



QUARTERLY U.S. RURAL ECONOMIC REVIEW

Price Volatility Returns to Agriculture

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:

- *Mother Nature has provided agricultural crop producers significant pricing opportunities over the past few months for both old and new crop production.*
- *Despite ample grain and oilseed inventories in the U.S. and throughout the world, fears of hot and dry growing conditions associated with La Niña at least temporarily reversed months of continual downward market pressure, and priced in a risk premium.*
- *Falling fertilizer prices and delayed farmer purchases have continued to haunt ag retailers as they struggle to match supply and demand while pricing product in a downward moving market.*
- *Growing overall meat and milk supplies put downward pressure on prices in the first half of 2016, but the summer grilling season and the potential for large pork purchases by China may signal a price turnaround. The animal protein and dairy sectors should benefit from a pickup in domestic and global demand in the latter half of 2016.*
- *Given that California is now in its fifth year of drought and that it is highly likely that 2017 will be a dry year, drought regulations are to remain in effect, and Californians are making water conservation a way of life.*
- *While the EIA’s latest coal retirement forecast is aggressive and highly uncertain, it does highlight an important recent development – i.e., that the market has begun to shift away from coal and will continue to do so, even without federal regulation of carbon dioxide emissions.*
- *The longer-term outlook for energy markets calls for lower energy prices brought on by the proliferation of renewable energy, competitive natural gas prices, and weak demand growth for electricity.*
- *In recent weeks, the FCC released its long-awaited USF Reform Order. Its aim is to shift federal subsidies for rate-of-return carriers away from voice telephony to broadband networks, especially those targeting rural areas that currently lack broadband access.*

Market Uncertainties Mount

The second quarter was shaped by concerns about agricultural supplies. South American harvests were deemed disappointing and La Niña forecasts moved U.S. weather risks forward into the 2016 growing season. The U.S. dollar softened, and speculative buying ensued for commodities ranging from crude oil to corn. This sustained rally offered unexpected yet welcome opportunities for producer crop sales. The corn and soybean rallies between May and June stimulated significant farmer selling and resulted in a moderate improvement of the outlook for 2016/17.

The tone of the financial markets changed, however, in the wake of the UK vote to exit the EU (Brexit), and commodities will feel the impact for weeks or possibly months to come. The U.S. dollar will be strengthened as global investment dollars flow to the relative safety of the U.S. and the Federal Reserve delays plans to raise interest rates. In turn, commodity prices will face increased resistance.

Global Economic Environment

Global economic growth remains subdued, with the mounting downside risks greatly outweighing potential upside surprises. The advanced economies face significant economic and political challenges. The UK's decision to exit from the EU rattled the global financial and currency markets while also injecting much additional turmoil and uncertainty into the global economic environment. Going forward, the EU will have to manage the realignment of the many EU charters and treaties, following the UK's exit, while it remains stuck in a quandary over refugee migration, Greek debt issues, and the potential elections in France and Germany which must occur by late 2017.

In Asia, Japan's Prime Minister Abe has announced a delay in the implementation of an increased consumption tax scheduled for April 2017. The new date is now November 2019, with additional fiscal stimulus likely to be announced in coming months. During the first half of 2016, the value of the Japanese yen strengthened considerably, hampering Japanese exports.

“*The global economy is vulnerable to major shocks – economic, financial, or geopolitical – without the political consensus and fiscal policy options needed to combat these shocks.*”

The divergence among central bank strategies continues to widen. The U.S. Federal Reserve remains committed to increasing the federal funds rate on a gradual basis. However, following the UK vote, the Fed is unlikely to raise rates until at least early 2017. The Bank of Japan may lower rates in the coming months in response to heightening fears of deflation, but its actions will be delayed until after the elections in Japan's upper house on July 10. The European Central Bank (ECB) began purchasing corporate bonds in early June to provide additional private sector stimulus. The ECB's negative interest rate policy continues and an extension of the quantitative easing program seems likely. The uncertainty over Brexit has tempered ECB actions and pushed the 10-year German bond into negative territory for the first time in history.

Among Asia's emerging economies, all eyes remain riveted on China and its continuing strategy to realign its economy toward greater reliance on the consumption sector. While recent fiscal stimulus actions and a weaker currency have improved China's near-term prospects, many analysts remain deeply concerned about the high degree of debt leverage present in many sectors of the economy. For now, it appears likely that China's economic growth trajectory will hover around the 6.5 percent target, providing continued support for the many other Asian economies with extensive economic ties to China.

Outside of Asia, the emerging markets are struggling, as rising current account deficits and volatility in currency values erode their growth potential. While the weak growth rates in the advanced economies are limiting capital flows and trade volume for many emerging markets, the recent turnaround in oil prices and the

improvement in many agricultural commodity prices will benefit many of the export-dependent emerging markets. Nonetheless, Brazil and Russia will likely remain in recession through 2017 but any stability in commodity prices will be beneficial.

Looking ahead to the next two or three years, global economic growth will likely remain subdued with downside risks continuing to outweigh potential upside surprises:

- The UK's June 23rd decision to exit the EU caught global currency and financial markets by surprise. From the U.S.'s perspective, the two biggest near-term effects of Brexit will likely be a stronger U.S. dollar vis-à-vis other major currencies and heightened risk and uncertainty in the global financial markets. A stronger U.S. dollar will hamper U.S. agricultural exports. Longer term, the Brexit decision will have far-reaching effects on trade flows within the EU and between EU members and non-member countries, on global financial markets given London's status as the preeminent global finance center, on the global currency markets, and on the global economy. These effects will play out over many years, and the risk of contagion (other country referendums to exit the EU) will remain elevated, adding to the uncertainty in global markets.
- The divergence in central bank policies continues to widen amidst growing concern about how best to unwind the extraordinary monetary accommodation that has emerged since 2009. While Brexit dominates current monetary policy debates, the central banks are clearly charting very divergent paths for the next two years.
- Political uncertainty and polarization have become impediments to economic growth and stability across the advanced economies. The U.S. election in 2016 will be driven by negative and divisive rhetoric. Elections in France and Germany, due by 2017, will be equally contentious around refugee migration issues, debt levels within the EU, the proper role of the European Central Bank, and the challenges around aging populations.
- The combination of central bank divergence and disparate growth rates among advanced economies will continue to roil the global financial and currency markets. After weakening during the first half of 2016 in response to the delayed rate hikes by the U.S. Federal Reserve, the value of the U.S. dollar will likely resume its modest uptrend into 2017.
- Structural problems persist in China's property and banking industries, but the authorities have significant room for easing their fiscal and monetary policies to address most challenges and support growth of 6-7 percent.
- World energy markets have emerged as a stabilizing element in the global economy. Oil prices have recovered to the \$45-50 per barrel price range and are likely to level out there, but current oil price levels will not bring about a sharp reversal in shale oil drilling activity in the U.S.
- Terrorism and geopolitical uncertainty will continue to cloud the global landscape. With no dominant growth driver and significant unevenness among country growth rates, the global economy is vulnerable to major shocks – economic, financial, or geopolitical – without the political consensus and fiscal policy options needed to combat these shocks.

U.S. Economic Environment

The U.S. economy appears to have regained its footing after a sluggish first quarter, featuring real GDP growth of just 1.1 percent at an annual rate and a surprisingly weak June employment report. Nonetheless, for the balance of the year and on into 2017, we still anticipate that annualized economic growth will average somewhere in the 2.0-2.5 percent range with continuing quarter-to-quarter volatility.

Consumer spending will remain the driving force going forward. For the first five months of 2016, retail sales averaged 3.2 percent above the year-earlier level. With debt levels relative to income at the lowest level in over a decade and wage growth averaging around 2.5 percent a year, the consumer is in a buying mood that

Exhibit 1: Index of Foreign Exchange Value of U.S. Dollar

Source: Wall Street Journal.

should continue through the second half of 2016. The other growth catalyst is residential investment. Housing starts have averaged around 1.15 million units at an annual rate for the past year, with an increasing share of multifamily units requiring about four times less lumber than single-family homes. With continued low interest rates and rising incomes, new home construction should continue to accelerate in coming months.

International trade and business fixed investment spending continue to be drags on the U.S. economy. Despite modest declines in the value of the U.S. dollar posted during the first half of the year, the U.S. dollar is still riding high following its steep, prolonged climb during 2013-15. (See Exhibit 1.) Hence, U.S. consumers still regard imported goods and services as inexpensive, while overseas buyers view American exports as expensive. The resulting net trade deficit has reduced the real GDP growth rate by nearly 0.5 percentage point. Plant and equipment investment has been sharply curtailed by the combination of declining corporate profits, major retrenchment in the oil and mining sectors, and the fragility of the global economy.

U.S. Agricultural Markets

Mother Nature has provided agricultural crop producers significant pricing opportunities over the past few months for both old and new crop production. Reduced harvests in Brazil and Argentina generated additional demand for old crop supplies while also shrinking the level of carryover into the 2016/17 crop harvests. Weather uncertainty concerning the 2016/17 harvests added to the buying frenzy. Soybean markets experienced the largest jolt with soybean contracts climbing from \$8.80 per bushel in March to well over \$11 per bushel in June.

December soybean meal surged from \$270 per ton to over \$400 per ton. December corn futures also rose from \$3.65 per bushel in early April to \$4.20 per bushel in June, largely reflecting concerns about the 2016/17 U.S. crop potential. Brexit turmoil and improved weather outlooks dragged on prices in late June, but progress of the 2016/17 crops will determine pricing over the next two months. Wheat and cotton markets remain range bound by the large existing global carryover stocks.

The animal protein and dairy sectors should benefit from a pickup in global markets as well as firm domestic demand. Growing overall meat and milk supplies put downward pressure on prices in the first half of 2016, but the summer grilling season and the potential for large pork purchases by China may signal a price turnaround.

