



QUARTERLY U.S. RURAL ECONOMIC REVIEW

Mounting Oversupplies and Trade Uncertainties Roiling the Agricultural Markets

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

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Key Points:

- The U.S. is now the epicenter of global uncertainty, amidst questions and concerns about the direction of its economic, trade, and foreign policies.
- U.S. agricultural markets remain under stress. Abundant supplies of crops, dairy products, and proteins continue to weigh on prices and producer margins. Growing ag exports have served as a safety valve, but the strong U.S. dollar continues to undercut the competitiveness of those exports.
- The continued expansion in global grain and oilseed production with nearly ideal growing conditions in the major crop-producing regions around the globe has held commodity prices at multi-year lows.
- Ag retailers began 2017 on a sour note as CoBank’s farm supply customers notched a significant drop in their net operating profits. Farmers cut back on input purchases as other farm production costs like cash rents remain stubbornly high.
- Meat supplies continue to expand. Exceptional export demand is playing its part in absorbing protein production increases and is a key element in the current positive margin outlook across the beef, pork and broiler segments.
- U.S. milk producers show no signs of slowing while consumers fail to keep up. Recent dips in dairy production in the EU, Argentina and Oceania have opened opportunities for U.S. exports to fill unmet demand.
- California has had an extraordinarily wet winter so far. With the exceptional amount of rain and snow that have fallen there this year, 2016/17 is now the state’s wettest year on record.
- President Trump signed an executive order in late February aimed at dismantling the EPA’s controversial Waters of the United States (WOTUS) rule. It directs the EPA and Army Corps of Engineers to revise and rewrite the WOTUS rule, involving a lengthy, complicated legal process that will take years to complete.
- President Trump signed another executive order in late March ordering the EPA to overhaul the Clean Power Plan, easing its restrictions on CO₂ emissions from power plants. However, the EPA will still be required to regulate CO₂ emissions, having been authorized to do so by the Supreme Court’s 2009 ruling that found CO₂ to be harmful to human health.

Mixed Signals

Agricultural producers, processors, and traders are closely monitoring the global trade outlook and prospective production cutbacks as larger supplies of crops, animal protein, and dairy products continue to enter the global marketplace. Modest improvements in global economic growth are bolstering world trade, but the strong U.S. dollar limits the competitiveness of U.S. commodities. Additionally, rising anti-globalization sentiments among the major advanced economies are spurring a reexamination of past trade policies, agreements, and institutions (including the EU itself), and injecting a high degree of uncertainty to markets. Meanwhile, Congress has begun to consider what the next Farm Bill should look like, compounding the current uncertainty. In this unsettled environment, the U.S. agricultural markets remain unusually skittish.

Agricultural producers are likely to maintain net cash income in 2017 near last year's levels by liquidating the large carryover inventories resulting from record yields in 2016. However, net farm income after the inventory adjustment will continue to decline to just over \$60 billion, the lowest level since 2009. Farmer cooperatives will benefit from larger product movements, but they will be under increasing pressure to provide productivity enhancements, speed, space, and risk management options at lower costs.

Global Economic Environment

In the opening months of 2017, the global economy gained some momentum, as the initial distress in reaction to Brexit and the surprising outcome of the U.S. elections subsided and optimism regarding potential global fiscal stimulus developed. The Dutch national election was held in mid-March, and the big surprise was that the populist party there failed to win. Upcoming national elections in France and Germany will be monitored closely and could become a distraction, while China's economy will likely continue to grow robustly in advance of the National Congress meeting in late 2017. Many of the emerging markets are benefitting from increased trade flows and greater stability in commodity and natural resource markets.

How well the global economy fares in 2017 and 2018 will depend critically on the actual magnitude and timing of fiscal stimulus in the U.S. and the ability of Europe and Japan to address the structural challenges linked to their aging populations. The epicenter of global uncertainty, however, is now the U.S. and the direction of its economic and trade policies. The U.S. Federal Reserve will likely continue to attempt to normalize the level of interest rates while other central banks maintain their current easing policies. This policy backdrop will maintain the upward pressure on the U.S. dollar while hampering the global competitiveness of U.S. products.

Going forward, downside risks due to policy uncertainty dominate the near-term, but opportunities could open up on the longer-term horizon with additional fiscal stimulus and structural reform:

- **Questions about the ability of the Trump administration and the 115th Congress to enact meaningful legislation are the source of major policy uncertainties in the year ahead.** Health care reform, tax reform, expanded infrastructure investment, reductions in regulatory burdens, and overhauls of the nation's immigration and trade policies are all on the table. Their economic impact will depend on the details and timing of the actual legislation signed into law. Many of the legislative bills may not be enacted until 2018 or even 2019, but 2017 will be impacted by the progress of the debate.
- **The divergent monetary policies of the central banks in the U.S., Europe and Japan will continue to inject volatility in financial and exchange rate markets.** Zero interest rate policies (ZIRP) have been in place for nearly nine years with little expectation of any sharp reversal in the next three years. The U.S. Federal Reserve will continue to tighten monetary policy in 2017, after having raised rates 25 basis points in March; but other central banks are likely to maintain their current easing policies.
- **The value of the U.S. dollar will remain under upward pressure provided that the divergent central bank policies persist and that the Trump administration and the U.S. Congress are able to enact legislation that delivers on their campaign**

promises. Federal Reserve actions and buoyant U.S. economic optimism have pushed the value of the U.S. dollar higher in recent months. Over the next three years, the U.S. dollar will be under moderate to significant upward pressure as a safe haven or as a result of more favorable U.S. growth prospects relative to other economies.

- **Leadership control in China will tighten as Chairman Xi convenes the 19th National Congress in 2017 to appoint new leadership of the communist party.** China will remain committed to realigning its economy toward greater consumer dependence, but the transition will be made more difficult by the subdued global economy. In the short run, China will continue to stimulate its economy to maintain growth of 6-7 percent and limit political turmoil.
- **Europe's near-term economic prospects remain fragile.** Negotiations over the U.K.'s exit from the EU, upcoming national elections in France and Germany, the growing immigrant migration pressures, and the continuing sovereign debt issues in other EU countries could unleash spasms of political and economic instability across Europe. Overall economic growth in Europe will likely remain steady in the range of 1.5 to 2 percent a year during 2017-19, with the potential for even worse outcomes.
- **Emerging markets will see improving access to capital as the global commodity and natural resource markets stabilize.** Modest improvement in growth in China and many advanced economies will support growth in many emerging economies, particularly those that have relied on raw material and commodity export growth to drive their economies.
- **World energy markets will likely be a source of some uncertainty as OPEC production agreements are tested and the new U.S. President pursues more fossil fuel friendly energy and climate policies.** Going forward, the combination of a more self-sufficient North American energy market, modest global growth and potential OPEC production limitations may move energy prices into a modestly higher trading range.

- **Geopolitical flare-ups will continue to add volatility to the global landscape.** Turmoil in the Middle East shows no sign of abating, and Ukraine's problems are likely to worsen. Russia, Iran and North Korea continue to engage in behaviors that are likely to have a negative impact on U.S. interests.

U.S. Economic Environment

U.S. economic growth will likely remain in the 2 to 2.5 percent range well into 2017, awaiting greater clarity regarding U.S. economic and trade policies. The Trump administration and the 115th Congress are debating major policy and regulatory shifts across a wide spectrum of issues, and these debates will likely extend through 2017 and into 2018. In the interim, consumers will continue to be the principal growth driver. Consumer sentiment remains very positive and is supported by continued job and wage growth. The U.S. trade deficit will continue to be a drag on growth as strength in the U.S. dollar boosts growth in imports relative to exports.

Whether the Trump administration and the 115th Congress will be able to boost economic growth, as promised, to 3 to 3.5 percent is uncertain. With the current unemployment rate hovering around 5 percent (widely viewed as "full employment") and productivity growth trending at a subpar 0.5 to 1.0 percent a year, U.S. economic growth doesn't appear to have much upside potential beyond 2.5 percent. In any event, an acceleration in economic growth is not in the cards until after the promised legislated policy changes have been enacted and signed into law, and then it will take a while longer before the new economic, trade, and regulatory policies have been implemented. Assuming that it occurs at all, the step-up in real GDP growth will most likely be delayed until 2018.

Greater fixed investment spending is the missing catalyst to higher U.S. growth rates. Residential investment will continue a pattern of steady growth as single family and multifamily housing construction gains momentum despite growing concerns regarding unaffordability. However, business fixed investment will likely remain subdued as companies and investors await Congressional

decisions on tax reform and investment incentives. Real business fixed investment has not increased significantly since 2014 despite the facts that corporate balance sheets have significant liquidity while debt capital remains very affordable. Swings in inventory investment are likely to add to quarterly volatility.

U.S. Agricultural Markets

The U.S. agricultural markets remain under stress. Abundant supplies of crops, dairy products, and proteins continue to weigh on prices and producer margins. For many processors, however, large supplies translate into high throughput and improved capacity utilization – as is the case, for example, for many grain and oilseed processors and meat packers. Nevertheless, coops are being impacted by the compression of farm income and the resulting stress on producers' ability to stay current on debt payments.

Macroeconomic and policy challenges continue to loom over the agricultural markets as well. The U.S. dollar is expected to remain strong or even ratchet higher in value as the Federal Reserve weighs further interest rate increases. A strong dollar will continue to put U.S. agriculture at a comparative disadvantage to its exporting competitors, while rising interest rates will put further strain on farm balance sheets. Meanwhile, any new policy initiatives related to trade, immigration, regulation, or tax reform all could have significant impacts – some positive, some negative – on the agricultural markets in 2017-18.

Grains, Oilseeds, and Biofuels

The theme of global abundance has intensified in the opening months of 2017 with South American farmers harvesting a record soybean crop on the heels of hefty crops harvested last fall in the U.S. Record wheat crops recently harvested in Australia and Argentina have also added to the global commodity surplus. The U.S. benefited momentarily last year with renewed exports as global wheat quality concerns and shorter corn and soybean crops in South America sent international demand back to the U.S. But that rejuvenated export pace now is in doubt as record crops come to market in the Southern Hemisphere.

“*The theme of global abundance has intensified in the opening months of 2017.*”

The continued expansion in global grain and oilseed production with nearly ideal growing conditions in major crop-producing regions around the globe has held commodity prices persistently at multi-year lows. For end users, the increased availability and affordable prices have been a godsend with livestock and biofuel producers continuing their expansions as they capitalize on the increased grain and oilseed stockpiles.

Ever-growing Chinese demand has been the main force buoying soybean prices, which has forestalled the price erosion witnessed in the grains. The question remains of how long relatively lofty soybean prices will hold if U.S. soybean growers expand soybean acreage as expected and summer weather remains cooperative. Current forecasts call for a moderate El Niño to bring benign growing conditions to the U.S. Midwest by summer and potentially support crop yields at trend or above-trend levels.

