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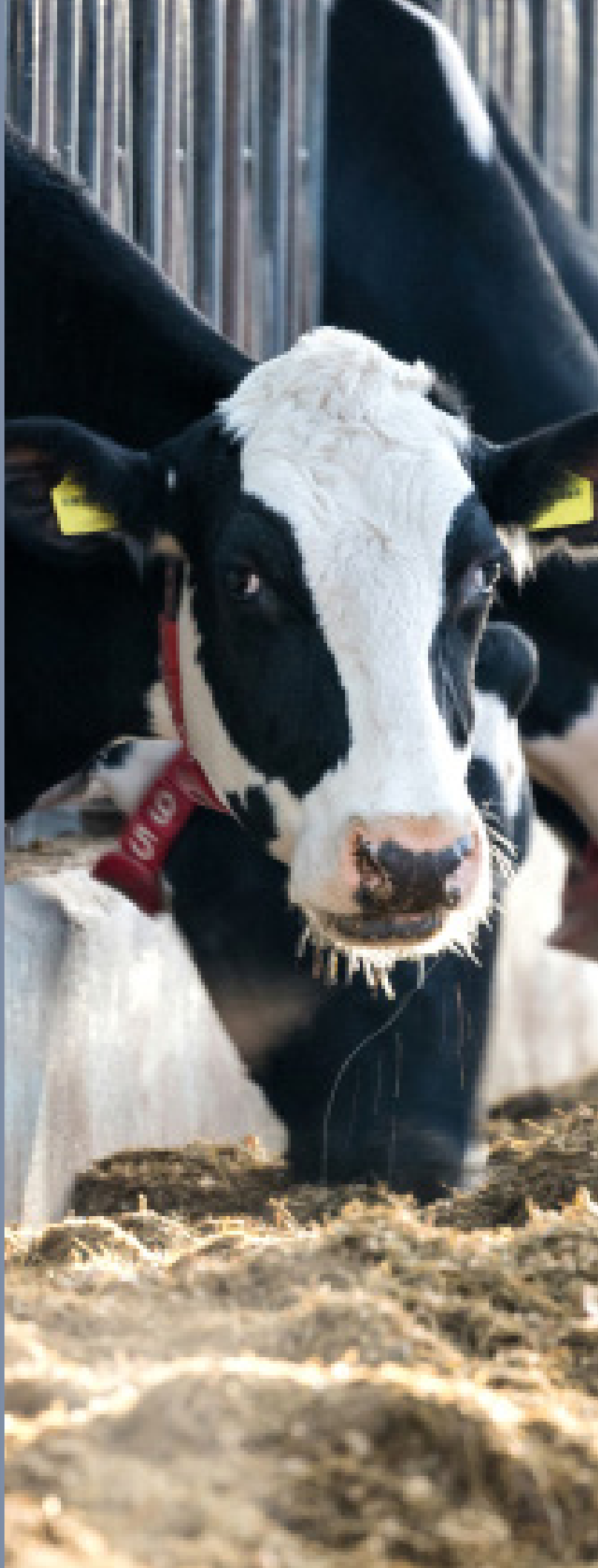
NCDPA Southeast Milk Movement Study

December 2021



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OBJECTIVES

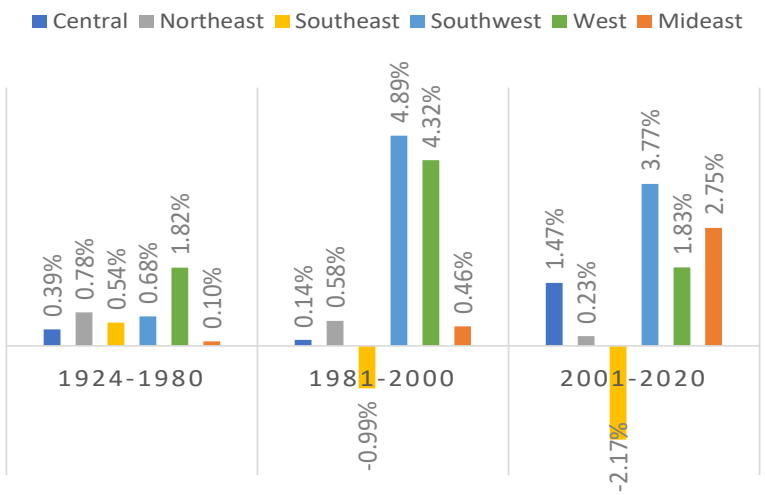
This report will provide the framework for regional stakeholders to assess the Appalachian and Southeast milk marketing orders to determine if federal order reform, legislative changes, or government assistance would reverse decades-long farm and milk supply attrition by promoting milk production and processing in the local market that supports dairy farmers and processors. The report will explore whether the current regulatory framework creates disadvantages disproportionately impacting the Appalachian and Southeast markets relative to other regions. In addition, the report highlights how rising costs led to compressed margins furthering milk production declines, fewer farming operations, and processing assets in the local market. Finally, the report discusses feasible solutions allowing stakeholders to reposition the local milk market to provide a more secure home for regional milk.

Finally, the report will review Covid-19, the government response, and the impact on the local market, and whether the effects of the pandemic sped up or slowed the trends already present in the marketplace.

US MILK MARKET

The United States was home to 9.44 million dairy cows that produced 223.2 billion pounds of milk in 2020. This year's output is expected to surpass last year with a similar-sized herd modestly. The top-five milk-producing states (California, Wisconsin, Idaho, New York, and Texas) account for over half of the nation's annual output. In contrast, the 25 states producing the least milk last year represented less than 4% production. Several states are in the Southeast, including Kentucky, North Carolina, South Carolina, Tennessee, and West Virginia.

Chart 1 US Milk Production Growth (CAGR) - by Region



source: NASS Milk Production 1924 to 2020

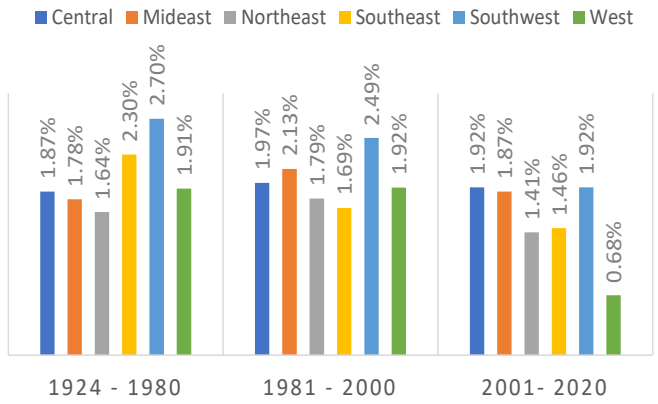
Between 1924 and 1980, the United States expanded milk production by 0.65% on compounded annual growth rate (CAGR). Over the next two decades, the pace of U.S. milk production growth quickened to 1.33%. And since 2000, U.S. milk output has grown at a CAGR of 1.45%. Between 1981 and today, three regions, the Southwest, West, and Mideast, accounted for the newest investments and expansion. These three regions are areas where dairies tend to be larger, and processing focuses on commodity products like cheese, butter, and milk powders. With expansion into Kansas, Colorado, and South Dakota, Central states have made sizeable gains during the last 20 years on a hefty base created by Wisconsin over the past century. Throughout this massive expansionary period, only Southeastern states experienced output declines, with the pace of those declines increasing in the last two decades.

Over that same period, the U.S. dairy herd contracted from a high of 27.8 million cows in 1945 to 9.34 million cows at the beginning of 2020. This reflects a recovery from the low established in 2010 of 9.1 million animals.

While the overall numbers have dwindled, milk cows are more productive today than their predecessors. In

2020, output per cow was 23,893 pounds nationally – up 12.6% compared to 2010 and 31.1% more than 2000. Unlike milk production growth rates, output per cow gains were more evenly distributed. However, in 2020 the Southeast had the lowest output per cow at 18,899 pounds compared to the other areas that ranged from 22,792 to 25,299 pounds.

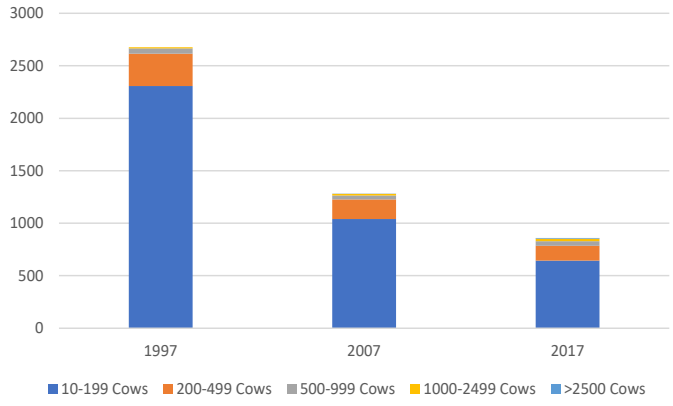
Chart 2 US Output Per Cow Growth (CAGR) - by Region



source: NASS Milk Production 1924 to 2020

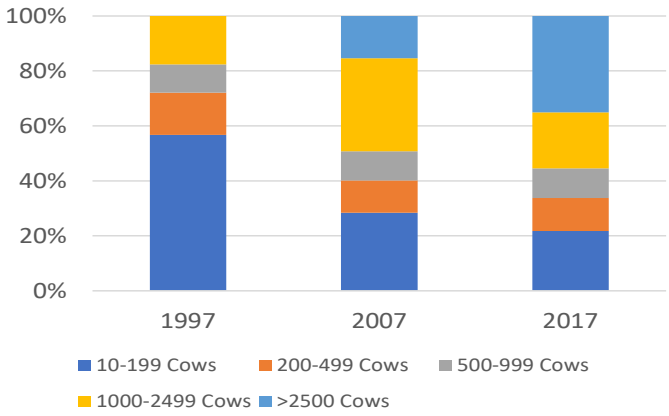
In 1978, 200,000 dairies in the United States had at least ten cows. As of 2020, the National Agricultural Statistics Service (NASS) reported 31,657 operations — an 84% decline. The United States is producing more milk with fewer cows. Still, only 5.2% of the nation's dairy operations are managing more than half those cows, according to the 2017 Agricultural Census, a trend that has likely continued through today. During the past 25 years, U.S. dairy cows have migrated from smaller dairies to significantly larger operations. Between 1997 and 2017, the number of U.S. dairies with between 10 and 199 cows and dairies with 200-499 cows fell 66% and 22%, respectively. Over the same span, the country added 180 dairy operations with more than 500 cows. These changes represent industry consolidation and have shifted where milk originates. In 1997, 56.3% of dairy cows were on farms with 10-199 cows; in 2017, 55.2% of U.S. dairy cows were on farms with more than 1,000 cows. The trend toward larger operations has led to a rapid decline in the total number of dairy operations throughout the country, especially dairies with 100 or fewer cows. In the Southeast, 75% of dairy farms in 2017 had 10-199 cows.

Chart 3 US Dairies by Herd Size (# of farms)



source: 2017 Agricultural Census

Chart 4 Share of US Dairies by Size of Operation



source: 2017 Agricultural Census

Federal Milk Marketing Order (FMMO) 5[1] and Georgia had 13,677 dairies with at least ten cows in 1978. Last year, that number had declined to 965 dairies; that 93% decline was higher than the national average. Ceres estimates that for these same states, dairies with more than 500 cows managed nearly 100,000 cows, putting control of approximately 61% of the milking herd in the hands of 6% of these states' dairy operations[2]

1 FMMO 5 includes Kentucky, North Carolina, South Carolina, Tennessee, and Virginia. During the 1978 Agricultural Census, Kentucky only reported total dairy cows and was excluded from the figures above.

2 The calculations are based on concentrated animal feeding operation (CAFO) permits, cooperative data, and news

last year. Like the national trend – cows in the Southeast are moving to larger dairy operations. Furthermore, FMMOs 5 and 7 have disparate dairy operations, likely contributing to milk assembly inefficiency and market balancing challenges. With 94% of the dairy farms managing 39% of the cows suggests frequent stops, variability, and longer distances need to be traveled to assemble a load of milk for the market.

Milk Supply Control

In 2020, the United States marketed 223.2 billion pounds of milk, with the top-50 cooperatives managing 81% of that supply (Schmitt, 2021). This year there are eight dairy cooperatives located in FMMOs 5 and 7 marketing producer milk[3], comprising the bulk of the 10 billion pounds of milk marketed in these orders in 2020. Five cooperatives own and operate plants in the local market; three are milk marketing cooperatives.

Few independent milk marketers operate in the region; milk marketing and processing cooperatives control most of the Southeast milk supply. Most of this milk came from dairy cooperatives including Dairy Farmers of America, Maryland and Virginia, Cobblestone, Prairie Farms and Southeast Milk as well as smaller regional cooperatives. FMMO 5 reported five producer-handlers in 2021; FMMO 7 reported 22 producer-handlers that year. These producer-handlers are dairy producers processing fluid products or dairy products for the local market (some may still deliver a portion of their milk to a cooperative).

The cooperatives in the Southeast, along with those moving milk to the region, are competing for a share of sales to bottling plants in FMMO 7 and FMMO 5, with 15 owned, in whole or part, by the top-five regional cooperatives.

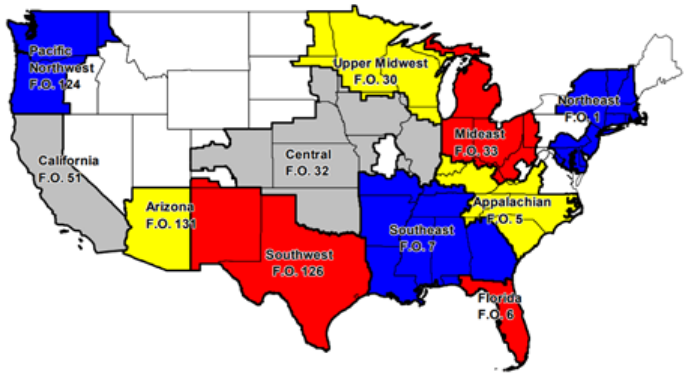
articles. The data is self-reported and encompasses only those dairies that volunteer information.

3 The cooperatives include: Appalachian Dairy Farmers Cooperative, Cobblestone Milk Cooperative, Inc., Cooperative MPA, Dairy Farmers of America, LANCO-Pennland Milk Producers, Maryland and Virginia Milk Producers, Prairie Farms, and Southeast Milk, Inc. as reported by FMMOs 5 and 7.

Milk Utilization

FMMOs track the amount of milk marketed within their boundaries to determine milk prices. Dairy producers' milk checks are based on end-product pricing and weighted based on usage, as reported by handlers or processors. Utilization varies across all 11 FMMOs based on the types of assets deployed in the region. California converted from a state to federal milk marketing area in November 2018. A few states remain outside the national order system, with the most significant being the former Western Order (FMMO 135) that included Southwest Idaho and Utah. Some of the milk produced in unregulated states is partially regulated within the federal order system; therefore, focusing on Class I utilization within the federal milk marketing orders should not substantially alter this analysis or the conclusions that are drawn.

Image 1 Federal Milk Marketing Order Map



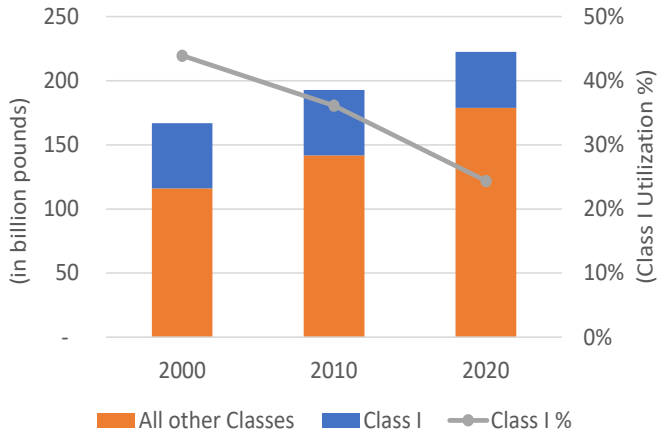
Source: AMS Federal Milk Marketing OrderStatistics

Although U.S. milk production is trending higher, the amount of milk heading to fluid bottling plants continues to decrease annually, with few exceptions. Of the 11 federal orders, only three, Mideast, Southwest, and Arizona, showed higher Class I utilization in 2020 than in 2000. In all cases, closures of less efficient Class I plants in surrounding states have consolidated processing into states with less costly and more available milk supplies, such as Michigan, Indiana, Texas, and Arizona.

