from rising beef output, demand has exceeded expectations and fueled profitability for the U.S. beef industry. Every sector of the supply chain is on pace to record positive margins in 2017, a significant turnaround for some sectors that faced challenging margins the past two years.

The U.S. cattle herd continues to expand, albeit at a slower pace than previous years. The result of aggressive herd expansion is a boost in overall beef production, on pace for a 3.7 percent increase in 2017. Output is projected to grow by another 4.5 percent in 2018, outpacing the more modest increases expected for pork and poultry.

Excellent packer profitability and robust domestic and international consumer demand have supported record slaughter levels in the fourth quarter of 2017. Year-to-date (YTD), federally inspected cattle slaughter is 5.5 percent higher than year ago. A 1.5 percent pull back in weights, due to aggressive marketings and current feedlot inventories, has limited overall beef production to 3.8 percent YTD.

EXHIBIT 5: U.S. Beef Exports to Japan



Source: USDA-ERS, USDA-FAS, Livestock Marketing Information Center

The expansion phase of this cattle cycle is expected to continue through the end of the decade, but will ultimately be determined by pasture/range conditions and profitability at the cow-calf level. Several years of excellent forage conditions fueled the cow herd expansion. In late 2017, drought conditions are beginning to creep into major cow country. If conditions worsen, the drought could shift the cow herd and create regional feeder cattle placement imbalances.

Price spreads for margin operators have returned to historical relationships throughout 2017, in contrast to significant production and pricing volatility in recent years. More normal price spreads have allowed profitability to return and offer more flexibility in terms of executing hedging opportunities.

The cattle feeding segment experienced record profitability in 2017, largely due to better than anticipated demand levels and aggressive buying by packers. The outlook for 2018 remains positive, but packers have gained leverage over cattle feeders due to high capacity utilization at feed yards and excellent profitability at the packing level. This scenario will play out through the first half of 2018, but not be detrimental to cattle feeding margins in the short term.

Positive feedyard margins, along with a positive forward cattle crush, have supported calf and feeder cattle prices. In early December, feeder cattle prices are, on average, 18 percent higher than year ago while live cattle prices

are down nearly 6 percent. This is somewhat negative for cattle feeding margins but also reflects the positive feeding margins for cattle to be marketed in early 2018.

Despite YoY increases in beef production, cutout values in late 2017 are nearly 10 percent higher than last year. A smaller increase in live cattle prices has bolstered packer profitability during the fourth quarter. Ongoing international demand as well as seasonal holiday rib demand has been supportive of the cutout and packer profitability.

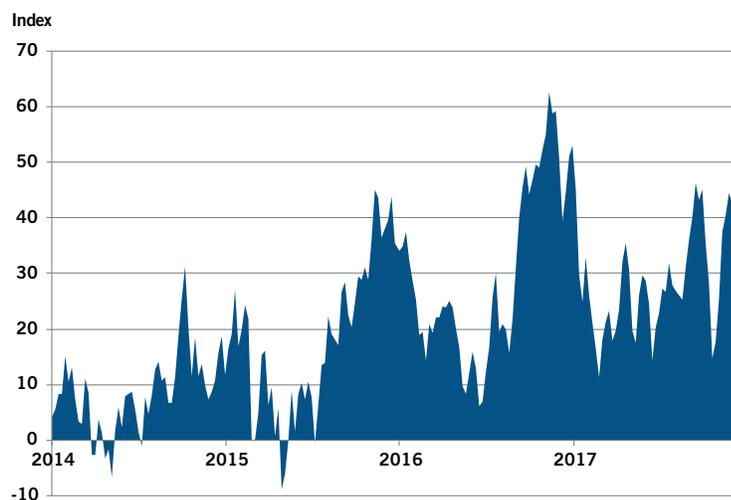
A recalibration of camera grading software in 9 major beef processing facilities created some short term price volatility in the fourth quarter of 2017. A perceived shortage of choice product leading into the critical holiday demand period sparked one of the largest 2 week cash cattle rallies on record. The market has since adjusted closer to a balance of supply and demand.

Retail beef prices have held steady in the fourth quarter of 2017, despite record amounts of product being produced. This is atypical because retailers and restaurant operators typically must increase featuring activity and lower prices to absorb the increased supply. This has not happened in 2017. The expectation moving into 2018 is for retail prices to be steady to lower. Increased competition from growing pork and poultry supplies will likely result in more competitive retail beef prices.

A strong U.S. consumer base is certainly an overall positive factor for the beef industry. However, much of the production increases must rely on steady to growing global demand in order to clear the excess supply. Through October, YTD beef exports are 14.3 percent higher than last year. (See Exhibit 5.) Export volume is currently forecast to increase 3-5 percent in 2018. Recent history suggests global demand has the potential to surprise the market and exceed expectations.

Strong import demand is fueling the market in key destinations such as Japan, South Korea and Hong Kong. Japan continues to be the pacesetter, posting a 19 percent increase in volume in October. However, the market is concerned about market access to Japan as the U.S. faces significantly higher tariffs than Australia. The

EXHIBIT 6: Weekly Pork Packer Margins



Source: HedgersEdge, Bloomberg

industry remains optimistic about trade prospects with China, but few U.S. cattle are eligible to meet China's import requirements.

