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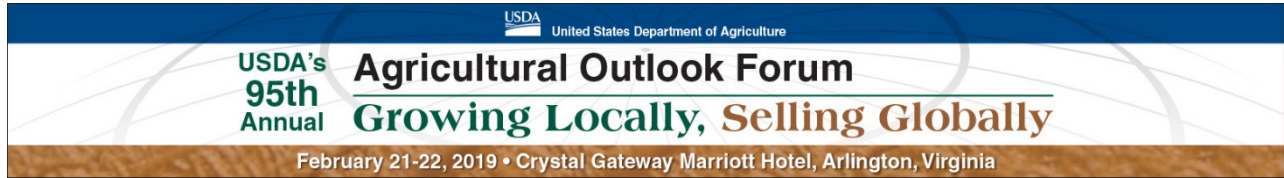
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Dairy Outlook

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OUTLOOK FOR U.S. DAIRY

Carolyn Liebrand
Economic Analysis, Dairy Program
Agricultural Marketing Service, USDA

Growing Locally, Selling Globally

Milk is produced in every State and the farmer-owned cooperatives that handle much of the milk as it comes off the farm are situated to highlight their member-farmers' role in supplying a nutritious, natural product. At the same time, members of the U.S. dairy industry have developed international markets for a variety of products and the dairy sector has become an important supplier of dairy products to the world.

Events during 2018 roiled the industry, delaying milk price recovery. The average all-milk price that farmers receive has fallen and remained relatively low since the record highs of 2014. Despite milk prices improving somewhat as 2018 progressed, the annual all-milk price averaged \$16.18 per hundredweight (cwt), the annual average since 2009. Milk prices at the mid-point are projected to improve about \$1 per cwt in 2019 to \$16.90-\$17.60. Yet while these prices have been hitting dairy producers hard, the cows have been hard at work.

Productivity—Record Milk Yield, Record Milk Production

The average annual milk per cow rose to 23,173 pounds per head in 2018, a year-over-year growth of 1.0 percent. Milk production per cow is projected to be 23,505 in 2019, up 1.4 percent over 2018 due to continued genetic and management improvements, somewhat improved prices and reflects the long run trend growth of 1.4 percent for 2000 through 2017.

On a daily average basis, each U.S. milk cow produced 63.5 pounds of milk per day in 2018. Seasonality in milk production continues to challenge dairy industry logistics. In 2018, a 4-pound difference in average output per cow per day between May (the month with the highest output per cow) and October (the month with the lowest output per cow), and with an inventory which was 38,000 head larger in May, meant the industry had to handle, and find markets for, 41 million more pounds of milk per day in May compared to October.

In addition to increased yields, the composition of milk is also trending richer. Butterfat percent averaged 3.87 in 2018, compared to 3.84 percent in 2017. Likewise, data from Federal Milk Marketing Orders¹ (FMMO) in 2018 showed that average nonfat solid content of pooled milk rose to 8.91 percent from 8.90 in 2017. These percentage-point changes may seem small, but the 2018 increase in component tests alone represent an additional 65 million pounds of fat and 22 million pounds of nonfat solids (i.e., not including the additional fat and solids from increased milk production 2017 to 2018).

Tough Times for Producers as Milk Price and Feed Costs Converge

Dairy cows must be well-fed, housed and managed to produce these ever-increasing volumes of milk and components. According to data from USDA's Economic Research Service (ERS), feed costs made up 46 percent of total production costs in 2017 and represented 75 percent of dairy producers' operating costs. As a major component of production costs, the margin between milk and feed prices, "income over feed cost," provides an indicator of farm profitability. Using the same feed cost formula as for the Dairy Margin Coverage program, feed costs to produce 100 pounds of milk averaged 9.2 percent above those in 2017, while milk prices averaged 8.4 percent below, resulting in 22.6 percent lower income over feed cost for 2018, on average, as compared to 2017. While income over feed cost did not hit the very low levels of

¹ Nonfat solids content is reported by 6 of the Orders. These orders represented 80.8% of the milk pooled on FMMOs in 2018.

2009, 2012 or 2013, they were below \$9 per cwt for all of 2018 and below \$7 per cwt for February through May and again in July. This margin has not remained below \$7 per cwt for such a stretch since 2013.