Table 1 Class I Utilization by FMMO (MM pounds)[4]			
Class I Utilization	**2000**	**2010**	**2020**
Northeast	10,484	10,386	8,188
Appalachian	4,743	4,134	3,921
Florida	2,519	2,513	2,056
Southeast	4,854	4,684	3,233
Upper Midwest	4,080	4,385	2,639
Central	4,862	4,378	4,674
Mideast	6,698	6,508	6,747
California[5]	5,681	6,216	5,104
Pacific Northwest	2,094	2,236	1,696
Southwest	3,960	4,346	4,145
Arizona	971	1,400	1,244
source: Federal Milk Market Orders Annual Statistics reports			

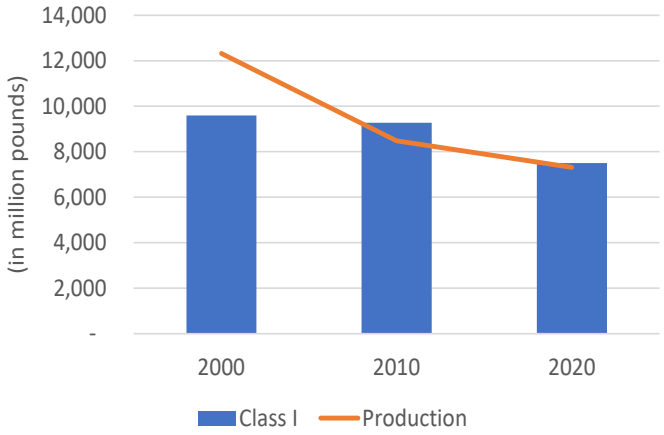
Class I milk utilization declined as consumers growingly prefer to eat dairy products rather than drink milk. Class I utilization in federal milk marketing orders decayed from nearly 51 billion pounds in 2000 to 43.6 billion pounds last year – a 14% drop. At the same time, U.S. milk production grew by 55.8 billion pounds, with most of that milk directed to cheese, butter, and milk powder production. The combination of the two reduced national Class I utilization from 44% in 2000 to 24% in 2020[6] . With the advent of a new cheese plant in late-2020, Class I utilization will continue to cede share to cheese this year; Class I may retreat to less than 20% of all milk processed in the United States – a complete reversal from the initiation of the federal order system when approximately 75% of processed milk went into a glass.

Chart 5 US Class I Utilization (2000 - 2020)



Source: AMS Annual Statistics reports; NASS Milk Production

Chart 6 FMMO 5 & 7 ClassI Utization vs. Milk Production



Source: FMMO 5 & 7 Annual Statistics reports; NASS Milk Production

In the Appalachian and Southeast federal orders, milk to Class I uses has declined by 0.8 billion and 1.6 billion pounds, respectively, over the last two decades. Given the limited investment in cheese, butter, and milk powder processing, these declines have resulted in less milk needed from the local market. Between 2000 and 2020, Class I milk utilization fell by 22%, while milk production in the region dropped by 41%. Although less Class I utilization was a factor, there were other contributors like producer age, cost of production, milk price, alternative land uses, and other causes that sped up the declines between 2000 and 2010. Reductions in Class I milk, and output off the farm plotted similar downward trends in the following 10-year period, dropping 19% and 14%, respectively, suggesting the influence of reduced bottled milk and plant consolidation could

4 2010 and 2020 were leap years. The data has been adjusted for leap year for comparability.

5 For 2000 and 2010, California state data is included and based on utilization calculated by the California Department of Food and Agriculture's Dairy Division. California 2020 data is based on FMMO 51 statistics.

6 2020 was a de-pooling year making Class III utilization lower due to plants disassociated with the FMMO for substantial periods of the year. Estimates indicate Class I utilization was closer to 18.5% has all Class III milk been pooled

be a primary driver of business exit decisions (or that lower output could indirectly influenced things like transportation costs that ultimately caused the exit).

Class I Milk Price

On December 20, 2018, President Donald Trump signed the farm bill, changing the Class I milk price formula – the most significant formula alteration since federal order reform in 2000. With few modifications to the Class I milk price formula since 2000, the milk price was derived by taking the advanced survey of commodity prices and calculating a Class III and IV skim and butterfat prices. The higher Class III or IV milk price established the Class I base or Advanced Class I price. That formula set the Class I price throughout the country for nearly two decades and was the basis for bottled milk pricing and milk checks within the Southeast. The higher-of aspect of the Class I formula made risk management difficult for retailers, processors, and dairy producers. Arguably, the higher-of provision created retail price volatility and potentially some consumer confusion or switching. Ahead of the 2018 farm bill, the industry, led by the National Milk Producers Federation (NMPF) and the International Dairy Foods Association (IDFA), worked to develop a new Class I pricing methodology to address the risk management and price volatility shortcomings of the previous Class I formula.

The new Class I formula is the average of the Class III and IV advanced milk price plus 74 cents per hundredweight of milk. While a reasonable proposal, the industry opted for a legislative fix to the Class I milk price formula rather than the traditional federal order hearing process. Although the hearing process can be time-consuming and expensive, it provides a better forum for disseminating information, discussing, and vetting various proposals. With little fanfare, the new Class I formula was implemented in May 2019.

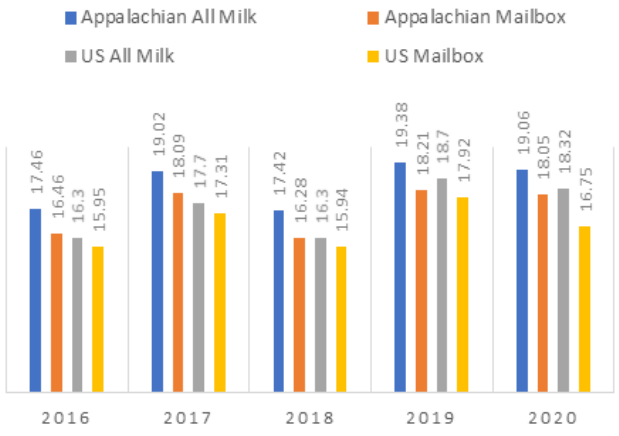
The Class I formula performed as expected throughout much of 2019; however, it was ill-suited for the market volatility the onset of the pandemic in 2020 caused. As USDA rushed to provide support for dairy producers and families alike, launching various initiatives like the Farmers to Families Food Box program, no one anticipated that consumer demand for cheese, coupled with government give-away programs and constrained capacity, would combine to send cheese prices to a record $3 per pound that year. At the same time, Class IV products like nonfat dry milk and butter did not keep pace, causing a staggering gap between the Class III and IV milk prices of $10.78/cwt. in July 2021. Under the new formula, the average of Class III and IV prices plus 74 cents established the August Class I price rather than the higher Class III price. For regions with high Class I utilization, like the Southeast, the new Class I price took a toll on milk checks and returned less to producers who supply bottling plants than those dairy producers who supply cheese plants.

There could be an argument that the stable Class I price afforded consumers more ability to buy the product during a period of uncertainty that helped to lift fluid milk consumption during the pandemic, more so than under the former formula where the retail price of milk per gallon would have hit record-setting highs. However, that is beyond the scope of this document, and it is difficult to ascertain the drivers of higher consumption and the potential impact that higher-priced milk could have had at the onset of the pandemic and throughout the extensive 2020 lockdown.

Regional Milk Price Comparisons

There are three different milk price series to compare how dairy producers are compensated in various regions of the country – the blend, All-milk, and mailbox milk prices. The blend price is the weighted

Chart 7 Milk Price Comparison



Source: AMS Mailbox Price; NASS Agricultural Prices

average milk price calculated using standard components; it refers to standard components and is unadjusted for butterfat. The All-milk price represents the gross price paid to dairy producers at the average butterfat test and includes items like quality premiums/discounts, volume premiums, and re-blends. Finally, the mailbox price is the net milk price reflecting deductions necessary to market milk like hauling, stop charges, promotion, and cooperative dues; it is also reported at the average butterfat value.

Appalachian state milk prices rank as some of the highest in the country exceeded only by the Southeast and Florida over the past five years. The mailbox price holds a similar relationship to other regions over the same period exceeding the average value for all FMMOs by 65-cents per hundredweight. The gap between the All-milk (gross) and mailbox (net) price represents charges to the milk check, net of premiums averaging $1.05 per hundredweight. It would be difficult to argue for higher milk prices for North Carolina and surrounding states as they are some of the highest in the country.

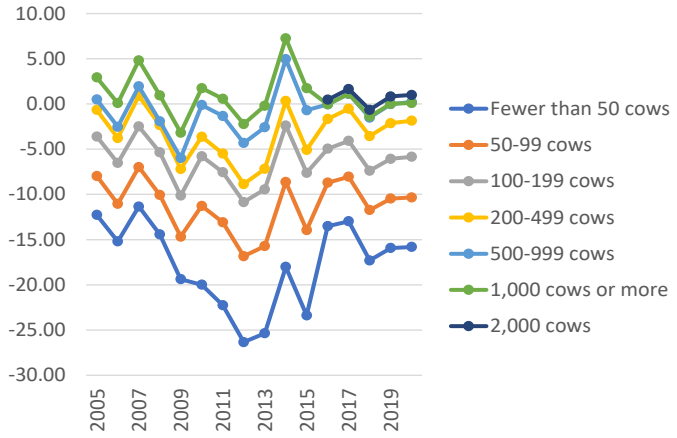
Although the gross milk price is one of the highest in the country, the mailbox price is nominally different. Considering the amount of Class I milk compared to other regions, and the data indicates the fees to market milk may be higher than in other areas. That suggests that efforts to reduce marketing costs – like hauling or re-blends could effectively lift net milk prices.

Cost of Production

Large dairy operations have had cost advantages over smaller dairies since 2005 (USDA Economic Research Services, 2021). The analysis considers the revenue generated from the dairy, including milk price, sale of cattle, and other revenue sources like cooperative payouts or government assistance. The Economic Research Service (ERS) compiled the total cost of operations and overhead costs. The opportunity cost related to unpaid labor can be subjective; however, ERS assigned a value to family labor that bigger operations expense as hired labor to ensure proper comparison across all dairy operation sizes. ERS computed these costs on a hundredweight basis.

Dairy operations with positive returns have more access to capital and the financing necessary to expand operations. Since 2005, larger dairies had a return advantage over smaller dairies, with gaps remaining consistent over time and despite direct payments or government programs that tend to favor smaller operations on a per hundredweight basis. That would explain why cows have migrated from smaller dairies to larger operations and why the trend will likely continue. Smaller dairy farms are at a significant competitive disadvantage, with no additional revenue to defray their higher operating costs (i.e., through organic, vertical integration, other

Chart 8 Value of Production Less Total Costs (by size)



Source: ERS Recent Milk Cost of Production Estimates, 2005-base, 2010-base, 2016-base

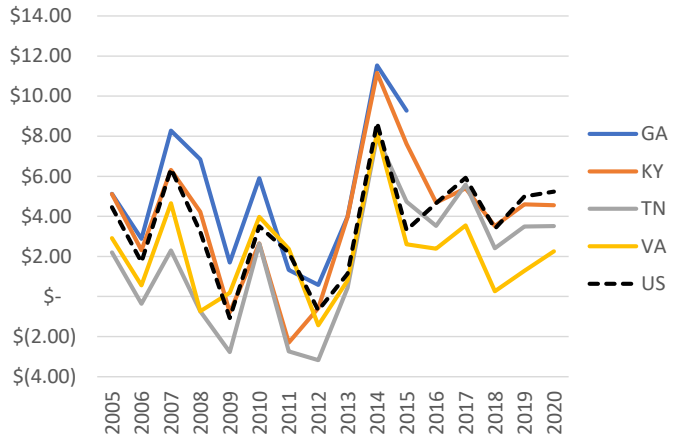
farming operations, etc.). Mitigating factors such as duration of the business, land ownership, quality, and specialty milk can reduce these gaps. Smaller dairies, on average, struggle compared to their larger counterparts to earn an adequate return following a traditional go-to-market strategy and cooperative affiliation.

Larger dairy operations enjoy a lower fixed cost per hundredweight, resulting from higher output per cow. While ERS discontinued reporting the percentage of dairies milking more than two times per day, the 2015 data demonstrates more than half of dairies with over 500 cows milked more than twice per day — a stark contrast to the 2-2.5% of dairies with fewer than 100 cows milking more than two times per day. Last year, dairies with more than 500 cows averaged approximately 23,000 pounds per cow compared to

15,000-18,000 for dairies with fewer than 100 cows. Higher output per cow and reduced seasonality drive milk assembly efficiency by lowering the costs related to smaller load sizes, frequent stops, and balancing supply and demand.

The data contains representative samples of Southeast dairy states between 2005 and 2020. The trend of dairy cows migrating from smaller dairies

Chart 9 Value of production Less Total Costs (by State)



Source: ERS Recent Milk Cost of Production Estimates, 2005-base, 2010-

to larger facilities has been displayed throughout the Southeast over the past two decades. For the years reported, Georgia bettered the national average returns, which could help explain dairy farm investment and expansion in that state[7]. In addition, Georgia has several larger dairies that may benefit from higher returns than their smaller counterparts. Furthermore, the 5-7% of the Southeast dairies that control over 60% of the region's cows are likely achieving above-average returns for the area.

Thus, smaller dairies in the region could be at a significant cost disadvantage compared to larger operations, given competition for land, feed, and labor. In addition, the local market competes with bigger, out-of-area dairies capable of exploiting further cost advantages and willing to transport milk long distances to service the market. The cost of production disparity could explain the long-term trend of Southeast dairies exiting the industry faster than elsewhere in the country.

Production Trends and Forecasts

Milk production expansion for developed nations like the United States, Europe, and Oceania is likely to close considerably over the next decade relative to the last twenty years as legislation and climate change commitments slow or reverse the deployment of new cows. The United Nations expects India and Pakistan to account for most new production through 2030. (OECD Publishing, 2021).

With the United States, cow numbers will fluctuate between 9.2 and 9.3 million animals; however, most of the focus will be on genomics and herd selection technology to push output per cow higher, asserting dairy cows could nearly double their current rate of production over the next 50 years (JH Britt, 2018). Future dairies will range between 1,000 and 10,000 head; however, larger dairies could be restricted due to concentrated animal feeding operation (CAFO) limits and population proximity. As dairy cows become more productive, fewer cows will feed more people, and fewer dairies will be needed. In addition, water and other resources will limit growth, primarily impacting western and southwestern states. Finally, cooperative base plans will grow milk consistently and based on a strategic plan – different from the previous 20 years.

US BOTTLED MILK MARKET

Fluid Bottling Asset Consolidation and Turnover

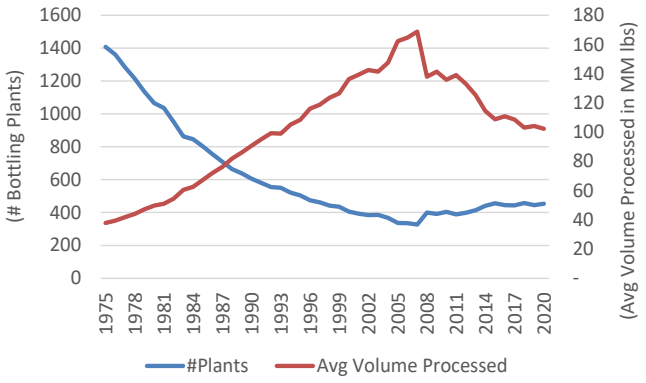
Like other aspects of the dairy industry, processing asset consolidation has been occurring over the last 50 years. Processors built new bottling plants during the past decade, including the largest high-temperature-short-time (HTST) facility, otherwise known as the Walmart plant in Fort Wayne, Indiana. Additionally, Coca-Cola and Select Milk Producers built three aseptic facilities to process the Fairlife brand and related products. Furthermore, Darigold, Dairy Farmers of America, Shamrock Foods, Nestlé, Danone, and HP Hood have made additional investments to renovate and build various aseptic and ultra-pasteurized facilities. These investments have helped increase the number of milk bottling

7 ERS reported that ARMS data for Georgia was insufficient to compile an analysis between 2016 and 2020.

facilities from 388[8] in 2008 to 453 last year. Between 1975 and 2007, consolidation led to plants processing more milk; however, after 2008, the average pounds of milk processed in bottling facilities declined. This decline could result from processing more alternative dairy beverages, juice, water, and tea; it could also indicate underutilized assets and future consolidation of aging assets.

