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Minnesota Dairy Farm Financial Resiliency Summary Report

By

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Introduction

Minnesota is home to more than 2,100 dairy farms (MDA, 2022). Narrowing profit margins for small- and medium-sized dairies from 2015 to 2018 have initiated discussions regarding how to maintain positive profit over the long run. Expanding herd size can improve profit through economies of scale but can be limited due to resource constraints, such as land, facilities, labor, and regulations. Some business structures enable farms to enter a niche market (conversion to organic production, A2/A2 milk, etc.) or add a value-added enterprise (vertical integration), but these operations often require a large initial capital investment. For many farms, barriers prevent them from utilizing these strategies. This makes improving efficiencies through management key to ensuring a healthy, economically sustainable business for the next generation.

Successful dairy farm managers use data and information from multiple sources to make informed decisions regarding farm profitability. But, farm management remains one of the most limited resources on small and medium-sized farms due to the increasing demands on the dairy farm manager's time. Merging production and financial databases has generated significant interest and discussion in recent years as a means to learn more about ways to improve profitability, but research merging real-time farm production and financial data has not been successfully accomplished. Understanding the relationship between key farm characteristics and long-term profit can be achieved by studying financial data from farms in conjunction with cow-level health records. Comparing financially resilient farms, or those with strong financial performance, to other farms within the state over a period of volatile market conditions – complete with record-highs and lows – gives a glimpse into the realities of profitable management.

The ability to answer this question was made available through funding provided by USDA-NIFA for the project, "Merging Milk Quality and Financial Databases to Improve Farm Level Decisions and Enhance the Economic Viability of Small and Medium Sized Dairy Farms" (Award #2019-68006-29333). This integrated research and Extension project proposed to enhance the economic viability of small and medium-sized dairy farms by using existing milk quality, production, and financial databases to improve the efficiency of dairy management decisions. This was achieved by (1) developing methodologies to merge existing production and financial databases, and (2) evaluating the economic relationship between production, milk quality attributes, and financial performance of dairy farms.

In this research, biological and economic factors of dairy production were tied together using two data sources – the University of Minnesota's FINBIN and the Minnesota Dairy Herd Improvement Association (DHIA) – by matching lactation-based production data with annual whole-farm financial data. Detailed descriptions of this process can be found in Gambonini (2020) and Roberts (2019). The purpose of this summary report is to present summary statistics at a farm and cow level for the unique data available for this study. These summary statistics were used as the foundation of the work presented by Gambonini (2020) and Roberts (2019) and are presented in an easy to use format to extend the work to Extension and stakeholder audiences.

Data & Methods

Data used for this study was compiled from Minnesota DHIA (Buffalo, MN) and the University of Minnesota Center for Farm Financial Management's (CFFM) FINBIN (St. Paul, MN). FINBIN is the largest nationally representative farm financial database that provides aggregate estimates of farm financial performance (CFFM, St. Paul, MN). Each farm participating in the study provided yearly whole-farm and enterprise-level finances, which included variables such as milk price, whole-farm expenses, feed expenses, etc. Lactation-level DHIA data was collected through a data sharing agreement with Dairy Records Management System (DRMS; Raleigh, NC), which included cow-level characteristics and production measurements for each farm, such as cow identification number, monthly milk production, fat and protein yields, somatic cell count (SCC), lactation number, days in milk (DIM).

Data was collected in FINBIN from 2012 to 2018 from 82 participating dairy farms who utilized monthly DHIA testing and contributed yearly farm financial and dairy enterprise data through the Minnesota State Colleges and Universities Farm Business Management Program (FBM). The study years were selected to capture farms' responses to fluctuating markets with record-high milk prices in 2014 followed by depressed milk prices through 2018 (USDA-NASS, 2021). This sample represents 30 Minnesota counties and 100,045 yearly lactating cow observations over the 7-year study period. Farms were required to have a minimum of three years of data to be included in the study, which removed 10 farms and 3,233 cow observations from the dataset. Three organic farms with 1,363 cow observations were also removed from the dataset to better represent similar costs and revenues among farms in the study. The final dataset included 95,449 cow observations across 69 farms. Yearly FINBIN data for each of the 69 participating farms was matched to the 95,449 cow observations based on unique farm identification numbers for each year of the study. This merging of datasets and analyses were performed using Stata Statistical Software (StataCorp, College Station, TX; Roberts, 2019; Gambonini, 2020).

Financial Resiliency

To distinguish strong financial performers from their peers, farms were divided into two categories: (1) resilient and (2) non-resilient. Resiliency was measured using the adjusted net farm income (NFI) ratio[1], which evaluates a dairy farm's ability to retain gross revenue as profit to build equity over time. Each year, dairy farms in the sample were ranked against each other using the adjusted NFI ratio. Farms that performed in the top 25% of all farms for the majority of the years studied were categorized as resilient. Farm participation in the study period ranged from 3 to 7 years; therefore, a farm was categorized as resilient using the following protocol: 2 out of 3 years, 3 out of 5 years, 3 out of 6 years, or 4 out of 7 years. In this study, 16 of the 69 farms are considered financially resilient. A farm that is coded as non-resilient does not indicate they are not financially successful, rather they did not outperform their peers using the resiliency measure in this analysis.

Figure 1 depicts the average NFI for resilient and non-resilient farms from 2012 to 2018. NFI is used in the adjusted NFI ratio calculation, which directly determines resiliency as mentioned above. As shown in Figure 1, resilient farms display positive average NFI throughout the study period. In contrast, non-resilient farms have higher average NFI than resilient farms in two of the study years—2012 and 2014—but also have negative NFI in two years—2016 and 2018. Averaging across each farm each year, resilient farms had an average NFI that was $24,000 more than non-resilient farms; resilient farms averaged $97,844 per farm per year, while non-resilient farms had an average of $73,750 per farm per year. The difference becomes larger between resilient and non-resilient farms when considering herd size; the average NFI per cow on resilient farms was $1,176 per cow per year compared to $402.78 per cow per year for non-resilient farms. Resilient farms were able to secure a stable income even when milk prices were extremely volatile.

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[1] The adjusted NFI ratio was calculated from a farm's financials, such that,

$$Adjusted\,NFI\,Ratio_{it} = \frac{NFI_{it}}{Value\,of\,Farm\,Production_{it}},$$

where $Adjusted\,NFI\,Ratio_{it}$ is the adjusted NFI ratio for the *i*th herd in year *t*; NFI_{it} is net farm income calculated as gross cash farm revenue less cash farm expenses, depreciation, and beginning and ending balance sheet inventory adjustments for crops, market livestock, and breeding livestock for the *i*th herd in year *t*; and $Value\,of\,Farm\,Production_{it}$ is the revenue generated through farm activities from dairy and crop production less the value of purchased feed and market livestock for the *i*th herd in year *t* (FFSC, 2021).

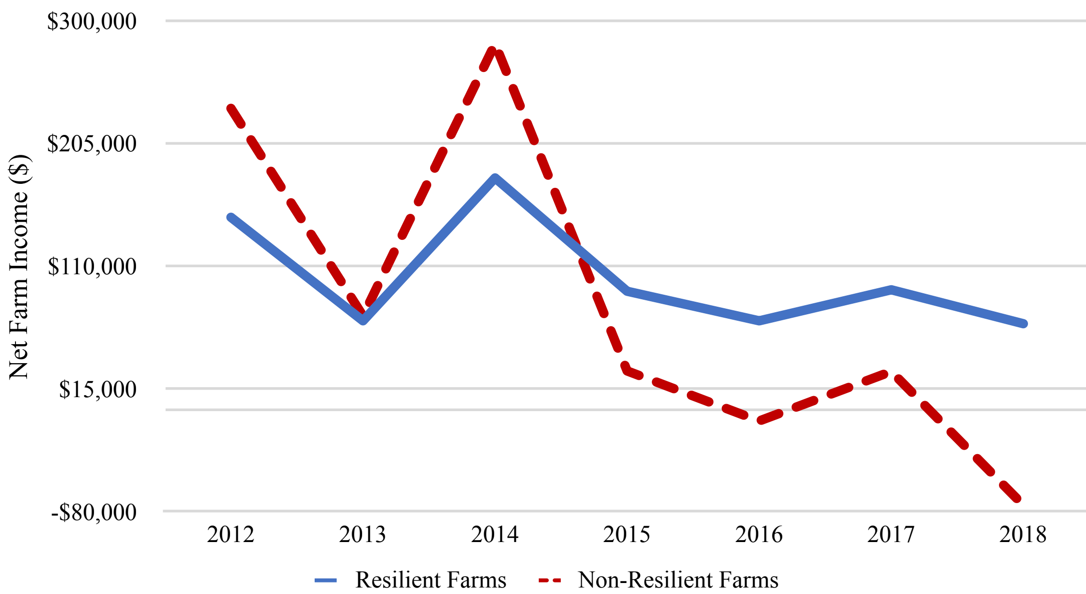

Figure 1: Mean farm-level NFI for resilient and non-resilient farms, 2012-2018

Figure 2 depicts the average NFI for resilient and non-resilient farms along with their associated ranges within the dataset. As demonstrated in Figure 2, the NFI range for resilient farms has a narrow dispersion around the mean, which is opposite to what is experienced by the non-resilient farms. Resilient farms are willing to trade off increased NFI when milk prices are high to avoid losses when milk prices are depressed. From 2012 to 2015, resilient farms experienced no losses in NFI. In comparison, 35% of non-resilient farms received negative NFI in 2015. When making this tradeoff, resilient farms experience more stability by limiting their potential losses, but also limit their net gains. While no resilient farms experienced negative NFI in 2015, only 10% of non-resilient farms achieved a higher net farm income greater than the highest netting resilient farm (~ $172,000). During sustained low milk prices, resilient farms remained profitable while non-resilient farms, on average, suffered a net loss.

