KNOWLEDGE EXCHANGE

QUARTERLY U.S. RURAL ECONOMIC REVIEW

Trade War Risks Loom over Agriculture

March 2018

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

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Key Points:

- Talk of trade wars is complicating the U.S. economic outlook, but fiscal stimulus in the form of tax cuts and increased government spending will boost U.S. growth over the next 18 months.
- There are three areas of concern with respect to the U.S. economy: The pace of increase in interest rates, uncertainties with respect to trade policy and the potential political volatility surrounding the Congressional elections in November. It is unlikely that any of these could significantly derail the 2018 growth path but current optimism for 2019 could be dampened.
- Persistent drought in Argentina could cut soybean output there by 20-30 percent. Global soybean stocks are at multi-year highs, but Argentina's sharp production loss puts increased focus on the U.S. growing season.
- Demand for animal protein and dairy products is strengthening domestically and abroad. U.S. meat and poultry production also continues to increase steadily, while dairy production remains stubbornly high.
- Several U.S. specialty crop industries are suddenly faced with the potential that 15 percent tariffs could be imposed on their exports to China. Most nuts, dried and fresh fruits, and wines would be impacted by the levies. In 2017, China accounted for the following share of U.S. exports: wine – 4%, fresh fruit – 3%, processed fruit – 10%, tree nuts – 3%.
- This year will likely be viewed as an inflection point for battery storage, largely due to FERC Order 841. The order is transformative in its spirit that advances the role battery storage technology will play in shaping the future of the power and energy sector.
- The $1.3 trillion Federal spending package passed in late March included $600 million for the USDA to create a pilot program within the Rural Utilities Service to support the buildout of rural broadband. The sum falls short of the $2.5 billion the industry has been hoping for, but a future infrastructure bill could add to the total.

Executive Summary

An impending trade war, continued large global supplies, and negotiations over a new farm bill and tax extenders continue to present challenges for U.S. agriculture and farmer cooperatives. Reduced harvests in Argentina and potential droughts in some parts of the U.S. have steadied grain and oilseed market prices but there remains a potential for significant volatility. Domestic demand for food and agriculture will remain strong with a U.S. economy supported by recent tax cuts and higher government spending. Disposable incomes will increase with continued job growth and low unemployment. However, export uncertainties remain large for all commodities including the animal protein and dairy sectors. World economic conditions remain favorable for improving trade flows but trade disputes are on the rise. If the world experiences trend yields for the 2018 harvest it is likely that commodity prices would remain near the 2017/18 levels and net cash farm income would not recover significantly. This would mean that net farm income from 2016-18 would average over 20 percent lower than the previous five years. The resulting erosion of working capital and the need for increasing debt at a time of rising interest rates would put more stress on the farm economy and the farmer cooperative system that supports rural America.

Global Economic Environment

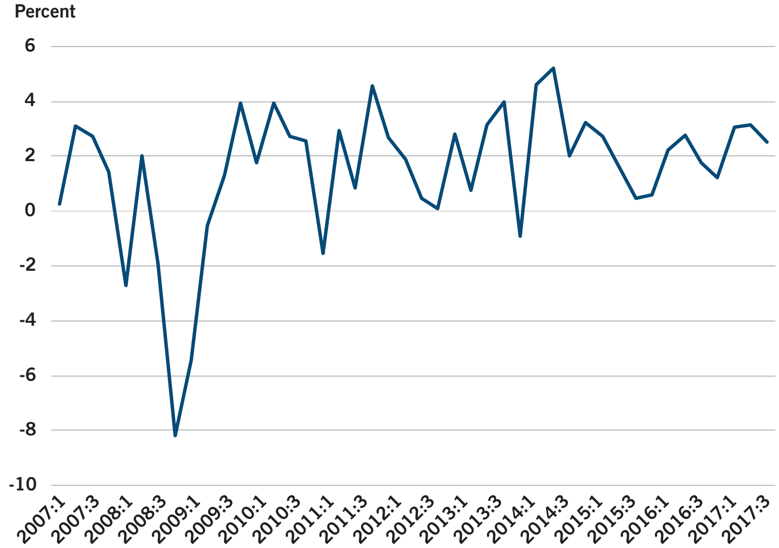
Optimism over global economic growth in 2018 remains high but it is clear that downside risks to growth far outweigh the likelihood of upside surprises. Global growth around 4 percent in 2018 would be the highest since 2011. Concerns over a potential trade war that could limit global trade volumes remains the greatest risk. Significant political uncertainty in many regions and the continuing trend toward nationalism and rising protectionist sentiment cannot be ignored. Asian markets, led by China, continue to grow at the 6-7 percent range with issues related to trade and North Korea providing the most uncertainty. Latin America has seen significant improvement in growth prospects for Brazil and Mexico and further deterioration in Venezuela. Mexican elections in July and NAFTA negotiations remain wild cards. The advanced economies, led by the U.S., are providing needed stimulus to the global economy. U.S. fiscal stimulus in the form of tax cuts and increased government spending are boosting U.S. growth expectations for the next 18 months. At the same time, growth rates in Germany have bolstered European growth expectations. The progress on Brexit negotiations and election results in Italy and Germany remain potential issues. Rising oil prices have boosted the oil exporting economies such as Saudi Arabia.

The divergence in central bank policies is likely to continue into late 2018. The U.S. Federal Reserve is expected to continue to move interest rates higher as growth accelerates in response to fiscal stimulus. The European Central Bank and the Bank of England are likely to continue current low interest rate policies but slow quantitative easing. The Bank of Japan may move rates higher but very cautiously.

Key factors to watch:

- **Ongoing trade negotiations and potential trade disputes** are the major concerns in the near term. U.S. tariffs on steel and aluminum may elicit responses from other countries and will certainly impact the ongoing NAFTA negotiations. Recently announced U.S. tariffs on Chinese imports triggered China to announce its own list of retaliatory tariffs which would largely affect U.S. agricultural goods. The completion of the 11 country Comprehensive and Progressive Agreement for Trans-Pacific Partnership (TPP) that does not include the U.S. or China could result in some erosion in U.S. export potential. The current trade environment will likely result in many countries reexamining their trade policy strategies and attempting to diversify their supply chain arrangements.
- **Fiscal stimulus will boost U.S. economic growth** with business investment likely to be more of a growth catalyst now that tax reform is completed and deregulation initiatives continue. Underlying consumer demand will be boosted by increased disposable income and continued strong job growth. With completion of the budget agreement in March there is little optimism for significant legislative action before year end. Farm policy changes included in the budget agreement have increased odds of completing a 2018 farm bill. Partisan disagreements related to the nutrition program could derail the bill, however. If the bill is stalled past the summer, a one year extension of the 2014 farm bill will likely be enacted. After midyear, the focus will turn to the Congressional elections in November and majority control of the House and Senate.
- **Growth in Europe has improved but the March 2019 Brexit negotiation deadline will be an increasing constraint as the year progresses.** Elections in Italy and Germany and the resulting coalition governments continued to reflect the trend toward nationalism and rising protectionist sentiment.
- **Central bank policy divergence will get increasing attention as the U.S. Federal Reserve continues to move interest rates higher.** After moving rates higher in March, the Federal Reserve will monitor economic growth rates, inflation and wage gains in assessing the need for further increases. At least two more increases may occur in 2018. The other central banks are unlikely to move their policy rates higher but may begin to slow or eliminate their infusion of monetary stimulus through quantitative easing.
- **The path of the U.S. dollar will be linked to relative economic growth rates, the magnitude of interest rate spreads across countries and the safe haven nature of the world's reserve currency.** The U.S. dollar has declined by 10 percent from a year earlier but continues to be volatile given the significant global trade issues. Continued improvements in growth outside the U.S. and a desire to diversify foreign exchange holdings may trend the dollar lower despite increased interest rate spreads among the major currency countries.
- **After completing its National Congress in 2018 and removing term limits for the President and Vice President, the Xi Jinping regime is firmly in place** and China is likely to continue on its 6-7 percent growth path. The One Belt One Road initiatives are likely to be accelerated as China seeks to enhance the infrastructure of its supply chains amidst global trade policy turmoil.
- **Geopolitical risks remain significant with potential issues in North Korea, Syria and Venezuela in particular.** Recently scheduled discussions between the U.S. and North Korea offer an opportunity to diffuse tensions on the Korean peninsula but the continuing anti-globalization trend and efforts to adopt protectionist policies may fuel further political unrest.

EXHIBIT 1: Real Gross Domestic Product



Note: Percent change from quarter one year ago

Source: IHS Markit

U.S. Economic Environment

The U.S. economy has been given a significant fiscal boost as a result of personal and corporate tax cuts and the increased government spending that was approved by Congress and the President in late March. While first quarter growth is likely to remain in the 2-2.5 percent range, the fiscal actions will boost growth through the remainder of 2018 and into 2019. (*See Exhibit 1.*) Consumer spending will remain a significant contributor to growth as increases in disposable income will permit some recovery in the currently low savings rate. The unemployment rate will likely dip below 4 percent with wage gains likely to move higher. The major new impetus for growth will likely be business investment. After remaining stagnant for several years, business investment has begun to accelerate and the corporate tax cuts and reduced regulation will provide an added boost. Any action on increased infrastructure spending would be an added bonus.

There remain three areas of concern. The pace of increase in interest rates, uncertainties with respect to trade policy and the potential political volatility surrounding the Congressional elections in November. It is unlikely that any of these could significantly derail the 2018 growth path but current optimism for 2019 could be dampened.

