
The Impact of COVID-19 on the Connecticut Dairy Farm Sector

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Executive Summary

This study presents preliminary estimates of the impacts of the COVID-19 pandemic on the revenues of Connecticut dairy farms. Given the market disruptions stemming from shutting down food service channels, the sudden shift in demand to grocery stores was not enough to overcome the decline in demand for farm-level raw milk, which resulted in revenue losses from declines in the farm price of milk as well as supply restrictions imposed by processors. We estimate the farm revenue loss at nearly \$16.5 million for 2020, which is about 19.4 percent of total farm revenues. Most of the losses are attributed to a decline in farm prices, with lower prices accounting for approximately 81 percent of the revenue loss. As the future of the pandemic remains uncertain in Connecticut for the remainder of 2020, these estimates might change as data and the situation on the ground change.

Introduction

Since the first report of a Connecticut resident being exposed to the novel coronavirus disease COVID-19, in early March 2020, the SARS-CoV-2 virus has spread rampantly across the state, affecting all levels of society. According to the State of Connecticut, as of June 2, 2020, there were 42,949 confirmed in CT alone,¹ accounting for just a small portion of the 1,802,470 cases nationwide.²

On March 10th, Governor Ned Lamont declared a public health emergency in Connecticut, and the state has since enforced six-foot social distancing as well as requiring face coverings and limiting public gatherings to fewer than five people. Life-at-home has become the norm since social distancing and self-quarantine measures took effect, buttressed by government mandates and public service messages. It has been extraordinarily difficult for businesses to adopt new procedures that will ensure the health of their employees, and as a result, over 40 million Americans have lost their jobs and filed for unemployment.³ The economic effects of the so-called lockdown proliferate throughout the food supply chain, shifting consumer preferences and causing bottlenecks from decreased labor supply. While the public health emergency was not officially declared in Connecticut until March, reports of the COVID-19 health crisis emerging out of China have been shown to have impacted U.S. dairy market prices as early as January.

The COVID-19 health crisis has had profound impacts on society around the globe, including the United States. Prior to the COVID-19 pandemic, Americans spent approximately 54 percent of

¹ Governor Ned Lamont, "Connecticut COVID-19 Response," CT.gov (State of Connecticut), accessed June 11, 2020.

<https://portal.ct.gov/coronavirus>. Data Tracker

² "CDC, "Cases in the U.S." (Centers for Disease Control and Prevention, 2020), Accessed June 6, 2020.

<https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html>. Data Tracker.

³ Irina Ivanova, "More than 4 Million Americans File for Jobless" (CBS News), accessed June 3, 2020.

<https://www.cbsnews.com/news/4-million-file-unemployment-jobless-claims/>.

their food dollars away from home.⁴ This situation completely changed in just a few weeks, as most restaurants, schools, and other institutions were forced to close or significantly cut back their operations. This has resulted in the near-total loss of foodservice markets, and a dramatic shift of consumers' food spending to retail stores. In the eight weeks following March 7th, American consumers spent approximately 30 percent more on dairy products in grocery stores than they spent during the same period in 2019.⁵ Additionally, grocery delivery options, such as Amazon, Instacart, and Stop & Shop's Peapod, have seen significant sales increases.

The pandemic has dramatically shifted consumer preferences away from purchasing and consuming foods at restaurants and institutions and towards retail grocery stores and eating at home. This has significantly shifted the types of dairy products demanded as well as the packaging and method of delivery of those products. Products and package sizes demanded by institutional markets have fallen significantly, while demand for retail products and packaging has surged. Meanwhile, dairy processing facilities and distribution companies have struggled to keep up. This has resulted in the seeming paradox of essential goods shortages in some grocery stores, while some producers have had to dump milk. Despite this rise in grocery store and delivery demand, overall dairy product sales have fallen.

The implications of COVID-19 are highly dynamic, affecting certain parts of the food supply chain more severely than others, which has resulted in bottlenecks. Our nation's dairy production cycle consists of a vast network of farmers, processing plants, transportation, and storage facilities, all with the common goal of supplying schools, restaurants, grocery stores, and foreign markets. When the supply chain is broken by removing restaurants and schools as sources of demand, processing plants and storage facilities struggle to adapt. Some farmers have had to dump milk to balance supply with processing capacity, while others have culled cattle to curtail future supply.

In terms of Connecticut agriculture, it is important to highlight that, in addition to food production revenues, nearly half of farm revenues derive from the largest sector, which produces greenhouse, nursery, and sod products (Figure 1). However, each sector of Connecticut's agricultural industry has been impacted differently by the COVID-19 pandemic and its related restrictions. While the greenhouse and nursery sector experienced a significant loss of demand and sales in the early Spring, they appear to be seeing a swift recovery from rising demand in mid-to-late Spring. The COVID-19 impact on the nursery and greenhouse sector will be difficult to quantify or assess until relevant sales data are available.