2020 was remarkable because two of the nation's largest bottlers declared bankruptcy – Dean Foods and Borden. After a months-long process, U.S. bankruptcy courts permitted Dairy Farmers of America, the country's largest dairy cooperative, to acquire most of the failing Dean Foods assets. KKR & Co. and Capitol Peak Partners LLC, an investment banking company, purchased the Borden dairy processing assets. That shifted a significant amount of Class I processing from proprietary processors to cooperative control and changed milk supply dynamics throughout the country.

Chart 10 US Fluid Bottling Plants vs. Volume



In the Southeast this year, Prairie Farms shuttered the former Barbers plant in Homewood, Alabama. Harris Teeter sold its Hunter Farms bottling facility, in High Point, North Carolina, to Maryland and Virginia Cooperative – another divestiture from a proprietary processor to cooperative control. In September, Saputo acquired Carolina Aseptic and Dairy businesses from AmeriQual Group. In late 2021, Dairy Farmers of America announced it would close its Country Delite Farms in Nashville, Tennessee, in early 2022. With these changes, the Southeast Class I market has become more balanced between supply and demand; however, some facilities may still have excess capacity. While the market is currently stable, further demand declines could cause additional rightsizing of bottling assets in the future.

Changing ownership and plant closures can disrupt local markets as relationships shift. Additionally, for dairy producers once located adjacent to milk bottling facilities, the milk needs to be transported greater distances increasing the farm's cost of hauling, thereby reducing earnings compared to pre-closure. The burden of lost markets and additional costs to market products can cause dairies to exit the business.

Fluid Milk Supply-Chain and Related Costs

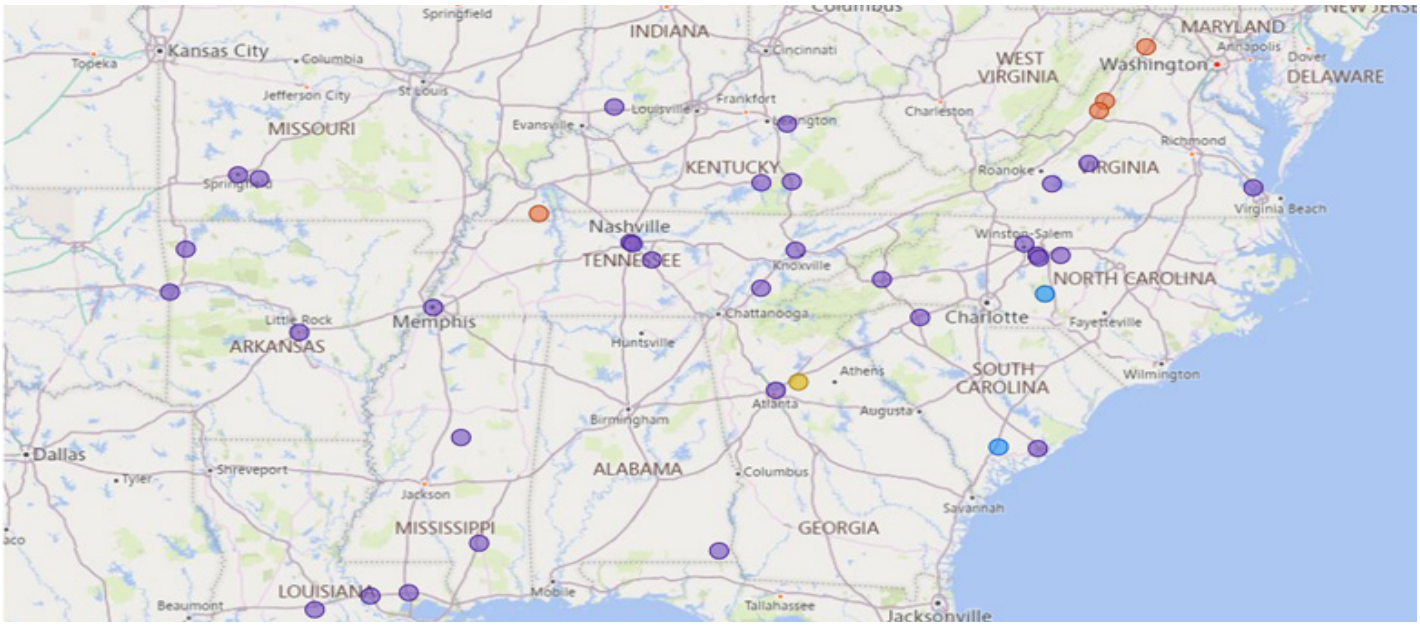
Before 2020, Dean Foods was the largest bottler in the United States, controlling 12.1% of the U.S. milk market share, according to Euromonitor (Lucas, 2019). Dean Foods sold most of its processing assets to Dairy Farmers of America as part of the bankruptcy settlement. That suggests since 2020, dairy cooperatives control a substantial portion of milk processing in the United States led by Dairy Farmers of America, Prairie Farms, and regional cooperatives like Darigold, Inc. in the Pacific Northwest and Maryland and Virginia Milk Producers Cooperative in the Southeast. In addition, several grocery and proprietary processors like Borden, Danone, Fairlife, HEB, HP Hood, Kroger, LaLa, Publix, Saputo, Shamrock Foods, Walmart, and others operate a substantial number of assets nationwide.

There are two aseptic bottling plants in the Southeast, one recently acquired by Saputo and located in North Carolina and Crescent Dairy in South Carolina. Danone and HP Hood own two aseptic/extended shelf-life (ESL) plants in Virginia. In addition, there are three ultra-pasteurized (UP) facilities in the region– Publix, Shamrock Foods, and Saputo. The remaining 33 facilities are HTST, of which 15 are co-op owned, 14 are proprietary, and 4 are grocery retailers.

Most of the aseptic and ESL plants in the Southeast have less than 64-ounce packaging capabilities and several target single-serve sizes; HP Hood makes Lactaid in Virginia with 98-ounce packing capabilities

(Dairy Foods). Several plants produce lactose-free, organic, flavored milk, creamers, high-butterfat products, alternative beverages, and refuel products. Some of these plants also manufacture Class II products such as yogurt, smoothies, sour cream, cottage cheese, and half-and-half. The aseptic plants have polyethylene terephthalate (PET) packaging, while the ESL plants include paperboard packaging. Proprietary processors with branded products own these plants, built between 2000 and 2018.

Image 2 FMMO 5 & 7 Fluid Bottling Plants (2020)



Source: FDA Interstate Milk Shippers List (2020)

The HTST plants are primarily blow-mold packing lines dedicated to gallon and half-gallon capabilities, with some paperboard for 64-ounces or less, and many, but not all, package paperboard half-pints for schools. Maryland and Virginia has caseless packaging capabilities at its Landover, Maryland facility (Dairy Foods). Several of these plants were built decades ago with older technology. Many use milk crates to transport products, increasing the delivery cost for these groups. Making extensive investments in older facilities can be challenging as finance teams struggle with allocating capital to projects when the volumes, or throughput, are likely to remain unchanged.

Cooperatives in the Southeast supply milk to all facilities throughout the region. Cooperatives primarily supply their facilities, providing a consistent off-take for farm milk, making the other relationships more transitory and subject to change based on bids. Cooperatives will work together to gain delivery efficiency and avoid trucks having to cross the roads; however, cooperative milk will likely prioritize member milk over other milk when the cooperative controls the supply agreement. Closing plants can be disruptive, leaving cooperatives with milk requiring longer hauls to find a market. In addition, the distance between farm and plant and balancing can substantially increase milk assembly costs.

U.S. and Dairy Alliance Milk Markets

In the United States, approximately 24% of 2020 milk went to a bottling facility – that figure was considerably higher in FMMOs 5 and 7 at 71% at 69%, respectively. FMMOs 5 and 7 have a higher percentage of school and institutional uses than the all-FMMO average but a smaller percentage of sales to Club Stores (Hayden Stewart, 2021)[9] . FMMOs 5 and 7 also have more sales to the Mass Merchandiser category with comparable sales through grocery stores.

9 The Club Store category includes retailers like Costco, Sam's Club, BJ's Wholesale Club, etc.

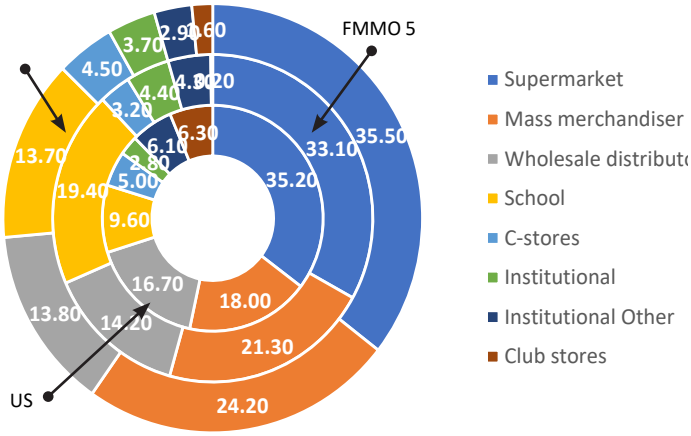
Gallon jugs are the largest packaging category, accounting for 58.3% of sales for handlers regulated by the FMMO program, but that is down from the high of 66.2% of total sales in 2013[10]. A shift toward the "other" size category has occurred. The other size category represented 0.7% of total sales in 2001 and expanded to 3.9% in 2019. Even within the half-gallon and quart categories, consumers opt for organic and ESL products that comprise much of the volume for those categories. As most Southeast milk processors dedicated most of the production capacity to HTST packaged in gallons, half-gallons, and half-pints, declines in these categories will result in excess capacity and the inability to access new consumer demand within the bottled milk category. In 2020, 73% of the milk sold in the Dairy Alliance region was in gallon jugs, which was well above the national average, according to IRI data. The data indicates that Southeast milk processors have a disproportionate capacity dedicated to lower-margin and highly competitive products like gallon jugs and school milk, with notoriously fierce competition and low margins. A more significant share of lower-margin milk sales could negatively impact farm milk checks over time, especially if there is excess capacity competing for a finite number of sales.

The historical USDA data corresponds to IRI's national and regional retail scan data for the last three years. In addition, IRI captures a subset of the data, including Supermarkets, Mass Merchandisers, Club stores (excluding Costco), and Convenience Stores. With a more significant percentage of milk directed to schools, Southeast milk demand will experience more seasonality than the national average, which will have implications for milk acquisition and assembly and production costs. Further, USDA school meal policy will have a disproportionate impact the Southeast due to the higher percentage of sales.

Covid-19 Impact on Retail Milk Sales

In March 2020, a global lockdown to stem the spread of the novel coronavirus or Covid-19 closed businesses. With little information about the severity of the disease, people sheltered in their homes. Overnight, U.S. restaurants closed, and grocery outlets, deemed essential businesses, remained open to keep the nation fed. Hoarding and stockpiling of goods aggravated an already challenging situation as grocery retailers struggled with the rapid implementation of safety protocols and social distancing measures and struggled with a dwindling workforce. Similarly, online sales of goods soared.

Chart 11 Fluid Product Sales for Handlers Regulated by the FMMO (November 2019)



Source: 2019 Packaged Fluid Milk Sales n Federal Milk Markets (AMS, April 2020)

The pandemic challenged the nation's dairy supply chain. For decades, food service was the driver of growth as people spent more on meals eaten out of the home than meals prepared at home. Dairy companies invested appropriately with assets or production lines dedicated to food service and retail package sizes. However, dairy companies were forced to idle foodservice lines with little warning while retail products failed to keep up with the mounting panic buying driving demand. Bare store shelves during the early days of the lockdown forced consumers to try new products like aseptic, lactose-free, or alternative dairy beverages.

In March and into early April, dairy plants unable to sell through foodservice channels reduced raw milk demand resulting in some dumped milk. Then, on March 26, 2020, President Trump signed the $2 trillion CARES Act coronavirus relief legislation. With additional funds and a mandate to help the nation's farmers and feed families, USDA launched the Farmers to Families Food Box program. USDA used

10 There could be some comparison issues with data prior to 2019 as California had a state milk pricing system outside FMMO regulation.

funds from the CARES Act to procure food products while keeping farms from dumping milk and growers from leaving potatoes to rot in the fields, to donate to food banks and churches to help feed Americans in need. Within weeks, markets turned higher as USDA bids for milk and cheese helped processors turn on idled foodservice equipment.

In 2020, the CME Cheddar block price traded as low at $1 per pound at the onset of the pandemic to a new record $3 per pound later that year. Extreme market volatility challenged the FMMO pricing system and rules that did not foresee such an event. While milk prices were high, they did not necessarily translate into higher prices for all dairy producers. The new Class I milk price formula, along with de-pooling and a host of other issues, resulted in pricing chaos in 2020. Dairy producers received direct payments through the Coronavirus Food Assistance Program (CFAP), which provided relief, and access to a few rounds of the Paycheck Protection Program (PPP).

In the end, the pandemic provided the dairy industry with insights that could not otherwise have been ascertained because the scope and scale of such a research study would have been cost-prohibitive. By forcing people to stay home and slow the pace of their lives, dairy product consumption, specifically milk, increased compared to 2019, breaking a decades-long trend of decline. Cereal, milk's complementary product, experienced the same sales bump. The pandemic confirmed that busier lifestyles have led to more grab-and-go morning products as people hurriedly leave their homes for work, school, and the gym. When home became work, school, and the gym, people reverted to former eating habits, like cereal and milk for breakfast. That caused 2020 milk sales to increase 2.2% for total U.S. Muli-Outlet ("MULO")[11] compared to 2019. Other products like Oreo cookies, Kraft Macaroni & Cheese, ice cream, pizza, etc., all benefited from consumers reaching for comfort foods during a period of uncertainty.

As vaccines rolled out in 2021 and people returned to work, school and pre-pandemic lifestyles, consumption of fluid milk returned to pre-pandemics declines, with retail sales slumping 3-5%. School milk increased above 2020; however, anecdotal reports suggest school milk demand may be above pre-pandemic levels during the 2021-22 school year. That could be because USDA enacted policies like free school meals for all students through the 2021-22 school year. A half-pint of milk accompanies each meal, likely resulting in greater consumption as more school-aged children avail themselves of the meals. In addition, in 2021, California and Maine legislated free school meals, making the program changes permanent, removing the stigma of free meals being only for those in need.

Moreover, USDA provides gallon jugs of milk and meals for children and families in need over weekends. In mid-December 2021, USDA announced an additional $1.5 billion in funding to assist schools with paying for school meals to offset some of the inflationary impact expected in 2022. USDA listed milk and cheese as targets for spending.

Southeastern Consumers

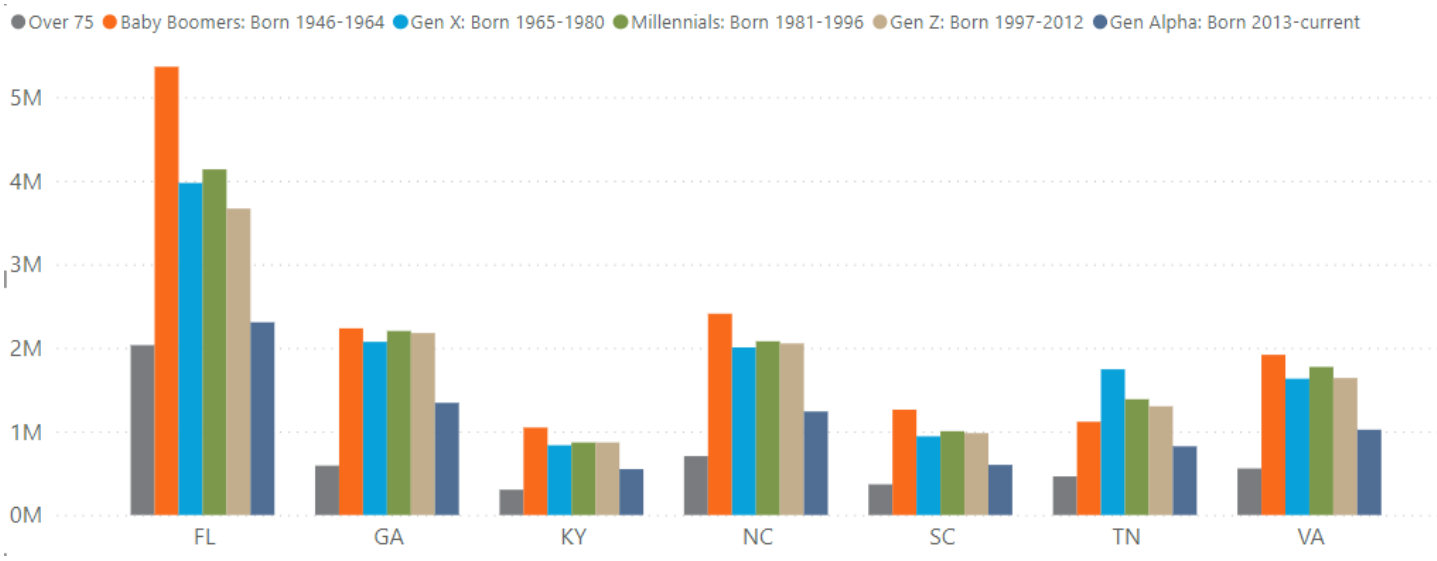
According to the 2020 Census, southeastern states have counties with some of the fastest population growth. People are looking for warmer climates. Additionally, post-pandemic people are better able to work from home allowing them to select different localities. Further, states like Alabama, Georgia, North and South Carolina are wooing technology companies like Amazon, Apple, Google, etc. supportive to the local economy and households with potentially larger disposable incomes. While a boon for local markets and the potential for dairy uptake, a growing population tends to constrain agricultural expansion as there is a competing use for agricultural land and new homeowners prefer to live away from livestock operations.

