

Value-Added Dairy Products from Grass-Based Dairy Farms: A Case Study in Vermont

Abstract

On-farm processing of value-added dairy products can be a way for small dairy farms to diversify production and increase revenue. This article examines characteristics of three groups of Vermont farmers who have grass-based dairy farms—those producing value-added dairy products, those interested in such products, and those not interested in such products—and their needs for information and assistance. The three groups differ significantly relative to herd size, engagement in organic operation, land management, self-rated level of business success, and demographic factors, such as education. Topics for which information and assistance are needed include how to make and market value-added dairy products and how to finance such operations.

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Introduction

The number of small dairy farms in the United States has decreased significantly in the past 4 decades due to highly volatile milk prices, increasing production costs, and a host of other factors (MacDonald et al., 2007; Wang, Thompson, & Parsons, 2015). For example, in Vermont, the number of dairy farms decreased dramatically, from 3,372 in 1980 to 874 in 2014, and small farms accounted for most of the loss (Vermont Agency of Agriculture, Food, and Markets, 2014). Although it is difficult to define a small dairy farm due to the complexity of dairy farming in regard to herd size, land use, employment, sales revenue, and so forth, the U.S. Department of Agriculture generally defines small farms as those with an annual gross cash farm income of less than \$250,000 (Hoppe, MacDonald, & Korb, 2010). By this definition, more than 40% of dairy farms in Vermont are small farms. The decrease in the number of small dairy farms has reduced the vitality of local economies and changed the agricultural landscape in many rural communities. For example, the loss of small farms not only has reduced the customer base of local businesses but also has affected the touristic appeal of local landscapes due to abandoned pastures and other negative landscape effects (Carpio, Wohlgenant, & Boonsaeng, 2008; Tew & Barbieri, 2012).

Although there is no simple solution for helping small dairy farms stay in business and maintain

economic viability, adding value to milk through on-farm production of dairy products such as artisan cheese and yogurt has been identified as a potential way for small farms to increase revenue and reduce dependence on fluid milk (with its volatile pricing) (Fiore, Niehm, Oh, Jeong, & Hausafus, 2007; Hancharick & Kiernan, 2008; Muhammad, Isikheumhen, & Basarir, 2009; Wang et al., 2015). Vermont, a dairy state with many small dairy farms, has experienced significant growth in the past 2 decades in the production of value-added dairy products, including cheese, yogurt, and farm-brand bottled milk. For example, the number of cheese makers in Vermont increased from 22 in 1996 to 70 in 2015 (D. Scruton, personal communication, July 29, 2015).

The major purpose of the research described in this article was to collect primary data from grass-based dairy farms to examine farmers' engagement and interest in value-added dairy products and associated information and assistance needs. Specifically, data collected from a survey of grass-based dairy farms in Vermont were used to compare the characteristics of three groups: (a) dairy farmers who produce value-added dairy products, (b) dairy farmers who are interested in value-added products, and (c) dairy farmers who are not interested in value-added products. The study also assessed the farmers' needs for information and assistance related to value-added products. This article discusses the results of the research and ways Extension can meet farmers' needs through its educational programs.

Data Collection

Data reported in this article were collected as part of a large study of grass-based livestock farms conducted by the University of Vermont (UVM) Center for Sustainable Agriculture in collaboration with the Northeast Organic Farming Association of Vermont, the Vermont Beef Producers Association, the Vermont Sheep and Goat Association, and the Vermont Agency of Agriculture, Food, and Markets. A survey questionnaire was developed to assess grazing management, farmer-observed environmental impacts, financial performance, personal health and social activities, biodiversity, and self-reported assessment of farm business success and personal satisfaction. A mailed survey was chosen over a phone survey or an Internet survey in an effort to reach a wider range of the target population and reduce self-selection bias. The survey design and data controls were approved through the UVM Institutional Review Board. The questionnaire was mailed to a list of 1,088 grass-based livestock farms with Vermont addresses in April 2011, and 229 completed responses were received, yielding a response rate of 21.05%. Data collected from the survey were coded and analyzed at the UVM Center for Sustainable Agriculture. See Colby (2012) for a detailed description of the survey procedures, analysis methods, and results. Although the surveyed farms represented a wide range of grass-based livestock operations, this article focuses on the data analysis for 71 grass-based dairy cow farms whose representatives answered the survey questions about value-added dairy products.

