May 2019

2019 Milk Marketing Update

Milk Marketing in the Northeastern United States

In this report, Farm Credit East is pleased to present two different perspectives from the field of milk marketing: Dr. Mark Stephenson, Director of Dairy Policy Analysis at the University of Wisconsin, and Lucas Fuess, Director of Dairy Market Intelligence at HighGround Dairy.

The articles examine the production, movement, processing and marketing of milk and dairy products across the United States and specifically in the Northeast.

While the dumping of milk and dairy producers losing markets have garnered headlines, the issues facing milk marketing are complex, and go beyond a simple case of supply versus processing capacity.

Regional shifts in milk production, changes in processing capacity across the country and shifts in consumer demand all combine to form an extremely complex network of milk movement, processing and marketing.

In this report:

There are indications as of 2019 that milk production and processing capacity in the Northeast have come into closer alignment than in recent years, leading to a decrease in surplus milk, and hopefully, higher prices for producers in the region.

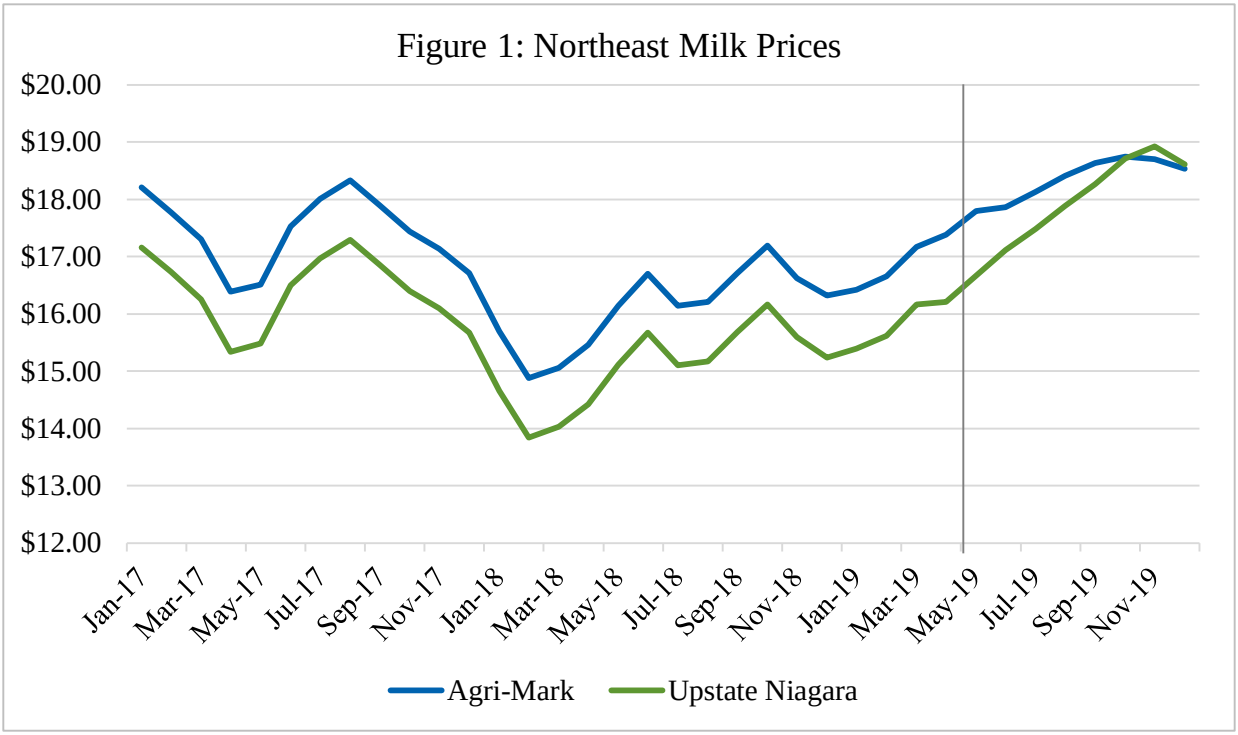
Milk Price Forecast

The dairy commodity market outlook has become more favorable recently and suggests that prices will climb slightly for most of the remainder of 2019.

One reason for this more favorable outlook is that milk production in the U.S. has been relatively flat recently, with reductions in cow numbers roughly countering increases in per-cow productivity. The USDA's 50-state data put April 2019 milk output up a mere 0.1 percent, year-over-year, while March production fell below last year's volume (-0.6 percent) for the first time in six years.[1] Meanwhile, consumption has been improving, at least for processed dairy products.

[1] UDSA / NASS Milk Production May 20, 2019

Butter usage has climbed by two percent since 2018, and U.S. exports were up by four percent in value for January 2019 over the prior year.[2] While trade disputes remain a concern, the recent lifting of metal tariffs between the U.S., Canada and Mexico, has increased the potential for dairy trade with our two closest neighbors, and should support ratification of the proposed United States-Mexico-Canada Agreement (USMCA).



Source: Agri-Mark; Boston Blend Price as of April 15, 2019. Upstate Niagara Cooperative; Average WNY Blend Price as of May 6, 2019.

