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## Impacts of COVID-19 on the U.S. Dairy Industry

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# Impacts of COVID-19 on the U.S. Dairy Industry

by Connor Mulvey, Ryan Peters, Nathaniel Rutkowski

# Impacts of COVID-19 on the U.S. Dairy Industry

An Interactive Qualifying Project  
submitted to the Faculty of  
WORCESTER POLYTECHNIC INSTITUTE  
in partial fulfillment of the requirements for the  
degree of Bachelor of Science

by  
Connor Mulvey  
Ryan Peters  
Nathaniel Rutkowski

Date:  
May 13<sup>th</sup>, 2020

Report Submitted to:

Dr. Ingrid Shockey and Dr. Uma Kumar  
Worcester Polytechnic Institute

*This report represents work of WPI undergraduate students submitted to the faculty as evidence of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review. For more information about the projects program at WPI, see <http://www.wpi.edu/Academics/Projects>*

## Abstract

The onset of the COVID-19 pandemic in the spring of 2020 exacerbated existing issues and vulnerabilities experienced by dairy farmers. We evaluated the impacts of the COVID-19 pandemic on the dairy industry by analyzing dairy market trends, interviewing dairy farmers, cooperatives, processors, vendors, and surveying consumers. We found that the shifts in demand due to unpredictable and dramatic societal changes lowered the price of milk, disrupted the supply chain, and left the dairy industry lacking in government support. We recommend short-term financial relief and long-term stability measures.

# Executive Summary

## Evaluating impacts of COVID-19 on the dairy industry

With the onset of the Coronavirus Disease of 2019 (COVID-19) pandemic, dairy farmers and the entire dairy industry saw wide changes in demand and supply chains. At the time of this report (March-May 2020) changes in domestic markets and the workforce upset systems that could not accommodate the rapid shift. The closure of non-essential businesses across the country including schools and restaurants has strongly shifted demand for dairy products from food service to retail markets.



Figure A: Happy dairy cows graze on a lush green pasture. Retrieved from the Facebook page of Buttercup Farm, 2020.

The United States (U.S.) is a significant producer and consumer of dairy products and has transformed into a technologically advanced and complex system which relies on many large organizations as its framework. Notably, dairy farms and dairy farmer cooperatives have been consolidating since the 1990's. Many smaller farms have been going out of business and selling out to larger farms. Between 1997 and 2017 the U.S. lost more than half of its dairy farms. Over the same time period, the average number of cows per farm more than doubled. (Morris & Richard, 2019; USDA & National Agricultural Statistics Service, 2019, 2020).

The COVID-19 pandemic came at a time that was already difficult for dairy farms in the United States. Our goal was to take a deeper look at the implications and consequences that faced this industry, both during the pandemic and looking ahead toward an uncertain future. We focused on East Coast farmers, many of whom have farmed for generations on the same land. To meet our goal, we identified 3 critical objectives. First, we evaluated changes in dairy farming

practices in response to the pandemic. Second, we determined the impact of the coronavirus pandemic on dairy cooperatives and creameries. Third we assessed vendor and consumer behavior during this time.

### Approach

Our data collection relied on interviews with key stakeholders within and supporting the dairy industry (Figure B). Interviews were conducted virtually over the phone and through Zoom. Questions can be found in the appendices.

### Results and discussion

Key results of our survey and interviews with dairy farmers, cooperatives, processors, vendors and consumers are presented here by objective.

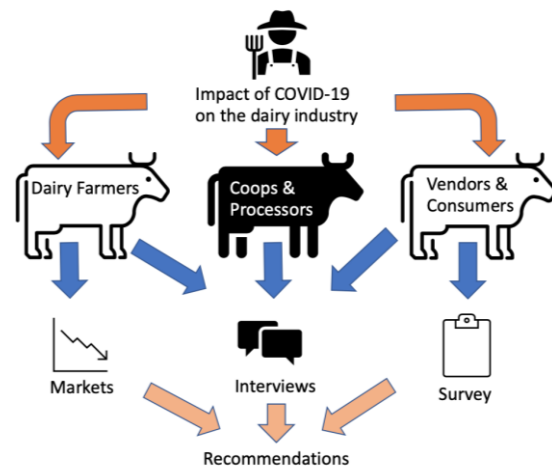


Figure B: Graphical representation of our methods.

## Executive Summary

### *Impact of COVID-19 on dairy farmers & the dairy market*

Weekly reports from the United States Department of Agriculture revealed that the market value of dairy products decreased sharply as the COVID-19 pandemic unfolded in the United States. This was a result of demand shifting from the food service industry to retail, largely as a result of school closures and reduced restaurant services.

We interviewed several farmers that ran their own farm stands or had their own independent processing facilities and found that these farmers had seen a significant increase in sales. Meanwhile, most farmers that simply sold raw milk to processing companies through their cooperatives saw prices for milk slashed and had to dump their milk. The interviews indicated that the relationship between farmers, cooperatives or processors, and the products they make had a great impact on their experience from COVID-19. In line with shifts in demand, we found that farms, cooperatives, and processors who make commercial food service products struggled to sell, while those making retail products were maximizing their manufacturing capabilities.

The majority of farmers we interviewed were uncertain about the long-term impacts of the COVID-19 pandemic on their farms with a few suggesting there was a possibility that they would be going out of business due to the financial losses. Despite these financial hardships and the bleak outlook on their industry only one farmer we interviewed had received financial assistance from the government.

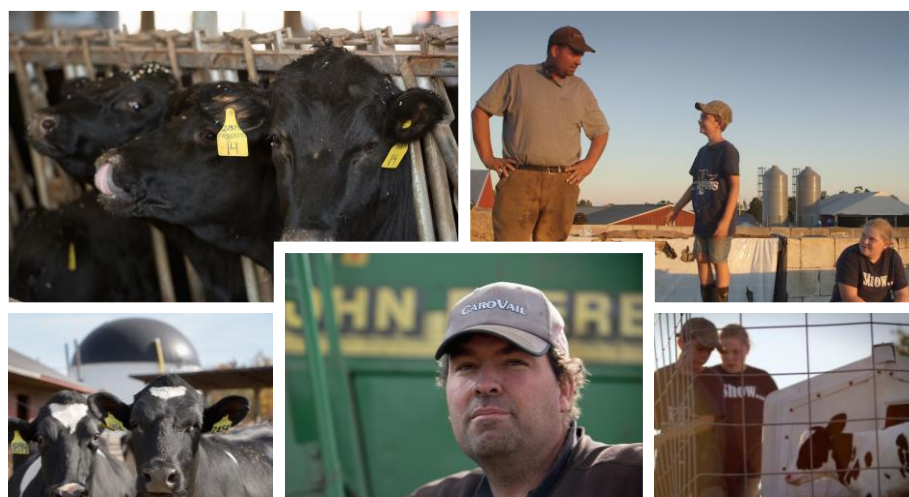


Figure C: A six-generation farm, concerned with making the business viable for their children. Retrieved from Vanguard Renewables, 2015.

### *Cooperatives and creameries*

Our interviews with processors revealed that those that made retail consumer products experienced minimal disruptions. Meanwhile, processors that made a mix of retail and bulk products intended for the food service industry had to significantly reduce the amount of milk processed despite maximizing the production of retail products.

Reducing the amount of milk that processors take in resulted in coops needing to dump milk and requests for farmers to reduce their daily milk production. This was catastrophic for dairy farmers, as they were getting paid less for their dumped milk and losing out on revenue by reducing milk production but still had to spend money taking care of the cows.

### *Analysis of consumer behavior*

Our interviews and survey with consumers revealed that there was initially some concern about the availability of dairy products as consumers were panic shopping in March. However, by April there tended to be few issues with dairy products being in stock at grocery stores. This juxtaposes against the tragedy of dairy farmers dumping their surplus milk.

We found that consumers were concerned about stocking up on dairy products due to their availability and expiration. This led to some consumers trying other brands or switching to dairy substitutes often citing their longer shelf life as a reason to make this switch. In some interviews we found that consumers had transitioned to buying from local farm stands and were likely to continue to do so in the future.

## Executive Summary

### *Discussion*

In our interviews it was revealed that dairy farms with a more diversified business tended to suffer less during the pandemic. We learned that there was a shift towards more people purchasing from local markets rather than chain stores during the pandemic. This led to farmers that were able to sell directly to consumers through farm stands to see an increase in sales as the COVID-19 pandemic took hold in the U.S. These farmers with more independence from the dairy market seemed to be less severely affected by the pandemic.

On the other hand, farms that do not have a niche market, primarily sell raw milk to their cooperatives and processors and have been hit harder by the COVID-19 pandemic. Many of these farms that we talked to have been on the decline over the past few years as they struggle to profit off depressed milk prices. With the pandemic, milk prices have dropped and will hasten the closure of many farms. Due to shifts in demand processors are taking in less milk, leaving many farmers no choice but to dump milk.

Our interviews revealed that the CARES Act was not effective in helping most of these dairy farmers. Larger farms that are eligible for aid by the government may be hurt in that they can only receive up to a certain amount of money even if their initiatives are funded. Many of the farmers also could not sell their milk on a larger scale because of the government regulations around selling raw milk. This could have provided farmers with an additional source of income rather than having to dump raw milk.

### Recommendations and conclusions

The following section outlines key recommendations we developed during this project.

#### *Recommendations*

We hope that some of our observations can assist with planning and policy for the industry if faced with recurrent or similar events. Many of the farmers we talked with expressed frustration and confusion about government programs. The government should better fund and make more programs accessible that can help farmers like PPP, CFAP, and WHIP+. The government regulations of the dairy industry should be carried out to consider deregulation. Regulations on dairy farms should better accommodate the two directions that the industry is going in: niche products and industrial farms.

The COVID-19 pandemic has caused a huge disconnect between cows and consumers, in part causing many farmers to dump milk. The supply chain needs more flexibility to better react to ensure milk makes it to consumers. As new processing facilities are built or remodeled, we recommend investments be made to ensure that they processing lines are more customizable so they can more quickly change between commercial and consumer products and packaging. Red tape regulations may need to be temporarily eased, and financial support will be required

Local farms are critical to maintain as they ensure biodiversity in the food industry, protect natural resources and the environment, and sustain local, rural economies (Nowakowski, 2018; USDA, n.d.). To help keep small farmers in business, we recommend that consumers consider the origins of their food and purchase from local farm stands if possible. We recommend policymakers develop plans to support sustainable small dairy farmers through subsidies, implementing programs to assist farmers in reducing operating costs or increasing profits, and increasing funding to existing programs dedicated to helping small farms.



