

COMPARISON OF EAST FRIESIAN-CROSSBRED AND LACAUNE-CROSSBRED EWE LAMBS FOR DAIRY SHEEP PRODUCTION

FIRST-YEAR RESULTS FROM A MULTI-YEAR TRIAL

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Summary

East Friesian-sired F1 ewe lambs (n = 27) and Lacaune-sired F1 ewe lambs (n = 31) born in 1999 were compared for lamb production, lactation performance, and udder morphology traits in a dairy sheep production environment in 2000. The ewe lambs were the progeny of seven East Friesian and five Lacaune sires. A contemporary group of high percentage East Friesian ewe lambs ($\geq 3/4$ East Friesian, n = 15), sired by two East Friesian sires, also were evaluated. Approximately 2/3 of the F1 ewe lambs were mated to a ram of the same breed as their breed of sire, and the remaining 1/3 were mated to a ram of the opposite breed. All of the high percentage East Friesian ewe lambs were mated to East Friesian rams. The F1 East Friesian and F1 Lacaune ewe lambs were similar for lamb production and udder morphology traits. The F1 East Friesian ewe lambs were superior to the F1 Lacaune ewe lambs by 15% for lactation length, 21% for milk yield, 9% for milk fat yield, and 10% for milk protein yield. However, none of the differences between the two ewe groups in lactation traits were statistically significant. Performance data will need to be collected on more ewes sired by East Friesian or Lacaune rams over additional years to determine if there are real differences between the two breeds for traits of economic importance. The high percentage East Friesian ewe lambs, mated to East Friesian rams, gave birth to more ($P < .05$) lambs, but the lambs had a higher ($P < .05$) mortality than lambs from the F1 East Friesian or F1 Lacaune ewes. This finding supports earlier results from our flock indicating that, at levels of East Friesian breeding greater than 50%, lamb mortality increases as the proportion of East Friesian breeding of the lamb increases.

Background

The raising of sheep for milk is a new enterprise to North American agriculture. Sheep in North America have been selected for meat and wool production. Therefore, one of the first major constraints to profitable sheep dairying was the low milk production of domestic breeds.

Rams of East Friesian breeding, a German dairy sheep breed (Alfa-Laval, 1984), were first imported into the U.S. in 1993 from Hani Gasser in Canada. The East Friesian cross ewes from these rams produced almost twice as much milk per lactation as domestic breed crosses (Dorset-crosses) under experimental conditions at the University of Wisconsin (UW-Madison) (Thomas et al., 1998, 1999a, 2000). Continued experimentation with East Friesian crosses at UW-Madison and their performance in commercial dairy flocks in the U.S. and Canada further showed their superiority for milk production, and most commercial operations moved quickly to crossbred, high percentage, or purebred East Friesian ewes. The accelerated move to East Friesians in North America was facilitated by the importation of semen, embryos, and live animals from Europe and New Zealand starting in 1992 – first to Canada and then to the U.S.

A second dairy sheep breed, the Lacaune from France (Alfa-Laval, 1984), is now available in North America. Josef Regli imported Lacaune embryos to Canada from Switzerland in 1996 (Regli, 1999), and the UW-Madison imported semen from three Lacaune rams into the U.S. from the U.K. and two Lacaune rams from Josef Regli in 1998.

While our early results at UW-Madison with crossbred sheep of 50% or less East Friesian breeding were very encouraging, previous researchers had reported some problems with East Friesian breeding, especially at levels of over 50%. In an experimental purebred East Friesian flock in Greece, 38.3% of the lambs were stillborn or not viable at birth, 29.6% of lambs born alive died before the age of two months, and 69.2% of lambs that were weaned died before one year of age. Ewes of 75% or greater East Friesian breeding that survived to one year of age had lifespans ranging from 2.0 to 2.7 years. Lamb survival and ewe longevity of East Friesian sheep were significantly lower than for the native Greek dairy breeds of Karamaniko Katsikas and Karagouniko that were their flockmates (Katsaounis and Zygoiannis, 1986). The major health problem observed in the East Friesian sheep in Greece was pneumonia in lambs and ovine progressive pneumonia (OPP) in ewes. Ricordeau and Flamant (1969) also reported an increased death loss to respiratory disease of East Friesian-cross lambs in France. In different years and with percentages of East Friesian breeding varying from 50% to 87.5%, they reported a 2.2% to 22.2% increased death loss in East Friesian-cross lambs from pasteurellosis and pneumonia compared to Préalpes du Sud lambs. The Préalpes du Sud is a French dairy breed whose type and performance was very similar to that of the Lacaune in the late 1960's (Ricordeau and Flamant, 1969). We also have reported decreased lamb survival in lambs of over 50% East Friesian breeding compared to lambs of 50% or less East Friesian breeding at UW-Madison (Thomas et al., 1999b, 2000).