[2] U.S. Dairy Export Council, March 27, 2019

Dairy Processing in the Northeast

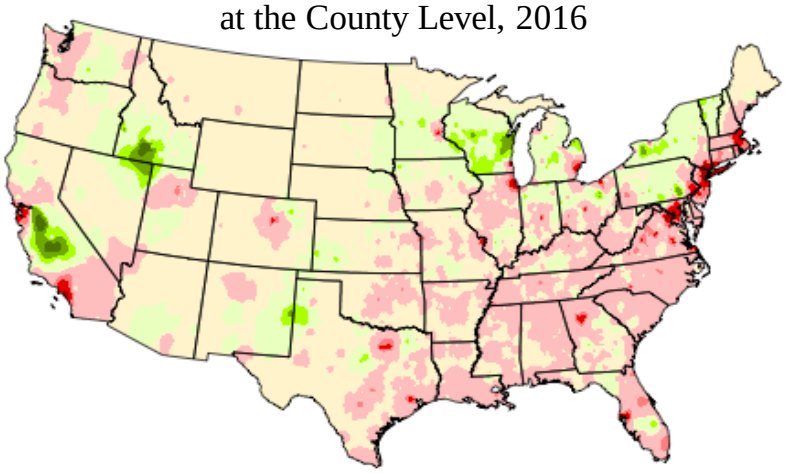
Mark Stephenson, PhD., Director of Dairy Policy Analysis, University of Wisconsin

Northeastern supply and demand for dairy products

Milk is produced in all 50 of the United States, as it has been for many years. However, specialization of milk production into or out of various regions of the country continues to evolve. The task of the dairy supply chain is to consolidate raw milk from farms where it is produced, transport it to plants where dairy products are made, and then to distribute those consumer products to locations where they are demanded.

U.S. farm milk production can be estimated at the county level from National Agricultural Statistics Service (NASS) and Agricultural Marketing Service (AMS) sources. Per capita demand for all dairy products can also be estimated with regional and ethnic variation from the Economic Research Service (ERS) and AMS data. Per capita demand estimates can be multiplied by the population estimates and demographics to calculate a total milk equivalent demand at the county level. County level production minus milk equivalent demand gives an idea of surplus/deficit areas of the country. Figure 1 shows these calculations where shades of green represent relative surplus and red represents deficit.

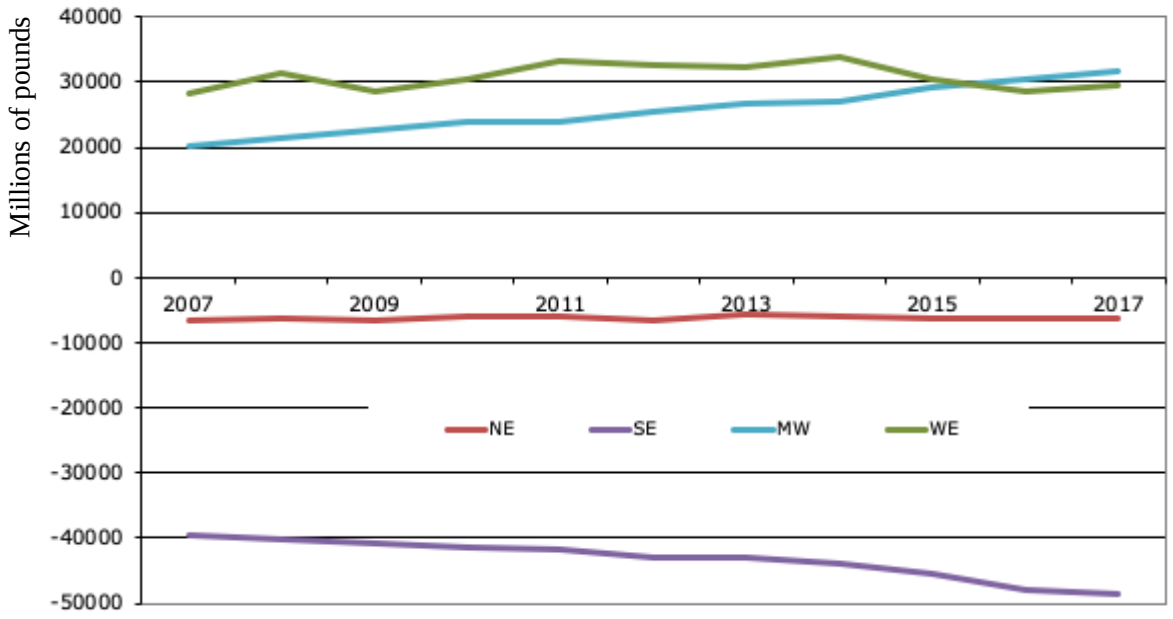
Figure 1: Milk Surplus/Deficit Estimates at the County Level, 2016



Source: NASS/AMS and Bureau of Labor Statistics

The focus of this report is on dairy plant capacity in the Northeastern states, which are defined for the purposes of this report as the states of New England, New York, New Jersey and Pennsylvania. The metropolitan areas from Boston, New York, Philadelphia and Washington DC are the most milk deficit regions of the country, even though the states of Vermont, New York and Pennsylvania are themselves surplus in milk production. However, the Northeast as a whole is net deficit about six billion pounds of milk annually and has remained steadily so over many years, see Figure 2. The Northeast is also neighbor to Southeastern states which are increasingly net deficit. Even though the Northeastern states are not self-sufficient, raw milk and dairy products from the Northeast moves into the Southeastern states to help supply their dairy product demand. Dairy products from the surplus regions of the Midwest and far West supply the balance.