*Figure D: A Vermont Breakfast on the Farm outreach event. Retrieved from the Facebook page of Gervais Family Farm, 2018.*

One of the issues facing the dairy industry in the long term and that has damaged the market in the past is unstable trade relations with other countries. The potential impacts on the dairy industry should

## Executive Summary

be more carefully considered in trade negotiations. Retaliatory tariffs have often been placed on American agricultural products like dairy which hurt the competitiveness of U.S. dairy internationally. An internationally competitive dairy industry should be maintaining a balance without destroying small local farms.

### *Conclusions*

At the close of this project, we realized the complexity of the U.S. dairy industry and the hardships that farmers have faced for years. This project revealed that we are systematically undercutting some of the most critical food sectors in our country. In the face of a global pandemic, we have learned that the United States cannot meet essential United Nations sustainability goals. The U.S. dairy industry must explore ways to build resilient infrastructure and ensure sustainable consumption and production practices so there is less volatility and disruptions to the industry. Many dairy farmers have been in the same family for generations and must be protected and preserved as it is essential for their family's existence, biodiversity and the local economy.



## Acknowledgements

We would like to give a special thanks to all the people who took time to talk with us, and all of those working in the dairy industry every day to bring us our favorite nutritious drink and other delicious dairy products.

Thank you to Professor Alexander Smith for his insights and guidance on the economics of the dairy market.

Finally, thank you to our advisors Professor Ingrid Shockey and Professor Uma Kumar for their guidance and feedback throughout the project, always pushing us to a higher standard.

## Authorship

The entire report was a joint effort among all three participants: Connor Mulvey, Ryan Peters and Nathaniel Rutkowski. All the main components of the paper, executive summary, introduction, literature review, methodology, results and discussion, recommendations, and conclusions, were equitably divided and shared, usually along the objectives of the project. The acknowledgements were written by Ryan. The abstract was composed by Nathaniel. The authorship section was written by Connor. All of revisions of the paper were done as a group.

## About the Authors

### Connor Mulvey

Good readings, this is Connor. I have grown up in a suburban town in Virginia before going off to Worcester Polytechnic Institute (WPI) to study chemical engineering. My only experience with farm animals was recreational chicken farming and herb gardens but it sparked my interest in agricultural topics from a young age. It was my great joy hearing the stories of all the farmers and stakeholders that we talked to and I hope we can impact some change.



### Ryan Peters

Hello! My name is Ryan Peters, and I am a Biology/Biotechnology student at WPI. I grew up on a small beef farm in Southbridge Massachusetts, though it was previously a multi-generational dairy farm. Throughout this project I have enjoyed immersing myself in learning the details behind dairy farms and the broader industry. I especially enjoyed talking to various stakeholders and hope we have been able to justly convey their stories through this work.

### Nathaniel Rutkowski

Hello, my name is Nathaniel Rutkowski and I am originally from East Lansing, Michigan. I am a current junior at WPI and am studying Aerospace Engineering. I really like farm animals and enjoyed being able to meet new people and hear about their stories. I hope this project is able to have a positive effect on dairy farmers.



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## 1.0 Introduction

Given the circumstances of the Coronavirus Disease of 2019 (COVID-19) pandemic, dairy farmers and the entire dairy industry saw wide changes in demand and the supply chain. At the time of this report (March-May 2020) changes in international trading, domestic markets, and the workforce upset systems that could not accommodate the rapid shift in demand. Dairy products such as milk and cheese normally provided to schools and restaurants were not sold when many of these outlets closed or limited their operations. Starting in March 2020, farms, processing facilities and vendors were at risk due to potential health hazards and workforce shortages. Dramatic images of farmers dumping milk had made national news, but less had been done to evaluate the far-reaching impacts of the pandemic on the dairy industry.

The pandemic came at a time that was already difficult for dairy farms in the United States (U.S.). In 1992, the number of small dairy farms with less than 200 cows accounted for over 66% of the nationwide inventory of cows. However, by 2006 this number had dropped to only 38% of the nationwide inventory. Consequently, larger dairy farms with over 1000 cows had increased their share of the nationwide inventory from less than 10% to over 33%. This shift in the dairy industry is caused by small farms not being able to earn enough money to profit and cost advantages, such as producing more milk with fewer resources, has led large farms to become more profitable. Reports from the United States Department of Agriculture (USDA) suggest that consolidation of dairy farms is likely to continue, driving small dairy farmers out of business (Macdonald et al., 2007). This trend has continued, and in 2019 the USDA reported that the number of dairy farms in the U.S. had decreased by 6.8% (Dickrell, 2019).

Our goal therefore was to take a deeper look at the consequences that faced this industry during the pandemic and looking ahead toward the implications on an uncertain future. We focused on East Coast farmers, many of whom have farmed for generations on the same land. To meet this goal, we identified 3 critical objectives. First, we evaluated changes in dairy farming practices in response to the pandemic. Second, we determined the impact of the pandemic on dairy cooperatives and creameries. Third, we assessed vendor and consumer behavior during this time. We hope that this work can assist with planning and policy for the industry if we are faced with recurrent or similar events.



## 2.0 Current State of the U.S. Dairy Industry

We begin with an overview of dairy farming challenges in the U.S. today, and outline the general mechanics of the supply chain and market systems. We investigate changes in the industry over the past few years. We feature data and reporting on how farmers were coping with the COVID-19 pandemic at the time of this writing in the spring of 2020. Finally, we focus on the implications of changes both in consumer behaviors and in farming practices due to the COVID-19 pandemic.

### 2.1 Susceptibility of the dairy industry to crises

In recent years, the U.S. dairy industry has been destabilized in part due to shifts in consumer preferences. These changes caused two major milk processing companies, Dean Foods and Borden Dairy, to file for bankruptcy as the loss of income has made their debt unsustainable (Byington, 2020a, 2020b). Before the COVID-19 pandemic the dairy market was rebounding. The USDA Livestock, Dairy, and Poultry Outlook reports indicated that average all-milk wholesale prices rose in 2016, then fell from 2017 to 2018 and began to rebound in 2019 (Cessna, 2020; Cessna & Law, 2019; Law & Cessna, 2017, 2018). However, the pandemic and its associated closing of schools and businesses meant that farmers expected prices to decline in 2020 (Donnay, 2020; Moore, 2020).



*Figure 1: Holstein cows in a pasture (Jacoby, 2018)*

In fact, as of mid-April 2020, the dairy industry was predicted to decline due to the COVID-19 pandemic (Rabobank, 2020). Some farmers were concerned about day-to-day operations of their farms if employees were affected by the coronavirus. Larger dairy farms

operate 3 shifts of 8 hours each day to keep the farm running and milk the cows multiple times every day. If employees were to miss work, it would severely impact the productivity of the farm (Moore, 2020; Sheehan, 2020). These fears and predictions suggest that the production and infrastructure of the dairy industry in the U.S. was not immune to events such as the COVID-19 pandemic. Furthermore, comparing the current state of the U.S. dairy industry to sustainability rubrics such as the United Nations (UN) global sustainable development goal 9 and goal 12 to “build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation” and to “ensure sustainable consumption and production patterns” suggests there are existing weaknesses in the resilience of the dairy industry, now made worse during a crisis (Spröte, 2010).

World events are also a major factor in the volatility and resilience of the U.S. dairy market. This was shown during the upheaval of international trade deals starting in mid-2018. U.S. tariffs and resulting retaliatory tariffs, and the abandonment of major free trade deals such as the Trans-Pacific Partnership trade pact and the North American Free Trade Agreement hurt the industry and stoked uncertainty. These two trade agreements were especially important since 50% of U.S. dairy exports went to Asia, 25% to Mexico, and 8% to Canada in 2017. These trade conflicts became a source of uncertainty in the U.S. markets and will likely continue to be a big factor in market volatility (Cessna, 2020; Cessna & Law, 2019; International Dairy Federation, 2019; Law & Cessna, 2017, 2018; Wiesemeyer, 2019).

## 2.2 The evolving U.S. dairy industry

The U.S. is a significant producer and consumer of dairy products. In 2019, the country’s 9.3 million dairy cows produced more than 218 billion pounds of milk, and Americans consumed 215 billion pounds of dairy products on a milk-fat basis (Cessna, 2020). In order to get here, the dairy industry has evolved over time into a modern system of farming.

Notably, dairy farms and cooperatives have been consolidating since the 1960’s. These cooperatives are owned by groups of farmers who band together to find markets for their milk (Morris & Richard, 2019; University of Minnesota, 2019; USDA, 2019c). The processors that buy this milk are part of an increasingly complex supply chain aided by advancements in technology (Kroll, 2015). The government plays a significant role in regulating and supporting the industry through federal, state, and local policies and programs. Additionally, the government

maintains a plethora of data through various reports on the market (USDA, 2019c, 2020f). This evolution from small family farms illustrates how the dairy industry in the U.S. has transformed into a technologically advanced and complex system which relies on many large organizations as its framework.

For several decades dairy farms have been consolidating, with many smaller farms going out of business and selling out to larger farms. Between 1997 and 2017, the U.S. lost more than half of its dairy farms. Over the same time period, the average number of cows per farm more than doubled. These changes are not isolated to dairy but reflected trends across all U.S. agricultural industries. Between 2012 to 2019, the total number of farms in the U.S. dropped by 86,410, a 4.0956% decrease, while the average farm size grew by 11 acres, a 2.5% increase (Morris & Richard, 2019; National Agricultural Statistics Service et al., 2020; USDA & National Agricultural Statistics Service, 2019, 2020). This is a continuation of a trajectory that has been seen for decades. These trends are partially driven by global pressures of industrialization that necessitate increased use of technology with expensive overhead costs and tighter margins. The same globalized economy can import products that undercut and destroy small local producers (Bello, 2007; Gray & Boehlje, 2007; Olmstead, 2016).



Figure 2: A family of farmers interact with their cows on a small farm. Retrieved from the Facebook page of Buttercup Farms, and [www.buttercuprawmilk.com](http://www.buttercuprawmilk.com).

The incorporation of technology and general industrialization of farms has increased the efficiency of cows and farms as a whole. Figure 3 shows that total milk production has been rising over the past four years and continued thus far. Despite slight reductions in the number of cows in 2019 milk production grew compared to 2018, which was made possible by increased efficiency. Milk production per cow increased by 1.0% in 2018, which is slightly lower than the prior compound annual growth rate of 1.3% each year between 2007-2017 due to advances in technology, precision dairy farming, and genetics via selective breeding (Cessna & Law, 2019; Runyon, 2016). Figure 3 also shows the seasonal variation in milk production, which is due to bovine physiology, but has implications for the supply chain and vulnerability of the whole market.