Grains, Oilseeds, and Ethanol

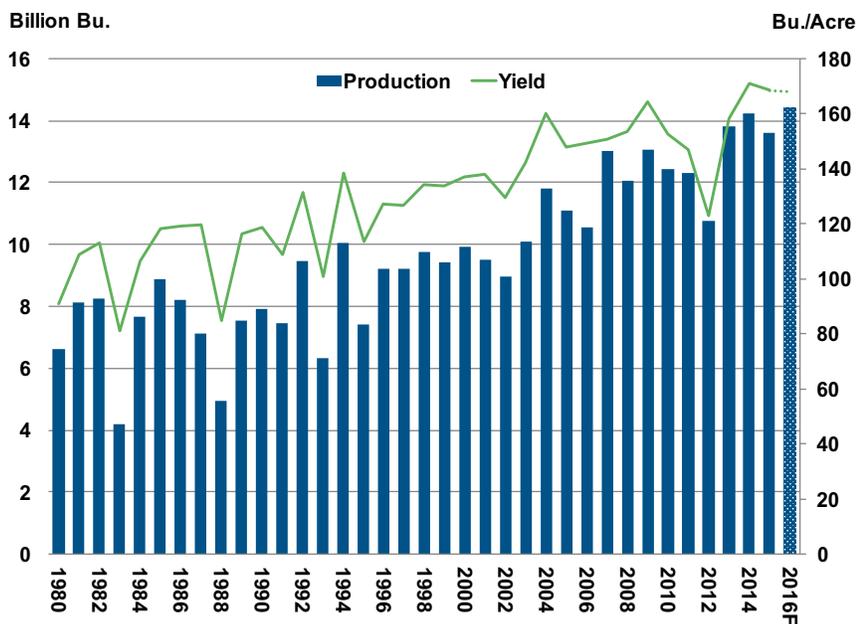
The “weather market” is in full swing for agricultural commodity markets. The onset of summer has refocused commodity values on ever-volatile weather forecasts, particularly concerning the arrival of La Niña, which is typically associated with hot and dry conditions in the U.S. and in key growing regions of South America.

Table 1: Prospective vs. Actual Planted Area

	Prospective Acreage (Reported March 31)*				Actual Acreage (Reported June 30)*			
	Corn	Soybeans	Wheat	Total	Corn	Soybeans	Wheat	Total
2016	93.6	82.2	49.6	225.4	94.1	83.7	50.8	228.6
2015	89.2	84.6	55.4	229.2	88.0	82.7	54.6	225.3
2014	91.7	81.5	55.8	229.0	90.6	83.3	56.8	230.7
2013	97.3	77.1	56.4	230.8	95.4	76.8	56.2	228.4
2012	95.9	73.9	55.9	225.7	97.3	77.2	55.3	229.8
2011	92.2	76.6	58.0	226.8	92.3	75.2	54.4	221.9
2010	88.8	78.1	53.8	220.7	87.9	78.9	53.6	220.4

*Millions of acres.
Source: USDA

Exhibit 2: U.S. Corn Crop



Source: USDA.

Despite ample grain and oilseed inventories in the U.S. and throughout the world, fears of hot and dry growing conditions associated with La Niña at least temporarily reversed months of continual downward market pressure, and priced in a risk premium. The USDA June 30 acreage report injected further volatility into prices, with soybean area falling short of expectations, and corn area exceeding expectations. (See Table 1.)

USDA's latest prediction points to a U.S. corn crop of 14.4 billion bushels with a yield of 168.0 bushels/acre, which compares to last year's crop of 13.6 billion bushels with a 168.4 bushels/acre yield. (See Exhibit 2.) Those projections are likely to change in July, however, with the latest planted area estimates increasing by a half million acres over the March prospective planting estimates.

A smattering of developments has breathed life into the corn market in recent months. The corn harvest in South

Meanwhile, the value of the U.S. dollar, while still historically strong, softened in the first half of 2016, though it edged up slightly following the Brexit decision. This softer dollar supported a broad-spectrum commodity rally led mostly by crude oil, which sparked a recovery in ethanol and gasoline prices. Corn and soybean exports also benefited from the softer dollar, while wheat sales and shipments continue to be

imperiled by global abundance. These price rallies in corn and soybeans now face headwinds as weather forecasts have improved and Brexit applies upward pressure on the dollar.

Corn

Corn supplies remain ample in the U.S. and throughout the world. Nonetheless, the arrival of the volatile growing season with La Niña on the horizon has raised concerns of feed grain availability in the event that hot and dry conditions arrive and persist in the U.S. Of primary concern in the weeks ahead will be Midwest weather during the critical pollination phase in July and grain-fill period in August with weather forecasts already being closely monitored.

America has been somewhat disappointing and basis there has been strong. Concerns about availability from Brazil and Argentina also boosted U.S. corn exports. The lack of South American supply, though, is a short-term problem that ultimately will be resolved as the harvest in Argentina and Brazil gains speed.

Long term, corn will contend with a greater world supply of competing feed grains, including a sizable feed wheat crop in Europe and the Black Sea region with Ukrainian and Russian feed wheat now the cheapest feed grain in the world. In mid-June, feed wheat in the Black Sea was priced at \$174/ton, compared to \$193/ton for corn and \$198/ton for soft wheat at the U.S. Gulf.

Longer term, corn likely faces headwinds from increased global competition. In South America, record profits being gleaned by Argentine and Brazilian corn farmers are stimulating interest to expand corn acreage and add further supply to the global balance. Meanwhile in China, where the government holds roughly half of the world's corn inventories, stocks are being whittled down slowly through public auction. China currently is no longer seen as a major destination point for exports of corn or other feed grains like sorghum or barley, thereby adding to the longer term bearish tone of the feed grain markets. Only a major weather-induced supply shock will materially change the supply-led feed grain scenario in the U.S. and world markets.

Oilseeds

The recent steep rally in soybean futures, created challenges for grain hedgers. Current supplies of soybeans in the U.S. and throughout the world are ample, and weak basis in the cash market has not indicated a material change in demand. Nonetheless, soybean and soybean meal futures began a steady march higher in early spring with speculators entering the market en masse just weeks ahead of the planting season.

After a short period of sagging prices following Brexit, soybean prices were again jolted by the USDA acreage report the last day in June. The USDA increased its soybean area estimate by nearly 1.5 million acres over its initial estimate in March, but the market was expecting a

larger bump. And with La Niña forecast to gain strength into the fall, soybeans will continue to be a higher risk crop with the critical development stages of flowering and pod-setting not occurring until August.

Chinese soybean demand remains robust, Malaysian palm oil inventories have fallen to a five-year low, and Canadian canola acreage is forecast to decline. Bullish sentiment from South America has been stirred by quality issues with the water-logged Argentine soybean crop at harvest, and slow farmer-selling in Brazil as farmers hold soybeans to hedge against inflation and political volatility. Both factors have stimulated more export demand for U.S. soybeans. Cumulative soybean shipments out of the U.S., though, continue to lag prior years. Domestically, the soybean crush has strengthened in recent months, spurred on by soybean meal's price rally that has exceeded all other traded commodities.

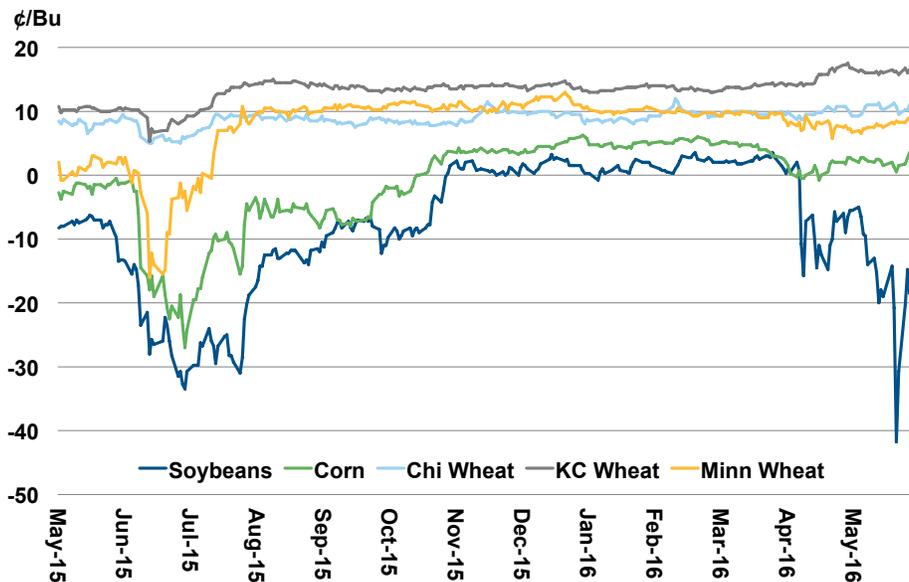
The sharp rally in nearby futures contracts, though, created headaches for commercial elevators with the futures market no longer offering profitable carry. With nearby soybean contracts trading at a premium to deferred contracts, commercial hedgers are penalized for owning and storing soybeans. (*See Exhibit 3.*) Weather forecasts and the flow of speculative money will likely remain in the driver's seat in the months ahead and create an uncertain and volatile hedging environment. Commercial hedgers hope for a return to profitable carry with back-month contracts returning to a premium over nearby contracts.

Wheat

Northern Hemisphere wheat harvests are expected to be bountiful this summer with record yields expected in the U.S. and big harvests anticipated in Europe and the Black Sea region. Late-season rainfall in Europe, Ukraine and Russia has raised quality concerns that could potentially send export business to the U.S., but the promise of record-large world stocks continues to hang over the market.

China continues to hold the largest share of the world's wheat stocks, with USDA forecasting China's inventories to grow by 22 percent – accounting for nearly half of

Exhibit 3: July - September 2016 Carry



Sources: CME Group, Minneapolis Grain Exchange.

the world's wheat stocks. However, China typically is a marginal net importer of wheat with few exports. Outside of China, global wheat stocks are figured to shrink to 139.8 MMTs, which would be the lowest level in three years and down 6.9 million tons from last year's record.

