W 1233

DIRECT-TO-CONSUMER DAIRYING: EXPLORING TENNESSEE'S VALUE-ADDED VENTURES

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Value-added dairy operations (VAD), or farmstead dairies, are dairy farms that process their farm's raw milk into a pasteurized product that can be sold directly to consumers, such as bottled milk, cheese, or ice cream. This business model may be appealing to dairy farmers who are seeking to escape low commodity milk prices (61 percent), maintain or expand family operations (29 percent), and/or supply the market with greater product differentiation (16 percent; Smith et al., 2013). With persistently low farm income, some farmers have turned to direct-to-consumer (D2C) models. Direct-to-consumer models show promising profit margins compared to traditional farming, but alone they might not provide a sustainable living wage (Lass et al., 2003; Paul, 2019). It is possible that by combining a VAD business model with other value-added enterprises and agritourism, a D2C model may provide farmers with a livable wage to offset low farm income.

In Tennessee (TN), as in other regions, dairy farmers face challenges where the cost of producing raw milk outweighs the price received for it (Agricultural Marketing Service [AMS], 2021; Economic Research Service [ERS], 2021a). This discrepancy results in negative profit margins, prompting exploration into value-added processing. Studies have shown varying VAD payback periods from short-term (one to three years; Smith et al., 2013) to longer-term (10 years; Durham et al., 2015). Studies in Kentucky and overseas have suggested greater earning potential and overall higher satisfaction (97 percent) with value-added businesses compared to conventional (non-value-added) agribusinesses (Emmanuel et al., 2018; Smith et al., 2013).

While Tennessee dairy farmers have expressed interest in VAD (Eckelkamp et al., 2021), limited research exists on VAD startup and maintenance costs or a comprehensive profile of successful TN VAD. A study was performed to fill this gap by surveying existing and potential VAD. The survey benchmarked farm demographics, products manufactured and sold, equipment requirements, decision-maker risk behaviors, financial performance, and the dynamics and challenges faced by TN VAD.

The goal of this publication is to outline the state of existing Tennessee value-added dairy operations using data obtained from the survey of existing and potential VAD operations. As a part of this study, we collected:

- Farm metrics including herd size, years managing the farm, somatic cell count, and average production
- Processing facility metrics including years managing the processing facility, percent of herds milk used in processing, volume of product produced, products produced, and equipment needed
- Labor metrics of dairy farm, processing facility, and marketing
- Locations and ways to market and sell their products
- Factors that impact decisions to start including risk behaviors and knowledge base
- Financial metrics including equipment costs, business profit, debt levels, income sources, and 5-year business plans

VALUE-ADDED DAIRY FARMS

The average age of farmers answering the survey was 39 years (Table 1). These respondents had owned or managed the farm for an average of 14 years (Table 1), but many of these farms had been milking before the 14-year average as family dairy operations that were passed down for generations. While all VAD processed milk from their own farms, four VAD were considering purchasing milk from other farms to supplement their raw milk needs. On average, participating VAD had been processing milk for eight years; the majority began processing between 2012 and 2021. Of the eight processing operations, five used all the milk produced on-farm for their own processing. Two operations sold most of their raw milk commercially but held back some product for on-farm processing while another split their sales evenly into commercial and VAD processing. Our eight VAD processors align with an earlier study by Sen (2021) who found that of the 90 cow dairies surveyed in TN, 50 percent sold their milk to a co-op, 44 percent had a direct plant contract, and 5 percent employed on-farm processing. The surveyed VAD operations processed 820,123 gallons of raw milk per year.

There was an average of 462 cows (Table 1), which is larger than the 175-cow average for TN (Progressive Publishing, 2021). The most common breed used was Jersey, followed by Holstein. Other breeds used were Brown Swiss, Normande, and Montbéliarde. Most had a mixed herd operation, with Holstein-Jersey being most common in order to balance the high Jersey butterfat with the high Holstein volume.

On average, 61 percent of the herd was dedicated to producing milk for the VAD (Table 1). The average production per cow was 61.5 lbs. per day (Table 1); this is slightly higher than the 2019 TN dairy farm average of 57 (Sen, 2021). Somatic cell count averaged 293,750 cells/ml (Table 1) and was slightly higher than the two reported TN averages of 274,000 cells/mL (Norman et al., 2022), and 289,940 cells/mL (Eckelkamp et al., 2021).