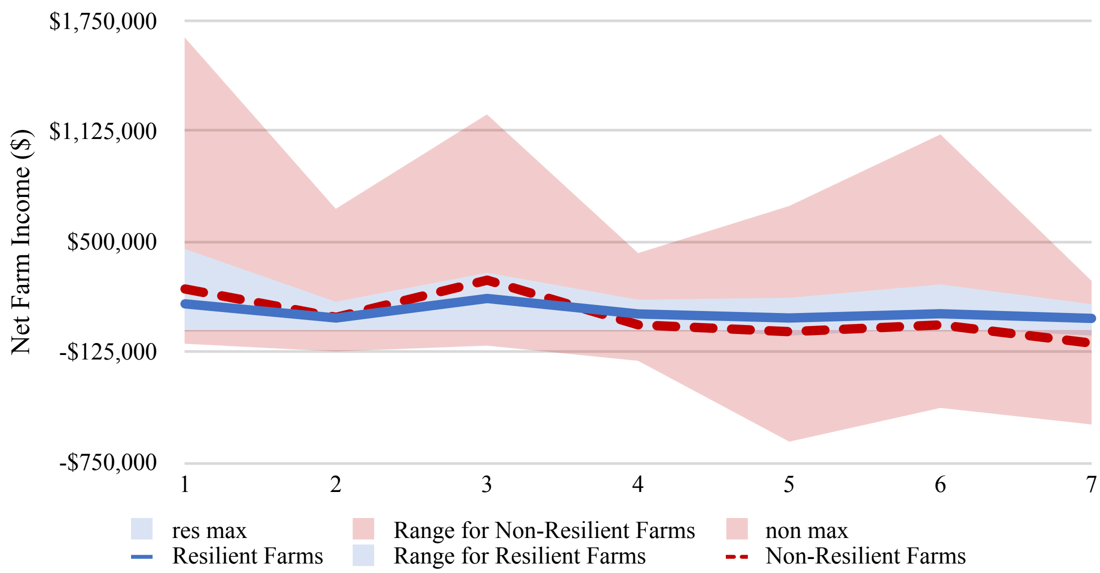

Figure 2: Mean and range of farm-level NFI for resilient and non-resilient farms, 2012-2018

Results Discussion

To better understand the interaction between farm characteristics, management decisions, and financial resiliency, farm-level characteristics were grouped into five categories: Animal Health, Farm Structure, Farm Costs, Financial Indicators, and Human Resource Variables. Each category with accompanying results are presented and described below. All statistics are presented at the farm level unless otherwise specified. Table 1 illustrates the maximum number of farms observed in each year for the resilient and non-resilient categories.

Table 1: Maximum number of farm observations by year for resilient and non-resilient farms*

Year	Resilient Farms	Non-Resilient Farms
2012	11	43
2013	11	47
2014	11	43
2015	15	48
2016	16	51
2017	16	53
2018	14	47

* Total number of farms with data in each year of the study for resilient and non-resilient farms. Not all farms were included for each variable if data was missing, resulting in fewer observations than listed above.

Animal Health Variables

Animal health variables that were analyzed in this study include milk yield, energy corrected milk (ECM) yield, butterfat test, protein test, cull rate, and death rate. The first four variables were analyzed at both the farm level and the cow level. Farm-level means were calculated for a group by averaging across the average of each farm within a group. In contrast, cow-level means were calculated for a group by taking an average of all cows across all farms within a group. Farm-level means are considered a simple average across farms, while cow-level means are considered a weighted average since farms with more cow observations will have greater representation in the sample.

Figure 3a illustrates the average milk yield per cow per year for resilient and non-resilient farms, represented by a simple average across farms. As shown in the figure, non-resilient farms, on average, have a higher milk yield per cow per year when compared to resilient farms. The year 2012 is likely lower than other years due to the number of cows with complete lactation data within that year, as cows who began their lactation in 2011 were not included in the sample. Across all study years, non-resilient farms have an average milk yield per cow that is 12.3% higher than that of resilient farms (16,188 pounds per cow compared to 14,418 pounds per cow).

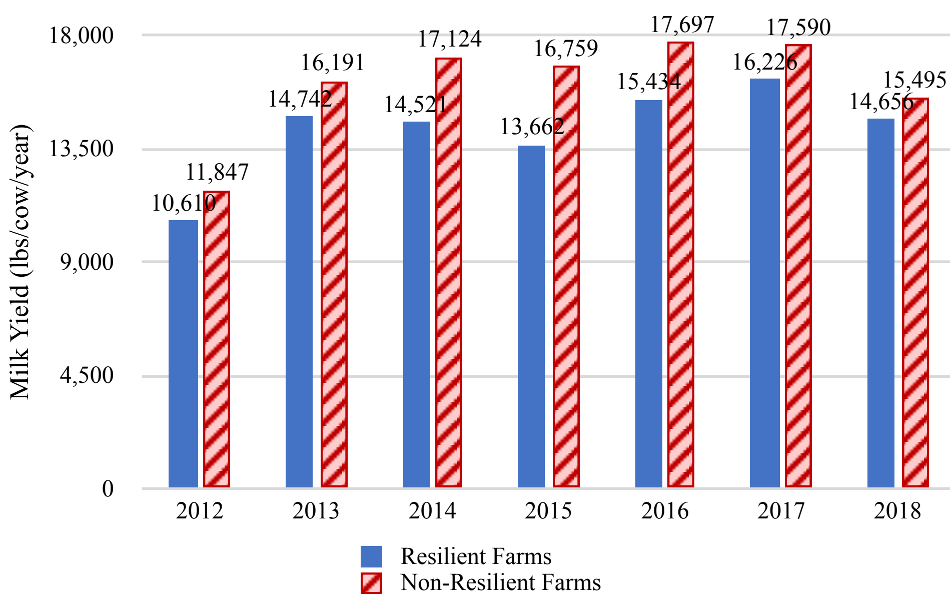

Figure 3a. Average Milk Yield, 2012-2018

Figure 3b depicts the average milk yield per cow per year for resilient and non-resilient farms, weighted by yearly cow observations rather than farm observations. Weighting by cows is calculated by dividing the total milk produced across the subsample (resiliency group in a year) by the total number of lactating cows in the given subsample. This differs from Figure 1a, which calculated an average value for each farm each year then averaged across those yearly farm averages in a subsample. Similar to Figure 1a, cows on resilient farms had a lower average milk yield each year compared to non-resilient farms. When averaging across all years of the study, milk yield per cow is higher using the weighted average method compared to the farm-level average portrayed in Figure 3a; resilient farms average 14,845 pounds per cow, while non-resilient farms average 17,054 pounds per cow.

