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Summary

Lifetime (5 years) lamb and wool production from 207 straightbred Targhee (T) and 474 ¼ Finn-¼ Dorset-½ Targhee (FDT) crossbred ewes managed in a range or farm flock system were evaluated for ewe fertility, prolificacy, ewe fleece weight, and total lamb weight weaned per ewe exposed. Data included 2,620 ewe exposures, 2,384 parturitions, 4,638 lambs born, and 3,498 lambs weaned. Ewes were born in 1984 through 1987 and lambed first as 2-year-olds. Results are presented as average annual ewe performance, lamb performance and survival, and cumulative production. Cumulative production is presented on a per ewe present and on a per ewe entering the study basis. Data show that FDT ewes produced more total lamb than T ewes in both management systems, while T ewes produced more wool. Also, ewes in the range management system produced more lamb and less wool, although their wool was worth more total dollars. Economic comparisons are given.

Key Words: Sheep, Breed, Management System, Lifetime Production

Introduction

Improving the reproductive rate of the ewe flock offers one of the greatest single opportunities for increasing the efficiency of lamb production. Combining ewe breeds that have specific strengths should result in a more productive ewe. Crossing Finnsheep, known for high prolificacy, with the Dorset, known for milking ability and meat conformation, and the Targhee, known for hardiness and wool production, should result in a highly productive ewe. This study was designed to compare the lifetime lamb and wool production of ¼ Finn-¼ Dorset-½ Targhee (FDT) ewes to straightbred Targhee (T) ewes under a farm or range production system.

Experimental Procedure

A total of 681 April-born T and FDT ewe lambs born in 1984 through 1987 at the Antelope Range Livestock Research Station, Buffalo, SD, were evaluated in this study. Lambs were reared with their dams on native range until weaning in August when they were moved to the Sheep Research and Teaching Unit at Brookings, SD. Upon arrival, lambs were placed in drylot, started on a grower ration, shorn, and treated for internal and external parasites. Lambs had ad libitum access to a 50% alfalfa hay:50% corn mixed ration until a weight of approximately 45 kg was reached. Lambs remained on the grower ration on a limited fed basis until approximately 1 yr of age, when they were randomly allotted within breed to either the farm (Brookings) or the range management system (Buffalo). Approximately June 1, ewes allotted to the range system were returned to the Antelope Range Livestock Station where they were managed for subsequent production cycles. Data included 2,620 ewe exposures, 2,384 parturitions, 4,638 lambs born, and 3,498 lambs weaned.

Ewes in both management systems were managed as a typical farm or range system. Management practices common to both systems included use of Hampshire rams as terminal sires, a 35-day breeding season, shearing 30 to 60 days before lambing, and shed lambing. Ewes in both locations with newborn lambs were placed in individual lambing pens within the lambing shed for 1 to 2 days. Ewes and

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lambs were moved into grouping pens when lambs were 2 to 3 days old. Ewes were not allowed to nurse more than two lambs. Lambs in excess of two or lambs that were doing poorly were classified as "bums" and sold. Ewes were not given any credit for weaning weight of bums that were sold nor were they included in calculating percentage of survival to weaning. Traits included in the analysis were ewe fertility (1 = lambed, 0 = open), ewe prolificacy (lambs born per ewe lambing; 1, 2, 3, 4), lambs born per ewe exposed (1, 2, 3, 4), lambs weaned per ewe exposed (0, 1, 2), ewe fleece weight (kg), total lamb weight weaned per ewe exposed kg), and ewe lambing date. Ewes that did not lamb or ewes that lambed but not rearing any lambs received 0 for total lamb weight weaned. Individual lamb weaning weights were adjusted to a common 70 days of age for total lamb weight weaned per ewe exposed.

Results and Discussion

Average Annual Ewe Production. Ewe fertility was similar (P = .30) between FDT and T ewes (Table 1). Fertility of range flock ewes was higher (P < .01) than for farm flock ewes (94.5 vs 88.7%, respectively). Range flock ewes were exposed later in the fall which may explain their higher fertility rate. Thus, time of mating may be more important than management system on fertility. Finn-Dorset-Targhee ewes had a higher (P < .01) prolificacy rate (lambs per ewe lambing) than T ewes (2.11 vs 1.75). The FDT ewes had a higher prolificacy rate than T ewes at all ages, although the difference tended to narrow as age increased. Farm flock ewes produced more (P < .01) lambs per ewe lambing than range flock ewes (Table 1). On a per ewe exposed basis, FDT ewes produced 22% more lambs than T ewes (1.94 vs 1.59; Table 1). Management system did not affect the number of lambs born per ewe exposed. Lambs weaned per ewe exposed favored FDT ewes by an average of .23 lambs per year (Table 1). Had credit been given for lambs that were bummed, this difference would have been even greater. Range flock ewes weaned .16 more lambs (P < .01) than farm flock ewes.