Corn

Following last fall's record corn harvest, U.S. corn exports benefited from Brazil's smaller corn crop last summer. Total export sales of U.S. corn for the current marketing year are a staggering 51 percent ahead of last year's pace. Nonetheless, corn prices have remained subdued as massive grain piles around the Midwest are reminders of the inventories that continue to overbear the marketplace.

Low prices are expected to discourage U.S. corn acreage this spring with USDA currently predicting farmers will plant 90 million acres to corn, down from last year's 94 million acres. Production is forecast to slip to 14.1 billion bushels, down from last year's mega-harvest of 15.1 billion bushels. A smaller corn crop in the U.S., though, is expected to be offset by an expansion in Brazilian production. Brazilian farmers are projected to harvest a record 91.5 MMTs of corn this summer while farmers in

Argentina are also forecast to produce a record corn crop of 37.5 MMTs.

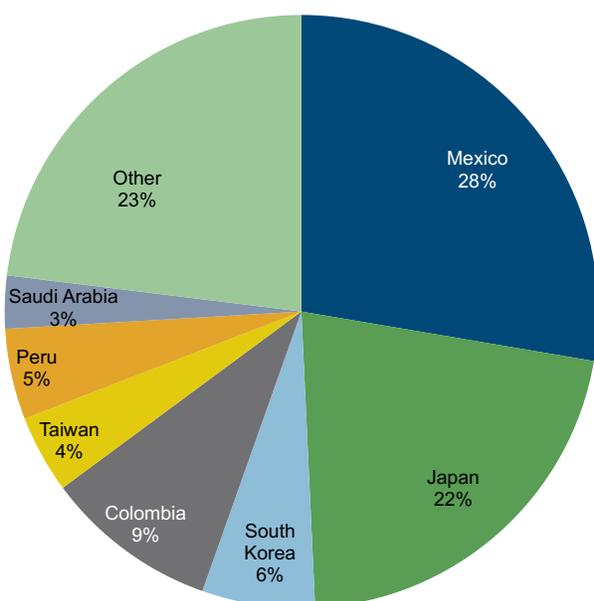
Expectations of bigger South American corn harvests have raised trade concerns in the U.S., particularly as the new Trump administration warns that NAFTA could be renegotiated. In retaliation to Trump's tough talk on trade and threats of making Mexico pay for a border wall, a bill was introduced in Mexico's Congress in February to source corn imports from Brazil and Argentina. (See Exhibit 1.) With Mexico accounting for 28 percent of all U.S. corn shipments, Mexican political leaders are signaling they are prepared to use their weight in agriculture to influence U.S. trade policy. A significant expansion of the South American corn crop could potentially give Mexico even more leverage in trade disputes with the U.S. Even token amounts of corn imported into Mexico from South America – despite the additional transportation cost – could rattle U.S. grain markets.

China's small shipment of corn in January to Japan – the U.S.'s second biggest corn export destination behind

Mexico – has also raised concerns of the U.S. losing its footing in global corn trade. While the Chinese government remains mute on official inventory numbers, it's widely presumed that China holds more than half of global corn stocks.

The poor quality of China's corn, however, may hamper its ability to sell it abroad. China's lack of quality grain storage has resulted in mass spoilage of corn stored outdoors, requiring continued corn and sorghum imports for blending purposes. To draw down its massive stockpiles, China has embarked on a plan to expand the domestic ethanol industry. It's widely presumed that the impetus for China hiking import duties on U.S. DDGs (dried distillers grains) in January was to bolster margins for Chinese ethanol. Spoiled corn, though, would result in unusable DDGs that are too toxic for livestock, which would leave Chinese policymakers with yet another problem of what to do with growing stockpiles of unsellable DDGs.

Exhibit 1: Share of U.S. Corn Exports by Destination, 2015/16



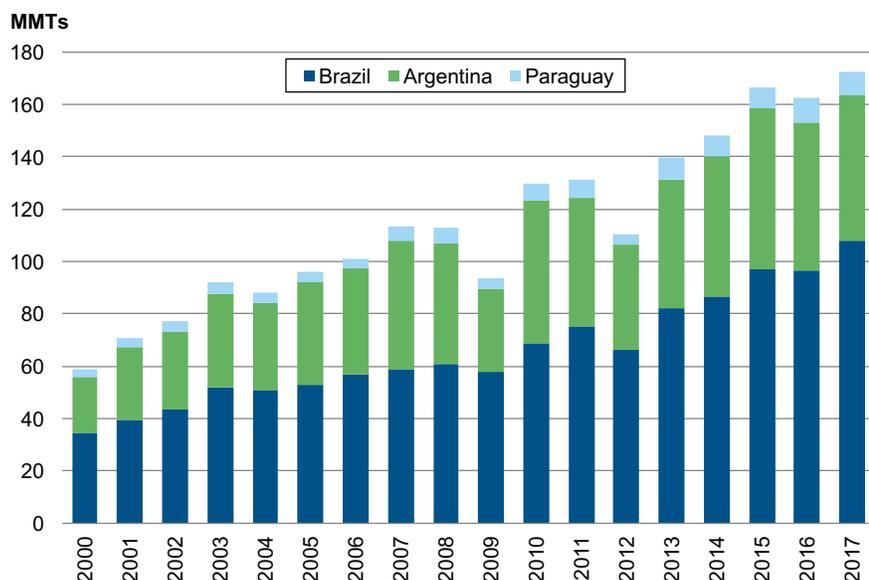
Source: USDA-FAS.

Wheat

Global wheat inventories have continued to expand to new records with each passing harvest around the world despite growth in demand spurred by low prices. Wheat stocks in the U.S. also remain burdensome even with exporters having benefitted from a renewed shipping pace prompted by quality concerns in Europe. The combination of insufficient grain storage, the global oversupply of wheat, and low protein levels of last year's hard red winter (HRW) wheat crop in the U.S.'s Central and Southern Plains has resulted in problems with market functionality. Specifically, cash wheat prices on the Plains have not converged with the futures market at key delivery points with farmers' wheat deliveries being rejected despite being under contract. This lack of convergence in the Kansas City wheat contract will continue to plague the market as long as storage remains insufficient and undervalued.

With basis remaining weak and cash wheat prices holding at decades-low levels, wheat farmers face difficult decisions ahead. Health of the winter wheat crop continues to deteriorate as drought conditions persist across the Plains. The early spring has also brought on

Exhibit 2: South American Soybean Crop



Source: USDA-FAS.

the early onset of diseases like wheat streak mosaic while also raising the risk of a late freeze severely damaging the crop. The Kansas wheat crop broke dormancy in mid-February – the second consecutive year for an extremely early start to the growing season.

With wheat prices largely below break-even for most growers and with crop conditions worsening, growers are expected to increase their abandonment rates of the winter wheat crop substantially, particularly in regions where graze-out with livestock is common. This spring, growers will weigh their options of abandoning wheat and switching to cotton, soybeans, corn or grain sorghum where soil moisture conditions allow. Abandonment of the winter wheat crop in Kansas, the main wheat-producing state, could be as high as 10-20 percent based on current crop conditions. This year's abandonment rate will likely push to the upper end of expectations should crop conditions continue to deteriorate in the weeks ahead and as growers make spring planting decisions.

USDA's latest projection on wheat production calls for harvested acreage in the U.S. to fall to 39 million acres, down 11 percent from 2016. Most of the reduction in area planted to wheat has come at the expense of

winter wheat, which is estimated to have the smallest planted acreage since 1909. Assuming an average yield of 47.1 bu/acre, down from last year's record of 52.6 bu/acre, the U.S. would see a sharp 20 percent drop in total production year-over-year (YoY), resulting in a significant tightening of the balance sheet. U.S. wheat-ending stocks, however, are still projected to be above the historical average as exporters continue to compete against a burgeoning global wheat crop.

Soybeans

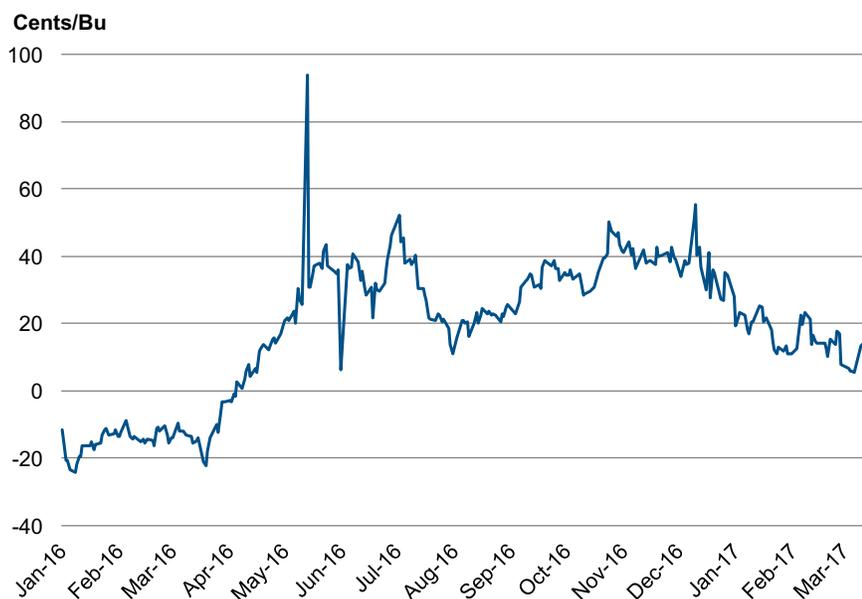
South America's soybean harvest was the main feature of the first quarter of 2017 as harvest commenced on a record-sized crop in Brazil. (See Exhibit 2.) Thousands of trucks

trapped on muddy, unpaved portions of highway BR-163 (a.k.a. "The Soybean Highway") are a reminder of the infrastructure challenges Brazil must overcome to deliver crops to market. USDA expects Brazilian farmers to harvest a mega-soybean crop totaling 108.0 MMTs, up 12 percent YoY, after growers significantly expanded acreage and benefited from nearly ideal growing conditions. Argentina's soybean crop, currently figured at 55.5 MMTs, would be down slightly from last year as growers contended with drought and floods that hampered yields.

China's seemingly inexhaustible demand for soybeans continues to be the driving theme behind the expansion of global soybean production. Imports from the U.S. remained robust through the first quarter of 2017 with no serious sign of retreat even as the South American harvest commenced. In February alone, Chinese soybean imports increased 23 percent YoY. With total imports expected to reach more than 87 MMTs this marketing year, China now accounts for nearly two-thirds of world soybean imports with no sign of slowing.

Domestically, soybean demand has mostly held at a significantly stronger pace over last year, but the rise

Exhibit 3: Ethanol Crush Margin



Source: Bloomberg.

in soybean prices in the first quarter appears to have slowed the U.S. soybean crush pace. Through the first six months of the current marketing year, U.S. crushers processed soybeans 2.5 percent ahead of last year's pace. The National Oilseed Processors Association, or NOPA, reported a record crush rate among its members in January, but that was followed by a slowdown in February crush. While February's crush was noticeably sluggish, the expectation for further growth in soybean meal usage for livestock and poultry feed, and for further demand growth of soybean oil for the biodiesel market, will continue to support stout domestic usage in the months ahead. New crush facilities and expansions in the U.S. portend an accelerated domestic crush pace in the future.