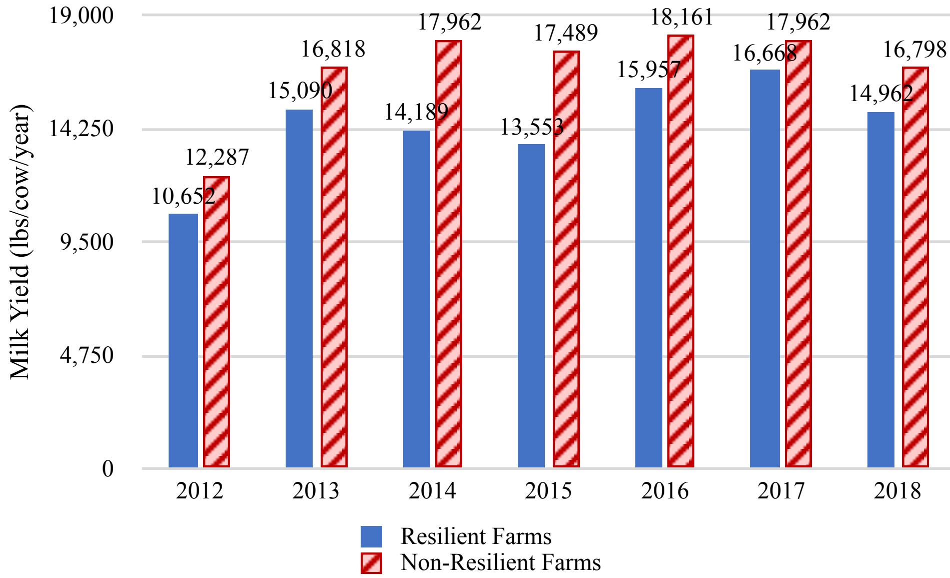

Figure 3b. Weighted Average Milk Yield, 2012-2018

Figure 4a represents the average ECM[2] produced per cow per year for resilient and non-resilient farms, depicted as a simple average of farms by resiliency category. On average, resilient farms produce less ECM per cow per year when compared to non-resilient farms. When averaging across all years of the study, non-resilient farms produce 11.7% more ECM per cow than resilient farms (17,042 pounds per cow versus 15,258 pounds per cow). Because the sample begins in 2012, any cows who begin their lactation part of the way through 2012 will report a lower average ECM due to the lactation being fewer days within that year. As expected, average ECM yield is higher across all columns (Figure 4a) than average milk yield (Figure 3a).

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[2] The ECM formula adjusts milk for 3.5% butterfat and 3.2% protein to replicate the Class III milk contract pricing mechanisms commonly used in Minnesota. ECM is calculated following the reported formula in DRMS' DHI Glossary (2014), such that,

$$ECM_{nit} = \left(0.327 * Milk\ Yield_{nit}\right) + \left(12.95 * Fat\ Yield_{nit}\right) + (7.65 * Protein\ Yield_{nit}),$$

where ECM_{nit} is the pounds of energy corrected milk produced by the *n*th cow in the *i*th herd in year *t*; $Milk\ Yield_{nit}$ is the pounds of milk produced by the *n*th cow in the *i*th herd in year *t*; $Fat\ Yield_{nit}$ is the pounds of fat produced by the *n*th cow in the *i*th herd in year *t*; and $Protein\ Yield_{nit}$ is the pounds of protein produced by the *n*th cow in the *i*th herd in year *t*.

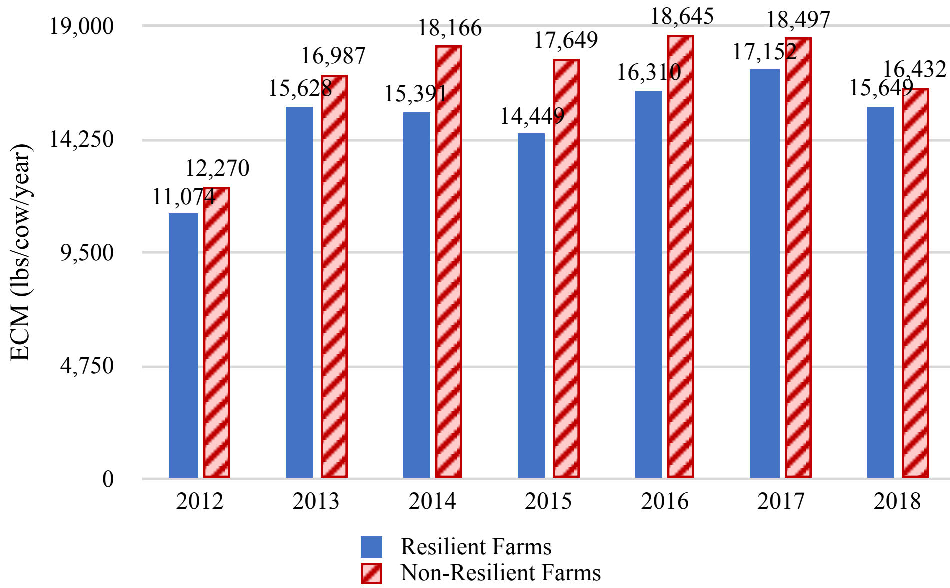

Figure 4a. Average ECM Yield, 2012-2018

Figure 4b represents the average ECM produced per cow per year for resilient and non-resilient farms weighted by yearly cow observations. Similar to Figure 4a, Figure4b shows that resilient farms have lower ECM across all years of the sample. Figure 4b also shows that average ECM yield is higher than average milk yield, as depicted in Figure 3b, for every year and subsample of the study. Compared to the simple average, the weighted average across all years is higher for both resilient and non-resilient farms, as resilient farms average 15,660 pounds of ECM per cow per year and non-resilient farms average 17,965 pounds per cow per year.

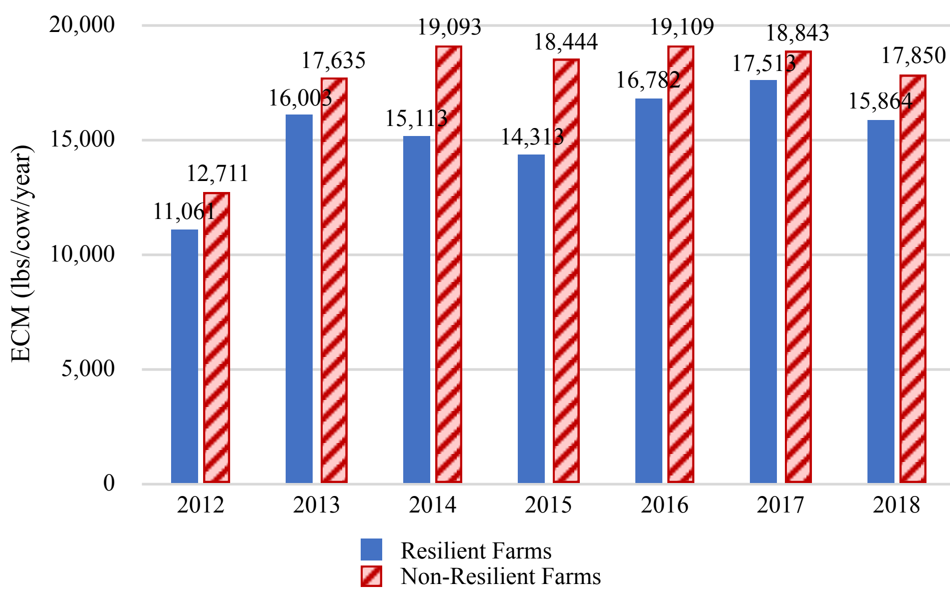

Figure 4b. Weighted Average ECM Yield, 2012-2018

Figure 5a presents the average butterfat test of milk for cows on resilient and non-resilient farms in the sample on an annual basis. Cows in resilient herds outperformed cows in non-resilient herds in butterfat test for every year except 2014. On average from 2012 to 2018, resilient farms had a butterfat test of 3.87%, while non-resilient farms averaged 3.83%. While the average butterfat was above 3.75% every year, the fluctuation across years may be due to feed quality and other unmeasurable parameters. The year 2012 observes the lowest butterfat tests across the two groups, coinciding with high feed market costs of that year. In addition, our data from DHIA begins in 2012, which means that cows are likely at an earlier point in their lactation compared to cows in other years of the study. The most recent years of 2017 and 2018 reflect the increased desire of processors to have higher component milk for manufacturing products. Minnesota dairy farmers are generally paid for their milk based on their components, of which milk fat is the easiest to alter with nutrition. Minnesota and the Midwest has high Class III utilization, meaning a greater number of cheese plants, making higher component levels beneficial to processors.

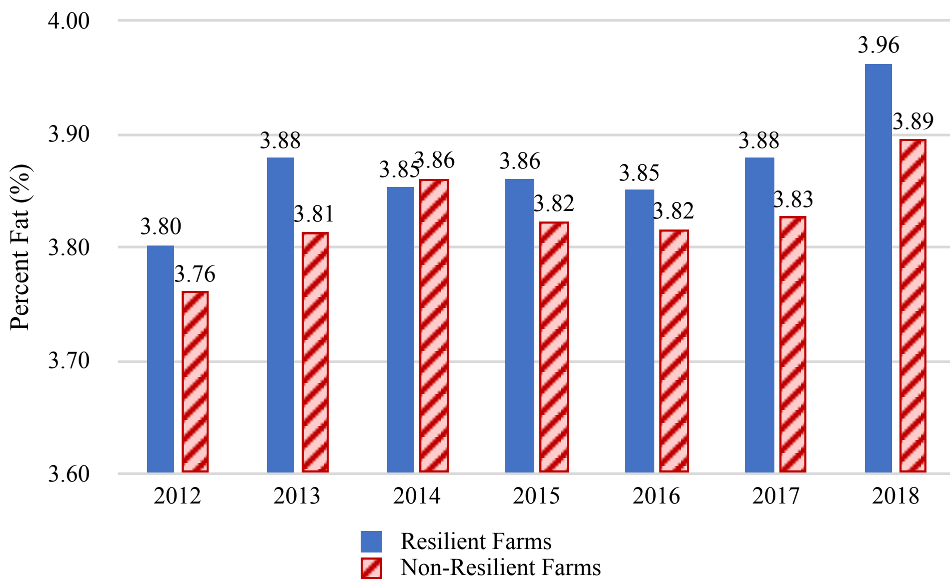

Figure 5a. Average Fat Test, 2012-2018

Figure 5b illustrates the average butterfat test for cows on resilient and non-resilient farms, weighted at the cow level. For greater detail, Table 2 displays the total number of cow-level observations (where one observation is equivalent to one cow in one year) along with the weighted average butterfat tests each year. When using a weighted average, resilient farms have a higher butterfat test than non-resilient farms in every year with the closest difference in average tests in 2014 and largest in 2013. From 2012 to 2018, resilient farms have a weighted average butterfat test of 3.85%, while non-resilient farms averaged 3.82%.

