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Situation and Outlook for the U.S. Dairy Industry

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2015, a Year Explained by Components

On the supply side, there were some movements back to more historic levels such as herd growth to pre-2009 cow numbers, declines in feed prices, and declines cull cow prices. However, the U.S. dairy market product prices in 2015 divergence from each other are best explained by the differences of how the U.S. Tariff Rate Quotas affect components: milkfat and skim-solids. Growth in domestic demand on a milk-fat milk-equivalent basis drove the market with increased prices, decreased exports, and increased imports. Growth in international supply and sluggish international demand drove demand on a skim-solids milk-equivalent basis lower.

The U.S. dairy industry ended 2015 with an average all-milk price of \$17.08 per cwt. which was down significantly from the record high price of \$23.97 per cwt. in 2014. However, the feed prices also fell significantly in 2015. The average corn price in 2014/15 was \$3.71 per bushel, which was a 9.7 percent decrease in the price from the previous year. The average 48 percent soybean meal price was \$341 per ton in 2014/15, which was a 28.7 percent decrease in the price from 2014. It was the largest year over year decrease in soybean meal prices since 1998 when there was a 39 percent decrease. The average price of alfalfa hay in 2015 was \$166.67 per ton, which was a 16.8 percent decrease in the price from 2014. The feed prices seen in 2015 are much closer to historic trends for feed prices. The decrease in the feed prices caused the 16 percent protein mixed ration to drop to \$8.31 per cwt., down 16.7 percent from 2014. The lower feed prices offset the decrease in the all-milk price, which allowed the drop to 2.13 in the milk-feed price ratio for 2015 to not be as great as the milk price decline might imply.

For 2015, milk production was 208.6 billion pounds, which was a 1.3 percent increase from the last year. The majority of the increase was due to the increase in cow numbers. In 2015, there was herd expansion particularly in the first and second quarters. There were some signs of contraction during the third quarter but the fourth quarter regained the losses of the previous quarter. The average number of cows for 2015 was 9,317 thousand head, which was 0.6 percent higher than 2014. It was the largest single year herd expansion since 2011.

The average yield per cow for 2015 was 22,393 pounds, an increase of 0.6 percent over 2014. The year over year growth seen in 2015 was the smallest growth since 2001, which had a negative growth rate in yield per cow. The drought in the western U.S. had effects on output per cow, especially in California, Nevada, and New Mexico with over 3 percent declines in each State. Mild summer weather in the Midwestern and Eastern states like Michigan, New York, South Dakota, Connecticut, Kentucky, Illinois, Wisconsin and Minnesota contributed to year over year growth of greater than 2 percent in output per cow. The Midwestern and Eastern states

growth was large enough to counter balance the decreases in the west, resulting in a positive year-over-year growth rate nationally.

The domestic commercial disappearance on a milk-fat basis in 2015 increased to 202.4 billion pounds. This increase was due to increases in domestic demand for butter and to a lesser extent cheese. Imports on a milk-fat basis grew in 2015 to 5.7 billion pounds, a 31.9 percent increase from 2014. The increase in imports was driven by the higher butter and cheese prices in the U.S. compared to the rest of the world. Imports of butter would have been higher in 2015 given the difference in the U.S. and world prices for butter except for the fact that the U.S. market is shielded from changes in the international market on a milk-fat basis due to tariff rate quotas (TRQs). Inversely, the exports on a milk-fat basis decreased significantly due to the higher domestic prices compared to the world market and also a strong dollar. Exports on a milk-fat basis were 8.8 billion pounds, a 29.5 percent decrease from 2014. Surprisingly, even with the increased domestic demand for milk-fat, ending stocks for 2015 were 13.3 billion pounds, an increase of 18.2 percent from 2014. Typically, high prices drive down stocks, however, in 2015 the stocks remained high.