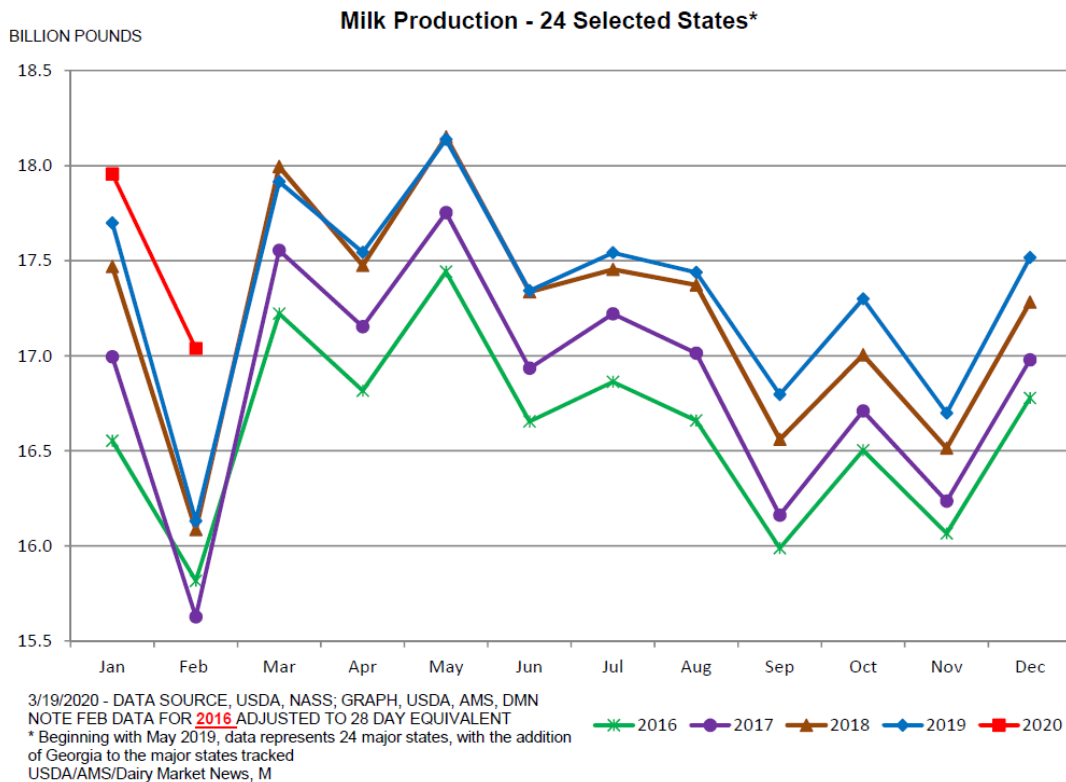


Figure 3: Milk production in the major 24 U.S. milk producing states from 2016 to March 2020. Retrieved from USDA Dairy Market News.

Another changing component in the U.S. industry is dairy cooperatives. Typically, these organizations are owned, funded and run by their farmer members. In 2017, 85% of milk marketed by U.S. producers was managed through cooperatives. However, cooperatives have been consolidating, just like the farms themselves, falling from 1,244 cooperatives in 1964 to

188 much larger cooperatives in 2017. Out of these remaining cooperatives, the four largest marketed 41.3% of U.S. milk in 2017. A report commissioned in 2019 by the U.S. Senate to review the impacts of cooperative consolidation identified several vulnerabilities for farmers. These issues included competing interests between diverse farmers, power imbalances due to different voting structures, cooperative ownership of processing plants hurting non-member farmers who are generally excluded from selling to the plant, and public sale of preferred stock changing earning structures for farmers (Morris & Richard, 2019).

### 2.3 The dairy supply chain

Beyond the consolidation of cooperatives, the supply chain for the dairy industry has become more complex as technology is incorporated and consumers demand more specialized products. The dairy supply chain moves with great speed due to the quick spoilage rate of milk. First, raw milk must be transported to processing facilities within 48 hours of milking, typically via trucks operated by the dairy cooperatives. The cooperatives gather milk from farmers, test for quality, deliver it to processing facilities, negotiate prices and terms of sales, offer insurance and financial assistance, and some cooperatives even own and operate their own processing plants to produce their branded products. These processing facilities pasteurize, homogenize and process raw milk into different products. Milk is then transported to vendors for sale, often landing on store shelves within two days of leaving the farm. Some of the challenges with the supply chain include transportation and fluctuations in supply and demand. Trucking remains the most common method of transporting milk due to its speed, but regulations limit maximum vehicle weight often forcing trucks to travel at less than their full capacity. The other major challenge is balancing supply and demand which both vary daily and seasonally even in ordinary times (Kroll, 2015; Maaß, Spruit, & de Waal, 2014; Morris & Richard, 2019; USDA, 2020f).

The dairy industry is interconnected with many other industries and markets. Most notably, dairy farms rely on other agricultural products to feed their livestock, so changes in one will impact the other. The U.S. livestock feed industry is very large, in 2017 the industry comprised \$170.4 billion in sales, and 545,810 jobs. Dairy cows were the fourth largest consumers of feed in the U.S. in 2016, consuming 23.8 out of over 236.3 million tons, primarily composed of corn and soybeans. (Decision Innovation Solutions, 2017b, 2017a; Stewart, 2018) The supply chain and transport systems that comprise the agriculture industry and bring products

such as feed to livestock farmers are susceptible to disruptions. If a shipment is delayed, it can have repercussions that span the agricultural supply chain and thus spill over into the dairy industry and beyond (Capehart, Liefert, & Olson, 2020; Kellogg, 2002; Packman, 2020; USDA, 2020i). In the same sense, disruptions in the dairy industry will impact other agricultural industries.

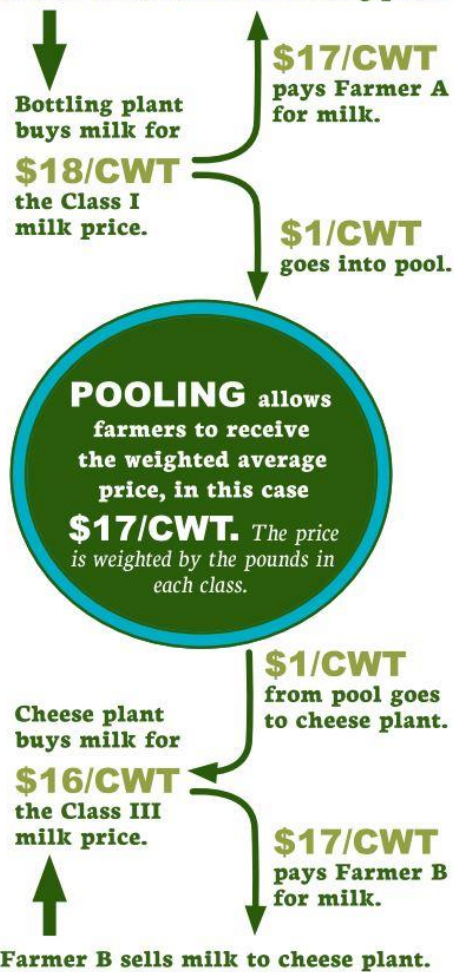


Figure 4: Graphic detailing pooling by Federal Milk Marketing Orders (FMMOs) (USDA, 2019)

Ultimately, it is the government that heavily regulates and supports the dairy industry. The USDA mandates minimum raw milk prices, runs several programs to help farmers maintain profits, and funds dairy research. Federal Milk Marketing Orders (FMMOs) establish minimum milk prices per one hundred pounds (hundredweight, or cwt) paid by processors; they are recalculated monthly and differ based on geographic region. Using a pooling system, detailed in Figure 4, FMMOs aim to ensure farmers always get paid a reasonable amount for their milk at the same flat rate regardless of what products processors ultimately make. Additionally, the USDA offers several protection programs including the Dairy Margin Coverage Program (DMC), Livestock Gross Margin for Dairy Cattle Program

and Dairy Revenue Protection Program to cover farmers when they are not profitable, their margins fall, or their sales fall, respectively. These programs create insurance policies that farmers may voluntarily purchase, with varying subsidies from the USDA. Some states have similar and additional programs. The USDA's research programs include the Dairy Research and Promotion Program which promotes dairy research and education, and the Fluid Milk Processor Promotion Program which offers general marketing assistance (Nowell, 2020; USDA, 2019a, 2019b; USDA & Farm Service Agency, 2020; Wiesemeyer, 2019). Together these initiatives attempt to offer comprehensive support to dairy farmers in a highly variable market.

During the first few months of the COVID-19 pandemic, the government has offered programs for general relief to most Americans and businesses as part of the Coronavirus Aid, Relief, and Economic Security's (CARES) Act. All eligible Americans, including some farmers, received \$1,200 and were able to apply for the Paycheck Protection Program (PPP) which offers forgivable loans to keep farm staff on payroll and up to 25% of the loan for utilities (Farm Credit Administration, 2020; Market Intel, 2020). To help dairy farmers more specifically, \$19 billion were set aside to support agricultural industries affected by the COVID-19 pandemic. It was provided through the Coronavirus Food Assistance Program (CFAP) as a part of the CARES Act to be managed by the USDA. Additionally, \$14.5 billion was given to the Commodity Credit Corporation, a part of the USDA, that regulates programs like the DMC program (Market Intel, 2020; PennState, 2020). The enrollment for insurance programs like the DMC program ends in mid-December. Unfortunately, enrollment in the DMC program was very low for 2020 with only about 50% of dairy farms purchasing coverage due to positive projections of milk and feed prices this year (Nepveux, 2020). Consequently, these programs that have received additional funding as a part of the CARES Act do not help the farmers that did not participate (USDA, 2020g).

#### 2.4 Rapid changes in demand

The COVID-19 pandemic triggered serious changes in social structures including one of great importance to the dairy industry: school closures. Schools across the United States began to close on March 16<sup>th</sup>, 2020 until at least April at the time of this writing. These closures affected at least 55.1 million students nationwide ("Map: Coronavirus and School Closures," 2020). In addition to school closures, considerable restrictions were placed on restaurants in every state forcing only delivery or takeout options (Wida, 2020). The closures led to a significant decline in demand for dairy products which severely impacted the farmers. Gibson's Dairy in Worcester, Massachusetts reported that business dropped by 65% in just one day when the state announced the closure of all schools and dine-in restaurants. Despite an increase in the number of people purchasing dairy products in stores, it was not nearly enough to offset the losses due to these closures (Gross, 2020; WCVB, 2020). Meanwhile, it became logistically difficult for suppliers to rapidly change from packaging large bulk bags or slices of cheese meant for restaurants and schools to smaller bags and wedges for retail stores for family shoppers (Huffstutter, 2020a; Morning AgClips, 2020; J. Smith, 2020).