Continued Shift to Larger Dairy Operations

In 2018, market adjustments on the part of processors and manufacturers to increase efficiency or their position in the marketplace caused a number of producers to lose their market outlet for their milk. In some cases, dairy cooperatives, and some proprietary plants, offered to pick up these producers' milk, at least temporarily. As the dairy sector rationalizes its systems, milk buyers may also be seeking the versatility that large farms offer. By way of example, the Central Milk Marketing Order (number 32) reported that in October 2018, of the total producers marketing milk on the Order, just 7 percent marketed more than 1.5 million pounds each, but represented nearly 70 percent of all milk pooled on Order 32. The report pointed out that farms that can offer a tank load per day, are sometimes referred to as a "milk plant on wheels." A tank load of milk each day is very mobile and can be readily directed to different locations as needed.

The low margins in milk production are reflected in the value of milk cows--prices averaged \$1,358 in 2018, the lowest they've been since 2010. And more dairy cows are being culled. In 2018, 10 percent more dairy cows were slaughtered in both October and November as compared to those months in 2017. (This is Federally-inspected (FI) milk cow slaughter.) Dairy cow slaughter through November 2018, is 6 percent above 2017. Summing the total weekly FI cow slaughter for weeks ending January 5th through January 26th, 2019 averaged 1.4 percent above the same period a year ago. A proxy for cull cow prices (the National, Live-Equivalent, Cutter, 90% lean, 500-pounds and up price) shows an annual average decline in prices for cows sent to slaughter from 2016 through 2018. For 2019, the annual cow price is forecast to decline from the 2018 price estimate.

Low Returns Slow Growth

For the first time since 2013, annual cow numbers are below year earlier, -0.1 percent in 2018. The average inventory of milk cows on a monthly basis dropped below year earlier each month from July through December. Average dairy cow inventory is expected to drop another 0.2 percent in 2019, due to the continued response to low margins in late-2018 and early 2019.

The result is slower growth in U.S. milk production. The annual average increase of 0.9 percent in 2018 was the lowest increase since 2013. Milk production is projected to grow 1.2 percent in 2019 to 220.1 billion pounds due to increases in cow productivity outweighing the slightly smaller U.S. dairy cow herd.

Over one-half of U.S. milk is produced in California, Wisconsin, Idaho, New York, and Texas. New York is the only one of these states to show a decline in milk production for 2018. Of the top 20 milk producing States, Colorado, Texas, and Kansas showed the largest annual growth rates in milk production, 8.8, 6.6, and 6.1 percent, respectively.

On an annual basis, domestic commercial disappearance on a milk-fat basis is expected to show an increase of just 0.7 percent in 2018 over the prior year but is projected to grow 1.7 percent in 2019. The domestic use on a milk-fat basis rose 7.5 percent from 2014 to 2018. In contrast, on a skim-solids basis, domestic commercial disappearance is projected to be up a meager 0.1 percent in 2018, and to improve 1.0 percent in 2019.

Retaliatory Tariffs Hamper Exports

Export numbers were promising in early 2018, starting with a 16 percent increase, skim-solids basis, for January and a whopping 30 percent year-over-year increase for April. Then came the retaliatory tariffs enacted by China, Mexico and Canada in July in response to U.S. tariffs on steel and aluminum. All of China's dairy product imports from the United States became subject to tariffs in addition to normal most-favored-nation tariffs by August 3, 2018. Almost all cheese imported by Mexico from the U.S. is subject to retaliatory tariffs. (Canada also has retaliatory tariffs on yogurt and pizza, but the U.S. sends few of these

products there.) November exports were down 14 percent on a skim-solids basis from the prior year. Commercial exports are expected to be up 10 percent on a skim-solids basis for 2018.

Likewise, monthly exports on a milk-fat basis were greater than a year earlier until November when they declined by 4 percent. Exports on a milk-fat basis are expected to be up 15 percent for 2018.

The U.S. is expected to continue to face headwinds in its export markets in 2019. In addition to the retaliatory tariffs, free trade agreements between our trading partners and competitors may limit U.S. export potential. For example, the EU and Japan's Economic Partnership Agreement (entered into force on February 1, 2019) and the Comprehensive and Economic Trade Agreement between the EU and Canada (provisionally in force September 21, 2017).

Exports on a skim-solids basis are projected to be down less than 1 percent in 2019. Similarly, on a milk-fat basis, commercial exports are projected to decline 3 percent in 2019 with the assumption the tariff situation continues.