U.S. Agricultural Markets

The announcement of impending U.S. tariffs on Chinese goods in late March spurred China to announce its own proposed tariffs on U.S. goods. The U.S. products on China's list include fresh and dried fruits, nuts, wine, ethanol, and pork. No tariffs are likely to be enacted from either side until the U.S. outlines its specific intentions and allows time for U.S. industries to comment. U.S. tariffs could be implemented as soon as late April, and China's retaliatory actions would likely follow immediately. There is considerable risk that China's list of U.S. ag products on which levies will be applied could grow. China has hinted that it will "keep its powder dry" which could put soybeans, corn, beef or other products at risk in the future.

Related to production, reduced corn and soybean crop potential in Argentina and drought concerns in some parts of the U.S. have provided some recent support for grain and oilseed prices, but the reality is that global stocks of most commodities remain large. With global commodity demand remaining firm, market attention will be squarely focused on the increasing trade tensions and 2018 crop developments. Ongoing NAFTA negotiations, the announcement of U.S. tariffs on aluminum and steel, and the potential of a trade war are tempering market expectations. With grain and oilseed season average prices likely to remain near year ago levels, the animal protein and dairy sectors should continue to enjoy favorable feed costs. Red meat production is expected to increase sharply in 2018 and the prices may trend lower unless supported by continued strong domestic demand and growing export markets.

With input costs holding steady, net cash farm income is likely to remain near 2017 levels under current conditions. The March budget agreement will fix the unintended consequences that were ushered in with Section 199A as part of the tax reform act. The budget deal will also provide necessary funding for the USDA.

The passage of a new farm bill in 2018 could provide additional revenue support in future years. Asset values, primarily land, have remained resilient despite the declines in farm income. Debt levels, however, continue to rise. When coupled with higher interest rates, the increasing debt will pose a problem if cash incomes don't improve in the near future. There remains significant variability in economic conditions by region, commodity and farm operating structure.

Grains, Oilseeds, and Biofuels

South American weather concerns dominated the grain and oilseed markets in the opening months of 2018 with export interest having shifted to the U.S. A season's long drought hit Argentina hard as hopes for a decent production year based on good soil moisture through January have been dashed. The USDA estimates Argentine corn and soybean production will decline by 12 and 19 percent, respectively. Some private estimates put soybean production in Argentina as much as 30 percent lower, while a major dip in corn production is forecast despite an increase in planted acres. These same private estimates peg Brazilian soybean production near last year's record levels, partially offsetting declines in Argentina's production.

Final production numbers from USDA cemented last year's U.S. corn crop as the second-largest on record thanks to record yield. Last year's U.S. soybean crop was the largest on record. With the 2018 growing season looming, soybean acres are poised to grow further and potentially exceed corn acres. Cotton in the Southern Plains, Hard Red Spring wheat in the Northern Plains, and soybeans across the U.S. are all competing for corn acres this year. Corn acreage is expected to remain flat this year despite the pressure. The first official indication of U.S. acreage comes at the end of March when the USDA publishes its Prospective Plantings report.

Strong corn demand surprised this quarter as ethanol production and corn exports exceeded expectations. Additionally, DDGS prices have surged and are following soybean meal prices higher on worries about Argentina's drought. However, the ongoing Renewable Fuel Standard (RFS) debate has ethanol managers distressed over prospects of demand destruction. Soybean demand is mixed with record domestic crush outweighed by a drop in exports year-over-year (YoY). This export decline is almost entirely due to a pullback in Chinese demand, though recent data shows they may be picking up their purchases going into next quarter. A relatively weak U.S. dollar has aided U.S. agricultural exports, but U.S. trade policy and the resulting retaliation to these trade policy moves creates headaches for agriculture going into the second quarter of 2018.

Corn

Pessimism reigned in the corn market early this year on ever-increasing production numbers. However, the corn market has turned bullish on better-than-expected export figures, strong ethanol use, and South American weather worries. Since mid-January, U.S. export commitments have surged, approaching year-ago commitment levels.

With trade tensions between the U.S. and Mexico rising, continued growth in U.S. corn export commitments may slow as Mexico accounts for over 25 percent of all export commitments. Mexico has begun actively searching out alternative corn suppliers, including Brazil and Argentina. Mexico's imports of Brazilian corn jumped over 900 percent in 2017 with all of its purchases coming between September and December.

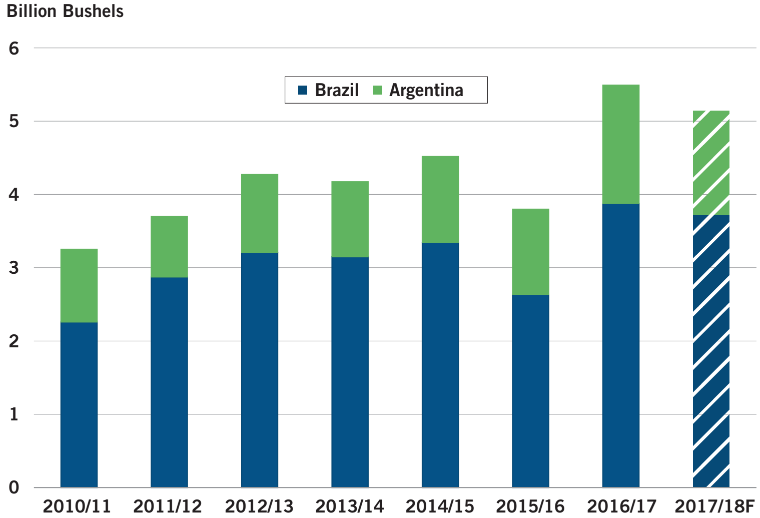
Sorghum had a rollercoaster first quarter in 2018 in what many say is a preview of trade wars to come. Sorghum exports jumped as the landed price in China became more competitive than alternatives like domestic corn or Australian corn. In late January, prices reflected this demand increase as cash sorghum prices in many parts of Kansas exceeded corn.

In early February, China began an anti-dumping, anti-subsidy investigation of U.S. sorghum following the Trump Administration's announcement of solar panel and washing machine tariffs. This move completely shut down the Chinese market for U.S. sorghum, sending cash prices plummeting in the western U.S. grain belt. In Kansas City, prices dropped 70 cents in one week.

Convergence issues in corn and soybean markets, meanwhile, are surfacing due to large stocks and production. The CME Group is now in initial talks with market participants to determine if they are observing any convergence issues in the corn and soybean markets. As these discussions progress over the coming months, the CME Group may consider changes similar to those made in the HRW wheat contract for corn and soybean contracts. If 2018 ushers in another bumper crop, convergence concerns will likely continue.

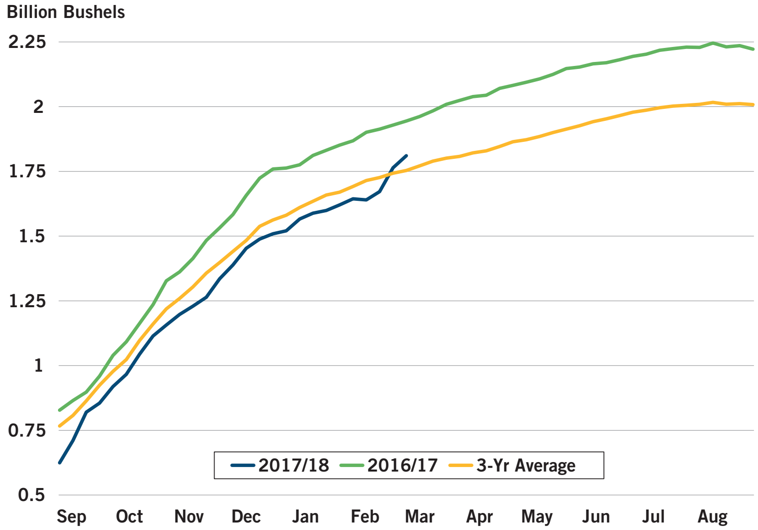
Next quarter, the size of Brazil's safrinha corn crop will come into focus and make clearer the export competition the U.S. faces. Wet weather during the soybean harvest has delayed planting for much of the safrinha crop. After acreage figures are determined, the spring will start to reveal the crop's progress. Later-planted corn is more likely to run into hot, dry weather at critical growth stages, which could reduce production. Before these issues arose, the safrinha corn crop was expected to shrink YoY, but by how much is still to be determined. (*See Exhibit 2.*)

EXHIBIT 2: Corn Production, Brazil and Argentina



Source: Bloomberg

EXHIBIT 3: Total Export Commitments, Soybeans



Source: USDA-FAS

Soybeans

Lackluster export demand has plagued U.S. soybean markets in 2018's first quarter. (*See Exhibit 3.*) The USDA now projects an ending-stocks-to-use ratio of over 13 percent, skyrocketing from last year's ratio of around 7 percent. The slow export demand (accounting for around half of total soybean use) and huge crop kept basis appreciation low compared to 5-year averages. However, basis has strengthened more than last year and is likely to continue following the normal strengthening pattern for the remainder of the year to the benefit of grain handlers.

The new foreign matter (FM) notification requirement for soybeans entering China from the U.S. is the major contributor to the slowdown in U.S. soybean exports. In order to comply with Chinese regulations, on Jan. 1, 2018, the USDA implemented a new procedure that adds a declaration to phytosanitary certificates stating if a soybean shipment contains more than 1 percent FM.