Population by Generation

While there are more people, generally the US population is consuming less milk. Between 2003-04 consumers drank between 0.8 and 0.9 cups of milk per day; that figure dropped to just below 0.6 cups in 2017-2018. (Hayden Stewart, 2021) Those declines are also reflected by age groups. In 2003-04 children consumed just over a cup of milk each day, dropping to 0.79 in 2017-18; teenagers went from

11 MULO includes channels like food/grocery, drug, mass merchandisers, Wal-mart, club stores, dollar stores, institution and convenience stores.

Chart 12 Population by Generation



Source: 2020 Census

0.79 to 0.40; adults from 0.43 to 0.23. The population change for North Carolina (1.13 million people) would account for an incremental 1.5 million gallons of milk consumption in 2020 compared to 2010 assuming the adult level of consumption. Georgia would have similar results with the other state under the study with smaller population changes. Although more people will increase average consumption – it may mitigate declines. Further, these transplants with large disposable incomes may be able to afford dairy products with attributes or characteristics consumers are seeking – vitamins, age-targeted products, lower sugar level, or higher protein. A growing, more affluent population provides better market opportunities when it comes to supporting new dairy investments.

Retail Value of Milk

Last year, the retail value of a gallon jug of milk ranged from $3 to over $5, and the U.S. MULO average was $4.03/gallon, 6.1% more than the previous year and higher than the Dairy Alliance region at $3.87/gallon. Table XX details the gallon equivalent price for some segments and package types. Paperboard products tend to achieve a higher per gallon equivalent return as they are often ESL. Gallon jugs represent the largest share of the Dairy Alliance region's sales in 2020 – 73%; however, gallon jugs provide the lowest gallon equivalent selling price and likely return compared to alternatives like organic, aseptic, lactose-free, and ESL. But compared to the U.S. average, sales volumes for Dairy Alliance gallon jugs are less variable, suggesting consumers have a more consistent consumption pattern.

Table 2 Dairy Alliance Fluid Milk Avg. Retail Value

(in US/gal)	2016	2017	2018	2019	2020
All milk	$3.71	$3.72	$3.61	$3.71	$3.87
Organic milk	$7.97	$7.75	$7.58	$7.60	$7.70
Aseptic	$15.35	$14.92	$15.16	$15.37	$13.80
Lactose-free / reduced	$7.56	$7.70	$7.88	$7.92	$7.97
Paperboard	$7.01	$6.99	$6.94	$7.01	$6.97
Plastic bottle	$3.40	$3.41	$3.29	$3.39	$3.54

source: IRI Milk Quarterly Report, January 12, 2021

Lactose-Free and Lactose Reduced sales were robust in the Dairy Alliance region (+20%), compared to the U.S. average (+21.3%) during Covid. Through Q3 2021, U.S. lactose-free sales volumes were 9% more than the same period last year. Similarly, the Dairy Alliance region retained lactose-free sales compared to the pandemic highs, up 10% through Q3, suggesting consumers might prefer the product. Last year, U.S. aseptic milk sales were flat (+0.2%) but may slightly improve in 2021. During the 2020

pandemic year, the Dairy Alliance region increased aseptic milk sales by 15.2%. This year, aseptic sales estimates reflect a 4% drop —that is less than during 2020 but still better than 2018 and 2019. Through Q3, the Southeast experienced minor declines compared to last year for MULO sales, down 6.4% compared to between 7.1% and 9.8% in other regions. With increases in the specialty categories, this suggests that white milk in gallon jugs continues to suffer. IRI reported year-to-date gallon jug sales through Q3 down nearly 10%, compared to the same period last year. The data indicates consumers continue to reach for customized milk products despite the higher per gallon equivalent costs.

Gallon jugs have high penetration in homes and are among the top-ten reasons consumers will head to a grocery store, a sentiment not lost on retailers. As a result, gallon jugs are often priced as low as possible to attract shoppers looking for value as they will likely conduct the remainder of their purchases at that store. While identical to store-branded products, national-brand milk held an approximate 50-cent premium between 2016 and 2020 (Kang, 2020). At the same time, sales of private label milk were approximately 50% more than national-brand milk over the same period. Although consumers are highly likely to purchase milk and have it in their homes as a staple, they are unwilling to pay a premium for a branded product; gallon jugs are a commodity with attributes indistinguishable. Staples like meat, dairy, flour, and sugar dominate American diets. Still, absent real or perceived added-value or customization, consumers are unwilling to pay considerable premiums for brands because of the quantity households need to buy.

That may explain why so many grocery retailers have dairy processing capabilities, with Walmart the last significant merchandiser to enter the processing arena. Grocery retailers attempt to procure milk at the lowest cost possible to supply their stores with low-cost gallon jugs. That will prevent cooperative and other proprietary processors from garnering disproportionately higher returns on gallon jugs. Although national brands can achieve higher prices than private labels, it is on a smaller volume. Still, retailers control shelf space. For example, for the 52 weeks ending July 12, 2020, nearly 60% of the dairy case milk was dedicated to private or store-branded products, with almost 16% dedicated to HP Hood, Danone, and Fairlife – largely lactose-free, high protein, and organic milk. As a result, very little space is left for branded gallon jugs when considering alternatives.

Alternative Dairy Beverages

There is considerable discussion about dairy beverage alternatives and how they have reshaped the dairy case once dominated by gallons of milk. In 2020, alternative beverages, defined as beverages marketed as a close substitute for milk, accounted for nearly 10% of total milk sales, with almond non-dairy beverages dominating the category at 77%. In recent years, coconut beverages followed by oat drinks have made inroads into the category. Decades ago, soy was the top category but had since fallen out of favor with consumers due to its inferior protein content compared to dairy, health concerns, and taste.

Remarkable growth has occurred in the alternative dairy beverage category, with 2020 bettering 2019 by nearly 20% for the IRI multi-outlet retail channel[12]; however, in recent years, consumers have begun to question the nutritional quality of these products as well as whether some of them, like those made from almonds, are environmentally sound. As a result, milk has lost some share to alternative beverages, but water has contributed to declines also. Still, alternative beverages have encroached on milk's space in retail dairy cases. In all cases, milk alternatives employ sleek and modern packaging – whether paperboard or PET bottles. Often the packages are small – single-serves or 64 to 96-ounce package sizes – sizes more compatible with consumers who drink less milk or milk substitutes daily. In addition, compared to the gallon jug, these products are more specialized and have more variety than butterfat content.

In the Dairy Alliance region, 2021 alternative beverage sales volumes were up 5% through September, compared to 2020. However, U.S. sales were up 2.6% over the same period, suggesting Southeast consumers reach for dairy alternatives more frequently. The most significant disparity was

12 According to IRI the MULO data set accounted for 62% of USDA fluid milk sales in 2020.

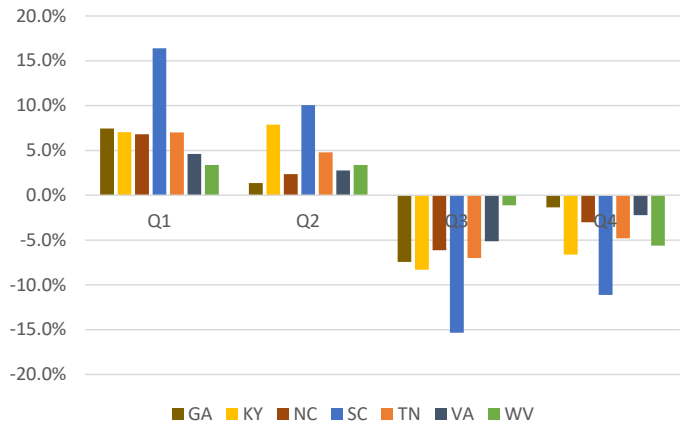
in almond beverages, with Dairy Alliance sales up 2.5% while national sales were down 1.1%.

THE DAIRY SUPPLY CHAIN

Farm-to-Plant

This supply chain segment has constraints that are unique to an agricultural production system. Some pinch points are the seasonality of milk production off the farm, milk needed to satisfy the local market, storage, and transportation. First, milk off the farm increases in the spring months – often called the "spring flush," with production peaking between April and May, depending on spring weather patterns. Similarly, milk production eases into the summer as heat and humidity negatively impact production because a cow's energy diverts to cooling. Finally, milk reaches its seasonal low in the fall. Nationally, Q1 milk production was 0.7% higher than the annual average, and Q3 output was 0.7% lower than the average in 2020. Dairy producers have invested in

Chart 13 2020 Seasonal Milk Variation



Source: NASS Milk Production

cow comfort, nutrition, genetics, and heat mitigation efforts to reduce seasonal variations over the last two decades. Given typically hot and humid weather in southeastern states, the seasonal variation would likely be more significant than other areas and exceed the national average. Peak to trough in 2020, West Virginia had the lowest observed variation at 3.4% in Q1 compared to -1.1% in Q3. South Carolina had the most prominent difference ranging from +6.4% to -15.3% over the same period. All other states fell within that range.

As discussed, the Southeast has significantly more milk directed to schools, nearly double the national average, and a much higher percentage of milk headed to bottling overall. Bottling requires processors to keep milk in reserve on the chance of additional demand from the market and market excess milk when less is needed, referred to as "balancing the market." Balancing not only occurs seasonally but daily, weekly, and monthly. For instance, retail sales of milk increase during the week and tend to slow over weekends. As a result, bottlers increase demand for milk on Sunday and slow considerably by Friday, meaning the milk supplier must have sufficient supplies available early in the week and the ability to process or market the milk over the weekend elsewhere.

Further, there are seasonal variations with the annual return to schools increasing demand in the late-summer and early-fall and declining when schools are out of session. On average, U.S. schools are in session 180 days per year; however, dairy cows produce 365 days per year. Although all FMMOs have fluid milk sales, FMMOs 5 and 7 have some of the highest percentages nationally, meaning there is more demand for balancing services in this region.

But balancing the market is more nuanced. Milk characteristics and cooperative affiliation further complicate the supply chain. For instance, contracted raw milk comes with quality stipulations acceptable to individual facilities. However, suppose a dairy producer located within 20 miles of a dairy plant has milk with a 500,000 somatic cell count (SCC) with a plant requiring 400,000 SCC. In this case, the farm milk may be acceptable under the Pasteurized Milk Ordinance (PMO) but may not meet the specification for delivery to that facility. Therefore, the cooperative must move that milk to another location and replace the milk with milk from another area.

Milk tanker trucks can haul up to 60,000 pounds of milk in the local market. Ideally, dairy producers would fill a truck every day or every other day, or at the very least, half a truckload every other day. Assuming 70 pounds of daily milk production per cow, a dairy would need approximately 230 cows to fill half a milk tanker every other day. If possible, 460

cows would fill a full tanker every other day. Based on the 2017 Agricultural Census, 47% of southeastern dairies have fewer than 100 cows. Smaller pickups can increase the cost of assembly and complicate the supply chain even further, especially when plants close or significant milk characteristics and quality disparities exist among farms.

While balancing, on average, suggests that the Southeast dairy industry could supply most of the market's needs throughout the year, the area appears to fall well short of requirements, requiring dairy cooperatives to purchase milk from greater distances to have milk in reserve for the market, especially when schools reopen in Q3, a time when local milk deficits are at their greatest. That does not preclude expansion in the local market to meet needs; instead, it suggests an ability to grow local milk supplies so long as this growth meets the criteria for replacing milk imported from other states.

Transportation may be the primary source of weaknesses for the farm-to-plant supply chain. Farm consolidation and plant closures created inefficient shipping lanes by increasing miles and complicated routings. Add to that the complications related to coordinating hauling from outside the area to service the local market. This, in turn, requires more assets and drivers, both of which are becoming more difficult to acquire and maintain. In addition, small farms and the inability to manage seasonal variations or assemble efficient loads have created ineffective hauling via increased miles, raising costs that are passed back to dairy producers through ancillary milk check deductions. Of course, there are other weaknesses in the system, but this appears to have the most immediate and most significant negative financial impact on milk checks.

Retail Distribution Methods

There are two primary methods of retail dairy distribution from plant to retailer – direct store delivery (DSD) and distribution centers (DC). These methods apply to grocery stores, mass merchandisers, convenience, and club stores. DSD is the most common delivery system. The manufacturer (plant) loads crates, boxes, or other secondary shipping units onto milk bossy carts[13] or pallets for delivery from a plant to a retail location. In DSD, the delivery area is usually limited to a few hundred miles to ensure quality and temperature and allow for a return trip to the plant so the truck can be loaded for the next day's deliveries. Bottling plants have logistics groups that build routes and the number of stops per day that are consistent and predictable. This distribution method was born when dairy products were very perishable and needed to be delivered daily to the grocery store to ensure sufficient shelf-life for consumers.

The distribution center delivery model has grown in popularity as dairy processing and packaging technologies have improved the quality and shelf-life of dairy products, enabling them to be shipped medium and long distances from the point of manufacturing without negatively impacting the shelf-life for consumers. These improvements have also increased the amount of inventory that can be held in DCs and grocery stores' on-site storage, increasing the load sizes and decreasing the frequency of deliveries. As a result, this has become the preferred method for distributing goods through retail channels but has remained elusive in fluid milk distribution.

School milk typically follows a DSD method; however, transporting small quantities of half-pints in rural locations can be cost-prohibitive for the schools and processors alike. The cost of delivering school milk can be elevated, resulting in unprofitable routes or meager margins for processors.

When negotiating dairy, including fluid milk, a retail buyer will evaluate the net landed cost (NLC). Put simply: Net landed cost = cost of goods + distribution – discounts. Years ago, lacking refrigeration, milk quality, and pasteurization technology limited the distance milk could travel to the market. Over the past two decades, as evidenced by investment throughout the country in refrigeration and pasteurization (ESL or aseptic), milk — whether off the farm or in retail packages — can move greater distances with some exceptions. Gallon jugs of milk are challenging to transport longer distances as HTST products have a shorter shelf-life. In addition, the use of bossy carts and milk crates requires a

13 A milk bossy cart is a stainless-steel, wheeled cart used to transport gallon milk jugs. At the retail outlet the bossy cart can be wheeled into the consumer facing dairy case.

return trip for the processor, so it has the equipment necessary to continue making shipments. That said, if a milk processor can be competitive and doesn't require a return trip, it is likely, given the higher Class I differentials throughout the Southeast, bottlers in states bordering FMMOs 5 and 7 can quote a competitive net landed cost for milk produced in the local market. Milk can move farther distances in specialty or smaller package sizes, allowing products to move from as far away as Utah to service some of the Southeast retail milk markets.

That makes it more likely that milk, especially value-added milk, can come from greater distances to supply the local market competitively. In some cases, retailers import gallon jugs from outside the region. When the Class I differentials were established with federal order reform, most plants were HTST with limited shelf-life. Today, there is ample ESL investment suggesting markets for UP and aseptic milk products are vast and likely to cross several FMMOs.

Retail to Consumer Delivery

The retailer almost exclusively controls this supply chain segment, absorbing fuel cost increases via margin compression or changing the price to consumers. Often, it is a combination of the two, slowly releasing the margin pressure by doling out small but steady price increases over time to the consumer within known pricing elasticity tolerances until average retailer margins are restored.