Inside the U.S., however, wheat stocks remain on a growth path despite shrinking crop acreage with all-wheat inventories expanding to a hefty 1,050 million bushels – the largest since the 1987-88 crop year thanks mostly to record wheat yields. USDA currently figures winter wheat yields at an all-time record 50.5 bushels/acre, thanks to a favorably cool and wet spring. The all-wheat yield, meanwhile, is expected to reach 48.6 bushels/acre.

With farmers expected to haul in the biggest yields in history, U.S. all-wheat production is forecast to hit a three-year high despite acreage falling to the smallest since 1970.

The expectation for record-large yields is already raising quality concerns over protein for the hard red winter wheat crop on the plains. As yields go up, protein levels typically fall. Elevators and millers will be keenly watching protein levels this harvest with some elevators implementing a discount schedule for low-protein

wheat. In the Midwest, elevators are hoping for a dry and plentiful harvest. They will be looking to blend this year's soft wheat crop with last year's crop, which was heavily contaminated with vomatoxin and largely unsuitable for flour milling or feed.

Lack of available storage is also becoming an issue for elevators that did not build storage or make sufficient space ahead of wheat harvest by moving out fall crops like corn and grain sorghum. In the event that elevators lack bin storage, they are storing wheat on the ground or in bunkers. This is common for storage of corn after harvest, but very uncommon for

wheat. Elevators are also poised to gain from an attractive carry in the wheat markets for 2016/17.

Meanwhile, the strong dollar and competitively priced wheat in Europe and the Black Sea region continue to thwart U.S. wheat export efforts. With ample old-crop wheat inventories available and a sizable new-crop looming, the market will work wheat into the global feed mix in the absence of renewed export demand.

In the U.S. Plains, cash values of hard red winter wheat are now offered at a discount to cash corn. With wheat now competing as a feed grain rather than a food grain that commands a price premium, corn prices will have an outsized influence on wheat prices in the months ahead. USDA predicts feed demand for wheat in the U.S. to expand to 200 million bushels for 2016-17, up nearly 43 percent from last year's total.

Ethanol

The summer driving season has arrived and is fueling record demand for ethanol. Even with production near-record highs, ethanol inventories in the U.S. are in retreat as consumer demand continues to gain speed and drive ethanol prices higher. Ethanol prices are again trading at a premium to gasoline as stocks dwindle. In early

June, U.S. ethanol inventories fell to a new year-to-date (YTD) low. (See Exhibit 4.) Americans are spending more time on the road and ethanol exports are booming – both factors are contributing to ethanol demand and price support. U.S. ethanol exports in the first quarter exceeded the same period last year by 5 percent.

Producers are quickly responding to the increased demand. In early June, weekly ethanol output surged to a near-record pace. A recovery in crude oil and gasoline prices has supported the climb in ethanol prices and the stronger grind margins. USDA predicts U.S. ethanol producers will grind a record 5.3 billion bushels of corn in the 2016-17 crop year, up 50 million from last year.

In May, the EPA proposed its statutory blending requirements under the Renewable Fuel Standard. The conventional corn-based ethanol share of the proposal was set at 14.8 billion gallons, up from the previously proposed level of 14.5 billion. While an improvement over the previously proposed level, industry groups argue that the figure still falls short of the 15 billion gallons originally mandated by Congress. The proposed volume would translate to about 100 million bushels of additional

corn use for 2017. EIA sees U.S. biodiesel production, meanwhile, growing to 100,000 barrels/day in 2016 and to 106,000 barrels/day in 2017, which compares to 2015 production of 82,000 barrels/day.

Strong soybean meal prices, meanwhile, have also lifted prices of dried distillers grains, adding additional support to ethanol margins and encouraging U.S. ethanol grind to continue at a near-record pace. Dried distiller grains in Iowa now are priced at about \$158/ton, which compares to about \$140/ton last year. Longer term, however, forecasts point to flat or slightly weaker energy prices, which would limit ethanol margin improvement.

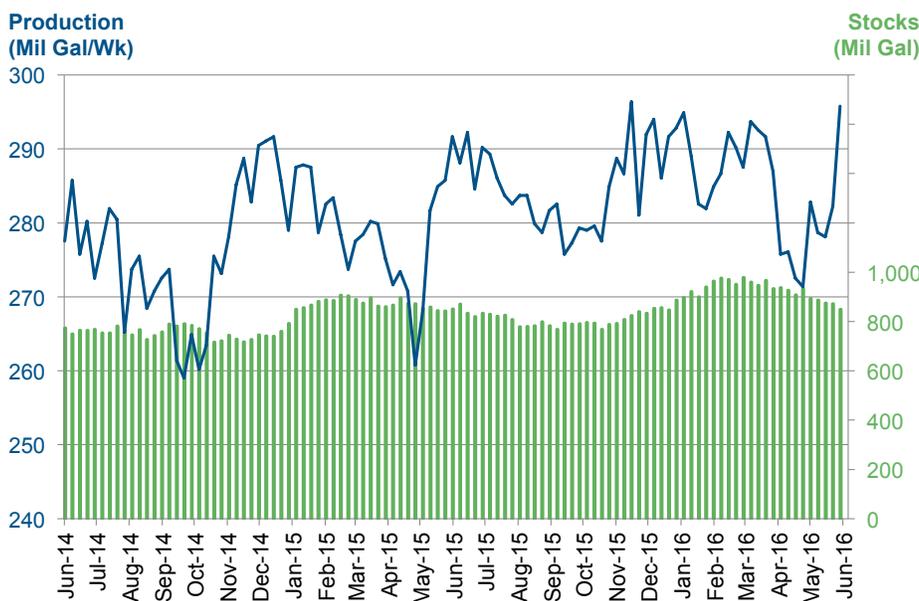
Crop Nutrients

Falling fertilizer prices and delayed farmer purchases have continued to haunt ag retailers as they struggle to match supply and demand while pricing product in a downward moving market. With fertilizer prices continuing lower in the post-planting season, retailers are now motivated to reduce their price risk exposure by minimizing inventory. Some retailers have been forced to write off inventories

that significantly exceed customer orders. As a result, many ag retailers have moved to a “hand-to-mouth” strategy of selling product to a farmer client and then sourcing the product from a wholesaler immediately after the sale. More fertilizer is also being shipped by truck in order to shorten delivery times and reduce exposure to price risk.

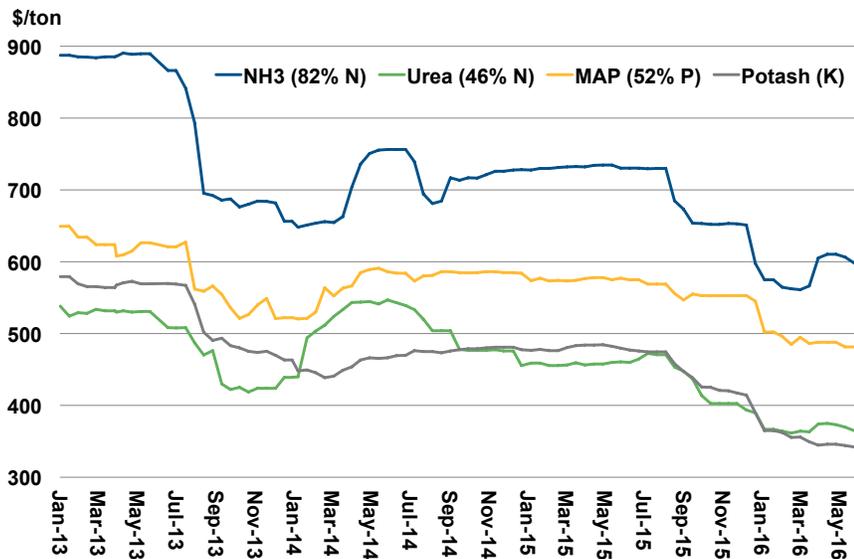
With agricultural commodity prices still down sharply from previous years, and the U.S. dollar’s strength encouraging fertilizer imports to move up river, fertilizer prices are expected to remain soft. Farmers, meanwhile, are also expected to remain cautious with their input purchases, putting retailers in another supply-demand conundrum with heightened price risk exposure

Exhibit 4: U.S. Ethanol



Source: EIA.

Exhibit 5: Central Illinois Fertilizer Prices



Source: USDA-AMS.

heading into fall application season. Many retailers are still lamenting write-offs they incurred in 2015 as product in inventory lost value. In 2016, retailers again will attempt to keep inventories low as fertilizer prices are forecast to follow a downward trend.

The longer-term price forecast also poses risk for retailers, but benefits for growers. Fertilizer prices are expected to weaken into 2017, with the exception of seasonal rallies, as was evidenced with the temporary recovery leading into this year's spring planting season. Spot urea prices at the U.S. Gulf are currently hovering near \$180/ton, less than half of last year's \$380/ton. (See Exhibit 5.) Prices are expected to remain flat to lower in the weeks and months ahead.

Meanwhile, ag retailers are also weighing the risks of increased regulatory challenges from the Occupational Safety and Health Administration (OSHA) regarding retail storage of anhydrous ammonia. OSHA lifted the exemption on retailers of complying with the Process Safety Management for Highly Hazardous Chemicals (PSM) standard in July 2015. In May, OSHA announced it would begin enforcement on ag retailers. However, a bill is currently being weighed in Congress to reverse the order. Ag retailers will be closely watching the progress of the bill as the cost of complying with PSM could be substantial.

Animal Protein

Total red meat and poultry production is expected to reach record highs in 2016, with overall supplies growing at a modest 2 percent. The recent rally in the grain markets increased the cost of production outlook for the livestock and poultry sectors. In response, producers are likely to curb future production growth plans. Meat demand, both domestic and international, will be a critical factor for the remainder of 2016 as the animal protein complex attempts to balance growing output with profitability pressures from input costs.