Analysis and Results

The 71 grass-based dairy farms are categorized into three groups: Group A comprises farms that currently produce value-added dairy products, Group B comprises farms having primary operators who are interested in adding value-added dairy products to their businesses, and Group C comprises farms having primary operators who are not interested in value-added dairy products. Of

the 71 farms, 13 (18.3%) are in Group A, 10 (14.1%) are in Group B, and 48 (67.6%) are in Group C. Selected summary statistics of these farms and their primary operators are presented in Table 1. Results of the *F*-test and chi-square test for examining the differences among the three groups are also reported in Table 1.

Table 1.
Summary Statistics of Grass-Based Dairy Farms in Vermont

Descriptive statistic category	Whole sample	Group A: Producing value-added dairy products	Group B: Interested in value-added dairy products	Group C: Not interested in value-added dairy products	<i>F</i> value or chi-square (χ^2) value
Number of farms	71	13	10	48	
Number of dairy cows per farm	58.49	21.23	50.30	70.15	<i>F</i> = 2.50*
Total acreage per farm	345.88	215.83	408.40	365.79	<i>F</i> = 2.46*
Acres of pasture/stockpile per farm	92.73	46.83	100.10	104.65	<i>F</i> = 1.99
Acres of pasture/hay rotation per farm	120.64	65.90	90.56	142.76	<i>F</i> = 1.27
Sales revenue per farm	\$276,599	\$86,140	\$263,318	\$326,796	<i>F</i> = 1.78
Sales from value-added products	\$1,381	\$7,554	0	0	
Sales from other products	\$275,218	\$78,586	\$263,318	\$326,796	<i>F</i> = 1.90
Schedule F net farm profit	\$24,724	\$16,396	\$14,569	\$28,897	<i>F</i> = 1.49
Land management (% of farms)					$\chi^2 = 19.33^{**}$
Certified organic	64.79%	53.85%	40.00%	72.92%	
Organic but not certified yet	21.13%	46.15%	10.00%	16.67%	
Conventional	14.08%	0.00%	50.00%	10.41%	
Dairy cows (% of farms)					$\chi^2 = 24.92^{***}$

Certified organic	56.34%	30.77%	30.00%	68.75%	
Organic but not certified yet	18.31%	53.85%	0.00%	12.50%	
Conventional	25.35%	15.38%	70.00%	18.75%	
Has a business plan	39.44%	23.08%	30.00%	45.83%	$\chi^2 = 2.65$
Farming as the primary job ^c	85.92%	61.54%	90.00%	91.67%	$\chi^2 = 7.83^{**}$
Has additional off-farm job(s) ^c	23.94%	38.46%	10.00%	22.92%	$\chi^2 = 2.60$
Age ^c	50.25	50.08	45.50%	51.33	$F = 1.03$
Years of farming ^c	28.49	25.38	25.50	30.02	$F = 0.60$
Gender (% male) ^c	83.10%	76.92%	90.00%	83.33%	$\chi^2 = 1.18$
Education ^c					$\chi^2 = 16.27^{**}$
High school	38.57%	23.08%	10.00%	48.94%	
Associate's degree	17.14%	15.38%	50.00%	10.64%	
Bachelor's degree	30.00%	53.85%	30.00%	23.40%	
Master's degree or above	14.29%	7.69%	10.00%	17.02%	

^aTotal acreage includes cropland, pasture, and woodland. ^bThe operators' unpaid family labor and management costs were not deducted. ^cPrimary operator of the farm.