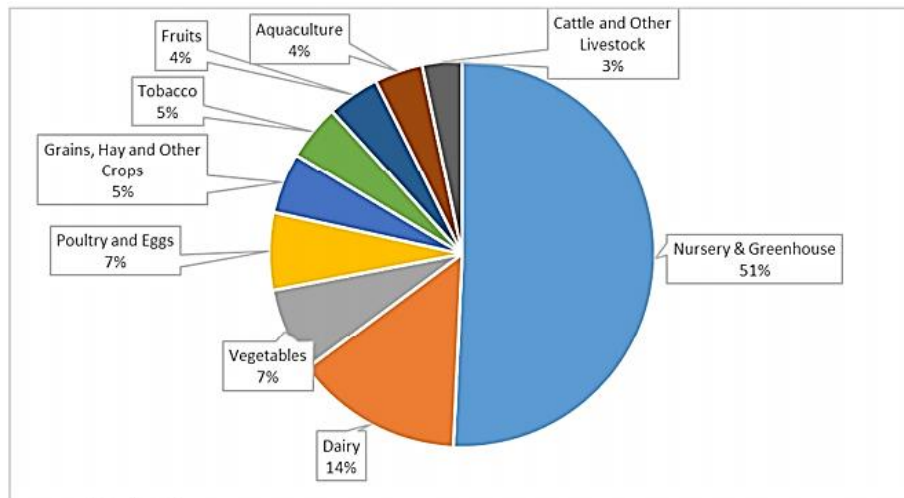
The most visible impact on Connecticut's agriculture is seen in the dairy and aquaculture sectors. This report focuses on the former as data to evaluate revenue impacts of the pandemic on the dairy sector are more readily available. The dairy farm sector, which is the second most important in the state in terms of sales and the number one food sector in the state, has experienced a significant loss of demand due to closures of schools, institutions, and restaurants.

⁴ Hayden Stewart, "Food Away from Home," Oxford Handbooks Online, September 8, 2011, <https://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199569441.001.0001/oxfordhb-9780199569441-e-27>.

⁵ Melissa Repko, "The Meat Supply Chain Is Broken. Here's Why Shortages Are Likely to Last during the Coronavirus Pandemic" (CNBC, May 7, 2020), <https://www.cnbc.com/2020/05/07/heres-why-meat-shortages-are-likely-to-last-during-the-pandemic.html>.

This sharp disruption in markets has impelled cooperatives to take extraordinary measures to reconfigure supply chains, sometimes trucking milk long distances to find markets or dumping milk when markets were not available.

Figure 1. Structure of Connecticut’s Agricultural Sectors by Farm Revenue, 2017



Source: USDA / NASS

Rapidly changing consumer preferences during the pandemic and its related restrictions have reduced demand for dairy products far below farmers’ projections. Because of COVID-19 market disruptions, supply management programs have been enacted by processing co-ops to reduce the excess milk produced. Agri-Mark, the major northeastern dairy farm cooperative that purchases and markets milk in Connecticut, has instituted a supply management program to reduce the amount of milk marketed to bring it in line with processing capacity. Agri-Mark’s supply management program affects production greater than 94 percent of a producer’s base quantity,⁶ penalizing that production by deducting \$14/hundredweight (cwt.) from the price and effectively incentivizing the producer to cut production by 4 to 6 percent. In this study, we utilize a supply reduction of 6 percent.⁷ Another major co-op that purchases milk from Connecticut producers, Dairy Farmers of America, or DFA, has enacted its own supply management program. DFA’s program affects 15 percent of a farm’s production, but the penalty realized is based on market conditions and may be less per cwt. than Agri-Mark’s \$14 penalty. All told, we believe that the impact of DFA’s supply management program on farms’ milk revenues is at least as significant as Agri-Mark’s, making our estimates conservative with respect to the segment of farmers that deal with DFA.

In order to quantify the financial impact of the COVID-19 pandemic on Connecticut’s dairy farm sector, this report will focus on price and quantity losses and distill the effects of shifting consumer preferences, supply chain bottlenecks, and supply management programs. At the outset, note that this analysis will not account for the impacts of federal insurance-type programs administered through USDA, such as Livestock Gross Margin (LGM-Dairy), or Dairy Margin

⁶ Catherine de Ronde, “COVID-19 and the Rural Economy,” [csg-erc.org](https://csg-erc.org/economic-impacts-of-covid-19-on-the-agriculture-and-rural-sectors/) (The Council of State Governments Eastern Regional Conference, May 29, 2020), <https://csg-erc.org/economic-impacts-of-covid-19-on-the-agriculture-and-rural-sectors/>.