The combined growth in China's appetite for soybeans and the faster pace of U.S. crush in recent months held soybean values at lofty levels through most of the first quarter as prices of other commodities like wheat and corn were considerably softer. The divergence in price between soybeans and the grains is widely expected to drive more acres to soy this spring. USDA currently projects farmers in the U.S. to plant a record 88 million acres to soybeans this spring, up from 83.4 million planted last year, while corn and wheat acreage is expected to drop significantly.

Some private estimates put soybean acreage this spring as high as 90 million. Most of the additional soybean acres are expected to come from the fringes of the Corn Belt while traditional corn-soybean growers are expected to largely stay in their rotations.

Biofuels

The U.S. grew into its role as the world's top ethanol exporter in the opening months of 2017 with a robust shipment pace to Brazil and Canada holding firm. Ethanol exports in January hit a record for the month at 122 million gallons while January's ethanol grind jumped sharply from the prior year to 476.3 million bushels of corn, thus setting the tone for 2017 for expectations of continued expansion in

the biofuel space. USDA raised their projection of corn used for ethanol in the 2016-17 crop year to 5.4 billion bushels, up 176 million YoY.

Despite the robust export demand and record production pace, softening energy prices compressed profit margins for biofuel producers in the first quarter. (See Exhibit 3.) The weakening of energy prices and the rise in ethanol stocks have raised uncertainty for producers heading into spring. Ethanol prices thus far have seen only modest pressure from the drop in crude oil and gasoline prices, but biofuel producers fear that a potential build up in crude oil inventories could eventually cause erosion in ethanol prices and further margin compression.

Adding downward pressure to ethanol producers' margins has been the softening of DDG prices. In January, China's government hiked anti-dumping duties on the U.S., arguing that the Chinese DDG market had suffered due to subsidized imports from the U.S. The strong U.S. dollar has further challenged DDG exports, particularly into Mexico where the peso has fallen substantially since the U.S. presidential election. Ample global feed supplies also remain a constant headwind on DDGs as record ethanol production continues to flood the market with more supplies.

Political uncertainty has also created a new level of volatility for biofuel producers. Rumors filled the marketplace last quarter of the new Trump administration considering changing the point of obligation from refiners to blenders, that E-15 fuel blends (15 percent ethanol) would be sold year-round, and that biodiesel imports would be curbed by limiting the \$1/gal biodiesel tax credit to domestic producers. Extreme market volatility followed in the wake of the rumors, which have been officially denied by the White House.

Biodiesel also saw a surge in market growth in 2016 with high hopes that the momentum will continue through 2017. Domestic biodiesel production hit a record 1.8 billion gallons, up 29 percent YoY. Imports also jumped to more than 1 billion gallons, up nearly 50 percent YoY. Expectations of expanded soybean production in the U.S. in 2017, along with continued demand growth following EPA's surprise ruling in December to raise the biodiesel mandate by 100 million gallons to 2.0 billion gallons, have bolstered confidence among producers currently planning plant expansions.

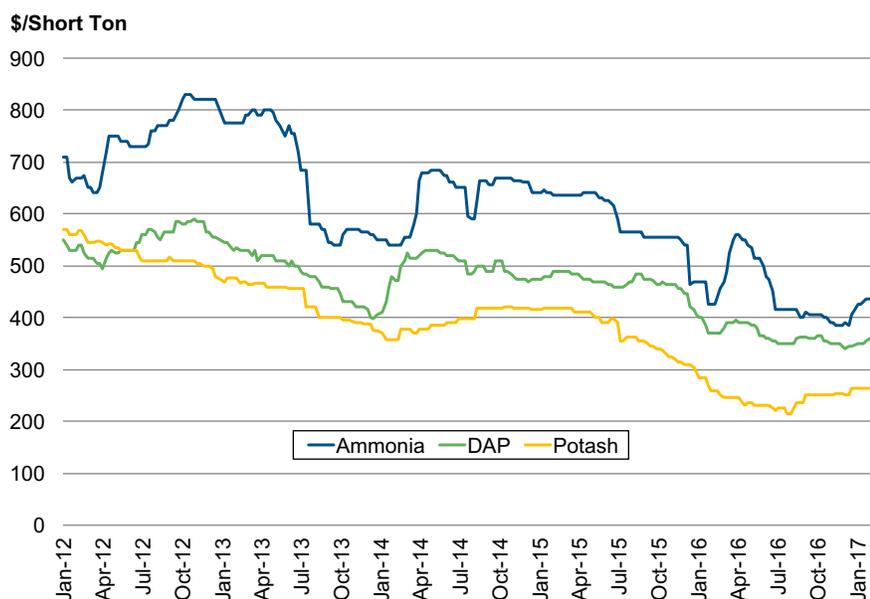
Farm Supply

Ag retailers started 2017 on a sour note as CoBank's farm supply customers notched a significant drop in net operating profit, down 82 percent YoY. Farmers cut back on input purchases as other farm production costs like cash rents remain stubbornly high. A bounce in fertilizer prices and an uptick in farmers' pre-bookings ahead of the spring planting season, though, were encouraging signs for an industry seeing growing financial distress among its customer base. The merger-mania brought on by a struggling farm economy is seen continuing into 2017 with mega-mergers like Dow-DuPont expected to be completed as planned.

Crop Nutrients

Fertilizer prices rebounded last quarter in an encouraging sign that prices have potentially reached a bottom after years of decline. (See Exhibit 4.) Ag retailers reported that farmers' pre-booking of fertilizer increased substantially after the New Year. While farm net income generally is strained, farmers benefited from record crop yields and a jump in farm program payments last fall, resulting in a resurgence of revenue for farmers to prepay fertilizer.

Exhibit 4: Corn Belt Fertilizer Prices



Source: Bloomberg.

Worldwide, the rationing of output among fertilizer producers, especially in China, has also supported a recovery in prices, while supply chain inventories in the U.S. have also dwindled after years of ag retailers going hand-to-mouth on fertilizer products to avoid write-downs. Potash and phosphate prices have also been supported by producers around the world idling production to stem the financial losses brought on by low fertilizer prices.

Despite the rebound in prices, the prices of most crop nutrients remain significantly lower than in prior years. Anhydrous ammonia in the Corn Belt has recently been quoted at \$470/ton, down \$20/ton from a year ago and \$85/ton under the price quoted two years

ago. The completion of new nitrogen fertilizer plants in the U.S. so far has not translated into softer fertilizer prices. While the expected drop in corn acres this spring would pressure nitrogen prices, an open and early spring could benefit corn acreage and provide a boost in nitrogen demand. A surge in soybean acres could also send demand higher for phosphate fertilizer.

Seed and Crop Protection

A jump in soybean seed sales has already hinted at an increase in soybean acreage this spring with growers and ag retailers bracing for new state regulations on the Roundup Ready2 Xtend (dicamba resistant) soybean varieties. Some states, including Arkansas, Indiana, Missouri and North Carolina, are restricting or evaluating proposed restrictions on use of dicamba following last year's numerous lawsuits and the shooting death of a farmer over off-label applications of dicamba that resulted in volatilization and spray drift damaging crops in neighboring fields.

New proposed rules for dicamba, depending on the state, include increased fines for off-label use of dicamba, restrictions on sprayer nozzles and height of the spray boom, allowable weather conditions for spraying, limitations on when in the growing season spraying of dicamba is allowed, and requirements for more operator education. Since the applicator of the herbicide ultimately is responsible for how various dicamba formulations are used, ag retailers will be keen on the liability that comes with custom spraying farm fields.

Seed and chemical prices in the upcoming planting season are not expected to decline significantly despite farm financial strains. In fact, seed prices are expected to hold steady to firmer as seed companies consolidate. In a recent Texas A&M study titled "Effects of Proposed Mergers and Acquisitions Among Biotechnology Firms on Seed Prices," ag economists estimated that the average price increase for corn and soybean seed would increase marginally by 2.6 percent and 1.9 percent, respectively, as a result of the Dow-DuPont merger that is expected to gain EU approval this year. The proposed Bayer-Monsanto merger is expected to increase cotton seed prices by more than 18 percent, according to the

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study. The mega-mergers in the seed and crop protection industries also have dealers concerned about a reduction in manufacturers' rebates.

Animal Protein

Meat supplies continue to expand. Total U.S. red meat and poultry output is projected to increase 3.2 percent this year, down slightly from the 4 percent increase in 2016. Fueling the production growth is persistently low input prices paid by livestock producers in the form of energy and feed costs. Exceptional export demand is playing its part in absorbing protein production increases and remains a critical element in the current positive margin outlook across the beef, pork and broiler segments. Robust U.S. consumer demand has also been supportive of overall price levels. Lagging retail prices are still retreating and will offer consumers the lowest meat prices seen in several years.

Demand growth and animal disease monitoring will be key areas of focus in the face of expanding supplies. For the various segments of the animal protein supply chain, supply-side pressures and potential price volatility will make risk management imperative for success. Operational efficiencies will be realized at the packing level, and workweeks will have to be lengthened to support elevated slaughter levels until new capacity comes online.

Protein industry participants will face a number of daunting challenges during the next six to twelve months. These include the domestic labor situation, monitoring of animal disease outbreaks, the strength of the U.S. dollar, and rising tensions among relationships with key export destination countries.

Poultry

Once again, the U.S. broiler industry is fixated on the potential market implications of Highly Pathogenic Avian Influenza (HPAI), with two positive cases having been confirmed at commercial breeder flocks in Tennessee. Those two flocks have been depopulated while the rest of the industry has implemented strict biosecurity protocols. Several Low Pathogenic Avian Influenza cases have also been confirmed in the U.S., but they carry much lower trade-related risks than HPAI. Globally, over the past few months, HPAI outbreaks have been reported in over 40 countries across Europe, Asia, and Africa. A shakeup in global trade flows will likely result from these outbreaks, but the exact details will unfold as 2017 progresses.

“*The recent global outbreak of HPAI and the two recent occurrences in the U.S. remain the wildcard in the broiler industry’s outlook.*”

To date, the U.S. broiler flock has been mostly unaffected, and trade-related restrictions have been limited. In early 2017, the U.S. benefited from supply gaps in other countries and broiler exports surged 12 percent in January YoY. Recent HPAI related restrictions by other countries have been targeted at particular counties and states. Owing to the uncertainty about the potential magnitude of a broader outbreak in the U.S., the projected growth in annual exports has been scaled down to 2-3 percent, from 5-6 percent just a few months ago.

Broiler production is up a slim 0.5 percent year-to-date (YTD), with steady weights contributing little to the overall increase in slaughter numbers so far in 2017. Annual forecasts call for broiler production to increase 2-3 percent in 2017 with broiler numbers increasing to support additional capacity coming online. Modest production increases and favorable feed costs should contribute to positive margins for poultry integrators throughout 2017. Profitability levels of 2-7 cents per

pound are expected to be the norm this year, decent but well below the margins experienced in recent years.