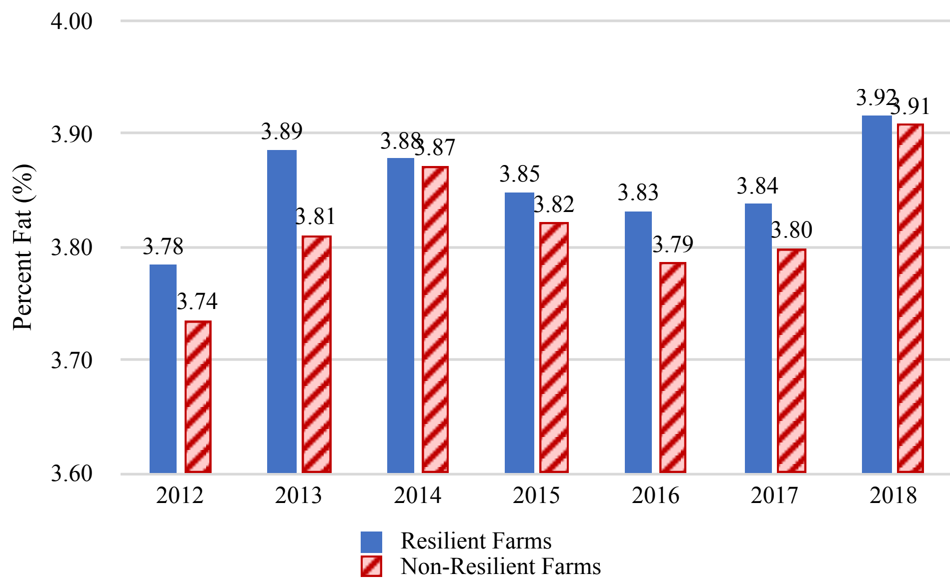

Figure 5b. Weighted Average Fat Test, 2012-2018

Table 2: Number of Cow-Level Observations and Weighted Mean for Fat Test, 2012-2018

Year	Resilient Farms		Non-Resilient Farms	
	Obs	Mean	Obs	Mean
2012	766	3.78	6,750	3.74
2013	848	3.89	8,818	3.81
2014	844	3.88	8,290	3.87
2015	1,370	3.85	9,887	3.82
2016	1,676	3.83	11,869	3.79
2017	1,805	3.84	13,710	3.80
2018	1,570	3.92	12,579	3.91

Figure 6a presents the average protein tests for resilient and non-resilient farms. On average, protein tests between resilient and non-resilient farms are fairly similar compared to what was observed in average butterfat tests. Only four of the seven years observe a difference larger than 0.1 percentage points between resilient and non-resilient farms. In 2015, resilient farms average protein test was 0.1 percentage points higher, while in 2018 non-resilient farms average protein test was 0.2 percentage points higher. Across all study years, resilient farms average 3.087% protein, while non-resilient farms average 3.089% protein. Milk protein is much more challenging to change than butterfat, and is often due to cow genetics.

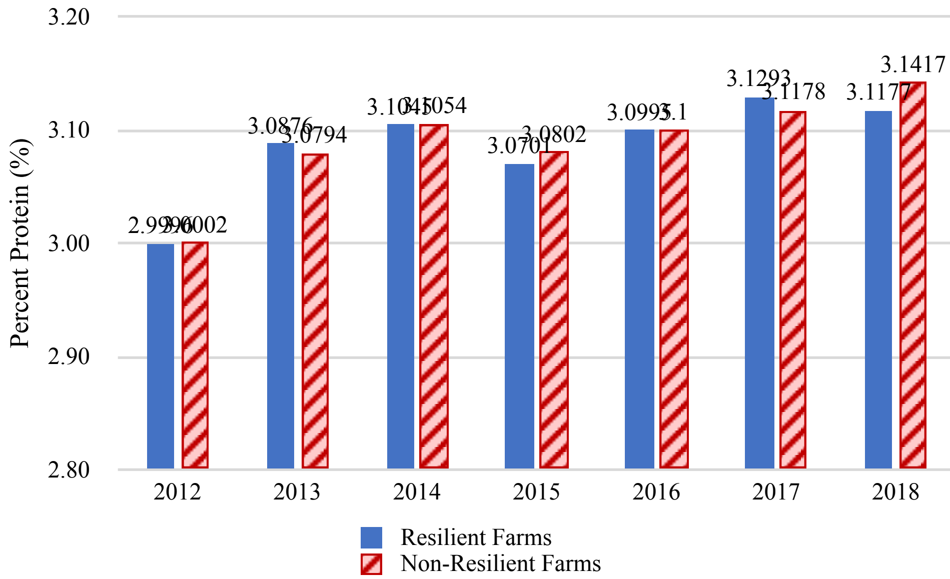

Figure 6a. Average Protein Test, 2012-2018

Figure 6b illustrates the average milk protein tests by year for resilient and non-resilient farms weighted at the cow level, while Table 3 presents the number of cow-level observations and weighted average protein tests by year. Compared to Figure 6a, Figure 6b observes non-resilient farms having lower protein tests when weighted at the cow level for all years of the study except 2012, while resilient farms show mixed changes. Unlike in Figure 6a, resilient farms have higher average protein tests than non-resilient farms in every year but 2012. Across all years, resilient farms observed a weighted average protein test of 3.087%, while that of non-resilient farms was 3.074%.

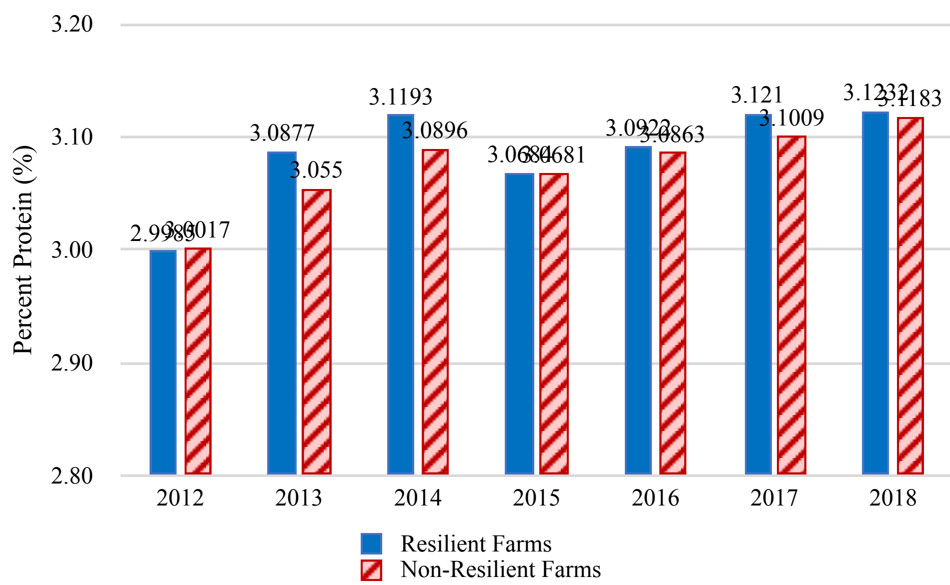

Figure 6b. Weighted Average Protein Test, 2012-2018

Table 3: Number of Cow-Level Observations and Weighted Mean for Protein Test, 2012-2018

Year	Resilient Farms		Non-Resilient Farms	
	Obs	Mean	Obs	Mean
2012	770	3.00	6,816	3.00
2013	851	3.09	8,894	3.05
2014	848	3.12	8,370	3.09
2015	1,381	3.07	10,011	3.07
2016	1,677	3.09	12,037	3.09
2017	1,814	3.12	13,854	3.10
2018	1,579	3.12	12,704	3.12

A farm may have a high cull rate if they are managing cows for strong efficiency and cows are not performing. While in other instances a high cull rate may indicate a farms inability to cover short term debt obligations and liquidating milk cows is the farms' way to pay that debt. Overall, cull rates have risen for both resilient and non-resilient farms in the past few years (Figure 7). Figure 7 shows resilient farms having a higher cull rate compared to non-resilient farms for four of the seven study years: 2012, 2013, 2017, and 2018. The year 2018 observes the largest cull rates for both resilient and non-resilient farms of 34.9% and 28%, respectively.