The Pandemic's Lasting Impact on the Dairy Supply Chain

Since 2015, the trucking industry forecast there would eventually be a shortage of drivers based on age and identification that the electronic log implementation could speed up retirements. Over the past decade, the industry contended with periodic equipment shortages and fewer drivers, but nothing compared to what happened in 2020 and 2021. The current driver shortage is at a record-high 80,000 drivers, according to the American Trucking Association, and that number could expand to 160,000 by the end of the decade (American Trucking Association, 2021). The pandemic bolstered online orders leading to 10.23 billion tons of freight movement in 2020 (American Trucking Association, 2021). As a result, groups such as FedEx, UPS, the United States Postal Service, and Amazon have openings for drivers. In addition, dairy competes with oil and natural gas for drivers in the Southwest. Dairy tanker driver wages historically have been below-average with comparatively few benefits. With lifestyle changes, long-haul drivers, those driving hundreds of miles, have become relics. Therefore, the dairy industry has struggled to retain drivers, making raw and fluid milk transportation more expensive and complicated.

But labor shortages are not the only pandemic-driven issues that linger. High fuel prices are raising costs to transport products through the supply chain.

Chart 14 US No 2 Diesel Retail Prices

Source: EIA

Fuel surcharges and routes could become more expensive, making inefficient hauling a considerable burden to the local market. That may cause the cost of Southeast milk transportation to increase, reducing net milk checks. At the same time, high fuel costs could temporarily make hauling outside milk into the Southeast less attractive as the returns decline, making local milk more cost-competitive. This could provide opportunities to expand local milk, assuming milk assembly costs are less than the incremental transportation costs.

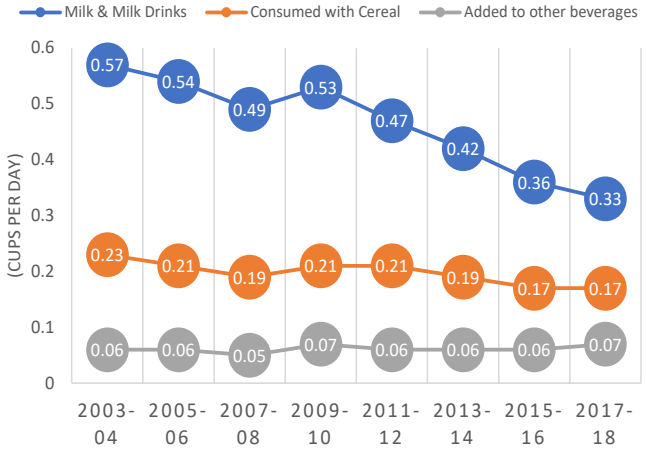
KEY DRIVERS FOR MILK AND DAIRY CONSUMPTION

Humans' consumption of milk and dairy products can be traced back 7,000 years in Central Europe, home to some of the world's first farmers. In the 1970s, archeologist Peter Bogucki found odd red

clay-baked pottery at a Stone Age site. At the time, Bogucki theorized the pottery could have been related to ancient cheese making but lacked the scientific methods to prove it. In 2011, Mélanie Roffet-Salque analyzed the pots found decades earlier. The tests detected high levels of fatty residue in the clay, supporting the early hypothesis that the pottery was indeed used to produce cheese. At that time, it became abundantly clear that humanity had been drinking milk and consuming dairy products for thousands of years.

Milk and dairy products are considered an essential source of protein and other vital nutrients; however, environmental concerns related to methane emissions and animal treatment have created consumer concern in recent years. At the same time, shifting consumer preference for the product,

Chart 15 US Avg. Dairy Milk Consumption



Source: USDA ERS, Examining the Decline in U.S. Per Capita Consumption of Fluid Cow's Milk, 2003-18

unlike during the previous century, has resulted in Americans eating dairy more than drinking milk. Further, on-the-go lifestyles have reduced milk drinking occasions and produced considerably more beverage choices for consumers — all factors that negatively impact daily milk consumption and suggest the trend could be challenging to reverse. USDA's Economic Research Service issued a study detailing that Americans are not consuming the daily recommended milk. That consumption continues to trend lower, whether through drinking a glass of milk, having it with cereal, or adding to a beverage such as coffee (Hayden Stewart, 2021).

While children drink the most milk, ERS determined that people of all ages drink less than in previous years. The study concluded that just over half of U.S. children, less than 30% of teenagers, and approximately 15% of adults consume milk daily. One of the most significant contributing factors is exposure to milk when young. The more children are exposed to milk when they are young, the more likely they will drink milk, albeit less, when they are older. Therefore, the quickened pace of decline from 2009-10 may be traced, in part, to the policy changes caused by the Healthy, Hunger-Free Kids Act (HHFKA) enacted in 2010. HHFKA mandated the fat content of milk be reduced, and if the milk was flavored, it could only be skim milk. Given flavor deficiencies and students "unhappy with school meals," kids reached for water or brought lunch.

Additionally, more so than teenagers and adults, children are eating less cereal as a meal for breakfast. The study concludes that when children consume less milk at school, they do the same at home. Further, when they become heads of households, these children are less likely to purchase milk for their homes, increasing the likelihood that the next generation will consume even less milk. These findings may suggest legislative intervention could partially reverse these trends, but that left as is, the policy could profoundly negatively impact future fluid milk consumption and the ability to arrest declines.

New Beverages and Consumer Demand

Between 2016 and 2020, companies launched an average of 1,005 non-alcoholic beverages in the U.S. market each year (Mintel, 2021), providing consumers with considerable choice. Several fluid milk product launches occurred over the last year, whether they contained attributes like organic, A2, flavors, vitamin enhancements, lactose-free, high protein, or age-targeted. Today, the dairy case is more diverse and representative of products made to meet consumers' every need. While several cooler doors remain dedicated to white milk, there is also more choice today. With other beverage choices, such as ready-to-drink coffees and teas, sparkling waters, sports beverages, kombuchas, smoothies, and sodas, consumers have a lot of products to choose from when they reach for a drink. Dairy and

non-dairy alternatives are mature markets with consumers consistently buying the products, but not necessarily increasing purchases — outside the impact of the pandemic. That said, nutrition focus and post-workout recovery drinks, and other innovations could provide the category with considerable growth opportunities, especially in the grab-and-go category (Graybill, 2021). As people's lives return to normal, shopping habits are following suit. Instacart noted that 2021 grocery purchases of "convenient, on-the-go, and easy-prep grocery items" have increased (Shoup, 2021). These purchases include energy drinks and cereal bars, while milk, yeast, flour, and cereal have experienced declines.

Eating versus Drinking Daily Dairy Requirements

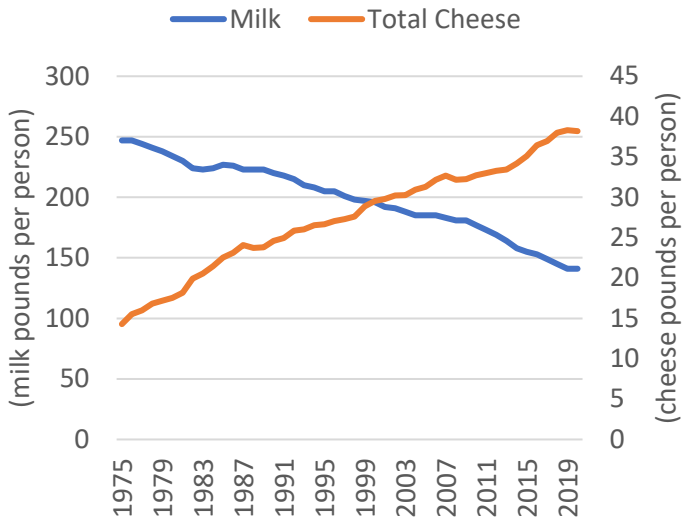
While Americans consume less milk each year, they eat more cheese, butter, and yogurt. One hundred pounds of milk can produce nearly equivalent amounts of milk and cheese – so the losses in milk have been offset by gains in cheese. Growing domestic and global cheese consumption continues to support U.S. milk production expansion, with most regions of the country investing in cheese, butter, yogurt, and milk powder processing capabilities. However, the Southeast region of the country is an exception. That could help explain why the Southeast milk supply has been declining faster than the rest of the country.

Absent substantial cheese production capabilities, the Southeast buys most of its cheese requirements from other regions of the country. In 2020, IRI reported 810 million pounds of cheese sales at retail in the Dairy Alliance region, or 14% more than the previous year. Through Q3, retail cheese volumes were down 3.1% versus 2020, compared to U.S. sales of 4.4% less than last year. Foodservice cheese consumption was complementary and similar to retail volumes. Given affluent suburbs throughout the Southeast, the data suggests the market could readily absorb locally produced cheese beyond what is sold today.

THE INTERVIEWS AND SURVEYS

As part of this project, Ceres interviewed dairy producers, cooperatives, and the Market Administrator in the study region and conducted surveys. The purpose was to understand better the pandemic's impact on the local market, challenges, and opportunities for stakeholders and dairy producer sentiment about the future of dairying in the Southeast. The interviewed cooperatives represent a significant percentage of the milk handled in the region, and the dairy producers provided a cross-section of farming operations.

Chart 16 US Per Capita Consumption (1975-2020)



Source: USDA ERS, Dairy Products: Per Capita Consumption, United States (Annual)

Throughout the supply chain, the stakeholders held similar beliefs about the market. They had a shared understanding of issues like seasonality, quality, and balancing that can increase the cost to service the market and reduce farm incomes. Interestingly, based on dairy producers interviewed and surveyed, it seemed opinions suggested that cooperatives could take a more assertive role managing dairies that had extreme seasonality or produced inferior quality milk to reduce the costs borne by the system for what may be outliers.

Cooperatives and the Pandemic

Most of the cooperatives interviewed provided similar responses to questions about the pandemic's impact on the supply chain. Initially, the pandemic caused a significant shift from food service to retail sales channels resulting in increased Class I consumption with bottling orders doubling or tripling in a short amount of time as retailers attempted to keep shelves stocked as consumers stockpiled products. Some cooperatives had to bring milk in

from other states to service the short-term needs and pay premiums to obtain the milk with a limited lead time. However, as quickly as the demand began, it ended. Overstocked retailers reduced purchases to match demand declines, shifting milk to balancing plants and forcing milk out of the area. The situation put considerable stress on the supply chain and caused losses.

The USDA's Farmers-to-Families Food Boxes program was viewed favorably as something that helped stabilize fluid milk demand. Despite the food boxes helping shore up lost demand while providing Americans in need with nutricious dairy products, that program created considerable price volatility that resulted in de-pooling and a Class I milk price that was less than other milk prices – like those used for cheese milk or yogurt. The price volatility persisted throughout 2020 and negatively impacted returns for processors, cooperatives, and dairy producers, offsetting some of the program's overall benefits.

Once vaccines began to roll out in early 2021, people began to return to a more pre-pandemic lifestyle, and bottled milk consumption declined. After that, channels shifted again, with foodservice demand increasing as retail subsided. Still, food service was not back to pre-pandemic levels at the point of the interviews.

Cooperatives and Milk Assembly

Creating routes to pick up and deliver milk from farm to plant can be difficult. Often there are co-mingled routes – routes where cooperatives work collectively to pick up milk despite affiliation to reduce costs throughout the system. Some milk travels long distances – between six and eight hours from farm to plant. Frequently, it is due to "sell-outs" and plant closures. While there may have been a logical and efficient route, one farm exiting the business can disrupt the efficiency of that route, increasing cost to the rest of the load because it must travel greater distances to pick up milk or hauling per hundredweight increases as the tanker is less than full. Additionally, while two farms may be located near one another – milk attributes may prevent the hauler from picking up the milk in a single load. For instance, if one farm is organic and the other is conventional – they cannot be picked up together.

The cooperatives tended to acknowledge that more could be done to optimize the movement of farm milk to plants throughout the system and the use of backhauls within the system; however, that would require extensive coordination on milk supply and demand, something that could be challenging. Additionally, differing company priorities can hinder coordination. Some states like the Carolinas and Tennessee experienced considerable production seasonality, complicating coordination efforts. When asked if they believe dairy producers could curb some of the seasonality – the responses ranged from complex for specialized milk production like organic to it seemed unlikely given the stage of the farm lifecycle the investment necessary was doubtful. Some were optimistic that seasonal premiums and discounts could encourage dairy producers to undertake investments or on-farm management practices to reduce seasonal variation. Several times, cooperatives and even dairy producers mentioned poor milk quality created system-wide issues. Nearly all the cooperatives believed management practices could reduce milk production fluctuations. Additionally, others suggest educational opportunities for dairy producers that explain and model the returns for reducing seasonality to benefit the area.

Cooperatives and Regulatory Solutions

When asked about potential regulatory solutions to prevent further attrition in the Southeast and what could improve producer milk checks – there was some consensus about relief related to milk movement. Today, given the distance milk travels, the cost of hauling is expensive, and it is typically passed back to dairy producers through milk check deductions – directly and indirectly. That puts an additional burden on the system for balancing local supply. Several items on the list included a review of the existing transportation credit program, not necessarily elimination, but enhancement, addressing the legislative changes to the Class I enacted with the 2018 farm bill, reviewing Class I differentials that appear out-of-step with current markets, and looking at a system-wide balancing charge to help mitigate the cost of managing seasonal on-farm production as well as variable retail demand. Several cooperatives explained that a lot of milk comes into the local

market throughout the year to help satisfy retail, school, and wholesale demand. But the cooperatives agreed while outside milk is essential, it should not necessarily impact the local milk market.

Although regulation and legislation can affect change in the markets, some warned to proceed with caution, citing the 2018 Class I milk price change example. Additionally, the rules as written may not be how the industry employs them; they do not always promote orderly marketing. Some of those warnings include further changes to the Class I milk price.

Some felt that all producers withdraw the same amount of money from the system –cooperative priorities and distributing money determines member returns. Many comments focused on the milk price; however, some noted that driving cost out of the system can effectively increase returns.

Cooperatives and Balancing

There was a single topic that all cooperatives agreed on – balancing is the most challenging aspect of this market that drives higher costs, inefficiency and can impact milk checks negatively. There was consensus that transportation credits and other regulatory solutions could be appropriate as balancing was a system-wide challenge and something that cooperatives or their producers should not necessarily bear.

Some explained that seasonal milk variation collides with shifting retail demand. Add to that a highly perishable product with little storage all drives the chaos of the current system. Further, there is more capacity than sales opportunities, so competition is fierce in the local market.

One of the typical notes, dairy producers producing small amounts of milk create multiple stops and less-than-truckload quantities. For example, if a truck can hold 50,000 pounds of milk and costs $1.50 per hundredweight (cwt) – that is $750 per load. Suppose the hauler picks up 39,000 pounds – the cost increases to $1.92/cwt – a 28% increase.

Cooperatives and Expansion Opportunities

While dairies have expressed a desire to grow milk – some cooperatives were skeptical because farmland availability is limited. Further, through the interviews, Ceres learned that financing and capital availability for dairies are less than other types of farming in the Southeast. Bankers may be reluctant to finance dairy expansions due to the milk price volatility compared to other crops or livestock operations. In some cases, solar farms are out paying dairies for productive land. Urban sprawl has limited agricultural land in some states like South Carolina.

As it relates to new plant investments in products like ESL or aseptic milk, most agreed it could be difficult outside of Virginia – where most of those plants are located today. While there has been some discussion, those looking to invest are concerned that milk may not be available long term and that the cost of milk and scarcity makes investments more viable in northern states.

Dairy Producers and the Pandemic

Dairy producers reported that cooperatives picked up milk during the pandemic, not noticing disruptions related to that aspect of their business. However, many said that labor became an issue and significant concerns about widespread sickness among farm staff. Some of the problems came later as the pandemic negatively impacted the supply chain. Dairy producers reported extended lead times, higher costs, and scarcity of parts necessary to run the farms. Many said they could operate, but there were concerns if there was a breakdown with no replacement parts on hand.

Most dairy producers conveyed direct payments to farms (CFAP), PPP loans provided a “band-aid” and short-term relief. However, the programs designed to help created long-term issues and considerable milk price volatility that negatively impacted margins.

A vertically integrated dairy noted that foodservice orders vanished at the onset of the pandemic and that direct sales to consumers offset lost volume.