Imports Favor Milk-Fat

Meanwhile, 2018 imports on a skim-solids basis are projected to decline by 10 percent from 2017. For 2019, imports on a skim-solids basis are forecast to decline 5 percent. The U.S. has been a net exporter of milk on a skim-solids basis since before 2000. Net exports (exports minus imports) are projected to increase by less than 1 percent in 2019 to a record 39.4 billion pounds.

Monthly imports on a milk-fat basis were above year-earlier levels for April through November, with 2018 expected to be up 6 percent over 2017. Imports on a milk-fat basis are projected to be up another 4 percent in 2019 as world butter prices are expected to be competitive with U.S. prices. Combined with the projected decline in exports on a milk-fat basis, net exports are projected to decline by 14 percent in 2019.

Shifting Stock Levels

Commercial ending stocks increased to 11.8 billion pounds on a skim-solids basis and 13.4 billion pounds on a milk-fat basis in 2017 (2018 ending stocks for dairy products are not available from NASS due to the government shutdown in December 2018 through January 2019). As milk production and consumption increase, it follows that stocks also may show a relative increase. Monthly ending stocks on both a skim-solids and milk-fat basis started 2018 above year-earlier levels but followed different trajectories as the year progressed. Ending stocks on a skim-solids basis fell below year earlier levels during the second half of 2018. They are expected to have ended 2018 at 600 million pounds below year-earlier and are forecast to drop another 100 million pounds to 11.1 billion pounds in 2019. Ending stocks on a milk-fat basis for 2018 on the other hand are projected up 300 million pounds but to decline to 13.3 billion pounds in 2019.

Ending stocks expressed as days of total commercial use peaked in 2017 at 19.7 days on a skim-solids basis and are expected to fall in both 2018 and 2019. In 2019, stocks are projected to represent 18.1 days of use on a skim-solids basis. On a milk fat basis, 2018 ending stocks are projected to amount to 22.5 days of use and drop to 21.5 days of use in 2019.

Of the 4 main dairy products—butter, nonfat dry milk (NDM), American cheese (includes Cheddar, Colby, Monterey, and Jack cheese) and dry whey, American cheese showed the largest ending stocks relative to total commercial disappearance, 51.4 days of use in 2017. The high levels of stocks are notable. It is possible stock levels reflect the changing nature of cheese production and marketing, as well as robust supplies. Perhaps adjustment in the variety of cheese being made, such as a declining utilization of cheese for processed cheese products and more utilization in aged cheese products, among other things, may be affecting the amount of American cheese in inventory. Ending stocks as days of use were below year-earlier levels for most months in 2018 through August and then moved above year-earlier levels for September through November. (Ending stocks for dairy products in December and 2018 annual, are not

available from NASS due to the December 2018 through January 2019 government shutdown.)

Ending stocks of Other-Than-American cheese were held at a much lower level than American cheese, 25.0 days of use in 2017, and have ranged from 23.7 to 27.8 days of use in 2018 through November. Butter stocks represented 33.2 days of use in 2017, slightly more than 2016 or 2015 and were below year earlier levels in October and November 2018. Ending stocks of NDM and dry whey in terms of days of total commercial use rose relatively sharply in 2017. Dry whey stocks in terms of days of use were below year earlier levels for March through November 2018.

USDA Donations of Dairy Products

In 2019, USDA plans to purchase dairy products, including fluid milk, for food donation programs to mitigate the impact of retaliatory tariffs placed on U.S. dairy exports. These products, 300 million pounds milk-fat basis and 200 million pounds skim-solids basis, will be purchased with Commodity Credit Corporation (CCC) funds and are identified as “CCC Donations” in the *World Agricultural Supply and Demand Estimates* (WASDE) report. USDA also purchases dairy products for food donation programs under Section 32 funding; these purchases are included in domestic commercial disappearance. Fluid milk was purchased by USDA for donation to food banks for the first time in 2018.

Prices to Be Modestly Higher

Even though the rate of increase in milk production slowed in 2018, abundant supplies dampened product prices. Prices for the major dairy commodities--butter, NDM, cheddar cheese and dry whey were all below year-earlier levels in 2018. Butter prices rallied in March, April and May above year-earlier levels, but fell below year-earlier levels in the other months except for December. In 2018, butter prices averaged \$2.26 per pound, 7 cents per pound below 2017. In 2019, the butter price is expected to average \$2.23 to \$2.33 per pound. The U.S. price has been above international prices for most of 2018, attracting imports which has had a dampening effect on domestic prices.

