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The Potential for a Dairy Sheep Industry in the Midwest

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Sheep products in the U.S. don't have to be limited to meat and wool. In parts of the world, sheep provide more milk than cattle. It is estimated that about 100 million sheep, 10% of the total number in the world, are milked. To U.S. sheep producers, milking sheep defies the imagination. A trip to France's sheep milking area (Rodez, France) will convince one that sheep milking and production of Roquefort cheese (made only from sheep's milk) are, indeed, thriving industries that deserve exploration by U.S. producers.

Unlike the U.S., one of the most profitable farm livestock enterprises in France is sheep milking. In France, 7 million cows, 1 million of the country's 10 million sheep, and 1 million goats are milked. France isn't the only country that produces sheep's milk. Producers in Spain milk 5 million, and Italy and Greece are big sheep milk producing countries. Many sheep are milked in Middle Eastern countries, but the industry is not as well organized as in Europe. However, only France has the Roquefort caves in which all genuine Roquefort cheese must be aged for three to four months.

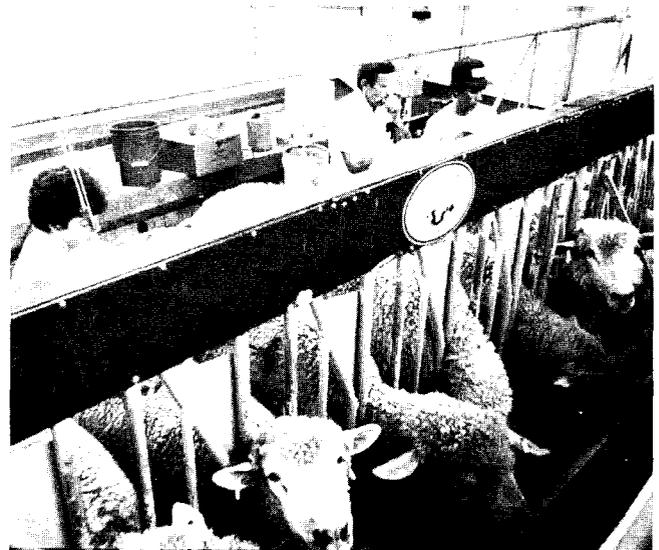
There is growing interest in dairy sheep since research was initiated at the University of Minnesota (Boylan, 1984; Jordan and Boylan, 1986). This research initially focused on evaluation of the production performance of various genotypes with the aim of examining methods to improve the milking ability of ewes nursing lambs. The research also included studies on milk composition, lactation curves, and repeatability of milk production records. The potential for creating a dairy sheep industry in the U.S. and the additional source of income for sheep producers and related agribusiness industries was a logical outgrowth of the initial lactation study.

A Look At Sheep Milking in France

In the spring of 1985, the French farmer was paid 1.8 francs per kilogram (kg) of cow's milk, 7 francs per kg of sheep's milk, and 5 francs per kg of goat's milk, or, in U.S. dollars, about \$35/cwt for sheep's milk.

Sheep in France are milked for about seven months (December to July) and produce during that period about 128 liters (1 liter = 2.2 lb) per ewe, up from an average production in 1950 of 76 liters. In 1980, France had about 3,000 sheep milk producers, who milked an average of 220 ewes per farm and produced 198 million pounds of sheep's milk.

About 65-70% of all sheep's milk in France is used for production of Roquefort cheese. The milk in excess of Roquefort production is often sold to cheese producers in Italy. While \$35/



University of Minnesota ewes in automatic-locking stanchions in sheep milking parlor.

cwt for sheep's milk may seem high by U.S. cow's milk prices, realize that it takes only about 4 pounds of sheep's milk per pound of Roquefort, in contrast to 8-10 pounds of cow's milk per pound of cheddar cheese.

Sheep income for the French producers is about 65% from milk (\$90-\$100/ewe) and 35% from the sale of the 30-day-old, 10-12 kg lambs that are sold for 250-300 francs (\$28-\$33) each to people who specialize in feeding lambs. Thus, gross income approximates \$125-\$150 per ewe annually. A similar procedure could be adopted in the U.S.

The objectives of this research are to present some results of milking sheep and the manufacture of several types of sheep milk cheeses at the University of Minnesota and to examine the economic potential for creating a sheep milking industry that would put U.S. sheep producers in a position to capture a portion of the 25-million-pound U.S. market for sheep cheese.