In contrast to the market for milk on fat basis, milk products on a skim-solids basis in the U.S. market is more affected by changes in the international market because the U.S. is a large exporter on a skim-solids basis. Some major changes in the international market that affect the U.S. market on a skim-solids basis were changes with China, Russia, and Europe. China previously was a large dairy importer from the United States, but significantly dropped their nonfat and skim powder imports in 2014 and 2015. Also the Russian ban on imports decreased Europe's export market greatly leading to more product being available, which caused the U.S. exports to be displaced since Russia did begin importing from other countries to the same extent. Furthermore, milk production in the EU grew significantly since April of 2015 when the Common Agricultural Policy (CAP) milk quotas were removed. Milk production in the EU 28 from April 2015 -Nov 2015 grew 3.3 percent compared to the same time period of 2014. The increase in EU 28's milk production significantly increased the amount of milk available in the international market, which was a factor leading to price declines in the world prices. Demand for exports on a skim-solids basis dropped to 37.3 billion pounds, a 4.5 percent decrease from 2014. This decrease was mainly as a result of lower world demand due to reduced buying by with China and Russia's ban on imports from key dairy product suppliers. U.S. imports on a skim-solids basis increased to 5.9 billion pounds in 2015, a 5.7 percent increase from 2014. Ending stocks for milk on a skim-solids basis increased to 13.8 billion pounds, an increase of 5.5 percent from 2014. On a brighter side, there was some growth from 2014 in domestic commercial disappearance on a skim-solids basis of 3.1 percent to 175.4 billion pounds in 2015. This growth, however, was not enough to counterbalance the EU production growth and the lower international demand to keep U.S. prices of products with high skim solids content from decreasing.

A Closer Look at Production Trends

There are many factors driving a producer's production decision, including the price of milk, the price of feed, the price of springers, and the cull cow prices. Prior to the dairy market price declines seen in 2009 and 2010, the U.S. dairy industry had been on a herd expansion trend, which started in 2004 and lasted until 2008. In 2009 and 2010, the dairy market price declines caused a large contraction in the national herd numbers of just under 200,000 cows. Since 2010,

the dairy herd has been slowly expanding again reaching a pre-2009 level in 2015. In 2015, there was some herd contraction in June and July, but the herd expansion started again in August. Much of the herd expansion that occurred 2015 can be attributed to the record high all-milk prices in 2014 and the relatively low feed prices.

The herd expansion likely contributed to above five year average prices for springers and replacement heifers in 2015. On the other hand, the higher prices might have tempered herd expansion in 2015. Springer prices at the end of 2015 decreased to a level last seen in February 2014. The level was still significantly higher than historic averages. The last time springer prices were that high was during the herd expansion seen in 2007 and 2008.

For all three prices of the major components of dairy feed there were periods in recent history of significantly increased prices. For corn, prices were exceptionally high from 2011-2013 with some relief in 2014. Alfalfa hay prices were well above historic levels for 2012-2014; and soybean meal prices were significantly higher from 2008-2014. These increases had significant effects on the farmers' margins. However, in 2015 corn and alfalfa hay prices were at their lowest since 2007 and 2010 respectively. Also, the soybean meal price was at its lowest level since 2011. These lower feed prices significantly helped maintain a higher milk-feed price ratio in 2015, and helped prop up producer profitability in 2015. Compared to the high feed prices seen in 2012, which yielded a record 16 percent protein mixed ration value of \$12.25 per cwt., the 2015 16 percent protein mixed ration value is \$8.31 per cwt. which is much closer to historic levels.

In the first quarter of 2014, there was an increase in the cull cow prices in the U.S., which lasted through the third quarter of 2015. The 2014 and 2015 cull cow prices were significantly higher than historic prices. Higher cull cow prices during an expansion period encourages herd freshening, where the older cows are slaughtered and younger, higher yielding cows are brought into the herd. However, in the last quarter 2015, the cull cow prices decreased to levels more closely seen in 2011-2013. Lower cull cow prices should cause less herd freshening and lessen the interest in herd contraction if a producer is considering it.

Dairy cow slaughter in 2015 was 2,914 thousand cows, a 3.5 percent increase from 2014. However, even with the increase, the total number of cows slaughtered was still below the previous five year average. A low number of cows were slaughter even with the high cull cow prices, a sign of interests in herd expansion. In January 2016, the dairy cow slaughter in much of the U.S. has dropped with the exception of Region 6 slaughter, which includes New Mexico and Texas, the area hit by a blizzard in late December.

