Proceedings of the

**24th Annual**

Dairy Sheep Association of North America

# Dairy Sheep Symposium

November 8-11, 2018

Kansas City, Missouri

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DSANA

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of North America

# Table of Contents

# MEADOWOOD FARMS

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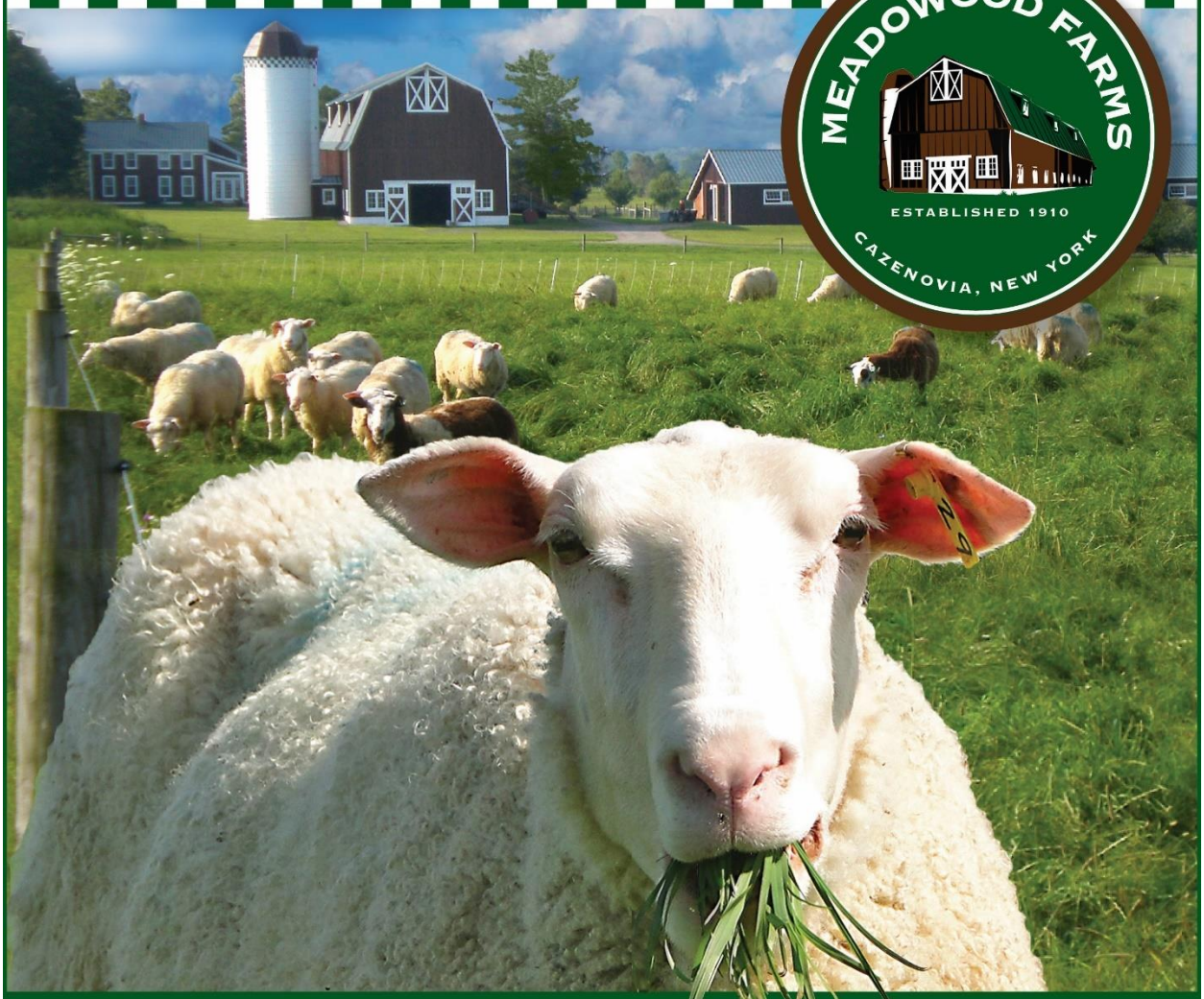


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# Program of Events

Wednesday, November 7, 2018. 3:00- 7:00pm -- DSANA Board Strategic Planning Session

Thursday, November 8, 2018. Topics: Economics of sheep dairying and on-farm processing; Agritourism, Direct Sales, Social-media Marketing, and other strategies to generate revenue for small sheep dairies.

Morning session sponsored by Ms. J and Co.

8:30 - 9:30 – *Creating an economically viable sheep dairy in 2018.* Yves Berger, former Superintendent of the University of Wisconsin Spooner Sheep Dairy Research Station, and co-author of *Principles of Sheep Dairying in North America.*

9:30 - 10:30 – *The economics of farmstead artisan sheep's milk cheese production*. Catherine Durham, Professor of Applied Economics, Oregon State University.

10:30 - 11:00 – Networking break

11:00 - 12:00 – *Starting a sheep dairy and on-farm processing business: What went wrong, what went right*. Producer Panel discussion with Jim Ashmore, Sheep Mountain Creamery, MT; Kendall Russell, Lark's Meadow Farms, ID; Bill Simmerman, Misty Meadow Farm, NJ. Moderator, Catherine Durham, Oregon State University.

12:00 - 1:00 – Lunch

1:00 - 2:00 – *Social-media direct marketing for small farms: How to use social media to reach our customers*. Kim Beer, Marketing Services Entrepreneur, President of Midnight Productions.

2:00 - 3:00 – *Marketing the farm and the cheese: how sheep producers use advertising, packaging, and social media to draw attention to their farm and product*. Producer Panel discussion with Rebecca King, Garden Variety Cheese, Royal Oaks, CA; Sarah Hoffmann, Green Dirt Farm, Weston, MO; Rachael Gwassa, Veldhuizen Cheese, Dublin,TX. Moderator: Kim Beer, Midnight Productions.

3:00 - 3:30 – Networking break

3:30 - 4:15 – *Putting your best foot forward: Reaching consumers through meaningful labels.* Emily Moose, Director of Communications and Outreach, A Greener World.

4:15 - 5:15 – *Agritourism: a revenue stream to improve the bottom line*. Producer Panel discussion with Debbie Webster, Whispering Pines Farm, Mauldin, SC; Ana Kelly, Dayspring Dairy, Gallant, AL; Jessica Gigot, Harmony Fields, Bow, WA. Moderator: Sarah Hoffman, Green Dirt Farm, Weston, MO.

6:30 – Cheese and Wine Reception

Friday, November 9, 2018. Topics: The role of genetic improvement and nutrition in fostering economic sustainability for the industry; nutrition and management of the ewe flock at breeding; nutrition for the high-producing ewe; producing fall milk

**Morning session sponsored by Meadowood Farms**

8:30 - 9:30 – *Using the numbers: how performance recording contributes to genetic gain and economic opportunities in sheep dairying.* Dr Ron Lewis, Professor of Animal Science at University of Nebraska, specializing in small ruminant genetic evaluation and improvement.

9:30 - 10:15 – *DSANA's Genetic Improvement Program and partnership with Genovis: how it works, and how you can participate*. Laurel Kieffer, Project Coordinator, Dream Valley Farm, WI.

10:15 - 10:45 – Networking break

10:45 - 11:45 – *Current trends of the Spanish Assaf Sheep Genetic Improvement Program.* Mariana Marques de Almeida, Ms J. & Co., Monroe, WI.

11:45 - 1:30 – Lunch and DSANA Annual Meeting with brainstorming session on the future of our sheep dairy enterprises.

**Afternoon session sponsored by Premier 1 Sheep Supplies**

1:30 - 2:30 – *Nutritional management of reproduction in dairy sheep.* Dr Andrea Mongini, DVM MS, M&M Veterinary Practice, Ewetopia Dairy, Inc, Denair, CA.

2:30 - 3:30 – *Relating Dairy Sheep Nutrition to Dairy Cattle Nutrition: are we feeding small cows, or are we feeding sheep?* Barbie Casey, M.S., Ruminant Specialist, Hubbard Feeds, Hamilton, OH

3:30 - 4:00 – Networking break

4:00 - 5:00 – *Management of AI reproduction in dairy ewes.* Dr Andrea Mongini, DVM MS, M&M Veterinary Practice, Ewetopia Dairy, Inc, Denair, CA.

5:00 - 6:00 – *Reproduction techniques and out-of-season breeding: a review.* Mariana Marques de Almeida, Ms J. & Co. Monroe, WI.

7:00pm – Banquet

Saturday, November 10, 2018. 8:00 - 6:00. – Tour and lunch at Green Dirt Farm in Weston, Tour the dairy and cheese making facility, events barn, and off-farm retail store. CMT testing demo at Green Dirt Farm. Bus leaves hotel at 8:00 sharp. Bagged lunch provided.

Sunday, November 11, 2018. – Cheese-making workshop: Focus on Soft Ripened sheep's milk cheeses at Green Dirt Farm Cheese Kitchen. **Workshop sponsored by Page & Pedersen**.

## Symposium Organizing Committee

Chair: Sarah Hoffmann, Green Dirt Farm, MO
Bee Tolman, Meadowood Farms, NY
Debbie Webster, Whispering Pines Farm, SC
Terry Felda, Tin Willows Farm, OR
Eliza Spertus, Green Dirt Farm, MO

## Proceedings Editing and Compilation

Bee Tolman, Meadowood Farms, NY
Carrie Abels, Willow Pond Sheep Farm, NY

## Photographs on the Cover

Provided by Green Dirt Farm, Weston, MO

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Our 2018 sponsors have been generous in their support of our 2018 Dairy Sheep Symposium, and the Dairy Sheep Association of North America. The Symposium would not be possible without their financial support. Please thank these sponsors as you enquire about their products, equipment, supplies, and services for your dairy sheep farm or sheep-milk processing facility.

# The Economics of Dairy Sheep Operations

Revised 2018

Yves Berger
University of Wisconsin-Madison
Researcher emeritus

Spreadsheet available to all at:
http://www.ansci.wisc.edu/Extension-New%20copy/sheep/index.html

## Words of caution

Although all efforts have been made to be as accurate as possible, numbers given in this article have to be taken with caution. They reflect one type of operation only while there are about as many types of operation as there are producers. Receipts and expenses can vary greatly according to conditions, resources, management skills and philosophy of the operator.

## Introduction

As in any enterprise, milking sheep and selling the milk (or processed products) is all about making a profit. Of course, the financial return will be variable according to the producer's reasons for starting a dairy sheep business (practical and/or philosophical), reasons which are going to influence the type of operation. Nevertheless, no matter the type of operation, it has to be a profitable one while respecting agro-ecosystem principles of sustainability. There are practically as many types of operations as there are producers, but in North America most sheep dairy enterprises are small-scale family businesses (50-150 ewes) either looking for a supplemental income or trying to provide a full-time occupation to at least one member of the household. These types of operations are generally oriented toward low labor and financial inputs, lambing late in the spring to reduce the need for buildings and to take advantage of the growth of grass to cover the high nutritional demands of the ewes in full production. With this system, milk is generally produced at a lower cost but the lactation length is shorter because of the declining length of days and high summer temperatures. In larger operations (more than 200 ewes), the initial investment for sheep dairying could be substantial because of the need of better milking equipment, larger freezer, etc. Such operations could look at the feasibility of milking all year around by dividing the flock for spring, autumn and winter lambing. However, the

system we are mostly interested in this article has mature ewes lamb in early winter and ewe lambs one or two months later. Although demanding more labor and feed inputs, winter lambing and milking offers many advantages.

In order to have a good economic idea of various systems, we developed a spreadsheet in which a producer can enter his/her own numbers. We think that after more than 20 years of sheep milking experience, we now understand better what it takes to produce milk at various levels.

The budget analysis example given below is for a winter lambing operation with 300 ewes (250 mature ewes and 50 ewe lambs). The example does not include financial incentives, if any, provided by the government (e.g., ewe lamb payment, feeder or slaughter lamb payment, wool payment). Fixed expenses would be very different depending upon the debt load of the operation, thus the example is given with a high and a low debt service.

*Milk production.* The total amount of milk produced per ewe is the most important factor for the success of the enterprise, therefore, it should be maximized. Some natural factors such as cooler temperatures optimize feed intake, which favors higher milk production. The lengthening of daylight also favors milk production by sustaining lactation for a longer period. Higher milk production can be achieved by removing lambs from their dams soon after birth, raising all lambs on milk replacer, and milking the ewes twice per day starting soon after parturition. About 30% of the total milk yield is produced during the first month of lactation. This system was routinely used at the Spooner Ag Research Station. The average milk production of all ewes at the Spooner Ag Research Station in its later years of operation was 789 pounds for mature ewes and 530 pounds for ewe lambs in 1st lactation. This production is for high percentage dairy ewes of East Friesian-Lacaune breeding.

The complete milking (twice a day- no more lambs) or partial milking (once a day but ewes are raising their lambs) during the first month of lactation has to be seriously considered when working with high producing ewes. The amount of milk produced by those ewes during the first 30 days is generally well above the needs of 2 or even 3 lambs. The surplus milk should be collected to avoid high rates of mastitis.

*Labor.* There is no doubt that winter lambing requires more labor because, with a climate such as in Wisconsin, lambing occurs in a barn. Lambs are generally isolated in lambing jugs, stored feed has to be distributed, pens have to be cleaned, etc. Moreover, the rearing of lambs on milk replacer will add an extra burden unless the producer is well set up for this endeavor. We consider that 1 ¾ persons, beside occasional family help, are needed for the care, lambing, and milking of 300 ewes.

With winter lambing, labor is well utilized at a period when outside work is near impossible. Peaks of lactation for most ewes (therefore longer milking time) occur before field work begins. In spring when outside work becomes possible and necessary, milking is already in a routine phase. When summer comes, milking can be phased down to once a day or better yet to 3 milkings in 48 hours (milking time could be 6 am, 10 pm, 2 pm etc...) leaving more time for family summer activities.

*Feed.* The highest nutritional needs (end of gestation and early lactation) are met with expensive stored feed. The needs are generally covered with high quality hay and corn. Dairy quality hay can cost as high as $180 a ton (2018 price). During the months of November, December, and January ewes are given roughly 4 pounds of average quality hay. During the first 3 months of lactation ewes are given 6 pounds of high quality hay. Whole corn is provided at a rate of 2 pounds during the last month of gestation and during the first 3 months of lactation. Thereafter, the ewes receive 1 pound for the next 3 months of lactation. As soon as the growing season allows, all ewes are grazed on 35 acres of legume-grass pastures (kura clover-orchard grass pastures at the Spooner Ag Research Station) in a rotational grazing system. All lambs and replacement ewe lambs are raised in complete confinement.

Lambs consume 200 pounds of a 21% CP creep feed between birth and sale at a live weight of 70 pounds.

Lambs raised on milk replacer consume an average of 18 pounds of milk powder between birth and weaning at 28 days of age. High quality lamb milk replacer can be purchased for US $2.5/lb. in 2018 when ordered in a large quantity.

*Equipment and buildings.* The equipment requirement for the milking of 300 ewes is independent of the type of management and season of milking. The system has to be efficient for a rapid milking twice a day, and the freezing capacity (if milk is sold frozen) should be sufficient for the rapid freezing and storage of 800-1200 pounds of milk daily during the peak of lactation. An additional advantage of winter or early spring milking is that the freezer does not work quite as hard as in June, July, or August

Buildings are necessary for a successful winter lambing, especially in cold areas. Their role is to provide protection against the natural elements and, therefore, do not need to be very sophisticated. They should consist of a main barn where lambing occurs and where ewes spend a minimum amount of time (a few days) and several three-sided shelters with loafing areas where recently freshened ewes and young lambs are transferred shortly after lambing. “Hoop” or “Green house”-type barns with natural ventilation are a good investment for the rearing of lambs on milk replacer. They are quickly set up for a fraction of the cost of a more permanent building. The necessary buildings will significantly increase the fixed cost of the operation.

However, on well-established farms, buildings are generally present and can be used as sheep barns with little additional investment cost.

The concentration of sheep in a barn has always been perceived as a leading cause of pneumonia. Therefore, barns should be well ventilated. Since East Friesian lambs or high percentage East Friesian crossbred lambs are very susceptible to pneumonia, their rearing in barns should be of some concern. However, in our experience we found that pneumonia in lambs is much more prevalent in spring lambing when there is a wide variation of temperature between days and nights than in winter lambing.

*Bedding.* Winter lambing and the use of buildings leads to a high consumption of bedding especially in a dairy sheep operation. Conventional straw bedding is becoming very expensive. In order to keep the 300 ewes of the operation (and their lambs) as clean as possible for milking, a total of 35 tons of straw might be necessary. Good quality straw is difficult to find in the Midwest for less than $140/ton. Alternatives such as slotted floors could be a solution to reduce the cost of bedding.

## Budget analysis

The Return to Labor and Management (the take home pay of the producer) using the high milk production obtained at the Spooner Ag Research Station is as low as $53,000 with a high debt service and as high as $76,000 if the farm has a low debt service. High fixed expenses appear to be the leading cause of the high cost of production. Variable expenses can be lowered only as long as it does not affect the well being of the animals and of the operator. In our example, the ewe feed cost represents 28% of the variable expenses, and it may be possible to reduce this amount without affecting the total milk production. Research has shown that high producing ewes have a better feed efficiency than lower producing ewes. Therefore, with higher producing ewes the ewe feed cost/receipt from milk ratio would be greatly improved. Also, less expensive feedstuffs such as haylage should be envisaged.

Total gross income, also, has a large influence on the Return to Labor and Management and in the case of a dairy operation the sale of milk can represent 75% of the total income. At a sale price of $1.00/lb., a flock average milk yield of at least 570 pounds (low debt) and 660 pounds (high debt) is needed to reach the breakeven point. Six hundred sixty pounds per ewe is a respectable average flock yield, which cannot be obtained with poor quality feedstuff and mismanagement. Moreover, with a lower yield it would become difficult to sell higher priced

breeding stock. In a winter lambing operation, cost of production can be reduced only by so much before dramatically reducing the total income and thus the Return to Labor and Management. Spring lambing systems (shown in the second example), on the other hand, offer more possibilities for the reduction of cost of production and have been shown to allow for a slightly better Return to Labor and Management, at least in a lamb/wool only operation. The total receipt from milk would be lower due to a lower overall milk production.

The adoption of a lambing system, however, is more often dictated by the conditions, the resources, and the availability of goods in or around the farm rather than by real choice. It will also be dictated by the ability to sell all the milk at a good price to a cheese maker which represents great risks. It will be up to the ingenuity, the knowledge, and the skills of the producer to make it work.

**RETURN TO LABOR & MANAGEMENT FOR AN INTENSIVE DAIRY SHEEP OPERATION**

| Information About Your Flock | | |
|---|---|---|
| Are you or will you be a member of WSDC (yes=1, no= 0) | 0 | |
| Number of ewes in the flock | 300 | |
| Number of ewes desired for the following year | 300 | |
| Percentage of ewes lambing | 93% | |
| Average number of lambs born per ewe | 2 | |
| Percentage of dead lambs | 12% | |
| Percentage of ewe loss | 5% | |
| Percentage replacement | 20% | |
| Number of rams | 6 | |
| Number of ewe lambs sold for breeding | 40 | |
| Number of ram lambs sold for breeding | 3 | |
| Average weight of lambs at sale | 70 | |
| Average weight of ewes | 170 | |
| Average milk production per ewe (pounds) | 745 | |
| Average # of ewes milked per hour | 120 | |
| Average set up and cleaning time before and after each milking | 0.5 | |
| Average # of days each ewe is milked | 204 | |
| Percentage of milk sold frozen | 0% | |

| Flock Results | |
|---|---|
| Number of lambs born | 558 |
| Number of lambs raised | 491 |
| Number of replacement ewe lambs to keep | 75 |

| | |
|---|---|
| Number of lambs for sale | 416 |
| Number of lamb sold for meat | 373 |
| Number of cull ewes | 50 |
| Number of ewes milked (85% of total ewes) | 255 |
| Minimum number of acres of improved pastures (8 ewes/acre) | 38 |

## Price of Products for Sale

| | |
|---|---|
| Price of lambs at sale per pound | $ 1.55 |
| Price of breeding ewe lambs | $300.00 |
| Price of breeding ram lambs | $650.00 |
| Price of cull ewes per pound | $ 0.65 |
| Price of wool including LDP | $ 0.42 |
| Average price of fresh milk per pound | $ 1.15 |
| Average price of frozen milk per pound | $ 1.00 |

## RECEIPTS

| | | |
|---|---|---|
| Lambs sold for meat | $ 40,475 | |
| Ewe Lambs sold for breeding | $ 12,000 | |
| Ram lambs sold for breeding | $ 1,950 | |
| Fresh milk | $ 218,471 | |
| Frozen milk | $ - | |
| Packaging of pallets of frozen milk (WSDC members only) | | |
| Culled ewes | $ 5,525 | |
| Wool | $ 643 | |
| Other income | | |
| Other income | | |
| Total receipt | | $279,064 |

## VARIABLE EXPENSES

| Ewe Feed | Quantity | $ | Unit | | |
|---|---|---|---|---|---|
| # months on pasture | 6 | $3.00 | month/ewe | $ 5,508 | |
| # months average quality hay (3% DM intake) | 1.5 | | month | | |
| Tons of average quality hay needed and price | 38 | $120.0 | ton | $ 4,544 | |
| # months good quality hay (4% DM intake) | 5 | | lb | | |
| Tons of good quality hay needed and price | 168 | $180.0 | ton | $ 30,294 | |
| # months average hay for rams (5lb/day/ram) | 6 | | month | | |
| Tons of average quality hay for rams and price | 3 | $120.0 | ton | $ 360 | |
| # months corn for rams (2lb/day/ram) | 3 | $ 0.08 | lb | $ 86 | |
| # months corn at 1 lb/day/ewe | 3 | $ 0.08 | lb | $ 2,160 | |
| # months corn at 2 lbs/day/ewe | 4 | $ 0.08 | lb | $ 4,896 | |
| Mineral 20 lbs/ewe/year | | $ 0.40 | lb | $ 2,448 | |
| Total Ewe Feed | | | | | $ 50,297 |

| Lamb Feed | Quantity | $ | Unit | | |
|---|---|---|---|---|---|
| Creep feed 21% CP | 200 | $ 0.18 | lb | $ 17,383 | |
| Finish ration 13% CP | 0 | $ 0.15 | lb | $ - | |
| # days on pasture | 0 | $ 0.05 | day/lamb | $ - | |
| High quality hay for replacement ewes | 12 | $180.0 | ton | $ 2,228 | |
| (2.5 lb for 120 days) | | | | | |
| Corn replacement ewes (1 lb for 120 days) | 9000 | $ 0.07 | lb | $ 630 | |
| Milk replacer | 18 | $ 2.50 | lb | $ 22,097 | |
| Total Lamb Feed | | | | | $ 42,337 |
| | | | | | |
| Other Expenses | Quantity | $ | Unit | | |
| Shearing | 2 | $ 2.50 | /ewe | $ 1,500 | |
| Marketing-trucking | | $ 5.00 | /ewe lamb | $ 2,115 | |
| Milk production testing (# of times tested) | 7 | $ 1.25 | /ewe/time | $ 2,231 | |
| Vet-Med | | $ 5.00 | /ewe | $ 1,500 | |
| Supplies sheep | | $ 5.00 | /ewe | $ 1,500 | |
| Supplies milking | | $ 8.00 | /ewe | $ 2,040 | |
| Bedding straw (lb/ewe) | 250 | $ 0.07 | /lb | $ 5,250 | |
| Electricity freezer (very variable) | | $ 0.05 | /lb of milk | $ - | |
| Electricity other | | | | $ 2,601 | |
| Machine operation cost | | | | $ 2,500 | |
| Ram cost (1/3 of rams changed every yr) | | | | $ 1,300 | |
| Maintenance and repair | | | | $ 2,000 | |
| Vehicle expenses | | | | $ 2,000 | |
| Hired labor for milking (hours) | 1071 | $10.00 | /hour | $ 10,710 | |
| Hired labor for other (hours) | 2000 | $10.00 | /hour | $ 20,000 | |
| Unplanned and unforeseen expenses | | | | $ 5,000 | |
| Other Equipment rental | | | | $ - | |
| Other (office supplies-telephone-internet...) | | | | $ 1,500 | |
| Interest on operating loan | | 8% | | $ 12,510 | |
| | | | | | $ 76,258 |
| | | | | | |
| Total Variable Expenses | | | | | $168,892 |