⁷ The Dairy Committee of the Connecticut Farm Bureau Association concluded that supply reduction is quite close to 6 percent.

Coverage (DMC), which may compensate producers for declines in milk margins if they purchased such coverage in advance. It also does not account for CARES Act, or other, relief programs created in response to the COVID-19 crisis, such as the Paycheck Protection Program, which could help to mitigate some of the financial impacts related to the virus.

Methodology

To understand how COVID-19 is affecting the revenues of Connecticut dairy farmers, we analyzed the two most significant impacts. One is the price impact due to a decline in demand from loss of foodservice markets. The second is the supply management policy being imposed by milk buyers in an attempt to balance supply with available processing capacity. The total revenue losses due to COVID-19 are the sum of these two components. Note that Appendix B provides more details on the data utilized and the statistical testing procedures used.

In this analysis, we are not accounting for the impacts of federal insurance-type programs administered through USDA, such as Livestock Gross Margin (LGM-Dairy), or Dairy Margin Coverage (DMC), which may compensate producers for declines in milk margins if they purchased such coverage in advance. We are also not accounting for CARES Act, or other, relief programs created in response to the COVID-19 crisis, such as the Paycheck Protection Program, which could help to mitigate some of the financial impacts related to the virus.

Revenue Losses from Price Changes

We utilized Agri-Mark’s price forecast from January 22, 2020, which we took as our pre-pandemic baselines and their forecast from May 19, 2020 (post-pandemic). The May forecast contained the actual pay prices for January-April⁹ and the forecast prices, which are based on futures markets for the remainder of 2020. Agri-Mark’s forecasts tend to have strong statistical correlation to USDA national milk prices. To quantify the price impacts due to COVID-19, we have calculated the loss in value of the base milk production quantity due to the decline in milk prices. We utilize Connecticut’s 2019 quarterly production quantities from the USDA National Agricultural Statistics Service (NASS), and allocate them equally to estimate 2020 monthly milk production.¹⁰

For a baseline projection of pre-COVID “unimpacted” values, we have used Agri-Mark’s January 22, 2020, forecast prices of Boston Blend milk @3.5% butterfat (which is close to the actual price paid to farmers) for January-December 2020. We have compared this to the actual prices in January-April from Agri-Mark’s May 19 pricing. We will utilize the May 19, 2020, forecast as our “impacted” post-COVID-19 prices. The May forecast also gives a more accurate representation of price losses expected to occur from May-December 2020. The estimated price losses due to COVID-19 are ascertained by calculating the difference in production value between the pre-COVID and post-COVID event forecast prices. We note that although

⁸ Catherine de Ronde, “Agri-Mark 2019-2020 Price Forecast”. Agri-Mark, January 22, 2020. “Unimpacted” values

⁹ Catherine de Ronde, “Agri-Mark 2019-2020 Price Forecast”. Agri-Mark, May 19, 2020. “Impacted” values

¹⁰ USDA, “USDA/NASS 2019 State Agriculture Overview for Connecticut.” U.S. Department of Agriculture National Agriculture Statistics Service New England Field Office.

https://www.nass.usda.gov/Quick_Stats/Ag_Overview/stateOverview.php?state=CONNECTICUT (June 10, 2020).

Connecticut did not declare a public health emergency until March 10, milk markets began reacting to the coming crisis as early as January.

Revenue Losses from Supply Restrictions

In order to help balance supply with available markets and processing capacity, cooperatives, including Agri-Mark, began supply management programs to reduce the milk supply by 4 to 6 percent and instituted \$14/cwt over-production penalties to incentivize farmers to reduce their production. While the first COVID-19 cases emerged in the U.S. in January, most supply management programs were not put into effect until April. Therefore, we focused on the supply management losses beginning in April. It is unknown if these supply management penalties will stay in place for the remainder of the year; however, they effectively devalue any milk produced over the limits while in effect. We have assumed supply management losses through the end of the year as a low estimate of sector losses, because cooperatives may continue to regulate production in the future.

The COVID-19 supply management program utilized in our estimates is currently in effect throughout Agri-Mark's purchasing region. Note that the milk subject to supply management is assessed a \$14/cwt. penalty, which would reduce the price of the over-the-quota milk to an average sum of \$1-3/cwt relative to the price forecasts in Table 1. It is reasonable to assume that the heavy penalties for supplying above the quota would, as intended, cause farmers to limit the production of additional milk. There is anecdotal evidence that some arrangements have been made for disposal of surplus milk that cannot be channeled through grocery stores, such as donations (sometimes at cost of disposal) to food pantries. However, since milk normally has to be processed into pasteurized fluid milk or cheese, those arrangements are typically made in coordination with processors.