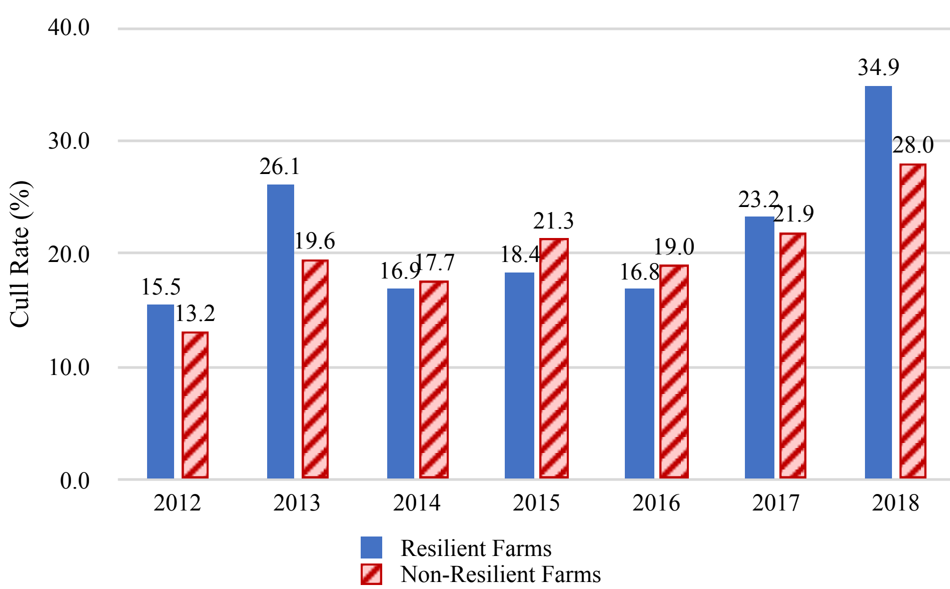

Figure 7. Average Cull Rate*, 2012-2018

* Values reported in Figure 5 only include farm observations with a cull rate greater than or equal to 1%.

Figure 8 depicts the average death rate for resilient and non-resilient farms across the study period. Years 2012, 2013, and 2014 are not depicted in the figure due to data confidentiality concerns, as outliers reduced the sample size for resilient farms to less than ten farms in those years. Averaging across 2015 through 2018, the average death rate on resilient farms was 3.02% while non-resilient farms reported an average death rate of 4.28%. Resilient farms reported a lower average death rate for each year. The average death rate for resilient farms ranged from 2.4 to 3.4 percent over the four years, while that for non-resilient farms ranged from a low of 3.4 percent to a high of 4.8 percent.

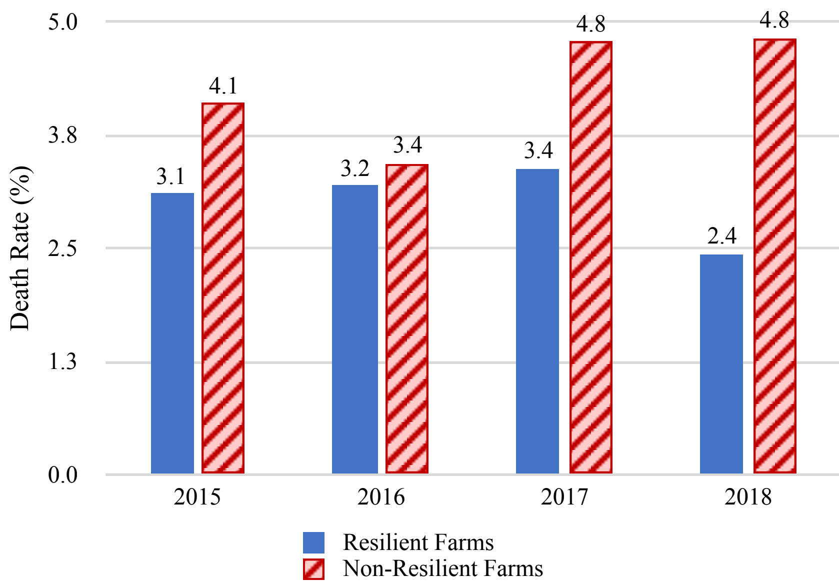

Figure 8. Average Death Rate*, 2015-2018

* Values reported in Figure 6 only include farm observations with a death rate greater than or equal to 0.5%.

Farm Structure Variables

Two variables were analyzed within the farm structure category. These variables included herd size and percent crop acres owned.

Average herd size, or the average number of milking cows on a farm, generally increased for both resilient and non-resilient farms from 2012 to 2018, as depicted in Figure 9. When comparing year-over-year changes in herd size, resilient farms saw an initial decline in average herd size from 2012 to 2013. 2014, which marked a year of high milk prices, began the initial incline in herd size for resilient farms, increasing by small margins until 2017. Non-resilient farms, however, added more cows each year, on average, from 2014 to 2018. The largest average herd size changes were observed in 2018 for non-resilient farms, representing an almost 11% increase from the previous year.

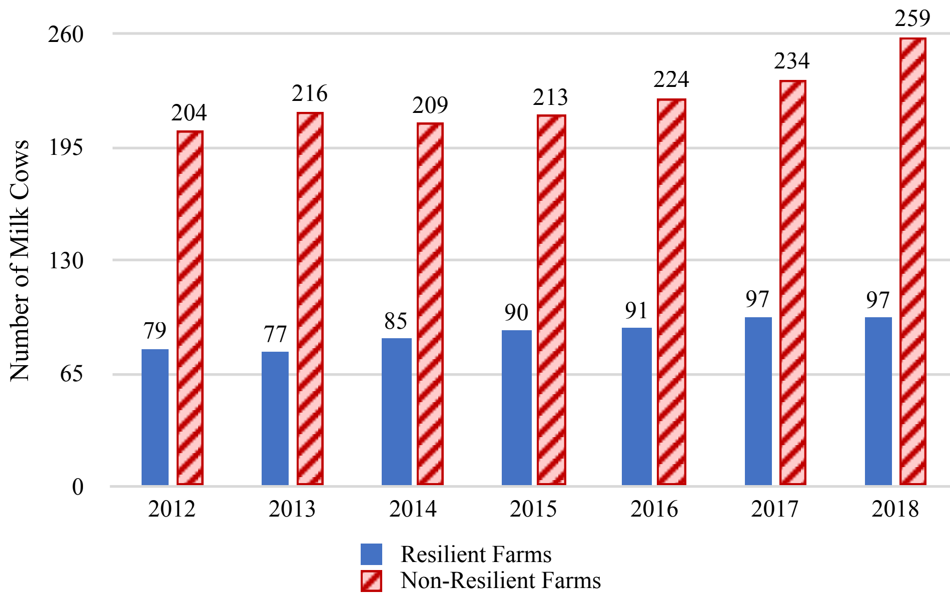

Figure 9. Average Herd Size, 2012-2018

Figure 10 shows the percentage of crops acres owned by resilient and non-resilient farms. The values represent the percentage of crop acres owned out of all crop acres that are owned, shared, or cash rented. Fluctuations in the percent crop acres owned are seen from year to year for both resilient and non-resilient farms, likely due to data availability. When comparing resilient farms to non-resilient farms, on average resilient farms own a larger percentage of their crop acres for the later four years.