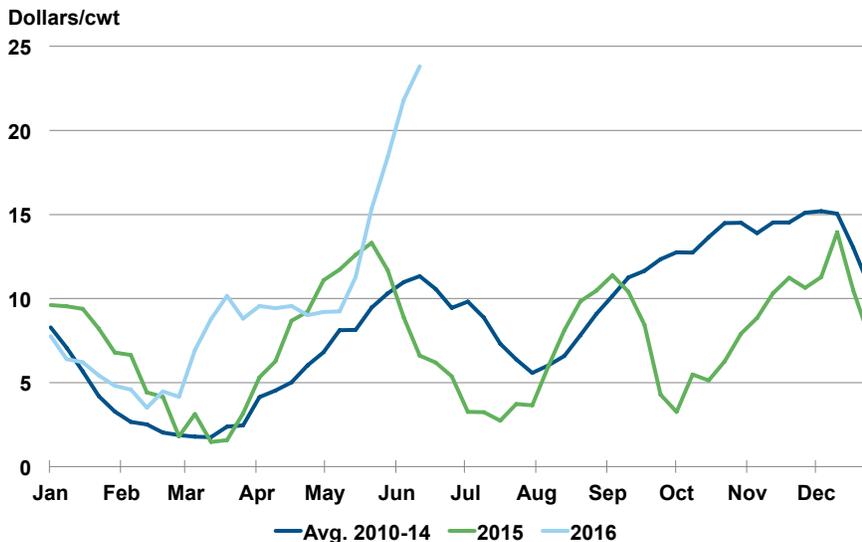
Beef

Herd rebuilding efforts, which began in late 2014, are starting to make their way to the marketplace in the form of increased beef supply in mid-2016. Lower retail prices have now reached the consumer, supporting overall demand levels. Larger available supplies of cattle are expected moving forward, creating downward pressure on prices for the cattle complex from now until possibly the end of the decade.

Downward pressure on feeder cattle prices is contributing to a declining profitability outlook for the cow/calf sector in 2016. As a result, producers will have to make tougher decisions regarding heifer retention this year compared to the past two years. These decisions will influence both the overall level of placements into feedyards and also the pace of herd expansion moving forward. Excellent pasture and range conditions this spring are continuing to provide adequate forage supplies.

Placements into feedyards gained momentum in early 2016, posting year-over-year (YoY) increases each month starting in February. The trend of increasing YoY placements is anticipated to continue throughout 2016, reinforcing increased availability of fed cattle moving forward. Economic conditions are encouraging fed animals to be marketed at a much higher rate than a year ago, and in stark contrast to the fourth quarter of 2015. 2016 slaughter levels are up 2.1 percent, and

Exhibit 6: Weekly Beef Choice-Select Spread



Sources: USDA-AMS, Livestock Marketing Information Center.

weights are up slightly, collectively contributing to a 3.2 percent production increase YTD. Increased marketings of fed cattle have dramatically improved the currentness of feedyards. Carcass weights are anticipated to follow seasonal patterns, but will remain under 2015 levels. Any increases in feed input costs could drive carcass weights even lower and ratchet down production forecasts in the second half of 2016.

Cattle feeders continue to navigate increased market volatility and challenging profitability conditions in 2016. Following 2015's major challenges, the feeding sector is in a more hospitable business environment today. However, the hedgeable profit opportunities that emerged in May have since evaporated and average breakeven levels are again above cash prices. Going forward, steady increases in the availability of feeder cattle will benefit the feeding sector in two distinct ways. First, more availability will pressure feeder cattle prices downward, giving breakeven levels the opportunity to better align with fed cattle price expectations. Second, increased availability will provide much needed improvements in capacity utilization. As always, the development and proper execution of a sound risk management plan will be paramount to the success of cattle feeders in 2016.

Beef packers have had a profitable first half of the year. Increased slaughter levels and a widening beef-cutout-to-cash-cattle spread have been the two major contributing factors to these positive margins. Increased weekly slaughter levels have been supported by strong consumer demand as increased volume of beef is reaching the consumer at lower prices. These dynamics have pushed the choice-select spread to weekly averages nearing \$22 in early June, the largest in over a decade. (See Exhibit 6.) Both demand and supply factors are in play here. Increased currentness has kept the percent grading choice constant while slaughter levels increase. A

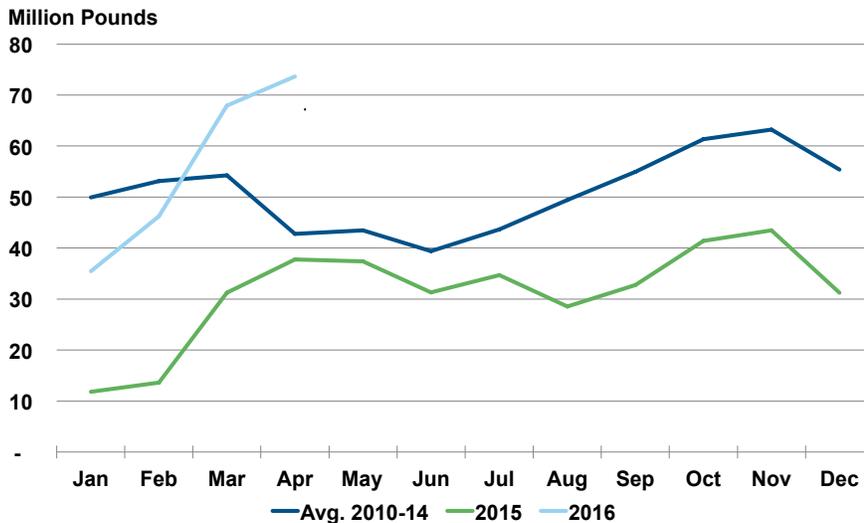
slight increase in select carcasses is also a result of faster paced marketings. Strong demand for choice middle meats is another driver of this widening spread. As the price of beef has declined from cyclical highs in 2014, retail and foodservice operators have been more willing to pay up for high quality middle meat items. If the demand for choice product remains, this spread could remain wider than 2015 levels for the remainder of 2016.

Beef exports YTD have held steady relative to 2015, but lower beef prices have contributed to a 13 percent decline in export value. Beef imports continue to track below 2015 levels, as expected. Year-over-year beef imports were down 21 percent, with the majority of the decline attributed to slower shipments from Australia and New Zealand.

Pork

Pork production growth levels have moderated significantly, coming off the heels of a substantial 7 percent increase in 2015. YTD pork slaughter is essentially unchanged compared to a year ago. Combined with a slight decrease in weights of 0.5 percent, overall YTD production is down 0.6 percent. For all of 2016, pork production is projected to rise

Exhibit 7: Monthly U.S. Pork Exports to China/Hong Kong



Sources: USDA-ERS, Livestock Marketing Information Center.

1-2 percent. Depending on the strength of domestic demand and the volume of exports, YoY changes in per capita supply could turn negative at times, adding support to prices throughout 2016.

Hog producers and packers have had a profitable start to 2016. Hog futures in the summer months have increased to contract highs in mid-June, providing producers the opportunity to lock in positive margins for much of the remainder of 2016. Larger increases in supply are anticipated in late 2016 and may create a price correction during that time period. Uncertainty regarding grain prices and potential increases in the cost of production could negatively affect producer margins as 2016 progresses. However, the prospect of strong domestic demand and a continuation of growing exports will be supportive of prices moving forward.

The industry may face slaughter capacity constraints later this year before several new and renovated plants come online in 2017 and 2018. The extra capacity will alleviate current constraints, but may also create localized short term supply and demand imbalances as the supply chain adjusts. A combination of production growth and a shuttering of existing, less efficient plants will contribute to optimal utilization of these new plants.

Pork demand has remained strong amidst modest production levels, and has supported this year's price rally. Already strong by-product values have moved even higher, posting YoY increases of nearly 10 percent in June. The belly primal is anticipated to be a positive driver to the cutout and provide price support for the third quarter of 2016.

U.S. pork exports are forecast to increase 4-5 percent in 2016. Export volume remained unchanged for the first 4 months of 2016, compared to year ago. However, exports to China/Hong Kong continue to build momentum. Record high live hog prices in China and rapid demand

growth have significantly increased Chinese imports from all global suppliers. Nearly one fourth of global imports are purchased by China, up from just over 5 percent as recently as 2005. China's April imports from all suppliers set a new record, up 53 percent from last year. (See Exhibit 7.) U.S. pork exports to China/Hong Kong have surged 78 percent YTD. The EU remains the number one supplier to China as the U.S. continues to face access challenges related to ractopamine use. Roughly one-third of U.S. hogs are eligible for shipment to China. Expanding the list of U.S. plants approved for export to China will continue to be a focus for the industry.

Record high hog prices in China and the associated profitability is fueling expansion of the Chinese hog production sector. However, the expansion is unlikely to translate into greater domestic supplies until mid-2017. Until then, China remains the greatest opportunity for pork exports, but also represents the greatest uncertainty.

Poultry

Broiler producers' concerns over a return of Highly Pathogenic Avian Influenza (HPAI) to the U.S. have diminished in 2016. USDA's robust HPAI preparedness and response plan is proving to be effective in avoiding another outbreak in the U.S. However, the risk remains for

future outbreaks, which highlights the continued focus of heightened biosecurity protocols.

Chicken production in 2016 is off to a modest start – up 3.0 percent YTD reflecting a 1.4 percent increase in head slaughtered and a 1.6 percent increase in average weights. Current projections have been slightly reduced since the beginning of the year, now calling for a 2-3 percent increase compared to the previous forecast upward of 4 percent. However, this figure will likely be a moving target as producers react to changes in the profitability outlook. Most recently, the outlook for higher grain prices indicate a potential pullback in average bird weights and a potential reduction in overall chicken output. YTD growth in chicks placed at 0.4 percent over a year ago suggests that integrators have already moderated plans for future production.