Pork

New pork processing capacity has come online in the fourth quarter of 2017 and leverage dynamics between producers and packers are playing out as expected. Profitability at the packer level and the desire to fill new shackle space has created competition for market ready hogs and benefited the producer. (See Exhibit 6.) Strong consumer demand and continued export growth have supported elevated slaughter levels.

Barrow and gilt slaughter numbers have increased 2.4 percent YTD in 2017. A slight pull back of 0.2 percent in weights has resulted in a modest 2.2 percent increase in overall pork production. Additional packing capacity will come online in 2018 and an increase in market ready hogs will support the new capacity. Pork production is expected to increase 3.1 percent in 2018, pointing to a modest increase in supplies. To support this increase, the market expects global demand momentum to continue.

The success of new packing facilities will hinge on continued demand growth, both domestic and globally. In 2017, exports will represent over 26 percent of total pork production, an entire percentage point higher than last year. As the industry becomes more export dependent,

the risk of a domestic oversupply situation is heightened. A natural transition to new plants and a phasing out of existing facilities will occur over the next two years. Any major export disruption would likely put pressure on outdated, less efficient facilities.

Pork exports are up 8 percent through the first ten months of 2017 and on pace to break \$7 billion in value for the second time in history. October export value averaged \$51.41 per head, up 9 percent from a year ago and the highest since July.

Export growth has been excellent in key markets including Mexico and Japan. But China will remain the focus of the global pork market.

U.S. export volume to China is down 8 percent YTD, reflecting the ongoing buildout of China's domestic pork industry. However, China has exhibited an increased willingness to pay as the value of its imports declined only 1 percent.

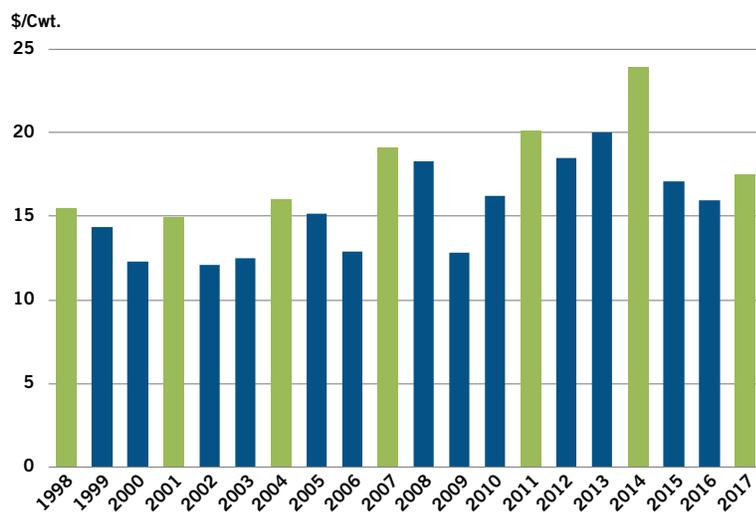
Poultry

U.S. broiler integrators have increased production only 1.3 percent in 2017. Egg sets are slightly higher in early December, indicating continued supply growth in the early part of 2018, but output increases for 2018 should be limited to 1-2 percent. Forecasts for 2018 are calling for an annual increase of 1-2 percent. Hatchability remains low and is limiting overall supply growth.

Abundant feed supplies at low prices will support integrator margins throughout 2018. And demand expectations are driving the optimism for continued chicken value support. Whole bird production is expected to lead the way in terms of cents per pound margin of nearly 25, with the cut up and deboning sectors still expected to be lower but still positive around 10 cents per pound in the first part of 2018.

Annual migratory patterns in the U.S. make avian flu a greater risk from the end of the year through the spring months, so producers are preparing for potential exposure from migratory waterfowl. Excellent biosecurity protocols that were enhanced following the 2015 outbreak are in place and the industry is confident that they will insulate the industry from a major outbreak.

EXHIBIT 7: Three-Year All-Milk Price Cycles



Source: USDA-NASS

Wings have cooled off from the price spike earlier in 2017. Excellent consumer demand for wings is expected in early 2018 and has the potential to raise overall integrator profitability should prices remain strong. Leg quarter values have also been increasing due to export growth and a recovery from the 2015 avian flu related trade restrictions. Leg quarters, too, have the potential to bolster integrator profitability should demand exceed current expectations into 2018.

YTD broiler exports are up 2.8 percent through October. Exports are expected to increase 1-2 percent in 2018, and the continual diversification of export destinations is a major advantage for U.S. integrators.

Dairy

Dairy industry prognosticators often point to the three year cyclical pattern observed in milk prices. A year of high prices triggers production expansions which drive down prices the following year. The lower prices lead to a contraction in milk production and a pick-up in demand. Eventually, markets tighten enough that prices climb and the cycle begins once again. 2014 was perhaps the most memorable peak to this three-year cycle in recent history. (See Exhibit 7.) 2017 was another peak year – higher than 2015 and 2016 – but unspectacular in comparison.