SURVEY METHODS

A 50-question in-person survey was administered to existing and potential Tennessee value-added dairy operation owners or managers (UTK IRB-20-05941). The survey included five main groups of questions: participant, farm, and processing information; equipment; and business economics. Participation was voluntary, and respondents had the option not to answer questions and stop the survey at any time. Eight existing and seven potential cattle VAD across 13 TN counties were surveyed. These surveyed operations were identified through a joint effort of the University of Tennessee Extension, the Tennessee Department of Agriculture, the Center for Profitable Agriculture, and personal contacts made by the participating operations. This publication will focus on the eight surveyed existing VAD with both a farm and processing facility.

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Table 1. Descriptions of Tennessee value-added dairy operations.

Value-Added Dairy Farm	Average	Minimum	Maximum
Respondent Age (years)	39	24	62
Years Respondent Owned/Managed the Farm	14	2	37
Total Mature Cows	462	23	1,900
Percent of Herd's Milk Used for Processing	61%	4%	100%
Average Production (lbs/cow/day)	61	38	92
Somatic Cell Count (cell/ml)	293,750	200,000	600,000
Years Processing	8	1	23
Value-Added Labor			
Family Farm Employees	3	1	7
Non-Family Farm Employees	7	0	25
Family Processing Employees	2	0	5
Non-Family Processing Employees	5	0	12
Marketing Employees	1	0	2
Hours/Week Family Employee(s) Work for VAD	48	0	120
Hours/Week Non-Family Employee(s) Work for VAD	45	0	120
Hours/Week Marketing Employee(s) Work for VAD	15	0	40

Table 1. Descriptions of Tennessee value-added dairy operations (CONTINUED).

Costs	Average	Minimum	Maximum
Total Major Equipment Pieces	10	3	18
Total Equipment Cost	$154,569	$60,000	400,000
Percent Financed by Debt	39%	0%	70%
Marketing Costs	$12,140	$0	$45,000

VALUE-ADDED LABOR

This survey followed a similar model as another survey by Sen (2021) and broke employment apart into family and non-family employees to understand the level of family investment. The VAD farming operations employed 30 percent family (3) and 70 percent non-family (7) employees (Table 1). Sen (2021) found that TN dairy farms had three family farm employees, and four non-family farm employees. The VAD processing facility contained fewer employees than the farming side with an average of two family and five non-family employees (seven total processing employees; Table 1). It was not explicitly asked how many employees crossed over between the farm and the processing operation, but some respondents did allude to a crossover existing. Family employees worked slightly more (47.5 hours/week) than non-family workers (44.7 hours/week) for the VAD (Table 1). Some employees, both family and non-family, worked a maximum of 120 hours/week. Surveyed operations had a range of employees dedicated to marketing from none to two. These marketing-specific employees spent 15.3 hours/week solely on the business' marketing while some worked full-time (40 hours/week). Many marketing employees still juggled other tasks beyond marketing.

VALUE-ADDED DAIRY PRODUCTS AND PROCESSING

Product diversification was a common theme among the TN VAD. Ice cream and creamline milk were the most-produced products, being produced by 50 percent of surveyed VAD (Figure 1). Creamline milk was produced in the highest volume (612,375 lbs. produced annually), followed by homogenized milk (484,746 lbs.; Figure 2).

With the exception of fluid milk, VAD product trends reflect national consumption trends (Figure 3). Since 1975, fluid milk consumption has decreased, while cheese consumption has risen. Butter and yogurt consumption have slightly increased, while ice cream consumption has stayed the same (Figure 3; ERS, 2021b). Most VAD used vat pasteurization, but high-temperature short-time (HTST) was used by some. Most processors built new processing facilities while three made retrofits to a pre-existing building. All VAD produced individual (8 to 16 oz milk bottles; 1/2 ice cream pints; 8 oz cheese blocks) and family servings (1 gallon or multi-gallon milk or ice cream containers; 1/2 lb. or more cheese blocks) and all but one packaged multi-serving sizes (quarts of milk; 1/2 gallons of ice cream; 16 oz cheese blocks).