In 2018, NDM prices averaged \$0.79 per pound, 7 cents per pound below 2017. In the fourth quarter of 2018, the NDM price rose above year-earlier levels. Skim milk powder (SMP) export prices moved up in foreign countries toward the end of 2018. The 2019 NDM price forecast is \$0.955 to \$1.015 per pound. Flagging milk production in Australia due to weather complications and slower growth in the EU countries are expected to contribute to price strength. Higher world prices are expected to lend support to U.S. prices.

Cheddar cheese prices in 2018 averaged \$1.54 per pound, 10 cents per pound below 2017. Changing supply and demand relationship for cheddar cheese in 40-pound blocks and 500-pound barrels resulted in divergence in the two prices and barrel prices remaining below block prices for an extended amount of time, which disadvantaged some barrel makers in 2018. In 2019 the cheddar cheese prices forecast is \$1.48 to \$1.55.

Dry whey prices in 2018 averaged \$0.34 per pound, 10 cents below year-earlier levels. However, fourth quarter dry whey prices were higher year-over year. U.S. dry whey was very competitive internationally in 2018. The projection for 2019 is \$0.435 to \$0.465 per pound, an increase from 2018 due to the strength of international dry whey prices.

Long-term projections, 2020-2028

The projections to 2028 use a starting point of the short-term forecasts from the October 11, 2018 World Agricultural Supply and Demand Estimates (WASDE) report. Therefore, these estimates are based on policy in place at that time, such as the retaliatory tariffs and the 2014 Farm Bill, and their assumed continuation. These projections are useful for analyzing impacts of alternative policy scenarios and other forces impacting the dairy industry. The 2018 and 2019 forecasts have been revised since the baseline was set; because of these revisions, the rate of change discussed below are from 2020.

Total milk production is projected to grow by 26 billion pounds from 2020 to 2028 based on continued milk per cow growth at an annual rate of 1.3 percent and less than 1 percent annual increases in cow numbers. These growth rates match that of the 2008-2017 period.

Domestic commercial use on a milk-fat basis is projected to average 1.3 percent annual growth to reach nearly 244 billion pounds in 2028, a leap year. This compares to 1.4 percent annual average growth for 2008-2017. On the skim-solids basis, growth in domestic commercial use is projected slightly slower at 1.0 percent annually to reach 200 billion pounds in 2028. However, this is a slightly stronger rate than for 2008-2017.

Total imports on a milk-fat basis are projected to decline an average of 1 percent annually over 2020-2028. The average annual growth rate 2008-2017 was 1.5 percent. Imports on a skim-solids basis are expected to increase 1.1 percent annual average to 6.2 billion pounds in 2028.

Commercial exports are projected to increase on both the milk-fat and skim-solids bases over 2020-2028. Commercial exports on a milk-fat basis are projected at 11.6 billion pounds for 2028 (an average annual increase of 2 percent from 2020) and 55.5 billion on a skim-solids basis (an average increase of 2.5 percent from 2020). The average rate of growth in exports on a milk-fat basis is higher than what it was for 2008-2017, but it is about half of the earlier period growth rate on a skim-solids basis.

The growth in exports contributes to slower growth in commercial ending stocks for 2020-2028 relative to 2008-2017 on both the milk-fat and skim-solids bases.

Butter prices are projected to rise 33 cents per pound by 2028 on the strength of continued demand while NDM prices are projected to grow 24 cents per pound by 2028 with the expectation of continued export market opportunities and strength in world prices for NDM and SMP. Cheese prices are projected to increase more modestly, 13 cents above 2020. Whey prices are projected to remain fairly flat, increasing just 1 cent between 2020 and 2028. The 2028 all-milk price is expected to be \$19.65 per cwt, \$2.25 above 2020.