Boyazoglu (1991) reviewed the results of experiments that evaluated the East Friesian in countries of the Mediterranean region. In all countries, the pure East Friesian was found to be unacceptable due to high incidence of respiratory disease and poor adaptability to high environmental temperatures, and only in Israel was a cross of the East Friesian with the local Awassi breed found to result in a more productive animal than the local breed (Gootwine and Goot, 1996).

East Friesian ewes also have been reported to have some undesirable milking characteristics relative to the Lacaune. Bruckmaier et al. (1997) reported that East Friesian ewes had a greater proportion of the udder cistern located below the exit into the teat channel, delayed oxytocin release and milk letdown, slower milk flow rates during milking, and longer milking times compared to Lacaune ewes.

The Lacaune breed has been selected in France for increased milk production under a sophisticated selection program incorporating artificial insemination, milk recording, and progeny testing of sires for longer than any other dairy sheep breed in the world. Annual genetic improvement for milk yield in the French Lacaune is estimated at 2.4% or 5.7 kg (Barillet, 1995). In the short - and medium-term, North America may rely on foreign countries for much of its dairy sheep genetics, and it is desirable to import genetics from a breed that is making continuous genetic improvement in its native country.

With the current availability of both East Friesian and Lacaune breeding in North America, UW-Madison initiated a study in 1998 to compare sheep sired by East Friesian rams and Lacaune rams for lamb, milk, and wool production under dairy sheep production conditions in Wisconsin. This paper will present some of the results from the first year of this study.

Materials and Methods

During the autumn of 1998, Dorset-cross, Polypay, and Rambouillet ewes were artificially inseminated or naturally mated to East Friesian or Lacaune rams. Seven purebred East Friesian rams and five purebred Lacaune rams were represented. Additionally, a group of ewes of 50% or greater East Friesian breeding was mated to two purebred East Friesian rams. Lambs from these matings were born from March 10 to May 24, 1999. Ninety ewe lambs were raised to mating age and naturally mated to rams between November 1, 1999 and January 2, 2000. All ewe lambs of 75% or greater East Friesian breeding ($n = 23$) were mated to East Friesian rams, ewe lambs of 50% East Friesian breeding ($n=33$) were mated to either East Friesian ($n=23$) or Lacaune ($n=10$) rams, and ewe lambs of 50% Lacaune breeding ($n=34$) were mated to either Lacaune ($n=24$) or East Friesian ($n=10$) rams. As a result of these matings, lambs born were of different percentages of dairy and East Friesian and Lacaune breeding – 87.5% or greater East Friesian, 75% East Friesian, 50% East Friesian and 25% Lacaune, 50% Lacaune and 25% East Friesian, and 75% Lacaune.

Two of the 90 ewe lambs present at mating died between the start of the mating season and the start of lambing. Of the 88 ewe lambs mated and alive at lambing, 87 gave birth (98.9% fertility) to 136 lambs (1.56 lambs per ewe lambing). In our management system, ewe lambs are typically placed on our DY30 system. The DY30 system is as follows: ewes nurse their lambs for approximately 30 days, after which lambs are weaned onto dry diets, and ewes are milked twice per day until a test day on which their total daily milk yield is less than .5 kg (.5 liters). Of the 87 ewes that lambed, 14 were placed on systems other than the DY30 system for use in other experiments. The results reported in this paper are for the 73 ewes and their 113 lambs on the DY30 system.