Results and Discussion

We estimated the two components of revenues losses accruing to dairy farmers based on the components of revenues: a price loss and a quantity loss from supply restrictions. The results are presented in Tables 1 and 2.

We estimated the price loss due to COVID-19 by using Agri-Mark prices forecast before the pandemic (January 2020) and actual and forecast prices during the pandemic (May 2020). We then multiplied that price loss by the 2019 milk production. The results are presented in Table 1. The estimated revenues lost due to pandemic-related price losses are approximately \$13.4 million for calendar year 2020, which is approximately a 15.7 percent decrease from estimated pre-pandemic market revenues. The impacts of COVID-19 will likely extend beyond the 2020 calendar year and have longer term effects on consumer trends and business structure, but without greater knowledge of human herd immunity, vaccine development, and public policy action related to the disease, it is difficult to forecast what will happen to milk prices with any degree of precision.

Table 1. Estimated Price-Related Revenue Losses due to the COVID-19 Pandemic

CY 2020	2019 Prod. (cwt.)	Agri-Mark Jan 2020 Forecast Price (cwt.)	Agri-Mark May 2020 Forecast Price (cwt.)	Price Loss	Est. Revenue Loss
Jan-20	363,300	\$ 19.10	\$ 18.78	\$ 0.32	\$ 116,256.00
Feb-20	363,300	\$ 19.65	\$ 18.12	\$ 1.53	\$ 555,849.00
Mar-20	363,300	\$ 19.81	\$ 17.74	\$ 2.07	\$ 752,031.00
Apr-20	360,000	\$ 19.88	\$ 14.92	\$ 4.96	\$ 1,785,600.00
May-20	360,000	\$ 20.01	\$ 13.21	\$ 6.80	\$ 2,448,000.00
Jun-20	360,000	\$ 19.92	\$ 15.93	\$ 3.99	\$ 1,436,400.00
Jul-20	346,700	\$ 19.95	\$ 16.68	\$ 3.27	\$ 1,133,709.00
Aug-20	346,700	\$ 19.69	\$ 16.91	\$ 2.78	\$ 963,826.00
Sep-20	346,700	\$ 20.06	\$ 17.08	\$ 2.98	\$ 1,033,166.00
Oct-20	356,700	\$ 20.27	\$ 17.15	\$ 3.12	\$ 1,112,904.00
Nov-20	356,700	\$ 20.00	\$ 17.11	\$ 2.89	\$ 1,030,863.00
Dec-20	356,700	\$ 19.97	\$ 17.06	\$ 2.91	\$ 1,037,997.00
Year					\$ 13,406,601.00

Table 2. Estimated Revenue Losses from Supply Restrictions

CY 2020	Amount paid full (cwt)	Supply Mgmt (6%)	Agri-Mark May 2020 Forecast Price (per cwt)	Impact on Quantity due to COVID-19
Jan-20	341,502		\$ 18.78	\$ -
Feb-20	341,502		\$ 18.12	\$ -
Mar-20	341,502		\$ 17.74	\$ -
Apr-20	338,400	21,600	\$ 14.92	\$ 322,272.00
May-20	338,400	21,600	\$ 13.21	\$ 285,336.00
Jun-20	338,400	21,600	\$ 15.93	\$ 344,088.00
Jul-20	325,898	20,802	\$ 16.68	\$ 346,977.36
Aug-20	325,898	20,802	\$ 16.91	\$ 351,761.82
Sep-20	325,898	20,802	\$ 17.08	\$ 355,298.16
Oct-20	335,298	21,402	\$ 17.15	\$ 367,044.30
Nov-20	335,298	21,402	\$ 17.11	\$ 366,188.22
Dec-20	335,298	21,402	\$ 17.06	\$ 365,118.12
Year				\$ 3,104,083.98

We estimate the revenue losses due to COVID-19-related supply management programs to be an additional \$3.1 million for calendar year 2020. The results are presented in Table 2. While there has been discussion of supply management from cooperatives prior to COVID-19, the impact of the public health crisis made supply management a more urgent matter. Agri-Mark had planned a base-excess program to go into effect in January, but the effects of COVID-19 resulted in more significant supply cuts. The penalties imposed on excess milk production in some cases have resulted in farmers receiving compensation far below their cost of production for that milk, providing a strong incentive to decrease production.