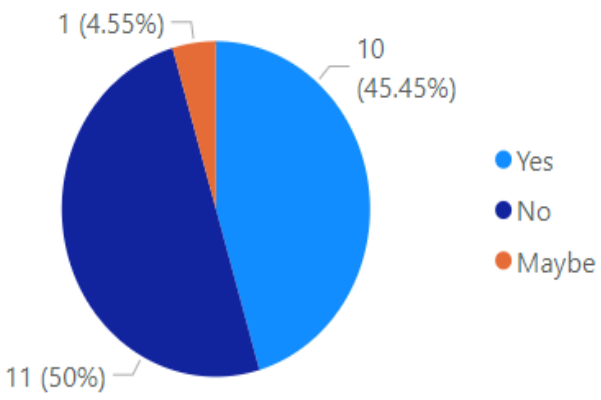
Dairy Producers and Cooperative Affiliation

Nearly all the dairy producers interviewed were members of cooperatives. Most reported favorable views of their cooperatives, noting cooperatives must balance competing member needs by enacting policies that benefit the most constituents. Some

felt that cooperatives protected dairy producers. However, some believe there are not enough options and that some cooperatives are difficult to gain membership. Dairy producers reported evaluating cooperatives on pay price, ethics, and market security. There were some critiques that cooperative quality programs are not strict and allow some members to ship inferior milk, which tends to increase the costs to the system, stating they would prefer enforcement over what some perceived as relaxed standards.

About half of the respondents contemplated marketing milk outside the cooperative structure at some time. Some moved forward with vertical integration and milk marketing. Others commented they had reviewed it but determined they may be too big to market dairy products outside the cooperative model consistently. For those that left dairy cooperatives, they were unable to make money under that model – they were too small.

Image 3 Survey Question Have you ever considered vertical integration - in vesting in bottled milk or cheese processing?



Source: Surveys & interviews)

Twenty-two respondents participated in the survey. The following is the response to vertical integration

Dairy Producers and Milk Check Deductions

Ceres asked interviewees about milk check deductions and those that were the most significant or most impactful. The ranking was transportation (hauling), quality deductions, and re-blends. FMMOs consider cooperatives dairy producers; therefore, cooperatives can pay dairy producers less than the minimum milk price. Re-blends is a term used to describe when a cooperative pays less than the minimum or federal order blend price during a given period. Re-blends can reflect the additional cost of hauling, higher cost to process products, the competitive price adjusts, a myriad of items that can result in milk prices being less than the blend.

Dairy Producers and Hauling

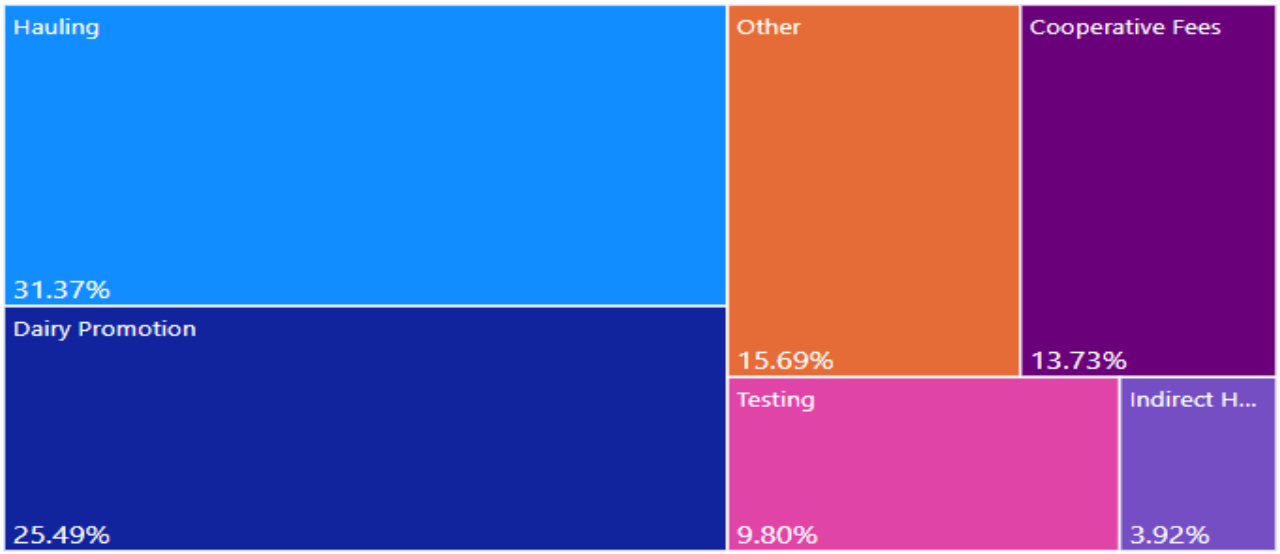
Whether cooperative or dairy producer, most agreed hauling was the largest system-wide cost and the most complicated to manage. One dairy producer stated, "larger producers can survive without small producers, but small cannot survive without big producers" -a sentiment that explained the impact of inefficient hauling caused by smaller dairy producers who are incapable of assembling efficient loads. The concept explains that a cooperative is likely willing to pick up a small producer's milk on its way to picking up more milk from a larger farm; however, if the small producer is the lone stop on a route, the cooperative may be reluctant to pick up the milk or may assess a much higher cost to that producer for a poorly located farm. Unfortunately for smaller dairy producers, once located near a milk processing facility, the farm can become remote if that bottling plant closes.

There was a comment that cooperatives could improve volume incentives and disincentives so that dairies better understood the programs to meet the cooperative needs and evaluate the appropriateness of investment to achieve the premiums and avoid discounts.

Dairy Producers and Balancing

Dairy producers understood that balancing was a challenge for cooperatives, and many noted that some of the issues originate at the dairy. Some interviewees stated that dairies could do more to eliminate issues that originate at the farm level, whether quality, seasonality, or inefficient load sizes. Some noted the cooperatives should do more to incentivize dairies to be more efficient or enforce

Image 4 Survey Question - What is the biggest expense on your milk check?



Source: Surveys & interviews)

stricter quality programs. Dairy producers believed that education, cost-sharing, or incentives to increase the use of technology, nutrition, cooling, breeding schedules, and the like could significantly reduce the seasonal impacts in the region. One dairy shared the improvements from an output-per-cow perspective that reduced hauling costs and cost per unit, noting that while feed cost more, the dairy was able to recoup that cost along with additional margin. The dairy also stated that while summertime conception is more difficult in the Southeast, it is not impossible and is more successful than dairies believe.

Dairy Producers and Regulation

In some cases, dairy producers felt that no federal order would be optimal compared to the system as it exists today with one exception – the payment system. However, most view the federal order's payment system as necessary to avoid creating cash flow issues for cooperatives and dairy producers that may otherwise exist but for the regulatory framework.

One dairy producer noted the North Carolina Department of Agriculture does an excellent job marketing local agricultural products to consumers and suggested it could be a model for other states.

Dairy Producers and Challenges

After the interviews, Ceres asked dairy producers about the biggest challenges facing them over the next five years – labor, inflation, and the pay price structure were most common. Most noted that access to quality and well-trained labor was a concern. Note Ceres asked these questions at the beginning of the current labor shortage, so the response would likely be more emphatic at the end of the year. Producers note inflation and rising interest rates as concerns that could prevent future investments if the dairies could not achieve a return on capital. Finally, some questioned whether other livestock payment models could work for dairy – specifically cost-plus models employed by hog and poultry producers.

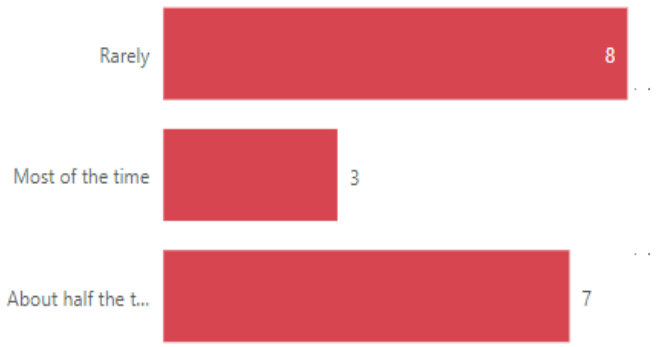
For vertically integrated dairies, they felt the local market was supportive to future growth and capable of paying the higher price for local milk.

The Market Administrator and Transportation Credits

The same staff currently manages FMMOs 5 and 7. This team has years of combined experience and provided considerable background on many issues. The Market Administrator explained, Class I plants pay transportation credits[14], not dairy producers. In FMMO 5, the transportation credit was raised to 15 cents in 2006, up from 9.5 cents, and has since been lower twice and is currently 7 cents per

14 Transportation credits are considered market-wide service payments.

Image 5 Survey Question Do FMMO policies impact my farm positively?



Source: Surveys & interviews)

hundredweight as it has been for the last three years. Since 2008, the FMMO 7 transportation credit is 30 cents, and 100% of the claims are paid annually. Not all out-of-area milk qualifies for transportation credits – the net of Class I differential gain must be less than the cost to haul the milk.

Today, transportation credits focus on supplementing the cost of moving milk into the market during the deficit season during the year to reduce the burden on the market for servicing higher regional demand later in the year when seasonally, milk supplies decline. However, the Market Administrator suggested there was no reason that the federal order hearing process couldn't redefine transportation credits to include Intermarket movement given the distance between farm and plant. As they reinforced several times, the Market Administrator's office administers the rules approved by dairy producers. Intermarket transportation cost-sharing may be a reaction to a Class I differential map that no longer reflects the actual cost of servicing the fluid milk market.

The Market Administrator and Market-wide Service Payments

Market-wide service payments are a concept that permits the Market Administrator to assess fees and distribute payments based on a set of established criteria or rules, much like the transportation credits. That said, the goal of the market-wide service payment would be to level the playfield within the market, with the Market Administrator staff stating, "they must help the market order, and be equitable."

The Market Administrator mentioned that the industry contemplated Intermarket transportation credits during a past federal order hearing. At that time, they were not implemented.

The Market Administrator and Rulemaking

The Market Administrator manages the touch-base provisions, diversion limits, and market-wide service payments regionally. Chapter 1000 – the General Provisions of the Federal Milk Marketing Orders strives to create uniformity across the entire system. The cost of standardized rules – the Market Administrators have very little authority to make changes outside of a national hearing process.

MILK MOVEMENT IN THE SOUTHEAST MILK MARKET

A Balancing Act –Supply and Demand with Seasonal Variations

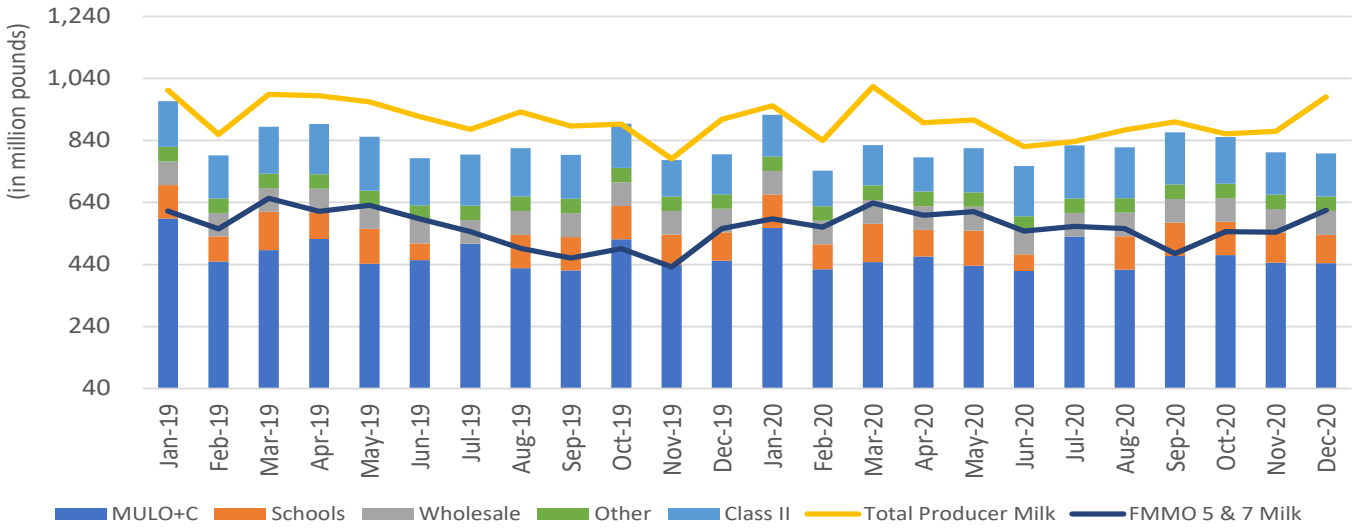
At its most basic, each month, the Southeast milk markets FMMOs 5 and 7 appear capable of reliably meeting the needs for 55% to 77% of MULO milk, and estimates for schools, institutional uses, wholesale other and Class II in the region. Ceres used IRI MULO scan data versus Class I utilization reported by the Market Administrators office to reflect milk purchased during the month capturing more than milk pooled on the order. The approximate demand includes Class II (cultured products and ice cream) milk used in the area and considered a demand product. Class III and IV, or milk used by cheese, butter, and powder plants, balance this market, are small and not considered "demand" and were excluded. Whether packaged or raw milk, 23% to 45% more milk is needed to fulfill market requirements. The data is subject to minor estimation errors; however, it demonstrates that there is a consistently sizeable gap between market requirements and local milk. Using a similar methodology with monthly Market Administrator usage figures and excluding producer milk from states outside FMMOs 5 and 7 yielded similar results. Further, the monthly averages mask daily variations that can create more disparity during a week.

Outside milk is necessary to satisfy the local market needs for several reasons. Presently, there is insufficient local milk of the required quality and composition to meet the needs of processors in the region. Whether cooperatives or processors procure raw milk from dairy producers/cooperatives located in adjacent states or retailers source packaged milk from other areas will depend on the net landed cost results (see earlier section for calculations). Therefore, whether raw or packaged, milk is coming in from outside the local market to satisfy demand. Given the gaps and approximately 18,000 pounds of annual milk output per cow, the region would need an additional 165,000 cows to fulfill all demand requirements – an unlikely feat.

be more inclined to provide a better price for second-half milk if the buyer is willing to take excess spring milk that is more difficult to market. It is a tradeoff. Economically the transaction makes sense; however, it can lead to more balancing and displaced local milk in the spring. Additionally, unexpected plant closures can leave dairy cooperatives with over-contracted milk, creating more need for balancing and displacement of local milk.

The data indicates that more milk could be produced within FMMOs 5 and 7, affording dairy producers the ability to expand; however, there are conditions for growing milk. The milk would need to be cost comparable to other regions, adjusted for transportation, meeting quality requirements,

Chart 17 Dairy Alliance Region Consumption by Channel vs. Producer Milk Production



Source: IRI MULO for Dairy Alliance Region, NASS Milk Production, ERS Reports, FMMO 5 & 7 Monthly Utilization Reports

Milk coming from long distances to service the local market adds more complexity to balancing milk. Most of the time, milk is in short supply during the second half of the year; however, procuring milk in the fall can be costly as many processors seek milk to meet short-term demand. Further, unexpected shifts from dairy farm attrition or plant closure confound the supply-demand balance. While the Southeast needs less milk during the first part of the year, economically, it may make more sense to procure milk year-round as it is more cost-effective for the cooperatives servicing the market. A cooperative or milk seller in northern or Southwestern states may

managing seasonality, and ideally full truckload quantities. In the end, that would permit expansion for dairies with more than 600 cows – if possible 1,800 to 2,000 cows milking three times per day (depending on daily production per cow). The space necessary to raise dairy cows and associated feed could limit the amount of land available for expansions of this size and scale. Therefore, the region would need no more than 82 2,000-cow dairies. But those are sizeable investments, and at the current rate of fluid milk consumption decline (2% per annum) – that number would fall to 122,000 cows or 61 2,000-cow dairies, a 25% reduction within ten years. Therefore,

for dairy producers contemplating more significant investments, building barns in states with cheese, butter, and milk powder processing capabilities and products with growing demand forecasts, is a straightforward investment, less so, in the Southeast due to declining demand.

It is unlikely the Southeast will add the quantity and scope of the dairies contemplated above; however, the exercise proves there is sufficient opportunity for dairies capable of supplying the market with full-truckload quantities. However, as stated earlier, the addition of dairies of this size could speed up the migration of cows from smaller farms to larger farms. That would substantially alter the composition of the Southeast dairy industry. Still, it may provide a more cost-effective and efficient model for servicing the local market, reducing the burden and cost of balancing for the remaining dairies. Further, consolidation of dairies in the Southeast may reduce ancillary hauling costs and improve overall returns for continuing dairies. The cost per hundredweight to produce milk would likely decrease based on the ERS study noted earlier. While outside milk will not alter FMMOs 5 and 7 utilization, less external milk and less milk sitting in reverse in outside states could mean more pool dollars shared among local dairies.