## FIXED EXPENSES

| | Invest-ment | Terms | Interest % | High Debt | Low Debt |
|---|---|---|---|---|---|
| Farm payment | $200,000 | 30 | 6 | $ 14,530 | |
| Livestock | $ 75,000 | 15 | 6 | $ 7,722 | |
| Sheep Equipment | $ 15,000 | 20 | 6 | $ 1,308 | |
| Buildings | $100,000 | 30 | 6 | $ 7,265 | $ 7,265 |
| Milking equipment | $120,000 | 15 | 6 | $ 12,356 | $ 12,356 |
| Freezer | $ - | 15 | 6 | $ | $ |
| Pick up truck (used) | $ 10,000 | 5 | 3 | $ 2,184 | $ 2,184 |
| Machinery | $ 20,000 | 5 | 6 | $ 4,748 | $ 4,748 |
| Feed storage | $ 5,000 | 10 | 6 | $ 679 | $ 679 |

| | | | | | |
|---|---|---|---|---|---|
| Other | $ - | 10 | 6 | $ - | $ - |
| Property Taxes | | | | $ 4,000 | $ 4,000 |
| Insurance | | | | $ 2,000 | $ 2,000 |
| Total | | | | $ 56,791 | $ 33,231 |
| | | | | | |
| RETURNS | | | | High debt | Low debt |
| Total Income | | | | $ 279,064 | $279,064 |
| Less Variable Expenses | | | | $ 168,892 | $168,892 |
| Return to Labor and Capital | | | | $ 110,172 | $110,172 |
| Less Fixed Expenses | | | | $ 56,791 | $ 33,231 |
| Return to Labor and Management | | | | $ 53,381 | $ 76,941 |
| | | | | | |
| Per Ewe | | | | $ 178 | $ 256 |

Table 1. Expected returns to labor and management according to the price of milk and milk yield considering all other receipts and expenses similar to the example of an intensive sheep dairy operation with a high debt service (**bold**) and low debt service (*Italic).*

| Price of milk in US$/pounds | Average milk yield of the intensive sheep dairy, in pounds | | | | | |
|---|---|---|---|---|---|---|
| | 300 | 400 | 480 | 570 | 660 | 750 |
| $0.75 | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*+1,907* |
| $0.85 | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*+5* | **Neg**<br>*+21,032* |
| $1.00 | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*+3,820* | **+3,210**<br>*+26,770* | **+26,160**<br>*+49,720* |
| $1.15 | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **+2,062**<br>*+25,622* | **+28,455**<br>*+52,015* | **+54,847**<br>*+78,407* |
| $1.25 | **Neg**<br>*Neg* | **Neg**<br>*Neg* | **Neg**<br>*+12,970* | **+18,097**<br>*+41,657* | **+46,785**<br>*+70,345* | **+73,879**<br>*+97,438* |

The second example (below) represents the return to labor and management for a smaller flock, low input, spring lambing system, which might represent more accurately the dairy sheep industry. Most of the producers using this system would use their own milk for cheese

production instead of selling the milk. Spring lambing will reduce the overall usable milk production per ewe mostly because of a shorter milking season due the ewes raising their lambs during the first month of lactation (less 25-30%) and a lactation during the hottest months of the year.

| RETURN TO LABOR & MANAGEMENT<br>FOR A LOW INPUT, SMALL DAIRY SHEEP OPERATION | | |
|---|---|---|
| **Information About Your Flock** | | |
| Are you or will you be a member of WSDC (yes=1, no= 0) | 0 | |
| Number of ewes in the flock | 100 | |
| Number of ewes desired for the following year | 100 | |
| Percentage of ewes lambing | 95% | |
| Average number of lambs born per ewe | 2 | |
| Percentage of dead lambs | 8% | |
| Percentage of ewe loss | 5% | |
| Percentage replacement | 20% | |
| Number of rams | 2 | |
| Number of ewe lambs sold for breeding | 0 | |
| Number of ram lambs sold for breeding | 0 | |
| Average weight of lambs at sale | 70 | |
| Average weight of ewes | 170 | |
| Average milk production per ewe (pounds) | 400 | |
| Average # of ewes milked per hour | 60 | |
| Average set up and cleaning time before and after each milking | 0.5 | |
| Average # of days each ewe is milked | 150 | |
| Percentage of milk sold frozen | | |
| | | |
| **Flock Results** | | |
| Number of lambs born | 190 | |
| Number of lambs raised | 175 | |
| Number of replacement ewe lambs to keep | 25 | |
| Number of lambs for sale | 150 | |
| Number of lamb sold for meat | 150 | |
| Number of cull ewes | 20 | |
| Number of ewes milked (90% of total ewes) | 90 | |
| Minimum number of acres of improved pastures (8 ewes/acre) | 13 | |
| | | |
| **Price of Products for Sale** | | |
| Price of lambs at sale per pounds | $ 1.55 | |

| | |
|---|---|
| Price of breeding ewe lambs | |
| Price of breeding ram lambs | |
| Price of cull ewes per pound | $ 0.75 |
| Price of wool including LDP | $ 0.42 |
| Average price of fresh milk per pound | $ 1.15 |
| Average price of frozen milk per pound | |

## RECEIPTS

| | | |
|---|---|---|
| Lambs sold for meat | $ 16,253 | |
| Ewe Lambs sold for breeding | $ - | |
| Ram lambs sold for breeding | $ - | |
| Fresh milk | $ 41,400 | |
| Frozen milk | $ - | |
| Packaging of pallets of frozen milk (WSDC members only) | lb | |
| Culled ewes | $ 2,550 | |
| Wool | $ 343 | |
| Other income | | |
| Other income | | |
| Total receipt | | $ 60,546 |

## VARIABLE EXPENSES

| Ewe Feed | Quantity | $ | Unit | | |
|---|---|---|---|---|---|
| # months on pasture | 6 | $ 3.00 | month/ewe | $ 1,836 | |
| # months average quality hay (3% DM intake) | 6.5 | | month | | |
| Tons of average quality hay needed and price | 55 | $140.00 | ton | $ 7,658 | |
| # months good quality hay (4% DM intake) | | | lb | | |
| Tons of good quality hay needed and price | 0 | | ton | $ - | |
| # months average hay for rams (5lb/day/ram) | 6 | | month | $ - | |
| Tons of average quality hay for rams and price | 1 | $140.00 | ton | $ 140 | |
| # months corn for rams (2lb/day/ram) | 3 | $ 0.09 | lb | $ 32 | |
| # months corn at 1 lb/day/ewe | 4 | $ 0.09 | lb | $ 1,080 | |
| # months corn at 2 lbs/day/ewe | 0 | | lb | $ - | |
| Mineral 20 lbs/ewe/year | | $ 0.40 | lb | $ 816 | |
| Total Ewe Feed | | | | | $ 11,562 |

| Lamb Feed | Quantity | $ | Unit | | |
|---|---|---|---|---|---|
| Creep feed 21% CP | 40 | $ 0.18 | lb | $ 1,259 | |
| Finish ration 13% CP | | | lb | $ - | |
| # days on pasture | 150 | $ 0.05 | day/lamb | $ 1,311 | |
| High quality hay for replacement ewes | 4 | $180.00 | ton | $ 743 | |
| (2.5 lb for 120 days) | | | | | |
| Corn replacement ewes (1 lb for 120 days) | 3000 | $ 0.09 | lb | $ 270 | |
| Milk replacer | | | lb | $ - | |
| Total Lamb Feed | | | | | $ 3,582 |

| Other Expenses | Quantity | $ | Unit | | |
|---|---|---|---|---|---|
| Shearing | 1 | $ 2.50 | /ewe | $ 250 | |
| Marketing-trucking | | $ 5.00 | /ewe-lamb | $ 225 | |
| Milk production testing (# of times tested) | 0 | $ 1.25 | /ewe/time | $ - | |
| Vet-Med | | $ 5.00 | /ewe | $ 500 | |
| Supplies sheep | | $ 5.00 | /ewe | $ 500 | |
| Supplies milking | | $ 8.00 | /ewe | $ 720 | |
| Bedding straw (lb/ewe) | 50 | $ 0.07 | /lb | $ 350 | |
| Electricity freezer (very variable) | | | /lb of milk | $ - | |
| Electricity other | | | | $ 675 | |
| Machine operation cost | | | | $ 1,500 | |
| Ram cost (1/3 of rams changed every year) | | | | $ - | |
| Maintenance and repair | | | | $ 1,500 | |
| Vehicle expenses | | | | $ 1,500 | |
| Hired labor for milking (hours) | 600 | | /hour | $ - | |
| Hired labor for other (hours) | 0 | | /hour | $ - | |
| Unplanned and unforeseen expenses | | | | $ 5,000 | |
| Other Equipment rental | | | | | |
| Other | | | | | |
| Interest on operating loan | | 8% | | $ 2,229 | |
| | | | | | $ 14,949 |
| | | | | | |
| Total Variable Expenses | | | | | $ 30,093 |

## FIXED EXPENSES

| | Investment | Terms | Interest % | High Debt | Low Debt |
|---|---|---|---|---|---|
| Farm payment | $ 200,000 | 30 | 6 | $ 14,530 | |
| Livestock | $ 30,000 | 15 | 6 | $ 3,089 | |
| Sheep Equipment | $ 10,000 | 20 | 6 | $ 872 | |
| Buildings | $ 40,000 | 30 | 6 | $ 2,906 | |
| Milking equipment | $ 40,000 | 15 | 6 | $ 4,119 | $ 4,119 |
| Freezer | $ - | 15 | 6 | $ - | $ - |
| Pick up truck (used) | $ 10,000 | 5 | 3 | $ 2,184 | $ 2,184 |
| Machinery | $ 20,000 | 5 | 6 | $ 4,748 | $ 4,748 |
| Feed storage | $ 5,000 | 10 | 6 | $ 679 | $ 679 |
| Property Taxes | | | | $ 4,000 | $ 4,000 |
| Insurance | | | | $ 2,000 | $ 2,000 |
| Total | | | | $ 39,126 | $ 17,729 |

| RETURNS | High debt | Low debt |
|---|---|---|
| Total Income | $ 60,546 | $ 60,546 |
| Less Variable Expenses | $ 30,093 | $ 30,093 |
| Return to Labor and Capital | $ 30,453 | $ 30,453 |
| Less Fixed Expenses | $ 39,126 | $ 17,729 |
| Return to Labor and Management | $ (8,673) | $ 12,723 |
| | | |
| Per Ewe | $ (87) | $ 127 |

Table 2. Expected returns to labor and management according to the price of milk and milk yield considering all other receipts and expenses similar to the example of a low input sheep dairy operation with a high debt service (**bold**) and low debt service (*Italic).*

| Price of milk in US$/pounds | Average milk yield of the low-input sheep dairy, in pounds | | | | | |
|---|---|---|---|---|---|---|
| | 300 | 400 | 480 | 570 | 660 | 750 |
| $0.75 | **Neg** | **Neg** | **Neg** | **Neg** | | |
| | *Neg* | *Neg* | *+5,223* | *+11,298* | | |
| $0.85 | **Neg** | **Neg** | **Neg** | **Neg** | | |
| | *Neg* | *+3,423* | *+9,543* | *+16,428* | | |
| $1.00 | **Neg** | **Neg** | **Neg** | **Neg** | | |
| | *Neg* | *+8,823* | *+16,023* | *+24,123* | | |
| $1.15 | **Neg** | **Neg** | **+1,107** | **+10,422** | | |
| | *+3,873* | *+14,223* | *+22,503* | *+25,622* | | |
| $1.25 | **Neg** | **Neg** | **+5,427** | **+15,562** | | |
| | *+6,573* | *+17,823* | *+26,823* | *+36,948* | | |

# How Does the Use of Sheep Milk Change Economic Feasibility and Breakeven Prices for the Artisan Cheesemaker?


## Catherine Durham

Associate Professor, Department of Applied Economics, Food Innovation Center, Oregon State University, Portland, OR 97209 cathy.durham@oregonstate.edu.

This work is based on models developed and research done with **Lisbeth Meunier-Goddik**, Professor, and **Andrea Bouma**, former Graduate Research Assistant, Department of Food Science and Technology, Oregon State University, Corvallis OR 97331.


## Artisan Cheesemakers

There are three types of artisan cheese makers. There are those that start as hobby farmers possibly because they were already raising goats or sheep, life style farmers who have traded off income to work outdoors, and those that are attempting cheese-making as their principle livelihood.

A livelihood artisan is looking for an income stream, expects a return on initial investment, has plans to scale-up to achieve that income and return, and even to pass their operation to the next generation or to finally sell for enough for a comfortable retirement. To be a livelihood artisan you need to plan how you will achieve that income, return, and future.

To provide the information that will help you to make that plan my colleagues and I worked with 7 existing cheesemakers and gathered information from cheese consultants, equipment manufacturers, engineering companies. We then developed model in Microsoft Excel to estimate costs of building and operating an artisan cheese facility, allowing for the examination of the economic feasibility under a variety of conditions. The variables that could be altered to fit circumstances included market locations and opportunities, prices of ingredients, energy, and wages, each to be set according to local conditions. It also allowed for the plant location and type and mix of milk used and cheeses to be set.

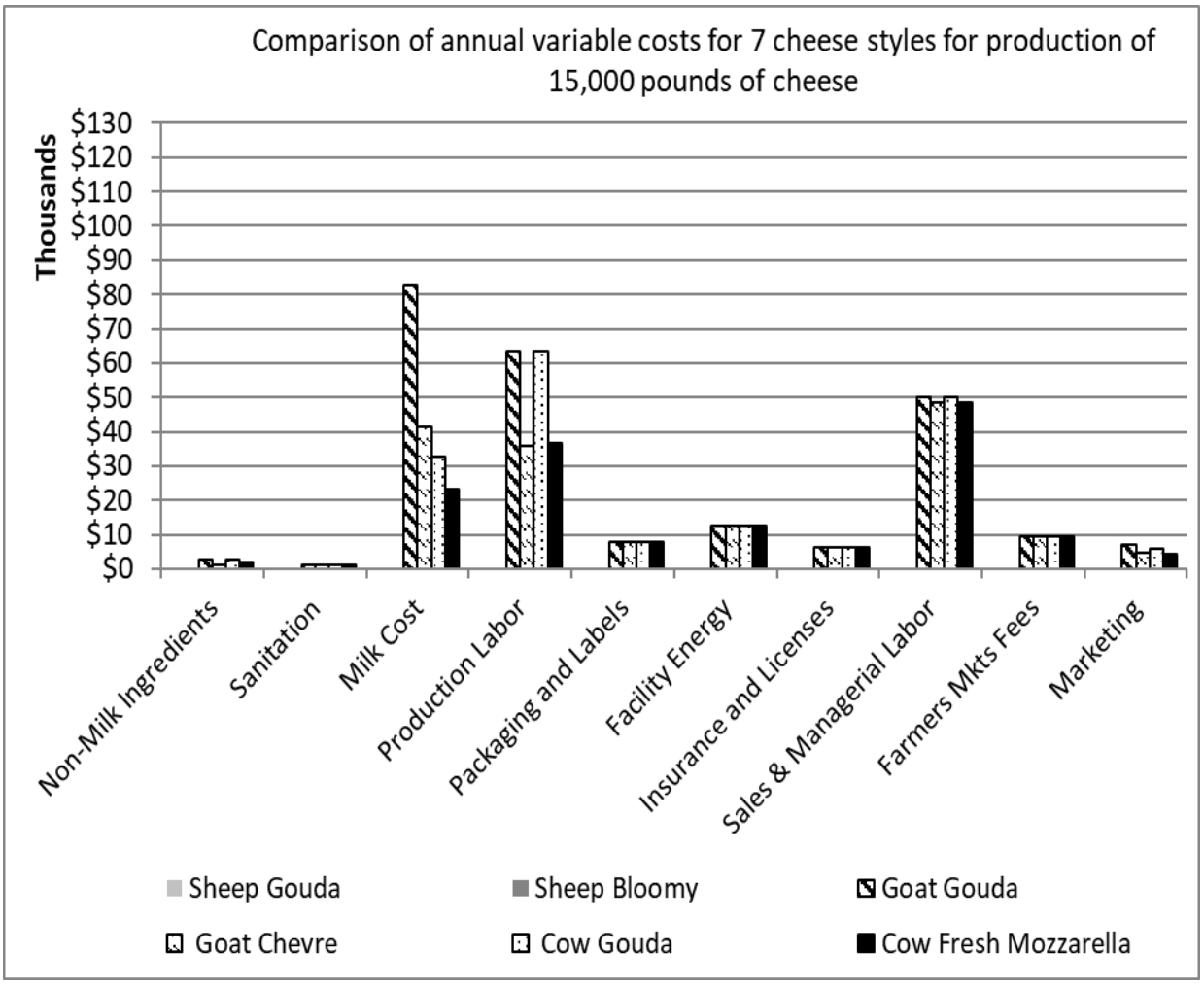
The model assumes that the buildings will be newly built, and that new equipment will be purchased, but it allows each of these costs to be overridden if, for example, building costs are more expensive locally.

Profitability measures output include Net Present Value (NPV), Internal Rate of Return (IRR). The model also calculates the cash needed to support the operation until positive cash flow is established. The model also allows us to solve for a break-even price based on all of the costs and attributes of the cheese that would be produced.

The following paragraphs review the factors we found to be most critical in determining the economic feasibility of an artisan cheese operation. We calculated costs for four basic scales of production have 4 production scenarios based on scale of production. WE assume a quick ramp of production from year 1 to 3, with 3-year production targets of 7,500, 15,000, 30,000, and 60,000 pounds of cheese produced, after that production growth slows to 3% a year. Plant design and equipment selections is based on production at the end of 15 years. This is further affected by scenario maximum for of cheese production days, which are 52, 104,156, and again 156 days per year.

## Costs of Production

The first figure examines the variable costs of production. The largest contributors to the variable costs are milk, production labor, and managerial and sales labor. We see that milk cost and production labor varies with cheese type, with aged cheese requiring more labor. But what about sheep milk. Higher yields help but don't overcome the higher cost per pound of milk. The



cost to make Gouda using sheep milk costs to produce 15,000 pounds of cheese would be near the top of this graph. Think of this in terms of cash needed to operate each year. Hopefully your revenues can cover this, but do not necessarily in the first few years, and certainly will not be entirely covered initially if you are waiting to sell your aging cheeses.

Only looking at variable costs for one plant size misses some important information, and you might be inclined to think if you operate on a smaller scale you could reduce these outlays.

After all, doesn't labor really just moves along with pounds produced? If I need smaller equipment and build a smaller building, shouldn't my production costs be the same as for a bigger producer?

> Unfortunately, the answer to that is no. There are few things that result in being able to produce cheese at a lower cost per pound as you *scale* up: equipment, buildings and some of the labor as well.

## Returns to scale –Variable Costs

### Labor

In the previous graph only one of the inputs does not change in a linear way due to using more milk or producing more cheese: managerial and sales labor. In the smallest operations one person is usually both the cheesemaker and the sales manager. They do almost all of the jobs of running an artisan cheese business. For our smallest design the owner-operator-cheesemaker does all of the work for the first three years, and then they hire part time workers to help with farmers market sales. But cheesemakers work is generally valued more highly our model assumes everyone is paid a fair wage. If a cheesemaker must spend too much time selling at farmer's markets, their time is not being effectively allocated. Retail sales staff are better used if possible, as the operation grows the cheesemaker can spend more time on production.

## Returns to scale –Fixed Costs –equipment and facility

### Consider the vat pasteurizer

One of the most basic pieces of equipment is the vat pasteurizer. And you might say you will just make raw milk cheeses, but they must be aged for 60 days, and aged variety cheeses have lower yields (and sheep milk is very …….), you will have to wait longer to sell aged cheeses (creating a cash flow problem). That cash flow problem may come out of your pocket or require a working capital loan (on which you will pay interest). Aging for such cheeses also requires an aging facility (more capital investment). So you are probably going to need a pasteurizer to

produce fresh, and other high moisture cheeses, that will enable you to start bringing in some revenue early on.

The last time we priced pasteurizers it cost about $32,000 to buy the pasteurizer to produce a planned peak of up to 10,693 pounds per year (7,500 pounds of cheese in year 3). This pasteurizer could process 264 gallons which would prepare the milk that could be made into about 863 pounds of a cow milk cheese that had a yield of 10%. The higher yield of sheep milk might allow some downward adjustment in size needed. But note how little extra it costs to buy a larger vat pasteurizer. This is an economy of scale in equipment.

Recall that a small processor would be expected to use this pasteurizer only one day a week. With a 52 entered as the maximum days per year to process milk for the smallest processors, the model will select the 105-gallon pasteurizer in base 7,500 pound scenario for fresh cheese, but either a larger pasteurizer or more days per week would be required for lower yield cheeses).

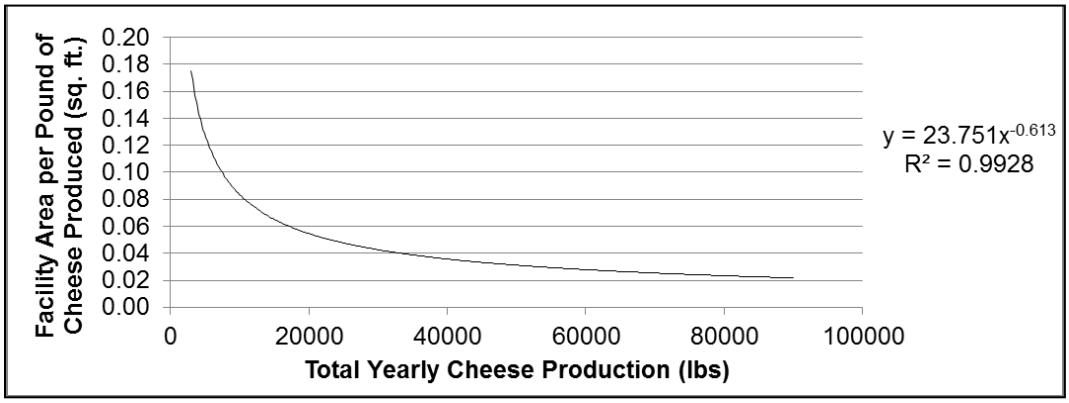
| Portion of Model Equipment Cost Data Used in Determining Economic Feasibility Model | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| VOLUME(gallons) | 52 | 105 | 158 | 211 | 264 | 396 | 528 | HTST |
| Raw/pasteurized milk bulk tanks | $2,800 | $3,500 | $3,500 | $5,500 | $5,500 | $5,500 | $5,500 | $11,000 |
| Pasteurizer (batch or HTST) | $26,385 | $28,236 | $30,459 | $31,753 | $34,647 | $37,048 | $41,540 | $101,000 |
| Model selects one column of equipment costs based on Target Pounds Produced, Type of Cheese, and Maximum Processing Days per year entered. | | | | | | | | |

The 1-day a week process plan fits in with what we learned from our original survey, because of the other tasks a small artisan cheesemaker undertakes on other days (packaging, farmers market days, aging, marketing), etc. Certainly for a farmstead operation with animal care as well the days are going to be very long. A larger operation/staff can increase usage and will probably process more often. Some staff will concentrate on processing, some on retail. We assume that processing will occur two days a week (104 days per year) for the 15,000, and three days a week (156 days per year) for the 30,000-pound operation.

For more detail on the details in these studies you can look at the papers I did with Lisbeth Goddik and Andrea Bouma. Links are in the endnotes, at least one paper is open access.