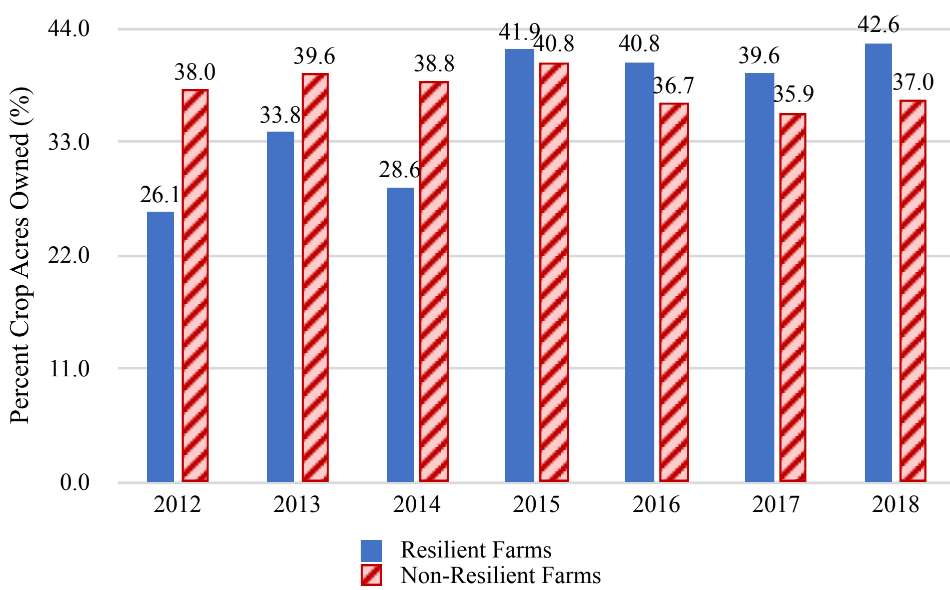

Figure 10. Average Percent Crop Acres Owned, 2012-2018

Farm Cost Variables

Farm cost variables analyzed in this study include feed cost per cow per day, hired labor per cow, and total costs of production. The cost of production is presented relative to revenue generated from milk sales for a more detailed comparison of margins for resilient and non-resilient farms.

Feed is the largest single expense on a dairy operation. Feed cost in FINBIN includes homegrown feed valued at local market prices as well as purchased feed (valued at the purchased price). As depicted in Figure 11, feed cost per cow trended downward after 2013, as high commodity prices were observed in the early years of the study period. On average, feed costs are lower for resilient farms across every year of the study. In the last four years (2015 to 2018), as both milk prices and feed prices declined, resilient farms exhibited even lower average feed costs per cow per day by as much as 19% in 2017. The higher feed costs associated with non-resilient farms may be associated with increased milk yield. Additionally, pasture was included as a feed source in FINBIN and may contribute to lower feed costs for some farms, but data is restricted due to a low sample size reported in FINBIN.

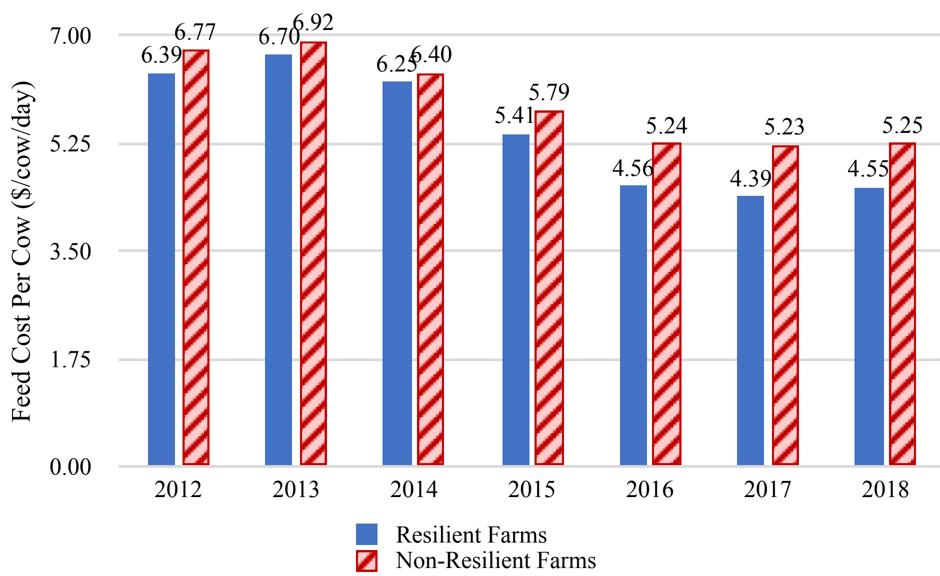

Figure 11. Average Daily Feed Cost Per Cow, 2012-2018

Figure 12 shows the drastic differences in hired labor per cow between resilient to non-resilient farms. On average, resilient farms have a much lower cost of hired labor per cow than non-resilient farms. These differences are likely due to business structures on resilient farms compared to non-resilient farms. As described earlier in Figure 9, resilient farms have a smaller average herd size. Often times, smaller herds have fewer hired employees, as more farms utilize family labor. Fewer cows means a higher percentage of the work is being done by the owners and family operators, likely leading to the lower average hired labor per cow for resilient farms. As average herd size has generally increased on both resilient and non-resilient farms over the period, so has the average cost of hired labor.

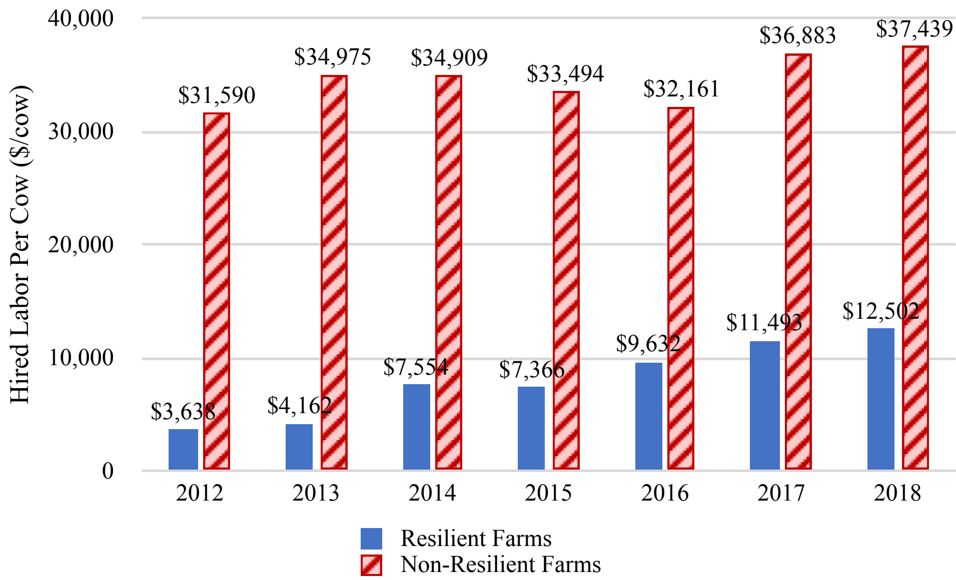

Figure 12. Hired Labor Per Cow, 2012-2018

In order to analyze revenue and cost differences between resilient and non-resilient farms, an average value for cost of production (COP) per hundredweight (cwt) of milk to compare to the farm's average milk price. The average milk price for each year was calculated in FINBIN as the total milk sales divided by the total hundredweights of milk produced. Milk sales includes both premiums, including bonuses tied to milk quality, and deductions on producers' milk checks. The cost of production for each year was calculated as the total yearly costs for each farm, including operating and ownership costs, divided by the total yearly hundredweights of milk produced. The cost of production does not include the opportunity cost of labor or management.

Figure 13 represents the average price received for milk and average cost to produce one hundredweight (cwt) of milk by farms in the study for each year. Each column in the figure represents the average milk price; the darkened part of the columns represents how much of the milk price received is used to cover the cost of production; and the lighter columns represent the margin between milk sales and costs. Figure 13 shows that the average cost of production for both resilient and non-resilient farms is higher during the early years of the study likely due to higher feed costs. Additionally, milk prices see record highs in 2014 for both resilient and non-resilient farms, as they reach more than $24/cwt. Resilient farms have substantially lower average costs for all years of the study period compared to non-resilient farms. The average milk price, however, stays fairly similar between resilient and non-resilient farms, with resilient farms having a slightly higher average milk price in five years of the study, ranging from 5 cents to 34 cents higher. Resilient farms are able to maintain their financial resiliency through their lower cost strategies.