Challenges: Small Load Sizes & Displaced Dairies

Servicing bottling plants is complicated and unique to this market. Milk is highly perishable, and the nuance of quality, seasonality, driver availability and consumer demand complicate movement. That is particularly true in the Southeast, where three out of four loads of milk go to a bottling plant. Typically, analysts review monthly or annual milk utilization data to explain balancing. As in the previous section, it tends to simplify a complicated topic for readers as the confounding factors are too numerous to list.

But to provide a glimpse of the complications – let's review the impact of a dairy with 100 cows that produce 18,000 pounds of milk annually or 50 pounds per day. Recall that the 2015 ERS data stated that 2-2.5% of dairies with 100 or fewer cows milked more than two times per day – so it is reasonable to assume this hypothetical dairy milks no more than two times per day[15].

The cooperative is likely to pick up the milk every other day on the fictitious dairy, assuming the dairy has adequate on-farm storage[16]. If the dairy has investments in refrigeration, storage, and low bacterial counts, the pick-ups could be extended to once every 72-hours[17]. To fill a single tanker every other day, the hauler will need to pick up five similarly sized dairies. Assuming stop charges of $50 – that load will accumulate $300 per load or $0.50/cwt in fees. That compares to a farm where a hauler can make a single stop at $50 per load or $0.08/cwt. Consider in this market that, on average, over 90% of the dairies have a similar profile to the proposed dairy. Several assumptions could complicate this scenario – there are no nearby farms that can complete the load, the dairy does not have adequate on-farm storage to permit every-other-day pick-ups, seasonal production variations, inadequate quality, and the miles to the nearest plant are considerable.

Milk Balancing Through 2030

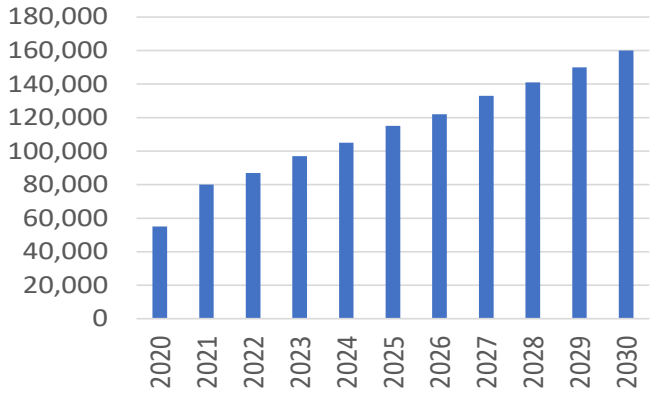
Unfortunately, data suggests the current milk assembly model is not sustainable given the distance, current driver shortage, and higher cost of fuel projected through the end of the decade. Today cooperatives approach passing hauling costs to dairies in various ways, from activity-based costing to cost averaging. With activity-based costing, cooperatives directly assess higher-cost dairies transportation fees without spreading them out to other dairies. Some cooperatives cost average hauling and pass the weighted average cost of hauling to the dairies assuming the entire network is necessary to supply the market; therefore, one farm should not be burdened more than another. Some employ a hybrid of the two models. The incentive programs are typically carrot and stick, encouraging dairy producers to invest in on-farm storage and refrigeration to make routes more efficient and enough of a disincentive to avoid

15 Dairy cows are typically milked two to three times per day for udder health. Udders can only hold so much milk before it needs to be expelled – milking at least twice per day ensures cow comfort and overall health.

16 A casual observation suggests most dairies have sufficient on-farm storage.

17 If the cooperative reduces the pick-up frequency to every three days (<72 hours), adequate quality and refrigeration are needed to avoid negatively impacting the finished product quality.

Chart 18 Truck Driver Shortage Forecast



Source: American Truck Association, Driver Shortage Report 2021

activities that negatively impact the system.

By 2030, there are two significant challenges the market will face 1) milk coming from longer distances to balance the market may become cost-prohibitive, and 2) excessive stops and inefficient routes in the local market could increase costs and become infeasible due to fewer tanker drivers and higher fuel costs. The conclusion is similar for both – there is likely to be additional dairy farm consolidation in the local market with cows migrating to larger dairies capable of assembling cost-effective loads of milk daily or every other day at a minimum. Additionally, there could be some expansion in the local market with dairies of the sizes noted earlier, providing more milk consistently throughout the year. However, some volume will be lost to outside markets – especially in bordering states with expanding, lower-cost milk supplies – whether by raw milk to processing facilities or bottled milk entering the market.

If milk consumption continues to decline, processors left with expensive underutilized assets will likely exit the market consistent with the trend over the last decade and noted earlier in the report. Those closures will shuffle milk supply relationships and ultimately disrupt supply relationships for a time. At that point, cooperatives will be in the unenviable position of passing more costs to remaining dairy producers. As a result, cooperatives and their members will need to review internal policies to determine whether it is more beneficial for all producers to share in the cost of inefficient hauling resulting from plant closures or if it is more appropriate to direct costs to those dairies that generate the expense with the understanding that any dairy could be on that side of the discussion at some point.

Expanding and Improving On-Farm Operations

Throughout the interviews, dairies and cooperatives noted more could be done at the farm level to lessen the supply chain costs, including reduced seasonality, improved quality, and expansion of local milk. Some dairy producers noted their dairy cooperatives were too lenient, with dairies incapable or unwilling to improve quality or operations. The general sentiment, dairies with inferior quality or unmanaged seasonality foist associated costs onto the other members. As quality and seasonality were noted numerous times, it would be appropriate for cooperatives to review programs to determine if more could be done to identify below-average dairies to assist them with targeted improvement or consider enacting stricter policies that isolate the cost of quality and variation to dairies so that individuals can make appropriate cost-benefit evaluations. Accepting poor quality milk or excessive variability negatively impacts the system by raising assembly costs, potentially negatively affecting shelf-life and consumer experience.

Outsourcing by Using Local Resources and Grants

There is state and federal government support to keep dairy farming diverse, sourcing milk from a broad cross-section of farms as that is best suited to fit the needs of a complex consumer market. However, given the above-average attrition in North Carolina and surrounding states, the region would be a candidate for further funding to arrest the declines and develop a cost-effective model for servicing the local market.

Southeastern dairies have tremendous resources from various universities, extensions, dairy promotion, and other programs to provide information about on-farm best practices, markets, vertical integration steps, etc., to assist dairies with producing a more consistent and high-quality milk supply. At the same time, dairy producers may not utilize these resources. Again, it may be incumbent upon cooperatives to effectively incorporate these programs to assist producers, considering mandatory participation for

those operating with below-average results for the region. It would redeploy scarce cooperate resources and potentially unlock a source of money that could support the local market.

Recently, USDA focused funding to provide support for local, underserved, and small agriculture by giving grants to various institutions or professionals to assist farmers or farm organizations. By partnering with universities and extension programs, cooperatives can provide much-needed and possibly funded resources to improve on-farm operations. As an example, in 2021, USDA announced programs like the Dairy Business Innovation (DBI) Initiatives with "efforts to develop higher uses for dairy products." (USDA Public Affairs, 2021). Additionally, the grant scopes are broad, allowing cooperatives to work with these groups for targeted projects to assist the local milk shed. For example, there could be opportunities for Universities to research current logistics issues and technology solutions, and other items plaguing the supply-chain to relay the information to dairy producers and producer groups to assist with streamlining the operation and expanding milk supplies appropriately. As an aside, there was $1.8 million reserved for projects that cover multiple states, utilizing existing dairy resources and serving niche markets like specialty cheese. While those applications are closed, the USDA makes considerable funds available to support local agriculture.

REGULATORY & LEGISLATIVE SOLUTIONS

Globally there are few industries as protected as dairy as most nations rank having an adequate and local supply of milk high. Prioritizing local milk has financial support within the United States. Dairy and related food processing industries create numerous jobs and support rural economies. The sector creates 3.3 million jobs and is 3.5% of the US gross domestic product (GDP) (Dykes, 2021). In short, dairy is important to state and federal legislators, regulators, and administrators. Although the composition of the industry may not be identical to today, there are compelling reasons for the government to sustain a regional dairy industry; however, that is not to imply taxpayers should support an inefficient, high-cost supply chain, but instead, government funds can provide industry assistance to facilitate transition or modernization of the current supply chain. If anything, the pandemic and prolonged supply-chain disruptions have highlighted the importance of have a local supply of milk for the region.

Federal Milk Marketing Orders

Federal Milk Marketing Orders (FMMO) were created and authorized in the 1930s. At that time there were concerns about product quality and safety, disorderly marketing caused by bargaining power imbalances, and outages in various markets (Congressional Research Service, 2017). Absent a uniform price and given the perishability of raw milk, dairy producers and cooperatives were at a disadvantage negotiating price. That is not unique to the United States – in markets with deregulation like Australia, its dairy industry faced similar challenges. The Agricultural Adjustment Act of 1933 authorized the FMMO system with later amendments charging USDA with establishing a minimum milk price.

The charges of FMMOs are few, but important to the US dairy industry – 1) promote orderly marketing; 2) improve the income situation for dairy producers; 3) supervise the terms of trade to promote "more equality of bargaining" between producers and processors and 4) provide consumers with adequate supplies of milk at a reasonable price. Consider, when legislators and regulators created this mandate 70% of the milk consumed as in a glass – a near reversal 90 years later. While important to consider what FMMOs do it is equally important to understand their limitations. FMMOs do not "regulate milk producers or restrict milk production," guarantee milk producers a market for their milk," set a fixed price, or set a maximum price," or create quality guidelines.

It is important to fully comprehend USDA's goals and objectives and what they do not do as it sheds light on why poorly conceived requests are doomed to fail during the hearing process. While the rules are created by industry, USDA is the arbitrator during the negotiation process and the enforcer once rules are in place. For instance, dairy producers often request supply management like the Canadian plan; however, based on what the USDA won't do "restrict milk production" that request is futile. Additionally,

requests to increase raw milk cost, absent well-supported justification, is also unlikely to move through the system as USDA must balance improving the income situation for dairy producers against a reasonable price to consumers. As the largest group of fluid milk consumers are families with children and older Americans – consideration for low or fixed incomes against the average cost to produce milk create tension in the marketplace that USDA must weigh when considering requests. Several times, the current US Secretary of Agriculture has stated industry must find consensus before USDA will entertain a regional or national hearing. Effectively, if the industry cannot agree on a set of rules why involve the legislators and regulators.

FMMOs are notoriously conservative and slow to change, causing milk pricing and rules often chided as unable to keep up with markets. Hearings are infrequent for a good reason - there are provisions of the process that permit dairy producers to terminate regulation if they are unable to find consensus. Many in the industry view the current system as inadequate but better than the alternative, unregulated markets. While complicated, the FMMO system works as designed and the rules are enforced equitably. Absent regulation, dairy producers or cooperatives must negotiate the value of milk. While that can be advantageous when milk is in deficit, dairy producers in Idaho and Utah, a market that voted out the FMMO system, would likely indicate that their milk prices have declined since the termination of the system. Similarly, in 2018, California, a state-regulated system, opted to join the FMMO as it perceived the regulation as more beneficial to dairy producer income than the state system. That does not mean the system is perfect or that data is accurate for today's operating environment. The rules, data inputs, and pricing mechanisms are up for scrutiny; however, while infrequent and deliberate, the process often yields a better solution than the legislative alternatives – the Class I formula change in the 2018 farm bill stands as a clear example of those shortcomings.

The FMMO hearing process provides a venue for all stakeholders to recommend, discuss and vet potential changes to the rules. To be clear, dairy producers create and approve the rules, while the USDA and the Market Administrators administer the regulations. Over time, the USDA migrated a complicated system of individual orders to 11 FMMOs with broadly consistent national rules. The implications, there are very few opportunities for regional rulemaking; most changes require a federal hearing process. That implies few rules within one FMMO would disadvantage another FMMO.

National Hearings

Based on a consolidated and consistent set of national rules, most modifications to the system require a national hearing process. This may be, in part, recognition that dairy products routinely move outside the current FMMO boundaries and that changes in one area could create disorderly marketing by creating unique differences between the markets that could be subject to arbitrage[18] to the detriment of dairy producers in certain markets. It could be argued the Class I differential increase in the Southeast, absent commensurate adjustments in other FMMOs, resulted in an arbitrage opportunity for milk from outsides FMMOs 5 and 7 resulting in more outside milk in the local market. The unintended consequence of a local change to increase the Class I differential for the local market resulted in a higher price, but declining local milk production.

The last national FMMO hearing was held approximately 15 years ago. During the hearing process, stakeholders submit proposals for consideration. That forum considers rule changes that will impact all 11 FMMOs and is the likely venue for recommendations that could profoundly affect the Class I differential maps, make allowances, balancing and transportation costs, etc. However, the timeline for national changes could be three years once the USDA notices a hearing. Further, a federal hearing is a massive negotiation of all topics – including those Southeast dairy producers may have little impact or interest. As mentioned, USDA is unlikely to hold a hearing absent consensus on significant topics from most of the industry; that is not to imply all proposals are completely buttoned up, but that the means may

18 Arbitrage is defined by Merriam-Webster as *the purchase of a security, commodity, or foreign currency in one market for the purpose of immediately selling it at a higher price in another market.*

CLASS I DIFFERENTIAL – A PRIMER

The definition or purpose of the Class I differential is often misconceived as a premium to approximately the value of fluid milk in a local market – that is an inaccurate, but widely held belief amongst a significant number of industry participants. Rather, the Class I differential is a transportation reimbursement to dairy producers. "The intention of the Class I differential is to provide a premium to move milk into the high consumption areas of an order. Historically, a major component of the Class I differential for each FMMO has been the cost of transporting fluid milk from a surplus to a deficit region, or the distance differential. Class I differentials may vary between orders and within an order." (Congressional Research Service, 2017) AMS goes on the explain what USDA considered in 1996 when Cornell built the original U.S. Dairy Section Simulator Model (USDSS),

> *Transportation costs in the model include costs of raw milk assembly, interplant bulk shipment, and the cost of hauling finished products. Transportation costs among regions reflected not only distance traveled, but also differences in wage rates and State highway weight limit restrictions. (USDA Agricultural Marketing Service, n.d.)*

In other words, USDA recognized that servicing the bottled milk market is challenging as many of the processing operations are in or adjacent to metropolitan areas. Additionally, USDA acknowledged, in part, the transportation cost to balance the market; credit for the full cost of balancing – keeping the product in reserve and idling facilities to service seasonal fluid demand appears outside the scope of the project. More importantly, the USDSS model conceived of "a shadow price" of milk or the marginal value of one additional unit of milk processed in the market. The USDSS updated with 1997 data represented the most efficient, least-cost means to supply the fluid milk market. Further, the shadow milk price was an important concept that should help form requests

> *If the regulated price, or cost of milk, is arbitrarily set higher than the shadow price at a particular processing location, a lower cost solution could be found by processing more milk at another location. This would imply higher transportation costs for either raw milk assembly, finished product distribution, or both. Such a result clearly leads to a higher cost, less efficient system. It is also contrary to what is generally thought of as the "orderly marketing" of milk which is a fundamental reason for the existence and goal of Federal milk marketing orders. (USDA Agricultural Marketing Service, n.d.)*

The shadow price of milk in FMMO 5 and 7 may help explain, that in periods where fuel costs decline, the regulated price of milk is higher than other FMMOs suggesting a lower cost solution like transportation of raw or processed milk from outside the markets exists. While the Class I differential change may have been necessary when fuel costs were higher, when prices abated it created an opportunity for milk outside the region to service the market – outside milk became the more efficient and cost-effective solution.

If the GSDSS model functions properly, the goal would be to reimburse dairy producers, or their cooperatives, for the transportation costs related to servicing the Class I milk market; Class II could be considered also as there is a 70-cent addition to the advanced Class IV skim and Grade A butterfat price. Therefore, the Blend price for FMMOs with high Class I utilization would be high, but the mailbox price would be comparable to other FMMOs if the cost of transportation is passed back to dairy producers. That is consistent with the All-milk and mailbox price observations in FMMO 5 and 7.

While the USDSS model may function properly, the industry could easily argue that the 1997 data are outdated and that USDA should undertake efforts to update the model for changes in the location of farms and plants over the last 25 years. Clearly, the USDSS model determined the most efficient and cost-effective means of servicing the fluid market in 1997 – current costs, location of operations, and technological advancements are absent in the current model.

be up for negotiation, but the goal or end is generally the same.

Conversely, stakeholders can provide input on Southeast proposals. At issue, the timeline may eventually effectuate changes, but solutions may arrive too late for some dairies and processors. Further, there is no guarantee the outcome of the lengthy process will address local concerns. Further, there is no guarantee the outcome will favorably impact the operating environment by increasing fluid milk consumption, providing at least a break-even milk price to dairy producers, or slowing attrition for milk processors. Referring to USDA's goals and what they do not do – the pricing will be benchmarked and likely an average for the operating region. That may benefit dairy producers and processors capable of operating at or below the average; there is little relief for those operating above benchmark rates.