This declaration creates enormous uncertainty for sellers shipping U.S. soybeans. They are concerned about taking on additional costs of cleaning, demurrage, or being held-up by Chinese buyers asking for a price reduction on shipments with more than 1 percent FM when boats arrive in China's ports. Soybeans that were shipped from the U.S. in January have arrived at Chinese ports without major complications. While these shipments did not have any reported issues unloading, shippers remain nervous that the declaration could be used as leverage in the future.

In response to the new FM declaration, sellers who have the option of shipping soybeans from different origins in their sales contract have opted to ship soybeans from South America, particularly Brazil. This sent Brazilian exports soaring in months that are normally peak season for U.S. soybean exports. As a result, soybean exports from the U.S. to China have dropped YoY. Recently, U.S. soybean export sales to China leapt above the pace set so far this year. This may be a sign of renewed Chinese demand for U.S. soybeans, but ongoing trade disputes and the conclusion of Brazil's soybean harvest will temper additional sales growth.

Domestically, USDA has pegged soybean crush at 1.96 billion bushels. Soybean oil ending stocks are now expected to be larger YoY as more production is forecast and demand for soybean oil from the biodiesel industry is weaker than expected. In contrast, soybean

meal use is projected slightly higher YoY. Demand from the domestic livestock industry remains rock solid, and new export opportunities will emerge as Argentina, the world's largest soybean meal exporter, will reduce exports on a smaller soybean harvest.

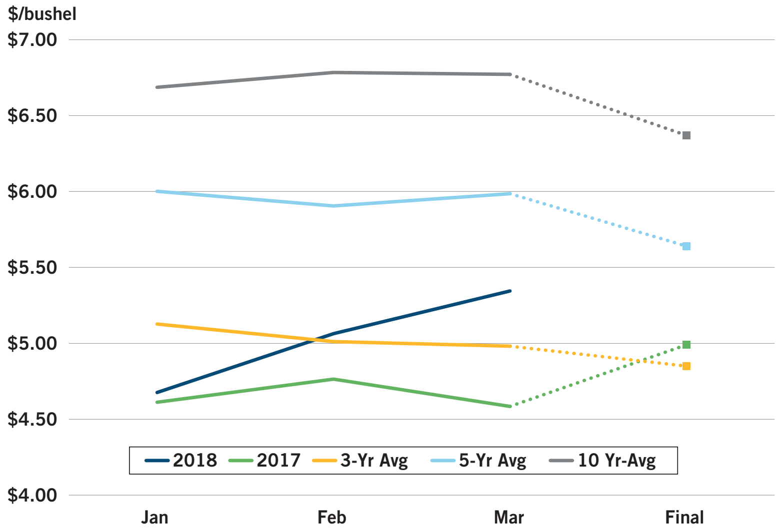
The next quarter will finalize South American soybean production estimates. Additionally, the USDA is projecting stronger soybean meal exports and lower soybean exports due to Argentina's strength in meal and oil exports. This also sets the stage for the U.S. soybean crop. A weather scare in the U.S. could send soybean prices surging if South American soybean production is as bad as some fear.

Wheat

Drought in the Central and Southern Plains decimated winter wheat crop conditions to start the year. Drought now covers around 40 percent of the winter wheat production area. As a result, less than 15 percent of the winter wheat crop is in good-to-excellent condition in Kansas and Oklahoma. This 15 percent is paltry in comparison to 5-year averages of around 40 percent. In contrast, major soft winter wheat production areas in Illinois and Ohio have had adequate moisture, keeping their crops in good shape.

Concerns over the Hard Red Winter (HRW) wheat crop in the Central and Southern Plains have pushed prices for both HRW and Soft Red Winter (SRW) wheat higher.

EXHIBIT 4: July HRW Wheat Contract Prices



Source: Bloomberg

Note: Mar 2018 average price calculated using prices through mar 20.

As a result, July futures for HRW and SRW wheat were trading above $5 earlier this year. (*See Exhibit 4.*) However, recent rains have pummeled HRW and SRW prices. HRW's premium to SRW has accelerated as HRW's crop conditions continue to deteriorate. USDA's surprising projected increase in SRW acres YoY has added support to the HRW-SRW spread. With significant stocks still on hand, prices remain relatively low compared to recent history. With good subsoil moisture still available, conditions could turn around quickly if spring precipitation is adequate.

Export competitiveness remains a sore spot for U.S. wheat as trade pacts continue to be made outside the U.S. amid abundant world wheat supplies. The Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) was signed on March 8, which is, in essence, the TPP trade agreement sans-U.S. While several steps remain before implementation, the trade pact is projected to put U.S. wheat exports to TPP countries at a competitive disadvantage. TPP-signees Canada and Australia will see wheat import tariffs in TPP countries reduced by $65/ton. This will make U.S. wheat exports $65/ton more expensive than Canadian and Australian wheat to TPP countries.

This is particularly painful for the U.S. wheat industry for two reasons. First, U.S. domestic wheat use is flat to declining with forecasted 2017/18 demand the lowest since 2010/11. Second, U.S. wheat exporters have shifted their focus to Southeast Asia away from the large North African and Middle Eastern markets dominated by Europe and countries that make up the Former Soviet Union. Australian and Canadian wheat are the major competitors to U.S. wheat in the Southeast Asian market much of which signed onto the CPTPP deal. President Trump says he is open to joining the CPTPP, but it remains to be seen if or when this will occur.

Biofuels

The RFS has become the subject of intense scrutiny in Washington, DC with several meetings held by the White House to find a compromise between the biofuel and oil industries. The debate for oil focuses on the cost of renewable identification numbers (RINs), which are used by refiners to comply with their obligation under the RFS, which mandates the blending of biofuels. While large refiners often blend ethanol themselves and do not directly pay for RINs, independent refiners that do not blend must purchase RINs on the open market where prices often fluctuate. The biofuel industry argues that RIN prices will come down if more ethanol is blended domestically. This would necessitate increasing sales of higher ethanol blends like E15 (gasoline with 15 percent ethanol) or E85 (gasoline with 85 percent ethanol) above the standard E10 (gasoline with 10 percent ethanol). Gaining a waiver to sell E15 all year is the main argument the biofuel industry is making to increase these sales.

While no deal has been struck, a compromise of a RIN price cap around 10 or 20 cents per gallon and an E15 waiver have been discussed as a "grand bargain." A price cap at 10 cents per gallon would eliminate all biodiesel production without a blender's tax credit and reduce ethanol production back to the E10 blend

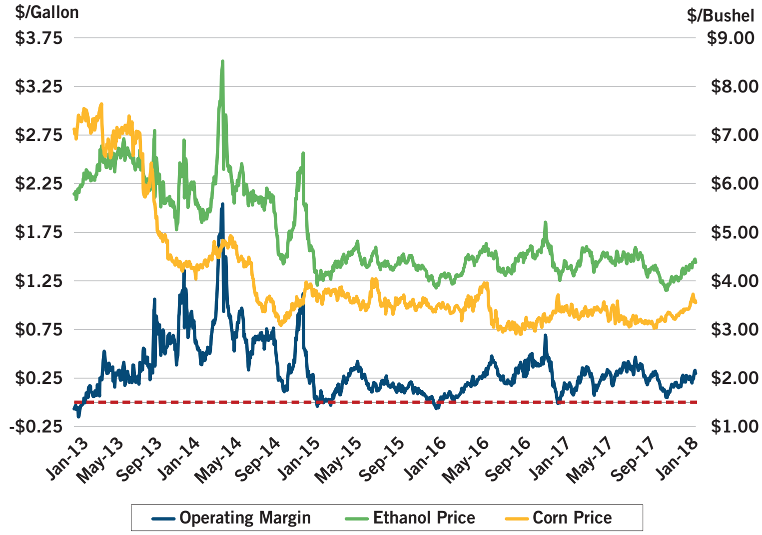
level. Analysis by the University of Illinois's Farmdoc daily shows that an administratively imposed RIN price cap is essentially a mandate waiver and would likely be unsuccessful when challenged in court because it would not fall under one of the EPA's three waiver authorities.

The ongoing RFS debate is currently the top risk for biofuel producers. Preventing a RIN price cap at the discussed levels is the short-term issue. The new political contentiousness around the RFS points to elevated policy risk in the long-term as well.

Amid the growing policy uncertainty, producers keep churning out more ethanol in 2018. Gasoline demand and ethanol exports remain strong despite headwinds. Year-to-date refiner and blender net input of fuel ethanol is up by over 20 million gallons (just under 1 percent). Additionally, 2017/18 U.S. exports are closely following the export trajectory seen last year.