Historically, it's been a pretty safe bet to count on a drop in prices following one of these cyclical peaks. But there

are also a number of fundamental reasons to expect downward price pressure in 2018. Luckily, there is enough underlying consumer demand strength to limit the severity of any price drop.

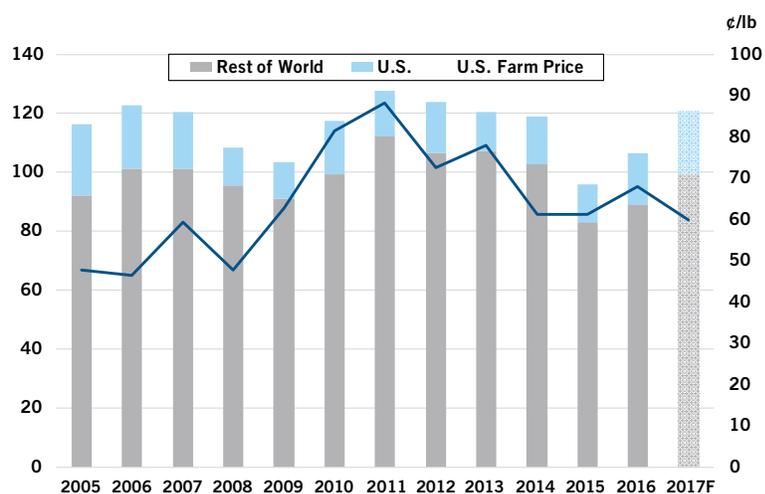
The rate of growth in milk production is expected to slow somewhat in 2018, but the level of production worldwide is still heavy compared to near-term commodity demand. Cow numbers in the U.S. climbed quickly early in the year, but have been declining gradually since August. Low feed costs have maintained moderate profitability on average, but increasing labor and other peripheral costs in a lower milk price environment will dampen any expansion plans amongst all but the most efficient producers. Meanwhile, the EU is in growth mode once again, despite continued concerns about powder inventories overhanging the market.

The current milk pricing environment is defined by strong demand and high prices for the roughly 3.8 percent of milk that is made up of fat which typically makes its way into high-value consumer goods, while the surplus of the remaining skim solids are dragging down the 8.7 percent of the milk known as “other solids” which typically become commodity products. The remaining 87 percent is water. Unless a significant new source of demand for skim solids appears, this pricing trend will continue. For processors, it will be critical to optimize product mix to avoid building up stockpiles of nonfat dry milk.

Demand for cheese is strong, but inventories continue to set new records. Lower tariffs on a number of consumer goods in China, including cheese, should boost U.S. market share in the growing Chinese cheese market and reduce U.S. inventory. U.S. exports to China are currently trailing those from New Zealand and Australia, but high levels of farm debt and environmental concerns are expected to limit expansions in Oceania.

There appears to be no relief in sight for the powder markets. The EU continues to hold significant inventories of skim milk powder in government intervention stocks. Recently, EU Commissioner for Agriculture and Rural Development, Phil Hogan has stressed the need to both

EXHIBIT 8: Cotton Production and Prices



Source: USDA-ERS

sell the current intervention stocks and avoid buying any additional product under public intervention in 2018. With no support programs in the U.S. (they were dropped to make way for the Margin Protection Program in the 2014 Farm Bill), no intervention purchases in the EU, and with Canada tying their skim prices to the lowest world price, new lows may be on the way in global powder prices.

For the upcoming year, we expect a seasonal first quarter price decline, and full-year average prices to fall below those of 2017. Thanks to continued strong demand for domestic consumer goods, the drop will be limited. The markets will be a balancing act between the strong demand for milkfat and resulting surplus of skim. As a result of consolidation and longer planning horizons on the farms that produce the majority of the nation's milk, the three year cycles of the future will likely be more muted than those of recent years. That bodes well for those averse to volatility, but will put astronomical peak years like 2014 farther in producers' rearview mirrors.

Other Crops

Cotton

The 2017 U.S. cotton crop is estimated to be 23 percent larger than the 2016 crop, driven by a rebound in plantings in all the Cotton Belt regions. (See Exhibit 8.) Consequently, 1.9 million more acres of cotton were harvested this year. Increased competition from other

major cotton exporters is expected to lower U.S. exports this season. Notwithstanding 2017/18 exports are set to be the third highest on record. The large crop will likely lead to a doubling of ending stocks, sending them to levels not reached since 2008/09. The increased supply will put further downward pressure on prices. Average 2017 upland cotton farm prices are projected to run from 55c-65c/lb. By comparison, 2016 cotton prices averaged 68c/lb.