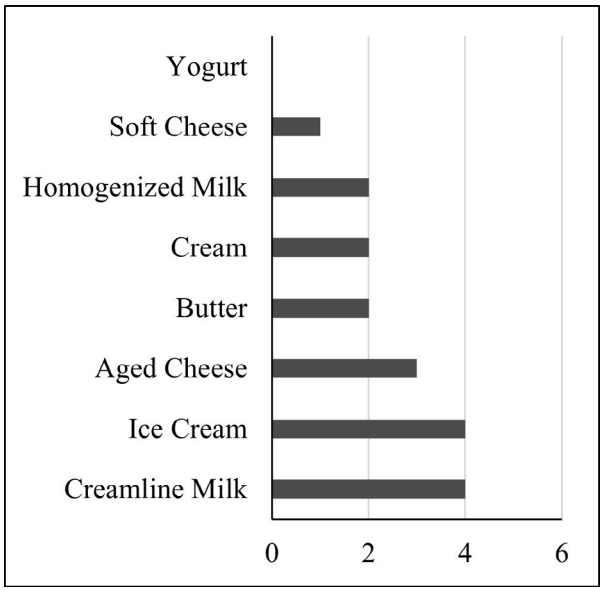

Figure 1. *Number of operations producing various value-added dairy products*

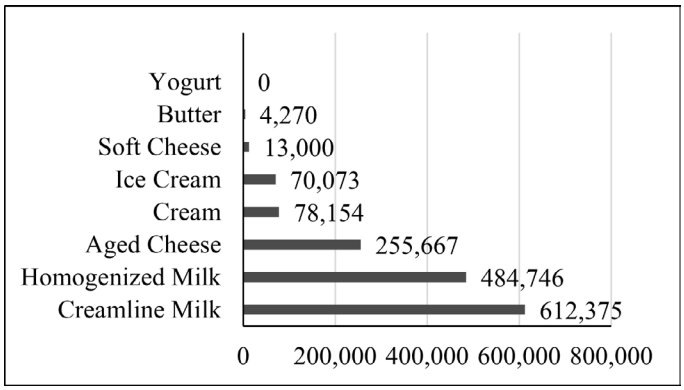

Figure 2. *Quantity of value-added dairy product produced annually.*

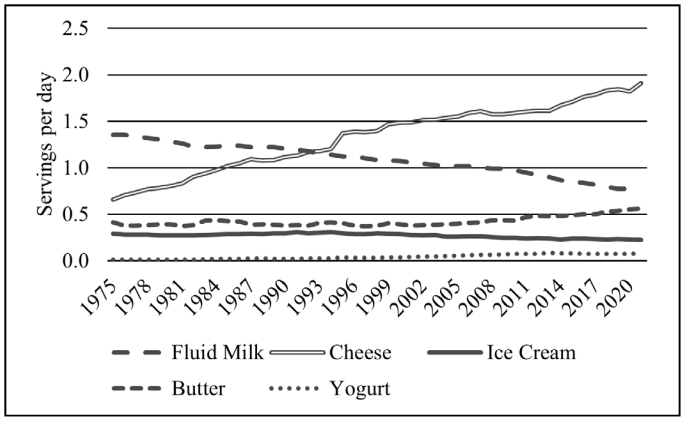

Figure 3. *National annual dairy product consumption trends. Adapted from Economic Research Service, 2021b.*

DECISION-MAKERS RISK BEHAVIORS AND PRIOR KNOWLEDGE

Respondents were asked to rate the amount of risk they were willing to take in business on a scale of 1 to 5, with 1 = strongly disagree, 3 = no opinion, and 5 = strongly agree. Statements and agreement ratings can be seen in Table 2.

Table 2. Assessment of risk-reward behaviors.

Statement	Agreement Level
I am a businessperson who is more willing to take financial risks than others.	4.1 out of 5
I must be willing to take substantial financial risks to be successful in a business.	3.9 out of 5
I am reluctant about adopting new production or processing methods until I see them work for others.	3.3 out of 5
I am more concerned about a large loss to my enterprise than about missing a substantial gain.	3.1 out of 5

Most respondents agreed (4.1 out of 5) with the first statement highlighting that processors were somewhat cautious about taking financial risks regarding their business. Respondents, again, agreed (3.9 out of 5) with the second statement, meaning they felt they must take substantial risks before they could be successful. The third and fourth statements had no impact or opinion (3.3 and 3.1 out of 5, respectively) for our VAD respondents. Across the board VAD owners/operators, while leaning more towards risky behaviors, maintained fairly neutral to positive opinions. No one strongly disagreed or disagreed with any of the statements.