## Processing Facility

Necessary processing space per pound produced also declines as production increases.. Multiply each value on the axis by $110 and you get the cost of the building per pound. However, that really isn't the number you need to compare which is how much you expend in fixed costs

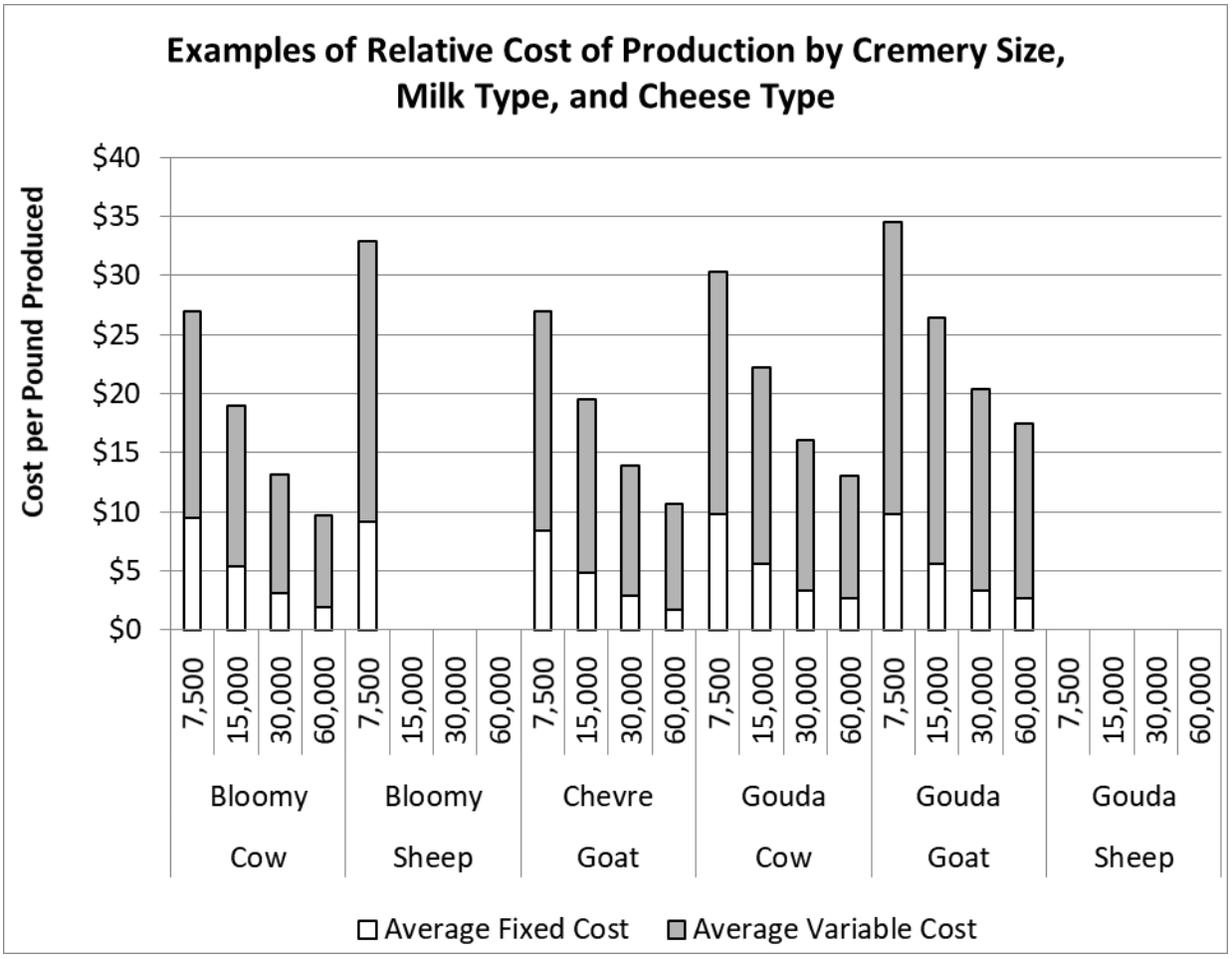



annually.

A facility that can ultimately produce somewhat over 10,000 pounds annually (the 7,500 pounds in year-3 design) is built for $128,700, a 15,000 lb year-3 facility for $168,300, a 30,000 lb for $219,900, and a 60,000 lb at $287,550, with each able to grow in volume by 3% a year through year 15. The processing facility cost only increases by a factor of 2.2, while going from the 7,500 to the 60,000-pound design--a factor of 8. Recall that equipment costs are essentially the same for the first three sizes, and the jump to 60,000 only increases equipment costs by a factor of 2.4.

*Putting it together*

So building and equipment costs both demonstrate the effect of scale. How do the variable costs and fixed costs enter into the picture of cost of production? It's handy to consider this in terms of average costs per unit produced so that you can compare production costs to retails prices. The next figure looks at this in terms of the type of cheese and milk and the facility size. First consider the fixed costs per pound these drop by just under a ½ from 7,500 to 15,000 pounds, and by smaller amounts for the next two expansions, but this takes them quite low when viewed on a per pound basis. Variable costs drops can be a bit of a surprise, but as noted above one variable cost factor that can be used more efficiently when operating at a larger size is managerial and sales labor. Many administrative tasks these individuals undertake don't change much with the amount of product produced and sold.




## Other Factors

Our model also allows us to input many factors that can have large effects on potential profitability. In addition to milk yield for cheese type, these include but are not limited to assigning a portion of direct sales-online or onsite, number of farmers markets and wholesalers within reach-and how far away they are on average.

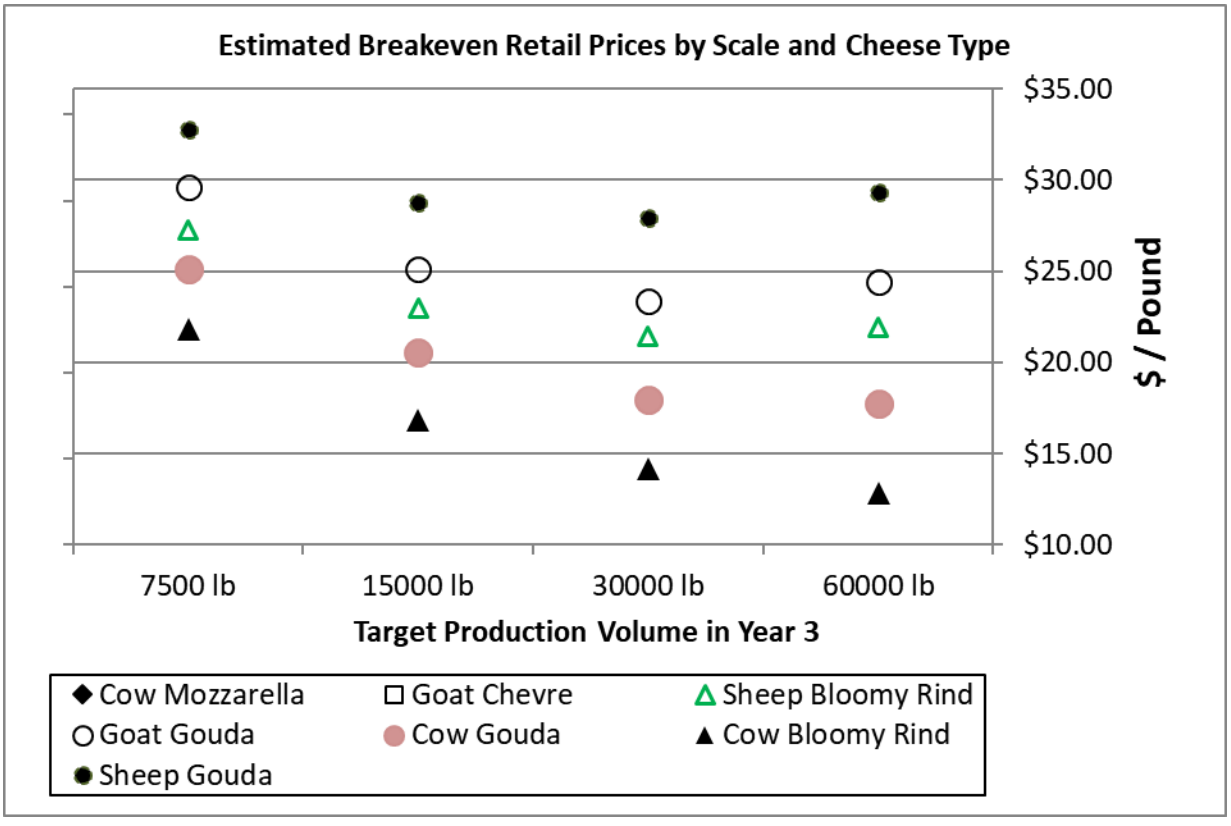
### Location

We have found that location is very important, because it determines your opportunities for marketing your product directly and receiving the entire retail price. The default condition for the model is for the start-up to begin with farmers market sales, progress to wholesale, and then distributor sales. Also by default the sales at each step are expected to continue, though after reaching a certain size all additional sales are made through distribution, though a direct sale percentage can be selected. However, the details for any enterprise are specific, so for the purposes of these comparisons we chose a common situation with the progression of markets

outlined above to allow the relative impacts of milk and cheese type, and scale of operation to be examined.

## How to break-even

All of the information I have presented so far is really about costs, and we saw that the price of sheep milk has a profound effect on how much it will cost to make cheese. One way to evaluate this is to look at how that high milk price will require you to charge more for your cheese to breakeven. Now break-even isn't really the goal we are hoping for but, in our model we have incorporated the pay-off of loans, and a salary for the owner-operator. Thus, our evaluation does have a sustainable business as a target. Furthermore, our cost estimates are based on newly built facilities and equipment, and there are probably ways of moderating some of these costs. One caveat is that no land cost is included.




The breakeven prices in the figure portray the tough situation for producing aged cheeses with sheep milk, the breakeven price is about 50% higher for sheep milk Gouda than for cow milk Gouda. Of course the difference is less in comparison to goat milk cheese. For Bloomy rind cheeses the difference is smaller. In any case it is clear that the differences in sheep milk cheeses

need to be emphasized. Scale helps too, to bring the cheese into competition with other specialty cheeses.

## Final Points to Ponder (from a marketing economist's point of view)

### Education of the consumer

Customers need to know that sheep milk costs more to produce. The impact of that on each type of cheese can be calculated. In the US sheep milk seems to be sold for $1.00 -$1.25 per pound right now. If I assume the raw cow milk price is $1.80 per gallon, at 8.6lb/gallon, it comes to about 21 cents per pound. If cow milk yield for Gouda is 11% and sheep milk yield for Gouda is 16%, then milk cost for a pound of cow Gouda is $1.80=0.21/0.11., for sheep milk Gouda cheese the milk cost is $7.81=$1.25/0.16, a difference of $5.93. The next time you have a curious customer, about why prices are high you can provide them with that type of calculation. Maybe DSANA can produce a sheet.

Like fine wine, the nuances of flavor need to be emphasized so that consumers want to try it and buy it. They don't need to make it their everyday cheese. But a little bit from each cheese lover will create sufficient sales.

### Education of the entrepreneur

At the Oregon State University Food Innovation Center, which is in Portland, we developed a course to help entrepreneurs called "Getting Your Recipe to Market". If you are thinking about starting an operation it will be worthwhile to take advantage of educational materials and courses that explain licensing, business plans, investment options, working with buyers, and other elements of operating an artisan cheese-making business. Some of these are specific to state law such as licensing so connecting with your state's department of agriculture or cooperative extension is worthwhile. Your local Small Business Development Center (SBDC) or community college may offer courses as well.

### Don't believe everything you read online

I've seen some mistakes in the popular press, about the price of sheep milk in Europe in particular and the notion that you are competing with very inexpensive milk. They do have an advantage on milk price, but it is not the equivalent of 15-30 cents per lb. The most recent EU price I could find published (in French, 2015) was the equivalent $0.55/lb being paid for grade I milk for Roquefort. Being able to produce at that price is likely to be due the well-developed structure and scale of production. The French aren't just now investing in buildings and equipment on the cheese production side either. Those aging caves, aren't something they just built and they are operating on a relatively large scale.

## Diversification of milk types

One way to get around the limited use of equipment and buildings is to produce some cheeses as blends of cow and sheep milk, or perhaps it is better to produce some cheese purely from cow milk. Increased utilization can really help to improve your utilization of capital, and improve your return on investment.

## Diversification of operations

My colleague Lisbeth Goddik has had the opportunity to observe artisan cheese operations all over the country and much of the world. She put together a list of ways in which artisan cheese-makers were successful including points made here about scale of operation, types of product offered, and agritourism. I travelled through Italy about 10 years ago and was astounded by how many arrow shaped signs with the word AGRITOURISMA I saw. I also found that that there had been considerable funding in the EU to support those developments. Nevertheless, thinking outside the box of cheese-making is worth considering. Of course this is one of the areas where the farmstead operations has some unique attractions, because face it: lambs are cute, and pasture is beautiful.

Nevertheless, my colleague Lisbeth, has observed many instances in which a specialty cheese producer, farmstead or artisan, has found a way to improve incomes and create a sustainable business. Tours and cooking classes, and cheese-making courses, are all possibilities. Think about how wineries work. A tasting comes at a charge but, that fee will be waived with a purchase. The tour can be difficult to manage and may interrupt operations too much, but some timing could be imposed. A cooking class or cheese-making course can take place on-sight as well.

## High yield products

The production cost per pound of cheese is greatly impacted by yield, and while that yield is good for sheep milk cheeses, it is less help in terms of cost for harder cheeses. Even accounting for yield the hard cheese milk cost difference is nearly $9/lb at the prices I input, but only 3$ for fresh cheeses. It is probably easier to sell that difference than it is at the other end. A caveat is that some styles of cheese may produce a more distinct, and desirable sensory differences with sheep milk. That will be another consideration. Of course it only costs about a $1 more to produce sheep milk yogurt, and niche of individuals who favor alternative milks and have been exposed to these products in their travels. The real Greek style cheese.

## Cooperation

The hopeful entrepreneur might want to investigate opportunities to work with an established processor. A small operator might welcome the chance to rent out their equipment part-time under the right circumstances. A relationship would need to develop, perhaps through working

for the current operator. Eventually that might develop into a rental. In such an instance it might be nice to specialize in different types of cheeses. Some farmstead operations might be interested in splitting out the milk and cheese production operations at some point.

Cooperative production has worked well for many winemakers getting their start.

## Marketing

My recent communications with sheep milk producers, and recognition of the increased simplicity of e-commerce is making me wonder if the high-priced niche of the sheep milk cheese-maker may benefit from some new thinking. Depending on where you are located sheep milk cheese prices may be too high for the local farmers market and you may need to consider the use of distributors, online sales. Use of distributors generally requires the cheesemaker to become recognized for the quality of their product and their ability to produce quantity consistently. Distributors and online buyers both will identify cheeses that win prizes and get talked about in the press. Though farmers market sales often provide a starting point for this recognition, it may take a little more to reach that higher production level with sheep milk cheese.

*Finally,* I love the taste of sheep milk cheeses. *I'll buy some.*

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[1] Durham, C. A., Bouma, A., & Meunier-Goddik, L. (2015). "A decision-making tool to determine economic feasibility and break-even prices for artisan cheese operations." Journal of Dairy Science 98(12): 8319-8332. https://doi.org/10.3168/jds.2014-9252.

Bouma, A., Durham, C. A., & Meunier-Goddik, L. (2014). "Start-up and operating costs for artisan cheese companies." Journal of Dairy Science 97(6): 3964-3972. doi:10.3168/jds.2013-7705. *OPEN ACCESS*

[1] https://www.pcc.edu/climb/small-business/getting-your-recipe-to-market/

# On-farm Processing: Ice cream and yogurt for visitors to the New Jersey Shore

Misty Meadow Farm, Petersburg, NJ

Bill Simmerman

*(as interviewed by DSANA member Carrie Abels)*

A few miles from the Atlantic shoreline in southern New Jersey, Bill Simmerman and his wife are establishing a sheep dairy with 40 ewes and a strong agritourism component. They own a 17-acre property in a rural/suburban area, and feed hay to their East Friesian flock, as they do not own pasture land. They will be milking for the first time next year (2019) and plan to sell yogurt, ice cream, and lamb to local Cape May restaurants and high end wineries.


Bill says he built his business plan "from the market backwards." He first secured strong interest in his sheep dairy products and then built his farm and creamery infrastructure. He has been selling his lamb through a local farm to plate organization, which has led to interest in his dairy products. After a long career in marine construction, "I thought for 6 months about what I wanted to do in farming," Bill recalls. "You need to have a niche and something that agricultural tourists are interested in."

The Simmermans built a 60' x 40' timber frame structure with a cathedral ceiling. This will be the centerpiece of their agritourism events. Alongside this structure is located the milking parlor, creamery, and a small store; glass windows allow tourists in the timber frame structure to see into the parlor and watch sheep being milked.

His ewes and lambs are housed in a new pole barn that has 4-ft. high knee walls all the way around and roll-up curtains above the walls. There is a center aisle for a tractor, and hay storage at one end with sliding doors . The concrete is 6" and there is automated water coming from frost-free hydrants. Total cost for the housing was $55,000.

The milking parlor has 6 head gates. It cost $25,000 to build, and then there were payments of another $25,000 for a bulk tank, pasteurizer, and other processing equipment. Bill is working with Microdairy Designs on finalizing the creamery plan before milking begins in April 2019.

Bill also worked closely with the Natural Resource Conservation Service (NRCS) to secure $50,000 in grant money to help pay for fencing and sheep housing. He strongly suggests that newcomers to sheep dairying work to find sources of funding from NRCS. "It has actually cost, to date, $250,000, with the $50,000 in grant money from NRCS for housing, waterers, fence. My budget was $250k, so I was right on and got some back!"

His biggest challenges have come from a neighbor who questioned whether his farm was allowed under local zoning laws, and from the barber pole worm – he is now selecting strongly for parasite resistance after losing more than a dozen lambs to the worm last year.

Bill's advice to anyone starting a sheep dairy is this:

1. "Make sure you have the market in place before you start. The market will come to you if you build your farm in the right place and build it around agritourism," he says, and
2. "Love to work long hours."

He also feels it is important for DSANA to begin a mentorship program so that new sheep dairies can obtain support and get information from established ones. "It really helps to have someone willing to answer the phone when you call," he says, "because this is all pretty difficult to do."

# The Economics of “On-ranch/farm” Processing;

KJ’n Ranch, Inc. & Sheep Mountain Creamery, Helena, Montana
kim@kjnranch.org, 406.750.5441
Kim & Jim Ashmore

KJ’n Ranch Inc. has been in operation for over 10 years with our signature line of “Lamb Sausage” and packaged lamb meat. This year (May 2018) we have expanded to having a sheep dairy and creamery “on-ranch” here in Helena, Montana under the name “Sheep Mountain Creamery “. We are located north-west of Helena.

We make Sheep Cheese using 100% sheep milk with Lacaune/East Friesian dairy ewes. We also are the only “Grade A –Sheep Dairy” in the state of Montana, and as far as we know in the Northwestern states. We provide Pasteurized whole sheep milk for customers with lactose tolerance issues.

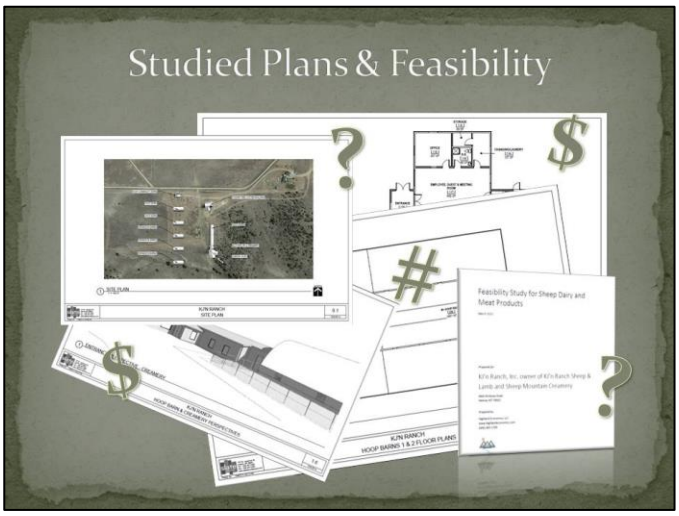
Our cheese products for the first couple years or so are “soft” cheeses which do not require long-term ripening in a temperature and humidity controlled cool room or cave.

Our sheep are raised on Montana natural grasses and all natural supplemental nutrition pellets (no GMO’s - no antibiotics – without any manmade hormones). We use vegetable rennet in our cheese processing; no meat rennet.

This venture didn't happen over-night, by a long shot …required a lot of patience with a serious time and research investment.

Kim was approached several years ago while developing a meat flock of Dorpers, "Why don't you try a sheep dairy?" After several years getting involved with DSANA, attending annual Symposiums, several dairy and artisan classes she convinced Jim (her husband) that we should explore this.

<u>Original planned costs were high.</u> After approximately 7 years of investigating the prospects of a dairy operation we started the decision-making process with more intense research, local and regional. We were able to secure some grant funds to facilitate a feasibility study ($25K) in March 2015 based on a building and operational footprint of 475 ewes and about $1.5 million in construction costs on about 10 acres of land. This was without any existing infrastructure, a complete new build.




The feasibility study proved promising but not quite at the large operation proposed or considered in the original business plan model. We visited numerous bank/lending institutions presenting our business plan to secure funding needed beyond our own cash flow capacity (long term); many were very interested and made upfront promises that never panned out.

However, we had one institution that was very interested and offered some suggestions that we followed and then about a year later went back with our changes and adjustments in our business plan and marketing approach; they said "Let's Do it!"

We down-scaled the project to a startup of 35 ewes and ~$400,000 in capital investment with an estimated $20,000 first year operating cost; about 27% of our original scale and scope we were hoping the region would support.

We crunched some more numbers to see if we would be able to show profit within 5 years and what would be the required operational footprint to achieve this. A flock of 250 milking ewes seemed to be the magic number and we felt, "we can do this."

So we pushed on to pursue a small scale operation with the whole process

## “On-Ranch” under one roof.

We broke ground in fall of 2016 and didn’t complete the build-out until April 2018. This was largely due to the DIY approach we took to build the structures needed to save cost and hopefully stay within budget. Our DIY team consisted of Kim and me, our two grandsons that are staying with us, and several neighbor friends.

Design features were important in this build to help minimize operational costs.

*19 Month DIY build - Cost break-down by space/room –*
*Construction $258,886 vs $1.5 million*

| $ 258,886.37 | Total Project | Space Dimensions | Sq Ft | $ / Sq Ft | | |
|---|---|---|---|---|---|---|
| $ 72,000.00 | Hoop Barn (4,608 Sq Ft) | 48' X 96' Hoop Barn on a 5 ft 6"X6" Post and 2"X6" T&G Pony Wall w/ cement slab floor | 4,608 | | | |
| $ 186,886.37 | Internal Rooms (640 Sq Ft) | Internal building - 16' X 40' dairy operation rooms & 6'X12' Mechanical Rm | 712 | $ 30,667.39 | Total Cost by Rm | Cost per Sq Ft including Equipment |
| $ 258,886.37 | < Total Project Cost | | | | | |
| ($4,361.00) | Milking Parlor | 11' X 16' | 176 | $ 7,580.70 | $ 11,941.70 | $ 67.85 |
| ($5,646.00) | Cool Rm/Bulk Tank | 6.25' X 8' | 50 | $ 2,153.61 | $ 7,799.61 | $ 155.99 |
| ($39,766.29) | Creamery:Pasteurizer/Cheese Vat/Bottler | 13' X 16' plus 6'X8' | 256 | $ 11,026.48 | $ 50,792.77 | $ 198.41 |
| ($3,436.46) | Lab | , 6' X 5' | 30 | $ 1,292.17 | $ 4,728.63 | $ 157.62 |
| ($1,300.00) | Refrigeration Rm | 6' X 8' | 48 | $ 2,067.46 | $ 3,367.46 | $ 70.16 |
| | Entry/Change Room | 5' X 10' | 50 | $ 2,153.61 | $ 2,153.61 | $ 43.07 |
| | Half Bathroom | 5' X 6' | 30 | $ 1,292.17 | $ 1,292.17 | $ 43.07 |
| ($5,900.00) | Mechanical Room | 6' X 12' | 72 | $ 3,101.20 | $ 9,001.20 | $ 125.02 |
| | Barn without internal rooms | 41' X 96' | 3,896 | $ 167,809.22 | $ 167,809.22 | $ 43.07 |
| $ (60,409.75) | < Net Equipment backed out of construction | | | | | |
| $ 198,476.62 | < Net General Construction Cost | | 4,608 | $ 43.07 | $ 258,886.37 | |
| $ 43.07 | < Construction Cost per Sq Ft (does not include Ranch donated labor or specific equipment, took about 19 months to build) | | | | | |

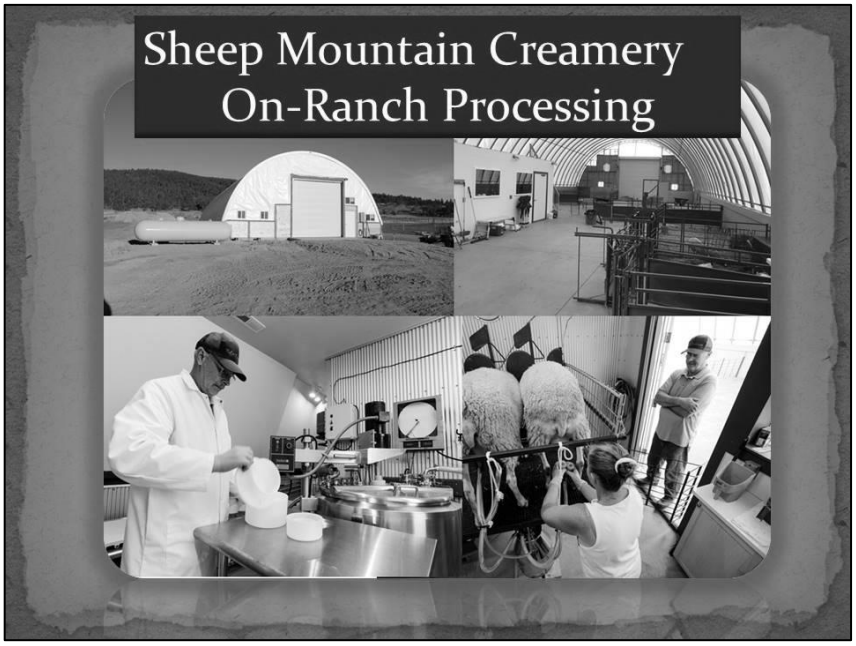
Full cost including land refinance came down to: $445,295

In our research and several site visits to farms and dairies we came up with the following things to consider in the build design to help minimize operational costs and provide a consistent quality product:

1. On-Ranch processing all under one roof – all processed on site made sense to us and because of our northern tier climate zone/weather we wanted to approach an enclosed

2. area to operate the business with minimal weather impacts to us, the equipment and the animals.
3. Gravity Flow Processing – in our research we learned about the influence of pumps on milk while moving it from one stage of the process to another and then visited one dairy that was built with a gravity flow system to move the milk from the milk parlor cool tank into the creamery and cheese making process without using pumps. We decided this is what we wanted as well; as this process contends that the end product is more consistent and processes better cheese without the churning of the milk.
4. High energy efficient equipment and appliances were a must – minimize energy consumption.
5. Well insulated building inside a barn structure – added weather and wind protection.
6. Animal health was critical – established sources for all-natural grass hay (no pesticides used in fields and no toxic weeds) with an all-natural mineral pellet supplement engineered specifically for our region and operation.
7. Grey water evaporative pond – all commercial discharge from the sinks and floor drains go into this pond. Eliminated the state requirement of regular cleaning and inspections of an in-ground septic type drain system. The toilet room has its own small dedicated septic system.