Cotton production is up globally, too. World output is 13 percent higher YoY and will again exceed consumption. However, consumer demand is improving as a result of higher synthetic prices and more competitively priced cotton. This has prompted expansions in cotton

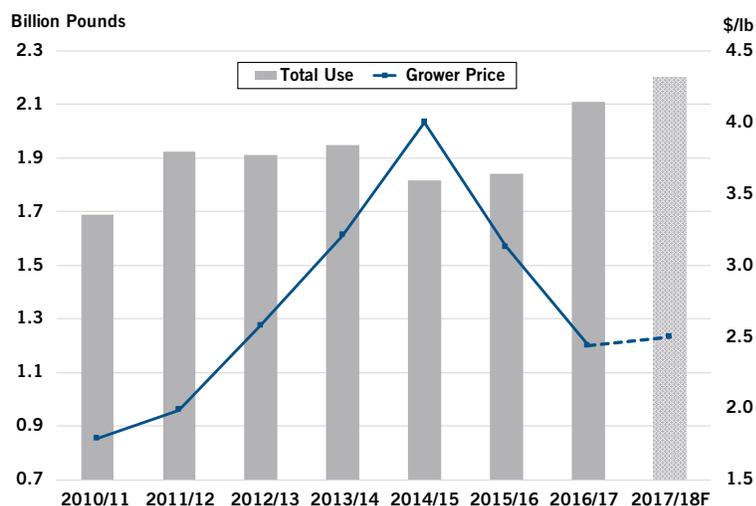
mill use in the major cotton spinning countries other than China, which continues to be the world's leading cotton user. In response to increased global consumption in 2017/18, world cotton exports are set to rise. China will continue to sell off stocks this season, but higher world production and increased ending stocks in India, Brazil and the U.S. will result in a small increase in global ending stocks.

Rice

Total harvested U.S. rice acres hit a 30 year low in 2017. Heavy summer rains and damage from Hurricane Harvey led to a 20 percent contraction in the U.S. crop. Arkansas and Missouri fared much better than the average, but production in Texas and Louisiana was well below normal. Although the bulk of Texas and Louisiana's rice crops were harvested by the time Harvey hit, the hurricane did prevent many growers from harvesting the second, or ratoon, crop.

Prices are up significantly on smaller supplies for all three classes. The 2017/18 long-grain and U.S. medium- and short-grain season average farm prices (SAFP) are projected to range from \$11.80-12.80/cwt and \$14.50-\$15.60/cwt respectively. Long-grain and U.S. medium- and short-grain prices last season averaged \$9.64/cwt and \$12.90/cwt respectively. Together, higher prices and the smaller crop will result in a decline in domestic use and exports. Total rice exports are projected to decline 11 percent from a year ago. World stocks are at an all-time

EXHIBIT 9: Almond Grower Prices and Total Utilization (Exports and Domestic Use)



Source: USDA-ERS, USDA-NASS, California Almond Board

high and global trade is flat YoY, relegating the U.S. to the role of residual supplier. U.S. ending stocks are forecast to be at the lowest level in a decade while imports are expected to reach record levels because of the smaller domestic crop. Imports of the aromatic long-grain varieties from India and Thailand continue to dominate the multi-year trend of rising imports.

Looking ahead to 2018, attractive prices should boost long grain acres in the Mid-South. Unattractive pricing for competing crops and strong market demand will bring several hundred thousand more acres into rice production.

Sugar

Domestic sugar production in 2017/18 is estimated to be slightly higher than last year due to a larger beet crop. Domestic use is expected to grow moderately in the coming year, spurred by a combination of population growth and the continuing increase in refined sugar's share of per capita sweetener usage. Imports from Mexico and other origins will rise slightly, to fill growing demand.

The outlook for the refined sugar market is more positive than at this time last year. Beet sugar and cane sugar consumption trends are returning to historical patterns with the narrowing of the gap between beet sugar and cane sugar prices in recent months. With the Mexican agreement in place, there is a lot less uncertainty in the sugar market, which should pave the way for a more normal season in terms of supply and demand fundamentals.

Specialty Crops

Raisins

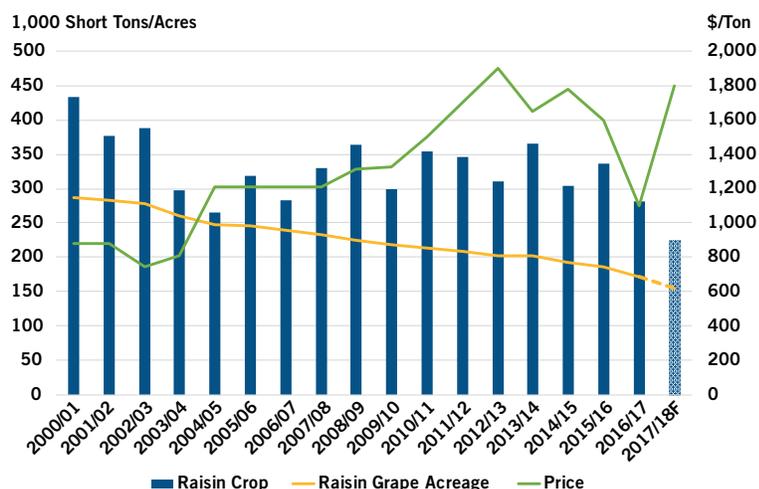
Prospects of a dismal raisin crop this year have prompted a surge in raisin prices. Raisin farmers and packers settled on a price of \$1,800/ton for the 2017 Natural Seedless raisin crop, making it the second-highest price in history. (See Exhibit 10.) The strengthening of the price after three consecutive years of declines is the consequence of below average domestic raisin stocks, an easing of global raisin production in 2017/18, and expectations of a short 2017 domestic crop following a very tough growing season. A severe heat wave in June further diminished the already short crop, yielding the smallest fresh crop in more than 30 years. In addition to the reduced tonnage for drying, two storms that hit in September while the majority of the raisin crop was drying, trimmed U.S. raisin production to a 35-year low. The extreme tightness in supplies will choke off demand via slower domestic sales and exports, and further erode stocks. Higher imports, meanwhile, will likely fill the supply void in the U.S.