We also asked processors about their knowledge base around VAD. A prior study of TN dairies asked a similar series of questions, excluding liability risk (Eckelkamp et al., 2021). Responses from our study of TN VAD and the previous study of TN dairies (Dairy Only; Eckelkamp et al., 2021) can be seen in Table 3. Decision makers felt that their knowledge level of state and federal regulations and liability risk had some negative to no impact on their decision to start their VAD operation. They stated that each of these points were unavoidable but could be helped or mitigated, suggesting why virtually no impact was noted. Value-added dairies felt that start-up costs had some negative impact on their decision to start a VAD, likely due to the consistently high costs required to purchase equipment and build facilities. Knowledge about processing, processing labor, and product marketing provided no impact on start-up decisions, but knowledge of processing did tend towards a positive impact. These responses may be explained because many processors had researched processing methods, and many planned on their family members working in the processing facility.

Table 3. Comparison of knowledge base impact across all Tennessee dairy farms (Eckelkamp et al., 2021) and Tennessee value-added dairies (1 = strong negative impact, ..., 5 = Strong positive impact).

	Tennessee Value-Added Dairies	Tennessee Dairy Farms
State Regulations	2.5 out of 5	3 out of 5
Federal Regulations	2.8 out of 5	3 out of 5
Start-Up Cost	2.0 out of 5	1 out of 5
Knowledge of Processing	3.6 out of 5	2 out of 5
Processing Labor	3.3 out of 5	2 out of 5
Product Marketing	3.1 out of 5	2 out of 5
Liability Risk	2.3 out of 5	-

Respondents felt that start-up costs had some negative impact, which can be explained by the high investment and start-up costs of VAD. Knowledge of processing, processing labor, and product marketing all had relatively positive impacts on starting a VAD operation. This suggests that respondents had a good support system and had done at least some research prior to starting the operation, whether this was through discussions with UT Extension professionals, other processors, or their own research.

One-on-one discussions during the survey backed this conclusion. One likely reason for our respondents rating these three production attributes higher might be because all respondents had a VAD, whereas the other survey was geared towards dairy farmers in general. Some questions were rephrased to target VAD in the current study. For example, Eckelkamp et al. (2021) phrased the question: if you were to consider VAD, how would each factor listed affect the decision. Another impact on product marketing might be that the average age of respondents taking Eckelkamp et al. (2021) survey was 58 years, whereas ours was 39 years. Younger generations may be more comfortable with social media, and this is the main way to market direct-to-consumer agriculture products. Lastly, while Eckelkamp et al. (2021) did not ask about liability risk, our respondents stated that liability risk was of little concern (some negative to no impact), possibly because this is something that can be mitigated but not removed so it had very little impact on VAD start-up decisions.

PROCESSING EQUIPMENT & BUSINESS FINANCIALS

Processors owned 11 major equipment pieces and spent on average $154,570 on equipment (Table 1). A wide range in price exists because some purchased new equipment, while others purchased used from equipment dealers or other processing plants that were out of business. Most bought a combination of new and used equipment. Processors purchased 56 percent of their equipment new and 44 percent used.