Table 1. Milk production and milk composition

Category	N	Production, lbs (130 d)	Average daily production, lbs	%			Total solids
				Fat	Protein	Lactose	
Overall average	158	159	1.28	6.3	6.0	4.8	17.8
<i>Purebreds</i>	**	**	**	**	**		**
Suffolk	12	182	1.47	6.8	6.2	4.8	18.5
Targhee	12	155	1.25	6.5	6.1	4.8	18.1
Finn	11	107	.87	5.7	5.7	4.8	16.8
Dorset	11	145	1.16	6.7	6.5	4.8	18.3
Lincoln	12	141	1.13	6.5	6.1	4.8	17.3
Rambouillet	9	154	1.24	7.0	6.2	4.9	18.7
<i>Crossbreds</i>	**	**	**	**	**		**
Finn crosses	24	186	1.49	4.1	5.8	5.0	17.5
Dorset crosses	22	143	1.14	6.1	5.9	4.7	17.6
Lincoln crosses	21	172	1.39	6.3	5.9	4.7	17.5
Rambouillet crosses	24	159	1.28	6.6	5.9	4.8	18.3

** P<.05

Experimental Protocol and Results

In 1985 and 1986, data on 158 purebred Suffolk, Targhee, Finn, Dorset, Lincoln, and Rambouillet ewes and crossbred Finn, Dorset, Lincoln, and Rambouillet ewes were obtained. The ewes were machine milked twice daily, commencing 30 days post-lambing and continuing for 130 days. Total milk production was obtained for all ewes daily, individual ewe milk production was obtained weekly, and milk composition data were obtained biweekly. These data are summarized in table 1.

The average daily milk production of all ewes was 1.3 lb, an amount similar to the 1.3 lb daily produced by the Lacaune breed in France but much lower than the typical daily production of 4.8 lb produced by the East Friesian milk sheep (Mills, 1982). The crossbred ewes produced about 20% more milk (due to heterosis) than the purebred ewes. While the purebred Finn ewe was a poor milk producer, the Finn cross ewes were the best producers (table 1).

Ewes reach their peak in milk production during the first three to four weeks post-lambing, though the percent of fat and total solids increases about 2.5 percentage points from the 5th week until the 23rd week. Our research indicates that ewes that produce high quantities of milk one year tend to repeat with high yields in subsequent years. By culling out the low producing ewes, the average production of the remaining ewes would increase average yields 30 to 40%.

Cheese Manufacture

What's unique about sheep's milk? It has about twice as much fat, 40% more protein, and 30% more total solids than either cow's or goat's milk and produces a high yield of cheese from 100 pounds of milk. Most important, it imparts a distinctive flavor, aroma, and texture to cheeses that entice U.S. customers to pay about \$8 per pound for it. Furthermore, the demand isn't thin, as the U.S. imports about 25 million pounds of it (10% of all imported cheeses) annually. At only \$5 per pound, that's \$115 million! Some of the world's most popular cheeses, such as Roquefort from France, Feta from Greece, Ricotta and Picorino from Italy, and Manchego from Spain, are made from sheep's milk.

Table 2 gives a summary of several varieties of cheeses manufactured from the sheep milk in our experiment. A popular and valuable (higher retail price) variety is Roquefort. In this trial, the yield of Roquefort-type cheese was 21.9%. The

Manchego (Spanish type) was also rated high in consumer preference tests, but the yield in our trial was unexpectedly low (16.7%). While the quality of Feta produced was high and well accepted in consumer taste tests, it is a less valuable cheese in price (about 1/3 to 1/2 the retail value of Roquefort). Hence it would not be a recommended variety to produce in this country compared to the price of alternative varieties.

Table 2. Cheese types produced by various batches and yield (%), 1986

Cheese type	Milk wt., lbs	Cheese wt., lbs	Yield, %
Manchego	2,210	369	16.7
Feta	5,763	1,045	18.1
Romano	2,500	505	20.2
*Roquefort	<u>2,215</u>	<u>484</u>	<u>21.9</u>
Total	12,688	2,403	18.9

*Roquefort is a registered tradename and cheese made in USA cannot be called Roquefort.

A second sheep milk product, yogurt, may have equal or greater profit potential than cheese. Limited taste panel tests suggest that yogurt made from sheep's milk is a gourmet product and rates very high in consumer preference tests.

Sheep Milking Production Options

Based on typical ewe and lamb feed intakes and the following feed costs: hay, \$60 per ton; corn, \$1.96 per bushel; and creep feed, \$100 per ton; it costs the sheep producer about \$17.35 to raise one lamb that is nursing its dam (conventional production program) to 70 days of age. If the lamb were weaned at 30 days of age, the cost to 70 days of age would be \$18.80; and if the lamb were weaned at one day of age, raised on milk replacer for 30 days, and then grain fed to 70 days of age, the cost would be \$34 per lamb.

Using these realistic cost values for producing a 70-day-old lamb plus feed costs to produce 60 lb of weight from 70 days to market, a selling price of \$70 per 100 lb, and a price of \$.50 per pound of milk, a picture of comparative returns per ewe using the three production systems is presented in table 3.

Table 3. Comparative costs and returns per ewe^a

Feed costs to 70 d.	Feed costs, 70 d. to 110 lb	Total ewe, lamb feed to 110 lb	Total returns/ewe			Total return	Profit over costs
			110 lb lamb	Milk lb	Milk value		
			<i>Conventional (raise lamb on ewe)</i>				
\$17.35	\$9.12	\$26.47	\$77.00	0	0	\$77.00	\$50.53
			<i>Option 1 (milk ewe for 130 days)</i>				
\$18.80	\$9.60	\$38.40	\$77.00	160	\$80.00	\$157.00	\$128.60
			<i>Option 2 (milk ewe for 160 days)</i>				
\$34.00	\$9.60	\$53.60	\$77.00	225	\$112.50	\$189.50	\$145.90

^a Cost to produce 60 lb of gain on a 70-day-old lamb: conventional system, 3.8 lb feed/lb gain; options 1 and 2, 4.0 lb feed/lb gain. Milk yield: option 1, 160 lb; option 2, 65 lb for first 30 days (2.2 lb/day) plus 160 lb for last 130 days. Product value: lamb, \$70.00/100 lb; milk, \$.50/lb.