Figure 2: Evolution of Regional Surplus/Deficit Milk Production



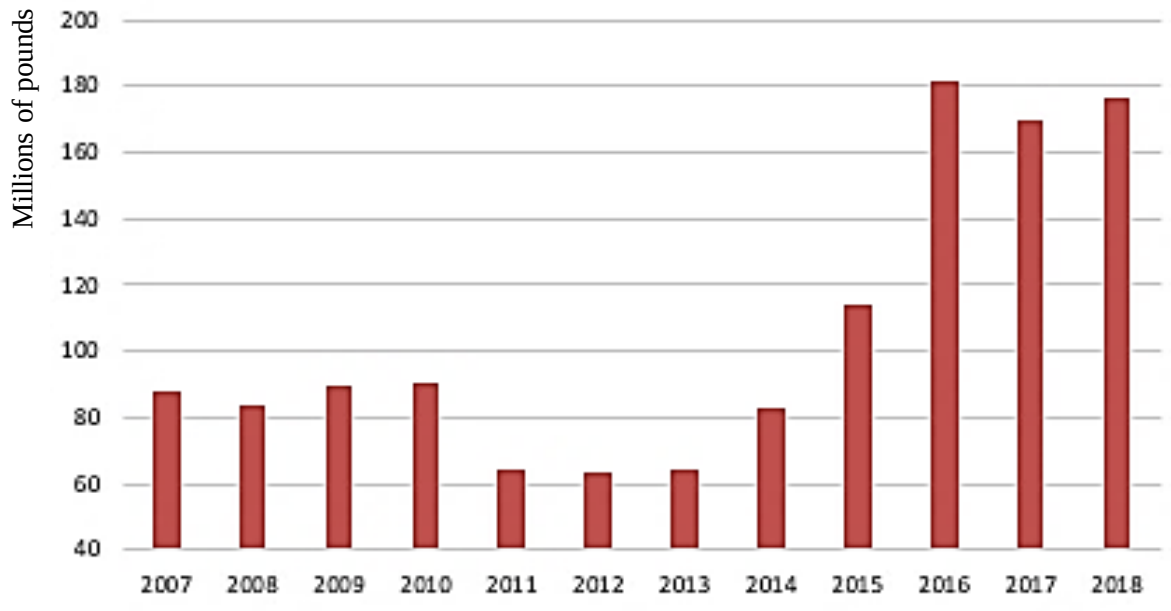
Source: NASS/AMS

The stability of the milk deficit in the Northeast does not imply stable milk production in the region. In fact, milk production in the Northeastern states has been growing at a compound annual growth rate of 1.14 percent or about 325 million pounds of milk per year. This growth in milk production will need to be matched by increased capacity of plants in the region to process the raw milk, or the milk will have to be shipped at significant transportation cost to plant capacity in other regions, or in the extreme case if the value of milk is not greater than transportation costs to a processing home, milk may be discarded and ultimately farm milk value is diminished.

Discarded Milk in Federal Order One

A small amount of milk is routinely discarded because it may have been delivered to a plant above critical temperature or it may have been found to contain antibiotics, etc. Milk quality is generally very high and milk lost for this reason is a relatively small volume—typically 0.3 percent of producer receipts. However, beginning in 2015, the volume of milk dumped in the Northeast has about doubled, compared to past normal volumes as there has been difficulty finding a processing home during the flush months of the year, see Figure 3. Note that even though these amounts have increased in recent years, it is still a relatively small percentage of the 28 billion pounds pooled in the Northeast Federal Order annually.

Figure 3: Annual Milk Dumped in the Northeast Federal Order



Source: Northeast Marketing Area Statistical Uniform Report (various issues)

Processing Plant Data

There is no definitive list of dairy plants in the U.S. The 11 Federal Milk Marketing Orders (FMMOs) maintain records of plants regulated (not the same as located) in their territory. However, not all milk in the U.S. is regulated under a FMMO. In the Northeast, there is a significant amount of milk in western New York, the central part of Pennsylvania and the state of Maine with state regulation, and there is some grade B milk which cannot be regulated by FMMOs. And, a few manufacturing plants may not find it advantageous to pool their milk and thus opt out of federal order regulation. Some states do maintain a list of licensed dairy plants but that isn't true for all states. There is also a plant list assembled by Homeland Security to be used in the event of a national or regional disaster, but it is woefully inadequate. The U.S. Food and Drug Administration maintains a list of interstate milk shippers but again, this is only for grade A milk and doesn't include plants who source their milk from within the state. AMS has a list of Dairy Plants Surveyed and Approved for USDA Grading Service which is extensive but not complete. One of the most complete and accessible lists is maintained by Dairy Foods Magazine[1] but it isn't a census of plants and it also contains many reload stations which are non-manufacturing.