The recent global outbreak of HPAI and the two recent occurrences in the U.S. remain the wildcard in the broiler industry’s outlook. Going forward, the industry will remain focused on biosecurity and will also attempt to steer any trade restrictions imposed on U.S. broiler exports toward individual states or regions as opposed to total nationwide bans. Export growth remains a critical element in absorbing production increases and keeping the domestic supply manageable. With its ample supply, the U.S. broiler industry is in a position to take advantage of global supply gaps, should they occur. At the same time, the risk of an oversupply situation could quickly be realized if major market access disruptions occur.

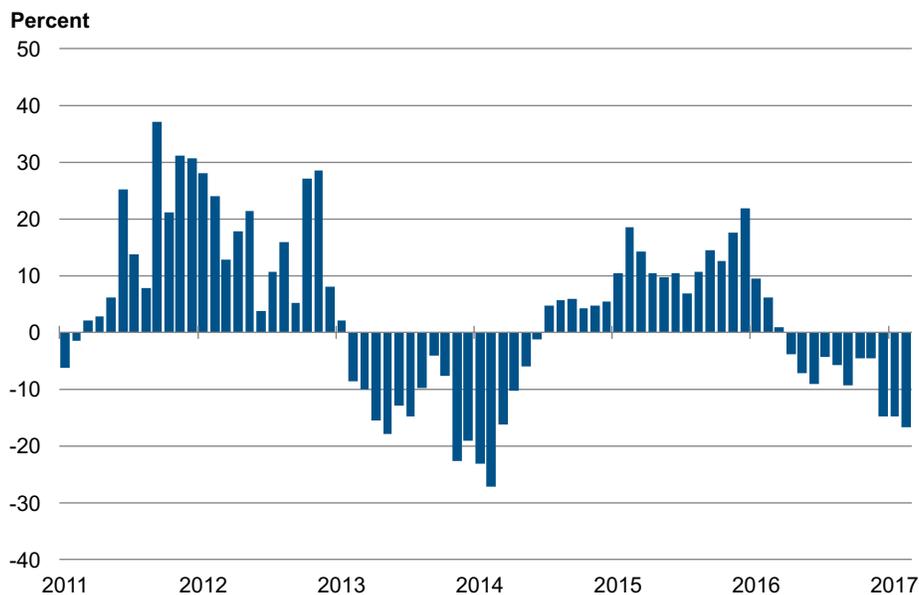
Beef

The nation’s beef herd remains in expansion mode with beef cow numbers up 3 percent as of January 1, 2017. USDA’s annual cattle inventory report also cited a 3 percent increase in the 2016 calf crop. Beef replacement heifers increased a more modest 1 percent, indicating a slight pullback in the overall pace of herd expansion. Profitability in the cow-calf sector and the associated pasture and range conditions remain the two key factors determining the pace of the expansion of the beef cattle herd.

Estimated cow-calf returns have improved since the fall of 2016. However, these profitability levels are well below what they were two years ago and are drifting toward breakeven, on average. The disparity between the profitability of high and low return producers has widened. Those that are investing in genetics and quality nutrition are realizing a return on those investments and will fare slightly better from a profitability standpoint. The beef cow herd will continue to expand over the next several years. Cow-calf profitability will decline until the next liquidation phase begins. Drought conditions will also play a critical role in determining the pace and duration of the current expansion phase.

Elevated slaughter levels and increased beef production have been supported by stronger than expected domestic and export demand for beef. A temporary tightness of

Exhibit 5: Monthly Cattle on Feed Greater Than 120 Days (Percent Change from a Year Ago)



Sources: USDA-NASS, CoBank.

market-ready cattle is the result of depressed placements in the fall of 2016. (See Exhibit 5.) Excellent product clearance at the wholesale level has supported live cattle cash prices, and strong basis has kept feedyards at an aggressive pace of marketing cattle. However, discounted deferred live cattle futures contracts and the long term outlook of increased production will create downward price pressure on the cattle complex as 2017 progresses. Prudent risk management strategies will be essential to take advantage of opportunities for hedging profits.

Current feedyard closeouts are the best the industry has experienced in over 28 months, a much needed relief for the cattle feeding sector. Average returns to cattle feeders in February and early March were north of \$200 per head. Aggressive marketings, improved currentness, and persistently low feed prices continue to factor positively into the margin outlook for cattle feeders. Feeding breakevens continue to drift lower, and the increased supply of feeder cattle should also apply downward pressure on calf and feeder cattle prices, reducing the overall amount of capital required to finish cattle. Opportunistic procurement of inputs to protect lower breakevens will remain a critical factor for cattle feeders throughout 2017.

A strong basis in early 2017 is incentivizing cattle feeders to continue the aggressive pace of marketings. A rally in the beef cutout in March has improved packer margins, and they will continue to be avid buyers in the market as long as product clearance remains brisk.

Strong live cattle cash prices in early 2017 squeezed packer margins in comparison to last year's record level of profitability. However, those prices have since rebounded with the strength of the beef cutout in early spring. Full capacity, 40-hour workweeks will be supportive of packer profitability, reflecting more optimal capacity utilization. Saturday

slaughter hours are trending higher and will remain the variable tool used by the industry to support elevated slaughter levels. Expanding beef packing capacity will be a key discussion throughout 2017 and beyond to accommodate growing cattle numbers. Additional capacity, current facility renovations, and supply chain integration through acquisition of further processing companies are likely to be the result of recent beef packer profitability.

Retail beef prices continued to ratchet downward in early 2017. As a result of more favorable wholesale pricing, retailers have responded with aggressive featuring activity. Beef as a percent of total beef, pork, and chicken advertisements has reached its highest level in seven years. Out-front boxed beef sales are also elevated, indicating strong purchases by retailers throughout the spring. Above-average temperatures throughout most of the U.S. have been supportive of the elevated beef featuring activity. Beef has also become more price competitive compared to pork and poultry, which is expected to pressure the prices of these competing meats throughout 2017.

The pickup in beef export momentum that began in the second half of 2016 has extended into early 2017. Volumes of U.S. beef to major export destinations in January increased substantially, despite headwinds from a strong dollar and rising political tensions. Key Asian markets posted exceptional growth. Exports to Japan were up 34 percent, South Korea up 35 percent, Mexico up 26 percent, Canada up 8 percent, Taiwan up 24 percent, and the ASEAN region up 56 percent (led by the Philippines and Indonesia). The industry is awaiting decisions to be made regarding progress toward market access to China. Trade negotiations with key export destinations will also be closely monitored in 2017.

News headlines in mid-March reported that Brazil's meatpackers allegedly had exported tainted meat. These news reports are likely to impair Brazil's beef exports in coming months, particularly toward Asian destinations. The U.S.'s favorable food safety reputation makes it well positioned to take advantage of any opportunities from potential reduced export volume out of Brazil.

Pork

U.S. pork production is essentially flat YTD, edging down 0.2 percent through mid-March. A tiny increase (0.1 percent) in hog slaughter numbers is being offset by a dip in average dressed weights of 0.2 percent YTD. Annual production is forecast to increase 2-3 percent, with larger increases in overall slaughter numbers being offset by an expected 1 percent decline in annual weights. Strong demand supporting aggressive marketings and an overall reduction in antibiotic usage are the main contributors to a pullback in average weights in 2017.

Hog producer profitability has been bolstered by strong prices and the downward drift in breakeven levels. The strength of the pork cutout in early 2017 was dominated by belly prices which supported a rally in the entire pork complex. (See Exhibit 6.) At the beginning of 2017, frozen belly inventories were reported at their lowest level in 40 years, sparking news coverage of a bacon shortage and the associated buying frenzy by end users in the wholesale market. Belly prices have since retreated

closer to average levels as the industry restocks frozen inventories and the reality of plentiful bacon supplies was realized by the wholesale market.

Hog producers should remain profitable throughout 2017, assuming that market-ready hog supplies remain current and that lower feed costs continue to sustain the downtrend in breakevens. Hog producers are also gaining bargaining leverage as new packing capacity comes online in late 2017. As the new processing facilities are positioning themselves to secure adequate supplies, negotiations and the resulting marketing arrangements are likely to create a slight edge for producers as the processing facilities compete for supply.

Another positive factor for hog producer profitability is the continued

Exhibit 6: Weekly Wholesale Pork Belly Prices



Source: USDA-AMS.

advancement in technology and the associated operational and production efficiencies. Through improved genetics, animal nutrition and facility design, improvements will be realized in metrics such as pigs per sow and average daily gain.

During the past several years, the excellent profitability of the pork processing sector has attracted capital and will result in an estimated 8-10 percent expansion of processing capacity over the next two years. The expanded capacity will drive production to record levels and increase the emphasis on export channels to absorb the additional production. These new, state-of-the-art facilities will ease capacity constraints, raise the industry standard for efficiencies, and likely put pressure on outdated facilities throughout the Midwest. Regional differences in market-ready hog supplies will also be a key factor in determining the amount of pressure that is felt by existing packing facilities.

U.S. pork exports are off to an incredible start to 2017, increasing 17 percent YoY in January and continuing the momentum that started in the second half of 2016. For the full year of 2017, exports are expected to increase 3-4 percent. Mexico is the number one export destination for U.S. pork, with 2016 representing the fifth consecutive record year for pork export volume. The January pace of shipments to Mexico showed no signs of letting up, with the volume up 33 percent. Other highlights in January included exports to China/Hong Kong up 17 percent, Japan up 6 percent, and South Korea up 32 percent. Pork Exports to Central and South America are also reflecting a growing demand for high quality U.S. pork. Volumes increased in January to Colombia, Honduras, Guatemala, Panama, and Peru.

The global pork industry is keeping a close watch on China, the planet's number one pork market. Following a surge of China's pork imports in 2016, the volume is expected to remain elevated throughout 2017. The Chinese government recently called for environmental regulations to be enforced on the hog production sector, with the intention of driving hog production away from waterways and population centers. A wave of modernization and commercialization is also reducing the number of backyard farms. The efficiencies gained

“U.S. milk producers are showing no signs of slowing and consumers are failing to keep up.”