Office of the Chief Economist, USDA Dairy Long-Term Projections to 2028

Item	Units	2017	2018	2019	2020 ^{1/}	2021	2022	2023	2024 ^{1/}	2025	2026	2027	2028 ^{1/}
Milk production and marketings:													
Number of cows	Thousand	9,392	9,400	9,410	9,415	9,425	9,430	9,435	9,440	9,445	9,455	9,460	9,465
Milk per cow	Pounds	22941	23200	23525	23930	24175	24495	24815	25210	25475	25,805	26,130	26530
Milk production	Bil. lbs.	215.5	218.1	221.4	225.3	227.8	231.0	234.1	238.0	240.6	244.0	247.2	251.1
Farm use	Bil. lbs.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Marketings	Bil. lbs.	214.5	217.1	220.4	224.3	226.8	230.0	233.1	237.0	239.6	243.0	246.2	250.1
Supply and use, milkfat basis:													
Beginning commercial stocks	Bil. lbs.	12.7	13.4	13.5	12.5	12.9	13.2	13.6	13.8	14.2	14.5	15.0	15.4
Marketings	Bil. lbs.	214.5	217.1	220.4	224.3	226.8	230.0	233.1	237.0	239.6	243.0	246.2	250.1
Imports	Bil. lbs.	6.0	6.3	6.3	6.2	6.1	6.0	6.0	5.9	5.9	5.8	5.8	5.7
Commercial supply	Bil. lbs.	233.2	236.8	240.1	243.0	245.8	249.2	252.7	256.7	259.7	263.3	267.0	271.2
Domestic commercial use	Bil. lbs.	210.5	212.9	217.5	220.2	222.4	225.2	228.4	231.9	234.4	237.1	240.3	243.7
Commercial exports	Bil. lbs.	9.2	10.5	9.8	9.9	10.2	10.4	10.5	10.6	10.8	11.2	11.3	11.6
CCC donations 2/	Bil. lbs.	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ending commercial stocks	Bil. lbs.	13.4	13.5	12.5	12.9	13.2	13.6	13.8	14.2	14.5	15.0	15.4	15.9
Supply and use, skim solids basis:													
Beginning commercial stocks	Bil. lbs.	9.5	11.8	10.8	10.8	11.2	11.4	11.7	11.9	12.2	12.4	12.7	13.0
Marketings	Bil. lbs.	214.5	217.1	220.4	224.3	226.8	230.0	233.1	237.0	239.6	243.0	246.2	250.1
Imports	Bil. lbs.	6.1	5.6	5.5	5.7	5.8	5.8	5.9	5.9	6.0	6.1	6.1	6.2
Commercial supply	Bil. lbs.	230.1	234.5	236.7	240.8	243.9	247.2	250.7	254.8	257.8	261.5	265.0	269.3
Domestic commercial use	Bil. lbs.	177.6	178.6	181.6	184.2	185.9	187.7	189.8	192.2	193.9	196.0	197.9	200.5
Commercial exports	Bil. lbs.	40.7	45.1	44.1	45.4	46.6	47.8	49.0	50.4	51.5	52.8	54.1	55.5
CCC donations 2/	Bil. lbs.	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ending commercial stocks	Bil. lbs.	11.8	10.8	10.8	11.2	11.4	11.7	11.9	12.2	12.4	12.7	13.0	13.4
Prices:													
All milk	hundredwei	17.65	16.40	17.30	17.40	17.55	17.80	18.15	18.55	18.85	19.00	19.3	19.65
Cheese	\$/lb.	1.63	1.57	1.62	1.66	1.68	1.70	1.73	1.76	1.77	1.78	1.78	1.79
Butter	\$/lb.	2.33	2.26	2.27	2.27	2.24	2.27	2.32	2.39	2.43	2.46	2.54	2.60
Nonfat dry milk	\$/lb.	0.87	0.79	0.86	0.85	0.88	0.91	0.93	0.96	0.99	1.02	1.05	1.09
Dry whey	\$/lb.	0.44	0.33	0.40	0.35	0.35	0.35	0.35	0.34	0.35	0.35	0.35	0.36

Note: Totals may not add due to rounding. 1/ Leap year. 2/ Expected purchases under the Food Purchase and Distribution Program.

The long-term projections use as a starting point the October 11th, 2018 WASDE report. They are a departmental consensus on a long-run representative scenario for the dairy sector for the next decade. The projections are based on specific assumptions about macroeconomic conditions, policy, weather, and international developments, with no domestic or external shocks to global agricultural markets as of October 2018. As such, the starting point for long-term projections do not necessarily reflect the short-term projections in the current WASDE report.

Additional information about the 2019 dairy forecasts and current dairy markets:

World Agricultural Supply and Demand Estimates

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

Livestock, Dairy, and Poultry Situation and Outlook

<https://www.ers.usda.gov/publications/>

Dairy: World Markets and Trade

<https://www.fas.usda.gov/data/dairy-world-markets-and-trade>

Dairy Program/Agricultural Marketing Service

<https://www.ams.usda.gov/about-ams/programs-offices/dairy-program>

Dairy Market News <https://www.ams.usda.gov/market-news/dairy>