The demand for dairy products overall increased for grocery retailers. This shift was partly due to panic buying in response to families staying at home and needing to buy enough food from grocery stores (Bekiempis, 2020). Panic buying during the month of March 2020 resulted in an increase in sales of dairy products. Dollar sales of milk, cheese and butter were up 52%, 84% and 127% respectively during the week of March 21st as compared to sales during the same time in 2019. Other shelf stable dairy and alternatives such as oat milk and powdered milk experienced a far greater increase in sales as compared to 2019 with oat milk sales increasing by 513% and powdered milk sales increasing by 285% (Crawford, 2020; Domonoske, 2020a, 2020b). The sudden demand at grocery stores resulted in quick, but temporary, sell out of entire stocks of dairy products such as milk (The Strait Times, 2020).

At this juncture, dairy farmers were struggling to sell and process all their milk during the COVID-19 pandemic. Milk sales were down because of fluctuations in consumer behavior with panic buying and restaurant and school closures creating uncertainty in the market (Chrisman, 2020; Huffstutter, 2020b; Purdy, 2020a). Unfortunately, this forced some farmers to dump upwards of 5,000 gallons of milk per day, in some cases half of their production, because they were unable to sell it due to uneven demand (Associated Press, 2020; Hancock & Eberly, 2020; Huffstutter, 2020b; Serie, 2020; J. Smith, 2020). Farmers cannot stop milking their cows, because they will be unable to produce milk in the future (Hancock & Eberly, 2020). At the same time, farmers must continue to pay their employees and keep up maintenance for the future of their production. Sales in the dairy industry had been running on thin margins for the past few years. Their inability to buffer losses in a pandemic will push many farms into foreclosure (Chrisman, 2020; Purdy, 2020b).





*Figure 5: Milk dumping at a small farm (Hancock & Eberly, 2020).*

To make matters worse, many stores that sell dairy products have limited the purchase of their products to consumers, a fact which has irritated most dairy farmers as they are dumping their excess milk. Unprocessed milk cannot be stored easily, as many farmers do not have a large storage capacity and unprocessed milk does not last for long periods of time (Serie, 2020; J. Smith, 2020; Stoney, 2020). Dairy farms were being helped to some extent through the pandemic with government loans, but the situation is not sustainable for many farmers (Chrisman, 2020; Serie, 2020).

## 2.5 Summary

One of the resolutions being given to dairy farmers was to quit dairy farming. This is a difficult option for most dairy farmers to agree to as dairy farming is traditionally a family business that has continued for generations. However, to prevent oversupply of milk in the market, some cooperatives were incentivizing dairy farmers to close their farm (Chrisman, 2020; WAUSAU, 2020). Many farmers were already in bad financial shape due to the recent low milk prices before the pandemic (K. Smith, 2020). Cooperatives have been trying to reduce the total number of milking cows and producers which could potentially help other farmers while demand remains low.

The modern image of dairy farming has evolved into a complex industry that is more vulnerable to disruptions in the labor force and consumer market. While no one was prepared for a global pandemic, the dairy industry seems particularly ill-equipped to manage the consequences of disruptions to its day-to-day operations. The rise of precision dairy farming and industrialization has improved efficiency and increased overhead, driving self-sufficient small farms to consolidate. The COVID-19 pandemic has revealed some serious problems with government aid to farmers and the dairy supply chain. Dairy farmers have been struggling and will continue to struggle more as profits flow down the drain amid the COVID-19 pandemic.

### 3.0 Designing a Qualitative Research Approach

Our goal was to take a deeper look at the consequences that faced this industry during the pandemic and looking ahead toward the implications on an uncertain future. To that end, our objectives were to evaluate changes in dairy farming practices in response to the pandemic; to determine the impact of the pandemic on dairy cooperatives and creameries; and to assess vendor and consumer behavior during this time. To meet these objectives, we analyzed dairy market trends, interviewed dairy farmers, cooperatives, creameries, vendors and consumers, and surveyed consumers.

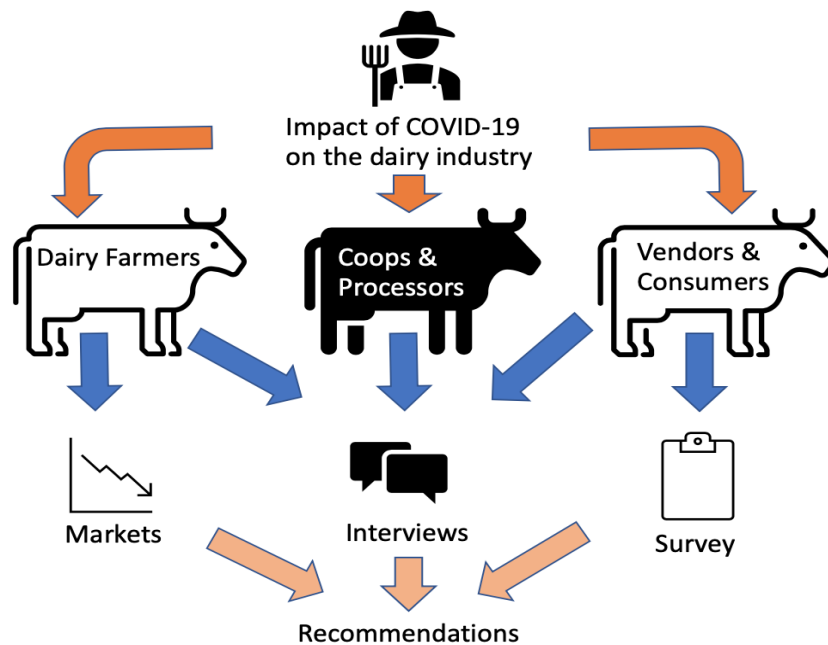


Figure 6: Graphical representation of our methods

We primarily used interviews to collect information on how the COVID-19 pandemic is impacting the dairy industry. Initial contacts were acquired through samples of convenience by family contacts and cold-calling farmers in New England, New York, and Virginia. After the initial connections were found, we expanded our reach through the snowball method of sampling, acquiring more informants per their recommendations (Ward et al., 2014). The interviews were conducted with a semi-standardized format in which the general flow and topics are outlined as a framework only (Berg & Lune, 2017). The interviews were conducted over the phone or through Zoom and infrequently recorded with the permission of the participant. The

consent form found in Appendix A was used for recording, as advised by the WPI Institutional Review Board. Interview questions for dairy farmers, cooperatives, creameries, vendors and consumers can be found respectively in Appendix B-F. We additionally asked dairy farmers for photos of their farm during these interviews.

To gain a broader picture of dairy farming practices, we examined trends in the dairy market over the past 20 years. The USDA regularly releases data on the status of the dairy market, including the daily market value of various dairy products. To better understand this, we met with economics professor, Dr. Alex Smith at WPI to better understand the market dynamics. We analyzed changes in this data to become familiar with baseline trends in the market before the pandemic. We monitored media and news reporting to build a timeline of important events to overlay on market data, providing relevant context.

We conducted an online survey using a sample of convenience to ask consumers how their buying habits have changed due to the COVID-19 pandemic. This aided in gaining an understanding of the current state of dairy products in grocery stores. A preview of the survey can be found in Appendix E. This provided us with a significant amount of data from which we identified trends with consumer behaviors and verified reported trends. We also asked members of the community to photograph the dairy sections of local grocery stores between the dates of April 5<sup>th</sup> and May 5<sup>th</sup> while they were shopping for groceries themselves as to avoid unnecessary and unsafe fieldwork during the pandemic.

## 4.0 Results

In this section we present dairy market data collected from the USDA, responses from our survey on consumer behaviors and information collected through interviews with dairy farmers, dairy cooperatives, processors, vendors and consumers (USDA, 2020e). The market data will draw from two products: 40-pound blocks of cheddar cheese and class II condensed skim milk. 40-pound blocks of cheddar cheese are typically converted to shreds, chunks or slices that will be used in food service industries such as schools, universities or restaurants (Jacoby, 2018). Class II condensed skim milk is typically used to make soft dairy products such as sour cream, cottage cheese, yogurt and ice cream (IDFA, 2019).

### 4.1 Impact of COVID-19 on dairy farmers & dairy market

In the months prior to the week of March 13<sup>th</sup>, 2020, the market value of a 40-pound block of cheddar cheese was steady with an average value between \$1.70 and \$2.00 per pound. After March 25<sup>th</sup>, 2020 the value began to plummet to around \$1.00, a decrease of nearly 50% in 3 weeks (Figure 7, USDA, 2020e).

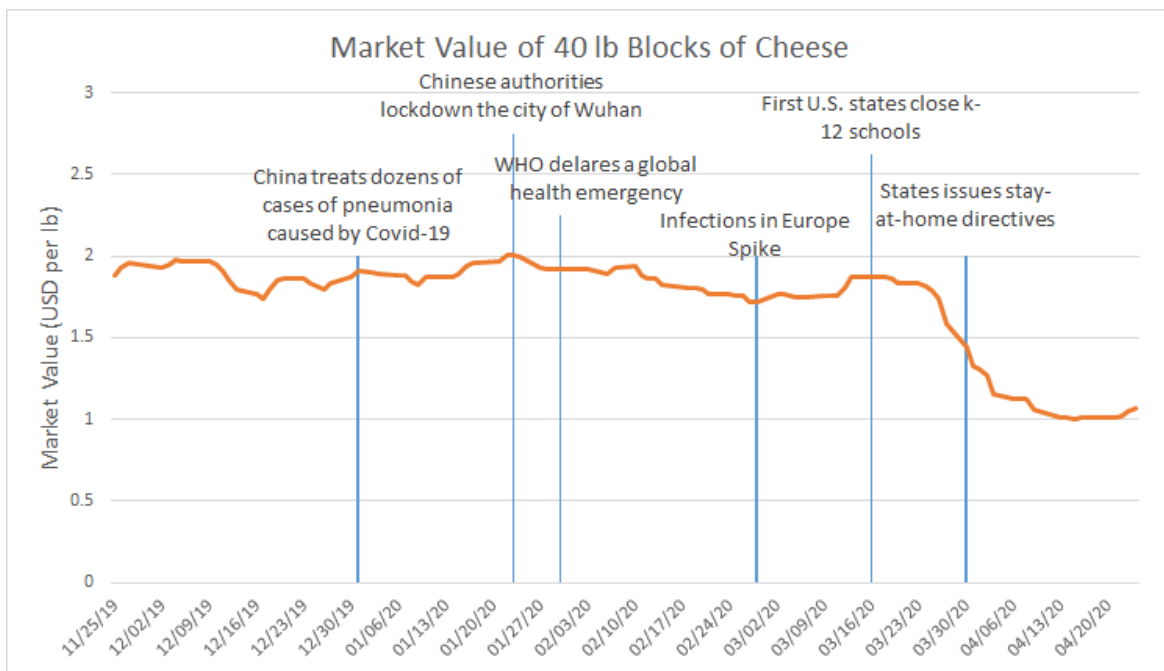


Figure 7: Timeline of market value for 40-lb blocks of cheese during the COVID-19 pandemic (USDA, 2020e)

Similarly, in the months prior to the week of March 25<sup>th</sup>, 2020, the market value for class II condensed skim milk was steady with an average weekly value between \$0.80 and \$1.00.