Average breast meat prices have fallen dramatically in recent months, down 23 percent in mid-June compared to year ago. This price drop is anticipated to spark aggressive retail featuring during the Fourth of July holiday. Conversely, the average price of leg quarters is up 26 percent over a year ago, bolstered mainly by strong domestic demand for dark meat. Exports have provided little to the increase in leg quarter pricing, but are expected to pick up steam in the second half of 2016. Whole bird prices have remained steady, aiding in a very positive profitability outlook for small bird production.

Low priced chicken, particularly breast meat, will weigh heavily on the entire meat complex. Attractive retail featuring of both breast meat and dark meat has the potential to exert a negative drag on beef and pork values as price competition intensifies in the meat case.

The profitability outlook for broiler production remains mixed for 2016, with potential adjustments needed throughout the year depending on grain input prices. Individual integrators' overall profitability is largely dependent on their product mix. The outlook for small bird production remains the healthiest, with tray pack and big bird production experiencing lower margins that have retreated closer to historical averages. Average weights are expected to steadily increase, although a significant increase in feed costs could reverse this trend.

Increases in production efficiencies will be a positive factor for profitability moving forward.

U.S. broiler exports are off to a dismal start in 2016, down 4 percent through the first four months of the year. There has been significant progress in eliminating the HPAI related trade restrictions, but exports remain lackluster. Broiler exports should improve in the second half of 2016, with an annual increase forecasted between 4 and 5 percent overall.

Export demand will remain a critical factor to prevent domestic oversupply issues. Moderating production plans in 2016 will reduce the risk of burdensome domestic supplies compared to 2015.

Dairy Situation and Outlook

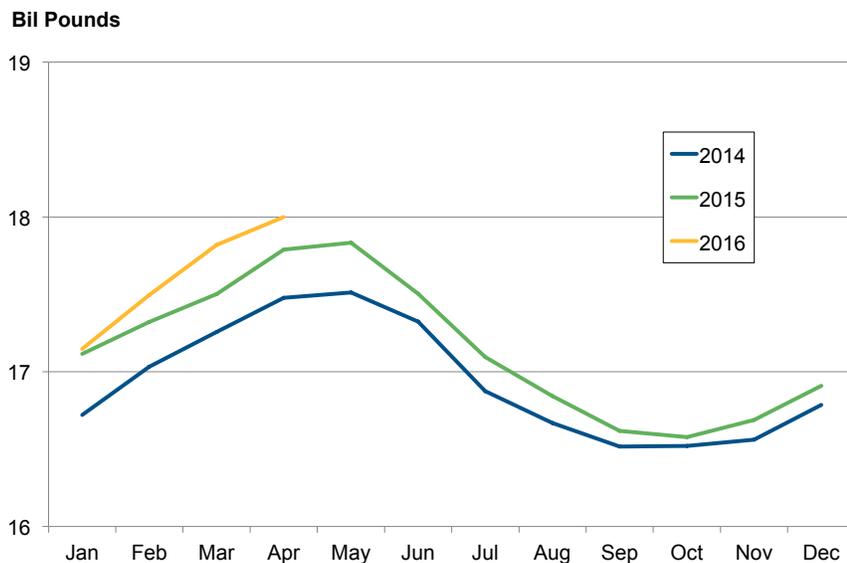
Though a heavy spring milk production season caught no one by surprise, it did strain capacity in most regions of the country, particularly in the Midwest and Northeast. April production was up 4.2 percent YoY in the Midwest and 3.1 percent in the Northeast. (*See Exhibit 8.*) These are substantial increases over an already strong baseline of 2015.

The Northeast was forced to once again dump skim milk as they did in the spring of 2015. The Northeast Federal Order reported dumping of 22.6 million pounds of milk in April, up from 5.4 million pounds the year before and 5.9 million pounds in March. In the Midwest, milk seemed to find its way into every available cheese vat which led to huge production levels and heavy inventories. With practically every cheese plant running at full capacity, cold storage space in the Midwest was hard to come by and cheese prices came under pressure to move inventories.

The low cheese prices have not yet been enough to stir up much export activity. The global oversupply of milk has led to depressed prices worldwide and the strong dollar has put the U.S. at a disadvantage. Intervention programs in Europe are increasing government purchasing limits, and milk powders are being diverted into these programs. In some situations this is creating a vacuum which U.S. exporters are able to fill, hoping

Exhibit 8: U.S. Milk Production

(adjusted to 30 day months)



Source: USDA.

that the low prices will be made up for by the strategic supplier relationships down the road. It also provides a welcome outlet for some of the domestic inventories and may be supporting some near-term price strength.

Many market observers and participants were expecting the butter market to collapse, at least temporarily under the weight of heavy inventories and strong production during the spring. Yet, despite the continued bearish fundamentals surrounding butter – net imports, high inventories, readily available cream, continued strong production – the butter market refused to collapse and is now beginning to test the upside potential in the market. Product in inventory right now is likely set aside for holiday demand, while the current production activity is reacting to the strong current demand from both retail and foodservice. The coming months will be watched closely to see if the market will make yet another shot at the \$3 per pound mark it has hit the previous two years.

The Margin Protection Program for dairy producers is in its second year of activity since being implemented as part of the 2014 Farm Bill to replace other safety net programs. The national margin level which dairy producers can insure at a maximum \$8 per hundredweight margin dropped to its lowest level, \$7.14 for the March-April

calculation period. This will result in payments for 345 producers who bought insurance above that level, but it will likely have little impact on a national scale since it only represents 0.4 percent of milk production.

New Zealand is nearing the end of its second production season of mostly below break-even prices. The outlook does not look promising with Fonterra's first forecast for mailbox prices in the 2016-17 season coming in still below most farms' break-even level. It remains to be seen whether European milk production will begin to cool down in response to continuing low prices. Year-to-date production in the EU is up more than 5 percent through April. China continues to decrease purchases of

skim milk powder and whole milk powder in favor of fluid imports as consumers trade up for fresh milk rather than the reconstituted variety. Little change is expected in the Russian embargo which was recently extended through at least the end of 2017.

Slight to moderate improvement in prices can be expected through the remainder of the year. Farm margins should improve from their current levels over the coming months but are expected to remain similar to what was experienced in the second half of 2015. Seasonal peaks leading up to the holiday season should be dampened somewhat by ample inventories in storage. With dairy product prices continuing to generally hold a premium to prices in the rest of the world, any enduring strength in the cheese and butter markets will be dependent upon domestic demand.

Other Crops

Cotton

U.S. cotton production and area harvested are expected to rise significantly in 2016/17. The 2016 crop is currently forecast at 14.8 million bales, but that number is likely to grow as a result of new acreage estimates. Total cotton

area has increased by nearly 1.5 million acres this year as a result of (1) a return of acreage that couldn't be planted last year due to wet conditions, and (2) a lack of attractive prices for competing crops prior to planting. Despite this boost in area, 2016/17 cotton acreage and production remain below historical average levels.

Demand for U.S. cotton should also be higher in 2016/17, which is welcome news for the U.S. cotton industry. U.S. cotton growers have been through a tough few years due to low prices on the back of a global oversupply and reduced federal support. An anticipated rebound in exports will be the driving force behind the expected increase in U.S. cotton demand (mill use plus exports) in 2016/17. Limited supplies and a sharp reduction in imports by China last year resulted in the lowest demand for U.S. cotton in 30 years.

Similar to the U.S., both global cotton production and consumption are forecast higher in 2016/17 than in 2015/16. A production recovery is expected in several of the major cotton producing countries, but modest growth in the global economy and continued low cotton prices are expected to bolster mill use in most countries, thus making 2016/17 the second consecutive season in which global consumption will surpass production. However, with lower oil prices making synthetic fibers more cost-effective for manufacturers and the overhang of large global cotton inventories still plaguing the industry, improvement for the sector will be slow.

With world consumption set to exceed production in 2016/17, world ending stocks, too, will shrink for a second consecutive season. World cotton stocks were at record levels in 2014/15, but have been falling since then as China implemented policies aimed at reducing reserve stocks substantially by curtailing production and imports and selling off government cotton reserves.

Prices will continue to be under pressure despite the more upbeat domestic and international outlook for 2016/17. U.S. upland cotton farm prices should remain in the region of \$0.60/lb in the coming year.

Lastly, the USDA announced in early June that it would be providing assistance of \$300 million to U.S. cotton growers in order to stabilize the industry following the

downturn in global cotton prices. The Cotton Ginning Cost Share program will offer one-time ginning-assistance payments (maximum of \$40,000 per producer) to cotton producers to aid in their ginning costs and to facilitate marketing.

Rice

Due to a substantial increase in area and yield, the U.S. can expect a bumper rice crop in 2016/17. The crop is projected to be the third largest on record and the biggest since 2010/11. In large part, U.S. rice plantings are up significantly this year because of a return of several hundred-thousand acres in the South that were not planted last year due to bad weather conditions. Also, alternative crop prices were not attractive at the time of planting. And finally, water restrictions in the Texas rice belt were eliminated, incentivizing more acres there.

Long-grain rice will comprise a larger share of the 2016/17 crop than usual, following a rebound in long grain acres in the Mid-South. Long-grain production is expected to be up 36 percent YoY, making it the second largest crop ever. Conversely, the medium- and short-grain crop is forecast to be 16 percent smaller – the leanest crop since 1986/87. Acreage expansions in California this year have been insufficient to offset reduced plantings in the South.

The expected near-record crop and resulting buildup in stocks will put downward pressure on U.S. rice prices. At the same time, larger supplies and lower prices will boost U.S. rice sales in the coming year both domestically and internationally. Aided by more competitive pricing, U.S. rice exports could be the best in a decade. Despite higher usage, total U.S. rice stocks will remain abnormally high for the third consecutive year with long-grain stocks on the rise and small- and medium-grain stocks declining.