Table 1. Least squares means and standard errors of ewe breed and management system for fertility, prolificacy, number of lambs born and weaned per ewe exposed[1]

Main effect	Fertility, %	Prolificacy[2]	No. born	No. weaned
Ewe breed				
FDT[3]	92.2 ± .82	2.11 ± .02[a]	1.94 ± .02[a]	1.41 ± .02[a]
Targhee	91.0 ± 1.1	1.75 ± .03[b]	1.59 ± .03[b]	1.18 ± .03[b]
Management system				
Farm	88.7 ± .99[a]	2.00 ± .02[a]	1.77 ± .03	1.22 ± .02[a]
Range	94.5 ± .94[b]	1.86 ± .02[b]	1.76 ± .02	1.38 ± .02[b]

[1]Average annual production.
[2]Lambs born per ewe lambing.
[3]FDT = ¼ Finn-¼ Dorset-½ Targhee.
[a,b]Means within a main effect lacking a common superscript differ (P < .0001).

Targhee ewes produced 1.0 kg more ($P < .01$) wool annually than FDT ewes (Table 2). Ewes in the farm flock produced heavier fleeces ($P < .01$) than those in the range flock. Using actual prices received not including incentive payments, T ewes returned $2.60 more for wool per year per ewe than FDT ewes. Although range ewes produced less wool, the prices received were higher. Therefore, the range flock returned $.75 more for wool per ewe per year than farm flock ewes.

Total lamb weight weaned per ewe exposed favored ($P < .01$) FDT ewes (Table 2) over T ewes and the range system over the farm flock ewes. Using $1.43 per kilogram of feeder lamb price, FDT ewes returned $5.50 more annually than T ewes. Therefore, the dollar increase in lamb production was in excess of two times the difference in wool value, not including the incentive payment.

Table 3 shows the number and percentage of ewes present at breeding. Forty-seven percent of the ewes remained for the fifth lamb crop. More ($P < .01$) FDT than T ewes remained (48.5 vs 43.0%) and range ewes had greater longevity than farm flock ewes.

Table 2. Least squares means and standard errors of ewe breed and management system for average annual fleece weight, total lamb weight weaned, and ewe body weight

Main effect	Fleece wt, kg	Total lamb wt, kg	Ewe body wt, kg
Ewe breed			
FDT[1]	3.5 ± .02[a]	33.8 ± .54[a]	67.9 ± .39[a]
Targhee	4.5 ± .03[b]	29.9 ± .76[b]	70.6 ± .55[b]
Management system			
Farm	4.2 ± .03[a]	29.0 ± .65[a]	70.7 ± .60[a]
Range	3.8 ± .03[b]	34.7 ± .65[b]	67.8 ± .36[b]

[1]FDT = ¼ Finn-¼ Dorset-½ Targhee.
[a,b]Means within a main effect lacking a common superscript differ ($P < .0001$).

Table 3. Number and percentage of ewes present at breeding by ewe breed, management system, and age of ewe

	Management system and ewe breed[1]									
	Farm				Range					
Age of ewe	FDT		T		FDT		T		Total	
2	244	(100)[2]	101	(100)	230	(100)	106	(100)	681	(100)
3	235	(96)	83	(82)	214	(93)	103	(97)	635	(93)
4	204	(84)	68	(67)	187	(81)	92	(87)	551	(81)
5	159	(65)	48	(48)	157	(68)	70	(66)	434	(64)
6	107	(44)	33	(33)	123	(53)	56	(53)	319	(47)
Total	949		333		911		427		2620	

[1] FDT = ¼ Finn-¼ Dorset-½ Targhee; T = Targhee.
[2] Number of ewes present followed by percentage of original ewes in the study in parenthesis.