Milk intake at dairy plants is considered highly proprietary information and none of the plant lists provide an estimate of this data. A few give categorical reference but it is a coarse partition of plant capacity. The U.S. Dairy Sector Simulator (USDSS)[2] is a very granular

[1] Dairy Plants USA, *Dairy Foods RSS*, dairyfoods.com/directories/7376-dairy-plants-usa
[2] Stephenson, M.W. and C.F. Nicholson. 2018. "Regional Values for Milk Are Changing." Choices. Quarter 4. Available online: choicesmagazine.org/choices-magazine/theme-articles/americas-dairy-industry-adapting-to-long-running-structural-pressures/regional-values-for-milk-are-changing

spatial model of the dairy industry and up-to-date information on plant locations, products produced at those locations and an estimate of milk intakes at the plants are maintained for that model. These are the data used in this study.

There are currently about 350 fluid milk and 1,300 manufactured dairy product plants in the U.S. Many of these are small volume and may be producer/dealer or value-added plants which process only their own milk supply. Others only purchase dairy ingredients like ice cream mix, cream, condensed milk, cheese curd, etc., and to include them would double-account for total processing volume. These plants are not of interest to this study and are not included in the processing volume estimate. There are 535 plants with raw milk intake estimates used in the USDSS list, excluding the producer/dealers, value-added and purchased dairy ingredient manufacturers.[3] The sum of the estimated milk intakes of the 520 plants represent about 98 percent of the volume milk produced in the NASS estimate for 2017.

Northeast Dairy Plant Characteristics

Dairy plants purchase raw milk and may manufacture multiple end products. For example, a plant may bottle milk and make ice cream and yogurt in the same facility. As a regulated Federal Order dairy plant, this would be classified as producing both Class I and Class II products. In Table 1, estimates of the number of Northeast dairy plants processing the various FMMO classified products is shown. Estimates of the milk volumes for 2017 and the percentages used in these classifications are also shown.

Table 1: Northeast Dairy Plants by FMMO Classification

Federal Order Classification	Number of Plants	Estimated Annual Milk Intake (Millions of Pounds)	Percent of Regional Total
Class I	54	9,288	33%
Class II	44	5,918	21%
Class III	32	7,180	26%
Class IV	13	5,634	20%
Total	143	28,019	100%

Source: USDA/AMS Dairy Program, Federal Milk Marketing Order Program

It should be noted that some raw milk leaves the Northeastern states to find a processing home outside of the region. Federal Order 33 (Mideast) receives quite a bit of New York and Pennsylvania milk and Federal Order 5 (Appalachian) receives a fair amount of milk from

3 For example, NASS shows that there are about 130 dairy plants manufacturing one or more dairy products in New York state in 2017 (note: this doesn't include fluid plants), while the USDSS list will estimate about 34 significant manufacturing plants who are purchasing farm milk.

Pennsylvania. Smaller amounts are pooled on Orders 6 and 7 (Florida and Southeast). By looking at the statistical bulletins from these FMMOs, it is estimated that about 2.4 billion pounds of Northeast milk, or about eight percent of Northeast volume, was processed outside of the region in 2017. Conversely, about 1.1 billion pounds of milk, or about four percent, was pooled on Federal Order 1 from states outside the region.

The processing estimates in Table 1, plus the amount of milk accounted for as leaving the region, minus the milk pooled on plants within the region from outside states, accounts for about 98 percent of the NASS estimate of milk production in the Northeastern states. The remaining two percent is probably accounted for by producer dealers and value-added sales of dairy products from farms producing milk in the nine states.

State level granularity can be added to plant numbers and type. Table 2 shows the number of plants accounted for in this study by the Federal Order classification of milk processed and the combined processing volume by state for farm milk purchased.

Table 2: State Dairy Plants Purchasing Farm Milk by FMMO Classification

	Class I	Class II	Class III	Class IV	Estimated Processing Volume (Millions of lbs)
Connecticut	2	3	1	1	518
Massachusetts	4	2	-	1	2,571
Maine	4	2	-	2	911
New Hampshire	1	1	-	1	too few to show
New Jersey	3	3	3	-	1,549
New York	17	19	13	2	10,798
Pennsylvania	20	9	9	5	9,000
Rhode Island	2	-	-	-	too few to show
Vermont	1	5	6	1	2,299

Source: USDA/AMS Dairy Program, Federal Milk Marketing Order Program

Figures 4 through 7 show the locations of dairy plants in the Northeast and the relative volume of milk intakes, which varies from about 25 million to two billion pounds of milk per plant annually, for products produced in federal order classes I, II, III and IV respectively.