<u>Biggest surprise or glitch</u>




- Local regulatory offices were not able to provide a full scope awareness of all equipment or processes required up front when initially approached for information, resulting in cost overruns due to last minute purchases to complete all requirements to start production.
- Storage capacity > freezer or cooler & packaging. We thought we could "work" on getting storage capacity as we started production but found it difficult and did not have enough cold space when it was needed.
- Construction and equipment cost increase – did not anticipate adequately the cost increases from time of feasibility study when estimates were developed to the time of securing funds and implementing construction.

- Limited Cash Flow / Emergency Reserve, watch cash flow to make sure you have reserves for the unexpected – don't get all your cash locked into short- and long-term debt just to finish the project.

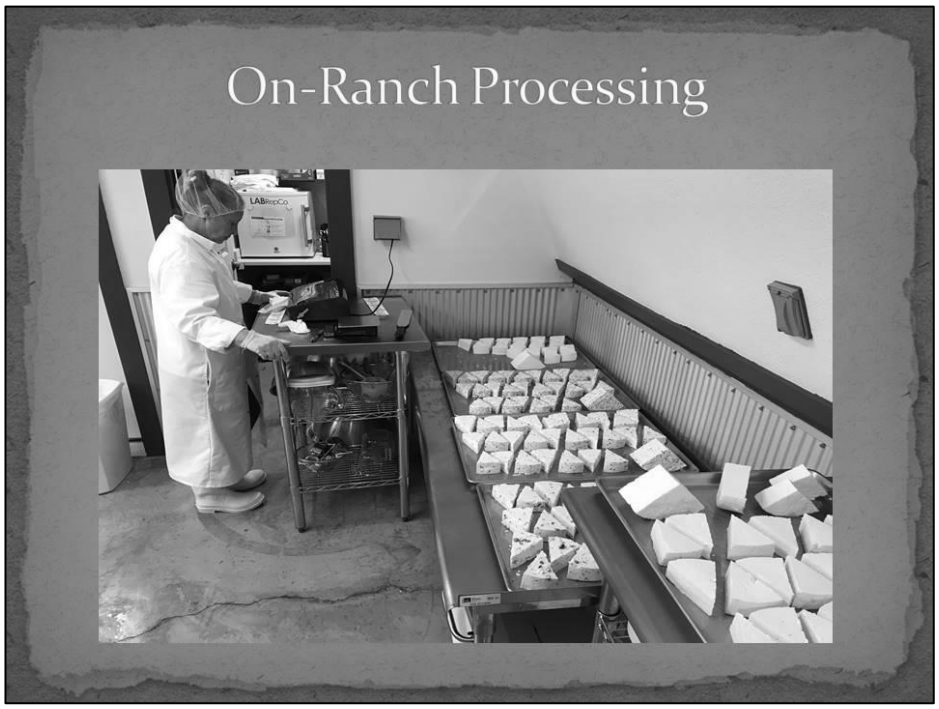
What we managed well

Construction and Production processes – all the parts seemed to flow smoothly without serious delays from subcontractors or vendor shipments. The length of build of 19 months was primarily because only one person, me was working on the job most of the time.

At "Turn Key" everything worked and product was out the door when starting operations!

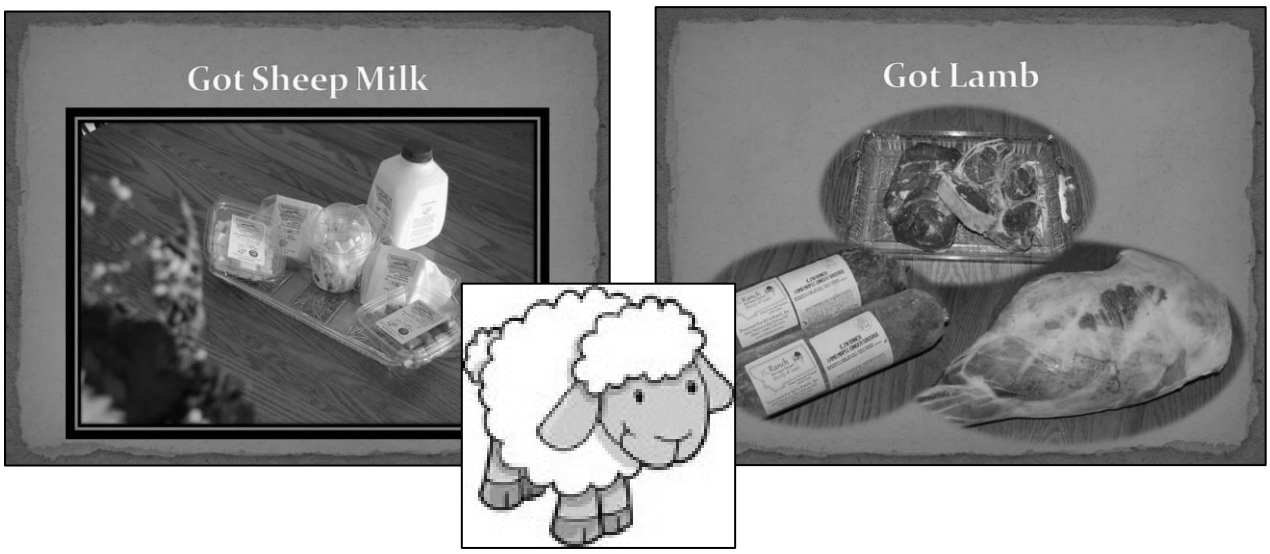
Some redundancy paid off (2nd cooling compressor) – when we did start production we discovered one of our cooling compressors was not working and was able to continue with our second compressor while waiting for service.

Design efficiency worked well (all under one roof; gravity flow of milk movement from one station to next-no pumping of milk, waste water discharge segregated between black/sewage and grey/floor and sink drains, energy efficiencies/LED lighting/high efficiency appliances/thermal barrier coating on exterior walls/2nd weather barrier being housed inside the barn)



## Best Advice

- ☆ Conduct a feasibility study or assessment for the market area of your business (ROI potential?)
- ☆ DIY - Do the homework necessary for your area
    - Licensing
    - Lab/Testing equipment – work with your inspectors and testing facilities.
    - If you do the construction know which parts require licensed professionals (e.g., Electrical, Plumbing, Waste/black water-grey water discharge, etc.) and request written bids and work agreements if you act as general contractor for the project (protect your investment/time & equipment).
    - Know and build for weather impacting issues (wind and snow loads, ground water and snow melt runoff, water lines, humidity/dry air)
- ☆ Build at least a 25% error margin in your project cost proposal
- ☆ Know your chemicals and how they interact with stainless steel
- ☆ Work with suppliers and subcontractors that are there to make you succeed and not fail at your project (willing to help guide you by anticipating your needs)
- ☆ Check and test new equipment when possible upon arrival, do not wait for production to turn it on.
- ☆ MARKET YOUR PRODUCTS – Be committed to sales opportunities > Farmer's Markets, Food Shows, Visit Retailers, Restaurants, Universities, Hospitals, local school systems, etc.



# Building a Farmstead Cheese Business with Cash

Lark's Meadow Farms, Rexburg, ID

## Kendall Russell

*(as interviewed by DSANA member Carrie Abels)*

In the Upper Snake River Valley of southeast Idaho, Kendall Russell and his wife produce award-winning sheep's milk cheeses on their 20-acre farm. This is their 10th year; they'll be milking 144 ewes next year (2019) and their eventual goal is to milk 196. They supplement their grazing with purchased dairy-quality hay and a barley ration in the parlor. On the farm is a house, a hoop barn for the sheep, and a barn/shop that houses their cheese cave, processing area, storage facility, and milking parlor (which has a 12-gate, single line stand).

This year the farm produced 10,000 pounds of cheese; next year that will go up to 20,000 pounds (not including the cow's milk cheeses made off season). Kendall is thinking about also producing yogurt and ice cream. "But if I've learned anything in sheep dairying," he says, "it's to master one thing at a time before going off to chase something else." He estimates it would cost another $75,000 for yogurt infrastructure and $40,000 for ice cream.

The family took over the dairy from Kendall's father-in-law; it had been struggling. Kendall invested $50,000 to put some quality milking infrastructure in place, and over seven years he's invested $20,000 in new livestock. Having watched his father-in-law run out of money before the farm's cash flow was self-sustaining, he is now committed to running a cash-flow only operation. The farm has no line of credit; next year, for example, Kendall will finally be able to lease a tractor because there is now money for it.

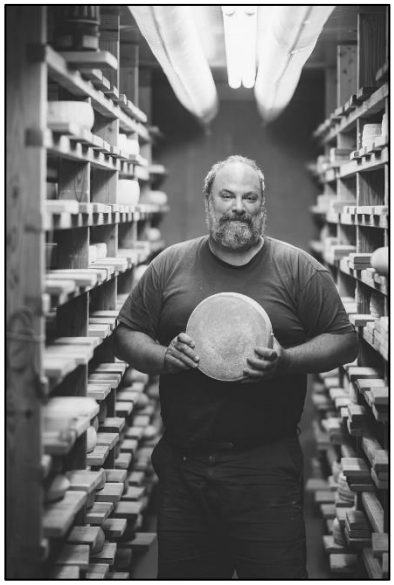
"I don't think you have to spend $500,000 to get into this business," Kendall says. "If you want to start on a small scale and run on cash flow, you can do it." However, he cautions that the biggest mistake a new sheep's milk producer can make is to overestimate how much money they can sell their product for, while underestimating costs. He always reduces his sales projections by 20% over what he initially thinks, and ups his cost estimates by the same percentage.

To survive in the American cheese world, Kendall says, you need to create unique styles of cheese, do a lot of networking, and have confidence when you call buyers. “It takes a lot of gumption to call someone and say, ‘Do you want to buy my cheese?’ If you sound less than competent, that scares the buyer.” Kendall didn’t hire a consultant to help him create his first cheeses 10 years ago, but he thinks new producers should seriously consider doing so.

It helps that Lark’s Meadow Farms is located an hour and a half from Jackson Hole, Wyoming, where Kendall can charge $30 to $35 a pound for his cheese “and no one blinks.” He makes $100,000 a year just selling cheese at farmers’ markets. He believes new sheep dairies should try to locate within a reasonable distance of a metropolitan area.

More of Kendall’s advice: new producers should talk often with peers in the sheep dairying world; they should do internships at sheep dairies “to see what they’re getting into”; they should advertise in magazines that food producers read, such as Culture magazine; and they should practice good animal husbandry and recordkeeping.

“Be painfully honest about your numbers,” he adds. “Send them to other sheep’s milk producers and ask, ‘Am I on track here?’”



# Garden Variety Cheese

Monkeyflower Ranch, Royal Oaks, CA

Rebecca King Monkeyflower Ranch, Royal Oaks, CA

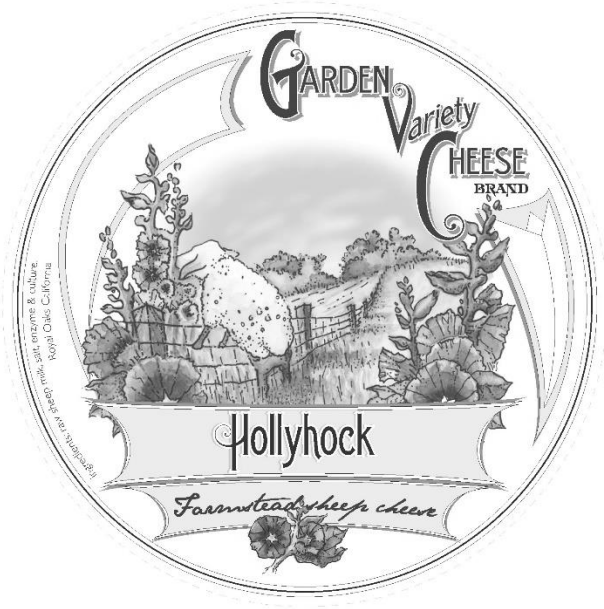

40 acres, 100 milking ewes

3 full-time, 1 part-time farmworkers

2 full-time, 1 part-time dairy and farmers market employees

1 full-time owner/dairy/market worker

| | year | 2014 | | 2015 | | 2016 | | 2017 | |
|---|---|---|---|---|---|---|---|---|---|
| Production | milk total | 7372 g | | 4946 g | | 6200 g | | 6740 g | |
| | aged cheese | 3414 g | 46% | 1663 g | 34% | 3158 g | 51% | 2600 g | 39% |
| | feta | 969 g | 13% | 796 g | 16% | 810 g | 13% | 400 g | 6% |
| | yogurt | 2022 g | 27% | 1617 g | 33% | 1482 g | 24% | 2033 g | 30% |
| | fresh cheese | 526 g | 7% | 762 g | 15% | 692 g | 11% | 1055 g | 16% |
| | | | | | | | | | |
| Sales | wholesale cheese | $37,602 | 15% | $28,507 | 13% | $19,678 | 10% | $36,085 | 14% |
| | wholesale yogurt | $24,934 | 10% | $21,851 | 10% | $15,808 | 8% | $31,889 | 13% |
| | fm cheese | $94,200 | 37% | $74,316 | 34% | $71,261 | 35% | $68,157 | 27% |
| | fm fresh/yogurt | $72,979 | 28% | $74,801 | 34% | $72,241 | 35% | $98,085 | 39% |
| | Adopt A Ewe | $26,577 | 10% | $19,232 | 9% | $24,684 | 12% | $15,380 | 6% |
| | dairy gross sales | $256,292 | | $218,707 | | $203,672 | | $249,596 | |


Garden Variety Cheese
BRAND
Hollyhock
Farmstead sheep cheese


Garden Variety Cheese
BRAND
Cosmos
Farmstead sheep cheese


Garden Variety Cheese
SHEEP MILK
YOGURT
Garden Variety Cheese
SWEET ALYSSUM
SHEEP CHEESE
Garden Variety Cheese
SHEEP MILK
YOGURT

*Do you enjoy local, artisan food that's been lovingly produced by hand?*

*Do you wish you were more connected to where your food came from?*

*Ever thought about quitting your job, cashing in your savings and following your dream of starting a sheep cheese dairy? Want to live vicariously through someone who has?*

*If yes, Garden Variety Cheese would like you to:*

# ADOPT A EWE

## For $500 you can cover the costs to feed and care for a naturally raised dairy sheep.

## In return, you will receive close to $600 worth of farm products from July through December 2018.

*You will also be the proud sponsor of a lovely individual animal and you and your family will be invited to visit your ewe and the ranch at private events. And you will have the satisfaction of helping a young entrepreneur fulfill her dream of a life on the land while supporting local artisan food production*

Garden Variety Cheese is a small farmstead cheese business, based on 40 acres in Northern Monterey County. We began commercial milking and cheese production in March 2009. Our sheep produce lovely, rich sweet milk that makes fabulous cheese. To ensure the health and well-being of the animals and the high quality of the milk and cheese from Garden Variety Cheese, the 100 milking ewes here at Monkeyflower Ranch are fed on pasture, non-GMO alfalfa hay, organic brewer's grain from Santa Cruz Mountain Brewing and organic grains from Modesto Milling. Each ewe is named after a garden flower and treated with love and respect. Dairy sheep only produce milk for about six months out of every year, and all of our cheeses are aged at least two months, some up to ten months, before they are ready for sale. This means there is a relatively long investment time from when the sheep eats the grass to when the cheese is turned into green. By helping us to better balance the cash flow for the farm, you can help to ensure the future production of more high-quality artisan cheeses and fresh yogurt. In return for your investment, you will receive delicious dividends when the cheese ripens and reaches its peak.

| |
|---|
| The **LAMB PACKAGE** includes a half lamb, processed to your specifications ($220 value)<br><br>**PLUS bi-weekly pick-ups of cheese and other dairy products** ($30 value per pick-up) |
| The **PORK PACKAGE** includes ~ 20lbs assortment of whey-fed pork – (app. $220 value)<br><br>**PLUS bi-weekly pick-ups of cheese and other dairy products** ($30 value per pick-up) |
| The **WOOL PACKAGE** includes a queen size wool blanket – ($220 value)<br><br>**PLUS bi-weekly pick-ups of cheese and other dairy products** ($30 value per pick-up) |
| **DAIRY ONLY PACKAGE $325**<br><br>**Bi-weekly pick-ups of cheese and other dairy products a month** ($30 value per pick-up) |

The **ADOPT-A-EWE** box pick-ups will be **BI-WEEKLY** at these farmers market locations:

- Downtown Santa Cruz, Wednesdays 1:30 to 5:30
- Downtown Palo Alto, Saturdays 8:00 to 12:00
- Palo Alto--California Ave, Sundays 9:00 to 1:00
- Mountain View, Sundays 8:30 to 1:00
- Temescal, Sundays 9:00 to 1:00
- Noe Valley, Saturdays 8:00 to 1:00
- A private residence in San Jose, Sundays
- Hidden Fortress Coffee, Watsonville, Fridays
- The farm in Royal Oaks
- Happy Girl Kitchen, Pacific Grove, Thursdays

# Veldhuizen Cheese

Dublin, TX

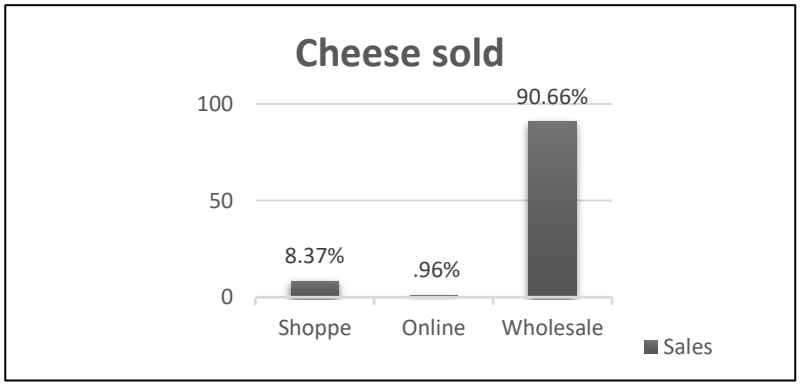
www.veldhuizencheese.com

Rachael Gwassa

Veldhuizen Cheese began in 2001, by Stuart and Connie Veldhuizen. We are a farmstead operation, making and aging artisan raw milk cheeses on our Central Texas farm of 180 acres. The creamery was started with cows; sheep were added in 2016. All our cheeses are raw, aged a minimum of sixty days, hard Dutch and English styles (Gouda, cheddar, etc.) available in wheels of 15lbs, 10 lbs, or 6 lbs. Total cheese produced annually is approximately 84,000 lbs.

Our cheeses are marketed via:

- Regional Distributors
- Wholesale to retail specialty shops, wineries
- Our own on-farm retail shop
- Our online website shop




Our operation:

- ☆ 180 acres, planted and native pasture
- ☆ 50 to 60 cows milking year round, Jersey/Guernsey/Lineback
- ☆ 50 to 60 ewes milked seasonally (flock is increasing each year!), EF/Lacaune/Awassi
- ☆ 13 laborers, half of them part-time, plus the help of my three kids

Our product is special because it is the best cheese in TEXAS, which makes it very important to our customers- who are Texans! Texans are very loyal to Texas. It is made with raw milk, naturally cave aged, handmade by our family of four generations working together, from our own small herd of grazing cows and sheep. It is a very unique situation, which appeals to the local/natural/organic/romantic/foodie types.

Velduizen Cheese driveway sign

Customers are engaged through social media, website, a direct email list (customers sign up for this when they visit our farm store), participating in local events, and hosting events at the farm.

Social media could be better utilized- but we do put a few posts up each month, and strive for a quarterly email. Online videos are a way to connect with those who want to learn more about us: not many people will read an article you post, but many will watch a video, particularly an entertaining one. This is a great way to communicate your story, your philosophy, your values, and attract a customer because they like you, not just your cheese! And after they taste that amazing cheese they will be your customer forever! Tell your story- it is why you do what you are doing…you are not mass producing a commodity product. It is special, because you have made it so.

The on-farm Cheese Shoppe is right on the dairy, which is six miles from the nearest town, and two miles off the highway. We have a blue State Highway "attraction" sign on the highway, pointing the way to the farm; which is great advertisement for a minimal cost. It took a few years for the word to get round about the Shoppe's presence, but today we have a shopkeeper who exclusively works in the Shoppe ( which is open six days/wk), and two people must be there on Saturdays to serve customers and give the regularly scheduled cheese tour. The Shoppe building is bright and inviting, with the cheese front and center as you come in. Other local/natural food and bath products for sale are displayed on shelves and refrigerators along the periphery.

On-farm events have been great for business. The extra labor involved is a challenge; however, these do increase sales at the farm store noticeably for weeks after the events. We have a farm day annually, as well as special events such as music and cheese nights, and wine (or beer) and cheese pairings. Farm Day consists of tours all day long, hayrides, grilled cheese/cheese burgers, petting corral, sand and haybales for kids to play in, special speakers, local vendors.


Cheese Shoppe at Velduizen Cheese

Ewes' milk cheeses are our new product. It has taken time to get these onto distributor sales lists, and into their warehouses. We occasionally ride along with distributor salesmen making sales calls to chefs, sampling our product and telling our story. The ewes' milk cheeses are challenging because of the price, as well as introducing a new product to Texans (You can milk sheep?!!!) We are still trying to find the right niche for these: high-end restaurants and specialty shops so far. They do sell well in our Cheese Shoppe, and in our cheese counter at 4.0 Winery in Fredricksburg, TX. Seasonal flavored cheeses have been a big hit, and we are planning to make more of these.


Inside the Velduizen Cheese Shoppe

# Putting Your Best Foot Forward: reaching consumers through meaningful labels

Emily Moose
Director of Communications & Outreach
and Labeling Coordinator for *A Greener World*

## Purpose of this talk

- Help you navigate and evaluate the labeling landscape, and utilize label claims accurately to best position your product in the marketplace
- Introduce you to A Greener World's three certifications: Certified Animal Welfare Approved by AGW, and its optional, additional accreditations, Certified Grassfed by AGW and Certified Non-GMO by AGW
- Offer tips on incorporating certified label claims into your marketing for best results
- What this talk doesn't cover: Legal aspects of cheese labeling. For more information on that, refer to FDA, your state department of agriculture, or relevant regulatory body on dairy labeling.

## Labeling Landscape: The Wild, Wild West

Status of the Market

- Consumer Proximity to Agriculture
- Demand for Transparency
    - Increased interest in claims being audited
- Sustainability, Animal Welfare and Values-Based Purchasing
    - Growth in consumer interest/demand
    - Refinement of expectations
    - Confusion around sustainability claims leads to producer frustration and consumer disappointment
- The "Local Food Movement"

## Consumer Expectations:

Consumer Reports nationally representative survey on food labels (2016)

- Believe a farm should be inspected to verify a "humane" claim (88%)

- Want to know if food is from U.S. (93%) and want USDA to ensure standards are consistent for meat labels (94%)
- Want products form animals routinely given antibiotics to be labeled "raised with antibiotics" (84%)
- Believe a humane label should cover slaughter (80%)
- Believe a humane label should mean that the animal went outdoors (78%)

*Certified Animal Welfare Approved by AGW is the only food label in the U.S. with meaningful welfare and audited slaughter standards for all species*

The Hartman Group, *Sustainability 2017*

About the author: The Hartman Group is a leading authority on demand-side trends in the food industry

> Quantitative Methodology: Nationally representative survey, fielded online in early August 2017 (n=1,500). General U.S. population, aged 18-71.
>
> Qualitative Methodology: Fielded July-August 2017, including in-home ethnographies, virtual interviews and homework; including subjects aged 19-70 with a mix of sustainability segments, gender, household income, children/no children
>
> This is the information buyers are getting. Advises food purchasers, executives, marketers—impacting the decision-makers shaping the food market

Source: http://store.hartman-group.com/content/Sustainability-2017-Overview.pdf

Increased demand for third-party certification: "Third-party certifications are key for engaged sustainability consumers, who look primarily for seals showing organic, fair-trade, and non-GMO, and indicating animal welfare."