Weaning the lamb at 30 days and milking the ewe for 130 days increases the profit over feed costs from \$50.53 (for no milking) to \$128.60 (for 130 days of milking). Milking for 160 days results in \$145.90 profit per ewe over feed costs. Although more labor is required, milking ewes for 130 days provides sheep producers the opportunity to increase their income about \$7,800 for each 100 ewes milked. Our data suggest that with very modest milking equipment, about three hours per day would be required to milk 100 ewes. In France, 250-300 ewes are milked per producer-hour.

Future

For a sheep’s milk industry to blossom in the U.S., it takes three ingredients: customers for the products, sheep’s milk in reasonable quantities, and manufacturers and distributors.

The first ingredient, customers, already exists. The orchestration, or bringing together, of producers and manufacturers is the bottleneck. No one wants to produce sheep’s milk if it can’t be sold profitably, and no one can manufacture sheep’s milk cheese or yogurt if there is no sheep’s milk available. A viable cheese production unit would likely need a source of milk from 500-1,000 ewes. Recently, several producers on the east and west coasts have initiated the milking of ewes and the manufacture of sheep cheese.

A unique characteristic of sheep’s milk is that it can be frozen, stored or transported in a frozen state, and later thawed without affecting the character of the cheese made from it. This single characteristic enables the accumulation of sheep’s milk until an adequate amount is available for cheesemaking.

A cottage-type industry could also be initiated by individual producers who would milk their ewes and produce cheese on the farm. The University of Minnesota developed such a program for dairy cow producers with the development of “Farmstead Cheese” production. On-the-farm cheese production may be the most practical initial route to utilization of sheep’s milk. Sheep milk cheese production in the United Kingdom has increased 20 fold in the last 3 years. Most is produced and marketed as a cottage type industry. Can the same growth occur in the USA?

How many ewes would be required to produce the milk for

the production of only 20% of the 23 million pounds of imported sheep’s milk cheese? If we assume that it takes four pounds of sheep’s milk to produce one pound of cheese, then 23 million pounds of cheese x 4 x 20% = 18,400,000 pounds of sheep’s milk. If a ewe, after suckling her lamb for 30 days, produced 2 pounds of milk daily for 100 days, or 200 pounds of milk, it would require 92,000 ewes, or 920 flocks of 100 ewes each.

Start-Up Costs

To provide an estimate of what it would cost to initiate a sheep milking enterprise, here are the expenditures the University of Minnesota made in 1985. Since then, the value of the dollar has declined, and inflation has likely caused these costs to rise 60 to 90%.

Start-up costs to equip a 100-ewe milking parlor (University of Minnesota):

Twelve semiautomatic stanchions (Fullwood & Bland Ltd.)	\$ 653
Portable vacuum pump (Fullwood & Bland Ltd.)	163
Two single-unit buckets, complete with teat cup, liners, claws, and pulsator	259
Miscellaneous spare parts, hoses, oil	83
Brushes, cleaning products	6
Milking equipment subtotal	\$1,164
Stainless steel double sink, 1’10” x 4’ (new)	\$ 170
Refrigerated bulk tank with compressor, 200-gallon capacity, used	400
Refrigeration labor to connect and start up bulk tank cooling	124
Elevated wooden platform, approximately 5’ x 18’2”, 2’9” height	325
Several 10-gallon milk cans, used for transfer of milk to campus (on hand)	
Ancillary equipment subtotal	<u>\$1,019</u>
Total costs, not including labor for platform	\$2,183

As a livestock alternative, milking sheep for the production of sheep cheese or yogurt appears to have tremendous potential.

Sources of Sheep Milking Equipment

Alfa-Laval Agri, Inc.
11100 N. Congress Avenue
Kansas City, MO 64153-1222
Phone: 816-891-7700
Scott Sanford, National Product Manager

Gascoigne Milking Equipment, Ltd.
Edison Road, Hound Mills
Basingstoke, Hampshire
United Kingdom RG21 2YJ
Phone: 44-256-463355
A. H. Miles, Export Manager

Fullwood & Bland Ltd.
Ellesmere, Shropshire
United Kingdom SY12 9DF
Phone: 44-069-1712391
J. R. Roberts, Export Representative

Hastings Welding
1630 Vermillion Street
Hastings, MN 55033
Phone: 612-437-1733
Andre Menard, Manager

The Schlueter Company
216 Center Street
P.O. Box 548
Janesville, WI 53547
Phone: 608-756-1269
Wm. Davenport, Regional Sales Manager

New England Cheesemaking Supply Co.
P.O. Box 85
Ashfield, MA 01330
Phone: 413-628-3808
Robert Carroll, Manager

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