Figure 4: Location and Relative Milk Intake Volumes of Class I Plants[4]

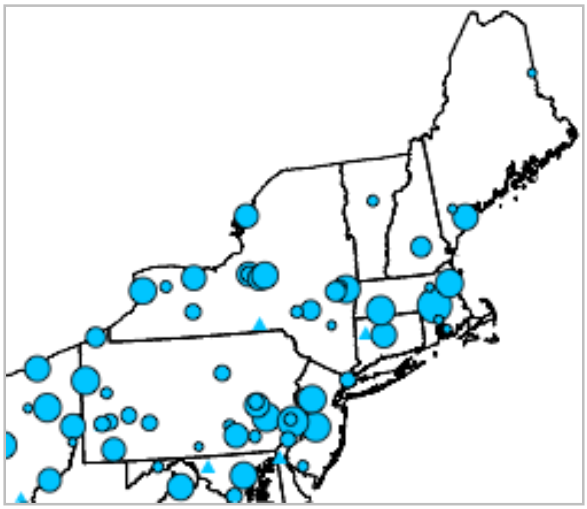


Figure 5: Location and Relative Milk Intake Volumes of Class II Plants

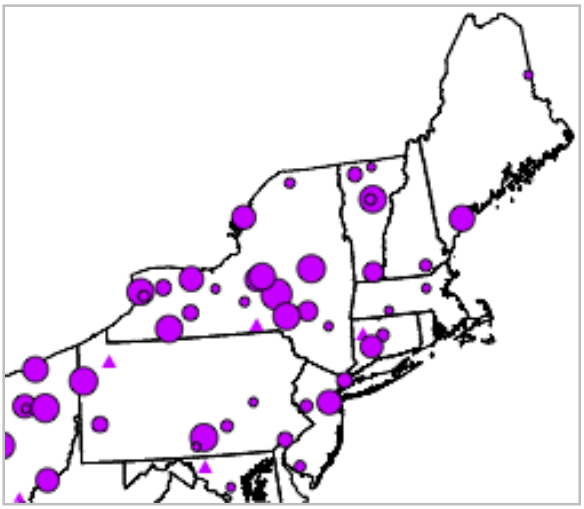


Figure 6: Location and Relative Milk Intake Volumes of Class III Plants

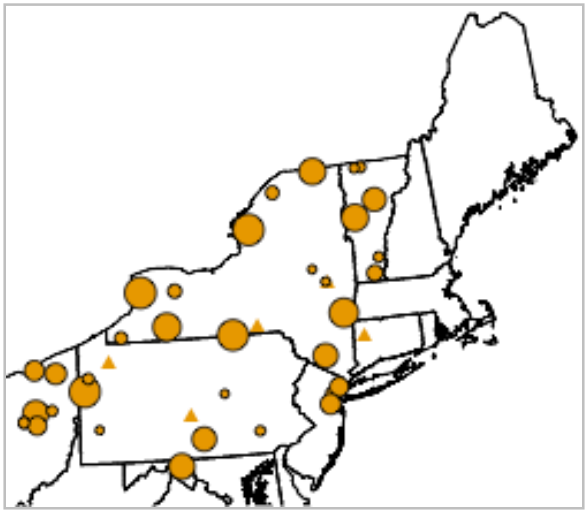
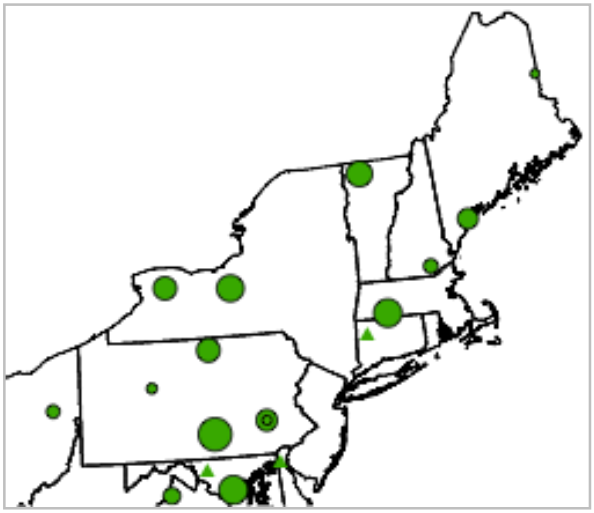


Figure 7: Location and Relative Milk Intake Volumes of Class IV Plants



Source: Federal Milk Marketing Order Program processing plant data estimates

Balancing Capacity

Balancing capacity is an important function of a milkshed. Milk production has a seasonal component with peak production occurring in April, May and June and the least amount of production in September, October and November. Demand also has a seasonal component that is almost the inverse of supply with peak consumption in the Fall. Dairy markets must process and hold storable dairy products during the flush season to carry over into the short

[4] In Figures 4 through 7, graduated circle sizes represent estimated milk volumes. Triangles show plant locations without milk intake estimates. Some triangle representations are plants that are not currently processing but are expected to process in the future.

months. This characteristic requires maintaining processing capacity capable of meeting peak production. It should come as no surprise that the monthly pattern of milk dumped in Figure 3 occurred during the flush season.

Balancing needs can also occur intra-week. Historically, fluid plants have only processed five or six days per week pushing the weekend milk off to manufacturing plants. Mondays have also been large demand days for fluid plants as they process higher volumes to re-supply retail stores. More recently, fluid plants have been enticed with discounts to invest in additional silo capacity and at least receive raw milk on the weekends. This has lessened, but not alleviated, intra-week capacity issues.

This balancing function has largely fallen to dairy cooperatives. More than 80 percent of the milk in the Northeast is handled by cooperatives.[5] Cooperatives can be characterized as being "processing" or "marketing" organizations. A processing coop owns plants that can take or give up milk according to a market need. A marketing cooperative bargains with proprietary manufacturing plants to take extra milk on weekends or provide fluid plants with needed supplies when they are short.