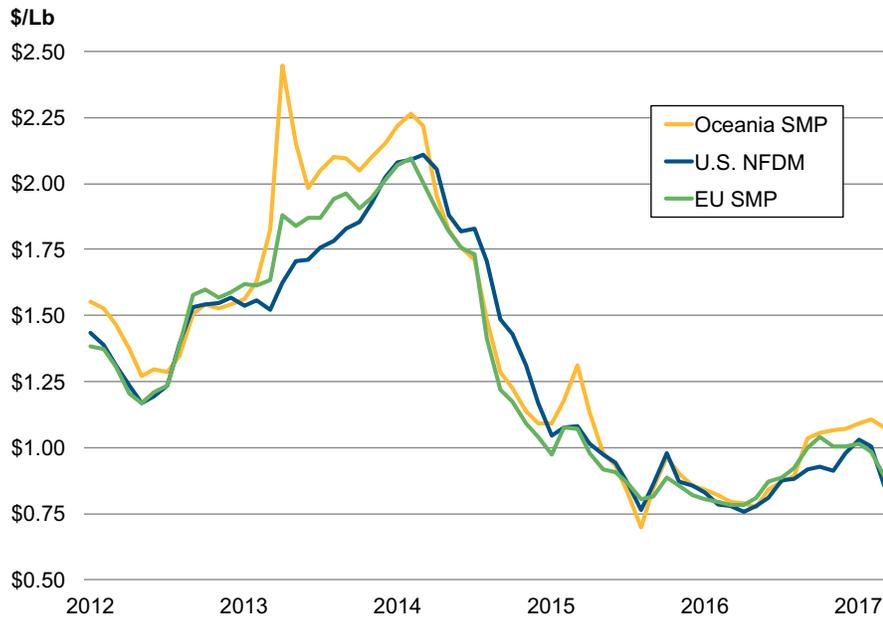
from modernization, however, are not expected to make up for the overall reduction in China's sow herd, creating an opportunity for global pork producers to fill a potential supply shortfall in 2017.

Dairy Situation and Outlook

U.S. milk producers are showing no signs of slowing and consumers are failing to keep up. Milk production was up 2.5 percent while domestic demand for butter and American cheese were down 15 percent and 2 percent in January, respectively, compared to a year ago. The domestic dairy industry's only grounds for optimism are rooted in the weak production occurring in the other major milk exporting regions of the world. YoY decreases in production in the EU, Argentina and Oceania over the past several months have revealed opportunities for U.S. exports to fill unmet demand. Exports of nonfat dry milk and whey have been above prior year levels over the past six months. However, industry participants are beginning to question how long the diminishing international production will last.

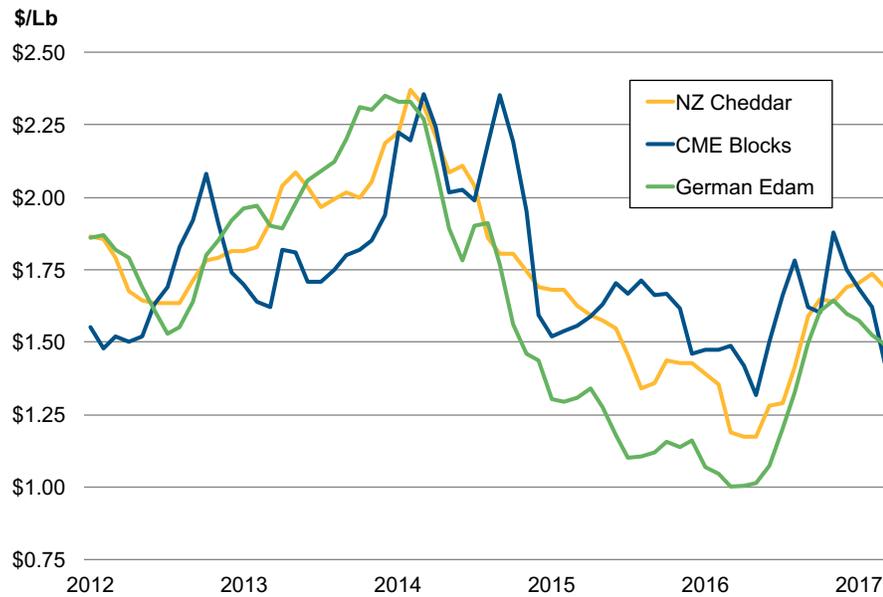
During the closing months of 2016, the EU's "Milk Production Reduction Scheme" had been incentivizing milk producers to reduce production over a 3-month period. Those incentives were phased out during a period of fairly low prices, but if milk prices were to improve, milk production would likely ramp up once again. For now, the potential for any major rebound in European production will be somewhat dampened by Dutch phosphate regulations which become effective at the end of this year. Under these regulations, dairy producers will need to reduce phosphate levels requiring a herd reduction of about 160,000 head – roughly equivalent to 1.7 percent of the U.S. herd.

Exhibit 7: International Skim Milk Powder (SMP) Prices



Source: USDA.

Exhibit 8: International Cheese Prices



Sources: USDA, ZMP.

Skim milk powder and nonfat dry milk prices have been shaken from what had been a steady upward trajectory and have collapsed back toward international support

Despite reports around the country of abundant and inexpensive cream, butter prices have remained at relatively high levels. One driver of the ample cream

levels. (See Exhibit 7.) This is largely the result of uncertainty which has been stirred by rhetoric between U.S. and Mexican leaders. While there have not yet been any major changes to trade policy between the two nations, Mexican buyers reportedly have been seeking out alternative sources of powder in the EU and New Zealand in preparation for possible disruptions in trade. In January, U.S. exports of nonfat dry milk were up 8 percent overall, but down nearly 10 percent to Mexico.

Domestic demand for cheese was down YoY in January. When combined with higher production (up 3.7 percent), higher stocks (up 5 percent) and lower exports (down 3 percent), it seems fitting that spot cheese prices have tumbled below \$1.40 per pound for block cheddar. This is down only slightly from last year around this time, and some amount of the weak demand can be attributed to seasonal factors. Futures markets are anticipating that there will be a rebound from current spot levels over the next few months.

A bright spot in cheese markets has been the subcategory “other-than-American cheese” (primarily Italian-style, e.g., mozzarella) which has been experiencing increasing demand and production. A silver lining to the current low prices is that U.S. cheese is now trading at a discount to the rest of the world which opens up export opportunities, particularly for these other styles of cheese. (See Exhibit 8.)

supplies has been the high value placed on the fat content of farm milk for the past couple of years. In response, the average fat content of farm milk has trended upwards. The cream is making its way into a number of products, including yogurt and ice cream, but the cheap cream now compared to strong futures prices later in the year will incentivize bulk churning and storage of butter.

Milk production, driven by ever-increasing cow numbers, will continue to ratchet higher, and will likely become burdensome in regions stretching from the Northeast to the upper Midwest as the “spring flush” arrives. After a typical seasonal lull in prices, the second half of the year could see some improvement, but any improvement will be modest, and will depend on how much strength the demand side can muster in the face of sustained supply growth. Meanwhile, the U.S. must avoid trade disruptions and the EU must hold off on any major production increases. A change in either of those factors could weigh heavily on U.S. markets.

Other Crops

Cotton

Improved weather conditions globally led to a boost in cotton production in 2016/17. Nevertheless, 2016/17 will be the second consecutive year in which global cotton use surpasses production. (See Exhibit 9.) Prior to the 2015/16 season, global production had outpaced consumption for five consecutive years. This reversal should buoy an industry that has seen several years in which sluggish demand (resulting from increased price competition from synthetic fibers) and high ending stocks have depressed prices.

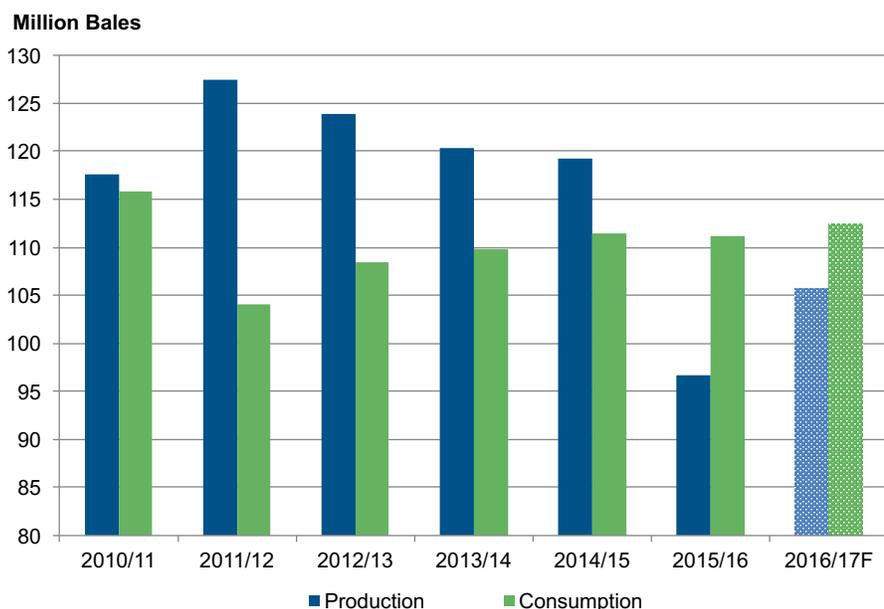
Chinese cotton output fell for the fourth straight year in 2016/17 and is expected to be the smallest Chinese crop since 2000/01. In an effort to further reduce excess domestic cotton surpluses, China has tightened import controls and resumed sales from its national cotton reserve. Consequently, China’s cotton imports are expected to decline again this season.

In the U.S., the 2016/17 cotton crop exceeded the previous year’s crop by 32 percent, and pushed stocks to their highest level since 2009/10. The larger, higher quality crop will boost exports to a four-year high and increase the U.S. share of global cotton trade. U.S. mill use is expected to contract slightly in 2016/17 due to continued competition from synthetic fibers. Cotton prices have been lifted in recent months by strong demand and speculator interest, but expectations for significantly larger plantings in 2017 should limit further price increases.

Rice

With U.S. rice plantings up 20 percent in 2016/17, the current crop is the third largest ever and the largest crop in six years. All of the increase in output was attributed to

Exhibit 9: Global Cotton Production and Consumption



Source: USDA-FAS.

long grain rice, while short and medium grain production slipped modestly. The increase in supplies and more competitive pricing are expected to result in a 3 percent bump in U.S. exports in 2016/17. Despite increased domestic use and exports, the huge crop will push U.S. ending stocks to their highest levels in over 30 years. As a result, futures and cash prices have suffered. The U.S. all-rice season-average farm price is expected to decline by about 14 percent this season. Long grain acres will fall significantly in the mid-South this spring, and depending on weather and yield, should bring a quick readjustment to supply in 2017/18. Short and medium grain acres should increase modestly in response to much improved conditions in California.

Globally, rice production hit record levels this year, mainly due to expansions in planted area. Global consumption will be at record levels, too, in 2016/17 with India, Thailand and the U.S. driving most of the increase in use. Higher global rice production and consumption in 2016/17 are expected to result in the first increase in global trade since 2014.

Sugar

The U.S. sugar industry continues to face considerable change and uncertainty. Talks between the U.S. and Mexico regarding U.S. imports of Mexican sugar were discontinued during the U.S. presidential transition. But both sides announced in mid-March that negotiations will recommence soon. The announcement immediately followed a spat where the U.S. declared that Mexico had reached its import quota and denied import permits for a sugar-loaded vessel that was scheduled to depart for the U.S. The sugar negotiations will likely be part of talks that encompass NAFTA more broadly. For now, Mexico is threatening to retaliate against U.S. corn-based fructose exports to Mexico should talks break down.