World rice production is expected to reach record levels this year. Global plantings are higher as many countries seek to rebuild stocks following the effects of El Niño in 2015/16. China will add to its large supplies while Thailand will continue to sell off its stocks, bringing inventories to a nine-year low. Although global consumption is also expected to reach record levels

in 2016/17, consumption will be just slightly lower than production leaving global ending stocks almost unchanged from 2015/16. However, if China's stocks are excluded, global stocks will fall for the fourth consecutive year to the lowest level in 12 years. A modest decline in world trade is anticipated as traditional importers in Sub-Saharan Africa and South Asia make strides toward self-sufficiency.

U.S. farm prices are expected to shift slightly in 2016/17 down to an average of \$10.50/cwt (vs \$11 in 2015/16) for long grain rice and up to an average of roughly \$16/cwt (vs \$15.40 in 2015/16) for medium/short grain rice.

Sugar

The U.S. sugar market is navigating a major shift in consumer demand. Several large food manufacturers are transitioning to non-GMO ingredients, and that change is rattling the domestic sugar supply chain. Nearly all sugar beets grown in the U.S. are GMO, while all sugar cane is non-GMO. As food companies rapidly transition from using beet sugar to cane sugar, two domestic sugar markets have emerged.

Cane sugar supplies are insufficient to fill the surging demand, and beet sugar sales have fallen significantly. Through April, beet sugar deliveries are down roughly 7 percent YoY. Cane sugar deliveries are up 5 percent over the same period. This divergence has created price premiums for cane sugar in the range of 3 cents per pound, and that premium could more than double in coming months if the non-GMO trend accelerates.

To reduce the supply tightness, the USDA recently announced an increase in Mexican import quotas and requested that the Commerce Department increase its 2015/16 import limit from Mexico for raw sugar. The move will provide some relief for buyers of cane sugar, but the future remains cloudy for beet sugar producers and processors. More than half of all sugar grown in the U.S. is from sugar beets.

Early growing conditions have been favorable for most U.S. sugar growing regions. A warm, early spring allowed producers to get an early start on planting which could translate into strong yields and an early harvest. Based

“*Several large food manufacturers are transitioning to non-GMO ingredients, and that change is rattling the domestic sugar supply chain.*”

on preliminary acreage forecasts, beet sugar production is projected to increase 0.5 percent from last year and cane sugar output is forecast to fall by 6.4 percent.

Specialty Crops

Update on the California Drought

The 2015/16 winter rainfall season was a mixed bag in terms of precipitation for California. At the end of the winter rainfall season, California's snowpack on April 1, 2016, was at 87 percent of the statewide historical average. Precipitation conditions were certainly better than in prior years, and will provide some relief for farmers during the 2016 growing season. But while El Niño brought above-average precipitation and snowpack to the northern parts of the state, precipitation totals in southern California and the southern parts of the Sierra Nevada were far below average. Based on several years of below-average rainfall and snowpack, California is now in its fifth year of drought: all of California is still experiencing some level of drought, and 43 percent of the state is under extreme or exceptional drought conditions.

The El Niño pattern has ended, and according to the National Oceanic and Atmospheric Administration's (NOAA) climate prediction center, La Niña is favored to develop in the Northern Hemisphere during late summer with a 75 percent chance that it will be in place by the fall. In La Niña years, Southern California is typically 25 percent drier than normal, so there is a strong possibility that 2017 will be a dry year. However, as the unrealized predictions about the monstrous rain storms that were to accompany the El Niño have shown, weather events do not always behave as expected.

Even though California didn't get the precipitation that everyone had hoped for, there is some good news in that the large northern California reservoir levels are above historical averages. The same cannot be said for reservoirs in the southern part of the state. Groundwater storage has certainly also not recovered. While the snowpack of this past winter was a vast improvement on the record-low 2015 snowpack, the early melt and warm spring temperatures have meant that the snowpack is disappearing faster than normal.

Surface water supplies have recovered to some extent over the past winter, but not enough to prevent California growers and agribusinesses from facing water restrictions in the current growing year. However, the new water restrictions are not as harsh as those of the last couple of years. State Water Project (SWP) and Central Valley Project (CVP) allocations for 2016 are higher with the result that some agricultural water users will actually be receiving water this year – a welcome improvement on the zero allocations they had in 2014 and 2015. Nevertheless, 300,000-350,000 acres will be fallowed this year – mostly field crops such as corn, wheat, cotton, alfalfa and pastures – because water supplies are still

tight. By comparison, the drought caused California farmers to fallow 540,000 acres last year.

Given that California is now in its fifth year of drought and that it is highly likely that 2017 will be a dry year, drought regulations are to remain in effect. With droughts likely to become a more common occurrence in the future in California, Californians are making water conservation a way of life and preparing for dry periods. In May, Governor Jerry Brown issued an executive order to continue water savings. State water agencies are to update temporary emergency water restrictions and transition to permanent, long-term improvements of water use. This entails the wiser use of water, eliminating water waste, strengthening local drought resilience, and improving agricultural water use efficiency and drought planning.

Processing Tomatoes

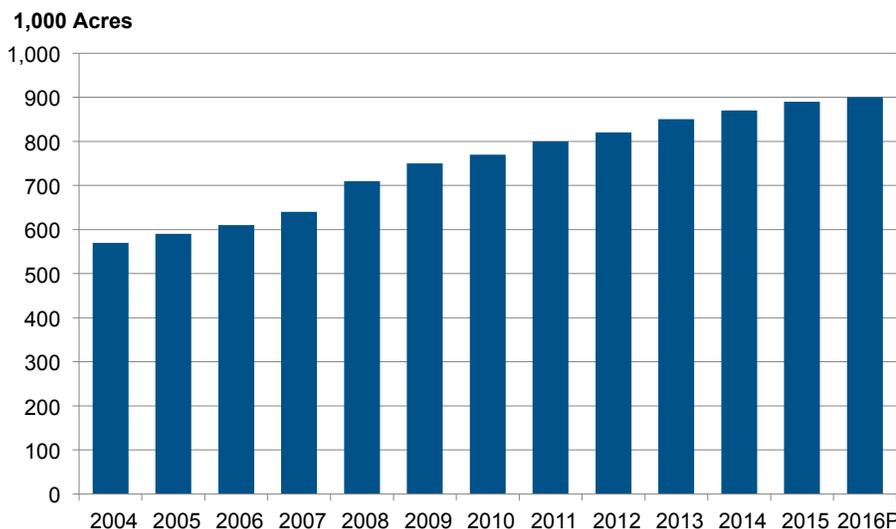
According to the latest estimate issued in late May, California's tomato processors will have contracted for 13 million tons of processing tomatoes in 2016. This is a slight decrease from the January 2016 intentions forecast of 13.2 million tons and represents a 9.1 percent shrinkage on final 2015 contracted production of 14.3 million tons.

Final contracted acreage in 2015 was 297,000 acres.

Tree Nuts

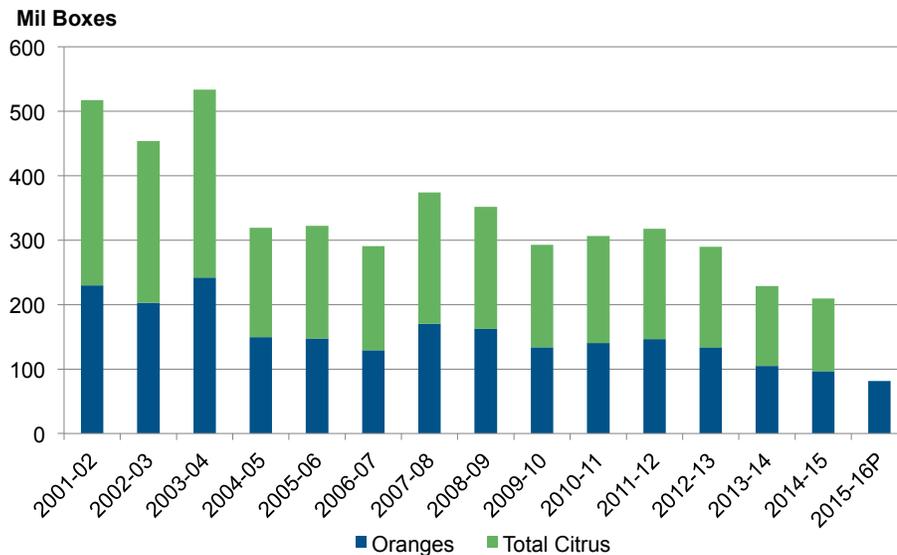
According to the USDA's May initial subjective forecast, the 2016 California almond crop is anticipated to be 2 billion pounds. This represents a 5.8 percent increase over the 2015 crop of 1.89 billion pounds. The forecasted bearing acreage and average yields for 2016 are 900,000 and 2,220 lbs/acre, respectively. (See Exhibit 9.) No doubt the good weather during bloom and the cooler, wetter conditions of this past winter aided with the expected 4.7 percent increase over 2015 yields of 2,120 lbs/acre. Almond prices are expected to fall, but most producer margins will remain in the black.

Exhibit 9: California Almond Bearing Acreage



Sources: USDA NASS, ERS, California Almond Board.

Exhibit 10: Florida Orange and Total Citrus Production by Crop Year



Source: USDA NASS.

With yields down 42 percent last year, few would deny that 2015 was a disastrous year for the California pistachio industry. But it appears that 2016 will be an improvement over 2015. The overall consensus is that the 2016 crop will be more normal. Sufficient chilling hours and the rains of the past winter are resulting in initial estimates of a 600 million – 800 million pound crop this year – a vast improvement on last year’s paltry crop of only 275 million pounds. However, we’ll have a more accurate estimate of the size of the 2016 crop in late July or early August, once nut fill is complete.