Approximately one-third of the milk processed in the Northeast is processed in cooperatively owned plants with the remaining volume in proprietary plants. Fluid and soft product manufacturers make relatively perishable products and their inventories are more often measured in days rather than months. These Class I and II plants cannot effectively perform a balancing function. The balancing activity falls to cheese, butter and milk powder plants in the region. Of the one-third of milk processed by cooperatives, most, but not all, are making storable products.

Close to half of the total volume of milk processed in the Northeast is manufactured into storable dairy products by both cooperatives and proprietary plants. These operations can perform a seasonal balancing function, but operating a plant at variable capacity and holding inventory is costly.

The actual capacity of a plant or a region is hard to define. Most plants will have an idea about how much milk can be run through their pasteurizer, separator, vat or dryer in a given eight-hour shift. But, what defines the maximum capacity of that shift is the most constrained element of product flow in the plant. In some plants it might be the receiving bays, while in others it could be a separator. Even this definition of capacity is inadequate as many smaller plants only operate a single shift. It is possible that they could potentially operate two full shifts or even three with the only downtime being daily cleanup.

Many manufacturing plants only operate five or six days a week and could perhaps operate an additional processing day. In looking at the typical days-per-week of operation of the hard

[5] As of 2018, almost 90 percent of milk volume in Federal Order 1 is handled by cooperatives.

product plants in the Northeast, it is estimated that increasing processing days to 6.5 per week would add an additional two billion pounds of milk processing to the region's 2017 estimate of what was actually processed.

Summary

In summary, the production, balancing, processing and ultimate sale of dairy products in the Northeast consists of multiple complex systems working together. In recent years, milk production in the region has increased, while consumer demand for dairy products both locally and worldwide continues to shift. This has, at times, created disconnects between the production of milk, processing capacity and demand for finished products. While overall demand for dairy products has increased, consumer demand for fluid milk has been on the decline, demand for processed dairy such as yogurt, cheese and butter has increased, as has export demand for powder. This has put pressure on the processing infrastructure of the Northeast to shift capacity to meet these demands.

In recent years, most often during the spring flush, some milk has been shipped long distances out of the region for processing, or dumped when an economical destination could not be found. However, this report suggests that this issue is much more complex than just plant capacity. A simple calculation of increasing processing days per week to less than the absolute potential of existing plants suggests that there may be enough capacity in the system to handle the spring surge of production. Still, plants, whether proprietary or cooperatively owned, do not want to manufacture more products than they believe they have customers for. Additionally, while export markets offer the potential to move large volumes of product, the price realized may not always cover the costs of manufacturing. Buying milk, processing and storing dairy products is expensive and alternative outlets for the raw ingredient will be sought.

While the trends of consumer demand towards processed dairy products are clear and long-term, shifting the region's processing infrastructure is an expensive and time-consuming process. The purpose of this report is to document the processing capacity that exists, so that changes in plants, whether additions or subtractions, can be considered in the context of the broader regional milkshed and market.

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Mark Stephenson is the Director of Dairy Policy Analysis at the University of Wisconsin, Madison. In this position, Dr. Stephenson conducts and coordinates research and outreach activities related to the dairy industry. He is involved in applied research at the firm-level, including milk assembly costs, processing costs and efficiencies, new processing technologies and new dairy ingredients. He is also active in sector-level performance including dairy policy and milk price forecasting.

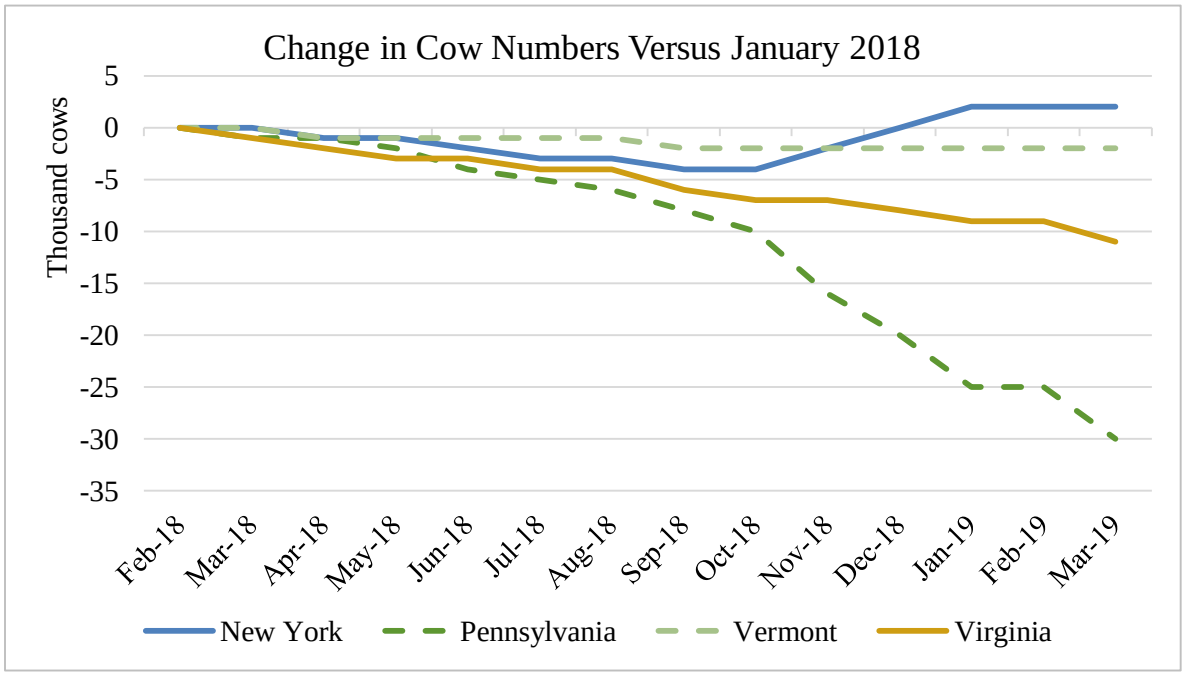
Prior to his present position, Mark was the Associate Director for Educational Outreach with the Cornell Program on Dairy Markets and Policy.