After this point, there was a rapid decline in value down to around \$0.40 per pound of solids in the following month (Figure 8, USDA, 2020e).

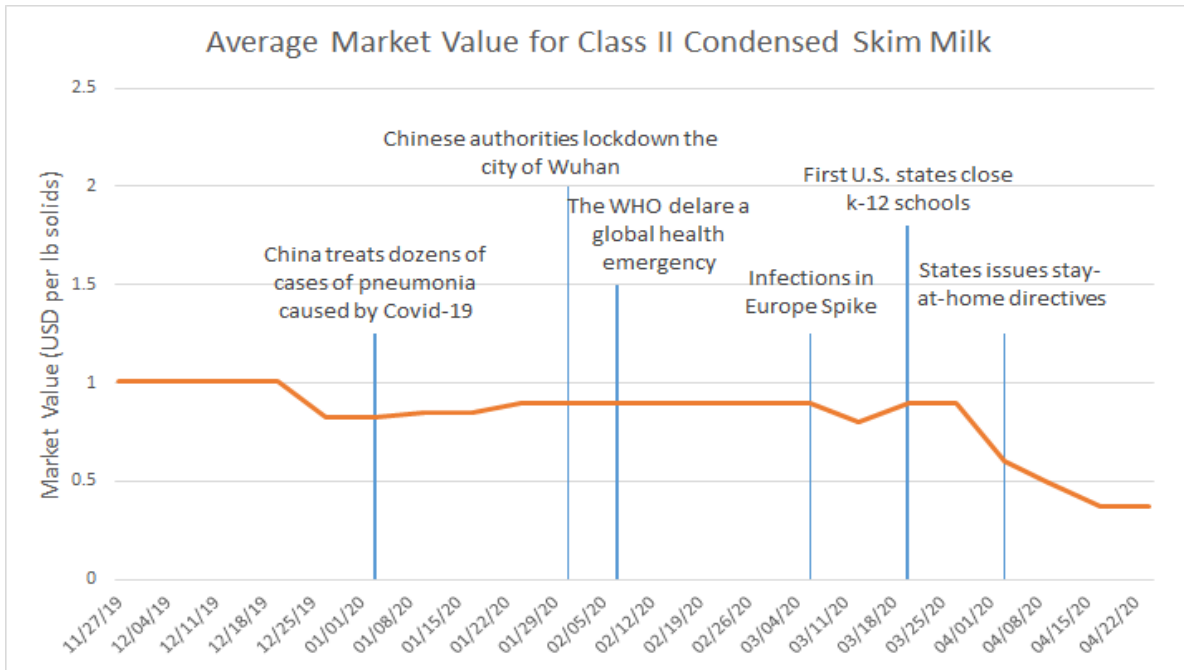


Figure 8: Timeline of market value for class II condensed skim milk during the COVID-19 pandemic (USDA, 2020e)

Figure 9 shows that the decline in market value for 40-pound cheese blocks and class II condensed skim milk was unprecedented as they were at a 20-year low. Interestingly, the value had been driven down to levels lower than that of the 2008-2009 recession, the 2015 recession, and the U.S. and China trade war which began in 2018 (Irwin, 2018; Palumbo & Nicolaci da Costa, 2019; The Economist, 2010). In 2019, the cheese market appears to rally while the skim milk market maintains a steady value. Figure 7 and Figure 8 also show that the week of March 25<sup>th</sup>, 2020 was a critical time for the U.S. dairy industry during the COVID-19 pandemic. The rapid decline of the dairy market began around March 26<sup>th</sup> which was the date the U.S. became the country with the most cases of COVID-19 in the world. In the days before and after March 26<sup>th</sup>, states enacted some version of a stay at home order which closed schools, non-essential businesses and restricted restaurants to delivery or take-out options only (Taylor, 2020, USDA, 2020e).

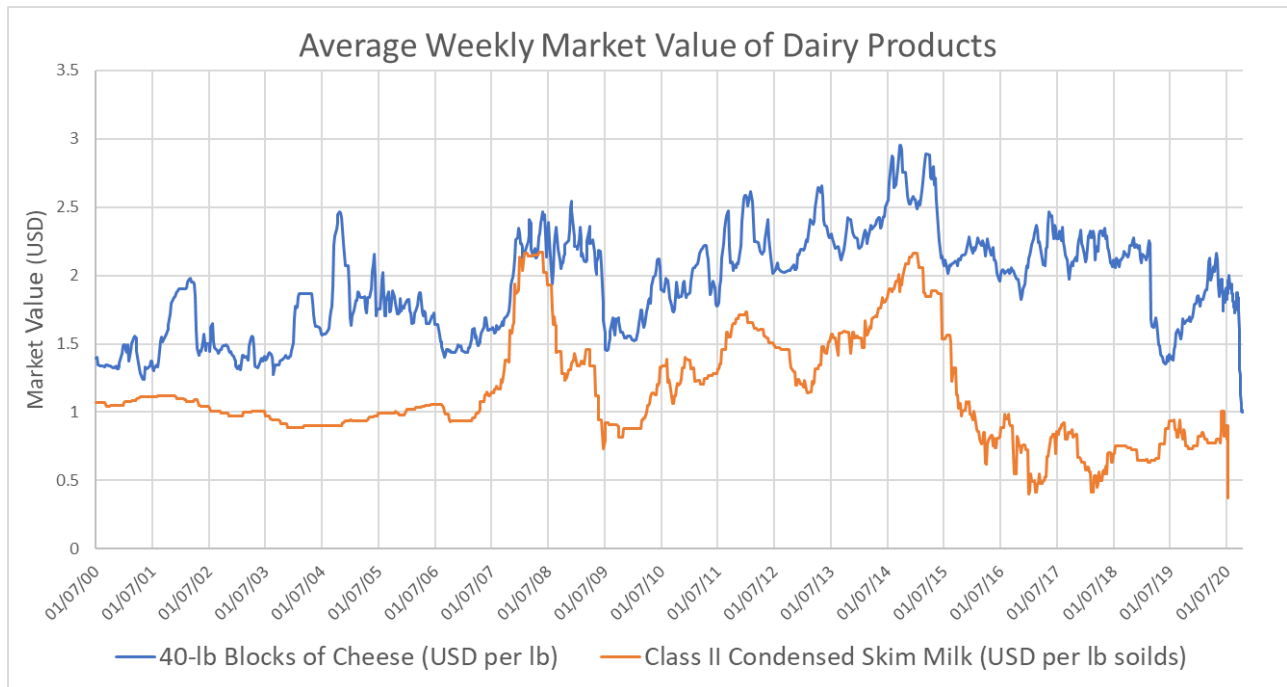


Figure 9: Dairy market trends for 2 products over a 20-year period (USDA, 2020e)

The USDA Agricultural Marketing Service for the week of March 23<sup>rd</sup>, reported that cheese demand had shifted to favor retail as school and restaurant orders were at a lull because of closures caused by the COVID-19 pandemic (USDA, 2020c). In the following two weeks, it was reported that cheese inventories were growing, retail orders remained steady to slightly lower

*“Cheese production is still busy with so much milk”*

and cheese production was active in fully functioning plants (USDA, 2020d, 2020b). In the week of April 13<sup>th</sup> – 17<sup>th</sup>, there began to be concern for storage space available for cheese as inventories continued to grow (USDA, 2020a). Despite closures in the food service

industry, all our interviews with dairy farmers revealed that raw milk production remained unaffected by the COVID-19 pandemic. All farmers we interviewed reported that social distancing guidelines were adopted, and additional sanitation measures were used by employees. These reports and our interviews with dairy farmers reveal that cheese inventories were growing while production of milk and processing of milk into cheese remained steady. Therefore, one possible explanation for the sudden decrease in value of 40-pound blocks of cheese is the loss of demand of dairy products in the food service industry, schools and universities.



*Figure 10: Images shared from a small Vermont dairy farm, (Interview 7, April, 2020).*

Our interviews revealed that some farmers felt financially unstable prior to the pandemic. Many farmers indicated they felt their operation and the industry as a whole had been declining over the past five or more years (Interviews 1, 2, 5 and 7, April 2020). One farmer mentioned that they were trying to salvage their business so it would be viable for their children but was not sure if it will be (Interview 9, May 2020). Small farms with their own processing and storefront facilities are separated from the larger market and were more likely to have had a positive experience farming over the past five years (Interviews 3 and 4, April 2020). Two farmers said they did not change much in the past five years and have been operating steadily (Interview 6 and 8, April 2020). More opportunities to sell directly to consumers will likely prove valuable in weathering the COVID-19 pandemic (Table 1).



Table 1: Overview of each farm we interviewed.

<b>Farm</b>	<b>Coop Member</b>	<b>Number of Cows</b>	<b>Farm Stand</b>	<b>Products</b>
Interview 1	Yes	330 Milking	Ice cream shop & deli	Milk, cream, ice cream, deli meat
Interview 2	Yes	65-70 Milking	“Half-assed” farm stand	Raw milk, beef, firewood
Interview 3	No	90 Milking	Own processing facility & store	Organic milk, flavored milk, ice cream base
Interview 4	No	25 Milking	Own processing & farm stand	Raw milk, cheese, yogurt
Interview 5	Yes	900 Milking 902 Dry	N/A	Raw milk
Interview 6	Yes	135 Milking 90 Dry	N/A	Raw milk
Interview 7	Yes	50 Milking 100 Dry	N/A	Raw milk
Interview 8	Yes	1800 Milking 400 Dry	N/A	Raw milk
Interview 9	Yes	275 Milking	N/A	Raw milk

Our interviews covered a wide variety of dairy farms, ranging in size from 25 to over 2,000 cows. About half of the farmers we interviewed sold raw milk to their dairy coop while the other half sold a variety of products in their own farm stand. Interestingly, two farmers were completely independent of the dairy market and had their own processing facilities and were not members of a coop (Table 1).

Most of the farmers we interviewed agreed that any monetary help would have to come from the federal government. Several farmers mentioned they did not receive any government assistance because they did not immediately qualify for the Paycheck Protection Program and the application was not open to farmers until all the money the government put into it was gone. Farmers were hopeful and believed that monetary support would come from the federal government but had not seen any yet at the end of April 2020 (Interviews 2, 4, 5, and 7, April 2020; Interview 9, May 2020). However, one farmer said it was unlikely that they were going to receive financial support from the government (Interview 5, April 2020). Luckily, one farmer we interviewed no longer had any debt and was careful to only buy what they can afford, while

another farmer had managed to receive some kind of support from the government but declined to share further details (Interviews 6 and 8, April 2020). Two farmers did not discuss government assistance in our interviews (Interviews 1 and 3, April 2020). Nearly all the farmers we interviewed did not receive adequate financial support from the government, leaving many to be uncertain about the future of their farm following the COVID-19 pandemic.