Transparency is here to stay: "Openness and honesty are becoming the currency of trust for consumers who care about sustainability. They want to see corporate responsibility efforts that indicate an authentic commitment to ethical action — especially on-pack."

Animal welfare as an indicator: "Animal welfare is an important pathway into the World of Sustainability for many consumers. Though most are driven by personal health concerns related to antibiotics or hormones, the morality of animal welfare helps reinforce attitudes and behaviors."

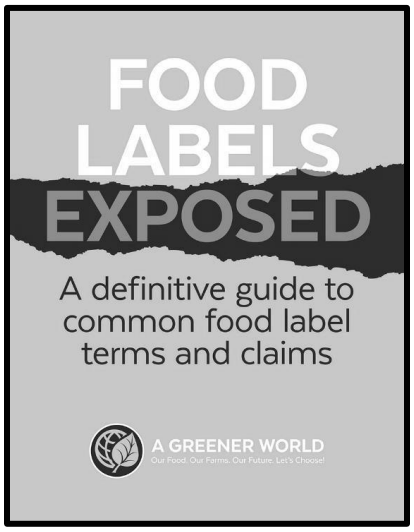
Consumer Expectations, Cont'd


The Hartman Group evaluated labels based on familiarity and impact on purchasing

Certified Animal Welfare Approved by AGW received the highest "impact on purchasing" rating for any food label (77%) – second only to Energy Star certified (79%)

The Hartman Group, *Sustainability 2017: https://www.hartman-group.com/acumenPdfs/sustainable-certifications-color-logo.pdf*

Expectation vs. Reality: Food Labels Exposed




The Basic Types of Label Claims

**AUDITED/ THIRD-PARTY CERTIFIED**

The most trusted food labels in this guide will have this green **audited/ third-party certified** icon. This symbol is your assurance that a term or claim made on the label is regularly verified by an independent third party, and farms and suppliers are physically audited at least once a year according to set of published standards. Audited/third-party certified labels include well-known food certifications such as Animal Welfare Approved and Certified Organic.

**UNAUDITED/NO THIRD-PARTY CERTIFICATION**

Whenever you see a food label claim or term in this guide with this red **unaudited/ no third-party certification** icon, it means there is **no** independent third-party verification or audit. When you see this symbol you should contact the supplier to find out more about the product or ask further questions to ensure you are satisfied with the validity of any claims made.

## Legend

The following symbols will help you quickly identify whether a term or label claim is independently verified by audit, and whether you can believe any of the wider issue(s) the label claims to address, such as the high-welfare treatment of animals or environmental sustainability.

**AUDITED/ THIRD-PARTY CERTIFIED**

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**PUBLISHED PROTOCOL**

This symbol tells you the food label or claim is backed up by a legally defined or agreed definition that is publicly available. If this symbol is absent, there is **no** such definition—you might want to ask more questions about the product.

**UNAUDITED/NO THIRD-PARTY CERTIFICATION**

Whenever you see a food label claim or term in this guide with this red **unaudited/ no third-party certification** icon, it means there is **no** independent third-party verification or audit. When you see this symbol you should contact the supplier to find out more about the product or ask further questions to ensure you are satisfied with the validity of any claims made.

**HIGH WELFARE ASSURANCE**

The label is widely recognized by consumer advocates as having highly meaningful animal care standards and, in addition, includes publicly available and audited standards to ensure high-welfare slaughter.

**ENVIRONMENTAL ASSURANCE**

The label makes claims about farming's impact on the environment that are independently verified by audit to a published set of standards.

**SOCIAL RESPONSIBILITY ASSURANCE**

The label makes claims about the fair treatment of workers and/or communities that are independently verified by audit to a published set of standards.

**LOCAL/REGION SPECIFIC ASSURANCE**

The label makes claims that the product was produced in a certain geographic region/country that are independently verified by audit.

**ANTIBIOTIC USE CONTROLLED ASSURANCE**

The label makes claims that antibiotic use is prohibited or significantly restricted that are independently verified by audit.

**SLAUGHTER REVIEW ASSURANCE**

The welfare of animals at slaughter—including a requirement for pre-slaughter stunning for all animals—is independently verified by audit to a published set of standards.

**NO CONFINEMENT**

The label makes claims that animals have access to range or pasture at all times (except when animal welfare would be adversely affected) that are independently verified. Feedlots, crates and cages are **never** used.

**HIGH WELFARE CLAIM**

The label makes claims that may affect animal welfare. However, the claims are **not** verified and/or the label has no audited standards to ensure high-welfare slaughter.

**ENVIRONMENTAL CLAIM**

The label makes claims that address farming's impact on the environment. However, claims are **not** independently verified by audit or to a set of standards.

**SOCIAL RESPONSIBILITY CLAIM**

The label makes claims that address fair treatment of workers and/or communities. However, claims are **not** independently verified by audit or to a set of standards.

**LOCAL/REGION SPECIFIC CLAIM**

The label makes claims that the product was produced in a certain geographic region/country. However, claims are **not** independently verified by audit.

**ANTIBIOTIC USE CONTROLLED CLAIM**

The label makes claims that antibiotic use is prohibited or significantly restricted. However, claims are **not** independently verified by audit.

**NO SLAUGHTER REVIEW**

The label makes claims that may affect animal welfare. However, the welfare of animals at slaughter is **not** independently verified or audited annually to a published set of standards, or the independent verification or audit does **not** require the stunning of animals before slaughter.

**CONFINEMENT**

The label makes claims about the ability of animals to roam freely on pasture or range. However, there is **no** independent verification or audit of this claim. Feedlots, crates and cages may also be used.

| Type of Verified Program | Details | Examples |
|---|---|---|
| Retailer | The standards-setting, auditing and decision-making processes are controlled by the individual or company profiting from the transaction. No third-party oversight. | McDonald's<br><br>KFC<br><br>Grocery Stores |
| Participatory Guarantee System | Standards set by certifying entity, audits carried out by program participants. Not an independent third-party certification. | Certified Naturally Grown |
| Producer | Standards are set by producers or industry groups and audited by auditors with a vested interest in the result. Potentially the same group that sets the standards is responsible for verifying and making the claims with no third-party oversight at all. | American Humane Certified (formerly "Free Farmed") |
| Producer-Independent | Standards are set by parties with a commercial interest in the result of audits, but audits are carried out by a third-party. | American Grassfed Association |
| Independent-Vested | The company or organization auditing the farms depends on the income generated from providing these audits and granting approvals. | Certified Humane, National Organic Program |
| Independent | No pressure can be exerted by farmers or retailers involved in the selection of farms to audit or the results of audits. | Certified Animal Welfare Approved by AGW,<br>Certified Grassfed by AGW,<br>Certified Non-GMO by AGW |

Understanding a Label

- Is it a series of talking points (e.g. “humane”) or are there actually standards?
- If so, are they publicly available? Are the standards simply suggested practices, or clearly defined, practicable production methods?
- Does a farm or operation have to be audited to get this label?
- Is it reliable and meaningful? If you’re a producer, does it reflect and protect your production claims?
- What do consumer advocates say about the label?


What it means

- Minimally processed, no artificial ingredients

What it DOESN’T mean

- Pasture-raised
- Responsible use of antibiotics
- No added hormones
- High animal welfare standards
- Environmentally responsible
- Non-GMO
- Third-party certified or audited in any way

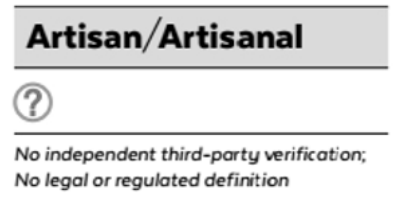


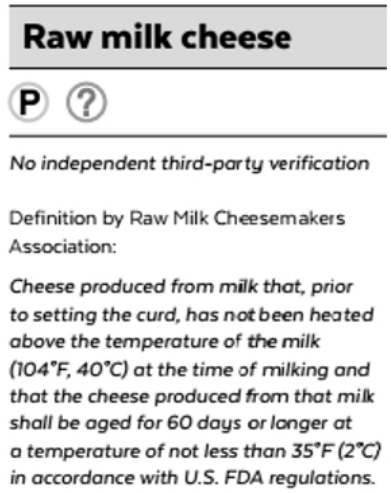
What it means

- Animals must be fed Organic feed
- Animals treated with antibiotics must be segregated and can no longer be sold as Organic, which can give producers an incentive to withhold treatment
- Range of organic labels: "100% Organic"; "Organic" (95%); "Made with Organic Ingredients" (more than 70% organic ingredients)
-

What it DOESN'T mean

- Pasture-raised
- Responsible use of antibiotics
- High animal welfare standards
- Healthy





## Grassfed

- Gaining popularity in the dairy industry
- No standard definition for grassfed dairy (USDA guidance for grassfed claims on meat is weak and does not meet consumer expectation)
- "In the eye of the advertiser" – inconsistency in definition can lead to consumer disappointment
- Consumers are learning to seek a third-party certification for assurance of genuine grassfed practices
- Only one grassfed label that addresses animal welfare: Certified Grassfed by AGW

## Challenges and Opportunities

- Challenges: Market Confusion (Example: Cage Free)
    - Moving Target
    - Not consistent
    - Leads to producer frustration and consumer disappointment
- Opportunities: Adding clarity can stimulate market
    - Consistent standards verified by a third-party facilitate reliable market growth
    - Example: Organic, Certified Animal Welfare Approved by AGW

## Helping Producers Meet Consumer Expectations: Where AGW Fits In

### A Greener World was founded to:

- Identify and promote agricultural systems that have a positive impact on the environment, society and animals (wild and farmed)
- To educate consumers about the environmental, social and animal outcomes of their food purchasing decisions
- To establish and promote trusted farm certification programs that help reconnect the consumer and food producer by encouraging—and rewarding—positive farm management

### Principles:

- Practical, science-based standards
- Outcome-based vs. prescriptive
- Nonprofit providing free-market solution


A GREENER WORLD
Our Food. Our Farms. Our Future. Let's Choose!

Our certifications:

- Certified Animal Welfare Approved by AGW
- Certified Grassfed by AGW
- Certified Non-GMO by AGW

A Greener World's ISO Certification (by IOAS) – and why it matters

- ISO = International Organization for Standardization - the "certifiers' certifier"
- AGW is accredited to International Organization for Standardization (ISO) 17065
- ISO 17065 is specifically designed to ensure that a certification body is operating in a consistent and reliable manner in all aspects of its work

Certified Animal Welfare Approved by AGW

- AGW audits, certifies and supports farmers raising their animals according to the highest welfare standards, outdoors on pasture or range
- The only food label rated "highly meaningful" by Consumer Reports for outdoor access, animal welfare and sustainability
- Certified farms use the label as a way to add value and to assure customers of high-welfare farming practices
- Our practical, science-based standards cover meat, dairy, eggs, and fiber animals throughout North America with products available in every state and province

What Certified Animal Welfare Approved by AGW Means

- Independent farmers practicing pasture- or range-based management
- The only truly pasture-based certification and food label: no cages, crates, or feedlots
- Independent certifier: non-governmental and non-industry
- The ONLY certifier in the U.S. to require audited, high-welfare animal management and slaughter practices for all species
- Certified farms use the label to add value and assure customers of high-welfare farming practices
- AGW offers technical assistance and marketing support to certified farmers, free of charge

A Greener World In the Marketplace

- Certified Animal Welfare Approved by AGW is ranked one of the Top 5 fastest-growing certifications and label claims according to SPINS, the leading information and service provider for the natural and specialty products industry
- A mark of quality: Nearly one in five of the top 100 U.S. restaurants listed in a recent Opinionated About Dining

national restaurant survey proudly serve Certified Animal Welfare Approved by AGW products
- High marks from multiple prominent news outlets, including CBS This Morning, Civil Eats, The Christian Science Monitor, Consumer Reports, Fox News, The Guardian, The New York Times, NPR, Wall Street Journal MarketWatch, The Washington Post and USA Today

Demand for grassfed beef has increased by 25–30% every year over the last decade!

- For Certified Animal Welfare Approved by AGW farmers and ranchers raising ruminant animals according to a grassfed feeding protocol
- The only certification and logo in the U.S. and Canada that guarantees animals are:
    - Fed a 100% grass and forage diet
    - Raised outdoors on pasture or range for their entire lives
    - Managed according to the highest welfare and environmental standards on an independent farm
- Available for beef and dairy cattle, meat and dairy sheep, meat and dairy goats and bison—and includes the same access to AGW's technical, marketing and other support services

- Developed in response to farmer, retailer and consumer demand for an affordable, reliable non-GMO certification
- Certified Non-GMO by AGW is the only food label in North America that provides assurance about animal welfare
- With independent annual audits to ensure compliance, Certified Non-GMO by AGW provides farmers, ranchers and food producers with a robust, trusted and highly competitive Non-GMO label claim.
- Packaged Facts–a leading publisher of market research in the food and beverage sector–forecasts a near doubling of the global market for Non-GMO foods and beverages by 2019.

## Species-Specific Standards

| | | | | |
|---|---|---|---|---|
| Beef Cattle* | Dairy Cattle* | Sheep* | Dairy Sheep* | Goats* |
| Dairy Goats* | Bison* | Pigs | Meat Chickens | Laying Hens |
| Geese | Ducks | Turkey | | |

**Also eligible for Certified Grassfed by AGW.*

*Farms and ranches may also apply for Certified Non-GMO by AGW certification.*

## Support Services for Certified Farms and Businesses

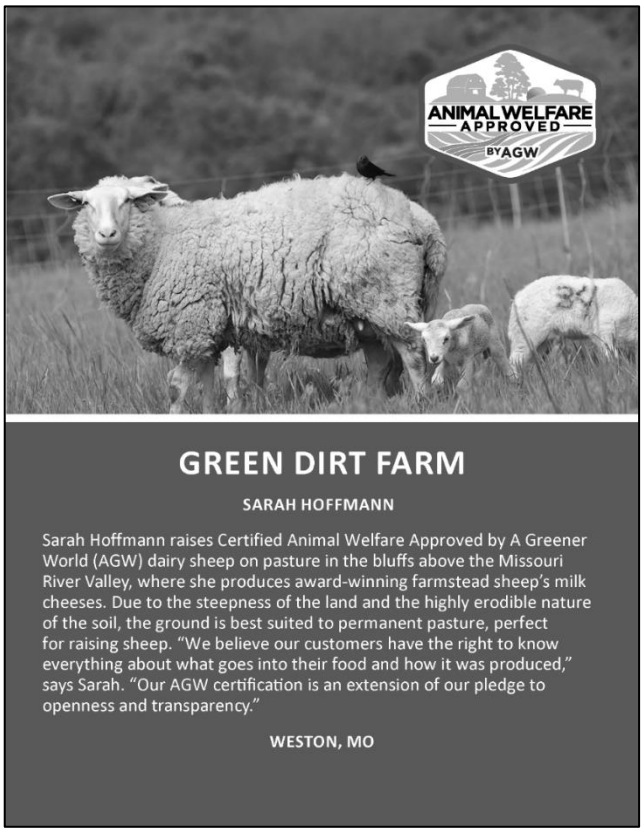
- Establish and build relationships in order to expand market opportunities for your products
- Draft and send press releases about your farm, your products or public events to targeted press outlets
- Feature news about your farm on our website, social media sites, blog and print newsletter
- Advise on how to create a successful online presence, including an effective social media strategy

## Online Directory

Searchable directory of Certified Animal Welfare Approved by AGW, Certified Grassfed by AGW and Certified Non-GMO by AGW farms and products--including farms, restaurants, retailers, CSA's and online purchasing options.

## Graphics Assistance

- Graphic assistance in creating materials to help promote AGW certification (banners, posters, farm signage, etc.)
- Available at no charge to farms and vendors in the program




## Event Support

- Host events and attend conferences or workshops
- Offer supporting materials and signage
- Assist with publicity and event promotion


## Promotional Materials

- Low cost promotional materials including brochures, signs, pens, banners and metal gate signs
- Raise consumer awareness and promote your business
- Available to farmers and vendors in the program


## Technical Support

- Technical Advice Fact Sheets cover commonly asked questions about production practices
- Access to expert technical advice that isn't covered in our published materials

## Examples of support:

- Determining costs of production
- Branching out into other species
- Mentoring and consulting to transition from conventional operations to pasture-based systems

## Farm Health Online

- Comprehensive information and sustainable approaches to enhance the health and welfare of farmed livestock.
- Accessible and practical advice and information for farmers to aid the decision-making process and to enable proactive animal health and welfare planning.
- Information on disease management and health and welfare issues for a range of species, as well as answering key veterinary questions.

## Labeling Assistance

- Work with you, your plant, our staff, graphic designer, and state or federal agencies to assist with food label design and approval – at no charge
- Visit the AGW Labeling page for more information

## In Practice: A Greener World's certifications on the label

- Credible third-party certification reinforces claims and protects market
- Eye-catching, engaging
- Gives consumers a destination for further information and provides an easy answer to the question, "How do you raise your animals?"
- Instills confidence that a farm's practices match their claims


## Case Studies:

Caputo Brothers Creamery

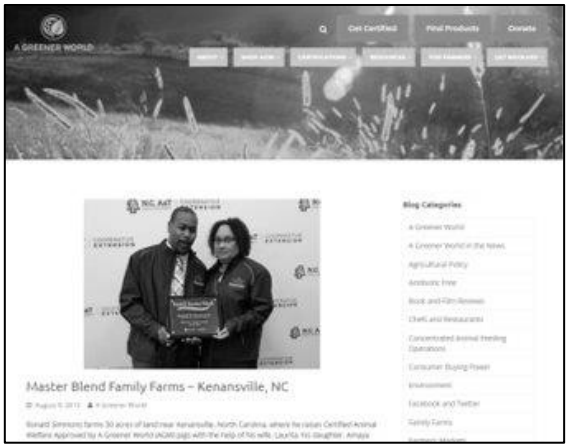

Prairie Fruits Farm & Creamery


## A Greener World QR Codes

- Links directly to producers AGW farm profile
- Provides farm-level traceability and customer engagement
- Available in multiple formats/certifications
- Recently launched; significant interest from producers, consumers and retailers

## Farm Profiles

- Increase visibility
- Customer inquiries forwarded regularly
- Maximize online presence
- Drives traffic to your website and social media




## The Takeaway

- ☆ Consumers increasingly interested in food and their diet's impact on the planet
- ☆ Third-party certification can give producers and consumers a common language, foster reliable markets and "pin down" the moving target
- ☆ Success of these added-value markets rests on ensuring meaningful standards and consistency
- ☆ Credible third-party certifications offer a straightforward solution while protecting and reflecting sustainable practices
- ☆ Learn more and sign up for our mailing list at:
- ☆ agreenerworld.org
- ☆ Contact Emily Moose at 202-618-4497 or emily@agreenerworld.org

# Agri-Tourism at Whispering Pines Farm

Whispering Pines Farm, Mauldin, SC 29662
dairysheepdeb@gmail.com
Debbie Webster

## What is it?

Agritourism is the crossroads between agriculture & tourism; when an agriculturally- based operation opens its doors for the public for Education, Entertainment or Recreation

Regardless of the exact definition or terminology, any definition of agritourism should include the following four factors:

• combines the essential elements of the tourism and agriculture industries;

• attracts members of the public to visit agricultural operations;

• is designed to increase farm income; and

• provides recreation, entertainment, and/or educational experiences to visitors.

*Note-* Agritourism operations exist throughout the United States and the world. These operations range from small operations that operate on a seasonal basis and offer limited consumer services to large operations that operate throughout the year and provide numerous consumer services. The term "agritourism" is often used interchangeably with "Agri-tourism," "agrotourism," "farm tourism," "agricultural tourism," or "agritainment."

## Why it's important to farmers?

- Additional farm income
- Build relationships between farmers and community
- Provide job opportunities for family and friends
- Share agricultural heritage & rural life
- Preserve the family farm
- Free advertising through social media

## Why is it important to consumers?

Consumers have 3 basic requests for a farm visit. A combination of all three is best.

The 3 E's of Agritourism-

1. Education- (teach) base your information on the age of your visitors- kindergarteners don't want to know about milk components or mastitis! Chefs would. We've invited Culinary students to the farm for class tours. Many consumers want to know what you feed and want to see healthy happy farm animals. Parents want their children to 'connect' with the land and learn where their food (cheese, yogurt or milk) comes from.

   "Customers are more interested in what they're eating and where it comes from. They want to know it's being grown responsibly."

   –National Restaurant Association

2. Entertainment- show bottle baby lambs using a lambar, a border collie herding sheep to a pasture or parlor. Show a part of the cheese in a process of development. Many children have not seen a sheep. Show the parlor or even a hay barn. Walk around the farm, observe and talk about the different types of forage. Observe the behavior of sheep and point out what makes them different from other animals. For the Creamery, explain why sheep milk is healthy, the different varieties of cheese you produce and why. Tell stories about the funny things animals have done.

3. Engagement- hands on - think recreational activities. Walking through barns, buildings and pastures is a great way to spend time and expel energy from youngsters- so they will pay attention to your information. Remember- the younger the child, the shorter the 'talk' and longer the walk! Sensory input can be as simple as petting a lamb and feeling the wool. Finding corn kernels in a grain mix and showing a corn stalk or ear of corn (plastic props or real). There's an amazing interest in things around the farm that you might find mundane or too simplistic.

Start small, use what you have- your animals, your experiences, your passion, keep it happy!!

At Whispering Pines, we started tours in 1980 as a supplemental income source for us and a fun learning experience for children. This part of the business has grown exponentially. We use the 'tour' as part of a birthday party venue, group field trips and a family outing. For family and individual tours, we charge $5 per person with a $20 minimum fee. An average family farm tour takes 20-30 minutes. Large groups require more time and more helpers, the fee is generally $10 per person. They stay on the farm 1.5 hours minimum. Currently, school field trips bring around a thousand children each year to the farm. Some groups have as many as 100 children. During the summer, we will have just as many from daycares. We grew into these numbers. It started with a few families, one local school field trip, one bold birthday party and it grew.

Many people are so far removed from anything Agriculture. The children don't understand or have experiences with farm animals. Once you have a school visit your farm, they will sign up every year!

Keep in mind, you schedule it around your available time. You have all the basic 'parts.' These days, people want to see how a farm works, see the animals and learn everything you care to share! We have a variety of farm animals with several choices for visitors, but even if you only have sheep, that's enough!

## Who requests a farm tour?

***The animal lover*** just wants to be able to pet or hold some sweet farm animal and of course, document their day with selfies!!! This tour could easily take 30 minutes, be all they wanted, and even bring you more business by their social media posts! While they're loving on the lambs, LGD, chickens or barn cats, you can tell your story- why you have this animal, it's role or purpose and even a cute story about it. Share your passion for what you do. Keep it upbeat and happy even if it's the 16th hour of your work day!

***The teacher or home school mom*** needs to know what they will learn, and they enjoy hands on. You need to learn what's age appropriate and cater to the youngest child in a group. Home school groups tend to have a wide age range. School Field trips are usually by grades which determines what you should do. For example, we have 100's of children ages 3 to 5 years old each spring. They don't want a lecture, half the words are wasted, movement is greatly appreciated. Have a 'take away' that they can remember. Chickens lay eggs. Lambs are shy- that's why we don't chase them! These sheep give us milk and it makes great cheese! These guardian dogs love their sheep so much and protect them from danger.

*Kindergarten classes from local school*

With the younger children, you need to be more proactive to protect your animals as well as keep the children safe. For example, we've learned to tell small children to pet the chicken using two fingers and don't ruffle the feathers. While they're focusing on the 'two fingers', it really saves a lot of feathers and keeps the children more focused on the task at hand. It's always best to explain safety rules for the farm at first, then rules for each animal on the way to see it before reaching the animal. Be sure to plan longer walks to reach each animal. That way, the kids can spend some energy and be ready to stand still and listen for a moment.

Typically for farm tours, field trips, birthday parties or even farm days, which all do basically the same thing- having adults and children walking around your farm with you or your helper. The biggest audience will be mainly children under 8 years of age.

Older children can listen to more fun facts. You're probably used to explaining to friends and family about the differences of milk types, sheep care and lambing.