Note that other milk buyers in Connecticut, such as Dairy Farmers of America, have implemented similar supply management programs. The DFA's program affects a greater percentage of a farm's milk production but likely has a lower impact per cwt. We believe the impact of the DFA's program, as well as other supply management programs, to be *at least as significant* as that of Agri-Mark's program.

The combined impacts of price and quantity losses are estimated to result in a nearly \$16.5 million loss, or an approximate 19.4 percent decrease in total dairy revenue for 2020 had the pandemic not occurred. As the pandemic subsides, consumer trends and businesses will likely begin a slow return to pre-pandemic conditions. Forecasting milk pricing beyond 2020 or 2021 is difficult to do with any degree of precision until more is known about epidemiology or viral subsidence of COVID-19. We may, however, reference models of pandemic growth, accounting for levels of mobility, social distancing, testing, and PPE use among a population to provide a guideline for what may be expected for business operations in coming years.

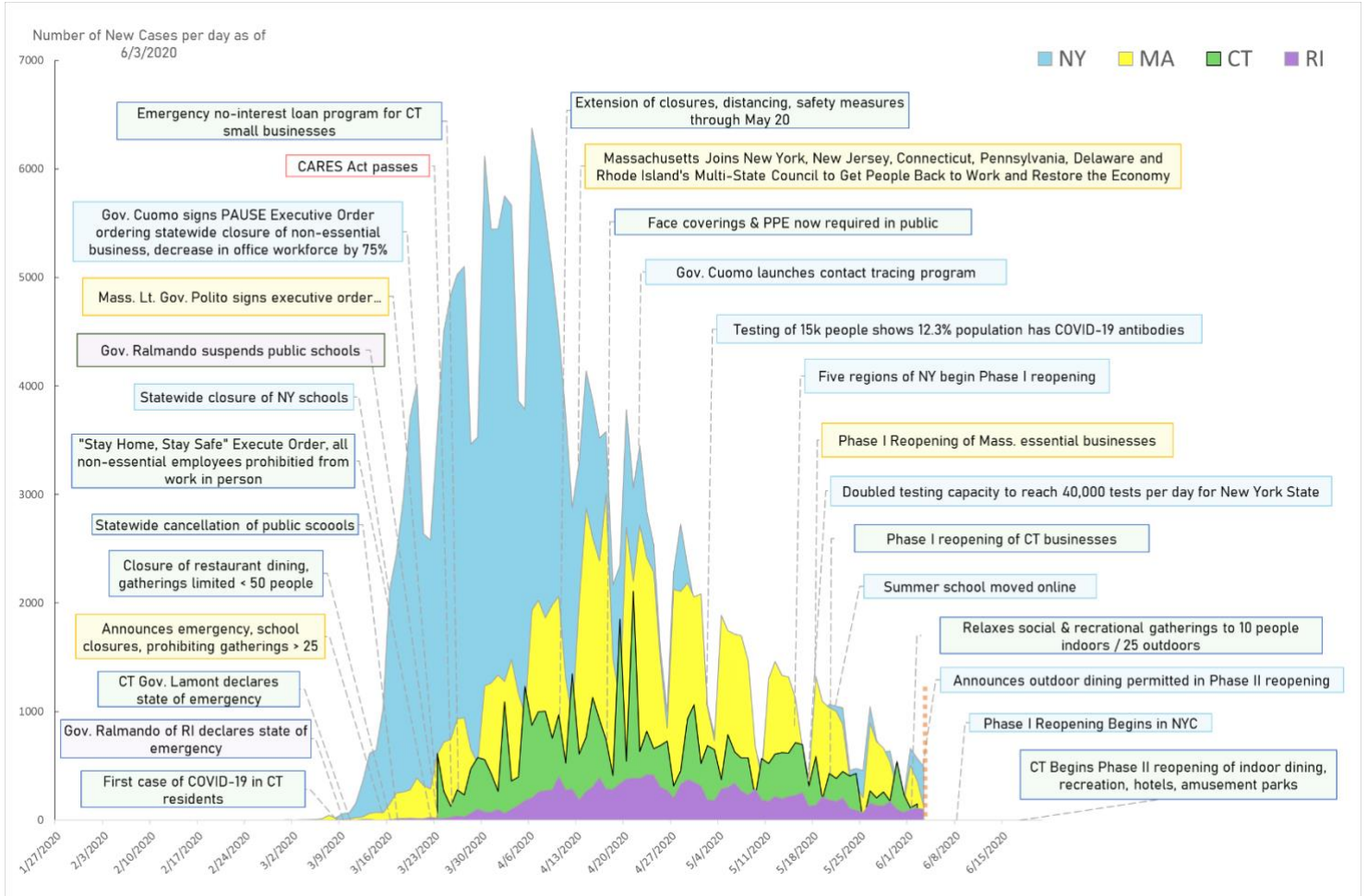
Conclusion

In conclusion, the Connecticut dairy farm sector is expected to experience a total \$16.51 million loss in revenues due to the COVID-19 pandemic in 2020. This translates into a 19.4% decline in total farm revenue. It is worth noting that most of the revenue loss stems from a decline in farm prices, amounting to a \$13.41 million loss, accounting for 81% of the total revenue loss, with the remaining 19% of the loss (or \$3.1 million) stemming from supply restrictions.

The rate at which the pandemic subsides is an integral component of evaluating the duration of the pandemic's impacts on the dairy farm sector. As restaurants and institutions, such as schools begin to reopen, demand for milk consumed away from home will gradually be restored, alleviating bottlenecks in the supply chain. However, there is also a possibility of a second wave of the pandemic. As the future of the pandemic remains uncertain in Connecticut for the remainder of 2020, the estimates presented in this report represent a snapshot and they might change with new new data and as the situation on the ground change.