Despite talk of a large crop this year, current pistachio pricing is only about 5 percent off price levels at the start of the 2015/16 marketing year. Compared with the major price corrections seen in the walnut and almond markets in recent months, the extremely short 2015 pistachio crop has helped to prop up prices.

While there are concerns over what the size of the 2016 pistachio crop could mean for grower prices, it is being reported that the Iranian crop has been hit by frost damage and could be down by as much as 20 percent. With higher volumes of U.S. pistachios expected to enter the market this year, reduced supply from Iran after two years of bumper crops would benefit the U.S. pistachio industry.

Citrus

The latest citrus forecast for the 2015/16 U.S. all-orange crop is up 4 percent from forecasts released earlier in the season and now stands at 135.47 million boxes. Still, the 2015/16 crop is projected to be 9 percent smaller than the 2014/15 crop. The improved forecast is due to the higher revised estimate of the Florida all-orange crop, now estimated at 81.4 million boxes, mostly due to an increase of 5.3 million boxes in the Valencia harvest to 45.3 million boxes. (See Exhibit 10.) The June forecast for Florida early, mid-season and Navel varieties is 36.1 million boxes with

navels accounting for 1.05 million boxes of the non-Valencia volume.

The expected increase in the Valencia harvest is certainly good news for the Florida citrus industry which has been ravaged by citrus greening to the extent that current production is nearly 70 percent below the production peaks of the late 1990s. Next year’s yields might not be as good, however. In addition to the negative production impacts from citrus greening, the Florida Valencia crop of next year will likely be further depressed as a result of Post-bloom Fruit Drop (or PFD), which hit Florida citrus groves this spring. The conditions were ideal for the onset of this disease this spring, with plenty of moisture during bloom, a pre-existing inoculum, and an extended bloom period.

Infrastructure Industries

Power and Energy

Energy prices across the country have been plagued by a combination of low natural gas prices, the expansion of renewable energy, and weak demand growth. This narrative has been playing out for several years; however, heading into the second half of 2016, market commentaries on the structural shifts occurring across the U.S. power sector and the resulting weakness in

energy prices have included more superlatives. Consider, for example:

- PJM’s State of the Market Report for Q1 2016 observed that, “The real-time monthly average locational marginal pricing (LMP) in March 2016 was \$22.90 per megawatt-hour (Mwh), which is the *lowest real-time monthly average LMP since February 2002.*”
- MISO’s Monthly Market Assessment Report for April 2016 noted that, “Energy prices remained low relative to previous years, due to strong wind production, comparatively low fuel prices and low spring-time loads. Gas prices averaged 26 percent less than last April. Wind production for April was 4,934 gigawatt-hours (GWh), *the highest monthly total recorded in MISO.*”
- California ISO’s Report on Market Issues and Performance for Q1 2016 commented that, “Solar generation *set a new peak during the quarter at just over 7,500 megawatts (MW)* and routinely provided 5,000 MW during midday hours. This is an increase from about 4,400 MW during the same midday hours last quarter.... Day-ahead and 15-minute

prices for the quarter continued to *decrease to the lowest levels in the past 15 months* during both peak and off-peak periods. This was *driven by lower natural gas prices, modest loads, and increased output from renewable resources.*”

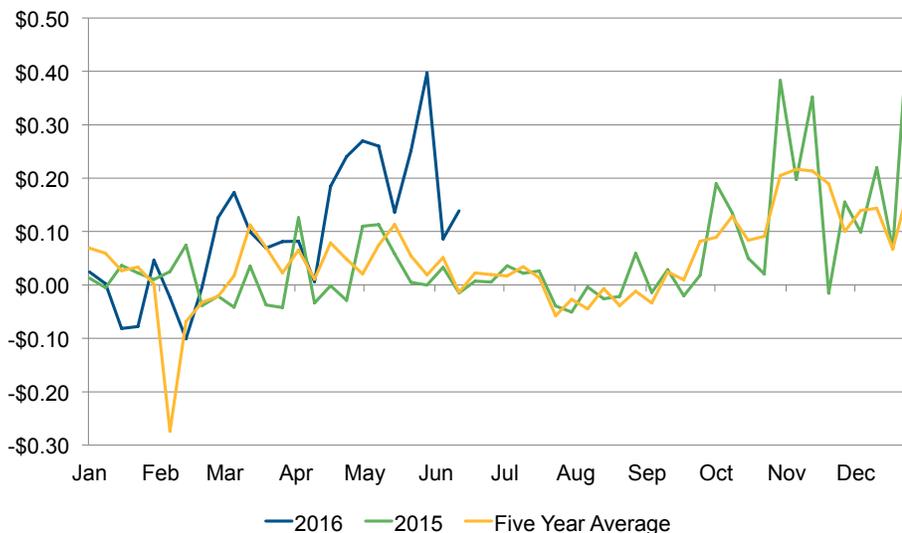
In the near-term, however, energy prices will likely benefit from a transitory boost with natural gas prices having rallied 55 percent since early March from an 18-year low of \$1.49/MMBtu.

Natural gas prices are poised to go even higher. Heading into peak summer cooling season, the natural gas futures contract for July has climbed markedly above Henry Hub spot prices. (See Exhibit 11.) Both spot and futures gas prices marched substantially higher through early June, with the futures contract for July averaging \$2.43/MMBtu as of June 8, \$0.13/MMBtu higher than the average Henry Hub spot price for the same period.

Bullish natural gas prices largely reflect expectations for summertime natural gas consumption to increase substantially from current levels, while production growth is forecast to slow. However, the resilience of shale gas producers continues to confound analysts.

U.S. gas production is beginning to show signs of slowing, but only after reaching an all-time high as recently as last February. June production from the Marcellus turned out to be stronger than previously expected. This strength in production is partially explained by the 1,158 drilled but uncompleted (DUC) gas wells, awaiting completion in the U.S. Approximately 60 percent of these DUCs are targeting the Marcellus with an additional 16 percent targeting the Utica. Furthermore, with 1.8 Bcf/d of take-away pipeline capacity from the Northeast scheduled to come online in 2016, gas production out of the Marcellus and Utica will likely grow through 2016.

Exhibit 11: Spread Between the Front Month Futures Contract and Spot Natural Gas Prices (\$/MMBtu)



Source: EIA.

Incremental growth in take-away pipeline capacity will largely supply the 8.7 gigawatts (GW) of gas-fired generation capacity that is under construction and scheduled to come online through the end of this year. Many of these additions are concentrated around the prolific Marcellus and Utica shale regions. The states located in these regions account for 3.8 GW of the gas-fired capacity that is currently under construction. The Southeast, led by Florida, has the second largest additions of gas-fired generation with 1.4 GW, followed closely by the Texas and Gulf Coast region with 1.3 GW.

Increased reliance on gas-fired generation could lift prices at the Henry Hub above \$3.00/MMBtu this summer. However, a price ceiling for natural gas will likely be established reflecting higher than expected production out of the Northeast, high gas inventories that are likely to remain at or above the 5-year average throughout the injection season, and reduced gas demand due to fuel switching economics. The economic incentive to burn gas in coal-heavy regions such as the Midwest and Northeast is severely eroded when Henry Hub prices reach \$3.00/MMBtu.

A temporary rise in coal-fired generation will not reverse the long-term trend of coal falling out of favor. Since 2015, approximately 15 GW of coal generation were retired, with an additional 11.5 GW announced through 2017. These retirements will likely grow as natural gas prices remain competitive, and renewable energy generation expands. For example, the EIA's latest Annual Energy Outlook anticipates an additional 29 GW of coal retirements through 2017, in addition to the 11.5 GW that have already been announced. Interestingly, the EIA expects that this stepped-up level of coal retirements will occur whether or not the Clean Power Plan is upheld.

While the EIA's coal retirement forecast is aggressive and highly uncertain, it does highlight an important development – i.e., that the market has begun to shift away from coal and will continue to do so, even without federal regulation of carbon dioxide emissions. This shift is underscored by the fact that wind and solar projects account for nearly two-thirds of the utility-scale generation scheduled to come online before year-end.

“*Water’s role as a public good is reflected in the overriding emphasis on maintaining affordable rates.*”

In the months ahead, higher natural gas prices will help support higher energy prices, but this uptick will likely prove to be transitory. The longer-term outlook for energy markets across the country calls for lower energy prices brought on by the proliferation of renewable energy, competitive natural gas prices, and weak demand growth for electricity.

Rural Water Systems

In contemplating how best to deploy and manage their scarce resources, rural water system managers face two major constraints – maintaining their systems’ financial sustainability and complying with the safe drinking water regulations. Low-cost funding, not surprisingly, is one critical ingredient to success. It enables rural water systems to set water rates that are high-enough to recover the costs of treating drinking water, but also low-enough not to compromise their affordability for their customers. A second ingredient for success is knowing which drinking water regulations are violated most commonly by small water systems. This knowledge enables them to develop effective training and technical support programs to facilitate their compliance with these regulations.

A recent study analyzed the capital costs, operations and maintenance costs (O&M), cost recovery, and rate affordability for 25 stand-alone drinking water treatment plants that serve rural populations of 1,000 or fewer people. (See the article entitled, “Cost Recovery and Affordability in Small Drinking Water Treatment Plants in Alberta, Canada,” by Aaron Janzen, Gopal Achari, Mohammed Doe, and Cooper H. Langford, in the [Journal for the American Water Works Association](#), May 2016, page 79.) Its findings suggest that capital and O&M unit costs vary considerably with the volume of treated water

and with the source of the pre-treated water. In particular, both capital and O&M unit costs tended to increase as the community's population shrunk, and those systems that use surface water were more expensive to build and operate than those that relied on groundwater sources.