Northeast Poised to Benefit from Regional Shift in Milk Production

Lucas Fuess, Director of Dairy Market Intelligence, HighGround Dairy

The past several years have been challenging for dairy farmers, with low milk prices causing margins and profitability to evaporate on all but the lowest cost dairies throughout most regions of the country. Declining Class I volumes continue to dilute higher prices farmers receive from fluid milk sales, processing capacity has been overwhelmed during recent spring flush periods as milk supply at times has exceeded demand causing milk to be dumped or sold at a loss, cull cow values have sharply declined, and some dairies have even been dropped from processors who are oversupplied, making farmers fearful of losing their milk buyer.

Even in light of lower milk prices and the generally disappointing dairy economy, total U.S. milk production continued to climb, showing that farmers were able to use advances in technology, genetics, nutrition and other tools to continue increasing milk per cow and drive milk production higher, even as the herd size was slowly ticking lower beginning in 2018. However, this all changed in March, when U.S. milk production trended lower versus the prior year for the first time in more than three years. Lower milk per cow coupled with a herd size that was down 86,000 head versus the prior year pulled milk production down 0.4 percent versus March 2018. Q1 2019 may have marked the beginning of a sustained price rally, bringing the contracting supply in closer alignment with demand and finally pushing prices higher—prices that will arrive in farmer milk checks soon.