Lamb Performance and Survival. Targhee ewes produced heavier lambs ($P < .01$) at birth (5.2 vs 4.6 kg) and at weaning (28.8 vs 25.4 kg) than FDT ewes (Table 4). Birth weights between management system did not differ. However, lambs from range ewes were heavier at weaning than those in the farm flock (26.2 vs 24.9 kg). Type of birth (single, twin, and triplet) and sex of lamb all affected lamb birth weight. This effect of type of birth and sex was also evident at weaning.

Lamb survival (Table 5) was higher for lambs from FDT dams than for lambs from T dams, even though FDT ewes had a higher lambing rate and lambs that were lighter at birth. Lamb survival (defined as number of lambs weaned per number born) was higher ($P < .01$) for range flock lambs compared to the farm flock lambs (76.6 vs 70.4%). Higher survivability of the range lambs could be due in part to the environment in which they were raised. Range ewes spent only a few days in confinement and crowded areas. On the other hand, lambs from the farm flock ewes were in semi-confinement until weaning. These lambs had a higher probability of being exposed to respiratory diseases. In addition, cold and wet (muddy) lot conditions could have contributed to their lower survival. The smaller the litter size the higher the survival rate. As reported earlier, farm flock ewes had a higher lambing rate which would also contribute to the lower survival. Furthermore, since ewes in this study were only allowed to raise a maximum of two lambs, higher lambing rate ewes would appear to have poorer lamb survival. When bum lambs were included in the analysis, overall lamb survival increased about 10%.

Cumulative Lamb and Wool Production. Lamb and wool production from each year (ewe age 2, 3, 4, 5, 6) was added to the previous total for that ewe to show a cumulative total over time. If a ewe failed to lamb or did not rear any lamb, she received a zero for that year's production. Cumulative production was evaluated on a per ewe present and on a per ewe entering the study basis. Thus, in the per ewe entering the study analysis ewes that died or were culled received a zero for subsequent years. From a practical standpoint, this measure probably is the most useful in predicting the difference one might expect from using these breed combinations in these management situations.

Table 4. Least squares means and standard errors of ewe breed, management system, lamb sex, and lamb birth type on lamb birth and weaning weights

Main effect	Birth wt (n)	Birth wt (kg)	Weaning wt (n)	Weaning wt (kg)
Ewe breed				
FDT[1]	3,463	4.6 ± .02[a]	2,601	25.4 ± .14[d]
Targhee	1,175	5.2 ± .03[b]	897	25.8 ± .20[e]
Management system				
Farm	2,270	4.9 ± .03	1,648	24.9 ± .17[a]
Range	2,368	4.8 ± .03	1,850	26.2 ± .16[b]
Lamb sex				
Female	2,353	4.7 ± .03[a]	1,796	25.1 ± .16[a]
Male	2,285	5.0 ± .03[b]	1,702	26.1 ± .16[b]
Birth type				
Single	548	5.7 ± .04[a]	464	28.8 ± .26[a]
Twin	2,904	4.9 ± .02[b]	2,351	24.5 ± .14[b]
Triplet	1,186	4.0 ± .03[c]	683	23.4 ± .23[c]

[1] FDT = ¼ Finn-¼ Dorset-½ Targhee.
[a,b,c]Means within a main effect lacking a common superscript differ (P<.0001).
[d,e]Means within a main effect lacking a common superscript differ (P<.05).

Table 5. Least squares means and standard errors of ewe breed, management system, lamb sex, and lamb birth type on lamb survival

Main effect	Lambs reared, %	Lambs reared, % including those bummed
Ewe breed		
FDT[1]	75.6 ± 1.01[a]	84.2 ± .86
Targhee	71.4 ± 1.38[b]	82.2 ± 1.18
Management system		
Farm	70.4 ± 1.22[a]	78.2 ± 1.05[a]
Range	76.6 ± 1.18[b]	88.2 ± 1.01[b]
Lamb sex		
Female	74.1 ± 1.13	84.4 ± .97
Male	72.8 ± 1.16	82.0 ± .99
Birth type		
Single	84.1 ± 1.88[a]	86.1 ± 1.61[a]
Twin	79.7 ± .99[b]	85.6 ± .86[a]
Triplet	56.6 ± 1.42[c]	77.9 ± 1.22[b]

[1]FDT = ¼ Finn-¼ Dorset-½ Targhee.
[a,b,c]Means within a main effect lacking a common superscript differ (P<.01).