*The difference among the three groups is significant at the 0.90 significance level. **The difference among the three groups is significant at the 0.95 significance level. ***The difference among the three groups is significant at the 0.99 significance level.

The summary statistics and statistical test results reported in Table 1 suggest several interesting findings. First, Group A has a much smaller average herd size (21.23 cows) than Group B (50.30 cows) or Group C (70.15 cows). One possible explanation is that the additional labor requirement for processing and marketing value-added dairy products makes it more feasible for small farms to engage in such activities.

Second, Group C has the largest proportion of certified organic dairy farms (68.75%) plus another 12.5% of farms that are in organic operation although not certified yet. Group B has the largest proportion of conventional dairy farms (70%). For Group A, although only 30.77% are certified organic farms, another 53.85% farms are already in organic operation. These numbers may suggest that one reason for Group B to be interested in value-added products is that most members of the group are in conventional dairy operation and are actively looking for alternative opportunities to

increase revenue. On the other hand, Group C is not interested in value-added products, likely because 81.25% of the farms in Group C are already benefiting from higher milk prices from organic operation and their significantly larger herd size tends to make it difficult for them to consider value-added dairy products due to time limitations.

Third, only 61.54% of the primary farm operators in Group A reported farming as their primary occupation, whereas 90% and 91.67% of their counterparts in Group B and Group C, respectively, reported farming as their primary job. Dairy farming is labor intensive and normally leaves little spare time for other activities, such as off-farm jobs and on-farm product processing, except on very small farms, such as those in Group A.

Fourth, Group A reported an average net farm profit of \$772 per dairy cow (Schedule F net farm profit divided by the number of dairy cows) as compared to \$290 for Group B and \$412 for Group C, but the difference among the three groups is not statistically significant at the 0.9 significance level due to the large within-group variation in relation to between-group variation.

Fifth, the farms in Group A have a significantly higher proportion of primary operators having a bachelor's degree or above than their counterparts in the other two groups, but there is no significant difference in age, years of farming, or gender composition among the three groups.

Sixth, regarding the sales of value-added dairy products, Group A clearly shows that these products accounted for only 8.77% of the total farm sales. Of the 13 Group A farmers who produce value-added dairy products on their farms, 11 provided data on their 2010 sales revenues by product. The total sales from all value-added products ranged from \$100 to \$48,000 per farm, with an average of \$7,554 per farm. Nine farmers sold raw milk or farm-brand bottled milk, with total revenue ranging from \$100 to \$10,000. Other sales included ice cream, aged cheese, soft cheese, cottage cheese, butter, and yogurt.

Farmers also were asked to rate the success of their farming businesses as well as their satisfaction with their farming and lifestyle choices. The summary statistics reported in Table 2 indicate that, of the 71 surveyed dairy farmers, 16.9% rated their businesses "highly successful," 66.2% rated their businesses "moderately or somewhat successful," 11.27% rated their businesses as "neither successful nor unsuccessful", and only 5.63% considered their businesses "moderately or somewhat unsuccessful." A comparison across the three groups shows that Group A had the largest percentage of farmers (92.3%) who reported their businesses to be either "highly successful" or "moderately or somewhat successful," followed by Group C (83.33%) and Group B (80%). The result of a Pearson chi-square test with a chi-square value of 22.98 indicates that the self-reported rate of business success was significantly different among the three groups at the 0.95 significance level.

Table 2.
Self-Reported Ratings of Success of Farm Business

				Group C: Not intereste d in
		Group A: Producin	Group B: Intereste	

Rating	Whole sample (71 farms)	g value-added dairy products (13 farms)	d in value-added dairy products (10 farms)	value-added dairy products (48 farms)
Highly successful	16.90%	15.38%	10.00%	20.83%
Moderately or somewhat successful	66.20%	76.92%	70.00%	62.50%
Neither successful nor unsuccessful	11.27%	0%	10.00%	12.50%
Moderately or somewhat unsuccessful	5.63%	7.70%	10.00%	4.17%
<i>Note.</i> Chi-square value = 22.98.				