***Senior adult groups***- less walking, more talking. Be prepared to hear their stories.

***Church groups***- People ask me how to do Inspirational or Christian based tours. I'm an endorsed Chaplain of the North American Mission Board, published Christian Author and speaker but you don't need special training or need to recite verses from the Bible. If you could share a personal experience of an answered prayer, tell the story of an unexpected kindness gifted to you or especially use your knowledge of sheep behavior to explain a Biblical truth. For example, in the 23rd Psalm, the 'sheep' will lay down or essentially be at rest. This is only when they feel safe. Around Easter, the lamb was a symbol of innocence and white symbolized purity.

Biblical or life principles are good too. For example, using a bale of hay or straw, have one child try to lift it. After a brief struggle, ask all the children to use one hand to help their friend lift the bale. Principle- life is much easier if we all work together. Simple but a necessary truth.

Anything with seeds, grain, forage, the miracle of birth, or even an egg. For example, when incubating eggs, chicks take a very long time to break through the shell. It might seem prudent to assist, but if you do, the chick will die. It's through that struggle, the chick prepares for life by pushing with his feet to strength his weak legs to walk and pecking at the shell to strength his neck to learn how to peck at food. Life Principle- It's through the struggles of life that we gain strength- physically, mentally and spiritually.

Regular Monthly groups- We started a 4H Dairy sheep club a few years ago. The response was amazing and has grown to 90+ kids in attendance. Why use 4H and not just have a club? It has name recognition, insures everyone on your place doing 4H activities and has free organizational

*4-H Dairy sheep show*

materials! We've learned a lot from the early days. The club members are very capable, and we've had several shows with kids 5 years old and up showing Dairy sheep. We have several kids that have received FAMACHA certificates, made cheese, work wool and help in the dairy parlor. We have days that they can go into one of the lamb pastures to weigh, score, take temperature, and record data.

Sometimes, things can go wrong but it's ok. I was doing a hay wagon ride for a family reunion. We ended up stuck in a hole- 4 big 'dads' helped push us out. They thought it was great! They came back every year still talking about how great it was and hoped we could get stuck again so they could do it again- who knew!

Always end on a positive happy conclusion. We had a lamb that was mauled by a dog. Visitors were encouraged to hear that we never gave up on the lamb and went to great lengths to help her to heal. We named her Hope, mostly because I hoped she would live and have function with her leg, people love an 'underdog'. By the way, this lamb went to a clinic to 'share' her hope of recovery with disabled children. Today, she's part of the milking line and occasionally, I can see a minimal disfunction in her pastern.

Work-on-a-farm experiences- as much or as little as you're willing to do. Some people would love to collect eggs from a coop. You can plan a short cheese making class. You can have a cheese tasting event and charge extra for a tour of the dairy and pastures. Once your potential customer gets to know you, they would prefer to purchase from you and tell their friends about you.

Life is chaotic without a schedule. However, you have animals that refuse to follow your schedule- be flexible and spontaneous- have a plan B- this 'problem' that arises could be a great memory for a group of kids to observe and maybe even help resolve. It could turn out to be an amazingly better plan than one you may have prepared! Farming, Dairy and anything agriculture has required schedules in feeding, watering and care but animals escape from enclosures, water lines break, electricity goes out and ewes can plop lambs out early! Life is messy. People want to connect with farmers. What better way to share life together than *real* life? The connection will be meaningful, more devoted and lasting. Be faithful in small doable tasks and it will grow.

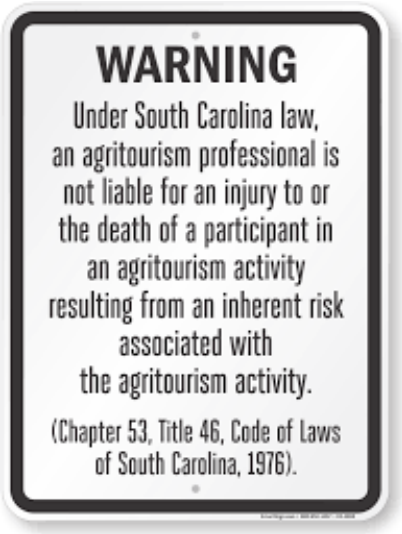
On-farm agritourism examples-

- Farm tours for families, school groups, church groups
- Hands-on education for kids
- Work-on-a-farm experiences
- Demonstrations- Milking, Cheese making, Working with Wool- Needle Felting, Drop Spindle, Spinning Wheels or Classes- Beginner cheese making, Starting a farm, How to raise sheep, Small Ruminants Healthcare
- Tastings- pair with other local producers- Craft Beer, Mead, Local Wineries
- On-farm shopping
- Hayrides
- Farm to Table dinners
- Event & wedding rentals
- Festivals & events-Shearing Day, Farm Day, Lambing
- Overnight stays- Airbnb

*Chefs visit from culinary school*

## USDA, Insurance, Laws

There's help from Government agencies with signage, helpful Laws to protect farmer which help with the cost of liability Insurance- check with your local agents.




USDA

## Signage


# Agritourism at Dayspring Dairy

Gallant, AL

www.dayspringdairy.com

Ana Kelly

Dayspring Dairy, LLC is a family run sheep dairy and farmstead producer located on 30 acres in Northeast Alabama. We are one of only a handful of sheep dairies in the entire Southeast. We became licensed in 2013 with a milking flock of 20 ewes. In 2018, we milked 80 ewes and produced 8500 pounds of cheese. We are planning a milking flock of about 95 ewes for the 2019 season which will be maximum capacity for our facility size. Our sheep range on pasture the entire year due to our milder winters.

Our dairy consists of a double 12 pit parlor with a highline. Processing takes place in the adjoining creamery with a 100-gallon Micro Dairy Designs vat and 40-gallon steam jacketed kettle. The owners, Ana & Greg Kelly, work full-time on the farm along with 1 other full-time employee and up to 3 part-time seasonal employees. Our farmers market sales staff consists of 9 part-time seasonal employees.

Our products include both fresh and aged cheeses with our fresh "Fresca" spreadable cheese being our best seller with 8 popular flavors. Other fresh cheeses include Halloumi, Ricotta, and Feta. Gouda and Manchego style cheeses make up most of our aged cheeses. We sell mostly direct to consumers at farmers markets in Birmingham, AL and Atlanta, GA, at special events/festivals and through our online store. We do limited wholesale to restaurants and small retail stores.

Agritourism has always been part of our plan for our farm. We are in a picturesque part of the state in the foothills of the Appalachians, 11 miles from our nearest Interstate exit. Currently, agritourism generates a small supplemental income (around $7K annually) through farm tours, field trips and our farm store. Our most successful revenue generating event is our annual Shearing Day & Farm Open House with 150+ visitors each year. The event is free to the public with all revenue coming from our farm store. Marketing directly to Homeschool groups has generated the most interest in field trips with the benefit of parents attending and spending. Senior groups at area churches are also a very good demographic for tour marketing. Most visitors to the farm want the whole experience of seeing the sheep, touring the facilities, learning about cheesemaking, and a cheese tasting. Sheep are rare in our state, so many visitors are delighted and amazed at meeting their first sheep.

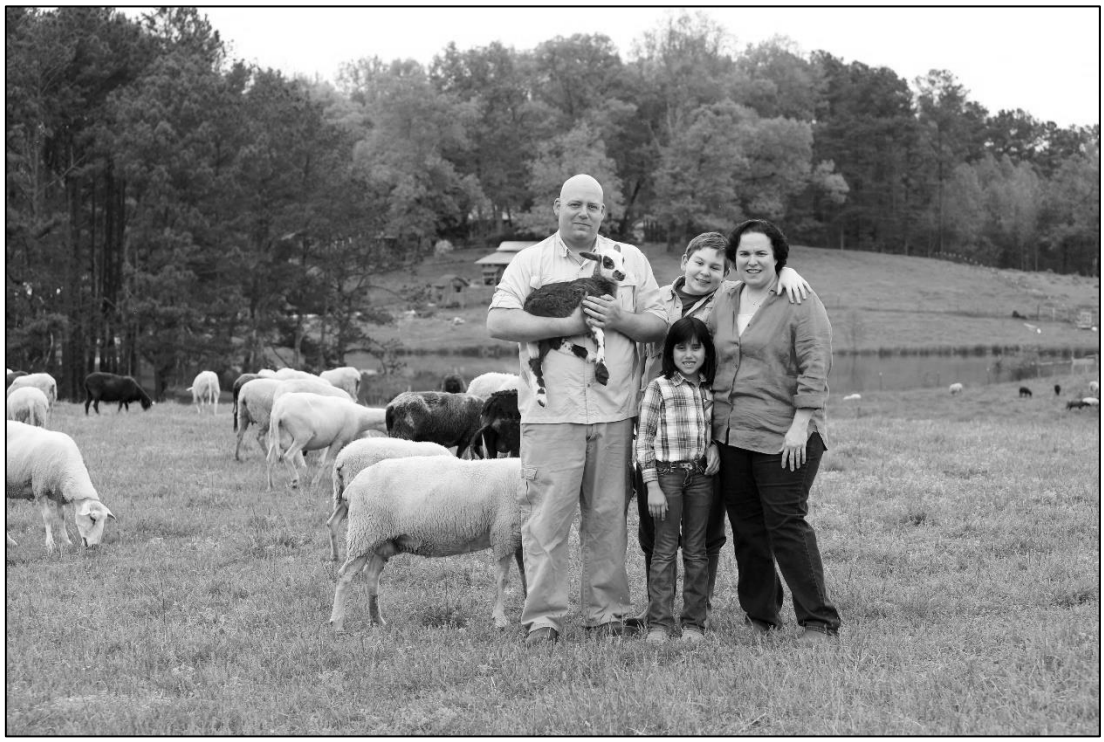
Our single biggest hurdle to increasing agritourism has been labor. Currently, we do not have dedicated staff for the store and tours and therefore don't have established hours. Instead we request visitors call and make an appointment to visit us. We also don't have any signage on nearby highways or interstate. Our facilities need improvements made for parking, driveways, and accessibility before we can apply for the any interstate signs.

State requirements for Interstate signage that has created challenges for us:

- Continuous operation at least 8 hours per day and 6 days per week.
- Attendants and/or tour conductor on site during operating hours.
- Restroom facilities available and suitable for public use.
- Adequate parking to accommodate the facility's traffic with a minimum of ten (10) spaces.

Other Considerations and Recommendations:

1. Liability Risks: Our state has a law in place that protects agritourism operators. Even so, we do have liability insurance that covers farm visitors.
2. Biosecurity: This can be very challenging and needs consideration.
3. Sheep can have a tremendous draw for tourism. We highly recommend having sheep suitable for petting.



*The Kelly family*

*Milking ewes at Dayspring Farm*

*Homeschool group at Dayspring Farm*

# Agritourism at Harmony Fields

Bow, WA

www.harmonyfields.com

Jessica Gigot

At Harmony Fields (Bow, WA) we make artisan, sheep cheese and grow organic herbs on 10 acres. We have offered workshops, tours, and a rental cottage since 2011. Sheep are charismatic animals and we enjoy sharing them with our customers and friends and anyone curious to learn more. Agritourism has been a secondary source of income and an important avenue for cultivating community connections and awareness of what we do on the farm and why we chose this work and lifestyle. Our workshops have been focused on herbs, art, and place-based living. Several regional schools (K-12 and college) plan their curriculum around trips to the farm. Many of these visits align with seasonal farm events, like sheep shearing and milking.

In Skagit County, agriculture is still the primary industry. However, there are many local, area residents from nearby towns like Mount Vernon and Bellingham, that are in search of a closer connection with their food. Two large, metropolitan cities (Seattle and Vancouver, BC) are under ~2 hours away and we get a lot of interest from tourists exploring the greater Pacific Northwest in the summer months. Most out-of-town visitors are seeking regional food and crafts.

Our rental cottage, which is available seasonally, brings in a regular income for the farm and our workshop revenue will vary based on size and subject matter. We do not charge for tours for schools or cottage guests. Our goal is to eventually host monthly workshops and dinners on the farm that feature our cheese and our herbs. For our workshops, there is a lot of time required to plan and manage registration via our website. Our rental cottage can involve multiple cleanings a week in peak season, yearly maintenance, as well as coordinating with visitors through our online booking system.

It is important for a farm to discern what they want to get out of any agritourism endeavor. As a teacher at heart, I am excited about welcoming people and using the farm as a teaching tool. Visitors also remind me of how special it is to live on a farm. However, hosting can be a lot of work in addition to the demands of the creamery and crop production. If this might become a primary source of revenue for a farm, there will also most likely be an early investment in facilities (parking, restroom, etc.). I would consider how many people your farm can handle and what is a reasonable use of your time by season. Over the past seven years since opening up the farm to the public we have learned to focus on the activities that are both rewarding and profitable.

***The Garudio, our rental cottage***

***Cob-oven building workshop using materials from the farm***

***Winter felting workshop (using our roving)***

***Shearing Day field trip with Greenwood Tree Cooperative Elementary School***

# Using the Numbers: how performance recording contributes to genetic gain and economic opportunities in sheep dairying

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## Introduction

Genetic selection is one strategy for changing the performance of farm animals. Although it is relatively slow compared to other methods, such as improved husbandry or feeding, genetic selection garners huge benefits by being permanent, cumulatively and, in most cases, highly cost effective. The availability and use of livestock of high genetic merit is central to the profitability of individual farms, and to the efficiency and competitiveness of livestock systems in general.

Objective approaches to genetic improvement, based on performance recording for traits deemed economically important, were first introduced and have been more widely used in pig, poultry and dairy cattle breeding than in sheep and beef cattle breeding. However, both regional and national genetic evaluation schemes have become available to beef cattle breeders in many countries over the last five or so decades, with similar schemes introduced more recently to sheep industries. This coincides with the development of breeding tools more intimately tailored to the needs of sheep farmers, and a growing awareness among sheep breeders and their customers of the economic value of genetic improvement within their flocks.

The objective of this paper is to review the methods for translating performance records into tools for genetic improvement in dairy sheep operations. The central theme is parsing out the genetics. That is, to define how genetic differences among animals, their so-called breeding value, can be separated from the other factors that impact their performance on-farm. Firstly, this entails considering the heritability of a trait, and its use when estimating breeding values. A relatively simple example is introduced as background to discussing the results of a GenOvis report, a provider of genetic evaluation services to DSANA members. The possible rates of genetic gain in milk yield that might be achieved through adoption of performance recording, and its impact on profitability, is then considered, closing with some thought on future breeding priorities in U.S. dairy flocks.

## Parsing out the genetics

For most traits of economic importance, the performance of animals is influenced by their genetic merit and by their management and feeding, seasonal conditions (temperature, rainfall patterns) and health status. A central aim of performance recording and genetic evaluation schemes is to disentangle such genetic and 'environmental' effects. That is, to identify those animals with the highest breeding value separate from the impact of husbandry and other environmental circumstances on their performance. By doing so, breeders can choose the genetically best animals to retain in their flock.

An animal's breeding value for a trait, such as milk yield, percentage fat in the milk, or somatic cell score, an indicator of udder health, reflects the genes (or alleles) it inherits from its parents. If those alleles confer, on average, higher levels of genetic merit for the trait, the animal's breeding value will be comparatively higher. The opposite also holds true. Unfortunately, we cannot directly 'see' an animal's breeding value for most of our economically important production traits. Instead, we need to estimate it.

Heritability is defined as the degree to which offspring resemble their parent's performance for some trait. Perhaps more intuitively, heritability can be thought of as that proportion of an animal's performance for a trait that is due to its breeding value for that trait. If a trait is highly heritable, animals with high performance tend to produce progeny with high performance, while animals with low performance tend to produce progeny with low performance. Conversely, if a trait is lowly heritable, the performance of the parents provides little information about the performance of their progeny. The heritability of a trait therefore intimately affects the estimates of animals' breeding values.

Heritability estimates for several traits in dairy sheep obtained from the flock at the Spooner Agricultural Research Station are provided in Table 1 (Murphy et al., 2017). When heritabilities are above 0.4, they are considered high. When heritabilities are below 0.2, they are considered low. Both percentages fat and protein are highly heritable, milk yield is moderately heritable, while somatic cell score, is lowly heritable.

**Table 1.** Estimates of heritability (on the diagonal in bold) and genetic correlations (above diagonal) for 180-day milk yield, percentage fat in the milk, percentage protein in the milk, and lactation average somatic cell score. Standard errors of the estimates are provided in parentheses (Murphy et al., 2017).

| Trait | Milk yield | Percentage fat | Percentage protein | Somatic cell score |
|---|---|---|---|---|
| Milk yield | **0.31** ± 0.04 | -0.31 ± 0.08 | -0.34 ± 0.08 | 0.30 ± 0.13 |
| Percentage fat | | **0.53** ± 0.04 | 0.61 ± 0.05 | 0.21 ± 0.11 |
| Percentage protein | | | **0.61** ± 0.04 | 0.03 ± 0.11 |
| Somatic cell score | | | | **0.13** ± 0.03 |

To illustrate the influence of the heritability ($h^2$) on breeding value estimation, consider the simplest approach to obtain an estimated breeding value (EBV):

EBV = $h^2$ X (animal's own performance – average flock performance)

In Table 2, performance records for three milk traits are provided for two hypothetical ewes. The assumed average flock performance for 180-day milk yield, percentage fat, and percentage protein was 396 kg, 6.3%, and 5.0%, respectively. The steps in determining the EBV for each trait for each ewe are illustrated. The sign of the EBV, either positive or negative, depends on whether the ewe's performance is above or below the corresponding flock average. Due to the genes inherited from their respective parents, ewe one is predicted to yield 3.3 kg less milk, while ewe two is predicted to yield 18.4 kg more milk, in a 180-day lactation than an average ewe. Furthermore, ewe two is predicted to yield 18.4 – (-3.3) = 21.7 kg more milk than ewe one.

Table 2. Performance records and estimated breeding values (EBV) for 180-day milk yield, percentage fat in the milk, and percentage protein in the milk for two hypothetical ewes.

| | Ewe one | | Ewe two | |
|---|---|---|---|---|
| Trait | Perf. | EBV | Perf. | EBV |
| Milk yield | 385.2 | (0.31) X(385.2 – 396.0)<br>= (0.31)X(-10.8)<br>= -3.3 kg | 455.3 | (0.31)X(455.3 – 396.0)<br>= (0.31)X(59.3)<br>= +18.4 kg |
| Percentage fat | 5.94 | (0.53)X(5.94 – 6.30)<br>= (0.53)X(-0.36)<br>= -0.19% | 5.26 | (0.53)X(5.26 – 6.30)<br>= (0.53)X(-1.04)<br>= -0.55% |
| Percentage protein | 5.04 | (0.61)X(5.04 – 5.00)<br>= (0.61)X(0.04)<br>= +0.02% | 4.42 | (0.61)X(4.42 – 5.00)<br>= (0.61)X(-0.58)<br>= -0.35% |

Although ewe two is genetically superior for milk yield than ewe one, her genetic merit for percentage milk components is less (Table 2). This in part reflects the genetic correlations of milk yield with percentage protein and fat. A genetic correlation occurs when a gene affects more than one trait. A good example is growth genes. Animals that weigh more at weaning often also weigh more as yearlings and at maturity. The reason is that the same genes affect growth throughout an animal's lifetime. Therefore, the genetic correlation among weights at different ages is substantially positive. The genetic correlations of milk yield with percentage fat (-0.31) and percentage protein (-0.34), however, are negative (Table 1). Increases in milk yield therefore tend to coincide with decreases in fat and protein percentages in the milk. Such was the case with ewe two. Still, all is not lost. Since those negative genetic correlations are only moderately strong, in practice there will be animals with favorable (high) breeding values for milk yield and components to select among.

## A better methodology: Best Linear Unbiased Prediction

As noted earlier, the illustration provided for obtaining breeding values is the simplest. It was based solely on an animal's own performance record. Over the last 40 or so years, a methodology known as Best Linear Unbiased Prediction (BLUP) has become the preferred method for obtaining EBV. The reason is that BLUP disentangles genetics from the environment in the best possible way, and thereby produces more accurate predictions of breeding value. A key feature of BLUP is that is uses performance records from all animals within a breed for a trait, and even from genetically correlated traits, in its predictions. In so doing, it considers the strength of relationships, with closer ancestors (e.g., parents, offspring) more heavily weighted than more distant ancestors. It accounts for genetic trend, since younger animals are often genetically superior to older animals. It also accounts for non-random mating assignments such as when higher merit rams are bred to higher merit ewes. Still, the fundamental aim is unchanged: to predict the breeding value of animals.

Within GenOvis, breeding values are estimated with BLUP. An example of an abridged reported provided for a pair of ewes, A and B, for their first parity lactation is shown in Table 3. However, instead of EBV, GenOvis reports Expected Progeny Differences (EPD). An EPD is defined as:

EPD = (½) X EBV

Therefore, rather than expressing the genetic merit of an individual itself, an EPD predicts the expected difference between the mean performance of an individual's progeny and the mean performance of all progeny. Interpretation of an EPD is therefore slightly different to that of an EBV. In the illustration (Table 3), daughters of ewe A and B would be expected on average to yield 15.8 kg and 86.5 kg, more milk respectively, than daughters on average. Additionally, daughters of ewe B would be anticipated to yield 86.49 – 15.83 = 70.66 kg more milk than daughters of ewe A.

**Table 3.** Expected Progeny Differences (EPD) at first parity for two ewes for 220-day milk yield, percentage fat in the milk, percentage protein in the milk, and somatic cell score from a GenOvis report. The accuracy of the EPD and percentile ranking (%) also are provided.

| | Ewe A | | | Ewe B | | |
|---|---|---|---|---|---|---|
| Trait | EPD | Accuracy | % | EPD | Accuracy | % |
| Milk yield (kg) | +15.83 | 78 | 80 | +86.49 | 74 | 99 |
| Percentage fat | +0.04 | 50 | 79 | -0.09 | 71 | 39 |
| Percentage protein | +0.11 | 50 | 88 | +0.00 | 71 | 56 |
| Somatic cell score | -0.24 | 50 | 12 | +0.37 | 71 | 94 |

Besides EPD, GenOvis provides an accuracy of the EPD. A higher accuracy indicates that the estimate of an animal's breeding value more closely aligns with its 'true' breeding value for a trait. Accuracy is affected by three key items: (i) the heritability of the trait, (ii) the number of performance records that are available on the trait, and (iii) the individuals on which those performance records were recorded. The higher the heritability, the more records available, and the closer the genetic relationship between the individual being evaluated and relatives providing the information, the higher the accuracy. As an observation (Table 3), since the heritability of milk yield is lower than that of percentage fat and protein, more records on milk yield than on its components appear to be available on these ewes and their relatives.

The final statistic provided on the GenOvis report is the percentile ranking, which is useful to rank animals within their breed. The percentile is a value from 1 to 99 expressed as a %. Animals with higher rank (closer to 99%) have better potential to produce higher merit progeny. For example, ewe B is ranked as 99% for 220-day milk yield (Table 3). That indicates that this ewe is in the top 1% of all animals in her breed for milk yield.

## Making genetic change

Using the heritabilities and correlations reported by Murphy et al. (2017), and building on estimates of the extent of variability found in dairy sheep traits provided by Barillet and Boichard (1987), annual genetic gain in milk yield, percentage fat and percentage protein were predicted. Three scenarios were considered: retaining the top 30%, 50% or 70% of animals based on their milk yield EBV. The premise was to capture from relatively more (30%) to relatively less (70%) intensive selection programs. A generation interval, the average age of animals at the birth of their progeny, of 3.5 year was assumed. Since selection was based on genetic merit for milk yield alone, any changes in milk composition traits was due to their genetic correlation with yield.

The results for the three scenarios are shown in Table 4. The genetic gains for milk yield are in line with those observed in the Spooner Agricultural Research Station flock (Murphy et al., 2017), albeit the gains for the 30% scenario were somewhat higher. Using an economic value of $1.65/kg milk (Dave Thomas, personal communication), annual income would increase by between $7 and $17 per ewe depending on the scenario adopted. However, with more intensive selection (lower percent retained) for milk yield, the rate of loss in percentage fat and percentage protein in the milk increased.

Table 4. Predicted annual rates of genetic gain in 180-day milk yield (kg), and correlated responses in percentage fat and percentage protein, for three selection scenarios.

| Top percent retained | Milk yield | | Percentage fat | Percentage |
|---|---|---|---|---|
| | (kg/year) | Income ($/year) | (%/year) | protein (%/year) |
| 30% | 10.43 | 17.21 | -0.046 | -0.024 |
| 50% | 7.19 | 11.86 | -0.032 | -0.016 |
| 70% | 4.50 | 7.43 | -0.020 | -0.010 |

## Setting future priorities

In the U.S. (Murphy et al., 2017), and internationally (Carta et al., 2009), milk yield represents more than two-thirds of the total income to the dairy sheep industry. With milk sold on a weight-basis, with premiums or discounts for components uncommon, financial signals to encourage incorporating component-traits into selection priorities are ambiguous. Carta et al. (2009) suggested that introduction of milk composition traits into breeding programs should be postponed until annual genetic gain in milk yield is at its maximum. However, as noted by Murphy et al. (2017), most sheep milk is processed into cheese where higher protein and fat contents, and lower somatic cell scores, affect yield and taste. Combining a broader set of priorities, or traits, in breeding programs in North American dairy sheep may therefore become economically more important in the future. Importantly, given the unfavorable genetic correlation between milk yield and its components, defining their balance in the breeding objective will undoubtedly be a key consideration.