Figure 11: A six-generation farm, concerned with making the business viable for their children. Retrieved from Vanguard Renewables, 2015.

Farmers that primarily sold their milk to their respective coops reported getting paid less as the price for milk had decreased substantially since the beginning of the COVID-19 pandemic. Many of these farmers reported that the current price they were being paid for milk was not nearly enough to sustain their operating costs. With a surplus of milk on the market coops, such as Dairy Farmers of America, have asked members to reduce milk production by 15% which will lead to losses of tens of thousands of dollars per month, with one farmer saying “we will lose upwards of \$500,000. There is no farmer that has a \$500,000 wiggle room” (Interviews 2, 5, 7, and 8 April 2020; Interview 9, May 2020). Most of the farmers that we interviewed have either had to dump milk due

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*“we will lose upwards of \$500,000. There is no farmer that has a \$500,000 wiggle room.”*

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*- Randy*

to lower demand or are expecting to in the near future (Interviews 2, 7, and 8 April 2020, and interview 9, May 2020). In contrast, several farms focused more on selling a wide variety of products through their own farm stands, as noted in Table 1. One farmer reported an increase in private sales by nearly 5-fold since the pandemic started but relied on suppliers that occasionally ran out of stock for a short time (Interview 1, April 2020). Two farmers were unique as they had their own processing facilities and were not members of a coop. Both farmers reported a significant growth in private sales and suggested that consumers were seemingly more interested in buying locally or were more inclined to purchase locally as chain grocery stores were out of stock (Interviews 3 and 4, April 2020). One person that we interviewed did not know if the price of their milk had changed because they were not involved in that part of their farm business (Interview 6, April 2020).



Figure 12: A multi-generational family farm has been delivering milk for over 100 years. Retrieved from [www.shawfarm.com](http://www.shawfarm.com)

About half of the farmers we interviewed were uncertain about what the long-term effects of the COVID-19 pandemic would be on their farms (Interviews 2, 3, 4, 5 and 6, April 2020). In addition, one farmer said that they were making plans to cease

dairy operations because it had been a losing business for several years (Interview 1, April 2020). Another farm mentioned that if something does not happen to help them, they'll be done, and a third mentioned that there was potential of going out of business (Interview 2 and 5, April 2020). Surprisingly, one farmer predicted that many dairy farms will go out of because of how dairy coops have handled the response to the COVID-19 pandemic (Interview 7, April 2020). Interestingly, one farmer was hopeful that consumers will become more aware of where their food comes from and look to local businesses, like dairy farms, to buy their food (Interview 8, April 2020). These interviews ranged from small dairy farms with less than 100 cows to larger dairy farms with around 2,000 cows. The financial hardships faced by dairy farmers especially during the pandemic is not an issue for just large or small dairy farms, but farms of any size.

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*If something does not happen to help them, they'll be done.*

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#### 4.2 Cooperatives and creameries

Dairy cooperatives and processors have found themselves torn between increasing milk production from farmers and rapidly changing demand from consumers, resulting in a wide range of experiences as a result of COVID-19. Typically, these cooperatives and processors ensure supply meets demand through a process of 'balancing.' Based on the market they determine how much raw milk to turn into each type of product, going between perishable items like fluid milk and more stable products like cheese and dry milk products. It is important to note that there are many ways cooperatives and processors can be situated in the market, impacting their balancing capabilities. Some cooperatives own processing facilities, blurring these two together, while others have contracts with independent processors, some sell milk on the 'spot market' to the highest bidder of the day, and some processors buy directly from farmers completely bypassing cooperatives. Normally, each of these relationships is accompanied by different amounts and types of risk, but these norms have been completely overpowered by the pandemic. Our interviews have shown that a farmer's relationship with a cooperative and processor(s), and the products they make had a great impact on their experience from the COVID-19 pandemic.

Different cooperatives experienced different levels of disruption based on the key factor of where their milk is marketed. As previously discussed, consumer demand has shifted from bulk food service towards individual retail. As a result, cooperatives and processors that produce bulk products for food service have struggled, while those making retail products have been

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*“Processors are maxing out lines that are desired but it’s not enough to process all of the milk”*

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working to move more milk. One cooperative we interviewed who sells to food service processors and the spot market has been particularly hard hit. Several of their contracts were cancelled amid the coronavirus outbreak, saying “Processors are maxing out lines that

are desired but it’s not enough to process all of the milk...manufacturing has not been able to change to accommodate [the shift in demand] completely” (Interview 11, April 2020). They also cited the seasonal fluctuations in milk production as contributing to the problem saying “...it couldn’t have happened at a worse time. In the spring there tends to be more milk...so you have the maximum [amount of] milk at a time with the least amount of capacity and demand because of COVID-19” (Interview 11, April 2020). As a result, only about one-third of their milk was being sold via contract to processors at the time of interview, and the other two-thirds was put on the spot market. Though they were willing to truck the milk across their state for sale at a

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*“if dumped milk is not paid for 25 out of [our] 27 farms will probably sell out within two months”*

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fraction of its normal value, much of this milk was not able to be sold, leaving no other option than to dump up to two-thirds of their raw milk. This has left them in a dire situation, saying their cooperative is in “big trouble, and... if dumped milk is not paid for 25 out of [our] 27 farms will probably sell out within two months” (Interview 11, April 2020). In contrast, a different cooperative with contracts to sell all their milk to processors making retail products has been minimally impacted by the pandemic and had not dumped any milk at the time of our interview (Interview 10, April 2020). Larger cooperatives with more vertical integration with processing and distribution, and diversification between bulk and retail products have been better able to adapt but were still “currently dumping a small percent” of raw milk. (Interview 12, April 2020). These larger cooperative processors have a better balancing capacity and are able to redirect raw

milk to “a facility that takes what they can’t handle and turns it into more shelf stable products” (Interview 13, April 2020). Due to the loss of revenue from dumped milk many cooperatives can only afford to pay farmers a lower rate for milk (compared to prices set by FMMOs) based on how much is being dumped (Interviews 1, 2, 5, 7, 8, 9, and 11, April and May 2020, USDA & Farm Service Agency, 2020). In addition, some cooperatives are considering asking farmers to cut demand, as previously mentioned. (Interview 12, April 2020).

Similarly, creameries who service retail are working to process as much milk as possible while those serving the food service market are struggling. Demand spiked in grocery stores for a

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*“seven days per week,  
twenty hours per day [with]  
four hours for cleaning”*

---

few weeks in March, during which time our interviewees indicated there were some delays in processing and distribution due to “the sheer volume [being] more than what we could make” (Interview 13, April 2020). Distribution woes were eased a bit by an exemption to requirements for truck drivers to take

frequent breaks (Interview 12, April 2020). Creameries producing these retail products were working on overdrive with one such facility working “seven days per week, twenty hours per day, (with) four hours for cleaning” (Interview 12, April 2020). They also streamlined

production by making a smaller variety of products but had begun expanding operations to

include more specialty items at the time of the

interview (Interview 12, April 2020). Another

processor who has over 300 retail shops has seen

a rise in demand and as a result “extended our

network of producers to source more raw milk”

which has helped some cooperatives who were

otherwise dumping milk (Interview 15, April

2020). In contrast, one plant making half-pint sized cartons for schools was running “three shifts

seven days a week before [the pandemic] but are now doing one shift once a week” (Interview

11, April 2020). Unfortunately, it is not realistic for processing facilities to switch from making

bulk or specialized food service products to retail products over the span of a few weeks, it

“typically takes months to make equipment changes and requires significant capital” (Interview

13, April 2020). Interviews with a cooperative mentioned that many processors in the area had

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*“three shifts seven days a week  
before [the pandemic] but are  
now doing one shift once a week”*

---

just completely shut down, however we were not able to interview any representatives from plants that shut down (Interview 10, April 2020).

Overall, neither cooperatives nor processors indicated social distancing and other quarantine orders were interfering with their business. Agriculture and related businesses have been deemed essential by the U.S Department of Homeland Security and individual states, so they have largely been able to remain open (Krebs, 2020; Massachusetts Office of the Governor, 2020; New York State Department of Agriculture and Markets, 2020; Tebbetts, 2020). Many noted that their operations typically do not involve people working in close proximity with each other, but they are taking precautionary measures such as “restricted traffic in certain areas where employees were together like breakrooms” (Interview 13, April 2020). Many also reported providing employees with personal protective equipment, conducting retraining on how to safely avoid contact, allowing some employees to work from home, and helping with contact tracing for those who tested positive for COVID-19 (Interviews 10, 13, and 15, April 2020).

Overwhelmingly, relief programs were widely discussed but had not yet resulted in payment at the time of most interviews. The CARES Act and USDA programs promised relief for small businesses, farmers, cooperatives and processors, however this had not yet been delivered for all but one cooperative who received a loan from the Paycheck Protection Program (PPP) for small businesses. Despite some desperately needing relief for dumped milk and reduced operations, government aid programs appear to be moving slowly (Interviews 10, 11, 12, 13, 14, 15, 16, April 2020).

The long-term impacts of the pandemic on these cooperatives and processors varies, largely by how they have been impacted so far. Cooperatives and processors who have seen an increase in business have a more positive outlook for the future, but still hope the pandemic improves quickly so things can return to normal (Interviews 10, 14, 15, and 16, April 2020). Those who have been negatively impacted are less optimistic, noting how it will take longer for “some of the industries to come back full steam, [such as] airlines, cruises, hospitality, the impact will linger, and restaurants will come back in a limited scope but faster” (Interview 13, April 2020). In order to survive, some processors have reported working to retrofit their operations to produce retail products, while some cooperatives who were dumping milk were considering asking farmers to reduce the amount of milk they produce. (Interviews 11, 12, and

13, April 2020). As previously discussed, Dairy Farmers of America, the largest U.S. cooperative, did announce a compulsory 15% reduction in milk production for all members beginning on May 1st, 2020 (Interviews 8 and 9, April and May 2020, Morris & Richard, 2019). One of our interviewees also followed up with us at a later point to report that Agri-Mark Cooperative imposed a 4-6% reduction in milk production for their members. These compulsory production cuts will undoubtedly hurt farmers, but the magnitude of damage remains to be seen.