Tree Nuts

Almonds

California almond growers produced another mega crop in 2017, estimated to tally 2.25 billion pounds. If realized, it will be the largest crop to date, surpassing last year's record crop of 2.14 billion pounds – this in spite of fewer chill hours last winter than in 2016, an extended bloom period because of a cold and wet spring, and a heatwave in June. The bulk of the increase resulted from expanded area, with bearing acreage hitting an all-time high of 1 million acres this year. Amidst the backdrop of this year's record crop and a forecasted 7-percent increase in total saleable supply, both domestic and export market shipments have been robust. (See Exhibit 9.) A delayed harvest meant that shipments for the new crop year got off to a slow start, but they've since recovered with October exports setting a new record for the month. Shipments to key markets in Central Asia, Europe and the Middle East have been particularly strong.

EXHIBIT 10: U.S. Raisin Crops and Prices



Source: Raisin Bargaining Association, USDA-NASS

Current price levels are expected to continue to fuel growth in almond consumption in the coming year. However, concerns are building over the elimination of the export tax break called the Interest Charge Domestic International Sales Corporation, or IC-DISC, in the current tax plan in the U.S. Senate. With the majority of the U.S. almond and other tree nut crops marketed overseas, the potential loss of the tax program ultimately could impair tree nut shipments at a time of swelling domestic supplies.

Walnuts

This year's walnut crop has likely suffered greater losses than initially expected. The USDA estimates California's 2017 walnut crop at 650,000 tons, but the industry puts the crop closer to 605,000 tons. Regardless, the 2017 crop will be smaller than the record 2016 crop despite a continued upward trend in bearing acres. A worsening of insect problems and compromised root systems as a result of excessive rains that flooded orchards in certain areas caused yields to fall this year. Heat waves over the summer also resulted in sunburn damage. The smaller 2017 crop reverses the trend of the past three years in which production has continued to reach new highs every year. This, together with strong demand for walnuts domestically and internationally, should boost walnut grower prices this season from the average of \$0.91/lb last season.

Pistachios

The U.S. pistachio crop proved resilient this year. The 2017 domestic pistachio crop is expected to come in at around 606 million pounds – the second largest harvest on record despite 2017 being an “off year” in terms of production. The crop overcame a cold, rainy spring followed by intense summer heat. On the heels of the record 2016 crop, this year's bumper supplies have led to a moderation in prices over the last 12-18 months. Grower prices averaged \$1.68/lb last season – less than half of the peak in 2014 and the lowest price in the last seven years. The smaller 2017 U.S. crop and the expectations of tighter supplies globally due to the possibility of another short crop in Iran this year have already

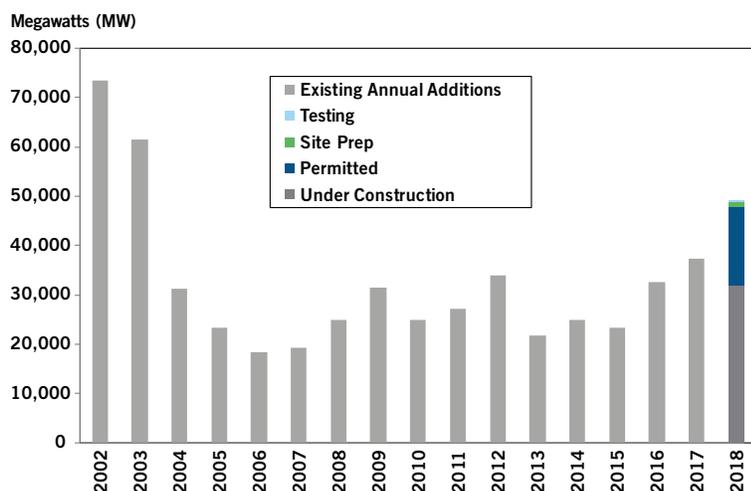
boosted prices, which are expected to hold through the remainder of the season.