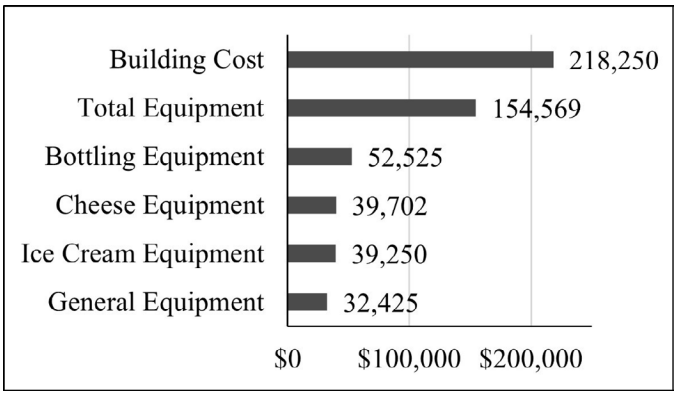

Figure 4. *Start-up costs associated with value-added dairies.*

Figure 5 shows VAD start-up costs including building cost, total equipment cost, and four major equipment groups: general, bottling, cheese, and ice cream. The greatest cost was the building cost ($218,250), at $54 per ft2. Of the four equipment groups, the bottling-specific equipment cost the most ($52,525) and included separators, homogenizers, in-line pasteurizers, vat pasteurizers, fillers, cappers, and sealers. The general equipment cost $32,425 and consisted of bulk tanks, chart recorders, chillers, clean out-of-place tanks, holding tanks, and refrigerator storage. These items were able to be used for several products. Cheese processing equipment cost $39,702 and included cheese drain tables, cheese presses, and aging rooms. The smallest cost was ice cream freezers and freezer storage ($39,250). Additionally, four processors purchased equipment in package deals – these costs were not included in the above pricing because equipment overlapped between groups. These processors purchased the equipment packages for a minimum of $15,000 and a maximum of $375,000. These package deals included anything from vat pasteurizers and chart recorders to packages including equipment from all four groups. This is a general list of larger equipment items needed for dairy processing but is not a comprehensive list.

Participating businesses had an average annual operating cost of $627,239 with the top three costs being utilities ($45,708), packaging ($38,311), and processing supplies ($21,961). The full list of major amenities, supplies, and their costs can be seen in Figure 6. Utilities included electric ($17,876), gas ($16,519), and water ($7,890). Packaging supplies included anything from plastic or glass jugs to sealing plastic and plastic containers and labels. Processing supplies included things like cheese cultures and cocoa for chocolate milk. The other costs included marketing ($12,140), cleaning ($10,656), and trash pickup ($2,044).

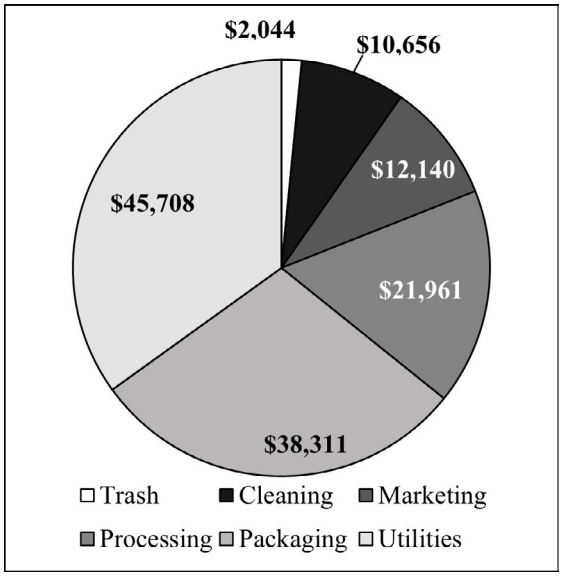

Figure 5. *Costs of major amenities, supplies, and services of value-added dairy processing facilities.*

Three respondents indicated their VAD made a comfortable profit, one made a small profit, and two were not yet breaking even. Two respondents chose not to answer this question. Those who made a comfortable profit had been in business > 8 years, the small profit had been in business for 4 years, and one of the two who had not yet broken even was only in business for one year, whereas the other had been in business 10 years. However, this respondent also made a more specialized product that required more extensive equipment and processing, which might explain why they had not broken even yet. Respondents who shared their prior years' sales reported sales of ≥ $100,000. Four reported a value-added net income of $75,000 and two reported ≤ $0. Operations' assets were financed with 39 percent debt.

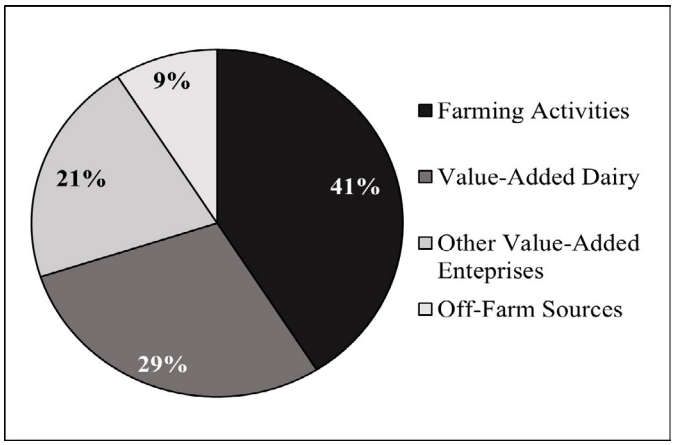

Figure 6. *Sources of annual household income for value-added dairy producers.*

Business longevity is an important indicator of success. We asked the participating VAD decision-makers about their 5-year business plan. All enterprises planned to grow by an average of 50 percent over the next five years. Growth would come in several ways including expanding into new stores, moving more existing products, expanding into new geographic markets, creating new products, and increasing product pricing.