The other major development for U.S. sugar is the rebound in domestic beet sugar consumption. Soaring food manufacturer demand for non-GMO cane sugar in 2015 and 2016 created two distinct sugar markets in the U.S., with drastically different prices. GMO beet stocks swelled (and prices fell) while cane stocks dwindled (and prices surged). But over the past few months, that price divide grew so wide that it enticed buyers to move

“*After just one wet season, the California drought is almost a thing of the past.*”

back to beet sugar in a major way. Beet sugar deliveries bounced and breathed new life into the beet sugar industry. The domestic market continues to search for consumers’ willingness to pay for non-GMO sugar and a new cane/beet equilibrium.

Total 2016/17 U.S. sugar production was essentially unchanged from 2015/16, while total domestic use is expected to increase slightly. Total sugar imports are forecast to drop 11 percent YoY due to trade restrictions with Mexico.

Specialty Crops

Update on the California Drought

California has had an extraordinarily wet winter so far. In fact, it’s been one for the record books. Since the beginning of October last year – the start of the current water year – California has been hit by storm after storm, and the state is now waterlogged. With the exceptional amount of rain and snow that California has had this year, 2016/17 is now the wettest year on record with rainfall totals far exceeding the average.

After just one wet season, the California drought is almost a thing of the past. According to the latest USDA drought monitor, 76.5 percent of the state of California is no longer in drought and only 1 percent of the state still remains in severe drought. By comparison, one year ago, essentially the entire state (99.6 percent) was in some form of drought with almost two-thirds of the state classified as being in extreme or exceptional drought. This is an incredible turnaround for a state that was severely parched after five years of extreme drought – more so given that just six months ago, the whole of California was blanketed in drought.

The ample rains have meant that many of California’s reservoirs are full, with water levels in all but three of the state’s major reservoirs well above historical averages.

Across the state, total reservoir storage is at 107 percent of total average storage. The state's snowpack, too, is astounding. Statewide, the snowpack is currently at 167 percent of the April 1 average and 174 percent of normal for this time of year. With 30 percent of the state's water coming from snowmelt run-off, the Sierra snowpack is a key component of California's water supply and as such, snowpack conditions are critical.

The abundance of rain and snow has been a blessing for the whole of California, especially for its agricultural communities. As the drought continued, dwindling surface water supplies meant falling agricultural revenues as many farmers had to fallow land. Due to the plentiful rain and snow that have fallen this winter, most water district customers are expected to receive better surface water allocations this year than they have during the last five years.

At the end of February, the U.S. Bureau of Reclamation announced an initial water supply allocation of 100 percent from the Central Valley Project for senior water rights holders in the Sacramento and San Joaquin Valley as well as for farmers in the Friant and Eastside Divisions. The last time that system demand was met fully was in 2006. Despite the high reservoir levels, growers south of the Sacramento-San Joaquin River Delta, including those in the Westlands Water District, will receive only 65 percent of their federal water project allocations.

As regards State Water Project deliveries, the Department of Water Resources recently announced anticipated deliveries of at least 60 percent of requested supplies. The vastly improved water allocations across the state are good news for growers, especially since some districts had zero surface water allocations during some years of the drought.

There's no doubt that the brimming reservoirs and abundant snow have greatly improved California's water supply outlook. However, the state hasn't completely shaken off the lingering effects of the drought. Despite all the rain and snow, underground water resources, many of which were severely depleted during the drought, have not been fully recharged. The recharging of underground water basins is a slow process that will

require more than just one wet winter, even an unusually wet one such as the current one, to recover. During the last couple of years of the drought, Californians made many adjustments and put in place several measures to conserve water and use it more efficiently. However, going forward, California water users would be well advised to continue to implement these good practices as history has shown that California can go from being very wet to very dry extremely quickly. Environmental experts warn that California's climate future will be characterized by prolonged periods of extreme drought punctuated with intensely wet ones. If they're right, the climate extremes of the last few years and water scarcity are going to be California's future reality.

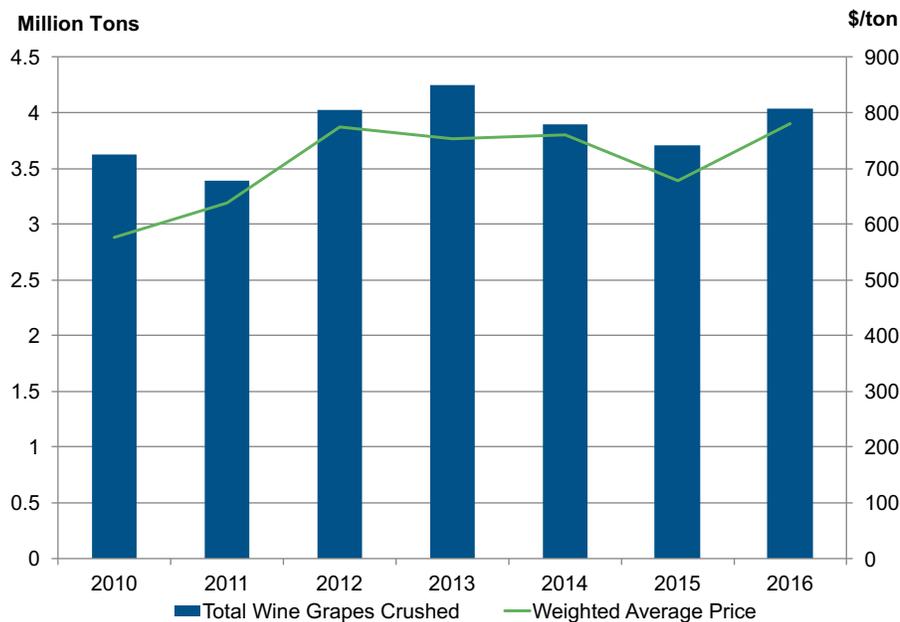
Across the state, Californians have welcomed the record rainfall as it has all but reversed the effects of the prolonged drought. While the storms have brought relief for California's agricultural communities, the rain has disrupted production schedules. In the Salinas Valley, California's main vegetable growing area that supplies much of the U.S. with leafy greens during a part of the year, the rain wreaked havoc with planting and harvesting activities that will likely result in supply gaps and quality issues in the Spring until harvesting begins in other cooler production regions. Prices of some vegetables have already skyrocketed in response to supply shortages with further price hikes inevitable.

Many orchards and vineyards were flooded, making it difficult for growers to complete winter crop management activities. For some of the permanent crops, most notably the early almond varieties, winter storms created less than ideal conditions during bloom and hampered the pollination activity of bees. Just what the impact of the rain will be on California's permanent crop harvests will only be clear later in the spring, but the precipitation has certainly re-invigorated vineyards, orchards and root systems.

Wine Grapes

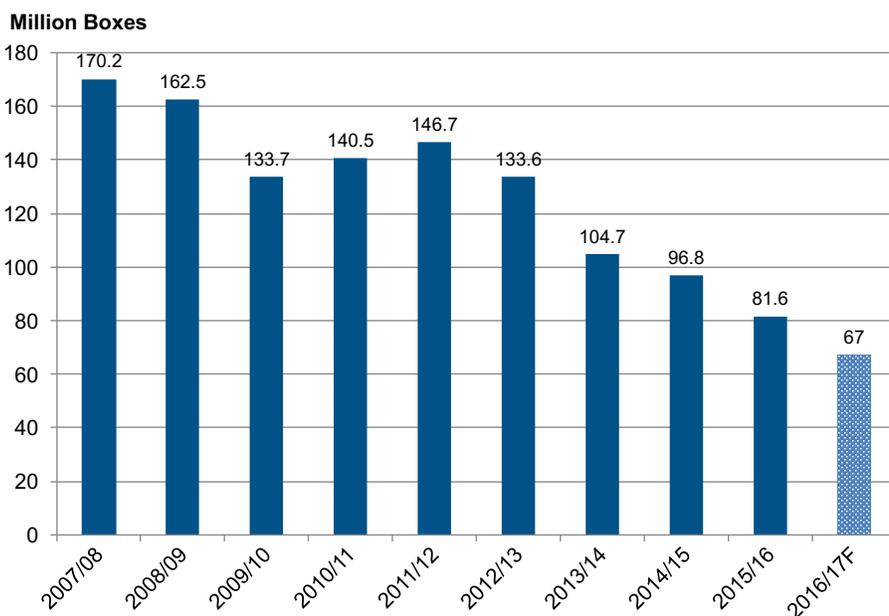
The USDA's Final Grape Crush Report on the 2016 season has been released and contains no surprises, confirming that the 2016 California wine grape crop came in at 4 million tons. (*See Exhibit 10.*) The 2016 wine grape crush was 9 percent higher than the 2015 crush with red wine

Exhibit 10: California Wine Grape Crush Tonnage and Price



Source: USDA-NASS.

Exhibit 11: Florida Orange Crop



Source: USDA-NASS.

grapes accounting for 57 percent of the total crush. Prices were up in 2016, too. At \$763/ton, the 2016 average price of all varieties was up 14 percent from 2015. The 2016

antibiotics – often referred to as bactericides – to their diseased trees in the hope that they would help stabilize this year’s crop. But some studies now seem to indicate

average price for red wine grapes was \$918/ton, up from \$790/ton the previous year, while the average white wine grape price was \$598/ton, up from \$540/ton in 2015. Cabernet Sauvignon and Chardonnay remain the leading wine grape varieties crushed in California.

Spring-like temperatures have meant that bud break has begun in earnest in some California viticultural areas, thus signifying the onset of the 2017 grape growing season. This year’s wetter and cooler winter has meant that the timing of bud break is more normal, although growers are still wary of spring freezes. After five years of drought-stress, the good rains have given new life to vines and root systems, which should bode well for the 2017 crop as vines tend to yield larger crops when they get plenty of water during the winter.

Citrus

Harvesting of Florida’s early-midseason and navel orange varieties is almost complete while the Valencia harvest has just begun. The USDA’s latest forecast is for a decidedly smaller Florida all-orange crop of 67 million boxes, down slightly from previous forecasts for the 2016/17 harvest. (See Exhibit 11.)

As the current 2016/17 season was just beginning, Florida’s current crop was expected to be the smallest in 53 years due mostly to the worsening citrus greening disease. As a result, many growers applied various

that bactericides need to be applied for two seasons, at least, before they would have a beneficial impact, although growers are reporting positive tree responses after having used the bactericides just once.

At 51.8 million boxes, California's all-orange crop is also expected to be slightly smaller than earlier forecasts due to a smaller Valencia crop, the harvesting of which should start in a couple of weeks. The navel harvest is expected to continue until early June. While the quality of the Florida orange crop has been good, the quality of the California crop has been outstanding from a flavor perspective. However, the rains were problematic in the case of the regular navel varieties, hurting external fruit quality (e.g., rind staining and puffing) and packout percentages. The rains were beneficial in terms of fruit sizing, however.