Pecans

This year's pecan crop is forecast at 277 million pounds, a 3 percent increase YoY. Hurricanes Harvey and Irma affected two of the main pecan growing regions and crimped production. Harvey hit Texas in late August, causing flooding in the southeastern parts of the state. In early September, Irma made landfall in Florida before moving into Georgia as a tropical storm. Georgia, the largest domestic producer of pecans, saw more damage than Texas with virtually every orchard in the state suffering losses. This resulted in a drop of about 30 percent in the state's crop. One estimate is that up to 10 percent of Georgia's acres will need to be replanted as a result of the damage caused by Irma.

Pecan prices have remained strong throughout 2017 despite last year's large crop. Increased demand, especially in the U.S. market, has supported grower prices. Export demand is also robust, driven mostly by improving sales in Asian markets. Exports to China have been bolstered by a 14-percent reduction in the tariff on U.S. pecan imports in February 2015. On Dec. 1 of this year, China further reduced the import tariff on U.S. pecans from 10 percent to 7 percent. This is a huge plus for the domestic pecan industry and it will likely continue to improve pecan sales in China. So far this season, in-shell pecan prices are trading slightly higher compared to

EXHIBIT 11: Annual Additions of Power Generating Capacity



Source: ABB Velocity Suite, CoBank ACB

last season. Further price increases are expected as the season progresses, especially as demand continues to grow relative to domestic production remaining more or less flat this season.

Citrus

The 2017/18 U.S. citrus crop will be smaller YoY for all varieties except lemons. The huge declines in orange and grapefruit production are reflective of the ongoing impacts of citrus greening in Florida as well as the damage caused by Hurricane Irma, which slashed Florida's non-Valencia orange and grapefruit crops by almost 40 percent. Valencia production is expected to be about 20 percent lower. Florida crops could likely be even smaller as some industry insiders have intimated that these early forecasts are on the optimistic side. Orange and soft citrus production in California, the largest supplier of citrus for the fresh market, is also expected to be lower this season. Fruit set that is below last year's measurements is behind the contraction in California's orange, mandarin and tangerine crops this year. Average fruit size is larger this season but the increase is not expected to offset the lighter fruit set.

Lighter orange and grapefruit crops in 2017/18 will support higher pricing again this season, especially in the fresh market. Current fresh orange and grapefruit shipping point prices are about 50 percent and 30 percent higher, respectively, versus the corresponding

time last year. Juicing oranges are fetching about 25 percent more this season. As was the case last season, tighter domestic supplies will likely spur strong fresh orange and juice imports and moderate increases in grapefruit imports while suppressing grapefruit exports.

There is some promising news for the domestic citrus industry. A collaborative research effort between U.S. and Brazilian universities and research centers has identified a molecule that attracts the Asian citrus psyllid, the vector of citrus greening. While not a cure for the disease, this development will help the industry in fighting the spread of the disease. The next step is to produce a chemical substance from the molecule which can be used to create a product

that will attract and trap the psyllids. Such a product is expected to be available to growers in a year's time.

INFRASTRUCTURE INDUSTRIES

Power and Energy

Across the U.S. there are 32 gigawatts (GW) of generating capacity under construction that should come online in 2018, with an additional 17 GW in various phases of development (received all permits, begun site prep, or testing). (See Exhibit 11.) Assuming all of this capacity comes online in 2018, it will mark the largest annual expansion of new power generating capacity since 2003.

The portfolio of new generating assets is highly diverse with natural gas and wind each accounting for 35 percent, followed by solar at 24 percent. PJM dominates the construction of new gas builds, the Midwest and Texas will see the largest expansion of wind capacity, while solar will be expanding across most states in the Western Electric Coordinating Council and in California.

As the stock of existing generating units are replaced with more efficient and lower cost plants, wholesale electricity prices should remain low relative to historic levels. Sustained economic pressure on existing power plants could result in one of the largest waves of retirements in 2018 – upwards of 29 GW of operating capacity is at risk of retirement in 2018. This is only slightly higher than the

24 GW of retirements in 2015 that was largely a result of increasingly stringent environmental regulations.

Today low electricity prices driven by cheap natural gas and the proliferation of renewable energy are largely responsible for retirements. As market forces worked through the nation's stock of inefficient coal plants, these same forces are now honing in on natural gas-fired plants. Historically, natural gas accounted for roughly 3-6 percent of annual retirements - that share will likely be closer to 25 percent in 2018, represented by 7,600 MW of capacity across the 35 states.

This capacity is evenly distributed between combined cycle, gas turbine, and steam turbine technology. Most of the units at risk of retirement have an average service life of 45 years, produce high heat rates, and are small.

The growing number of gas plants at risk of retirement suggests that energy markets expects persistently low electricity prices, and it also portends weak growth for the share of energy produced from natural gas as renewables take a larger share of the pie.

Rural Water Systems

The challenges faced by the water utility industry have translated into rapidly increasing water rates in many communities across the country. As a result, affordability issues are bubbling to the surface. However, it is apparent that traditional methods of measuring affordability are flawed. Accurately measuring affordability and being able to adequately address it becomes increasingly important in an industry that is likely to see steadily rising rates in the future.

Many factors have been tied to the rise of water and wastewater rates over the past 15 years. Water utilities face challenges of drought, source switching and diversification, aging infrastructure that often requires substantial capital investment, population growth and shifts to water strapped areas or urban centers, and declining demand resulting from conservation efforts and technologies.