APPENDIX A: COVID-19 EVENTS RELEVANT TO CONNECTICUT

Figure A1. Relevant COVID-19 Events in the Connecticut Region, including New York, Massachusetts, and Rhode Island.¹¹

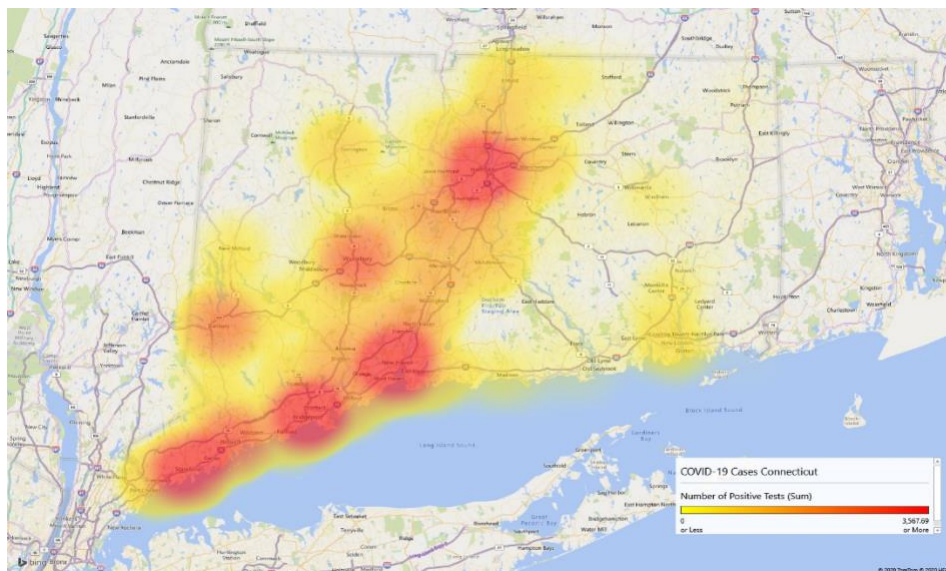


¹¹ Constructed from multiple sources, including the following: Connecticut State Government, "Governors Press Releases," Connecticut's COVID-19 Response, <https://portal.ct.gov/Coronavirus/Pages/Governors-Press-Releases>; "Sector Rules for Reopen," <https://portal.ct.gov/DECD/Content/Coronavirus-Business-Recovery/Sector-Rules-and-Certification-for-Reopen> (June 10, 2020). New York State Government, "Coronavirus." Press Releases." <https://www.governor.ny.gov/keywords/coronavirus> Massachusetts State Government, "Baker-Polito Administration Announces Emergency Actions to Address COVID-19." Mass.gov. State of Massachusetts, 2020. <https://www.mass.gov/news/baker-polito-administration-announces-emergency-actions-to-address-covid-19>. Rhode Island State Government, "State Government Press Releases." <https://www.ri.gov/press/>.

As the number of new cases and hospitalizations due to COVID-19 has been steadily declining, policy makers have started the progressive reopening of non-essential businesses in an attempt to jumpstart the economy. We use data from New York City as an indicator for transmission rates within the Northeast, in conjunction with policy actions in Massachusetts and Rhode Island. Connecticut began its Phase I partial reopening of restaurants on May 20, which allowed for outdoor dining at 50 percent capacity, providing that establishments adhered to strict safety protocols and limited groups to fewer than five people. The state is poised to begin Phase II reopening of indoor dining at 50 percent capacity on June 17, as well as opening hotels, amusement parks, and entertainment.