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# Dairy Sheep Genetics Improvement Project

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## Project History and Justification

The sheep dairy industry began in North America in the mid to late 1980's. Commercial dual-purpose breed ewes were being milked –producing rich milk at very low volumes. Limited dairy rams were available in Canada being imported into the United States until the mid-1990's when the United States border was closed. Importation of new genetics into the United States remained prohibited until regulations began to loosen up in 2016. Genetics across the United States flocks were closely linked.

Simultaneously, very few sheep dairy farmers were collecting milk samples and doing production testing. Those who were testing had no other flocks to compare results against to predict how those animals would fare in other flocks. The industry seemed stuck with little hope for improvement in production unless things changed.

In 2017 a grant was received from the American Sheep Industry through the *Let's Grow* program to lay the groundwork for a genetics improvement project. At the same time efforts were made to import nearly 900 straws of semen from the French Lacaune Genetics Improvement Program. Late 2017 the National Sheep Industry Improvement Center granted DSANA funds to begin implementing the genetics improvement project.

## 2018 Project Focus

The genetic improvement components of the NSIIC grant are to establish a systemic approach to gathering and analyzing quantitative production data. This will be done through implementing a 3-tiered system of data collection and estimated breeding value generation. Specifically, this includes the development of a uniform milk production testing and analysis process, implementing a pilot project (involves aligning DHIA affiliates, GenOvis (Canada), etc. and producers), and assisting sheep dairy producers to understand the impact of estimating the production values of progeny can have on a producer's profitability, and ultimately enrolling in the program. In addition, the project will attempt to make connections across sheep dairy flocks who have participated in the Lacaune semen importation and prominent sources of breeding rams.

## Processes

Work with GenOvis began early in 2018 to develop enrollment and data entry forms. The national Dairy Herd Improvement Association was also contacted to determine the feasibility of working through DHIA and what services were available. The American Dairy Goat Association

was also included in conversations to determine benefits and challenges in establishing a production-based genetics improvement program. All three organizations have established protocols with data entry codes that merited consideration. GenOvis does not provide milk analysis. DHIA does not have a system in place to analyze sheep milk separate from the cow dairy industry. The ADGA subcontracts with DHIA to obtain the results of the milk analysis – they do not own their data. Breed codes throughout North America are maintained by the Canadian Association of Animal Breeders. This organization works with ICAR (International Committee for animal Recording) to streamline animal breed codes for genetic evaluation worldwide. Ultimately, there was a great deal to learn from all of the organizations with experience and track records of developing and maintaining production-based genetics. DSANA has the opportunity to build a system that bridges the needs of DSANA members with the individual and external resources available.

It was determined to work with the Rocky Mountain Dairy Herd Improvement Association laboratory to conduct the milk component testing. Going with one laboratory provides a strong assurance that all samples will be tested in a uniform manner. The uniform testing removes one of the variables in attempting to establish component baseline results.

## Deliverables

Working with GenOvis, an enrollment process was modified to meet the wishes of the DSANA Genetics Improvement Project. Several layers of initial enrollments needed to be developed. Five United States sheep dairy operations were asked to participate in the 2018 pilot. As the producers began completing the forms, modifications were made based on the producers' feedback. It is expected that a few more changes will be made to the forms before the 2019 rollout of the project.

1. *Farm Enrollment Form:* provides basic farm information and an agreement to follow the protocols, pay the enrollment fees, and a release of information.
2. *Animal Enrollment Forms:* spreadsheet one is data entry for the adult ewes and rams that includes date of birth, parentage, litter size, etc.; spreadsheet two is data entry for the current year's offspring that are retained on the farm past day 3.
3. *Milk Collection Procedures:* Outlines the procedures to follow in setting up
4. *Milk Production Forms:* TEST DAY PARLOR SHEET is a brief spreadsheet to use in the barn when samples are being collected. The test day results then need to be transferred to the GENOVIS REPORTING WORKSHEETS. Separate spreadsheets have been developed to report only milk weights and to report both weights and components. Each farm will be encouraged to submit tests five times during the milking season.
5. Protocols for Tier One participation are in final draft stages.

## Initial Observations

Producers who have never participated in a DHIA or similar individualized production testing program may find the initial enrollments to be challenging. For those who have participated in DHIA, the DSANA process will be less cumbersome. Getting the full flock information into the spreadsheets may be challenging as each animal requires a unique identification number. The animal's scrapie tag is being used as that ID. Each animal will also need to have the Scrapie Farm Identification number (farm of origin) included. This will take time to gather for those who have not previously tracked ewe/ram parentage information.

There is an issue in getting the milk test day spreadsheet completed and the samples mailed in a timely manner following test day. Milk sample vials have a preservative included to extend the life of the milk in transport. Milk samples can also be frozen for later shipment. The RMDHIA laboratory identified a significant variance in the milk samples from month to month. Modifications in the producer sampling procedure will need to be made.

The first five producers have enrolled over 500 adult animals and nearly 300 lambs. While this is too small or a number to create any genetic trends or predictions, it is indeed a start and represents enough information for the pilot.

## Recommendations and Going Forward

The 2018 milking season is drawing close for those who are milking on a seasonal basis. The pilot project provides the protocols and foundation for moving the genetic improvements project forward. It is expected that the DSANA project will be ready to accept the following producers who are DSANA members with the 2019 season.

1. Any size of sheep dairy that wishes to enroll in the Tier One program.
2. All producers who have participated in the Lacaune importation project *are expected to enroll* the progeny and a peer group in the Tier One program at minimum.
3. Sheep dairies of any size that wish to enroll in the Tier Two program.
4. Sheep dairies that wish to pilot the Tier Three program.

The DSANA Three-Tiered Genetic Improvement Project Table follows.

| | *Required Data* |
|---|---|
| *Tier One* | • Lactation number, age of first lambing, lambing intervals<br>• Pounds of milk weighed a minimum of five times per ewe per lactation<br>• Parentage, date of birth, sex, litter size, survival/disposal<br>• Breed type<br>• Management Group identification: lamb rearing protocols, ewe flock management protocols as defined in the required worksheets.<br>• All F1 offspring of semen importation are expected to participate in Tier 1 testing, at a minimum. |
| *Tier Two*<br>Includes all of Tier One recording requirements plus Tier Two. | • Milk composition analysis (Protein, Butterfat, Somatic Cell Count, Lactose, MUN-Protein, BHB-nutrition-ketosis) through a certified laboratory (i.e. Dairy Herd Improvement)<br>• Lamb weights at birth and 30 days, adult weights and condition scoring at breeding<br>• Single sire mating and/or DNA blood cards with multiple-sire breeding for lambs and sires. |
| *Tier Three*<br>Includes all of Tier One and Two in addition to Tier Three | • DNA blood cards collected on all lambs and sires. Cards will be collected, logged, and stored in a central repository for future genetic analysis.<br>• Udder morphology and dairy conformation type analysis<br>• Animal health and disease testing and assurances (Scrapie, OPP, Brucellosis Ovis, Johnes? –this category has yet to be determined). |

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# Current Trends of the Spanish Assaf Sheep Genetic Improvement Program

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## Origins:

The Assaf breed is an established dairy sheep breed. Assaf has its origins during the 1950/60's at the Volcani Research Center in Israel, as a result of a cross between the Israeli improved Awassi breed and the East-Frisian breed from Germany, in the proportions of 5/8 and 3/8, respectively.

Awassi is a breed from the Syro-Arabian desert and is considered the Israeli's native breed. In the 1930's its average milk production was around 70 liters. However, after the genetic selection and improvements in management made by the Israeli, the milk production of the Awassi breed increased to 500 liters per lactation and the breed was called the Israeli improved Awassi. However, the Awassi breed still had a problem, their rate of reproduction. In average, an Awassi ewe gave birth to one lamb a year, making it difficult to respond to the high needs and expectation of producers. Faced with this problem, Israeli sheep researchers and farmers decided to address the issue by crossbreeding with a new breed of sheep. As a result, the crossing breeding between the Israeli Improved Awassi and the German East-Frisian started in 1955. The German breed was famous for its high fertility, high litter size (2-2.2) and also for high milk production (550 liter/lactation) but was unable to survive in the climate conditions in Israel (Gootwine and Goot, 1996).

After 15 years of research, around 1970, the new breed was considered stabilized and the Assaf breed was born. The new improved breed combines the positive aspects of both original breeds. The Assaf breed replaced the Awassi as the main dairy breed in Israel (Pollott and Gootwine, 2004) and is now well established in other countries such as Portugal and Spain.

In 2004 the Assaf breed in Israel had an average milk production of 334 liters in a 173d lactation period, with 1.3 lambing per year and an average litter size of 1.57 lambs per lambing (Pollott and Gootwine, 2004).

## The Spanish Assaf Breeders Association

During the period from 1977 to 1983, Spain imports 320 Assaf ewe lambs and 77 rams from Kibbutz

Gazit in Israel, which would be the initial population of the breed in Spain.

In 1993 the first organized group of dairy farmers start collecting data for what would be the future genetic improvement program.

The last genetic imports from Israel took place in 1994, when Portugal imports 5,000 doses of semen and 500 embryos. Together with the first Spanish imports these would lay the foundations for what it is today the Spanish Assaf breed. One year later, in 1995 the Israeli borders closed due to health problems and no more genetics are exported.

The Spanish Assaf sheep have been subject to a process of adaptation and selection over the past thirty years, in order to produce larger qualities of milk, higher protein and fat contents and better udder conformation.

In 2002, the National Association of Assaf Breeders (ASSAF.E) was founded. Only one year later, 2003, was the breed officially acknowledged by the Ministry of Agriculture in Spain and included in the Official Catalogue of Breeds of Spanish Livestock under the category of "breeds from non-EU countries". In 2005, ASSAF.E was officially acknowledged as a collaborating entity in maintaining the Assaf Flock Breed Register.

Nowadays, Spain has around 1 million Assaf sheep which makes it the biggest population of Assaf sheep in the world. Only the farms registered in the ASSAF.E flock book are part of the selective nucleus of the genetic improvement program. In 2017 ASSAF.E had 129 farms registered in the association with a total of 142,832 animals registered in the official flock book and during that year the association recorded and validated 86,095 lactations. The association has 8 full time staff (4 veterinarians, 3 office staff and the executive director).

## Genetic Improvement Program (GIP)

A Genetic improvement program is based on the selection of parents (Sires and Dams) with high genetic value and on a selective breeding scheme to increase the genetic gain in the next generation of animals.

A GIP requires the collaboration and effort of farmers (who own the animals), independent milk recording entities (who collect the data), semen collection centers, breeding services (artificial insemination), research centers (geneticists) and an organization that connects and controls all the information.

The Spanish Assaf GIP involves the collaboration of several official organizations:

- ASSAF.E- the Spanish Assaf Breeders Association. The association is responsible for keeping the flock book records and for coordinating and validating all data collected. The

veterinarians coordinate the animal electronic identification, the selective breeding of the Assaf population, the blood sampling, as well as to perform the artificial insemination, evaluate the mammary morphology and help the farmers with their day to day needs.

- Official Milk Recording is carried out by an independent governmental state agency that collects milk production and milk samples monthly and works directly with official certified laboratories to analyze milk composition.
- OVIGÉN is the Semen Collection Center responsible for the care of the breeding sires, semen collection and preparation of doses used for artificial insemination.
- Genetic Laboratories (Xenética Fontao and ABC genetics) carry out all the DNA analysis either parentage certification, scrapie resistance and, since 2015, genomics.
- Geneticists from the National Agriculture Research Institute (INIA) process all the data and determine the breeding values for all the animals in the Assaf population.
- The Spanish department of Agriculture (Ministerio de Agricultura) overlooks and audits the genetic improvement program, thus guarantying the transparency and accuracy of the whole process.

The Assaf sire catalog is published every year and is based on all the work of the above-mentioned organizations.

## Animal identification and genealogy records:

For the success of a GIP, it is crucial to have a reliable animal identification system, with unique identification per animal, preferable electronic identification.

For the Assaf registry all animals are electronic identified with ruminal bolos. Also they have a flock book number tag, their progeny is confirmed by DNA testing and are genotyped for scrapie resistance.

Every year more than 30,000 new lambs, the replacing stock, are electronic identified and have their blood analyzed.

## Selection Objectives:

The Spanish Assaf improvement program is designed to increase milk production and quality, improve ewes milk ability and at the same time maintaining the breed standard features. The Assaf GIP has four main selection objectives: milk production, milk components, milk quality and mammary morphology.

Milk production quantity, composition (protein, fat and urea) and quality (somatic cell count) are recorded and collected following the ICAR guidelines (AT4- alternate, morning-afternoon, in 28 days interval).

Mammary morphology traits are evaluated by only one of the association veterinarians using the system proposed by De la Fuente et al (see figure 1).

## Genomic Selection:

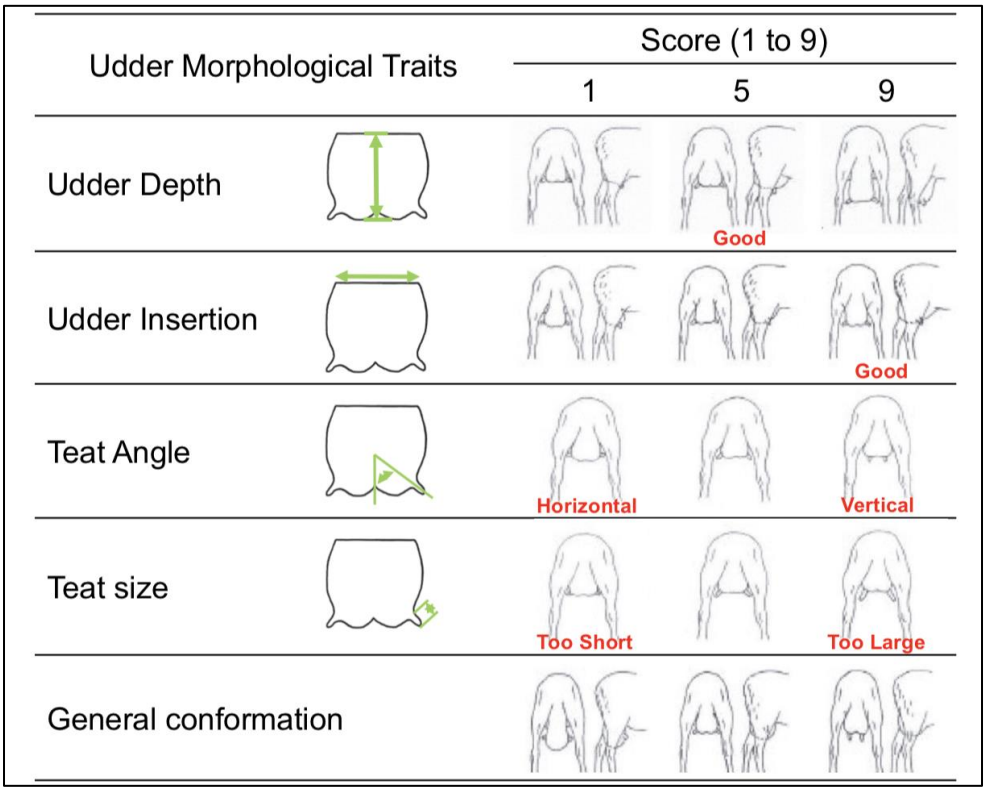
In 2015 ASSAF.E started a 3-year project to develop the Assaf breed genomic selection. The Genomic Project, as it was called, involved the collaboration with 2 Spanish Universities (University of León and University of Madrid) and the Agriculture National Research Institute (INIA).

The 3-year project budget was 360,000 dollars and the costs were divided between the Spanish government and the Assaf dairy farmers.

This money was used to creating the reference population with at least 3,000 animals and to design a custom SNP's chip (Affymetrix Axiom Array).

The animals genotyped to be part of the reference population had to have a high reliability in the traditional improvement program ($R^2$>70% for males and $R^2$ >55% for females).

Figure 1: Linear scores for evaluation of udder morphological traits for Dairy Sheep




*Adapted from: De la Fuente et al, 1996*

## Results from the GIP from 25 years of improvement:

In 2017 ASSAF.E had, in the semen collection centers, a total of 564 males genetic evaluated based on the performance of a total of 28,156 daughters. A total of 38,887 artificial inseminations (mainly fresh semen) were performed by the association technicians in the 129 farms of the association.

The Assaf data base has 360,218 animals with their genealogies certified by DNA.

## Milk production results:

Assaf uses as a standard milk production (L150d) the total milk produced by an ewe in the first 150 days of lactation.

All milk production used to build the average results were recorded and validated according to the ICAR guidelines of AT4 milk recording.

The average results of 23 years of data (1993-2016) are shown in table 1. From 1993 to 2016 there were 818,195 validated lactations with an average standard milk production (L150d) of 321kg (712lbs). During the same period the average total milk production was 394kg (868lbs) in an average lactation of 201days.

The 2016 data shows that the population average standard production at 150d was 373kg (822lbs) in 66,001 validated lactations. The outstanding point is that the 10% best ewes of this population produced an average of 637kg (1,468lbs) of milk at 150d. The same trend is also observed with total lactation, the population average was 448kg (988lbs) in a lactation period of 198 days but the 10% best ewes produce 803kg (1,768lbs) in a lactation period of 235days. As a last note these are the mothers of the future sires.

*Table 1- Average milk production results between 1993 and 2016, 2016 and the 2016 average 10% best milk production.*

| | 1993-2016 | 2016 | 2016<br>Average 10% Best |
|---|---|---|---|
| Nr. of ewes | 303,042 | 64,307 | 6,597 |
| Nr. of validated lactations | 818,195 | 66,001 | 6,601 |
| Milk Production (L150d) | 323kg (712lbs) | 373kg (822lbs) | 627kg (1,486lbs) |
| Total Milk production:<br>Lactation Length<br>Milk Production | <br>201d<br>394kg (868lbs) | <br>198d<br>448kg (988lbs) | <br>235d<br>802kg (1,768lbs) |

Genomic Project:

In 3 years of the genomic project ASSAF.E built a reference population of 3,459 animals. These animals were genotyped using a 50,000 SNP genomic chip.

In 2018, the selection of male lambs (the future sires) for the semen collection center is done using genomics.

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# Nutritional Management of Reproduction in Dairy Sheep

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Reproduction in sheep is affected by many different factors. Nutrition is a key player in ewe and ram health and the ability to create live lambs. There are other factors to consider that can have tremendous impacts on the outcome of breeding. These include but are not limited to ewe health, housing, the environment and weather before, during and after breeding, and disease status. Even stage of lactation can influence a ewe's ability to conceive. In the following article, we will review nutritional factors and concepts that can affect reproduction with an emphasis on the ewe. These are areas of importance that should be evaluated on a flock and individual level when making breeding decisions.

To further the discussion on how nutrition influences reproduction, let's break down what our goals are. We expect the ewe to ovulate. It is possible to induce estrus with a CIDR® and not induce ovulation. The ewe will only ovulate naturally during breeding season (Fall). If breeding 'out of season', an exogenous source of PMSG is necessary. We are aiming for a high conception rate. This means we want a lot of ewes to get pregnant while exposed to the ram (or to frozen semen). We want a high lambing rate. In other words, the ewes that get pregnant need to carry those lambs to term without aborting or giving birth to weak or stillborn lambs. Finally, we want a low rate of fetal/embryonic absorption. This means that we don't want to confirm pregnancy early on or have ewes miss the first cycle after insemination but then have them cycle or breed back in the next cycle.

How does nutrition affect reproduction? Management of BCS (Body Condition Score) prior to breeding season is essential. This can be difficult with lactating ewes and will be discussed further on in this article. We can influence ovulation, both the number of oocytes ovulated and the number of ewes that ovulate at the same time through proper nutrition. Nutrition has a high impact on both pregnancy and lambing outcomes.

There are limitations to our knowledge of dairy sheep nutrition. The realm of dairy sheep nutrition in the United States is still an emerging field. There has been very little research related to dairy sheep production systems in the US. There is extensive European research and although some of it is dated, they also milk different breeds on different diets. The NRC was updated for sheep but it does not address dairy sheep when discussing lactation. In addition, the studies used to create the recommendations were small and not fitting dairy settings. The result has been that most dairy sheep producers rely on hearsay to come up with diets for their

ewes. It is very important to remember that nutrition is regional. The variations related to feedstuffs available, forages (both quality and type), and feed costs will have big impacts on what determines the 'best' diet for your sheep. The breakdown of diets into components is necessary to understand the basics of what our goals are for our sheep. When assessing a diet or feed, you need to consider the following: Starch, Protein, Fiber, Minerals, and overall Quality. We will touch on these areas and how they can affect reproduction. These categories all influence reproductive outcomes and we will review why they are important in the remainder of this article. Body condition, ovulation, conception, and fetal growth respond to nutrition and what sheep consume. Let's review these areas from a nutritional standpoint.

Body condition in the extremes is the enemy of reproduction. Fat dairy ewes are common in many production settings. The basic mechanism for why we see fat, milking ewes is that the starch: protein ratio is incorrect. High starch (grain) diets or diets that are low in protein will produce the same result- over condition. Disappointingly, this scenario also limits milk production so you will see fat ewes that do not produce very much milk. To manage this scenario, we need to balance the starch and protein levels. This is best achieved by raising the protein level in the diet. Starch drives milk production so reducing grain to the ewes is not advised until they are tailing off in milk volume at which time it is wise to reduce grain as milk output drops. Dieting ewes is NOT advised. Attempts to reduce feed to milkers will result in dry ewes. It is very difficult to pull significant amounts of weight off of dry ewes. This is a very stressful situation for the ewe on a physiologic level and will result in very poor reproduction. Obese ewes are also less fertile and should be rejected for specialized breeding programs. I do not recommend assisted reproduction in ewes with a BCS> 3.50. Thin ewes present a different issue. They are common in grazing flocks where feed quality and the time required to consume enough feed to support lactation is limited. These ewes can be successful in assisted reproduction settings because they are often quite responsive to positive energy balance shifts. The biggest concern for thin ewes (BCS<3.0) is that they have mineral deficiencies from being limit fed. Thin ewes should go onto an improved diet 4-6 prior to breeding. The benchmarks to keep in mind related to body condition and diets are as follows: 1) Do not select obese or very thin ewes (BCS<2.50); 2) Closely monitor BCS coming into the breeding season in case adjustments are necessary; 3) Breeding ewes should be on a 16-18% protein diet; 4) Grains should be limited to 1.5lbs (likely 1-1.33 lbs by Fall); 5) If grain mix contains protein pellet and grains, total should not exceed 2.5 lbs per day.

What does nutrition have to do with ovulation? The number of oocytes (eggs) produced depends on the ewe's energy and protein status. Remember that hormones are simply proteins that act on receptors in a specific part of the body. Reproduction is biologically designed so that proteins related to reproduction will only be produced when ewes are in a good nutritional state. If the ewe is protein deficient, she will not have the resources to grow lambs in her uterus.

Lambs contain a lot of protein! To make sure this doesn't occur and risk killing the ewe, the ewe simply doesn't ovulate and get pregnant or she ovulates one follicle and has a single lamb. We can jump start the ovulation process by boosting protein prior to breeding. Historically this was called 'flushing' the ewe. Both soluble protein and starch have an effect and should be considered. To positively influence ovulation, make diet changes 4-6 weeks prior to breeding. Do NOT change the diet within 4 weeks of breeding! If feeding grain, raise the grain by 0.5lbs/day unless you are already feeding the maximum levels listed above. If the ewes are dry prior to entering the breeding season, a mixed grain can be fed at a rate of 1-1.5lbs per day. No diet changes should occur for 60 days post-AI.

The next phase of reproduction to discuss is fertilization, which leads to conception. We can extrapolate a few things from other ruminant species. For instance, sperm utilize glucose in the female reproductive tract for energy and capacitation (the final step required before fertilization occurs). Frozen sperm can be glucose depleted and this can be a major limiter in frozen sperm conception rates. We know that higher protein diets lead to healthier oocytes (eggs). Unfortunately, very high protein (>20%) or high nitrates can have a negative effect on fertility. This consequence is amplified by low starch diets. Ruminants can process high protein and high nitrates more effectively when fed starch (grains). Nitrates accumulate in certain types of forages during stress. For example, drought or frost can trigger plants such as Sudan grass to produce nitrates. Over-fertilized crops are at risk for nitrate accumulation too. Some weeds, such as Lamb's Quarter, are naturally nitrate accumulators. Nitrate levels should be under 0.5% (5000ppm) in forages fed to sheep. One way to measure nitrogen levels in sheep is to measure the BUN (blood urea nitrogen) or the MUN (milk urea nitrogen). These numbers can be used to correlate the ewe's efficiency of nitrogen utilization. We can use the cow reference range, but again, sheep are slightly different from cows and this must be considered whenever we interpret across species. The 'old' range for MUN for cows was 12-16mg/dl. There is evidence that as low as 9 mg/dl is normal now. The key to these tests to remember is that we are only looking for outliers- the very low (<6) and the high (>18). A low BUN/MUN suggests that we are underfeeding protein and increasing the protein levels in the diet would have a positive effect. A high BUN/MUN implies a number of possibilities. Excess protein, underfeeding starch, or high nitrate forages (sudan, clover) are all options to rule out in that scenario.