Exports to Brazil have survived import tariffs, but are down slightly from year-ago levels. Exports to China are also now at risk as a result of U.S. ethanol being listed as a potential retaliatory tariff target. However, China has been aggressively cutting back on imports of U.S. ethanol for more than a year. In 2017, China accounted for only 2 percent of U.S. ethanol export sales versus 17 percent in 2016. Overall, ethanol demand appears to be solid going forward, and should support ethanol prices into the summer. (*See Exhibit 5.*)

EXHIBIT 5: Ethanol Plant Profitability



Source: ISU-CARD

EXHIBIT 6: Fertilizer FOB Prices, Gulf

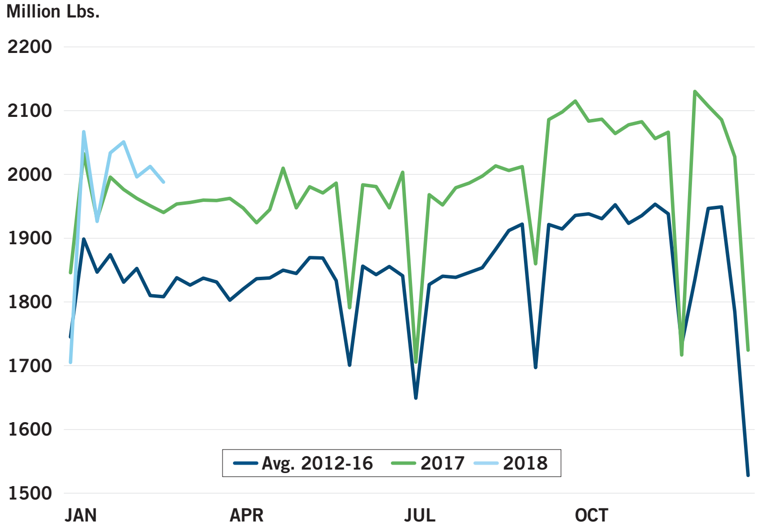
Source: Bloomberg

Farm Supply

In the short-term, fertilizer prices should rise steadily into the spring planting season. (*See Exhibit 6.*) Prices for the three major macro-nutrients have moved higher with corn prices, with no immediate let-up expected. Farmers are steadily applying fertilizer to replace nutrients from last year's bumper crops and prices remain low from a historical perspective. Additionally, no major changes to crop acres are expected with corn acres projected to remain around 90 million acres, keeping fertilizer demand steady.

For nitrogen, two countervailing factors will impact prices. On the one hand, U.S. nitrogen fertilizer production capacity is forecast to grow this year which will put downward pressure on prices. On the other hand, Chinese fertilizer production and exports are expected to be lower this year. This is a result of China shifting natural gas supplies from industrial users to residential users and the government's crackdown on industries that are major contributors to China's pollution problem.

EXHIBIT 7: Total Meat Production - Beef, Pork, & Broiler



Source: USDA-AMS, USDA-NASS, Livestock Marketing Information Center

Phosphorus in the form of MAP and DAP is leading the way to higher prices. With large corn yields and the same corn acreage expected in 2018, growers will need to recharge phosphorus levels in their soils for the following soybean crop. Additionally, phosphorus production cuts in the U.S. and in China will support prices in the short run. However, to the extent that acres shift out of corn or major producers bring production back online, further price increases will be limited.

The potash market will be well balanced going forward. No major changes have been reported since the merger between Potash and Agrium closed. However, this will be closely watched in the months ahead.

While the two other major mergers in the seed and crop protection industry have long since closed, Bayer and Monsanto plug away at obtaining regulatory approval in the U.S. and elsewhere. Most recently, they have received the green light from the EU. This required Bayer and Monsanto to make additional divestments including the sale of Bayer's vegetable seeds business to BASF, the sale of Bayer's hybrid wheat business, and granting BASF exclusive access to Bayer's digital farming data. Monsanto has also agreed to sell its NemaStrike product. Meanwhile, Bayer stated that negotiations with U.S. anti-trust regulators are behind those with the EU, and sources indicate that U.S. regulators may require additional divestments. As a result, this merger is unlikely to close in time to impact the industry until the second-half of 2018.

Animal Protein

Strengthening demand both domestically and abroad was the unifying theme across the animal protein complex in the opening months of 2018, setting a tone of optimism for the year ahead. Robust global and domestic demand boosted profitability for animal protein producers in the final months of 2017, with the momentum continuing to be driven by the strength in the U.S. and world economies.

Meat and poultry production also continue to increase steadily. U.S. output is expected to reach record levels in 2018. Total meat and poultry supplies are projected to grow 3-4 percent, eclipsing the 100 billion pound mark for the first time. (*See Exhibit 7.*)

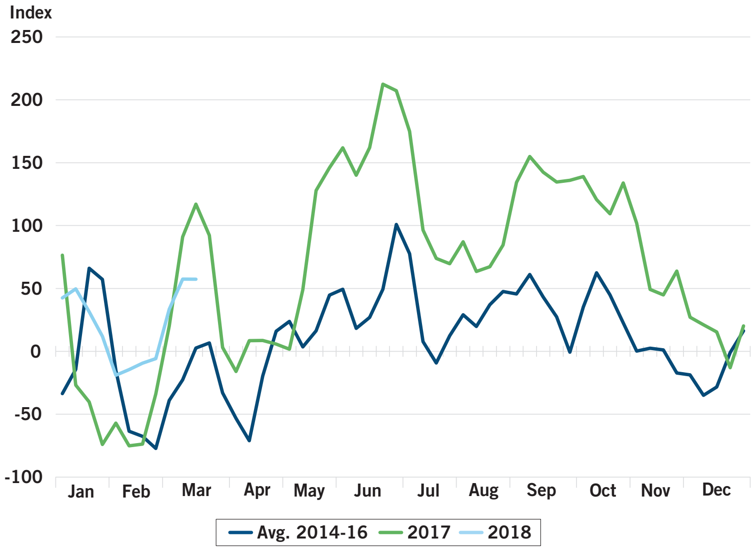
The persistent production growth places greater emphasis on the export side of the equation. Several key trade agreements, though, remain in the balance amid rising threats of trade protectionism. Any disruption to export channels would create an oversupply situation in the U.S., resulting in price pressure and margin compression. Assuming there is no significant fallout from trade policy, an improving net trade balance should limit the per capita supply increase to a more modest 2.5 percent.

Beef

Robust demand surprised the beef market throughout 2017 and created profit opportunities for every sector in the beef supply chain. In order to maintain profit opportunities in 2018, demand growth must be steady to increasing, especially in the face of increased output.

The U.S. cattle herd continues to expand, albeit at a slowing pace. According to the latest USDA-NASS Cattle Inventory Report, the beef cow inventory grew 1.6 percent to 31.7 million head in 2017. But

EXHIBIT 8: Beef Packer Margins



Source: HedgersEdge, Bloomberg

downward revisions to the 2017 calf crop have slightly reduced the beef replacement heifers - a strong indication of slowing herd expansion.

Pasture and range conditions and profitability at the cow/calf level will be the major determinants in assessing herd expansion moving forward. The ongoing drought conditions in the Central and Southern Plains remains the biggest threat to the herd expansion. Should the drought worsen, the cow herd could shift and the flow of feeder cattle into feedyards could rise. Moisture conditions will also play a large role in producer decisions to retain replacement females and affect overall beef production levels later in 2018.

Beef production is expected to grow by 4-5 percent in 2018, outpacing the more modest increases expected for pork and poultry. Cattle slaughter is up 2.5 percent YTD with a slight increase in carcass weights boosting overall production over last year. Increased consumption of beef at lower prices will help offset supply side price pressures as flat to declining retail prices should assist in clearing more volume amid greater competition in the meat case.

Excellent packer profitability has supported aggressive marketing of cattle and kept the front end inventory more current than previous years. While meat demand is expected to remain robust, weakness in variety meat and hide values are compressing packer profitability in the short term. (*See Exhibit 8.*)

The cattle feeding segment was the beneficiary of aggressive buying by packers throughout 2017. Looking forward, crush margins look good for the remainder of 2018. Demand will play a critical role in keeping the pace of cattle moving through the system and keeping front end supplies current.

Drought conditions on the plains increased the flow of lighter weight feeder cattle entering feed yards from late 2017 into the opening months of 2018. Cattle inventory at feedyards were up 8 percent YoY in January. The quickened pace of placements will likely slow in the second half of 2018, dragged lower by the lower estimate of the 2017 calf crop.

Retail beef prices have remained steady while featuring activity has increased. However, rising output will pressure prices in the months ahead. Growing pork and poultry output will drag on beef prices as competition grows for consumer dollars.

Strong U.S. beef exports, meanwhile, have continued to buoy beef prices. While a strong U.S. consumer base insulates the market from oversupply pressures, it does not completely eliminate the risk. Total beef exports in January increased 9 percent in volume and posted an impressive 21 percent surge in value YoY. Beef exports are forecast to increase 3-5 percent YoY in 2018, with Asian markets driving the growth. Still, trade uncertainty remains an ongoing risk amid trade negotiations with key destinations such as Canada, Mexico, Japan and South Korea.

Pork

As new pork processing capacity comes online in early 2018, market dynamics in terms of the leverage position between producers and packers is playing out as expected. Robust packer profitability throughout the second half of 2017 and the desire to efficiently operate expanded capacity has supported elevated slaughter levels and supported producer prices.

Pork production has increased 2.8 percent YTD and is expected to increase 3-4 percent annually in 2018. The combination of a growing breeding herd and investments in additional market hog growing facilities over the past two years are resulting in increased production. Production efficiency gains are also boosting pork output in the U.S.

With demand growth limited in the U.S., continued global demand growth is necessary to support current advances in production. Roughly one-fourth of all U.S. production is destined for the export channel. The growing dependence on exports has only heightened the risk of an oversupply situation in the U.S. A natural transition is expected over the next two years as newer and more efficient packing facilities replace existing outdated plants. Any disruptions in exports could result in domestic supply increases and compress margins across the entire supply chain.

Pork exports are off to a steady start and projected to increase 2-4 percent YoY for 2018. January volume is on par with last year while value increased 7 percent, but the growing threat of international trade spats continues to loom over the market.