Lower fruit volumes in California will likely put even more upward pressure on season-to-date prices that are already up about 13 percent over last year. Prices are likely to be 20-25 percent above last year's prices by the end of the season. Depending on grade, quality and potential for export, small (138 & 113 count) navel FOB prices are ranging from \$9.00 to \$13.00/carton; medium (88 & 72) prices are in the \$10.50 to \$15.75/carton range, and large (56+) fruit prices are running from \$11.00 to \$18.00+/carton. Prices may be higher, but a 23 percent increase in harvest costs over last season is eroding much of that gain.

Declining orange production in Florida will result in a further reduction in orange juice volumes. This, together with very low production in Brazil this season, means that orange spot prices are up about 20 percent, on average, YoY. The current average early-mid orange price is \$2.54 per pound solids (pps) vs the \$2.14 pps of last season. The current Valencia orange spot price is \$2.85 pps compared to the final 2015/16 average price of \$2.34 pps. As opposed to California, production and harvesting costs have remained relatively stable in Florida from last season. Consequently, growers who were unprofitable last season have been able to earn modest profits this season despite lower production.

Infrastructure Industries

Power and Energy

The Trump administration's proposed budget for fiscal year 2018 allocates no funding at all for implementing and enforcing the Clean Power Plan (CPP). President Trump followed up with an executive order in late March ordering the EPA to overhaul the Clean Power Plan, easing its restrictions on CO₂ emissions from power plants. Such an order, however, would not relieve the EPA from having to regulate carbon dioxide (CO₂) emissions. The EPA is authorized by the Supreme Court to regulate CO₂ emissions based on a 2009 ruling that found CO₂ to be harmful to human health.

At present, the CPP is under review by the Court of Appeals for the District of Columbia Circuit, with opposing arguments having been heard in September 2016. Scott Pruitt, the newly appointed EPA administrator, will likely request the court to hold the case in temporary suspension and return it to the EPA for reconsideration. In that event, the EPA would have several alternative courses of action from which to choose:

1. Propose a "no action" rule, which is essentially a revised CPP with no regulation,
2. Propose a much more limited version of the CPP that would be less costly for coal-fired generating units,
3. Attempt to reverse the Supreme Court's 2009 ruling that found CO₂ to be harmful to human health, thereby removing any requirement for the EPA to regulate CO₂.

Many stakeholders believe that passing a less stringent CO₂ emission rule is superior to having a "no action" rule on the books. Replacing the CPP with a weaker version would create a strong legal precedent for CO₂ regulations, providing protection against potentially more aggressive CO₂ regulations in the future. However, to "re-do" the CPP, the EPA would have to go through the full rulemaking process, including notices, comments, responding to comments, and fighting new legal battles.

Rewriting the CPP would surely be a lengthy process. In fact, legal experts believe that the soonest a new version of the CPP could make it through the rulemaking process would be the summer of 2020, just months before the next presidential election. Therefore, the regulation of CO₂ emissions from power plants will remain essentially a non-issue for the rest of Trump's term in office, even if a limited version of the CPP is proposed.

With CO₂ regulation in the rearview mirror, the useful life of existing coal-fired units will get an extension. Currently, 268 gigawatts (GW) of coal-fired capacity operate in the U.S., with 22 GW owned by the nation's generation and transmission (G&T) cooperatives.

It will likely be just a temporary extension, however. The nation's coal-fired power plants face inhospitable market forces. Competition from low-cost natural gas and renewable energy will likely drive energy prices lower in virtually every region of the country. Given the growth in renewable energy and the resulting downward pressure on wholesale energy prices, many coal plants will find it difficult to compete on an economic basis. Moreover, high penetration of renewable energy requires more quick-ramping gas units that can respond to intermittency.

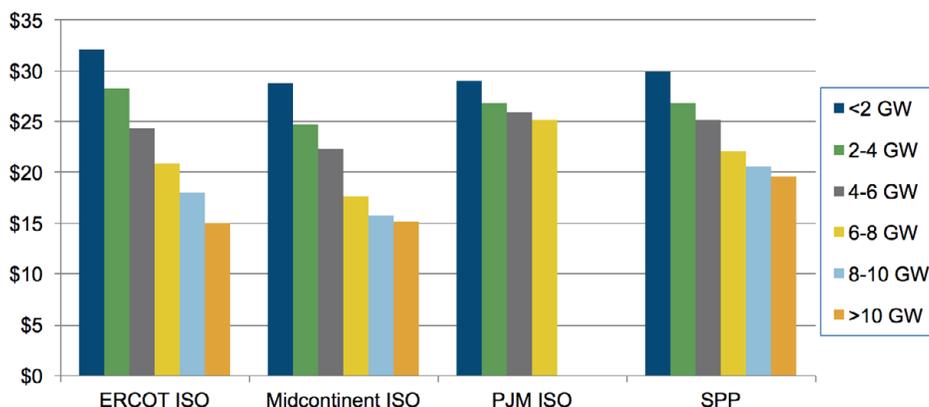
Renewable energy is particularly challenging for wholesale energy prices because the fuel cost is essentially zero. The "merit order" of dispatching generating units dictates that the most expensive units are turned on last to meet incremental demand. Renewables are turned on first, therefore displacing higher cost sources of power. This is borne out in lower capacity factors for higher-cost units. For example, capacity factors for coal-fired plants operated by G&T cooperatives declined on average by 13 percent from 2013-16. Electric coops and other utilities are opting to purchase an increasing amount of inexpensive wholesale energy from the spot market, in lieu of higher cost self-generation.

Cumulative wholesale energy purchases among G&T cooperatives increased by 733 gigawatts-hours (GWh) during 2013-15 (the most recent annual data available). While this represents a modest 3 percent increase, the composition of those purchases changed significantly. Spot energy purchases expanded by 22 percent, while long-term firm purchases declined by 50 percent. Roughly 72 percent of the growth in spot energy sales consisted of purchases from private merchant plants.

In coming months, the electric utilities will likely purchase a growing amount of spot energy as renewables drive wholesale prices lower.

An evaluation of the generation data for the year ending in March 2017 shows the impact of growing amounts of wind generating capacity on wholesale energy prices. (See Exhibit 12.) For example, energy prices in ERCOT averaged \$32/MWh when less than 2 GW of wind capacity was online. Wind capacity increased to more than 10 GW in some instances, pushing energy prices to \$15/MWh. These low wholesale energy prices highlight the market forces working against coal-fired units, where the marginal cost of production averages close to \$25/MWh.

Exhibit 12: Average Hourly Wholesale Energy Prices with Increasing Wind Capacity (\$/MWh)



Note: Average wholesale price of electricity at different intervals of average hourly wind-power generation from March 2016 - March 2017. PJM did not report wind capacity greater than 8 GW.

Sources: ABB Velocity Suite, Bloomberg.

Lower energy prices will persist as renewable capacity expands. Currently, there are 2.5 GW of wind capacity under construction nationwide and scheduled to come online in 2017, along with 1.8 GW of utility-scale solar.

The growth in renewable energy resources not only affects prices, but also poses operational challenges. Owing to the intermittency of renewable resources, grid operators become increasingly dependent on fast-starting flexible resources such as natural gas combined-cycle units that can ramp up quickly when the wind stops blowing or the sun is hidden behind a cloud. Operational flexibility combined with low natural gas prices is driving strong growth in new gas units. Currently, 6.6 GW of gas-fired capacity is under construction with a commercial operation date in 2017.

The nation's increased dependence on natural gas also introduces a greater degree of price volatility. For example, in the PJM region, natural gas prices were 25 percent lower in 2016 than in the previous year. Persistently low natural gas prices, combined with low energy prices driven by the zero fuel cost of renewable energy, can dampen the investment signal for new natural gas resources and pipelines that are needed to provide backup for those renewables.

To mitigate against potentially fewer investments in generating capacity, and to ensure reliability, state subsidies for particular types of units or rate base regulation could well become more rather than less prominent over time. This could help provide the necessary revenues to cover the fixed costs of a power fleet more dependent on renewable resources with backup fossil or nuclear generation.

Rural Water Systems

At the top of the water industry's long list of urgent concerns is the imperative for ensuring that the public has safe drinking water. The Trump administration's proposed fiscal year budget eliminates a USDA loan and grant program that helps fund water and wastewater systems in rural communities of less than 10,000 people. However, this loss is somewhat offset by a \$4 million increase to the EPA's State Revolving Funds that

“*At the top of the water industry's long list of urgent concerns is the imperative for ensuring that the public has safe drinking water.*”

will have a total budget of \$2.3 billion. Overall, funding for water and wastewater infrastructure should remain close to past funding levels, allowing the EPA to enforce its statutory and regulatory authorities under the Safe Drinking Water Act, which was enacted in 1974 and amended and reauthorized in 1986 and 1996.

In December 2016, the EPA completed its Drinking Water Action Plan (DWAP), designed to provide long-term guidance and rules aimed at improving the nation's drinking water infrastructure. Of the many DWAP rules under development, regulation of perchlorate in drinking water is especially pertinent to rural and small drinking water systems. Recent studies suggest that the very small public water systems are likely to end up saddled with an outsized portion of the compliance costs associated with a federal maximum contaminant level (MCL) for perchlorate.

It will be a while before the new rules have been finalized and longer still before they actually take effect. The EPA's timetable calls for completing the peer review process for the new MCL rules governing perchlorate in drinking water by October 2017, promulgating the proposed rules by October 2018, and implementing the final rule by year-end 2019.

Perchlorate is both a naturally occurring and manmade chemical used in the production of rocket fuel, missiles, fireworks, explosives, and some fertilizers. Its release into the environment is primarily associated with defense contracting, military operations, and aerospace programs. Perchlorate can be widespread in groundwater, soils and plants, and is a health concern because it can disrupt the thyroid's ability to produce hormones needed for normal growth and development.

Water utilities will be responsible for treating drinking water to meet federal standards. Research on the topic suggests that the national cost to limit perchlorate levels in drinking water to 4 micrograms per liter ($\mu\text{g/L}$) would be \$120 million per year. This is relatively low compared to compliance costs for other National Primary Drinking Water Regulations. However, these costs will be spread over a relatively small number of public water systems. An estimated 620 public water systems would be impacted by a federal perchlorate MCL standard of 4 $\mu\text{g/L}$, with over 40 percent of these systems serving fewer than 500 people.

For individual water systems, the cost of compliance will vary greatly with the number of customers served by a given water system. The large utilities that serve a population greater than 10,000 will benefit from economies of scale that reduce the cost of compliance to roughly \$0.03 per 1,000 gallons of treated drinking water. However, the cost of compliance among very small systems that serve a population of fewer than 500 could explode to \$3.00 per 1,000 gallons of treated water. This high cost of compliance would translate into an average increase in annual water bills of more than \$500 for a family of four, according to the American Water Works Association.