On a per ewe entering the study basis, FDT ewes produced 1.72 more lambs at birth than T ewes and weaned 1.1 more lambs (Table 6). After five lamb crops, FDT ewes had produced 21.2 kg more lamb weight weaned than T ewes. This amounts to 2,120 kg more lamb per 100 ewes entering the flock. At $1.43 per kg of lamb weight at weaning, this would be $3,031.60 (or $30 per ewe) advantage for use of the crossbred ewe.

Table 7 shows the comparison of management systems. The range system was superior in number born, number weaned, and total weight weaned but not total wool produced after 5 years. Targhee ewes produced 2.5 kg more wool than FDT ewes with a calculated advantage of $7.60 without the incentive payment. Although on a grease weight basis farm flock ewes produced more wool, the price advantage of range ($1.80/kg) to farm ($1.45/kg) flock wool resulted in ewes in the range flock returning $4.06 more for wool without the incentive payment than farm flock ewes.

Tables 8 and 9 show the results on a per ewe present or "snapshot" view at each age of ewe. At each age of ewe, only those ewes present at breeding were included in the analysis. Since only the more productive ewes remained to older ages, these figures are higher than on a per ewe entering the study basis. Also, fewer numbers of ewes were used in the analysis due to ewes leaving the study. These results reflect what production might be expected at any given point in time but ignores ewe longevity and culling. As expected, the advantage of the crossbred ewe for lamb production is greater and actual values higher for both breeds of ewe. The advantage for wool is also greater for T ewes in this analysis.

In summary, results presented provide the relative production differences of this particular crossbred ewe compared to the straightbred ewes used in this study. This information should be useful to producers in evaluating alternative production choices.

Table 6. Least squares means and standard errors for cumulative lamb and wool production per ewe entering the study by ewe breed

Ewe breed	n	Age of ewe 2	3	4	5	6
				No. Born		
FDT[a]	474	1.86 ± .10[b]	3.69 ± .10[b]	5.24 ± .10[b]	6.46 ± .10[b]	7.42 ± .10[b]
Targhee	207	1.33 ± .15[c]	2.80 ± .15[c]	4.07 ± .15[c]	4.98 ± .15[c]	5.70 ± .15[c]
				No. Weaned		
FDT	474	1.47 ± .08[d]	2.85 ± .08[b]	4.02 ± .09[b]	4.85 ± .09[b]	5.48 ± .09[b]
Targhee	207	1.13 ± .13[e]	2.27 ± .13[c]	3.23 ± .13[c]	3.88 ± .13[c]	4.38 ± .13[c]
				Lamb Wt Weaned (kg)		
FDT	474	35.2 ± 2.1	68.5 ± 2.1[b]	97.1 ± 2.1[b]	117.8 ± 2.1[b]	131.7 ± 2.1[b]
Targhee	207	29.2 ± 3.2	58.1 ± 3.3[c]	82.1 ± 3.3[c]	98.6 ± 3.3[c]	110.5 ± 3.3[c]
				Wool Production (kg)		
FDT	474	3.2 ± .18[f]	6.7 ± .17[b]	9.6 ± .17[b]	12.0 ± .17[b]	13.6 ± .17[b]
Targhee	207	3.8 ± .27[g]	8.0 ± .27[c]	11.5 ± .26[c]	14.2 ± .26[c]	16.1 ± .26[c]

[a]FDT = ¼ Finn-¼ Dorset-½ Targhee.
[b,c]Means within a column within main effect lacking a common superscript differ ($P < .01$).
[d,e]Means within a column within main effect lacking a common superscript differ ($P < .05$).
[f,g]Means within a column within main effect lacking a common superscript differ ($P < .10$).

Table 7. Least squares means and standard errors for cumulative lamb and wool production per ewe entering the study by management system

Management system	Age of ewe				
	2	3	4	5	6
			No. Born		
Farm	1.60 ± .12	3.27 ± .12	4.66 ± .12	5.67 ± .12	6.38 ± .12[c]
Range	1.58 ± .12	3.23 ± .12	4.65 ± .12	5.78 ± .12	6.74 ± .12[d]
			No. Weaned		
Farm	1.30 ± .10	2.49 ± .11	3.45 ± .11[c]	4.04 ± .11[a]	4.48 ± .11[a]
Range	1.30 ± .11	2.63 ± .11	3.80 ± .11[d]	4.69 ± .11[b]	5.39 ± .11[b]
			Lamb Wt Weaned (kg)		
Farm	31.6 ± 2.6	60.0 ± 2.7[e]	81.8 ± 2.7[a]	96.2 ± 2.7[a]	106.5 ± 2.7[a]
Range	32.8 ± 2.6	66.6 ± 2.6[f]	97.4 ± 2.6[b]	120.2 ± 2.6[b]	135.8 ± 2.6[b]
			Wool Production (kg)		
Farm	3.4 ± .21	6.7 ± .17[c]	11.2 ± .22[a]	13.6 ± .22[a]	15.2 ± .22[a]
Range	3.6 ± .22	7.0 ± .22[d]	10.0 ± .22[b]	12.5 ± .22[b]	14.5 ± .22[b]