Both New York City and Massachusetts also began Phase I reopening as of late May. Safely reopening restaurants and recreation will begin to restore a large portion of demand for dairy products. Effective PPE and social distancing measures will be essential to prevent the outbreak of new cases. Public policy measures will truly be tested in the coming weeks, as many states levy restrictions on businesses and public mobility. Adoption of widespread testing and monitoring will allow for greater assurance of long-term viral containment so that business can return to normal.¹²

Figure A2. Map of COVID-19 Cases by Town in Connecticut as of June 6, 2020.¹³



¹² Mulligan, Casey B., Kevin M. Murphy, and Robert H. Topel. "Some Basic Economics of COVID-19 Policy." Chicago Booth Review, March 27, 2020. <https://review.chicagobooth.edu/economics/2020/article/some-basic-economics-covid-19-policy>.

¹³ Connecticut Open Data, "Connecticut COVID-19 Tests, Cases, Hospitalizations, and Deaths - Statewide" (State of Connecticut, 2020), <https://data.ct.gov/Health-and-Human-Services/COVID-19-Tests-Cases-Hospitalizations-and-Deaths-S/rf3k-f8fg/data>. COVID-19 Cases by Town.

APPENDIX B: PRICE AND QUANTITY STATISTICS

Table B1. Pre-Pandemic Farm Milk Production and Prices in Connecticut

Year	Milk Prod. Cwt	Avg Returns per cwt.	Value of Milk Production
2014	3,830,000	\$ 26.10	\$ 99,963,000
2015	3,960,000	\$ 18.40	\$ 72,864,000
2016	4,090,000	\$ 17.00	\$ 69,530,000
2017	4,200,000	\$ 18.60	\$ 78,120,000
2018	4,270,000	\$ 17.10	\$ 73,017,000
2019	4,280,000	\$ 19.20	\$ 82,176,000