A Closer Look at Major Dairy Product Markets

There are four major benchmark dairy commodities that are closely associated with farm milk prices: cheese, butter, nonfat dry milk (NDM), and dry whey. From 2010-2014, in all four commodities there were large price shifts above the historic averages from 2005-2009 leading to some thoughts that there had been a permanent shift in the markets. In 2015, some prices shifts remained, while others reverted to more historic levels. Cheese (\$1.65 per pound), butter (\$2.07 per pound), and dry whey (\$0.38 per pound) prices remained above the 2005-2009 averages,

while the NDM (\$0.90 per pound) price was significantly below its average. However, by the end of 2015, dry whey was well below its average too. As discussed previously, much of what has been occurring in the dairy markets can be attributed to the effects of the international market and increased domestic demand for milk-fat. An individual look at each product provides some interesting insights.

U.S. cheese manufacturers are currently competing with butter manufacturers for milkfat. The cheese market is somewhat protected from price changes in the international market because of the TRQs. The Oceania cheese price in 2015 was \$1.51 per pound, which was significantly lower than the U.S. price of \$1.65 per pound. Part of the reason for the lower cheese prices was because the EU had extra cheese supply on the market which had previously been exported to Russia and also because of the EU's increase in milk production. Furthermore, other major exporters such as Australia and New Zealand were cutting back the production of whole milk powder (WMP) and channeling more milk to production of cheese. Since there was a significant price difference with the Oceania cheese price, the U.S. increased imports and decreased exports of cheese. Imports were 23 percent higher in 2015 than 2014. Exports of cheese dropped 14.0 percent from 2014 to 2015. On the other hand, New Zealand exports of cheese increased 17.6 percent. U.S. ending stocks of cheese were 12.6 percent higher in 2015 than 2014. The ending stocks of cheese in 2015 were above the most recent five year average.

The butter price of \$2.07 per pound in 2015, while not an annual record high like in 2014, remained well above the average of 2005-2009. The butter prices were greatly affected by the increase in domestic demand. The butter market is fairly shielded from the international market because of the TRQ for butter entering the U.S. However, butter imports have been growing despite of the TRQ. The over-quota tariff for butter is about \$0.70 per pound¹, so the U.S. price of butter needs to be about \$0.70 per pound higher than the world price to encourage butter imports to the U.S. over the in-quota imports. The U.S. butter price has been higher than the international butter prices consistently from May 2014 to January 2016, except for January and February of 2015. Oceania and European butter prices in 2015 were \$1.44 per pound and \$1.47 per pound respectively. The U.S. butter price has been more than \$0.70 per pound higher than the Oceania butter price since August 2015. Due to the large price discrepancy between the international prices for butter and U.S. prices, U.S. imports have increased by 67 percent despite the TRQ. In October of 2015, a safeguard duty through the end of 2015 of \$0.233 per pound was triggered due the high import level of butter into the United States. Exports of butter have fallen 71.3 percent from 2014. Exports of butter have not been this low since 2006. Exports would have been lower if Cooperative Working Together had not been supporting butter exports in 2015. Butter stocks in 2015 ended at 152.890 million pounds, which is the highest level since 2012, even though butter prices were historically high.

NDM is the U.S.'s largest dairy export product, so that the U.S. NDM market is closely tied to the international market. The U.S. NDM price averaged \$0.90 per pound, the lowest since 2006. International demand for skim milk powder (SMP)² has been sluggish and the market is flooded with additional supplies of SMP from Europe and from New Zealand and Australia because of

¹ In-quota imports do occur at lower price differences. Also, the \$0.70 approximation for the over-quota imports doesn't take into account freight charge differences. Over-quota imports can occur also when the price difference is less because not all importers have quota licenses.