#### 4.3 Analysis of consumer behavior

The dairy supply has been disrupted by the COVID-19 pandemic. Before the government stay at home orders in mid-March, uncertainty about future supplies caused consumers to panic buy (Green, 2020). In our survey and interviews, we recorded instances of dairy products being harder to acquire which was reflected by a multitude of news reporting (Borter, 2020; Green, 2020). Some consumers that we have interviewed have said that “milk has always been in stock” but have often had a harder time acquiring it leaving some to think that “dairy may become an issue” in the future (Interview 21, April 2020; Interview 22, April 2020). This juxtaposes against the tragedy of dairy farmers dumping their surplus milk.

As seen in many large grocery stores, they have had trouble stocking basic supplies to keep up with panic buying, and some shoppers have found empty shelves as seen in Figure 13 (Borter, 2020). This has led consumers to create a cycle of shortages by buying as much as they can for fear it will be unavailable in the future. We have subjectively recorded images of insufficient supply in stores through sample photos taken during the week of March 15<sup>th</sup> to the 22<sup>nd</sup>.





Figure 13: Shortages of dairy products taken in mid-March in Worcester, MA. Photo Credits: Left: Katherine Blumanthal; Right: Nathaniel Rutkowski

Dairy products were heavily affected by waves of panic shopping as many households view these products as essential items. Consumers reported being concerned about their ability to go shopping as often and get dairy on a reliable basis. We interviewed one consumer who shared his feelings of uncertainty about the availability of dairy products in stores (Interview 21, April 2020). Our assessment of consumer fears can be seen in Figure 14 created from responses in our survey.

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*“Lots of uncertainty never know when you’re gonna be able to buy stuff”*

*-John*

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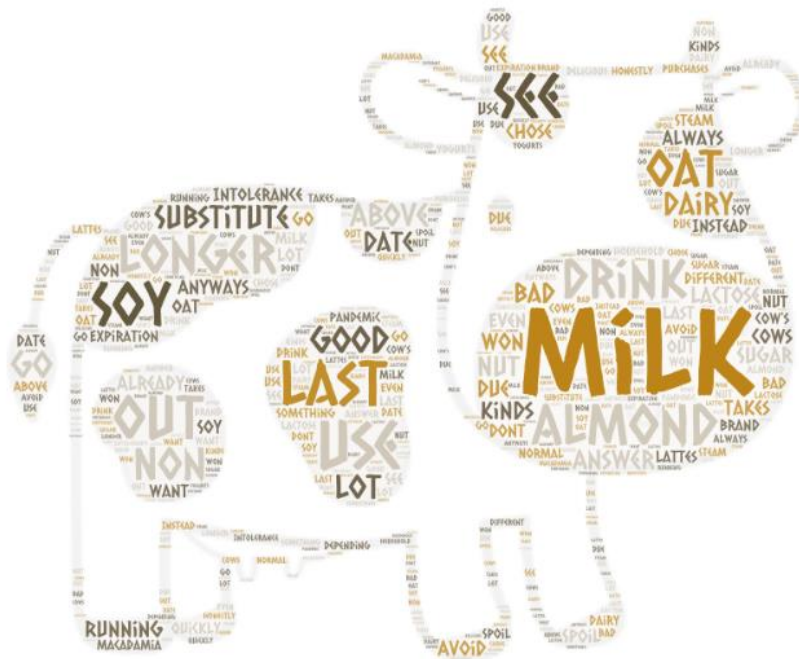


Figure 15: Word cloud generated from survey question: have you tried purchasing different dairy substitutes due to the recent pandemic (i.e. silk, oat milk, almond milk)

Throughout interviews, respondents thought there could be potential long-term effects in the way consumers acquire their dairy products. In large commercial stores like the mega-marts and the big-box stores, people found that their safety was at risk. One consumer found

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*“Biggest problem was all the general public. People going the wrong way down the aisle, not following physical distancing.”*  
*-Ben*

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negligence in the larger stores and the people shopping there (Interview 22, April 2020). Additionally, with longer supply chains, there were delays resulting in shortages and limitations at these large stores causing people to seek alternatives. Many people sought out farm stands due to high availability of fresher products, better physical distancing, and shorter

supply chains. Due to the perceived improvement in quality of the dairy products and the general shopping environment, many consumers will most likely continue shopping at farm stands well into the future (Interview 21, April 2020; Interview 22, April 2020).

Grocery stores that we talked to in April, after the waves of panic buying, have had reduced numbers of employees in the store due to many workers not wanting to come in during

the COVID-19 pandemic. Consequently, many stores reduced their hours congesting them at peak times in the afternoons. To compensate for this, they added in selective hours for senior citizens to go shopping in a safer environment. The grocery stores employees that we interviewed had not seen any disruption in their supply chain for ordering dairy products. Over all the stores have reduced their stock of dairy due to the relative decrease in overall customers visiting the store with the exceptions of substitute milks and Velveeta cheese (Interview 17, April 2020; Interview 18, April 2020; Interview 19, April 2020).

#### 4.4 Discussion

In our interviews it was revealed that small dairy farmers typically have farm stands to sell products in the local market. The dairy farms that had a more diversified business tended to suffer less during the pandemic. This could range from selling various dairy products to meats or even firewood at their farm stand. While dairy farmers with their own farm stands are in direct competition with grocery stores, they can set their own prices on their own dairy products which means that they are less impacted by changes in the broader dairy market. Two of our interviews were with dairy farmers that were completely independent of the national dairy market. They were not members of a cooperative and they did not sell their raw milk. Rather, these farmers had their own processing facilities for specific dairy products such as cheese, milk and yogurt. Our interviews with consumers and dairy farmers saw a shift towards more people purchasing from local markets rather than chain stores during the pandemic. This led to farmers that were able to sell directly to consumers to see an increase in sales as the COVID-19 pandemic took hold in the U.S. Overall, the dairy farmers with more diversified business and nearly complete independence from the national dairy market seemed to be less severely affected by the pandemic than those that sold raw milk into the dairy market through coops or had a less diversified business.



*Figure 16: Small farms, like the one pictured here, have seen a large increase in sales of raw milk at farm stands.  
Retrieved from the Facebook page of Rogers Farm.*

On the other hand, farms that do not have a niche market specialize in selling raw milk to their cooperatives and processors have been hit harder by the COVID-19 pandemic. The all milk prices set by FMMOs for the general market favor larger farms with tighter margins by nature. Many of these farms that we have talked to have been on the decline over the past few years as they struggle to profit off depressed milk prices. With the pandemic, all milk prices have fallen and will hasten the closure of many farms. Milk operations intertwined with more complex supply chain have been backed up by the bottleneck in processing, forcing these farmers to dump milk.

Our interviews have shown that the relationship between farmers, cooperatives and processors, and the products they make had a great impact on their experience with the COVID-19 pandemic. In line with shifts in demand, we see that farms, cooperatives, and processors who make bulk food service products struggle to sell, while those making retail products are trying to make as much as possible. While diversification has helped many as previously detailed, those specializing in the bulk or retail markets have been strongly impacted. Unfortunately, processors making commercial products cannot quickly switch to retail products, while retail plants have hit

their limit, running at maximum capacity. As a result, farmers and cooperatives previously serving food service markets have struggled to forge new relationships with processors and are left with nowhere to send their milk. During these trying times, these relationships have been stressed and broken in some cases, highlighting their importance.

Only one of the farmers that we talked to had received help from the government. The CARES Act was not effective in helping these particular farmers. Larger farms that are eligible for aid by the government will also be hurt in the fact that they can only receive up to a certain amount of money even if the initiatives are funded effectively. We learned from farmers that current programs exist such as the Wildfire and Hurricane Indemnity Program Plus (WHIP+), which are designed to cover losses incurred during disasters. Although it refers to wildfires and hurricanes, it was used under presidential emergency disaster declarations for natural disasters of which farmers feel the COVID-19 pandemic has had similar impacts (USDA, 2020h). Government programs have been slow to disperse funds to farmers and may not currently provide enough to support farmers through the losses incurred due to the COVID-19 pandemic.

## 5.0 Project Outcomes

This project has taken a deeper look at the implications and consequences facing the dairy industry during the COVID-19 pandemic and looks ahead to an uncertain future. How the industry learns from this experience is important. We hope that some of our observations can assist with planning and policy for the industry if faced with recurrent or similar events.

### 5.1 Recommendations

The following sections outline actions that can be taken in the short-term and long-term to provide relief to dairy farmers, improve the resiliency of dairy processors, and improve regulations and milk pricing.

#### *Immediate action for cooperatives*

Throughout our interviews, we learned that some dairy farmers were losing an unnecessary amount of money each month because their cooperative did not allow them to dump their milk themselves. We recommend that dairy cooperatives authorize farmers to dump milk in their own manure pits instead of having the dairy coops dump milk for them. This will save dairy farmers several hundreds of dollars in transportation and storage costs. In the cases where dairy cooperatives want to continue to test the raw milk for quality assurance, farmers can take their own samples, or arrange for a cooperative representative to do so, prior to dumping the milk.

#### *Government financial relief programs*

One of the trends we noticed in our interviews is that federal government policies are not currently working for the dairy industry. Many of the farmers we talked with expressed frustration and confusion about government programs. Currently, most farmers are struggling to receive aid through the PPP and CFAP as they are underfunded for the scale of the current disaster affecting the dairy industry. These programs need to be better funded and PPP should be more readily available to farmers who must keep employees on staff to care for the animals. PPP has been given preference to businesses that have more established relationships with banks which has hurt many smaller farmers so additional funding of PPP should prioritize actually funding small business. Some farmers are talking about extending programs like WHIP+, which was funded in 2018 and 2019, to cover losses incurred during the COVID-19 pandemic (USDA, 2020h). This program is already setup so it would require less logistical organization, enabling

payment to reach farmers quickly. Many farms are struggling and are going to be the last generation of their family farm. Dairy farms need more available and immediate aid if the industry is going to be anything more than local niche farms in the future.

### *Reimagining government regulations and milk pricing*

We propose further in-depth analysis of government regulations in the dairy industry to consider deregulation. Regulations on dairy farms should better accommodate the two directions that the industry is already going in. Small family farms have become more successful marketing themselves as healthier, more environmentally friendly supply chains and should be supported and allowed to sell their products like raw milk more easily. Larger farms and cooperatives may benefit from less control by the government in terms of setting prices and production amounts allowing for market conditions that actually match demands.

One of the most ubiquitous themes in our interviews was the complex nature of milk pricing, with nearly every farmer reporting that they do not understand how these prices are set. Our own research backs this up, as the exact formulas are available on the USDA website, but they consist of several pages of mathematical formulas not explained in plain English. Even beyond the setting of prices, the large number of government programs, insurance policies, subsidies, regulations, and bureaucracy complicate the U.S. dairy market. In theory all of these programs protect farmers and ensure they get paid a fair amount for their milk, yet many farmers we talked to reported that the price they are paid is often below what it costs them to produce the milk. This has driven many farms, especially small operations, to move to directly serving consumers, where they can set their own fair prices, and avoid the complicated and volatile market. We recommend that a detailed and holistic review is done by the U.S. federal government of their milk programs and regulations, and their actual impact on farmers and the broader market. There is clearly room for improvement, and we suggest that deregulation may help the market and farmers, but further detailed analysis is needed.