Responses about personal satisfaction with farming choice or lifestyle are summarized in Table 3. Farmers in Group C are more likely to be "extremely satisfied" or "very satisfied" (70.83%) than those in Group A (69.23%) or Group B (60%). Also, farmers in Group B were more likely to be "neutral" or "somewhat unsatisfied" (30%) as compared to those in Group A (7.69%) and Group C (6.25%). However, the result of a Pearson chi-square test with a chi-square value of 14.17 indicates that the self-reported personal satisfaction with farming choice or lifestyle was not significantly different among the three groups at the 0.90 significance level.

Table 3.

Self-Reported Rating of Personal Satisfaction with Farming Choice or Lifestyle

Rating	Whole sample (71 farms)	Group A: Producing value-added dairy products (13 farms)	Group B: Interested in value-added dairy products (10 farms)	Group C: Not interested in value-added dairy products (48 farms)
Extremely satisfied	16.90%	7.69%	10.00%	20.83%
Very satisfied	50.71%	61.54%	50.00%	50.00%
Somewhat satisfied	21.13%	23.08%	10.00%	22.92%
Neutral	7.04%	0%	20.00%	6.25%

Somewhat unsatisfied	2.82%	7.69%	10.00%	0%
<i>Note.</i> Chi-square value = 14.17.				

To assess dairy farmers' needs for information and assistance related to value-added dairy products, farmers in Group B were asked what information and assistance they would like to receive. Of the 10 respondents, all expressed a need for some information and assistance. Specifically, respondents expressed needing information on or assistance with how to make value-added dairy products (69.3%), how to finance a value-added dairy products operation (61.4%), how to get permits for producing value-added dairy products (53.8%), and how to market value-added dairy products (38.5%). Respondents also mentioned, in comments, needing information on or assistance with understanding rules and regulations and engaging the next generation. Such findings may help Extension develop educational materials according to the farmers' needs for information and assistance.

Discussion and Implications for Extension

Readers not familiar with dairy farming may find it surprising that there is limited interest in value-added dairy products among the dairy farms that are not engaged in such products yet (i.e., only 10 of the relevant 58 farms, or 17.24%, in our data set). Dairy farming is very labor intensive, and a major reason that farmers in Group C are not interested in adding value-added dairy products to their businesses is likely the labor limitations posed by having relatively large herd sizes. The study suggests that although all dairy farmers are likely looking for opportunities to boost their revenue and income, value-added dairy products seem more applicable to farms with small herds and more available labor.

As can be seen in Table 1, 45.83% of the farms in Group C have a business plan, as compared to only 23.08% and 30.0% in Groups A and B, respectively. Those farmers with business plans may have already determined that going the value-added route is not for them but this preliminary conclusion requires additional research to confirm. Many of these farmers likely developed their business plans with the UVM Extension Farm Viability Program, which has assisted about 40 farms per year in developing business plans (M. Cannella, personal correspondence, July 27, 2015). Very often the development of a business plan convinces a farmer not to go ahead with novel ideas because the adoption of new business could leave the farmer in poorer financial condition than before (M. Cannella, personal correspondence, July 27, 2015).

Evidence from the survey results indicates that farmers are most interested in technical information and assistance, from how to make value-added products to how to market the products and how to finance a value-added products operation. These needs may not align with the focuses of existing Extension programs. One challenge for Extension in this case is to meet the educational needs of farmers and help them understand the potential benefits and risk of adding value-added products to their operation. For example, farmers must consider the potential impacts of the investment, the time to learn about a new product, product safety regulations, production time, and marketing the new product. Marketing includes pricing, placement and distribution of new products, and identification of a customer base. Often, value-added activities take years to be profitable, requiring

time to master the production activities as well as to learn how to market new products (M. Cannella, personal correspondence, July 27, 2015). Thus, when made clear, the demands of developing and marketing a value-added product are often more than enough to discourage farmers from adding the value-added activities.