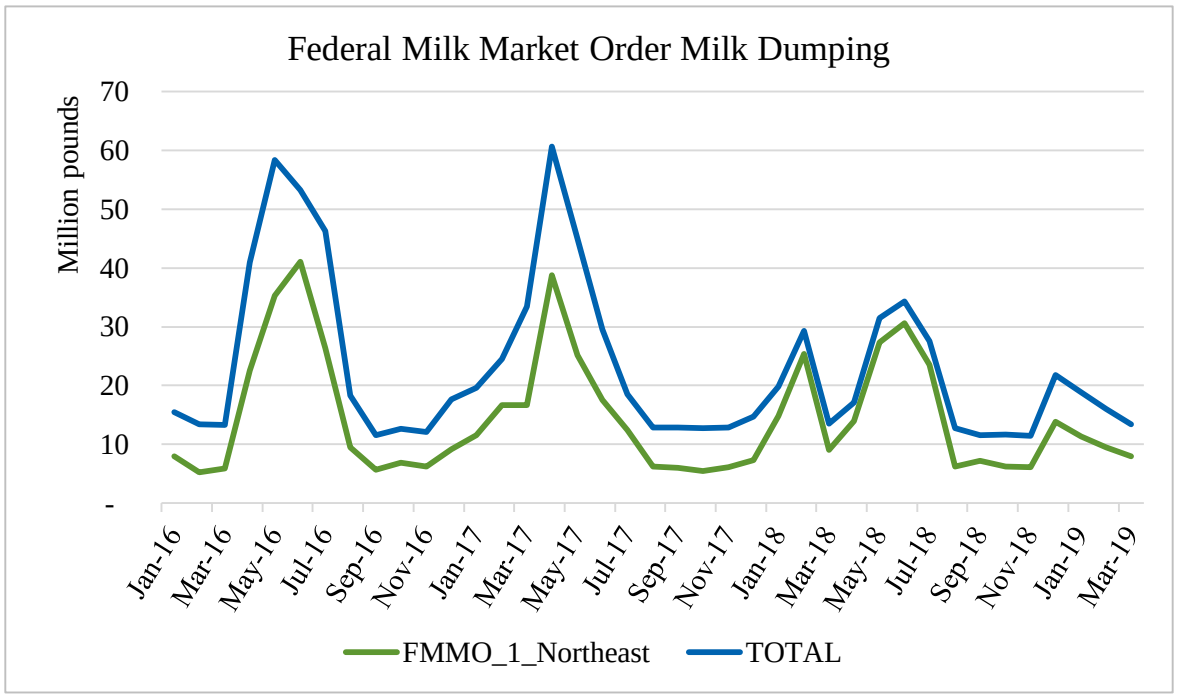


Source: USDA milk production report

However, while it took until March for the U.S. to show lower total milk output, several states were struggling from negative margins well before that and reducing cow numbers and losing dairy farms at high rates. Several states across the Midwest and Mideast have shown lower milk output and lower cow numbers. Even Michigan, which has shown consistent expansion and milk growth over the past several years, had a difficult 2018. Perhaps the most striking impacts have been felt just south of the Farm Credit East territory: in both Pennsylvania and Virginia. Pennsylvania, the sixth largest milk producing state in the country, has now shown a production decline versus prior year for 16 consecutive months. In a sign that milk production is unlikely to return quickly in the state, cow numbers have declined sharply and are now down 30,000 head in March versus just 14 months prior. The situation is similar in Virginia as well, where the herd size is down 11,000 since January 2018. However, the impact has been larger on overall milk production in the state due to its smaller base; milk production has shown double-digit percent declines over the past seven consecutive months.

In that same timeframe, New York milk output has been remarkably resilient. Cow numbers in the state are actually up 2,000 head in March versus the beginning of 2018, and New York has shown expanded milk output each month since June. Vermont has shown some declines, but not at the steep rates seen in Pennsylvania and Virginia. Overall, lower milk output is reducing pressure on processing capacity across the region, especially in the peak spring flush period.

Over the past few years, surging milk production has contributed to increased levels of dumping. Looking at Federal Milk Marketing Order data, the Northeast marketing order, which stretches from New Hampshire to Virginia, often accounts for more than half, and at



Source: USDA Federal Order statistical data

times has accounted for as much as 89 percent of the total milk dumped in the U.S. due to oversupply. When milk is dumped, it is often valued at the minimum Class price of the month, returning the lowest value possible to farmers and lowering overall milk checks throughout an entire region. It should be noted that while the volume of milk dumped increased in 2016 and '17, it remains a very small portion of overall milk production in the region.

In recent history, the highest volume of milk dumped in the Northeast market area was in June 2016, when 41 million pounds of milk was disposed of. 2017 saw a lower peak, at 39 million pounds in April, while the 2018 peak came at 31 million pounds in June. The lower trend suggests that milk has become less oversupplied in recent years, but looking ahead, 2019 is likely to be an even sharper departure from recent history. In March 2019, just eight million pounds of milk was dumped, the lowest March milk volumes that found their way to a field for land spreading since 2016.

Coupling milk production declines with milk dumping data, it is likely that 2019 will show some of the lowest volumes of milk needing to be disposed of in recent history. Perhaps more importantly, New York and Northeast dairy farmers could see higher milk checks, as a result of milk utilized being valued at higher Class prices where it is actually processed.

Taking a higher-level look, how do these shifts in production manifest themselves around the country? Looking at the U.S. from a regional basis, the largest milk deficit area in the country (an area with high population but low milk production) is the Southeast. This region typically "imports" milk from the Midwest, largely to fulfill Class I fluid milk needs across the area. However, expanded processing capacity (cheese plant expansions in the Upper Midwest, fluid milk processing in Indiana) coupled with stagnant to lower total production have increased milk demands in the region, sharply reducing available milk across the Midwest so far this spring. In fact, USDA reported during the week ending May 3 that spot milk volumes available in the Midwest were selling for as much as $1.00/cwt. over Class prices, a sharp departure from recent springs when spot milk was available for as much as $3-$4/cwt. under Class.

The lack of excess milk in the region has the Southeast turning elsewhere for milk: the Mid-Atlantic. However, the steep production declines in Virginia and Pennsylvania have tightened milk in that region as well. What does this mean? It is HighGround's opinion that plentiful milk across New York and New England will begin to move South to fulfill processing needs in other parts of the country, and to make up for steep production declines in states to the South. This milk moved out of the region could reduce milk dumping throughout this year, therefore increasing utilization of higher value Classes and increasing milk prices across the Northeast marketing area.

While it is certainly difficult to see production declines of any sort, or to hear stories about friends or family selling farms because of tough times, it seems low prices have finally removed excess supply from the dairy supply chain. Milk that remains in the region, and farmers who have weathered this difficult storm, will soon begin to help supply milk to

deficit regions and realize this higher value in their milk checks. There are new co-ops in the region sourcing milk to ship directly to milk plants as far south as Maryland and Virginia—plants where there is no longer enough milk in the region to fulfill demand. With forecasts and the futures market showing climbing milk prices throughout this year, coupled with stronger demand from milk deficit regions, New York is geographically poised to benefit from these trends.

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Lucas Fuess is the Director of Dairy Market Intelligence at HighGround Dairy, Chicago, IL, a firm specializing in dairy hedging, risk management and market analysis services. HighGround Dairy is committed to providing the global dairy industry with the tools necessary to become expert price risk managers in today's volatile environment. Whether it be education, intelligence, market analysis, strategic planning or trade execution, HighGround will provide the highest level of service to meet and exceed our customers' hedging and trading goals.

Farm Credit East Contributors

Tom Cosgrove, SVP of Knowledge Exchange, Public Relations and Marketing
Chris Laughton, Director of Knowledge Exchange

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