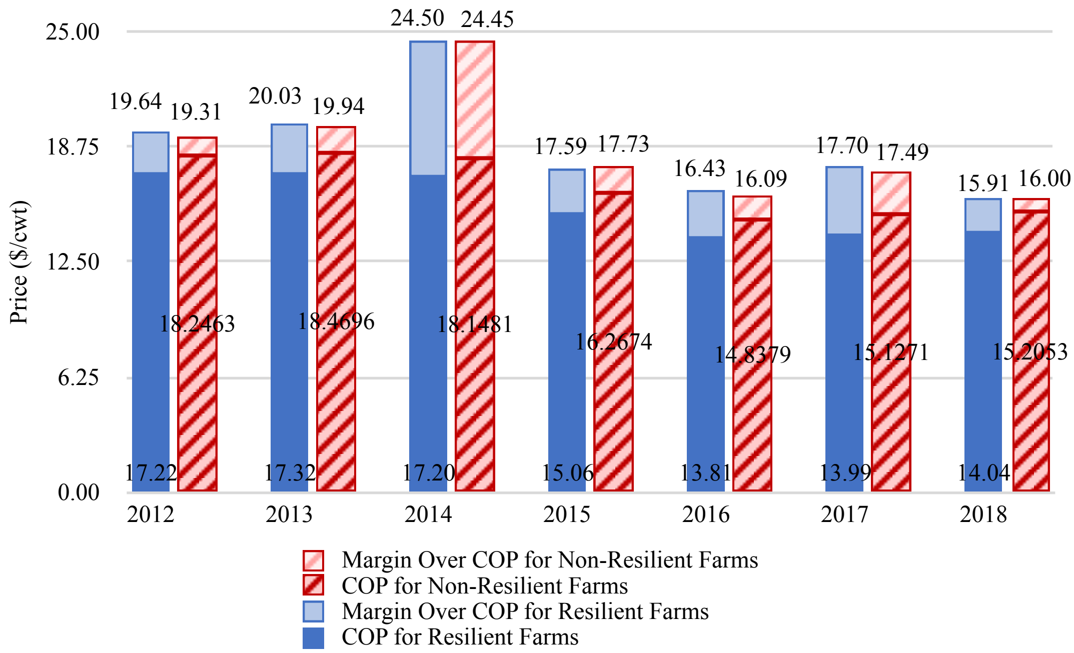

Figure 13. Average Milk Price and Cost of Production, 2012-2018

Financial Indicators

Financial indicators include debt to asset ratio, interest expense per cow, and working capital per cow.

Resilient farms and non-resilient farms show differences in average debt-to-asset ratio across the study period (Figure 14). In 2012 and 2013, resilient farms have a higher average debt-to-asset ratio; but beginning in 2014, the average debt-to-asset ratio for non-resilient farms is above that of resilient farms. A high debt-to-asset ratio could indicate concern of high liabilities for a farm; however, it could also indicate a lender's trust in an operation. Generally, a debt to asset ratio below 40% is desired. From 2012 to 2018, resilient farms are able to maintain their debt to asset ratio below 44.6, while non-resilient farms increase above that level in 2016, reaching an average of 50.9 in 2018.

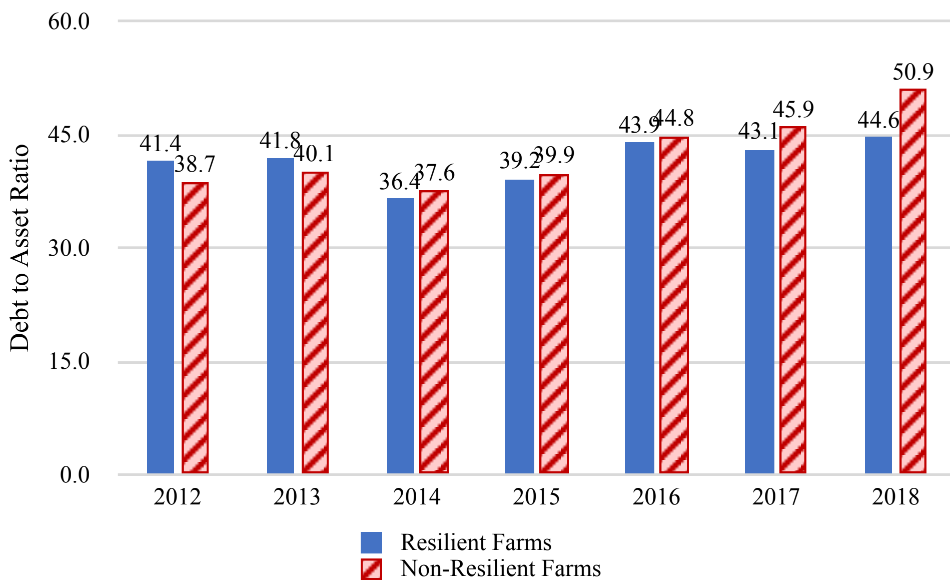

Figure 14. Average Debt to Asset Ratio, 2012-2018

Figure 15 shows the differences in average interest expense per cow between resilient and non-resilient farms over the study period. For both resilient and non-resilient farms, interest expense decreases from 2012 to 2014, with resilient farms decreasing at a faster rate. Non-resilient farms decrease in average interest expense per cow for one more year, while resilient farms begin to increase. After that, interest expense per cow rises through 2018 for both farm groups. On average, resilient farms show a much lower interest expense per cow across all years than non-resilient farms. Farms with lower interest expense could have lower liabilities, stronger credit history, lower interest rates, or fund their improvements through their own profits, making them more resilient.

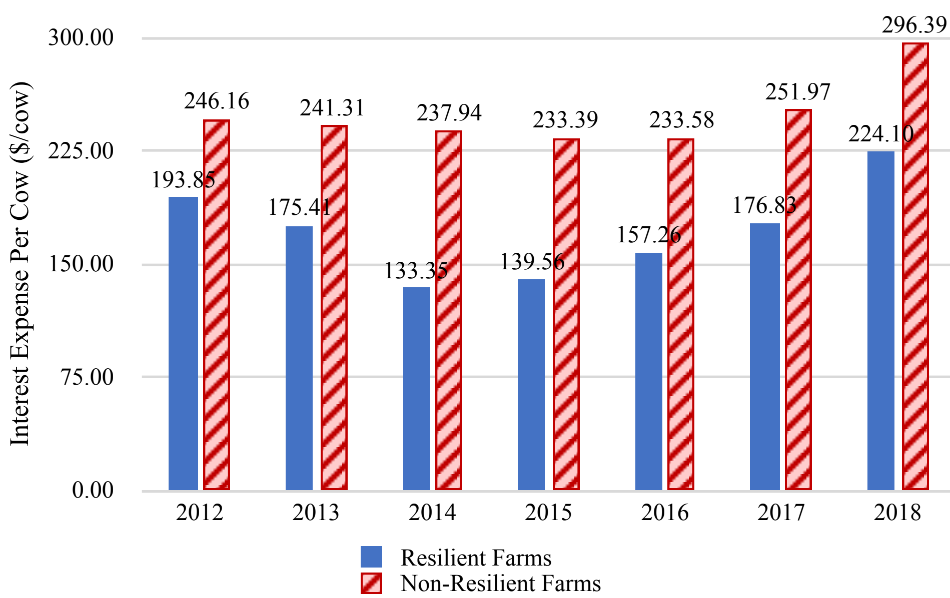

Figure 15. Average Interest Expense Per Cow, 2012-2018

Figure 16 illustrates that resilient farms have a higher average working capital per cow across all years of the study when compared to non-resilient farms. This means that resilient farms, on average, have more liquid capital available to use compared to non-resilient farms, especially as seen in the larger differences from 2015 to 2017. A higher working capital per cow represents greater liquidity with the ability to cover short-term debt liabilities with short-term liquid assets. 2014 shows the highest working capital per cow for resilient farms and the second highest for non-resilient farms, as this was a year of record-high milk prices.

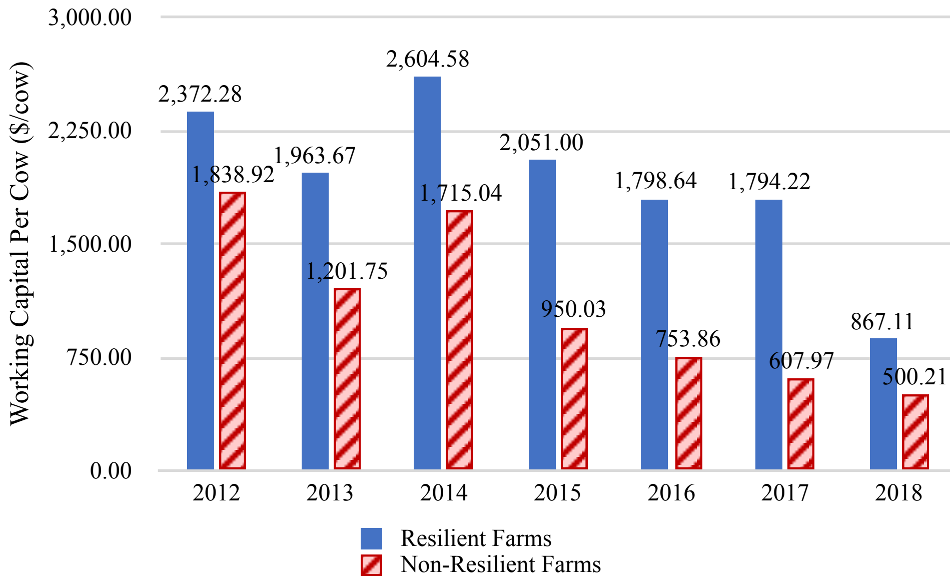

Figure 16. Average Working Capital Per Cow, 2012-2018

Human Resource Variables

Human resource variables are those variables associated with a farm's workforce, relating to employees, managers, and owners. Human resource variables used in this analysis include age of the principal operator, whether a second generation works on a farm, and whether a farm participates in the Minnesota Dairy Initiative Program.