### *Enable and encourage farms to market directly to the consumer*

More than 90% of farms in the U.S. are considered small farms. These small, local farms are critical to maintain as they ensure biodiversity in the food industry, protect natural resources and the environment, and sustain local, rural economies (Nowakowski, 2018; USDA, n.d.). To



help keep small farmers in business, we recommend that consumers consider the origins of their food and purchase from local farm stands if possible. To increase sales, we recommend dairy farmers consider implementing some degree of public access to their farm to educate the public on the origins of their food as well as market their dairy products. This could involve implementing hiking trails along the perimeter of the farm, opening the farm to members of the public for tours during the day, or farm-to-table cooking classes. Lastly, we recommend policymakers develop plans to support sustainable small dairy farmers through subsidies, implementing programs to assist farmers in reducing operating costs or increasing profits, and increasing funding to existing programs dedicated to helping small farms.



*Figure 17: A Vermont Breakfast on the Farm outreach event. Retrieved from the Facebook page of Gervais Family Farm, 2018*

### *Resiliency in the supply chain*

The COVID-19 pandemic has caused a huge disconnect between cows and consumers, in part causing many farmers to dump milk. The supply chain needs more flexibility to better react to ensure milk makes it from teat to table instead of into the trough. Some of this involves evaluating disaster scenario plans at processing facilities to minimize disruptions in the supply chain and workforce. As new processing facilities are built or remodeled, we recommend investments be made to ensure that their processing lines are more customizable so they can

more quickly change between packaging commercial and consumer products. Increased flexibility during times of rapid, large-scale changes in demand from bulk commercial to retail markets may require government intervention. Red tape regulations may need to be temporarily eased, and financial support will be required. For example, food banks have received huge increases in demand and shortages of products. Increasing government funding for food banks would allow them to purchase, transport, and increase storage capabilities to decrease food waste on the farms. This would not only help feed their local communities but also reduce disruptions to the dairy industry supply chain (Reiley, 2020).

### *Improve international trade relations for dairy products*

One of the issues facing the dairy industry in the long term and that has damaged the market in the past is unstable trade relations with other countries. Seemingly brash tariffs have hurt the U.S. dairy industry in recent years, and the government should do more to ensure the free trade of dairy products to support the industry. The current administration has often used tariffs as one of its primary methods of political influence. Retaliatory tariffs have often been placed on American agricultural products, including dairy, which hurts the competitiveness of U.S. dairy internationally. Trade wars have often resulted in tariffs up to 25% from countries like China and Mexico, the largest importers of U.S. dairy products, during this administration (AEIdeas, 2018; Drum, 2019). The recently created United States-Mexico-Canada Agreement has allowed for more favorable dairy exports in North America (Oustr, 2020). The potential impacts on the dairy industry should be more carefully considered in future trade negotiations.

## 5.2 Conclusion

At the close of this project, we realized the complexity of the U.S. dairy industry and the hardships that farmers have faced for years. Initially we struggled to find farmers available to interview, as many responded saying they either recently closed their milking business or were too busy to be interviewed. However, once we began to conduct interviews with dairy farmers, nearly every interview revealed the dire situation that their industry has been in for years. During one critical interview, we realized that interviewing dairy farmers, vendors and consumers was not sufficient for understanding the effect that a crisis, such as the COVID-19 pandemic, has on the dairy industry. We adapted our focus to include interviews with additional points along the dairy supply chain including cooperatives and processing facilities in order to gain a complete

understanding of where disruptions were occurring and how they were impacting the entire industry.

Resilience through food security is a benchmark of national sustainability. This project revealed that we are systematically undercutting some of the most critical food sectors in our country. In the face of a global pandemic, we have learned that the U.S. cannot meet essential UN sustainability goals, including Goal 9 to “build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation” and Goal 12 to “ensure sustainable consumption and production patterns” (Spröte, 2010). We found that the U.S. dairy industry has yet to develop resilient infrastructure as limitations in processing facilities severely disrupted the supply chain during the COVID-19 pandemic. The U.S. dairy industry is also tending to become a less inclusive business as there has been a trend of small farms going out of business and consolidating into larger farms. This trend is likely to be accelerated due to the COVID-19 pandemic. During times of crises, there is a lack of responsible consumption which was witnessed towards the end of March and beginning of April as consumers were panic buying dairy products and causing shortages in grocery stores. Additionally, the current state of the dairy industry is unsustainable for many dairy farmers as the current prices of milk are not able to provide farmers with enough income to offset the costs of operating their farms. Continuing reckless consolidation of dairy farms is also irresponsible to the sustainable production of dairy and maintaining biodiversity within the dairy industry. The U.S. dairy industry must explore ways to build resilient infrastructure and ensure sustainable consumption and production practices so there is less volatility and disruptions to the industry. Many dairy farms have been in the same family for generations and must be protected and preserved as it is essential for their family's existence, the local economy and national food security.

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## Appendices

### Appendix A: Site Consent Form



We are a team of undergraduate students from Worcester Polytechnic Institute (WPI) in the United States. We are participating in a project to evaluate the effect of the COVID-19 pandemic on the dairy market. If you are willing to participate in this project, please read and note your preferences on this form. The final results will be made public, and can be found at the following link: <https://digitalcommons.wpi.edu/iqp-all/>

Do we have your permission to record an interview?

Yes  | No

Do we have your permission to directly quote you?

Yes  | No

Do we have your permission to use your name in reference to quotes?

Yes  | No

I understand that these interviews will be published at WPI for educational purposes and made available to the public. If you wish to change any of the terms in the consent form feel free to email us at [gr-farm@wpi.edu](mailto:gr-farm@wpi.edu).

Sign:

Print:

Date:

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## Appendix B: Interview Questions for Dairy Farmers

### Background info on farm

1. How long have you been working on this farm?
2. How many cows do you have?
  - a. What is your daily or weekly volume of milk produced?
  - b. What is your onsite storage capacity for raw milk?
3. What is the number of employees on farm?
  - a. Typically
  - b. Now
4. How much of your farm is automated and what machines do you use?
5. How has the farm changed in the past 5 years before the pandemic?
  - a. Has it changed in size?

### Market

6. Are you part of a cooperative, conglomerate milk group, or other organization?
7. Where do you sell your milk?
  - a. Has the price changed in response to the coronavirus pandemic?
  - b. Have you experienced any disruptions in the supply chain due to the pandemic?
  - c. Are you paid for each pickup individually or on a monthly/yearly contract?
  - d. What products do you make?

### COVID-19

8. What changes has your farm made in response to the pandemic?
  - a. Have you had to dump milk?
  - b. Have social distancing or other government mandates reduced or closed any parts of your dairy operation?
  - c. Have you taken any safety measures to protect workers or visitors?
9. What long-term impacts do you think the pandemic will have on your farm?
  - a. What about the industry as a whole?
  - b. Will this cause any changes in your farm?
    - i. Number of cows?
    - ii. Number of employees?
    - iii. Equipment used?
10. Will/Have you received any support from the \$2 trillion CARES act?

### Conclusion

11. Do you know anyone else who would be interested in talking with us?
12. Would you like us to send us a copy of our report when it is finished?

### Consent

13. Do we have your permission to directly quote you?
14. Do we have your permission to use your name or farm name in reference to quotes?

## Appendix C: Interview Questions for Dairy Cooperatives

### Background on coop

1. How many members do you have and what is the amount of milk they produce?
2. Do you transport the milk from the farms to processors?
3. What is the payment structure for farmers?
4. Which processors do you sell to?
5. Do you own your own creameries?

### Coronavirus

6. Can you compare the current state of coop now to same time last year?
7. What has changes have you experienced in the last two months?
  - a. Specifically, in transport?
  - b. Specifically, in workforce?
8. Have you had to dump any milk?
9. What do you think are the long-term impacts on the coop?



## Appendix D: Interview Questions for Processors

### Background on creamery

1. What products do you make?
  - a. How many processing lines do you have?
  - b. How many lines for large bulk products? How many for small retail products?
  - c. Do you make the packaging yourself or order it?
2. Where do you get your milk?
  - a. Contract vs. Spot Market?
  - b. Coops vs. Farmers?
  - c. How much milk do you take in on a daily or monthly basis?
3. What is the payment structure for suppliers?
4. Which vendors do you sell to?
5. How has your creamery changed over the last five years?

### Coronavirus

6. What changes has your creamery(s) experienced in the last two months?
  - a. Specifically, in the work force
  - b. Specifically, in hours of the plant operations?
  - c. Operation of different processing lines? What is their degree of flexibility?
  - d. Transportation
  - e. Disposing or dumping any products?
7. Are you taking in less milk?
  - a. Have any of your contracts changed?
8. Are you limiting the production of products?
9. What do you think are the long-term impacts of the pandemic on company?

## Appendix E: Interview Questions for Vendors

1. Has your grocery store had to change orders from your suppliers due to the pandemic?
2. Has your store had to limit operating hours?
3. Has your grocery store placed limitations on the number of dairy products per customer or household?
  - a. Which ones?
  - b. Why?
4. Has your grocery store experienced any shortages of dairy products?
  - a. Which ones?
5. How has customer demand for dairy products changed over the past month?
  - a. Have there been more customers?
  - b. Was there a distinct 'peak' in demand?
  - c. Has demand returned to 'normal' pre-pandemic levels?
6. Have you seen an increase in demand for substitute milk products in the past month?
  - a. Have there been shortages of these products as well?

## Appendix F: Interview Questions for Consumers

1. Did you panic buy any dairy products in response to the pandemic or quarantine orders?
  - a. Which products?
  - b. Why or why not?
2. Did you have trouble accessing any dairy products due to shortages?
3. Have grocery stores you visited put limitations on dairy products?
  - a. If so which products?
4. Describe your grocery store experience.
5. Have you changed the number of times you go grocery shopping in response to the pandemic?
  - a. Why or why not?
6. Are you shopping for more people during the pandemic than before? (e.g. grandparents, neighbors)
  - a. Why?
7. Are you concerned about shortages of dairy products in the future?
  - a. Why?

## Appendix G: Survey

Target audience: people shopping at the grocery store (the consumer market)

Deliverance: 12 questions: Facebook and email release.

**Title:** Novel Coronavirus Effects on Dairy Market

**Link:** [http://wpi.qualtrics.com/jfe/form/SV\\_0k3x7CAGRFmT4kR](http://wpi.qualtrics.com/jfe/form/SV_0k3x7CAGRFmT4kR)