Progressing beyond conception, it is important to consider the CL (corpus luteum) that has formed on the ovary. The CL produces progesterone, which maintains the ewe's pregnancy. The presence of a strong CL will prevent the ewe from ovulating again and it will help ensure that the placenta grows and nourishes the growing lambs. Each ovulation produces a CL so a ewe carrying triplets will have 3 separate CLs on her ovaries. Sheep carry the unique trait of being able to terminate their CLs in stressful situations. This is significant in the first 90 days of gestation, but most marked in the first 45 days. Stressors to avoid include but are not limited to

extreme diet fluctuations, moving sheep to new pens, introducing new pen mates or removing pen mates, ram brutality, dogs, weather stress. If you are traveling to a location to have your ewes bred, it is best to return the same day. Waiting a few days to return to their normal environment could prevent adequate CL formation and failure to maintain the pregnancy produced from the breeding.

The feed traits we have not discussed are fiber, quality issues, and minerals. Let's review these topics briefly as they are also important to ewe health and reproductive success. When we talk about fiber, we are talking about rumen effective fiber. The other type is rumen non-effective fiber. Effective fiber is anything that has retention in the rumen and will stimulate cud chewing. Non-effective fiber (such as soy hulls) is of such small particle size that it is not retained. The reason this matters is that we are actually feeding the rumen microbes that digest these large fiber pieces that get 'stuck' in a fiber mat in the rumen. The grains and protein we feed are actually being fed to the microbes. Forage quality matters for this reason. Molds poison both the rumen microbes and the sheep itself. Liver and kidney damage will result from excessive mold consumption. Remember that molds often grow in the bottom of feeders that are not cleaned out regularly so a producer could feed 'clean' feeds and then expose their sheep to molds via dirty feed mangers. Another fiber/forage issue to be aware of is tobacco in alfalfa hay. Tobaccoing occurs when hay has higher moisture levels at baling but not high enough to create molds. The heating in the bale effectively cooks the protein and renders it unavailable to the sheep. This can be beautiful hay but the protein test on paper will not match what the sheep can utilize. It is not uncommon for 60-80% of the protein in 'tobaccoed' alfalfa hay to be unavailable to the sheep. A separate but pertinent feed issue relates to grazing clover forages. Red clover is part of the legume family and can produce both non-estrogenic and estrogenic compounds called phytoestrogens. Phytoestrogens will act similar to naturally produced estrogens in the ewe and can impair fertility. Both non-estrogenic and estrogenic compounds produced by red clover affect the ewe during follicular development in the ovary. This means that ewes consuming red clover may not ovulate during estrus. There are various factors sited that can cause more of these compounds to be produced by the plant. Genetics play a role; older varieties are more likely to produce phytoestrogens. Plant stress, often from lack of fertilization or soil mineral deficiencies, can lead to greater phytoestrogen production. There is some research supporting seasonality also with springtime showing higher levels produced than other times. Ensiled red clover appears to favor more estrogenic and non-estrogenic compound development. The plant produces substrates that are broken down into these compounds during the fermentation process in the silage (or in the rumen) leading to phytoestrogen production. It is recommended that red clover not be fed as more than 25% of the forage in the diet. This can be accomplished by feeding other forages in the barn and then turning out the ewes after hay feeding for a 12-hour period. The effects due to grazing these forages (white

clover is also considered at risk, but at lower levels) can be reversed in 4-6 weeks after removal from the feed source. It can be difficult to evaluate whether or not sheep are exposed to phytoestrogens because of the seasonal reproductive cycles of ewes. Some ewes will show frequent estrus behavior (coming into heat more often than normal) and some ewes will show anestrus (never coming into heat). Since we don't expect ewes to cycle naturally in the summer months and we generally aren't breeding them, it can be hard to tell if they are being affected by phytoestrogens.

Last but certainly not least, minerals are very important to healthy reproduction. Sheep have different mineral requirements than goats and cattle. You should NEVER feed goat or cow formulated minerals to sheep! Sheep are much more efficient at storing copper than these species and can accumulate excessive amounts of copper in their liver while appearing outwardly normal until a stressful event occurs (such as laparoscopic AI). After a stressful incident, the liver releases the stored copper and the sheep often die or abort after an acute massive hemolysis (lysis of all the red blood cells in the body). I have seen cases of acute copper toxicosis after simply coming into estrus that resulted in death. The copper: molybdenum ratio is an important number to keep an eye on. Many feed companies do not manage copper effectively in sheep diets and copper deficiency or toxicosis can result. The goal is 10:1 (copper: molybdenum). Avoid feeding grain mixes from other states as they might have different baseline copper and molybdenum levels. Always remember that nutrition is regional! For example, in California, the molybdenum levels are 0.1-0.3ppm, in Idaho, 4-5ppm and in Pennsylvania up to 8ppm! We do not generally adjust Molybdenum in the diet but a diet with 20ppm copper in California would lead to toxicity while in Pennsylvania it could cause deficiency. Copper toxicity holds the risk of acute death with any stress. Copper deficiency results in poor immunity and fertility.

Reproduction and nutrition are tightly linked but the overall goals are simple. Feed good quality, balanced diets to your sheep and you will set them up for success. Keeping in mind a few basic principles will help your ewes produce quality healthy lambs. Assess your ewes carefully before scheduling your breeding dates and do not breed ewes that will not be ready. As the old saying goes, what you put in is what you get out.

# Relating Dairy Sheep Nutrition to Dairy Cattle Nutrition: are we feeding small cows, or are we feeding sheep?

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## What are your Goals and Priorities?

1. Pancero 4 Core Values
    a. Increase Profit
    b. Increase Competitive Advantage
    c. Decrease Risk
    d. Make life easier
2. Setting realistic benchmarks
    a. Weather can't be controlled, the effects on production can be managed
    b. Don't risk future production by feeding low quality to young stock

## Methods of Feeding and Supplementation

1. Healthy Rumen = Healthy Animal
    a. Gut health
2. Wet vs. Dry Feeding
    a. Mycotoxin Risk Management & Effects
3. Inorganic vs. Organic Trace Minerals

## Late Gestation Feeding

1. Single, Twins/Triplets-Should I feed differently
    a. Nutritional Cost vs. Veterinary Expense
2. DCAD-Dietary Cation-Anion Difference
3. NPN, RUP(Bypass Protein) & Bypass Fat

## Maintaining Peak Milk and Expanding Milk Yield

The economics of value-added feeding

# Management of AI Reproduction in Dairy Ewes

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The challenges related to AI in sheep are primarily related to stress management. When discussing methods to improving AI success, we need to focus heavily on ways to reduce or manage stress in the ewe. Stress is a vague and somewhat general term and in order to understand the concepts of stress as related to reproduction, we need to breakdown the stressors into categories. There are two types of stress this article will address. Internal stress includes things such as disease status, age, and lameness. External stressors are things such as the housing environment, weather, herd status and social interactions. In order to succeed with an advanced reproductive program, you will need to assess and manage all of these factors in your flock.

Diseases of dairy sheep are varied both in length of infection and how the sheep is affected by the infection. Abortion causing infections are obviously important to manage when dealing with reproduction, valuable semen, and stress. Oftentimes, sheep can be silent carriers and stress will cause the pathogen to begin growing and result in early embryonic death or abortions at various stages of gestation. There are four common abortion-causing pathogens in the US sheep flock. *Chlamydia spp.* and *Campylobacter spp.* are two pathogens that can be managed through vaccination. All ewes should be vaccinated for these pathogens but at the very least; AI ewes should receive these vaccinations. Toxoplasmosis is another common abortifacient spread by cats defecating in the feed areas. Control of cat populations is very important to managing this disease. A stable cat population is considered less risk (than high numbers of kittens) but as long there are cats living in the sheep housing areas, toxoplasmosis is a risk. Q Fever is another pathogen to be concerned about however we are somewhat limited in our ability to manage this pathogen due to the lack of vaccine approval in the US. Measures that will control the other abortion causing diseases will also prevent Q Fever spread within a flock. If you are experiencing abortions or open ewes at lambing, it would be wise to sample aborted fetuses and placentas to make an accurate diagnosis. Spending resources on AI may not be advisable during an abortion outbreak at your dairy. Other diseases to be mindful of are Ovine Progressive Pneumonia (OPP) and Contagious Lymphadenitis (CL). There is a simple blood test for OPP and all AI candidates should be tested. The best management practice for CL prevention is vaccination along with culling of positive ewes. These diseases create internal stress for the ewe and will reduce reproductive success in an AI program.

Parasitism in grazing herds is both an internal and external stressor. Prior to deworming ewes, take fecal samples to ascertain both the type and severity of parasite infections present. Deworm with the appropriate dewormer under the advice of your veterinarian. Many dewormers are not approved for lactating ewes and the dewormers that are approved may be ineffective in your area. Nationally we are battling parasites that are resistant to all available deworming agents. Careful use of the drugs on the market will hopefully protect your flock from multi-drug resistant worms. In any case, do not select ewes with high worm burdens. Poor parasite immunity can be a genetic trait and should not be propagated with valuable semen.

There are a few general conditions to consider such as age and social status. The primary benefit of older ewes is that they are proven performers within your flock. You know what their udder and body conformation are and how they have held up over time. There may be production records to emphasize genetics you would like to propagate. What is wrong with older ewes in AI programs? Ewes need to be at the tail of lactation for AI, which is poor timing for Fall AI. Dry ewes in the Fall are often too fat because they had a short lactation. Older ewes tend to have well developed mammary veins, which are dangerous when trocarizing the abdomen for artificial insemination. The stage of lactation (high producing verses dry) is not as significant of a factor as the time of year. If most ewes freshen in the springtime, they will be later in lactation in the Fall. Ewes in the first half of their lactation are likely less fertile than in the second half of lactation due to high demands for milk production. The udder will act as a protein 'sink' and it will remove amino acids for milk proteins that could otherwise be used for reproduction. The bigger risk with high producing ewes is both the risk of hitting mammary veins and the stress caused by manipulating and then fasting a heavy milker for the AI event. Heavy milking ewes have a tremendous energy requirement and not eating for 24 hours will cause enough stress to potentially effect the outcome of the insemination. Finally, fertility can be lower with older ewes than younger ewes.

General animal care should be performed 60 days prior to AI as part of ewe selection; hooves trimmed, wool shorn, vaccinations given. Although this seems logical, ewes should be rejected if they have chronic foot rot, laminitic changes to the hooves, etc. Another important rejecting factor is social status. Ewes of low social status will always have lower fertility in advanced reproductive scenarios. It is very stressful for any herd animal to be in a low social status environment. Bullying occurs in all settings but confinement with housing bottlenecks can greatly increase stress and the negative effects of stress on milk production and reproduction.

Areas of concern include but are not limited to shelter space (can all sheep escape rain, wind, snow, and hot sun comfortably?), feed manger space, water trough space, gate size for ewes traveling to and from milk barn, pastures, bedding pack areas, feed space. A good rule for housing area is 15 sq ft/ewe. This is area of clean, dry bedded pack. Air quality must be assessed at the level of the ewe since ammonia is denser than air and will build up in lower areas. You must kneel down in the barn to assess ammonia levels. If your knees are wet or dirty when you kneel down, your barns are not dry enough. If your eyes, nose or throat burn, there is too much ammonia. The amount of linear space required in the feed manger should approximate 12-18'. Twelve inches is adequate for shorn ewes and possibly ewes shorn twice a year. Ewes shorn once a year will require 18-20" of linear feed space. In settings where feed space is inadequate, the most common sign is a variety of body condition scores ranging for obese for dominant ewes to thin for subordinates. In these instances all sheep suffer but for different reasons; none are acceptable for AI programs. What can we do to prepare for a successful AI program? Clean and rebed barns 60 days prior to AI and find a method of rebedding that will not disrupt ewes during the breeding season. Improve ventilation to housing areas, which may include fans to push ammonia out of the barns.

Weather and time of the year are both factors to consider when scheduling artificial insemination breeding. AI should ideally occur after two natural heat cycles have occurred. Estrus may begin anywhere from mid August to mid September. You can use your overall flock to gauge when breeding begins. Count 34 days from the beginning of your breeding season and schedule AI after that. Fall AI is the most successful time to breed while April and May are the worst. These months are six months past the best breeding months and considered the 'deepest' anestrus. If you do not need out of season lambs, plan for September to December breeding.

When selecting ewes for AI, plan on completing this step 60 days prior to your scheduled date. Move ewes to smaller pens where you can manage their diets and environment more intensively. If you select ewes from multiple pens, it is ideal to move them into separate smaller pens. First fresheners should not be housed with mature ewes. Next, watch the ewes during feeding times. Can they eat without competition? Can the ewes rest comfortably? Are there ewes that sleep by themselves? Observe the pens you removed the ewes from. Are there ewes in those pens that are now sleeping alone? Sheep have complex social structures. Removing them from their 'families' will create stress and the release of corticosteroids, which are inhibitory to fertility-related hormones. Let the ewes assimilate for a few days, but reject ewes

that do not adjust to the new pen. If you have a ewe that needs to be in the program but does not interact, try to locate her buddy and move her into the pen for comfort.

There is an alternative to managing mature ewes and it should be seriously considered. Ewe lambs are much more adaptable to specialized breeding programs. Diet restrictions are minimized. Mammary veins have not developed yet. The likelihood of carrying disease is lessened by the age factor. Feeding for growth also stimulates good reproduction. The downside of ewe lambs is the lack of production records, udder conformation is unknown, and lower lambing rates could mean fewer lambs per litter than mature ewes.

The next period to review is the time of preparation for the laparoscopic AI. Ewes should be handled as gently as possible. Chasing and stressing ewes will have negative consequences and since the ewes will need to be handled many times, calm and skilled sheep handlers should perform all tasks such as inserting and removing CIDRs and giving injections. Ideally, rams should not be nearby on fence lines for the last 30 days prior to insemination. Rams can alter the synchronicity of the ewes and any outside hormonal effects could interfere with the CIDR synch. The vasectomized ram should be introduced 12-15 hours post- CIDR pull and expect standing heat 18-24 hours post CIDR removal. Ewes that do not fall into this time frame should be removed from the AI program. Early and late ovulators will not be 'ready' for sperm at the time of insemination. Without a vasectomized ram, you trust the program more than it deserves and will have poorer results than expected. When performing a multi-day synch program, all ewes in a pen should be synched and AI'd on the same day. The same teaser can be used but must be moved from pen to pen each day. Do not move the ewes to the teaser. A teaser on fence line will elicit a stronger ovulatory response than not having one present during the CIDR pull/prep period.

After the AI has been performed, all rams should be removed from fence line contact. Interactions and handling of the ewes should be done with a goal of minimizing stress. Do not change diets for at least 45 days. Clean up rams should not be introduced until 17 days post AI. The ram should be quietly moved to the pen. Only choose rams that will work calmly and not abuse the ewes. It is advisable to wait until 45 days post insemination to confirm pregnancy. Ideally, use an ultrasound to delineate AI from natural breedings. A blood test will not differentiate between these matings and bleeding ewes sooner will cause stress, which could be detrimental to maintaining the pregnancy. One final concept to understand is called the Male or

Ram Effect. Research about 15 years ago found that the male actually influences the pregnancy AFTER fertilization. About 28 days post fertilization; the embryo can fail to continue to grow. The ram effect occurs when the sperm are stressed (by heat waves, freezing and thawing semen, dietary insufficiencies for the ram, etc.). Sheep semen is well known to not freeze well. This species seems to be very sensitive to the freezing and thawing process. The variation is ram to ram. Some rams will freeze well and some will not. In addition, different collection facilities utilize different recipes for extending semen and then freezing it. Different rams will freeze better with different extenders. You are unlikely to know about this process since it is considered confidential for each collection facility. In addition, a ram may have a good collection and freeze well, but the next collection could be affected by a previous illness, diet change, weather event, etc. Collections can vary for each ram in terms of quality and sperm concentration. It is very difficult to know what you are actually inseminating with since there are many factors that will not show up under a microscope. The pregnancy rate will determine the success rate of many different factors. It is not uncommon to see ewes cycle back 'off cycle' after 28 days bred. The fetus dies at day 28 and after resorbing the remains, the ewe will come back in heat. Missing the first heat at 17 days, it is easy to assume she is pregnant. Confirmation and sizing of the pregnancy will tell you how well the AI went. Many breeders tell stories of ewes that cycled back at 30 days post AI even though the rams were introduced sooner.

There are many factors that affect reproduction in sheep. As you have seen, the details that improve AI success are actually good management practices. Specialized AI programs using frozen semen are the most difficult to achieve success with. Many factors can alter the outcome of the breeding program and we can manage the ewe's diet and environment to achieve better results. The male factors are difficult to control and it is easy to blame the ewe for a lack of success but the semen collection, handling, extenders, freezing, thawing process, and location of placement in the female reproductive tract are all areas you have less control over as a producer. Proper management and synchronization of the ewe are essential to achieving results. Without these, we cannot create an environment for the ewe to conceive a pregnancy with frozen semen.

# The William J Boylan Distinguished Service Award

*(prior to 2009, known as the DSANA Distinguished Service award)*

The Bill Boylan Distinguished Service Award recognizes those who have made significant contributions to the growth and progress of the North American dairy sheep industry. This honor is awarded annually to a nominee or nominees who has been considered and voted on by the DSANA Board of Directors; the award is presented at the Symposium during the Banquet.

## Recipients of the Distinguished Service Award

Dave Thomas, 2003. Madison, Wisconsin, Dairy sheep researcher

Dan Guertin, 2004. Stillwater, Minnesota, Dairy sheep producer

2005 (no award given)

Pat Elliot, 2006. Rapidan, Virginia, Dairy sheep producer and artisan cheese maker

Tom and Nancy Clark, 2007. Old Chatham, NY, Dairy sheep producers & sheep milk processors

William Wendorff, 2008. Cross Plains, Wisconsin, Sheep milk processing researcher

Yves Berger, 2009. Spooner Wisconsin, Dairy Sheep Researcher

Eric Bzikot, 2010. Fergus, Ontario, Dairy sheep producer and sheep milk processor

Tom and Laurel Kieffer, 2011. Strum, Wisconsin, Dairy sheep producers

Bill Halligan, 2012. Bushnell, Nebraska, Dairy sheep producer

Axel Meister, 2013. Markdale, Ontario, Dairy sheep producer

Terry Felda, 2014. Ione, Oregon, Dairy sheep producer

Sid Cook, 2015. La Valle, Wisconsin, Sheep milk processor

Michael Thonney, 2016. Cornell University, Ithaca NY, Sheep reseacher

Dr Richard Bourassa, 2017. Hôpital Vétérinaire, Sherbrooke, Quebec;

and Andre Charest, OVIPRO advisor, CEPOQ, Quebec

# The DSANA Mentorship Award & Scholarship Fund

The DSANA Mentorship Award recognizes those who have generously given their time and experience to newcomers in the North American dairy sheep industry. The sheep dairy industry of North America, since its inception, has benefited from the generous giving of time, support and mentoring by many people who have provided the backbone and foundation for growing a new industry. These are the people who worked through the good and challenging times in their own businesses, yet were ever willing to share what they learned with whoever asked, or give their time and energies to support the emerging dairy sheep industry in North America. These are the familiar faces that bring us back to the Symposia year after year and the people we contact throughout the year when we are stumped by industry challenges. The DSANA Mentorship Award recipient will be nominated by the DSANA membership, then considered and voted on by the DSANA Board of Directors. A scholarship that covers the registration costs of that year's upcoming DSANA Symposium will be given to a dairy sheep producer new to the industry, to be identified by that year's Mentorship Award recipient.

Recipients of the DSANA Mentorship Award

| | DSANA Mentorship Award Recipient | Scholarship Recipient |
|---|---|---|
| **2017** | **Eric and Elisabeth Bzikot, Best Baa Dairy, Fergus, Ontario.** | Meghan Spares, Nova Scotia. |
| **2018** | **Kendall Russell, Lark's Meadow Farms, Rexburg, ID** | |

# DSANA: History, Current Board of Directors

## Board of Directors, 2018-2019

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## Brief History of DSANA

November 1-3, 2001 – Decision made at the 7th Great Lakes Dairy Sheep Symposium, Eau Claire, Wisconsin, to form the Dairy Sheep Association of North America. Nancy Clark, New York, elected the interim/organizational President.

June 26, 2002 – DSANA by-laws, written by Nancy Clark, New York; Alistair McKenzie, Quebec; Carol Delaney, Vermont; and Charles Capaldi, Wisconsin, were adopted.

November 7, 2002 - Charter Meeting of DSANA held at the 8th Great Lakes Dairy Sheep Symposium, Cornell University, Ithaca, New York

## DSANA Presidents

2002 - 2004: Nancy Clark, New York
2004 - 2005: Mike Thonney, New York
2005 - 2007: Larry Meisegeier, Wisconsin
2007 - 2009: Claire Mikolayunas, Wisconsin
2009 - 2011: Bill Halligan, Nebraska
2011 - 2012: Laurel Kieffer, Wisconsin
2012 - 2013: Bill Halligan, Nebraska
2013 - 2015: Michael Histon, Maryland
2015 - 2017: Laurel Kieffer, Wisconsin
2017 - : Bee Tolman, New York

# Locations of Past Dairy Sheep Symposia

and Chairs of the respective Symposium Organizing Committees

1995 1st Great Lakes Dairy Sheep Symposium, Madison, Wisconsin. Chair: Yves Berger

1996 2nd Great Lakes Dairy Sheep Symposium, Madison, Wisconsin. Chair: Yves Berger

1997 3rd Great Lakes Dairy Sheep Symposium, Madison, Wisconsin. Chair: Yves Berger

1998 4th Great Lakes Dairy Sheep Symposium, Madison, Wisconsin. Chair: Yves Berger

1999 5th Great Lakes Dairy Sheep Symposium, Brattleboro, Vermont. Chair: Carol Delaney.

2000 6th Great Lakes Dairy Sheep Symposium, Guelph, Ontario. Chair: Axel Meister.

2001 7th Great Lakes Dairy Sheep Symposium, Eau Claire, Wisconsin. Chair: Yves Berger.

2002 8th Great Lakes Dairy Sheep Symposium, Ithaca, New York. Chair: Michael Thonney.

2003 9th Great Lakes Dairy Sheep Symposium, Victoriaville, Québec. Chair: Lucille Giroux.

2004 10th Great Lakes Dairy Sheep Symposium, Hudson, Wisconsin. Chair: Yves Berger.

2005 11th Great Lakes Dairy Sheep Symposium, Burlington, Vermont. Chair: Carol Delaney.

2006 12th Great Lakes Dairy Sheep Symposium, La Crosse, Wisconsin. Chair: Yves Berger.

2007 13th Great Lakes Dairy Sheep Symposium, Guelph, Ontario. Chair: Eric Bzikot.

2008 14th Great Lakes Dairy Sheep Symposium, Maryville, Tennessee. Chair: Claire Mikolayunas.

2009 15th Great Lakes Dairy Sheep Symposium, Albany, New York. Chair: Claire Mikolayunas.

2010 16th Great Lakes Dairy Sheep Symposium, Eau Claire, Wisconsin. Chair: Claire Mikolayunas.

2011 17th Great Lakes Dairy Sheep Symposium, Petaluma, California. Chair: Cynthia Callahan.

2012 18th DSANA Dairy Sheep Symposium, Dulles, Virginia. Chair: Laurel Kieffer.

2013 19th DSANA Dairy Sheep Symposium, Cambridge, Ontario. Chair: Eric Bzikot.

2014 20th DSANA Dairy Sheep Symposium, Chehalis, Washington. Co-chairs: Terry Felda, and Brad & Megan Gregory.

2015 21st DSANA Dairy Sheep Symposium, Madison, Wisconsin. Co-chairs: Brenda Jensen and David Thomas.

2016 22nd DSANA Dairy Sheep Symposium, Ithaca, New York. Chair: Michael Thonney.

2017 23rd DSANA Dairy Sheep Symposium, Orford, Quebec. Chair: Marie-Chantal Houde.

2018 24th DSANA Dairy Sheep Symposium, Kansas City, Missouri. Chair: Sarah Hoffmann.

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