Of the 25 plants that were analyzed, only one recovered greater than 100 percent of the full cost (all capital and O&M costs) of treating drinking water. Most systems recovered only O&M costs, or the marginal cost of treating drinking water. Although marginal cost recovery rates do not provide reserves for long-term capital upgrades and/or replacements, the researchers found that the rates charged do provide price signals to customers that are adequate enough to influence their consumption behavior. Furthermore, marginal cost recovery seems to be the most realistic option based on an affordability threshold of 2 percent of median household income.

Water's role as a public good is reflected in the overriding emphasis on maintaining affordable rates. This goal necessitates the use of low-interest loan programs that cater especially to those small rural water systems that rely on various cost recovery mechanisms. Absent access to this low-cost funding, many of these rural water systems would likely end up implementing cost recovery rates that exceed the 2 percent affordability threshold.

Along with balancing cost recovery with affordability, many small systems also face unique challenges in complying with safe drinking water regulations. According to a 2014 study by the Rural Community Assistance Partnership (RCAP) of small water systems, approximately 85,000 violations occurred in 2013, where water systems failed to properly monitor and report safe drinking water regulatory standards. This outcome reflects the combined effects of growing regulatory oversight and of limited resources available to the 151,000 small water systems included in the study. In general, the smaller the system, the higher the incidence of violations. For example, those systems serving fewer than 500 people posted the highest percentage of violations.

The most common health-based violation (accounting for approximately 7,500) was found to be not meeting

the standards set forth in the Total Coliform Rule (TCR), which is aimed at limiting fecal contamination into drinking water distribution systems. The study's results indicate that the probability of a violation is roughly the same – i.e., 4 percent – for systems serving fewer than 500 people as it is for those serving up to 100,000 people. However, this probability drops to 1 percent for systems that serve populations in excess of 100,000 people.

Small water systems frequently fail to comply with regulatory reporting standards or with the requirements of the TCR, leading to court orders, fines, and expensive quick-fixes. Therefore, both failings should be priority topics for training and technical assistance. Researchers at RCAP suggest training to emphasize the importance of monitoring and reporting, in conjunction with focused training on measuring chlorine residual, coliform sampling, maintaining chlorine residual, and distribution system operation and maintenance.

Clear recommendations, such as those made by the RCAP, will greatly enhance the effectiveness of the Grassroots Rural and Small Community Water Systems Assistance Act, which was enacted on December 11, 2015. Through this act, the Environmental Protection Agency (EPA) provides technical assistance and training for small public water systems. The program received an appropriation of \$13 million for 2015, with an additional \$15 million to be provided annually from 2016-20. Though the law is not a panacea for all the challenges faced by small rural water systems; it will help keep the cost of providing service and affordability in check, while enhancing the ability of small water systems to comply with safe drinking water regulations.

Communications Industry

In the final days of the first quarter, the Federal Communications Commission (FCC) released a number of significant orders and proposals, including the USF Reform Order and clarifications to the 2015 Open Internet Order. Communications companies are scrambling to analyze and assess what impact these orders and proposals will have on their operations. FCC Chairman Tom Wheeler continues to push an ambitious agenda to resolve as many issues as possible prior to

the November election and Wheeler's anticipated exit in January 2017, when the next administration takes office.

For rural communications providers, the most significant order is the long-awaited USF Reform Order. Its intent is to shift federal funding for rate-of-return (ROR) carriers from voice telephony to broadband networks, especially in those rural communities that currently lack broadband access. Under the Reform Order, rural local exchange carriers (RLECs) must choose between a modified legacy support mechanism based on the provider's own allowable expenses or a new model (yet to be finalized) based on certain benchmarks, caps and a 9.75 percent rate of return. Once the final model is published, each RLEC will have 90 days to declare if it will move forward with model-based funding or modified legacy funding.

The USF Reform Order establishes a finite annual budget and a 10-year funding period, which is anticipated to begin sometime in 2017. However, those rural providers that already meet certain broadband speed thresholds will not be eligible for support and will be identified by Form 477 data – the accuracy of which is contested by many rural providers. Companies will remain in their selected funding program during the entire 10-year funding period, and it is anticipated that carriers selecting the new model are permanently changing their regulatory paradigm, with no opportunity to revert to cost-based funding at any point in the future. Though some specific and important details have yet to be clarified, it is evident that both funding mechanisms will provide less support for the majority of ROR carriers while also requiring more stringent buildout and service benchmarks and reporting requirements than previous programs.

In coming months, senior executives at the ROR carriers will expend considerable time and resources in analyzing how the current competitive environment will evolve in response to the regulatory changes, and then in determining how best to position their own companies to benefit from the ensuing structural changes. JSI's senior vice president, Steve Meltzer describes the Reform Order as an "opportunity for RLECs to transition into an IP-based communications company during a 7 to 10-year planning window with predictable support." Meltzer goes

on to say that "it is imperative companies determine where they want to be at the end of this funding period and immediately begin planning how to get there. Any support that may be available following this funding period is likely to be distributed through a dramatically different mechanism."

In a similar vein, the FCC approved a plan to award nearly \$2 billion over a 10-year time period in a reverse auction to those providers willing to deploy broadband in areas where the incumbent provider elected to forego support. The deployment requirements are technology-agnostic and open up the auction to any broadband provider that can meet the service standards. The FCC also relaxed a credit requirement. The FCC's new plan will likely allow more small, rural players to become eligible bidders and provide for a more competitive process when the auction begins in late 2016 or early 2017. Non-traditional providers, including satellite and wireless Internet service providers (WISPs), are expected to vie for the funding.

In June, the U.S. Court of Appeals upheld the FCC's 2015 Open Internet Order. The Court's decision affirms that the FCC does have the authority to reclassify broadband as a regulated telecommunications service and impose regulations intended to foster net neutrality. These rules have been in effect since June 2015 and apply equally to fixed and mobile Internet service providers (ISPs). In particular, they specifically prohibit paid traffic prioritization and other forms of traffic blocking, bar "unreasonable" interference with edge providers, establish FCC jurisdiction over interconnection agreements, and institute stronger consumer protections. Opponents, however, are expected to appeal the recent decision to the Supreme Court.

The RLECs should be able to adjust readily to the FCC's 2015 Open Internet Order. Greg Whiteaker, principal at Herman & Whiteaker, LLC, explains that, "overall, the reclassification of broadband is not particularly groundbreaking for the RLECs, as these companies are well-versed in selling regulated services. Their main concern lies in the potential for regulatory creep in the future, where the FCC may opt to regulate an aspect

of broadband, such as pricing, that it forebears in this initial order.”

Months ahead of the court decision, the FCC had issued a public notice clarifying the rules designed to protect consumer privacy and security, and improve transparency. Accordingly, ISPs will be required to:

- Allow consumers to control how personal information is utilized,
- Opt-out of marketing of related and affiliate services,
- Opt-in to marketing of non-related services.

The proposed rules also outline enhanced ISP disclosure practices that will satisfy the transparency requirements. Providers with fewer than 100,000 subscribers are exempt from this requirement until December 15, 2016, but rural advocates will lobby to extend this exemption. In a separate release, the FCC shared a broadband label which broadband providers may choose to use as a safe harbor to ensure that network disclosures are compliant.

Internet connectivity has become a critical service. Consumers in a recent poll rated its necessity nearly equal to utilities such as electricity and plumbing. In fact, the youngest adults rated the importance of Internet and WiFi access above that of plumbing. Cisco's latest analysis found that 870 exabytes of data were consumed last year. That number is expected to jump to 2.3 zettabytes by 2020 – the equivalent to every person on earth streaming 12 hours of music every day. Video accounted for 68 percent of consumer traffic in 2015 and is expected to grow to 82 percent over the next five years. Wireless networks also continue to experience an uptick in usage. Last year, U.S. mobile users consumed 2.8 trillion voice minutes, sent 2.1 trillion text messages and generated 9.6 trillion megabytes of data. To handle the increasing traffic, the average global broadband speed will nearly double from 24.7 megabits per second (Mbps) in 2015 to 47.7 Mbps in 2020.

The mobile-first tipping point occurred in 2015; that is, for the first time ever, traffic from Wi-Fi enabled and mobile-connected devices generated a majority (62 percent) of global Internet traffic. By 2020, it is estimated that

71 percent of all IP traffic will be generated by non-PC devices, with smartphones alone generating 30 percent of all data traffic and PCs contributing 29 percent.

While cable companies reported 3.3 million new broadband subscribers during the 12-month period that ended in April 2016, the traditional pay TV model continues to raise questions. Market research reveals that over-the-top (OTT) users prefer streaming TV shows via Netflix two to one over watching live TV. Analysts expect that the U.S. OTT streaming video market will reach \$6.63 billion by year-end, and that OTT will reach saturation within the next three to five years. The wave of cord-cutting seems to have ebbed in recent months; but of the broadband households that subscribe to streaming video, nearly one in five plans to drop its pay-TV subscription in the near future. In combination, these trends signal that content providers of all types will soon have to cannibalize each other's subscribers in order to grow, instead of relying on an expanding marketplace. Experts predict that winners in the pay TV segment will design value-added services that aggregate multiple content services, including OTT, with a robust, interactive, single-search platform.

The Internet of Things (IoT) is beginning to gain traction in the general marketplace, with analysts predicting a 23 percent annual growth rate through the end of 2021. IoT is expected to represent 16 billion of the 28 billion connected devices over the next six years, and presents real opportunities for rural carriers by way of “smart” home and agricultural monitoring, and wireless subscriptions for smart cars and heavy equipment.

Cloud services represent another area for growth. A recent market analysis pegged the market for cloud-based software-as-a-service (SaaS) for small to medium providers in the U.S. and U.K. to be worth as much as \$22 billion. Communications providers that properly understand the customer and their needs, and how to engage those customers are likely to find great success in the cloud. A handful of small and rural-operated providers are already making important investments to establish a position in the market. Others are looking to complimentary opportunities in the data center market. ■

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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