Models used to analyze the data were:

Lamb growth traits = lamb birth weight as a covariate + lamb sex + sire breed + dam breeding + lamb birth type (multiple or single). Birth weight was deleted from the model when birth weight was analyzed.

Ewe reproductive traits = ewe breeding.

Ewe lactation and udder morphology traits = litter size (single or multiple) + ewe breeding + litter size x ewe breeding interaction.

Lamb mortality rates were analyzed by Chi-square analysis using dam breeding by lamb survival (dead or alive) two-way tables.

Results and Discussion

Lamb production by ewe breeding is presented in Table 1. Reproduction, lamb mortality, and lamb growth were similar for 1/2 East Friesian and 1/2 Lacaune ewes. The highest percentage East Friesian ewes ($\geq 3/4$ East Friesian) gave birth to .35 more ($P < .05$) lambs per ewe lambing than the other two groups, but weaned no more lambs per ewe lambing because of a significantly greater lamb mortality to weaning at approximately 30 days of age. Lamb mortality to July 1, 2000 was high for all three ewe groups, especially after weaning, but was highest ($P < .05$) for lambs from the high percentage East Friesian ewes. Sixty-three percent of the lambs from the high percentage East Friesian ewes were dead by July 1, 2000. The high mortality rate of lambs of a high percentage of East Friesian breeding in this set of sheep supports similar findings in this flock from previous years (Thomas et al., 1999b, 2000).

Birth weight and growth to 30 days of age were similar for lambs from 1/2 East Friesian and 1/2 Lacaune ewes but lower for lambs from the high percentage East Friesian ewes (Table 1).

Table 2 presents the lactation performance of the three ewe groups. Compared to the two East Friesian groups, the 1/2 Lacaune ewes were lower by approximately 12 days for lactation length, 17 kg for milk yield, and .5 kg for fat and protein yield. However, none of these differences were statistically significant. More data will need to be collected to determine if these breed differences are real.

Table 1. Least squares means (\pm SE) for lamb production.

Trait	Ewe breeding		
	$\geq 3/4$ EF	1/2 EF	1/2 Lacaune
No. ewes lambing	15	27	31
Lambs born per ewe lambing, no.	1.87 \pm .12 ^a	1.52 \pm .09 ^b	1.52 \pm .09 ^b
Lambs weaned per ewe lambing, no.	1.27 \pm .16	1.33 \pm .12	1.42 \pm .11
Lamb mortality, birth – 30 d, % (no.)	33.3 ^a (9)	7.7 ^b (3)	8.7 ^b (4)
Lamb mortality, 30 d – July 1, 2000, % (no.)	44.4 (8)	34.3 (12)	21.4 (9)
Lamb mortality, birth – July 1, 2000, % (no.)	63.0 ^a (17)	39.5 ^b (15)	28.3 ^b (13)
Birth weight, kg	4.2 \pm .2 ^b	4.8 \pm .1 ^a	4.7 \pm .1 ^a
30-d weight, kg	13.0 \pm .6 ^b	14.5 \pm .3 ^a	14.0 \pm .3 ^{ab}
Preweaning average daily gain, g/d	283 \pm 18 ^b	332 \pm 12 ^a	317 \pm 11 ^{ab}

^{a,b} Within a row, means lacking a common superscript letter are different ($P < .05$).

Table 2. Least squares means (\pm SE) for lactation traits.

Trait	Ewe breeding		
	$\geq 3/4$ EF	1/2 EF	1/2 Lacaune
No. of ewes milked	15	27	31
Commercial milk yield, kg	106.5 \pm 16.3	104.0 \pm 8.4	88.3 \pm 8.0
Machine milking period, d	105.5 \pm 9.2	101.2 \pm 4.8	91.7 \pm 4.5
Average daily milk yield, kg	.98 \pm .11	.97 \pm .06	.92 \pm .05
Milk fat, %	5.46 \pm .44	5.57 \pm .22	5.65 \pm .22
Milk fat yield, kg	5.59 \pm 1.03	5.67 \pm .53	5.11 \pm .50
Milk protein, %	4.46 \pm .31	4.65 \pm .16	4.68 \pm .15
Milk protein yield, kg	4.58 \pm .78	4.66 \pm .40	4.17 \pm .38
Test-day 1 SCC, log units	4.71 \pm .31	4.56 \pm .16	4.98 \pm .15
Test-day 2 SCC, log units	5.04 \pm .21	4.93 \pm .11	5.25 \pm .12
Test-day 3 SCC, log units	5.00 \pm .20	5.01 \pm .12	5.22 \pm .12