Figure 17 presents the average age of the principal operators for resilient and non-resilient farms. The average age of principal operators on resilient farms has remained rather constant from 2012 to 2016, indicating that an increased number of younger farmers continue to enter the database keeping the average age lower. The average age of the non-resilient farms increased from 2012 to 2018 by slightly more than resilient farms, which indicates these farms are not leaving the sample.

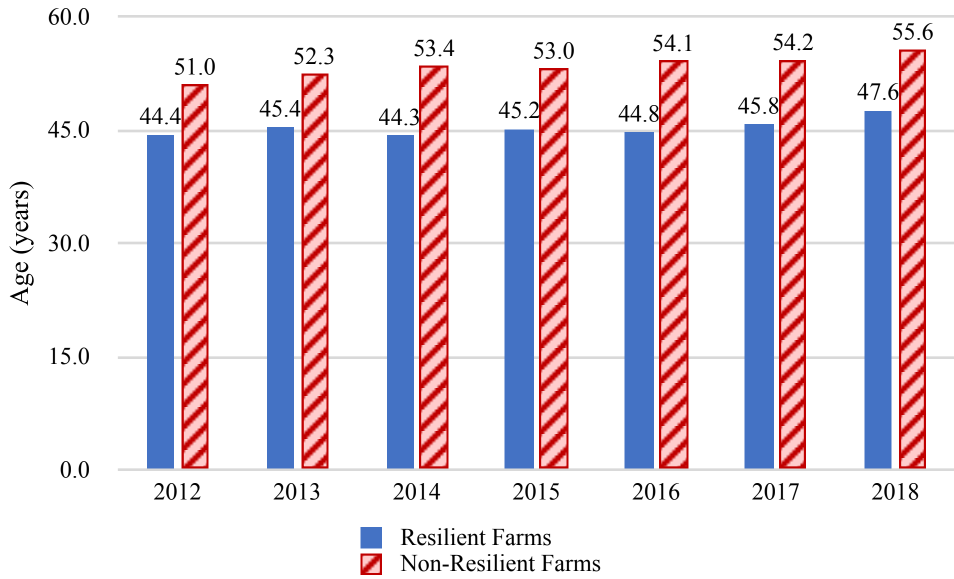

Figure 17. Average Age of the Principal Operators, 2012-2018

Having a second generation on the farm may allow for more specialization in tasks while also indicating a potential farm transition in the future. Figure 18 presents the percent of farms reporting a second generation in the farming operation. Between 81-94% of the farms, regardless of resiliency, indicated a second generation is helping on the farming operation. Although resilient farms observe a lower percentage of farms with a second generation in the later years of the study, it is important to note that resilient farms have fewer observations each year compared to non-resilient farms, likely contributing to these large year-to-year swings.

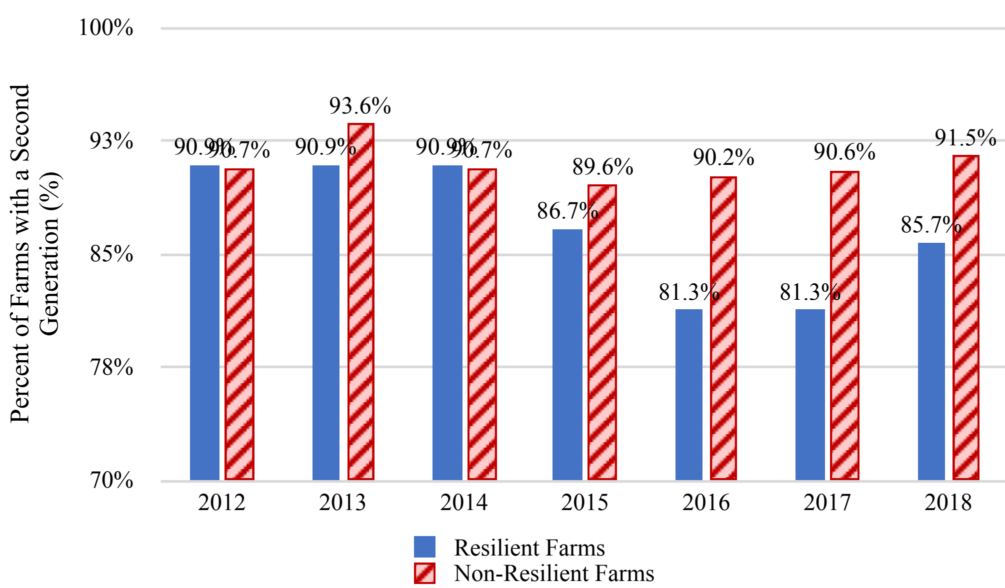

Figure 18. Second Generation Working on the Farm, 2012-2018

The Minnesota Dairy Initiative Program[3] is a program designed by a collaboration between the Minnesota Dairy Initiative and Minnesota Department of Agriculture to provide education around enhancing a dairy farm's profitability. Figure 19 shows that resilient farms have a much larger percentage of participants in the Minnesota Dairy Initiative Program compared to non-resilient farms. Farmers participating in this program could be gaining beneficial education, leading them to resiliency. Moreover, farmers participating in this program could be more progressive farmers who are more willing to make changes and improvements to their farms to maintain positive profit.

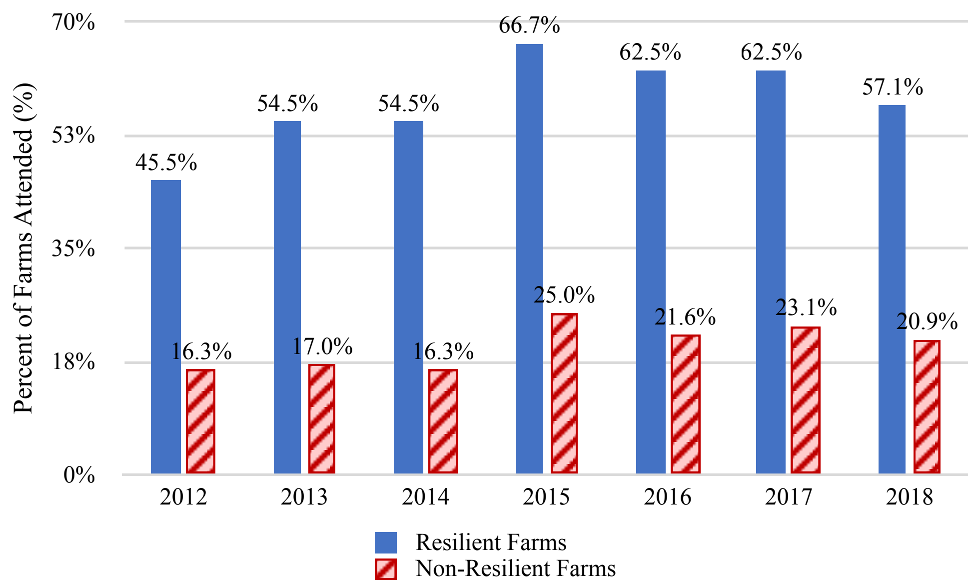

Figure 19. Minnesota Dairy Initiative Program Attendance, 2012-2018

Conclusion

Dairy farmers are continually seeking ways to become more efficient producers given the current circumstances of the market. This research highlights key differences between resilient and non-resilient farms to give farmers a glimpse into the common characteristics of dairy farms with sustained strong financial performance. On average, resilient farms reported lower milk yield and ECM per cow compared to non-resilient farms, but resilient farms had slightly higher component tests across most years of the study. Resilient farms had lower average feed costs per cow and substantially lower hired labor per cow across all years of the study which is likely influenced by their smaller average herd size. These much lower costs coupled with relatively similar milk prices resulted in resilient farms observing larger margins. Resilient farms also reported a higher average working capital per cow and lower average interest expense per cow across all study years. Lastly, resilient farms are younger on average, and have a higher participation rate in the

[3] More information on the Minnesota Dairy Initiative Program can be found at https://www.mn-dairy-initiative.org/.

Minnesota Dairy Initiative Program, which may indicate their openness to eliciting management recommendations from a variety of farm perspectives.

Although this research seeks to provide average levels of a variety of characteristics for resilient and non-resilient farms, several assumptions can impact the accuracy of this information. Matching finances to production isn't always perfect due to assumptions, so many variables were presented at the farm level. Variables presented at the cow level, like milk yield and ECM yield, were likely lower than reality in 2012 due to when DHIA data was collected. Furthermore, the same farms are not in the dataset every year of the study, which can cause some of the year-to-year variation that is being seen in the figures. This holds especially true when looking at the resilient category as there are fewer resilient farm observations overall than non-resilient farms.

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