These financial demands are reflected in rising rates. Water rate increases were roughly on par with the rate of inflation growth from 2000-2006. After 2006, however,



water and wastewater rate increases outstripped inflation by margins not observed in previous years. As a result of these increases, the rate of growth in water bills has nearly doubled the rate of inflation in many communities across the country. On the other hand, wage growth adjusted for inflation has remained relatively flat.

Rising costs and flat wage growth for a large portion of the U.S population have brought renewed and increasing attention to the affordability of water and sewer services. Accurate assessment of affordability is critical as utility leaders seek to serve low-income customers while simultaneously raising the revenue necessary to maintain and advance public health and conservation. However, many in the industry believe that the conventional method of measuring household affordability is fundamentally flawed.

The traditional method of measuring water and sewer affordability sets the threshold at 2.5 percent of median household income for a community. However, this method does not measure affordability at the household level; rather it provides a gauge of a community's financial capability for purposes of enhancing the utility's ability in negotiating regulatory compliance.

A more accurate way to measure household-level affordability is the Affordability Ratio (AR), which determines the percentage of basic water and sewer costs to disposable household income for low-income customers.

Improved affordability measures can facilitate better decisions when setting rates or developing affordability programs. This is critically important given the long-term and mounting financial pressures on water utilities that suggest the recent pattern of rate increases are unlikely to abate in the near future.

Telecommunications

Swift adoption of technology, rapidly changing consumer behavior and exponential growth in data consumption are the reality for the communications industry. While emerging trends and disruptive technologies will continue to alter the communications landscape, the need to consistently invest in the network for faster connections will persist.

Nearly 90 percent of American adults use the internet on a regular basis, and roughly three-quarters have an internet connection in their home. Virtually every U.S. adult under 30 uses the internet, and that group tends to spend more time online than older adults with the youngest members of the group checking their smartphone as often as every three minutes. Smartphone penetration has reached maturity with 265.9 million devices and analysts expect that per capita ownership will top out within the next decade at 90 percent penetration. While the U.S. has greatly improved its average download speed in recent years, reaching 70.75 megabits per second (Mbps) as of July, the drastic digital divide between metropolitan and rural areas remains. Rhode Island, for example, boasts an average speed of 36.69 Mbps, whereas Montana's average speed is just 10.94 Mbps. The rural divide is alarming since small businesses create roughly two thirds of jobs in rural America and small- and medium-sized businesses that rely solely on local markets have a 30 percent lower survival rate.

A recent study shows that small rural providers are diversifying with complimentary services. Between 2015 and 2016, these companies realized a 2.8 percent increase in revenues. However, the slim margins on services such as home security, IT solutions, hosted and cloud services, as well as data and network operations centers, resulted in a 3.9 percent dip in operating income. The study noted that companies with faster speeds experienced lower churn rates, and in general,

“*While the U.S. has greatly improved its average download speed, the drastic digital divide between metropolitan and rural areas remains.*”

companies devoted 22 percent of operating revenue in 2016 to upgrade and maintain the network, more than in previous years.

Competition in most markets will intensify as providers implement G.fast, DOCSIS 3.1, 5G, fiber and other innovations to deliver faster and more reliable connections. Fiber to the home (FTTH) deployments are expected to level the field between legacy telco and cable providers. Analysts also expect that nationwide providers will split the terrestrial market, with cable companies having a slight edge. While only four percent of U.S. households rely solely on their smartphone internet connections, faster mobile wireless speeds will increase this number among young adults. Fixed wireless subscriptions are also expected to grow, with revenues reaching \$5.2 billion by 2021, up from an estimated \$2.7 billion in 2017.

Some markets will likely see new entrants, fueled by the promise of recurring monthly revenues and a limited awareness of the many challenges associated with deploying and delivering high-speed broadband. After investing at least one billion dollars, Google Fiber has yet to really take off, and has missed fiber deployment deadlines. It appears the tech giant failed to employ an effective build strategy and underestimated the cost to roll out a city-wide fiber to the premise (FTTP) plan. Google is now reportedly looking to fixed wireless solutions to serve some areas. A few electric cooperatives are also taking a more calculated and strategic build approach and have found success in the rural broadband market. These co-ops are leveraging their local brand recognition and deep experience in construction and project management to offer fiber broadband services. More competitors and relatively homogenous speeds require providers to differentiate themselves with added value, such as improved customer experience.

As over-the-top (OTT) gains momentum and consumers find less value in the traditional pay TV subscription, the future of the pay TV model is unclear. The major legacy cable companies saw unprecedented third quarter losses totaling nearly one million subscribers, accentuating the steady decline in pay TV subscribers. Despite gains in the number of U.S. TV households, pay TV households are on a decline, with penetration rates falling from 86 percent in 2009 to less than 80 percent in 2016. Meanwhile, OTT subscriptions among the 200 plus providers in North America are expected to rise to 144 million by the end of the year and bring in \$10.9 billion in revenues, with Netflix accounting for at least \$5 billion of that total. Consumers' shift away from linear broadcasts, coupled with low month-to-month fees and compelling original content, has strengthened the position of OTT providers. Though some analysts warn that the proliferation of offerings may cause "consumer confusion" and push some households back to the traditional bundle, this theory seems to heavily discount the savvy of consumers, especially younger digital-native adults. Consumer preferences for more flexible and lower-cost entertainment options may finally bring a la carte video to fruition.