[a,b]Means within a column within main effect lacking a common superscript differ ($P<.01$).
[c,d]Means within a column within main effect lacking a common superscript differ ($P<.05$).
[e,f]Means within a column within main effect lacking a common superscript differ ($P<.10$).

Table 8. Least squares means and standard errors for cumulative lamb and wool production per ewe present in the study by ewe breed

Ewe breed	Age of ewe 2	3	4	5	6
			No. Born		
FDT[a]	1.86 ± .06[b]	3.85 ± .06[b]	5.82 ± .07[b]	7.82 ± .08[b]	9.96 ± .09[b]
Targhee	1.35 ± .09[c]	2.98 ± .10[c]	4.66 ± .11[c]	6.44 ± .13[c]	8.11 ± .15[c]
			No. Weaned		
FDT	1.47 ± .06[b]	2.98 ± .06[b]	4.53 ± .06[b]	6.00 ± .07[b]	7.61 ± .08[b]
Targhee	1.15 ± .09[c]	2.44 ± .09[c]	3.71 ± .10[c]	5.13 ± .12[c]	6.57 ± .13[c]
			Lamb Wt Weaned (kg)		
FDT	35.1 ± 1.5[d]	71.5 ± 1.5[b]	109.6 ± 1.6[b]	146.4 ± 1.8[b]	183.8 ± 2.1[b]
Targhee	29.8 ± 2.3[e]	62.6 ± 2.4[c]	94.2 ± 2.6[c]	130.0 ± 3.0[c]	165.7 ± 3.5[c]
			Wool Production (kg)		
FDT	3.2 ± .09[b]	6.9 ± .09[b]	10.5 ± .10[b]	14.2 ± .11[b]	17.6 ± .13[b]
Targhee	3.8 ± .14[c]	8.6 ± .14[c]	13.2 ± .15[c]	17.9 ± .18[c]	22.5 ± .21[c]
n	681	635	551	434	319

[a]FDT = ¼ Finn-¼ Dorset-½ Targhee.
[b,c]Means within a column within main effect lacking a common superscript differ ($P<.01$).
[d,e]Means within a column within main effect lacking a common superscript differ ($P<.05$).

Table 9. Least squares means and standard errors for cumulative lamb and wool production per ewe present in the study by management system

Management system	Age of ewe				
	2	3	4	5	6
			No. Born		
Farm	1.62 ± .08	3.43 ± .08	5.29 ± .09	7.22 ± .10	9.18 ± .12[c]
Range	1.59 ± .08	3.39 ± .08	5.19 ± .08	7.04 ± .09	8.89 ± .11[d]
			No. Weaned		
Farm	1.32 ± .07	2.66 ± .07	4.00 ± .08[c]	5.35 ± .09[a]	6.92 ± .11[c]
Range	1.30 ± .07	2.76 ± .07	4.24 ± .08[d]	5.78 ± .09[b]	7.27 ± .10[d]
			Lamb Wt Weaned (kg)		
Farm	32.0 ± 1.8	64.0 ± 1.9[c]	94.8 ± 2.1[a]	127.0 ± 2.4[a]	165.2 ± 2.9[a]
Range	32.9 ± 1.8	70.1 ± 1.9[d]	109.0 ± 2.0[b]	149.4 ± 2.2[b]	184.3 ± 2.5[b]
			Wool Production (kg)		
Farm	3.4 ± .11	8.1 ± .11[a]	12.6 ± .12[a]	16.9 ± .14[a]	21.1 ± .17[a]
Range	3.6 ± .11	7.3 ± .11[b]	11.1 ± .12[b]	15.1 ± .13[b]	19.0 ± .15[b]

[a,b]Means within a column within main effect lacking a common superscript differ ($P<.01$).
[c,d]Means within a column within main effect lacking a common superscript differ ($P<.05$).