Widespread export growth is buffering the industry's trade concerns. Central America, the ASEAN region and Oceania all experienced healthy volume increases in January. China, which remains the driver of the global pork market, is ramping up domestic production, which is dampening its import demand. If enacted, China's proposed 25 percent tariff on U.S. pork products would put European exporters in prime position to gain more market share from the U.S. In 2017, China accounted for 13 percent of total U.S. pork exports.

Poultry

U.S. broiler production has softened YTD and is projected to increase 3 percent annually in 2018. A slight increase in bird weights has boosted overall output in early 2018, but decreased productivity of the hatchery supply flock will limit expansion opportunities in the year ahead.

Cheap and abundant feed supplies and robust consumer demand continued to bolster integrator profitability in the opening months of 2018. Expectations for further demand growth in 2018 are driving the optimism for further increases in chicken value. Rising supplies of competing proteins, though, may cap meaningful price appreciation.

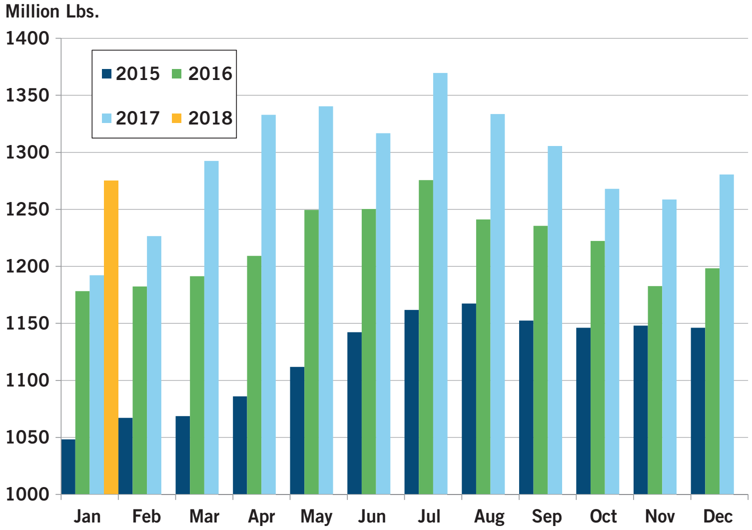
The outlook for integrator margins has been lowered recently as supply competition builds across the animal protein sector. The major production categories of whole bird, cut up and deboning are expected to post an average margin of 5 cents per pound throughout 2018.

Concerns over bird flu have dramatically declined this year, largely due to enhanced biosecurity that has been established over the past three years. However, migratory patterns in the coming spring months still pose risk of a potential outbreak in the U.S. Given the success of biosecurity protocols in recent years, the industry is confident about controlling exposure from potentially infected migratory waterfowl.

Greater availability of total meat and poultry in the U.S. has intensified featuring activity at retail and restaurants. Whole birds, breast meat, tenders and wings will benefit from this activity in the form of increased volume and a level of price support. The wing market is expected to remain volatile as price tends to quickly react to major promotional activity. Dark meat values are improving due to continued global demand growth and are even seeing some support in the growing domestic market for deboned dark meat.

Export demand, though, is off to a slow start in 2018. January exports were down 1.5 percent compared to last year. Broiler exports are expected to increase modestly by 2-3 percent annually in 2018. A weaker dollar will be a tailwind for exports that gives global customers more purchasing power. For U.S. integrators, the vast diversity of export destinations will be a major advantage over competing meats and other countries.

EXHIBIT 9: Total Natural Cheese Stocks



Source: USDA-NASS

Dairy

Dairy product inventory levels are high, and continued strong milk production growth out of the EU will make it difficult to clear them. Production growth is showing signs of leveling out, first in the U.S. then in the EU, but the sizeable inventories will continue to weigh on prices. Farm milk prices will not be drastically worse than anything experienced in the past three years, but margins will be pressured as labor, energy and other peripheral costs continue to climb.

In the U.S., no major decreases in milk production are expected on a national scale, but major expansions are unlikely as dairy producers balance anemic milk prices with increasing production costs that now include rising hay prices in some regions. Unfavorable margins have migrated from small farms to larger farms, which are typically insulated from such pressure by their scale. Higher slaughter rates so far this year and ample replacement heifer supplies reflect the hesitation to expand.

The EU, meanwhile, is still in growth mode. However, production across the EU is expected to cool off in the second half of the year as producers succumb to similar margin pressures as those experienced in the U.S.

For now, as the U.S. moves into the spring flush, all of this extra milk is finding its way through the processing sector and onto the markets, continuing to weigh down product prices. Most of the additional milk is becoming cheese. Cheddar production hit a new record in 2017. However, consumption growth has slowed, resulting in higher inventories. Total cheese inventories in cold storage as of January 31 were a record 1.275 billion pounds, up 7 percent from a year earlier. (*See Exhibit 9.*)

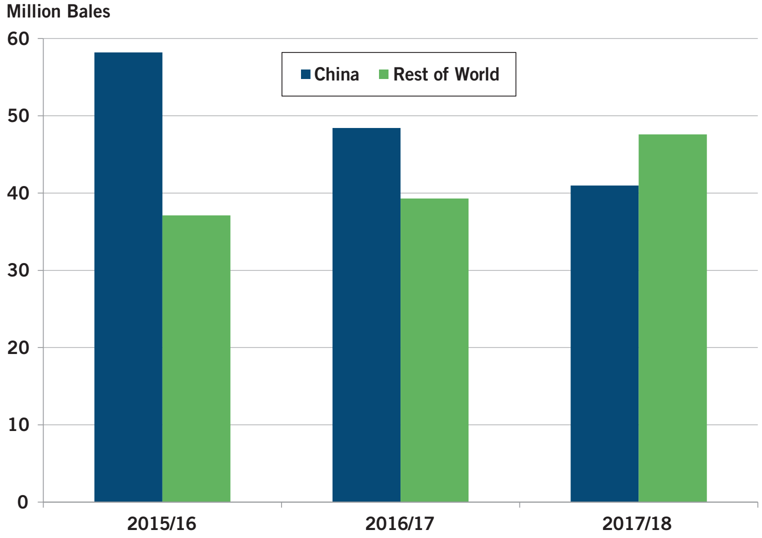
Butter production was also up 4.3 percent YoY in January. A strong start to sales in the beginning of the year combined with Easter orders have kept prices firm. In response to the high value of fat for an extended period of time, producers have managed to increase the output of milkfat by 3.1 percent in January. Demand also remains good for higher-fat dairy products like whole milk and full-fat yogurt, but the surge initiated by Time Magazine's "Eat Butter" cover story may be fading as it approaches its four-year anniversary.

Exports have been showing signs of improvement thanks partially to a weakening of the U.S. dollar relative to currencies of major competitors in the global dairy trade. China, the Middle East and North Africa showed strong gains in purchasing at the end of 2017. Still, a supply glut of milk powder has led to nonfat dry milk spot prices to the all-time low territory of $0.65/lb.

While the supply and demand balance feels heavy, it is mostly free from surprises, which has been welcomed particularly by end users in the supply chain. The stories of heavy supply out of the EU and tepid demand are nothing new and have largely already been priced into the futures markets. Aside from the potential for a serious trade disruption resulting from NAFTA renegotiations, which would have serious near term impacts for the U.S., it seems more likely that any surprises at this point would be to the upside.

On the policy front, U.S. dairy producers benefitted from changes to safety net programs that were passed as part of the recent budget bill. The Margin Protection Program increased the amount of production covered by the free baseline coverage, premium costs for additional

EXHIBIT 10: Cotton Ending Stocks



Source: USDA-ERS

coverage were favorably adjusted and the calculation period for payments was modified to be a monthly calculation. In addition, the cap on available funds for the Livestock Gross Margin program was lifted. These represent the most substantial adjustments to both programs after several years of only minor changes.

Aside from Easter butter demand, the otherwise seasonally quiet demand period and spring flush will likely weigh on prices in the coming months. An eventual rebound is expected in the second half of 2018 if global production growth finally begins to wane.

Other Crops

Cotton

Expectations point toward more acreage for cotton this year. Planting in South Texas is underway, though the western part of the state is still too dry, and the Southeast and Delta regions have been experiencing storms and wet weather. Despite the higher expected acreage, yields should be lower than last year and abandonment rates should be higher. Combined, this should result in a decrease in overall production.

Stocks in the U.S. are projected to end at 5.5 million bales which is the highest in 10 years, and the U.S. isn't alone. With the exception of China, stocks globally have been increasing since 2016. The U.S. remains the largest exporter of cotton, but is facing increased competition from other global cotton regions. The high levels of stocks being carried over will drive farm prices down to a range of 58 to 68 cents per pound in 2018/19 compared to 69 cents in 2017/18. (*See Exhibit 10.*)

Aside from other cotton exporters, the cotton industry continues to face competitive pressure from synthetics. The ratio of cotton to polyester prices remains high, but it is beginning to shift in cotton's favor. Consumer trends toward "athleisure" apparel and trimmer fitting clothing continue to dampen demand. However, growing global textile demand in areas like Central Asia and China are enough to offset these factors.

Prices for cotton have improved relative to other crops, but cottonseed prices have fallen. The lower seed prices increase the net cost of ginning which has put pressure on the gins. Increasingly, the industry will be focused on not only the value of the cotton fiber and the seed, but the combined value as defined in the recently amended 2014 farm bill as "the unginned upland cotton that includes both lint and seed."