² SMP is a very similar to product to NDM. The main difference is that SMP has a standardized protein content.

their shift away from WMP; this drove down SMP prices around the world. From January to November of 2015, the EU production of SMP is 8.1 percent higher than for the same period in 2014. Currently, SMP is being sold into Europe's public intervention support program, which has been providing a sort of floor for the SMP price and is scheduled to end September 30, 2016. Since 2014, the U.S. has fairly consistently been below the Oceania price for SMP, except for the months of June and July of 2015. Since the U.S. price has been below the Oceania SMP price, the U.S. has still been exporting. NDM exports in 2015 increased 2.7 percent from 2014 and imports are down 51 percent. Annual ending stocks of NDM for human consumption are down from the record high level in 2014 by 16.6 percent, but are still well above historic levels; suggesting that some sellers are holding stocks and waiting for prices to improve.

Dry whey prices in 2015 fell considerably starting in January at \$0.59 per pound and dropping to \$0.23 per pound by December. Dry whey prices had not been this low since May 2009. Dry whey prices in the recent years have been increasing due to increased demand for whey products. However, dry whey, similar to NDM, is a product affected by the international market. The U.S. is a large exporter of dry whey. Before 2011, the U.S. consistently had the lowest price in the world for dry whey. Starting in August 2011, the lowest price producer of dry whey began to fluctuate more between the U.S. and Europe. The U.S. has had lower dry whey price than Europe since September 2015. The decrease in demand for dry whey and competition with Europe for export demand has caused dry whey exports to drop 22 percent in 2015 from 2014. Dry whey exports have not been this low since 2004. Imports of dry whey are typically near zero. Dry whey ending stocks ended 2015 14 percent higher than in 2014 and are the highest on record. The high stocks could be a sign that sellers are holding stocks and waiting for prices to improve or that sellers may have stocked up to fill demand in 2016. Another possibility is that seller have already contracted the stocks.

A Look Forward to 2016

In 2016, Californian dairy farmers are hoping for drought relief from the El Nino, which started in the 2015 and is expected to end in the latter part of spring 2016. An El Nino tends to create wet winters in California. California's snowpack would need to be at 150 percent above normal by April 1 to end the drought. On February 2, 2016 at the Echo Summit in the Central Sierra the snowpack measured 130 percent of above normal. Throughout the Sierras, the snowpack measured on average 114 percent above normal according to over 100 electronic sensors. Since February 2, 2016, the snowpack has not increased, but the normal values continue to increase, which has led to slips in the percent of average.

Many of the conditions seen in 2015 are expected to be similar those of 2016. The feed prices in 2016 are expected to be lower than in 2015. The average corn price in 2015/2016 is \$3.35-\$3.85 per bushel, which would be a 5.6 percent decrease in the price from the previous year. The average 48 percent soybean meal price is projected to decrease to \$270-\$310 per ton, which is a decline of 16.4 percent from 2014/15. The average all-milk price in 2016 is projected to decline from 2015 to an annual average of \$15.30 to \$16.00 per cwt.

The relatively low margins at the end of 2015 are projected to extend to 2016, slowing growth in cow numbers and yield per cow. The reduction is only a fractional percent decrease in cows. The average yield per cow for 2016 is projected to 22,795 pounds, which would be an increase of under 2 percent from 2015. On a per-day basis, growth in the first two quarters is expected to be

below 1 percent with expected continued below average year over year growth. Increases in yield per cow, although still below recent trends are projected to grow about 2 percent and 3 percent in the third and fourth quarters, respectively as margins improve and the effects of the poor weather (or drought and late season winter storm) during 2015 are minimized. Given the projected cow numbers and yield per cow, milk production in 2016 is expected to grow to 211.9 billion pounds, an increase of just under 2 percent from 2015.

On a milk-fat basis imports are expected to increase further to 5.9 billion pounds, up about 4.0 percent from 2015. Domestic commercial disappearance is expected to continue to increase by just over 4 percent from 2015 to 209.6 billion pounds. Due to the expected high prices for products high in milkfat, exports are projected to be lower than 2015 at 8.3 billion pounds. The strong dollar also is contributing to the low export projections. Stocks on a milk-fat basis are expected to decline in 2016 to 12.2 billion pounds, a decrease of 8 percent from 2015.