The transition to 5G wireless service will underscore the importance of a ubiquitous and robust high-speed network, as 5G technology relies heavily on small cells and a dense fiber network. Fiber transport companies will realize growth from 5G as wireless carriers look for partners to implement the fiber densification necessary to effectively deliver faster speeds. Wireless companies are counting on the Internet of Things (IoT) enterprise market to fully monetize their 5G networks, as carriers are finding that the consumers are "tapped out" and less willing to pay for wireless subscriptions for multiple devices.

IoT may hold opportunities for rural providers as well, as agriculture turns to drones and smart-ag technology to reduce costs and improve efficiency and yield. Real-time wireless broadband connectivity is required to effectively operate these high-tech devices. The smart-ag market is predicted to grow 13.5 percent annually through 2025 and reach \$23.4 billion. However, the extent to which the market grows will be directly correlated to the availability of high-speed internet, especially mobile availability.



The adoption of in-home IoT has been slower than originally anticipated, largely due to device cost and interoperability. Many smart-home devices are compatible only with a proprietary application and other devices from the same manufacturer, while open-system devices do not always work well with the consumer's application of choice. Additionally, many consumers are reticent to set up their smart home on their own. Nearly 85 percent of consumers would want help establishing the connection between as few as two devices in the home, and 71 percent would look to a communications provider to manage their connected home. Rural providers looking to gain revenues from smart-home installation and management must establish themselves as the local expert, offer a range of device choices that can all be controlled by a single application, and be prepared to ensure that the in-home devices work together seamlessly.

The Federal Communications Commission (FCC) returned to the forefront in the fourth quarter. Chairman Pai was reconfirmed to another term and he pushed forward with his plan to help foster broadband deployment. The FCC took action to ease the retirement of legacy copper telephone, clarify the Lifeline program that helps low-income households access broadband, and eliminate burdensome, duplicative and outdated rules. It also released details on the second Connect America Fund reverse auction, which may award nearly \$2 billion over ten years to spur broadband deployment in underserved rural areas. Rural advocates have applauded the FCC's

efforts to hold the auction as soon as possible next year, and continue to push the FCC and Congress to carve out additional funding for rural broadband, as the current programs are \$210 million short of the annual funding needed to expand high-speed internet in rural America.

On December 14, the FCC formalized its long-awaited decision to repeal net neutrality. Pai and his Republican counterparts argue that net neutrality overstepped the FCC's authority and imposed "heavy-handed, utility-style regulations" on the internet. Pai claims that the new rules will simply reinstate a "light-touch regulatory approach" and only require internet service providers (ISPs) to be transparent in their business practices. The change also disallows state laws that would contradict the new policy, and transfers oversight of the internet to the Federal Trade Commission. Opponents, including consumer rights groups and Democrats, purport that the reversal will strip consumers of important protections and allow ISPs to prioritize their interests and give larger providers additional advantages over smaller competitors.

As anticipated, merger and acquisition activity remained healthy, with a wide range of transactions closing, from the mega-merger of CenturyLink and Level 3 to smaller deals combining contiguous footprints and strategic acquisitions of specific assets. Small- and medium-

sized providers seek to gain synergies and scale, expand footprints and gain competitive advantages with vertical transactions. Tier one companies are focused on diversifying revenue and strengthening internal capabilities through horizontal acquisitions.

Although the FCC is proving to be merger-friendly under Republican leadership, the Department of Justice's (DOJ's) current preference for structural transaction conditions over behavioral conditions is proving to be troublesome for some deals. Companies typically prefer the latter as divesting assets becomes complicated. In some cases, the required divestiture drastically diminishes the value of the merger and causes the parties to abandon the transaction. Additionally, the DOJ's suit to prevent AT&T from purchasing Time Warner Inc. signals that there is concern with providers getting into the content business. However, providers are expected to spend billions to acquire content companies as content is proving to be a key market differentiator and an effective way to combat the "big dumb pipe" reputation shared by both wireline and wireless providers. Despite DOJ pushback, content company assets will remain high-value acquisition targets for the foreseeable future. ■

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

Trevor Amen

Economist, Animal Protein

Terry Barr

Senior Director, Knowledge Exchange

Tanner Ehmke

Manager, Knowledge Exchange

Taylor Gunn

Lead Economist, Power, Energy, and Water

Daniel Kowalski

Vice President, Knowledge Exchange

Ben Laine

Senior Economist, Dairy Processing and Production

Christine Lensing

Senior Economist, Specialty Crops

Will Secor

Economist, Grain and Farm Supply

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

Please send them to KEDRESEARCH@cobank.com.

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