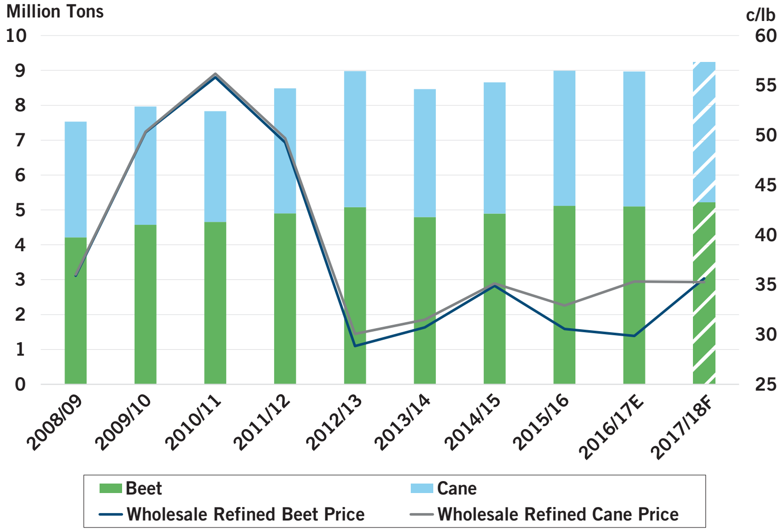
Cotton was one of the biggest beneficiaries of the recently passed Bipartisan Budget Act of 2018 when seed cotton was included as one of the covered commodities for ARC and PLC programs. Generic base acres under these programs, which had been cotton base acres prior to the 2014 Farm Bill can be either reallocated to base acres for cotton, other covered commodities or unassigned base.

Rice

The time for rice planting has arrived and all indications point to a decisively larger planted area than in 2017.

Total planted acreage is expected to be 2.88 million acres, an increase of 17 percent from the previous year. This increase in acreage will be driven by higher expected returns, particularly when compared to

EXHIBIT 11: U.S. Sugar Production and Prices



Source: USDA-ERS

soybeans. Combined with what is expected to be a 2 percent increase in yield on average, rice supplies in 2018/19 should more than offset the weak carry-in stocks.

Stocks worldwide continue to build, though that is driven largely by rising stocks in China while the rest of the world is experiencing decreases. Most of this inventory build, which has led to record high Chinese rice supplies, has been the result of domestic production being slightly higher than consumption over a period of the past several years, which has led to increasingly large beginning stocks.

The 2018/19 farm price for long-grain rice is expected to average $11.20 per hundredweight. This is lower than the 2017/18 average by 50 cents. Medium and short-grain rice is projected to average $14.20 per hundredweight, down 80 cents from the previous season average.

Sugar

U.S. sugar output forecasts for 2017/18 are up from last year due to increases in both beet and cane production. Record sugar cane production in Louisiana resulting from good yields and increased harvested acreage more than offset smaller crops in Florida, where a series of adverse weather events have negatively affected production this season. On the beet side, higher sugar extraction rates have made up for the small contraction in this season's sugar beet harvest, resulting in an increase in beet sugar production. Domestic consumption continues to grow modestly, thus counterbalancing domestic production increases. (*See Exhibit 11.*)

The cane and beet sugar markets appear to be in balance again as some of the hype around GMOs seems to have settled down. Following two years of distorted inventory levels, both beet sugar and cane sugar stocks are back in line with historical averages. Beet and cane sugar prices, too, have continued to converge with wholesale sugar prices averaging at around 36 c/lb. Conditions since harvest have also been favorable for sugarbeet processors. Temperatures have been cold, and now most of the exposed piles have been processed. As a result, sucrose extraction rates should be high and shrink minimal.

Good weather across almost all sugar-producing regions in the world has boosted global sugar production this year. The global sugar surplus is expected to continue into next season, although the surplus is not expected to be as large. Increased global supplies continue to put pressure on world sugar prices, sustaining a U.S.-world price spread above historical averages.

Specialty Crops

Several U.S. specialty crop industries are suddenly faced with the potential that 15 percent tariffs could be imposed on their exports to China. Most nuts, dried and fresh fruits, and wines would be impacted by the levies. In 2017, China accounted for the following share of U.S. exports: wine – 4%, fresh fruit – 3%, processed fruit – 10%, tree nuts – 3%.

Conditions in California this water year are dramatically different from last year. The 2017 water year (Oct. 1, 2016 – Sept. 30, 2017) was the wettest year on record for most of northern California with rainfall and snowpack nearly double the long-term average. At this time last year, snow water content stood at 180 percent of average, leading to flooding in some regions and damage to infrastructure like levies and reservoirs. The wet winter was well received as it brought an end to the crippling statewide five-year drought.

Below average precipitation during the first five months of this water year, though, has sent California back into drought. According to USDA's latest drought monitor, currently about 89 percent of California is abnormally dry or experiencing moderate or severe drought compared with 23 percent at the same time last year. Of particular concern is that statewide snow water content currently stands at only 52 percent of the April 1 average in spite of a series of strong March storms that helped to dent the state's water deficit. Snowmelt typically supplies about a third of California's water needs.

The good news is that because of last year's abnormally wet winter, California's reservoirs are full despite having received only about 65 percent of average precipitation for the water year to date. Statewide, the water levels in reservoirs are at historic averages. If not for this, water users would be facing a grim outlook for the crop year ahead. Water conservation is still likely to be a priority again this year if water needs are going to be balanced with sustaining the state's growing urban economy.

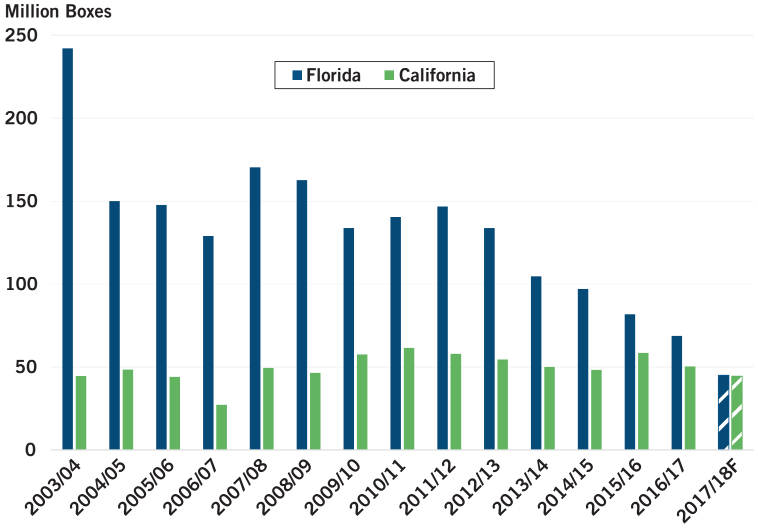
Low precipitation this winter has already prompted curtailments to water allocations. California's Department of Water Resources (DWR) announced that the majority of State Water Project (SWP) contractors will receive just 20 percent of their requests – a huge drop from last year's 100 percent allocation. The Bureau of Reclamation's initial 2018 water supply allocations are also on the conservative side. The initial allocations for the South-of-Delta, Friant and Eastside contractors amount to 20, 30 and 100 percent of their contract totals respectively. While the agency has not provided initial allocations to the remaining contractors, both SWP and the Central Valley Project (CVP) allocations could improve if water supplies improve over the remainder of the rainy season. The majority of growers in all areas served by the SWP and the CVP also have access to other sources of water such as groundwater, streams and local reservoirs.

Tree Nuts

The warm start to February resulted in an earlier than normal almond bloom in California, which was followed by a cold snap that hit unexpectedly late in the month. The frigid temperatures damaged blossoms, but reports of damage vary widely as the extent of the damage depended on a variety of factors, including the stage of bloom and crop development, the length of time at minimum temperatures, the minimum temperatures experienced and whether growers could take frost control measures. The full extent of the losses will not be known until later in the spring, but one thing is certain: the potential for the 2018 crop will be lower. Almond prices have already firmed 40-50 c/lb – the highest level in two years – following reports of the freeze.

The unseasonably warm start to the year is also raising concerns over whether the pistachio crop has had sufficient chill portions to synchronize bloom and pollination. The warmer weather and lack of rainfall will mean that this on-year crop will fall far short of the 1-billion pound crop expected for 2018. Early thoughts are that the crop will come in closer to 700 million pounds. Pistachio growers are also grappling with navel orangeworm infestation and are being urged to apply pest control measures this spring to prevent further crop damage.

EXHIBIT 12: All Orange Production



Source: USDA-NASS

Citrus

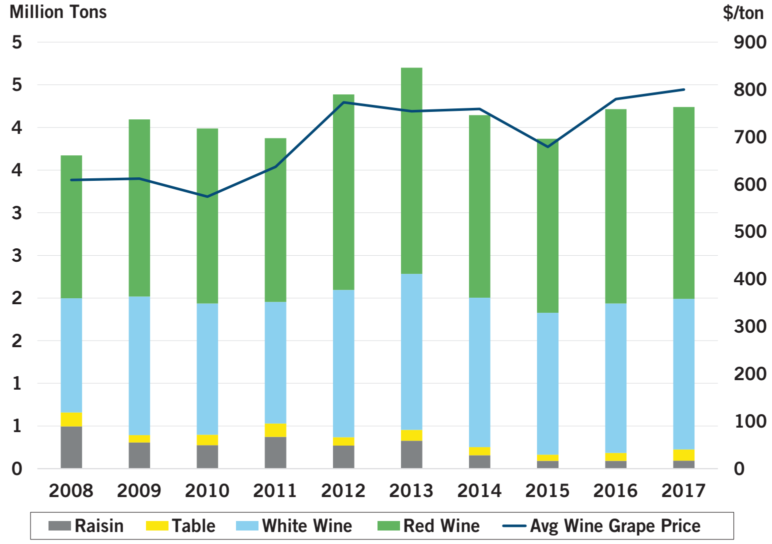
The freezing temperatures in February have also threatened California's citrus crops. With the citrus bloom running 2-4 weeks earlier than usual due to milder temperatures that have prevailed since the start of the year, citrus growers implemented freeze protection measures to protect the blooms of next season's crop. Growers were more concerned about the impact on the 2018-19 crop than damage to the current crop as the mature fruit on the trees are better able to withstand the cold. The extent of the damage on next season's crop will be clearer by April. Damaged trees could still recover and bloom again this spring, thus minimizing the effect of the freeze.