Raising Class I Differentials or Milk Prices

Raising prices is often a fool's errand as it pits producers against consumers, creating opportunities for others to capture a larger share of the local markets. Supply and demand will determine the equilibrium milk price that clears the market. That said, US dairy milk prices are regulated with a goal of orderly marketing conditions within the boundaries of FMMOs. When regulations are based on outdate information it can negatively impact FMMOs and create arbitrage opportunities that should not otherwise exist in a regulated system.

With the understanding of the Class I differential purpose and the intent of the USDSS model used to establish those differentials, when regulated prices no longer represent the most efficient and cost-effective way to assemble milk for an FMMO it should be reviewed. The current Class I differential is based on 1997 data, with FMMO 5, 6, and 7 updated for 2008 information. In any case, a dynamic model like the USDSS requires periodic updates and review to capture the current costs, dairy and processing locations, and local market demand otherwise the Class I differential could be based on dated information that no longer reflects the current price surface resulting in disorderly marketing. A hearing request, absent information could be difficult for the myriad reasons noted throughout the report – specifically, consensus will be difficult as positions will be based on conjecture rather than facts – a receipt for unintended consequences that tend to negatively impact dairy producer milk checks. Rather than requesting a hearing, the Southeast dairy industry could consider steps to compel USDA to update the USDSS model for the industry as it is not meeting its objectives of promoting orderly marketing and improving the income situation for dairy producers. Given the amount of Class I utilization in those FMMOs and the impact on dairy producer milk checks, it could be considered imperative to the health of the local market.

Once industry has updated information it could begin to review the current Class I differential map to determine whether changes are appropriate. Consider, consumers have more beverage choices relative to 25 years ago and that milk cost increases could drive consumers to alternative products accelerating losses in the category. Focus on inter-FMMO competitiveness may provide relief to the local market without overburdening consumers.

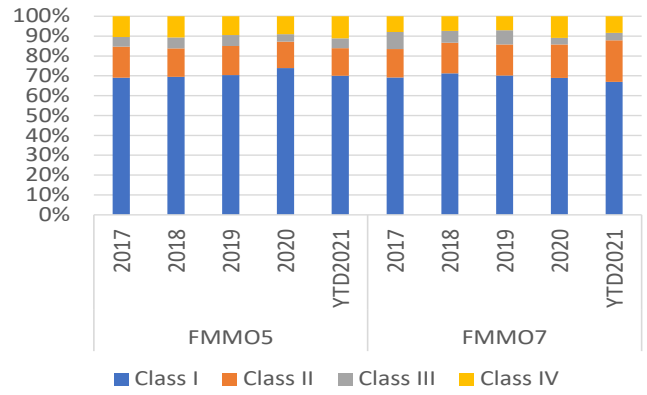
Consolidation

Given the size, similarities, and joint management, one consideration is the appropriateness of consolidating FMMOs 5 and 7 into a single region to allow for consistently applied rules and fewer incentives to play one system off the other. FMMOs 5 and 7 orders ranked as eighth and ninth by total producer milk handled in 2019[19]. FMMOs 5 and 7 ranked fifth and sixth in dairy producers, respectively, as of August 2021; consolidated the market would tie the Mideast (FMMO 33) for the third-largest market for dairy producers delivering milk within the federal order system.

Further, the milk utilization in the orders was similar and has been consistent during the past five years suggesting that consolidation may have a limited impact on dairy producer checks. The benefits of consolidation could include consistent rulemaking across a similar region and potentially better coordination moving milk throughout the unified area. However, that would need further review and

19 As of December 21, 2021, AMS has not completed the 2020 report; however, the partial 2020 report through September 2020 had similar results.

Chart 19 Historic Milk Utilization FMMO 5 & 7



Source: AMS 2017-2021 Utilization of Producer Milk in Class I-IV Products

input by the Market Administrator. The impact of outside milk on a consolidated system would require further exploration.

Transportation Credits

As discussed earlier, FMMOs 5 and 7 could contemplate modifying existing transportation credits to assist and, in part, finance milk movement throughout the region and enhance assistance for milk that travels into the system. The interviews yielded that dairy producers pay to balance the market through direct and indirect hauling charges. Further, cooperatives are responsible for shortfalls between the cost of seasonal milk and related transportation to service the market – a price that ultimately gets transmitted back to its membership. Transportation credits could be modified to balance a demand complicated by size, relationships, and expanding distances from farm to plant. This could be a regional fix to address the previously mentioned shortcomings of the current Class I differentials; however, if there are national changes to the Class I differentials – corresponding changes to the transportation credits may be appropriate. Again, caution is appropriate as raising costs to processors could result in more milk imported a raw or packaged product to the local markets. Given the nominal transportation fees that seem like less of a risk, but it should still be considered.

Balancing Costs Credits

While there are sizeable players in the Southeast, no one group commands sufficient bargaining power to enforce over-order premiums. As a result, there is too much incentive to purchase raw or processed milk from other regions if the over-order premiums are excessive – consistent with the shadow milk price theory. Further, plant closures complicate relationships in the local marketplace. An example of the difficulties of maintaining cooperative efforts to serve the local market would be the repeated demise of various marketing agreements in common. Regulation of balancing and transportation of milk could reduce the burden on dairy producer milk checks without negatively impacting consumers.

While some commodity milk powder plants are built to service overseas and domestic demand, others largely situated on the East Coast remain balancing plants. Although the current regulatory system attempts to address the costs of balancing, it appears to fall short. There is cost reimbursement for transportation; however, the recognition of balancing plants saturated with milk during surplus periods and empty facilities during deficit periods is a burden shifted to cooperatives and ultimately dairy producers.

Throughout the interview process, balancing was one of the most discussed topics with consensus the costs to the supply chain were not properly reflected. Balancing costs are difficult to assess within FMMOs due to the insufficient bargaining power of dairy producers. The economic theory of an externality may be applicable to balancing costs within FMMOs. The International Monetary Fund (IMF) defined externalities as “the indirect effects have an impact on the consumption and production opportunities of others, but the price of the product does not take those externalities into account. As a result, there are differences between private returns or costs and the returns or costs to society as a whole.” (Helbling, 2020) Regulators step in to manage the economics of an industry when externalities exist. Pollution is a typical example of an externality – absent regulation, companies benefit from the lower cost of dumping waste into a river; however, downstream consumers or riverboat operators are impacted by polluted waterways. In this case, the polluting company created a negative externality as its decisions did not consider the cost of pollution to society – the

indirect costs were passed onto society rather than the product cost.

While negative externalities are a large economic concept – there is applicability for dairy and balancing costs. There are documented costs of balancing – transportation, distressed milk prices, reserve milk premium, labor, under-utilization of plants, etc. Bottlers or other processors that flex operations to meet demand resulting in highly variable milk intake are making profit decisions without proper consideration for the cost of balancing that market. Similarly, dairy producers that do not manage seasonality may also create negative externalities for cooperatives and other dairy producers. At issue, as the IMF discusses, "When there are differences between private and social costs or private and social returns, the main problem is that market outcomes may not be efficient. To promote the well-being of all members of society, social returns should be maximized, and social costs minimized. This implies that all costs and benefits need to be internalized by households and firms making buying and production decisions. Otherwise, market outcomes involve underproduction of goods or services that entail positive externalities or overproduction in the case of negative externalities. Overproduction or underproduction reflects less-than-optimal market outcomes in terms of a society's overall condition." (Helbling, 2020)

It could be argued North Carolina and surrounding states should maintain local dairy markets and a vibrant producer base to service internal needs, at least in part. The pandemic and the lasting supply-chain impacts reinforced that message given supply chain disruptions and years of stock-outs at retail. It is important for legislators to understand not only the positive economic impact of dairying and the extended food processing sectors for the state economies but the importance of a reliable food supply. Less local agriculture could, at times, result in a negative externality for society should food production or supply become unreliable.

Balancing is a complicated topic as wholesale compensation to all market participants through the blend price appears unfair, rewarding those that do not perform a balancing function for the FMMO by failing to address the costs absorbed by the system for seasonal operations. Simultaneously, how the market recognizes balancing function can be nuanced also. Some handlers employ commodity plants to absorb the milk supply fluctuations, others use a complicated set of sales networks and storage, and some do all the above. Balancing appears ripe for a market-wide service payment; however, the industry will need to provide more input as the impact is highly regionalized. Further, this appears to be a national issue as any regional adjustments could create a shadow milk price providing arbitrage opportunities for other FMMOs.

Left unaddressed, balancing costs are a market failure. Again, given the pretext of USDA goals of orderly marketing and to improving dairy producer income situation, balancing fees should be within the scope of discussion. However, more data is needed to provide a clear request to address the negative externalities and present market failure. Market-wide service payments appear an appropriate tool for addressing the issues, but the industry will need to determine activities that constitute balancing, an appropriate fee, and how those will be redistributed to those incurring balancing costs.

All or None

The all-or-none approach of the FMMO could be its greatest shortcoming. One of the biggest critiques of the existing FMMO regulation is that the system is not dynamic and incapable of keeping up with brisk markets. While the criticism is legitimate, it may not be the whole of the system, but rather the static nature of the data. Reviewing the economic principles, models, and underlying theory behind the FMMO price regulation, admittedly it is complicated, but that level of complication may be appropriate for a geographically diverse, product dense, and ever-evolving marketplace. Further, under FMMO regulation the US dairy industry, overall, has expanded and become a reliable exporter during the last two decades.

While the industry should find consensus ahead of a hearing process, updating studies and data, relevant to the marketplace should not be confined to the rulemaking process. There should be some stability for the price surface and markets, but waiting 15 or more years, given dynamic markets, is entirely

too long for regulation to remain effective without creating market inefficiencies. Additionally, the system, because of outdated information, should not put good operators out of business or create arbitrage opportunities within the FMMO system – that is antithetical to USDA's goals and objectives.

During a national hearing process, it would be appropriate for the industry to consider some indexing for items like transportation, labor, etc that have a significant impact on dairy producer milk checks. That would permit the system to update to current markets without having to entertain a hearing process. Again, referencing the FMMO 5, 6 and 7 Class I differential change as an example of how static data can disadvantage a region. Indexing would permit fuel costs, for instance, to move periodically up and down. That may have mitigated the resulting disparity between the orders that incentivized outside milk in the local market that pressured some dairies and processors to exit the business.

School Milk

The Health, Hunger-Free Kids Act (HHFKA) enacted in 2010 may be an area that merits review and legislative efforts to correct decision-making that incorporated inaccurate assumptions. USDA noted HHFKA as the catalyst that accelerated milk consumption declines, especially among children. In 2010, widely held beliefs linked saturated fats to heart disease, the leading cause of death for U.S. adults 65 and older in that year (Arialdi M. Miniño, 2012). In 1977, the Senate led by George McGovern studied "Dietary Goals for the United States." In 1980, USDA codified those findings, and a few years later, the National Institute of Health recommended Americans over the age of two drop their fat intake to reduce their chance of a heart attack. By 2012, Americans were sicker than ever, with diabetes, pre-diabetes, and other ailments increasing. Still, heart disease maintained its top spot (Walsh, June). Decades after those recommendations, scientists found that not all fats are bad and that fats, like dairy, may not be as harmful as once thought. Unfortunately, the government enacted HHFKA before the new studies concluded. School milk butterfat was reduced from 1% and 2% to 0% and 1%, driving taste deficiencies that caused children to choose other products or drink less milk. It is unclear whether the legislation weighed the impact of modestly higher butterfat intake against the nutritional benefits like vitamins, micronutrients, and protein eight-ounces of milk of imparts. Further, consideration that, for many children, school meals may account for most of their daily nutrition, or the nutritional requirements for athletes may fall short under the current dietary guidelines. Unfortunately, that policy caused a profound negative shift in consumption, one that a decade later is just starting to reveal the negative impact on milk intake.

As a result of the pandemic, under Secretary Vilsack, the USDA provided funding to continue free school meals through the end of the 2021/22 school year. As mentioned, free meals appear to be lifting school milk consumption. Suppose industry or state and federal legislators permitted changes to milk's butterfat content, returning it to pre-HHFKA levels, and followed California's example by legislating free meals. In that case, it may begin to undo some of the sizeable declines over the last decade.

In part, USDA and states may need to allocate additional funds to help schools purchase milk – similar to the December 2021 announcement of $1.5 billion to supplement school purchases caused by rising costs. Today, school milk is a low-margin, fiercely competitive market; processors are exiting the business in some parts of the country. In the Southeast, school milk likely provides some cost absorption for plants but remains a very low, if not negative, margin product. Legislative changes, including permanent funding, could positively impact farm milk checks over the long term if access to school milk causes declines to slow.

Regulatory Solutions are Slow

While the region should actively participate in the regulatory process to ensure an outcome that does not disadvantage North Carolina and other southeast states, it is, by design, a deliberate process designed to drive consensus. That implies solutions that apply to large swaths of the country versus precise solutions for the region. Additionally, the process is exhaustive and can take considerable time and resources to influence.

CONCLUSIONS

In summary, North Carolina and other Southeastern dairy states are experiencing farm exits, and milk production declines faster than the U.S. average, but this is not new; it has been happening for decades. The rate of decline accelerated after the Healthy, Hunger-Free Kids Act (HHFKA) Act of 2010 when school-aged children consumed less milk, whether from alternative offerings like water or inferior taste due to reduced butterfat in the milk. The Southeast has the most Class I utilization of any region of the country, with three of four loads of milk headed to bottling. At the same time, the Northeast, Mideast, and California process more milk for bottling than FMMOs 5 and 7 combined but are not experiencing the same declines; on the contrary, these regions grew milk supply and processing over the past two decades. At issue, the Southeast has not invested outside of bottling and lacks diversification represented within other areas – all of the proverbial eggs are in a single basket – bottled milk. For decades consumers migrated from drinking milk to eating dairy products. This trend is unlikely to reverse. The pandemic conclusively proved what most believed, people are too busy to sit and have a bowl of cereal with milk. Drinking milk does not fit a grab-and-go lifestyle adopted by many Americans. Additionally, many beverage choices significantly reduce occasions to drink milk.

With assets focused on gallon jugs and school milk, regional cooperatives are burdened with lower margin milk products, complicated and costly balancing, considerable distances between farm and processor, and market demand that is in decay. There is no silver bullet solution – it will take a concerted effort and improvements throughout the supply chain from farm to plant to attempt to slow and reverse current trends. Unfortunately, dairies with fewer than 100 cows are likely to exit, given the historical data. There are opportunities for smaller dairies to consider vertical integration, but that is not necessarily a solution for all producers and needs to be vetted throroughly before making investments as it may not be an appropriate solution for everyone.

Regulatory considerations are unlikely to sway consumers' purchase decisions but updating models and data could provide the information needed to evaluate potential changes to the system to address negative externalities caused by balancing costs absorbed by dairy cooperatives and producers. Presently, the outdated information and infrequent data updates may be creating arbitrage opportunities that could disadvantage FMMOs, including the Southeast, compared to others. A lot of consolidation and migration of operations occurred since 2008 – the data and regulatory constructs should reflect those updates. Further, the FMMO is limiting absent periodic model review and indexing that would permit recalibration of the system outside of the hearing process. Regionally, there are some opportunities to provide a backstop to the national hearing process by addressing ideas of order consolidation as well as temporary adjustments to the transportation credit system with the understanding further adjustments may be needed should a federal hearing recalibrate the Class I Differential transportation reimbursement.

While inflationary pressures resulting, in part from the pandemic, are negatively impacting the entire dairy supply chain, higher fuel prices and fewer drivers may provide stakeholders time and USDA funds to contemplate overhaul of the existing supply chain and expansion of local milk supply; conditioned on cost-effective growth, meaning, the milk, on a net, landed cost basis, needs to remain competitively priced.

The pandemic wreaked havoc on milk prices and the dairy supply chain. However, the pandemic also shed light on milk consumption trends and likely confirmed milk doesn't lend itself to a grab-and-go lifestyle like other dairy products. While the pandemic challenged the supply chain, the long-term impacts, including supply and labor shortages and inflation that could linger for months, are taking an enormous toll.

In summary, stakeholders need to make changes on several fronts to reverse milk production declines. Because there are so many issues for the market, no single solution will alter the current course; however, over time, efforts in all areas could slow losses and create a robust market like other regions.

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