Extension must seek to develop a blend of educational programs that guide farmers through the development of a business plan that calculates the farm's strengths, weaknesses, challenges, and opportunities; consider viable options; identify needed capital and labor resources; and recognize production, marketing, financial, legal, and human resource risk. UVM Extension's Farm Viability Program has made great efforts to guide farmers through the business planning process to enable the farmer to complete and, most importantly, take ownership of a business plan.

According to the evidence from the survey analysis presented here, Extension faces challenges in meeting the needs of the various groups of farmers. The survey was based on the hypothesis that smaller-scale dairy farmers are engaged or interested in value-added dairy products as a way of improving farm income and sustainability. Contrary to the expectation, however, the study showed that only 18% of the survey farms were involved in value-added products and that only another 14% of the farms were interested in such products. Also, with average sales of \$7,554 from value-added dairy products, or an average contribution of less than 9% to the total farm revenue for the farms that are engaged in value-added products, the economic impacts of value-added products are quite limited.

There remains a measurable demand for Extension to provide education to dairy farmers about what to consider before getting into value-added products. As indicated above, farmers request support in many areas. One primary Extension responsibility is to address areas that many farmers should know about but likely have not considered, such as marketing and regulations. In Vermont, Extension conducts educational programs both in classes and one on one. Both formats have proved effective for training individual dairy farmers to seriously analyze whether value-added production or any other option is viable for them. Evaluations of Extension education programs consider both the number of business plans that are completed and the number of those that lead to a conclusion that the original idea will not work. Education programs that enable individuals to prevent expensive business errors are considered to be a success.

While the study described here focused on adding value by processing milk into dairy products such as cheese and farm-brand bottled milk, value-added opportunities also should include adding specific product attributes, such as organic certification. In this regard, the certified organic farms in Group C are not interested in adding value by processing milk into value-added dairy products at their farms, but they have indeed engaged in value-added activities through organic operation and have obtained "added value" for their milk through the price premium for organic milk. More studies are needed to assess consumer preference and willingness to pay not only for dairy products processed on farms but also for many attributes that can be applied by farms, such as organic, grass fed, and so forth. For example, Organic Valley contracted with 12 organic farms to begin producing milk from grass-fed cows to meet a consumer niche in 2015.

Conclusions and Recommendations

The study reported here examined the characteristics of three groups of grass-based dairy farms in Vermont, categorized on the basis of their operators' engagement and interest in value-added dairy products, and the farmers' needs for information and assistance. The results suggest that the three groups differ significantly in herd size, engagement in organic operation, land management, personal satisfaction, and demographic factors, such as education. Value-added dairy products for farms that are engaged in such products (i.e., Group A) accounted for less than 9% of total revenue. Farms involved in value-added dairy products are more likely to have smaller herds, as are farms interested in adding these products. Experience from Extension educators indicates that value-added processing activities require considerable time and management.

The business successes and personal satisfaction of those interested in beginning value-added production are lower than those of producers without an interest in value-added production and of farmers currently involved in such production. Farmers with struggling businesses and those who are dissatisfied with their farming activities appear to be the most interested in developing new business opportunities via value-added production.

Also, all the farmers who are interested in value-added dairy products would like to receive related information and assistance. Farmers want information about and help with making value-added dairy products, financing the operation, getting permits, and marketing the products. There is an opportunity for Extension to develop programs for those farmers interested in pursuing activities of adding value to milk through processed dairy products such as artisan cheese or specific milk attributes such as organic. Experience from UVM Extension suggests that a successful Extension education program is one that not only enables farmers to take ownership of their business plans but also helps farmers assess whether a business plan would be viable. If farmers do not adopt a business plan due to foreseeing that it will not be viable, this result is still considered an educational success by the Extension program.

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