Source: USDA/NASS

Figure B2. Comparison of USDA vs. Agri-Mark Farm Milk Prices

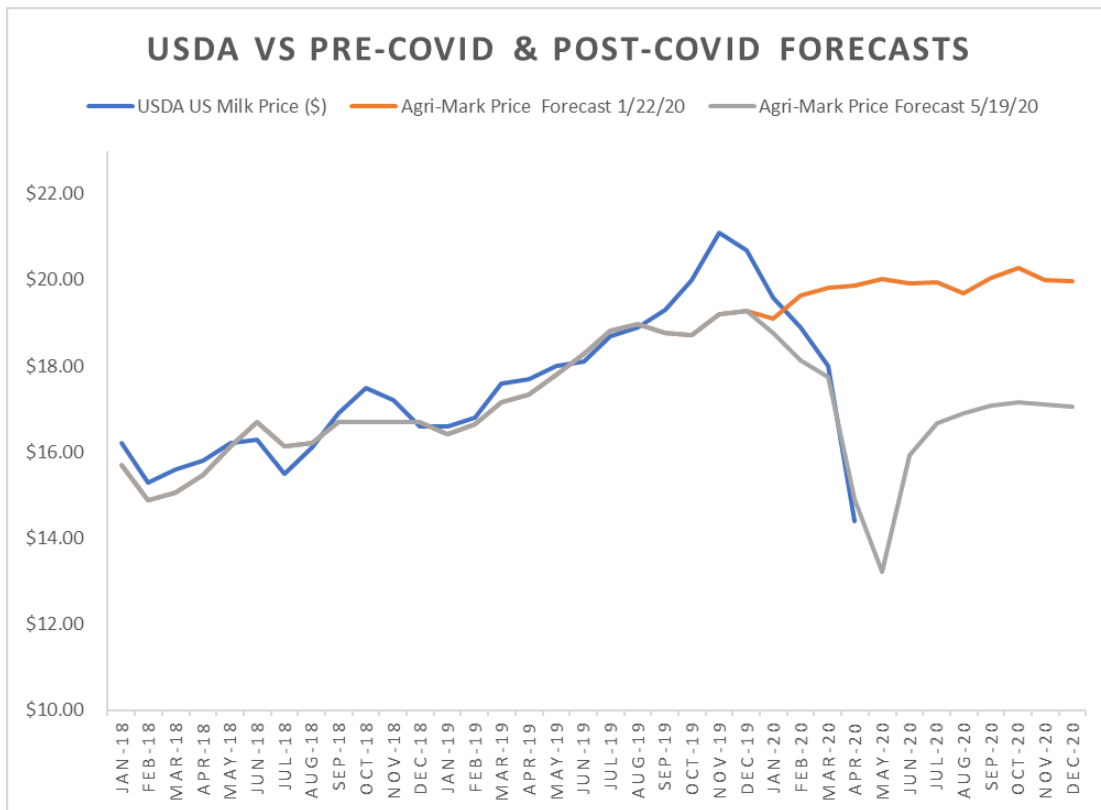


Table B3. Agri-Mark Milk Price Forecasts Pre- and COVID-19 periods

Agri-Mark Forecasts of 2020 Boston Blend Price @ 3.5% Butterfat			
Date	Price Forecast 1/22/2020	Price Forecast 5/19/2020	% Price Difference between forecasts
Jan-20	\$ 19.10	\$ 18.78	-1.7%
Feb-20	\$ 19.65	\$ 18.12	-7.8%
Mar-20	\$ 19.81	\$ 17.74	-10.4%
Apr-20	\$ 19.88	\$ 14.92	-24.9%
May-20	\$ 20.01	\$ 13.21	-34.0%
Jun-20	\$ 19.92	\$ 15.93	-20.0%
Jul-20	\$ 19.95	\$ 16.68	-16.4%
Aug-20	\$ 19.69	\$ 16.91	-14.1%
Sep-20	\$ 20.06	\$ 17.08	-14.9%
Oct-20	\$ 20.27	\$ 17.15	-15.4%
Nov-20	\$ 20.00	\$ 17.11	-14.5%
Dec-20	\$ 19.97	\$ 17.06	-14.6%
AVG	\$ 19.86	\$ 16.72	-15.8%
Q2-Q4 AVG	\$ 19.97	\$ 16.23	-18.7%

To establish the statistical relevance of utilizing Agri-Mark price forecasting for our analysis, we compared the variance in Agri-Mark historical prices with USDA prices. Performing a 2-sample t-test on the Agri-Mark historical data versus USDA reported pricing for 2019 yields a t-stat of -0.994, at 95% confidence interval, which shows negligible differences between their data. To confirm the results, we conducted a Pearson correlation analysis relating Agri-Mark pricing to USDA pricing, resulting in an r-coefficient of 0.9098. This is a strong correlation, given the range (-1,1), where the strongest correlation is closest to the absolute value of 1. As the USDA prices are calculated nationwide and Agri-Mark co-op operates exclusively in the Northeast, there are zone differentials of price between geographic locations, accounting for transportation and processing costs. This is likely to be the factor of difference between the two data sets and is not expected to change significantly due to the circumstances of the pandemic.

Table B4. Statistical Tests of Agri-Mark vs. USDA/NASS Prices

Agri-Mark vs. USDA Historical Milk Prices (\$/cwt)			
Month	Agri-Mark Forecast Oct. 23, 2018	Agri-Mark	USDA
Jan-18	15.70	15.70	16.2
Feb-18	14.88	14.88	15.3
Mar-18	15.06	15.06	15.6
Apr-18	15.46	15.46	15.8
May-18	16.14	16.14	16.2
Jun-18	16.70	16.70	16.3
Jul-18	16.14	16.14	15.5
Aug-18	16.21	16.21	16.1
Sep-18	16.71	16.71	16.9
Oct-18	17.29	16.69	17.5
Nov-18	16.98	16.69	17.2
Dec-18	16.94	16.69	16.6
Jan-19	16.97	16.42	16.60
Feb-19	17.01	16.65	16.80
Mar-19	17.14	17.17	17.60
Apr-19	17.28	17.34	17.70
May-19	17.43	17.80	18.00
Jun-19	17.48	18.28	18.10
Jul-19	17.67	18.83	18.70
Aug-19	17.92	18.97	18.90
Sep-19	18.16	18.78	19.30
Oct-19	18.22	18.72	20.00
Nov-19	18.15	19.20	21.10
Dec-19	18.04	19.28	20.70

Table B5. Selected Statistical Test for the Validity of Using Agri-Mark Prices

t-Test: Two-Sample Assuming Equal Variances		
	<i>Agri-Mark Price</i>	<i>USDA Price</i>
Mean	18.12	18.625
Variance	1.020363636	2.078409091
Observations	12	12
Pooled Variance	1.549386364	
Hypothesized Mean Difference	0	
df	22	
t Stat	-0.993772875	
P(T<=t) one-tail	0.165569395	
t Critical one-tail	1.717144374	
P(T<=t) two-tail	0.331138791	
t Critical two-tail	2.073873068	

r-Pearson Correlation	
Agri-Mark vs USDA Prices	Agri-Mark Forecast vs USDA Prices
0.90979	0.93024