Demand across all nuts remains strong. Both domestic sales and exports of almonds, pistachios and walnuts continue to grow, buoyed by strong demand locally and globally. Movement has been brisk with YTD shipments of almonds and pistachios at record highs. Almond shipments and commitments are up 11 percent YoY with shipments rising in all major regions, most notably China (+21 percent), India (+29 percent) and Europe (+15 percent). January YTD shipments of pistachios were also up 4 percent over last year's record pace with impressive growth domestically (+16 percent) and in the Middle Eastern and African markets (+72 percent). With exports accounting for about two-thirds of U.S. nut demand, there is heightened concern of trading partners imposing retaliatory levies on U.S. tree nuts in response to American tariffs on steel and aluminum, or of the U.S. withdrawing from NAFTA and impairing exports to Canada and Mexico. Potential trade spats could have a muted effect on U.S. nut exports as the U.S. remains the key global supplier, especially into the EU and Asian markets.

California's current season all orange crop is forecast at 44.5 million boxes, an 11.5 percent decrease from last year. The forecast for Florida's orange crop continues to be downsized as further impacts from Hurricane Irma have unfolded over the season while the crop continues to incur losses from citrus greening. At 45 million boxes, Florida's all-orange crop is down more than a third from last season, making it the smallest crop in more than 70 years. (*See Exhibit 12.*)

The recent passing of the Hurricane Irma relief package by Congress means Florida's citrus growers should soon be getting some relief for the crop losses they suffered at the hand of Irma. Citrus' share of the $3.6 billion relief package totals $760 million. Further good news for the citrus industry is the new citrus tax incentive contained in the new tax bill. The Emergency Citrus Disease Relief Act is aimed at assisting farmers in replanting trees lost to disease and natural disasters by allowing them to deduct the full cost of replanting in the first year. Previously, farmers had to deduct replanting expenses over a 14-year period. The new rule is hoped to spur replanting and investment in the citrus industry.

EXHIBIT 13: California Grape Crush



Source: USDA, NASS, Pacific Regional Office - CA

Grapes

California's 2017 grape crush was nearly unchanged from 2016. At 4.24 million tons, the final 2017 crush volume is only 0.5 percent higher than the prior year. Wine grape varieties accounted for 95 percent of the total crush with table and raisin type varieties making up the difference. Red wine varieties continue to comprise the largest share of grapes crushed. (*See Exhibit 13.*)

Following several years of supply growth due to increases in bearing acreage, California wine grape supply appears to be stabilizing. Production is expected to settle at about 4.25 million tons annually for the foreseeable future given that since 2015, growers have been replacing vines at the same rate at which they have been removing them. At just under 600,000 acres, bearing acreage is not expected to grow materially from now until 2020. In the meantime, the consumer preference for medium and higher-end wines continues to trend upwards, driving growers to favor red varietals such as Cabernet Sauvignon and Pinot Noir in replanting decisions.

Infrastructure Industries

Power and Energy

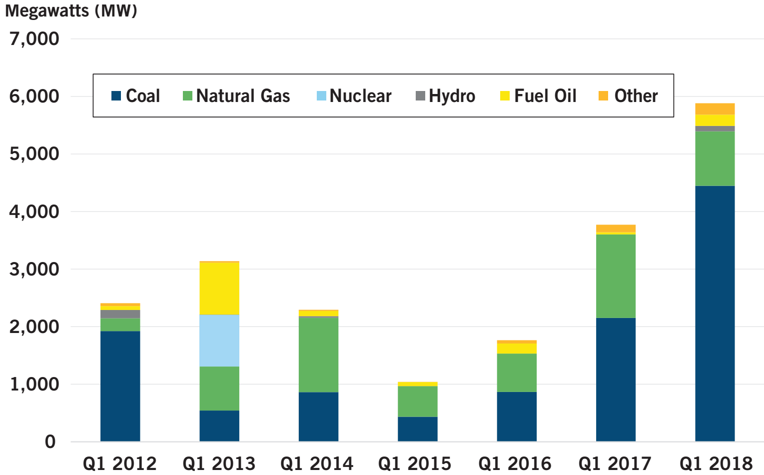
The most prominent event to occur in the power and energy space year-to-date is Order 841 from the Federal Energy Regulatory Commission (FERC). This order is important for its design that will standardize the participation of batteries across independent system operators (ISOs) and regional transmission organizations (RTOs). The order is transformative in its spirit that advances the role battery storage technology will play in shaping the future of the power and energy sector.

FERC gave ISOs and RTOs (excluding Texas) nine months to file plans that comply with the order and another year to implement those plans. Grid operators now begin the process of creating models that compensate for all the attributes storage can provide, without favoring a specific technology. This is a highly complex process that will require significant attention from all stakeholders involved.

Despite this complexity and a lag of almost 2 years before storage tariffs will be introduced, Order 841 provides meaningful momentum to the storage market beginning this year. Market participants must now consider more than ever how battery tariffs in wholesale energy markets will drive growth in storage, and how this will impact broader market trends that are already challenging the status quo: oversupply of generation, low wholesale energy and capacity prices, and a shifting generation portfolio that is experiencing a rapid expansion of renewable energy.

Incumbent generators already face a challenging operating environment. This is evident in the 5,800 megawatts (MW) of retirements during the first quarter of 2018 - the largest wave of retirements through the first three months of any year on record. The rate of

EXHIBIT 14: Plant Retirements Through the First Quarter, 2012-2018



Source: ABB Velocity Suite

retirements should remain elevated through the rest of 2018 with an additional 19,800 MW slated for retirement. (*See Exhibit 14.*)

Almost sixty percent of proposed retirements through 2018 are coal assets, which report an average marginal cost of production of $31 per megawatt-hour (MWh) over the previous 72 months, reflecting the effect of increasing renewable generation and sustained low natural gas prices.

Proliferation of battery storage will apply further pressure on wholesale electricity prices and accelerate retirements. Recent analysis indicates that in the next five years battery storage that provides a 4-hour duration is expected to compete economically with 40 percent of all peaker capacity. In the next 10 years, battery storage is expected to beat out all peaker capacity on economics. This time frame will compress in areas with high electricity prices such as California and the Northeast.

This year will likely be viewed as an inflection point for battery storage, largely due to FERC Order 841. The order provides significant momentum to the battery storage industry and sends a signal to incumbent generators that FERC regulators are proactively seeking ways to integrate new technology into the U.S. power and energy sectors.

Rural Water Systems

Elevated levels of nutrients in water sources from fertilizers, insecticides, and urban runoff result in a growing number of algae blooms across the country. Algal blooms in drinking water supplies can result in unpalatable flavors in tap water, human health concerns, and increased treatment costs. Finding a solution that serves the needs of the agriculture industry, consumers, water utilities, environmental groups, and the government is challenging. Proposed language in the 2018 Farm Bill could provide crucial support to creating a solution that serves all stakeholders.

Nationwide, drinking water systems have reported increased costs associated with treating water for tastes and odors resulting from algae. For example, the city of Wichita, Kansas spent $8.5 million to install an ozone treatment facility to address taste and odor problems associated with algae in its drinking water. Treatment costs for the city of Toledo, Ohio increase by $150,000 per month when cyanotoxins are present in the city's water supply. A recent study of the impact of algal blooms on the water system in Waco, Texas indicates that from 2002-2012 the city incurred an estimated cost of $70.4 million in addressing tap water taste and odor problems. The city potentially lost between $6.9 million and $10.3 million in revenue, partly as a result of decreased water sales to neighboring communities.

The 2018 Farm Bill offers an opportunity for farmers and water utilities to collaborate on solving the problems associated with nutrient runoff. The American Water Works Association (AWWA) is asking Congress to include language in the reauthorized Farm Bill that specifically emphasizes drinking water protection and encourages farmer-water utility collaboration. The AWWA proposal includes the following:

- Provide robust funding for the conservation title in the Farm Bill.

- Expand opportunities for the National Resource Conservation Service (NRCS) to work with water systems to prioritize source water protection activities in each state.
- Increase benefits for farmers who employ practices that benefit downstream water quality.
- And ensure that at least 10 percent of conservation program funds are focused on the protection of drinking water.

Including language in the Farm Bill that enhances funding for conservation measures and provides clear incentives for farmers to protect water quality would ensure high quality drinking water while keeping agricultural operations healthy and productive.

Telecommunications

Broadband, and rural broadband in particular, have gained heightened awareness in federal and state policy circles, leading to noteworthy legislative activity and significant funding potential. The digital divide has been an issue since the dawn of the internet, but renewed interest from Washington D.C. and state capitols across the country about the challenge of bringing broadband to all citizens, regardless of location or income, has led to a flurry of policy and funding activity.