Udder measurements (Table 3) were remarkably similar among the three ewe groups indicating similar udder shapes, udder sizes, and teat placements. The only difference of significance was longer ($P < .10$) teats of 1/2 East Friesian ewes compared to 1/2 Lacaune ewes.

Table 3. Least squares means (\pm SE) for udder morphology traits.

Trait	Ewe breeding		
	$\geq 3/4$ EF	1/2 EF	1/2 Lacaune
Teat thickness ¹ , mm	5.1 \pm .2	4.8 \pm .1	4.7 \pm .1
Udder circumference ² , cm	44.3 \pm 1.8	45.9 \pm 1.0	46.6 \pm .9
Cistern height ³ , cm	1.6 \pm .4	2.0 \pm .2	2.0 \pm .2
Teat length ⁴ , cm	2.7 \pm .2 ^{cd}	2.9 \pm .1 ^c	2.5 \pm .1 ^d
Teat width ⁵ , cm	1.5 \pm .2	1.6 \pm .1	1.5 \pm .1
Teat angle score ⁶ , no.	6.0 \pm .6	5.9 \pm .3	6.1 \pm .3
Udder half demarcation ⁷ , no.	1.4 \pm .2	1.7 \pm .1	1.6 \pm .1
Udder height score ⁸ , no.	4.4 \pm .3	4.1 \pm .2	4.6 \pm .2

¹ Average teat end thickness of both teats measured with a caliper immediately before milking.

² The distance around the udder at its widest point measured with a scrotal circumference tape.

³ The average distance of both udder halves from the bottom of the udder to the point of attachment of the teat.

⁴ The average length of the both teats measured from base of attachment to teat apex.

⁵ The average width of both teats measured at middle barrel.

⁶ Subjective score assigned to teat placement (caudal view): 1 = horizontal, 5 = 45°, and 9 = vertical.

⁷ Subjective score assigned to the udder half demarcation at the intramammary groove (caudal view): 1 = no demarcation, 5 = moderate demarcation, 9 = very strong demarcation.

⁸ Subjective score assigned to the height of the udder (caudal view): 1 = udder height closest to abdomen, 5 = udder height equivalent to the level of the hocks, 9 = pendulous udder that greatly surpasses the level of the hocks.

^{a,b} Within a row, means lacking a common superscript letter are different ($P < .05$).

^{c,d} Within a row, means lacking a common superscript letter are different ($P < .10$).

Conclusions

This is a progress report of the first comparison of East Friesian-cross and Lacaune-cross ewes in the U.S. The data are from the first year of a multi-year trial, and the number of animals evaluated to date is small. The 1/2 East Friesian and 1/2 Lacaune ewe lambs were similar for lamb production and udder morphology traits. The 1/2 East Friesian ewe lambs were superior to the 1/2 Lacaune ewe lambs by 15% for lactation length, 21% for milk yield, 9% for milk fat yield, and 10% for milk protein yield. However, none of the differences between the two ewe groups in lactation traits were statistically significant so data will need to be collected on more ewes over additional years to determine if there are real differences between the two breeds for traits of economic importance.

A contemporary group of high percentage East Friesian ewe lambs ($\leq 3/4$ East Friesian) mated to East Friesian rams produced lambs that had a significantly higher lamb mortality than lambs from the 1/2 East Friesian and 1/2 Lacaune ewes. This finding supports earlier results from our flock indicating that, at levels of East Friesian breeding greater than 50%, lamb mortality increases as the proportion of East Friesian breeding of the lamb increases.

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