We also asked respondents where their annual household income came from (Figure 6). Participants received 29 percent of their income from the VAD, 21 percent from other value-added enterprises such as agritourism, 41 percent from farming activities, and 9 percent from off-farm income. Following the 2017 Census of Agriculture, 84 percent of dairy producers used farming as their primary occupation, but farming included all farming aspects such as crops and other livestock (NASS, 2019a).

MARKETING AND SALE OF VALUE-ADDED PRODUCTS

Avenues where current VAD market and sell their product can be seen in Figures 7 and 8. The most common marketing methods were farm websites, product sampling, social media, and word of mouth. Other marketing sources were publicized grand openings, apparel, TV shows, and trucks with logos. The most common locations these processors sell their products were wholesale food distributors/buyers, direct to restaurants, and on-farm stores. Other locations where processors sell products were scheduled events, food trucks, school clubs, local food banks, market wagons, and agritourism stands. No VAD delivered directly to customers or had off-site farm stands. To read about a related study of TN VAD consumers and their desire to purchase VAD products, see the UT Extension publication "Navigating the Tennessee Farmstead Milk Landscape: Generational Perspectives on Consumer Preferences, Purchase Locations, and Awareness Channels." To see visual comparisons of this information and information from the TN consumer study, see the **Farmstead Dairy Surveys** on the UT Dairy Website.

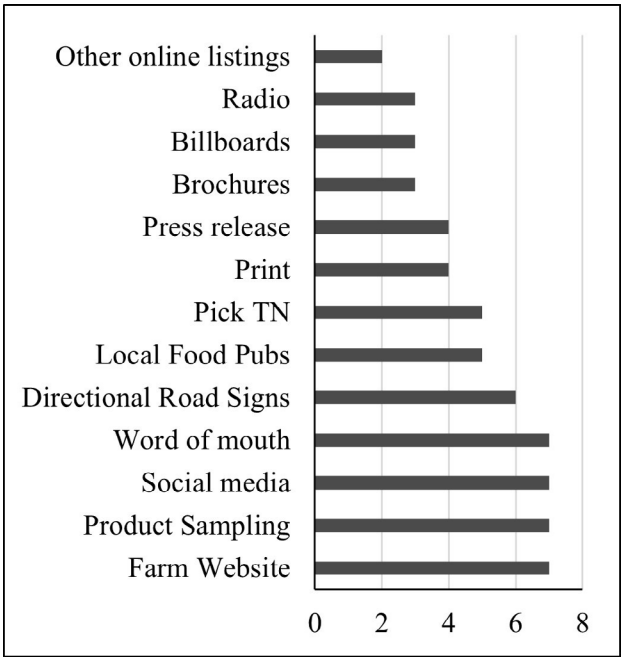

Figure 7. *Number of value-added dairies that use or plan to use each marketing channel to market their products.*

Figure 8. *Number of value-added dairies that sell or plan to sell their products at each location.*

FINAL THOUGHTS

This review of Tennessee value-added dairy operations (VAD) highlights a promising avenue for dairy farmers seeking alternative paths for their business. Despite facing challenges related to the gap between the cost to produce milk and the price milk is sold for and the initial investment hurdles, these operations demonstrate the potential for profitability and growth with some readily achieving comfortable profit margins. Plans for expansion and growth over the next five years signal a positive outlook for the VAD industry in TN. This study sheds light on the previously unknown Tennessee's VAD industry and provides insights that can aid prospective and existing VAD owners in navigating challenges and identifying opportunities in their dairy.

Anyone interested in entering or expanding into a value-added dairy operation (VAD) is encouraged to take advantage of workshops, grants, and sub-award programs put on by the Southeast Dairy Business Innovation Initiative (SDBII) program; a program based out of the University of Tennessee Institute of Agriculture's Animal Science Department. For more information on value-added dairies, reach out to your **local county Extension agent** or dairy specialist (865-974-8167 or eeckelka@utk.edu).

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