The $1.3 trillion spending package passed in late March included $600 million for the USDA to create a pilot program within the Rural Utilities Service (RUS) to support the buildout of rural broadband. The sum falls short of the $2.5 billion the industry has been hoping for, but a future infrastructure bill could add to the total. RUS will distribute the funding through grants and loans under the following conditions:

- 90% percent of the households served by any project funded through this program must be unserved or underserved and can't currently have 10/1 Mbps broadband access
- Any entity receiving funds from the program is prohibited from overbuilding an existing RUS borrower
- No more than 4% of funds received through the program can be used towards administrative costs

Other Federal legislative proposals focused on rural broadband also saw significant momentum in the first quarter. The Communications and Technology sub-committee of the House Energy and Commerce committee debated 25 pieces of broadband focused legislation alone. These pieces of legislation focused on everything from accurate mapping of broadband availability to streamlining government red tape, to introducing billions of dollars in potential infrastructure spending targeting rural broadband.

Other noteworthy federal level broadband activity includes the FCC Broadband Deployment Advisory Committee (BDAC), created in January 2017 to advise the commission on how to accelerate the deployment of broadband. BDAC met in January 2018 and considered nine proposals focused on streamlining federal and state regulations that would enhance broadband deployment timelines. These proposals included 'one-touch-make-ready' pole attachment suggestions, among others. BDAC is currently scheduled to remain in operation through 2019.

Beyond this federal broadband focus, individual states are also increasing their broadband focused activity. According to the National Conference of State Legislatures, at least 22 states have introduced more than 31 bills or resolutions related to rural broadband in the past year. Many states have created Offices of Broadband Deployment, directing statewide efforts to close the digital divide, which increasingly includes managing direct state funding. New York, through its New NY Broadband program issued $209 million in broadband funding in January 2018. Eighteen broadband service providers gained funding, including Frontier, TDS, Verizon, and Windstream. Minnesota issued $26 million in broadband funding in late 2017 that funds 39 projects across the state.

Significant additions will be made to federal rural broadband funding in the months and years to come. Funding comes through traditional programs like the FCC's Connect America Fund (CAF) and new sources have been earmarked during the congressional budget cycle.

The upcoming CAF II Reverse Auction will make $1.98 billion (or approximately $198 million annually over 10 years) available to carriers who agree to provide service in designated unserved and underserved territories. The funding comes from CAF money that was initially turned down on a statewide basis by price cap carriers including AT&T, Verizon, and CenturyLink, among others. Those carriers decided not to accept CAF II money for their rural territories in certain states. The FCC decided to take that declined funding and auction it off to eligible broadband carriers who want to serve these territories. The reverse auction is scheduled to commence July 24, 2018.

Unlike historical distribution of USF dollars, CAF II Auction monies can fund a diverse set of technology platforms including fixed wireless, satellite, cable broadband, and rural electric cooperative broadband. The auction is expected to draw carriers who have not normally participated in the USF program, which has historically been dominated by rural telephone companies and cooperatives. Carriers have a March 30, 2018 deadline to apply to participate in the auction.

The CAF II auction is an interesting experiment. Depending on its outcome and success factors, it could influence future methods for distributing CAF monies, as well as broaden the type of broadband carriers who participate in this and other federal broadband programs. Indeed, that change is already happening. Wireless ISPs, electric cooperatives, and cable companies have been on the receiving end of other federal broadband funding programs, including USDA RUS grant programs.

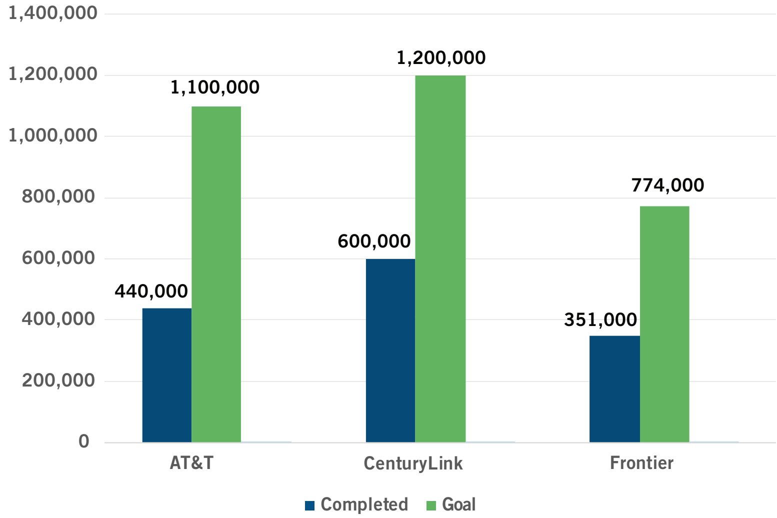
In addition to the $1.98 billion CAF II program, other federal rural broadband funding programs have been identified, although with less clarity. A February 2018 budget deal approved by Congress and President Trump earmarks $10 billion annually for the next two years, or $20 billion total, for rural infrastructure. It's expected that rural broadband will get a share of this infrastructure funding, but how much has not yet been determined.

In a February 2018 letter to Congress, the National Rural Electric Cooperative Association (NRECA) requested that $2.5 billion of the annual $10 billion be earmarked for rural broadband, and be made available to their electric cooperative members for the purpose of building out rural broadband. Given the federal government's increasing openness to providing funding to diverse carrier types, electric cooperatives are likely to join telcos, cable companies, WISPs, mobile wireless, and maybe even satellite providers in gaining access to this new source of rural broadband funding.

President Trump has signaled his support for rural broadband as well. He signed two executive orders in January 2018 that streamline and expedite requests to locate broadband facilities in rural America. That was soon followed by his Rebuilding Infrastructure in America Plan, which includes specific funding programs for rural infrastructure.

The plan calls for allocating $50 billion for rural infrastructure capital investments in broadband, power generation, water facilities, transportation, and other

EXHIBIT 15: Reported CAF II Progress
Number of Rural Locations Reached By Major Carriers



Source: Company disclosures

While there are details to be worked through, this renewed interest and focus on rural broadband and the digital divide at both federal and state levels is leading to new funding. The precise amount is unknown, but the ranges being discussed could make a significant impact and will probably involve participation from a wide variety of broadband carrier types.

Legacy rural broadband funding mechanisms, including the Connect America Fund, are already making an impact. In 2015, the FCC authorized $10 billion for price cap carriers to expand rural broadband, to be allocated in annual installments of $1.65 billion for six years. Most of this money was accepted (close to $2 billion was not, leading to the aforementioned CAF II Reverse Auction) by carriers like AT&T, CenturyLink, Frontier, and Windstream, among others.

infrastructure assets. Eighty percent of this funding, or $40 billion, will be provided directly to state governors to be used at their own discretion for rural infrastructure investment. The plan specifically says governors are free to spend 100 percent of these allocated funds on rural broadband, the only asset class that was designated in this fashion.

The remaining $10 billion will be issued in the form of "[r]ural performance grants based on competitive criteria, including increased investment in broadband. A portion of this funding will also be dedicated for tribes and territories." The plan stresses flexibility and suggests "[s]tates will be provided funding without burdensome bureaucratic commands on how they should spend it."

The White House is calling on rural broadband projects to "enhance regional connectivity for rural communities through interregional and interstate projects developed by the public and private sectors." Congress and President Trump will have to collaborate over the coming months to turn this infrastructure proposal into actual legislation. Final details may or may not resemble the President's vision.

Many of these carriers have reported progress through this CAF funded expansion. AT&T has chosen fixed wireless service that delivers 10/1 Mbps broadband service as their primary vehicle for rural broadband expansion. In February 2018, AT&T reported they have reached 440K rural locations with this service and are on their way to reach 1.1 million locations by the end of 2020. (*See Exhibit 15.*)

Frontier, which receives $331 million annually from the CAF program, reported in January 2018 that they have achieved 45 percent of their agreed upon CAF goal of reaching 774K new locations with broadband by 2021. Frontier deployed at least 10/1 Mbps service to 351K locations, across 29 states as of January 2018. Many of those locations are able to receive 25/3 Mbps service.

CenturyLink, which receives $500 million annually from the CAF program, announced in January 2018 that 600K additional locations can now receive broadband. Seventy percent of these new locations

can receive 20 Mbps service or better. CenturyLink is scheduled to reach 1.2 million new locations by 2021 under the program.

Hawaiian Telcom, which is being acquired by Cincinnati Bell, is using CAF funding to help bring gigabit service to rural areas throughout Hawaii. In December 2017, the carrier, which was awarded $26 million in CAF II funding, reported that 5K additional locations have been reached, with 70 percent eligible to receive gigabit service via FTTP. Hawaiian Telcom has agreed to reach a total of 11K locations by the end of 2020.

Smaller rural rate-of-return carriers are also leveraging the CAF program, with many of them choosing the Alternative Connect America Cost Model (A-CAM) to support rural broadband service. The A-CAM program committed close to $5.3 billion over ten years.

One of the largest recipients of A-CAM funding is rural carrier TDS, which is receiving $75 million annually. TDS is using A-CAM funding and private investment to reach an additional 160K locations across 25 states with rural broadband. TDS reports the majority of these locations will receive 25/3 Mbps service, but the costliest to serve locations will receive 10/1 Mbps. ■

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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