On a skim-solids basis, imports are expected to increase to 6.2 billion pounds. Exports on skim-solids basis are projected to decrease to 37.0 billion pounds, less than 1 percent lower than 2015. The continued decline is due to the expected continued growth of milk production growth in the EU, weak international prices, and a strong dollar. The lower NDM and dry whey prices are expected to decrease further in 2016 and are expected to help increase domestic commercial disappearance on a skim-solids basis to 179.8 billion pounds, a 2.5 percent increase from 2015. The decreased exports are expected to increase stocks to 14.0 billion pounds, an increase of just over 1 percent from 2015.

Prices for the four major dairy products in 2016 are all projected lower than 2015. For 2016, the butter price projection is \$1.990-\$2.090 per pound. Weaker exports and greater supplies are expected to keep butter prices below 2015 prices. The cheese price is projected to be \$1.550-\$1.620 per pound. The NDM price is projected at \$0.775-\$0.835, which is significantly lower than 2015 due to continued large supplies from global competitors. The dry whey price is projected at \$0.230-\$0.260 per pound.

The Long-Term Projections

USDA publishes long-term projections every year. These projections are made following publication of the USDA *World Agricultural Supply and Demand Estimates* (WASDE) report, published in November of the previous year. USDA's current outlook numbers for 2015 and 2016, as presented in the latest WASDE report, have since been updated from those in USDA *Agricultural Projections to 2025*, but they are not substantially different. The estimates and projections presented in this work for 2015 and 2016 are from the most recent February WASDE report.

Following 2016, milk cow numbers are expected to continue to expand with the herd size remaining stable from 2017 to 2020 at 9,305 thousand head. Modest herd expansion is projected from 2021 to 2025 to 9,350 thousand head, due to favorable milk-feed price ratios. The yield per cow for 2017-2025 is estimated to start at 23,290 pounds in 2017 and peaks in 2025 at 27,405 pounds. The year over year growth rates are between 1.9 percent and 2.1 percent from 2017 through 2025. These changes in herd size and output per cow result in milk production growing between 0.9 percent and 1 percent each year and rising to 256.2 billion pounds in 2025.

Commercial exports are projected to rebound in 2017 especially on a milk-fat basis. On a milk-fat basis, they are projected to grow to 11.5 billion pounds in 2017. From 2018 on, exports on a milk-fat basis are expected to continue on an upward trend to 13.6 billion pounds in 2025. On a skim-solids basis, commercial exports are expected to grow from 40.6 billion pounds in 2017 to 53.4 billion pounds in 2025, which is a 3.4 percent average annual increase.

The all-milk price long term projections from 2017 to 2025 range from \$16.15 - \$19.90 per cwt. There is a slightly higher all-milk price expected in 2017 of \$16.25 per cwt. Then a slight decrease in 2018 to \$16.15 per cwt. is projected. From 2018 on, the all-milk price is projected to increase each year up to \$19.90 per cwt. in 2025. The average all-milk price increases each year, starting from the low in 2018, is 3 percent. The inflation-adjusted all-milk prices are expected to remain fairly stable with a slight increasing trend from 2018 to 2025, with an average annual increase of 0.3 percent. Typically, real farm-level prices decrease due to productivity. Since prices are starting from a low point in 2014 and 2015, the real price increases are expected because of the expected rebound in international demand.

Additional information about the 2016 dairy forecasts is available at:

World Agricultural Supply and Demand Estimates

<http://www.usda.gov/oce/commodity/wasde/index.htm>

Milk Marketing Order Statistics

<http://www.ams.usda.gov/AMSV1.0/DairyMarketStatistics>

Dairy Market News

<http://www.marketnews.usda.gov/portal/da>

Livestock, Dairy, and Poultry Situation and Outlook

www.ers.usda.gov/publications/ldp/

Dairy: World Markets and Trade

<http://www.fas.usda.gov/dlp/dairy/dairy.asp>

National Agricultural Statistics Service – Data

<http://www.nass.usda.gov/>

The data were last accessed on February 22, 2016. All data are consistent with the February WASDE report except the milk production numbers, which reflect the February 19, 2016 National Agricultural Statistics Service Milk Production report.