Higher treatment costs for reducing perchlorate levels could exacerbate the already-shaky financial situations of many small water systems. A recent study in North Carolina showed that roughly 20 percent of small water systems that serve a population of less than 1,000 struggle to generate enough revenue annually to cover their O&M and debt service costs, compared to 1 percent of systems that serve a population greater than 10,000. Furthermore, small systems that are financially stressed were found to be less likely to raise rates than their larger and more financially secure counterparts.

The final rule for perchlorate is not imminent, providing regulators time to design an effective rule that considers the outsized portion of compliance costs that would be borne by small water systems. This is critically important given the challenges small systems face in raising rates, which are largely due to a lack of affordability among the customer base of many small water systems.

“*President Trump signed an executive order in February to reconsider the EPA’s controversial Waters of the United States (WOTUS) rule.*”

WOTUS in the Crosshairs

President Trump signed an executive order in February to reconsider the EPA’s controversial Waters of the United States (WOTUS) rule and apply a more traditional definition of “navigable waters,” thus limiting the scope of the federal government’s jurisdiction under the Clean Water Act. As issued in 2015, the EPA’s WOTUS rule greatly expanded the types of waterways covered under the Clean Water Act of 1972, to include small bodies of water like wetlands and streams. Opponents object strenuously to the broader definition and contend that the WOTUS rule is vague, gives the federal government too much authority over private property rights, and places an undue burden on farmers and ranchers.

President Trump’s executive order will not have much immediate effect, however. This executive order does not repeal the WOTUS rule; instead, it directs the EPA and Army Corps of Engineers to revise and rewrite the rule – a lengthy, complicated legal process that could well take years to complete. Meanwhile, the WOTUS rule is on hold, having been blocked since 2015 by the Court of Appeals for the 6th Circuit due to litigation. For now, this rule remains in legal and regulatory limbo.

Telecommunications Industry

The Federal Communications Commission (FCC) maintained a busy schedule through the opening months of the year, a departure from what usually occurs during administration transitions. Though outgoing FCC Chairman Tom Wheeler refrained from moving forward with any new orders during his final two months at the agency, he continued to shepherd lesser regulatory actions through the eleventh hour. Shortly

after the inauguration, President Trump selected FCC Commissioner Ajit Pai to serve as the new Chairman of the agency. Pai's appointment received positive feedback across the communications industry as he is a proponent of less regulation, has shown an understanding of rural communications, and most importantly, supports consensus-based solutions for critical issues including Universal Service reform.

No Senate confirmation is required for a sitting commissioner to step into the Chairman role, allowing Pai to move ahead with his agenda immediately. Pai moved quickly to make good on his promise to "fire up the weed whacker" and cut regulations that he believes overreached the FCC's authority and are hindering investment, innovation, and job creation. In the first two weeks under his leadership, the FCC rescinded Notices of Inquiries, white papers, progress reports and policy reviews; retracted designations and returned petitions to pending status; and closed inquiries from Wheeler's last days at the FCC – which Pai described as "Midnight Regulations" lacking majority Commissioner support. The FCC also eliminated or stayed rules to alleviate unnecessary burdens and costs for providers, especially small and rural providers; acted to provide interim relief from the data security section of the FCC's broadband privacy Order issued in 2016; eliminated outdated accounting rules; and exempted carriers with fewer than 250,000 subscribers from having to comply with the Open Internet Order's enhanced transparency reporting requirements for five years. Plus, Pai implemented several FCC procedural reforms and a pilot program to improve transparency and accountability throughout the agency.

Going forward, industry insiders expect the FCC to repeal the net neutrality order that re-classified broadband as a telecommunications service and allowed for heavier regulatory oversight of broadband providers. Both Chairman Pai and fellow Republican Commissioner Michael O'Rielly had strongly voiced their opposition to the order when it was adopted early in 2015. In general, Pai is expected to work to foster broadband deployment with a light regulatory touch and policies that emphasize fiscal conservatism.

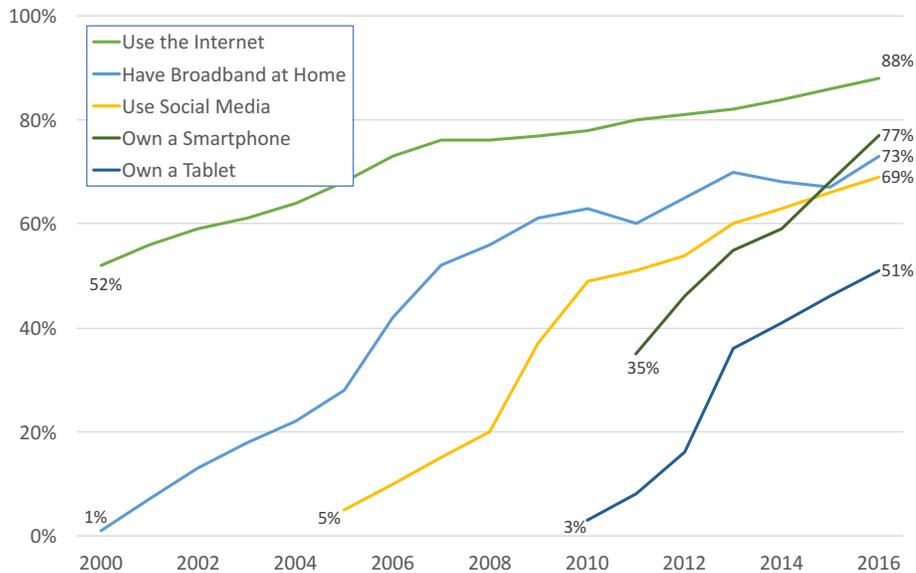
In the closing months of 2016, rate-of-return (ROR) carriers filed their decisions with the FCC to move forward under either a new model-based or a modified version of the legacy universal service funding mechanism. The model-based (A-CAM) plan proved to be more popular than anticipated and created a \$160 million funding shortfall above the initial \$150 million annual budget. In late December, the FCC adopted an order to add an additional \$50 million to the annual model fund budget, and closed the remaining \$110 million budget gap by reissuing 228 offers with reduced funding and relaxed deployment requirements. After more than a decade of heightened uncertainty, funding levels are now in place, and ROR carriers can move forward with predictable support for the next ten years.

Even as federal regulators are weighing and debating how best to fund and oversee a nationwide, high-speed broadband network, consumer adoption of streaming video paired with growing over-the-top (OTT) entertainment options and access to fixed wireless (WiFi) networks are spurring exponential growth in data consumption. As 2016 ended, total international data traffic surpassed the zettabyte threshold, or roughly one billion gigabytes per month. In 2015, consumer-generated video traffic in North America nearly reached 10,000 petabytes, a number that is projected to rise to 31,000 petabytes by 2020. Today, 88 percent of Americans use the Internet and 77 percent of U.S. households subscribe to a broadband service. (See *Exhibit 13*.) Roughly 77 percent of Americans own a smartphone and subscribe to a corresponding data plan. Nearly three-quarters of U.S. households have at least one connected entertainment device. Homes with WiFi access boast more connected devices, suggesting these in-home networks encourage more devices and subsequently more data usage.

Network investments are likely to climb as wireline and wireless companies of all sizes implement new technology and deploy more fiber to improve broadband speeds. Roughly 88 percent of Americans have access to connection speeds of at least 4 megabits per second (Mbps), including 61 percent with access to speeds of at least 10 Mbps and 39 percent who can connect

Exhibit 13: Evolution of Technology Adoption and Usage

% of U.S. Adults who...



Source: Pew Research.

with speeds at least 15 Mbps. The average broadband connection speed in the U.S. reached 16.3 Mbps in the third quarter of 2016, up 30 percent from a year ago. Average mobile broadband speeds are expected to triple from 6.8 Mbps in 2016 to 20.5 Mbps in 2020 as 5G networks are deployed. WiFi networks are expected to grow 30 percent a year over the next five years and reach 151 million connections by 2022, again owing to 5G technology. However, some experts caution that fiber is more cost-effective than wireless for serving rural areas over the long-term as it requires fewer upgrades in the future, and that 5G is better suited for high density areas as the solution loses some effectiveness over greater distances.

The long-term viability of the traditional pay TV model remains uncertain. For the past several years, legacy cable and IPTV providers have each touted subscriber additions during those quarter-years when they occur, while failing to mention that the growth came at the expense of competing providers. The pay TV subscriber base has been shrinking since 2013. Less than 10 percent of subscribers contemplate cutting the cord each year, with many fewer actually doing so, but a growing OTT market and new low-cost media players

make cord-cutting easier than ever before. YouTube recently rolled out an OTT service that includes five local broadcast channels, Netflix produced nine of the 10 most popular original streaming content shows in 2016, and new products such as the AirTV integrate local broadcast channels into a user-friendly programming interface. At year-end 2016, 54 percent of households (including those who share passwords) subscribed to Netflix, while 53 percent had a DVR in the home.

Though Pay TV providers have long bolstered revenues with high-speed data services, today they are attempting to stem the losses in their

pay-TV subscriber bases with skinny bundles, improved on-demand content libraries, TV everywhere apps, feature-rich set-top boxes and robust program interfaces that allow seamless access to subscribers' other paid OTT content. The true test of the pay TV model's longevity will come in five-to-ten years as Millennials, who currently make up 43 percent of the cordless video market, become the heads of their households who decide how to spend their entertainment dollars.

The wireline broadband companies are bracing for further cord-cutting in response to the recent reinstatement of unlimited wireless data packages. AT&T and Verizon both announced their new unlimited wireless data plans during the first quarter of the year, likely in response to competitive pressures from T-Mobile. Both companies affirmed they are prepared for the uptick in data usage on the network; however, the new plans are subject to speed throttling after a monthly data threshold is reached.

As wireless broadband speeds improve, researchers anticipate that up to 10 percent of broadband households will cancel their wired-broadband connections during the next 12 to 18 months. Younger customers and lower-income consumers are the most likely to rely on wireless connectivity. In a seemingly

preemptive move, Verizon introduced a prepaid service for wired Internet, pay TV and phone service; subscribers can pay online with a debit card, or in cash at kiosks or in stores. Rural providers may also experience some broadband cord-cutting in service areas that overlap with major wireless carrier coverage, but industry insiders expect that substitution will be more prevalent in the more densely populated, urban and suburban locations.

Consolidation increased across all segments of the telecom industry during 2016, except for wireless deals. Merger and acquisition activity is expected to remain strong in the coming months, owing in part to the Trump administration's affinity for less market interference. Rural consolidation may pick up as the now more predictable Universal Service support could make rural businesses more attractive to buyers. Future transactions will continue to aim to remove competition, create operational synergies and economies of scale, expand network footprints, and improve overall service capabilities. Larger operators may look to smaller horizontal acquisitions to add or bolster services, though these deals will be outliers.

Data centers and fiber transport companies remain strong performers within the industry, as the need to transport, process and store data is ever-increasing. Wireline and wireless providers face more challenges as meeting the demand requires significant investment to build and upgrade networks as well as an innovative approach to determine the ancillary services that customers want. Going forward, small and rural community-based companies will need to be creative and employ new solutions and business structures to compete effectively and efficiently. ■

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.

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