Lifetime Lamb and Wool Production of Targhee or Finn-Dorset-Targhee Ewes Managed as Farm or Range Flock: I. Average Annual Ewe Performance

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ABSTRACT: Lifetime (5 yr) lamb production and wool production from 207 straightbred Targhee (T) and 474 1/4 Finn-1/4 Dorset-1/2 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 the first time as 2-yr-olds. Expressed as mean annual values, ewe fertility rates were similar (92.2 vs 91.0%, \(P = .30\)) for FDT and T ewes. Finn-Dorset-Targhee ewes had higher (\(P < .001\)) prolificacy (2.11 vs 1.75), weaned more lambs per ewe exposed (1.41 vs 1.18), produced more total lamb weight weaned per ewe exposed (33.8 vs 29.9 kg), and lambed 2 d earlier than T ewes. Targhee ewes produced more (\(P < .001\)) wool (4.5 vs 3.5 kg) than FDT ewes. Range flock ewes had a higher (\(P < .001\)) fertility rate (94.5 vs 88.7%), higher number of lambs weaned per ewe exposed (1.38 vs 1.22), and higher total lamb weight weaned per ewe exposed (34.7 vs 29.0 kg) than farm flock ewes. Farm flock ewes had a higher (\(P < .001\)) prolificacy (2.00 vs 1.86) and produced more wool (4.2 vs 3.8 kg) than range flock ewes. Targhee ewes had heavier lambs at birth (5.2 vs 4.6 kg; \(P < .001\)) and at weaning (25.8 vs 25.4 kg; \(P < .05\)). Range flock lambs were heavier (\(P < .001\)) at weaning than farm flock lambs (26.2 vs 24.9 kg). Lambs from FDT dams had a higher (\(P < .01\)) survival rate than lambs from T dams (75.6 vs 71.4%). Lamb survival from birth to weaning was higher (\(P < .001\)) for range flock lambs than for farm flock lambs (76.6 vs 70.4%). Incorporation of Finnsheep and Dorset breeding increased the reproductive performance in both management systems but decreased wool production.

Key Words: Sheep, Ewes, Management, Productivity, Systems, Wool

Introduction

A main goal of sheep producers is to increase the overall productivity of their flocks. One way of achieving this is to increase the genetic potential of their animals. Improvement in the reproductive rate of the ewe flock offers one of the greatest single opportunities for increasing the efficiency of lamb meat production (Shelton, 1971). The use of the Finnsheep in crossbreeding to combine the meat conformation and adaptability of other breeds with the high prolificacy of the Finnsheep breed presents a rapid means of increasing efficiency of lamb production (Terrill, 1974).

Weight of lambs at birth and at weaning are important components of overall ewe flock productivity because of their effect on lamb survival, lamb growth rate, and therefore total lamb weight marketed. Survival of lambs to weaning is a major factor affecting the number of lambs weaned per ewe lambing, and it has a strong genetic correlation with weight of lambs weaned per ewe lambing (Fogarty et al., 1985). The high relative efficiency in crossing indicated for purebred Dorset and Targhee ewes suggests their use in crosses with highly prolific breeds such as the Finnsheep to produce ewe replacements for intensive spring lambing programs (Dickerson and Glimp, 1975). Crossbred ewes of these breeds should benefit from average gene effects as well as from heterosis (Dickerson and Laster, 1975; Dickerson et al., 1975).

In this study, 1/4 Finn-1/4 Dorset-1/2 Targhee (FDT) and straightbred Targhee (T) ewes managed in either a farm or range system were evaluated for lifetime lamb and wool production.
Materials and Methods

**Populations.** 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. Data included 2,620 ewe exposures, 2,384 parturitions, 4,638 lambs born, and 3,498 lambs weaned. Ewes lambed the first time as 2-yr-olds. Each birth group of ewes was given five opportunities to lamb during the 10 yr of this study. The duration of the study (8-yr span of lambings) should remove any concerns of "year" effects. The numbers of ewes by breed, treatment, and year entering the study have been reported previously (Iman and Slyter, 1993). 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, they were placed in drylot, started on a grower ration, shorn, and treated for internal and external parasites. They had ad libitum access to a 50% alfalfa hay:50% corn mixed diet until a weight of approximately 45 kg was reached. Lambs remained on the same diet but on a limited 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). On approximately June 1, ewes allotted to the range system were returned to the Antelope Range Livestock Research Station where they were managed for subsequent production cycles.

Ewes in both systems were considered typically managed for their respective areas. Management practices common to both systems included use of Hampshire rams as terminal sires, a 35-d breeding season, shearing 30 to 60 d 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 d. Ewes and lambs were moved into grouping pens when lambs were 2 to 3 d 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 given lambing credit for "bum" lambs but not weaning credit. All lambs were weaned and(or) weights were taken at a mean age of 65 to 75 d. Lamb weaning weights were adjusted to a common age of 70 d using the SID (1988) equation that includes birth weight. The result from this analysis would show the benefit of having a system of raising bum lambs. A separate analysis for lamb survival was calculated from the number of lambs born that were present at weaning. The model used to analyze lamb traits was similar to the ewe model, except in addition it contained sex of lamb and lamb birth type effects. A few quadruplet lambs were present in the data set and were combined with the triple-born lambs for analysis.

**Statistical Analysis.** Traits included in the analysis were ewe fertility (1 = lambed, 0 = nonpregnant), ewe prolificacy (lambs born per ewe lambing; 1, 2, 3, 4), lambs born per ewe exposed (0, 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 did not rear any lambs received 0 for total lamb weight weaned. The statistical model used to analyze ewe traits was $Y_{ijkl} = \mu + B_i + M_j + AY_{kl} + E_{ijkl}$, where $\mu =$ overall mean, $B_i =$ the effect of ewe breed type ($i = 1, 2$), $M_j =$ the effect of management system ($j = 1, 2$), $AY_{kl} =$ the effect of ewe age nested within lambing year, and $E_{ijkl} =$ random variation. All main effects were considered to be fixed. All two- and three-way significant interactions ($P < .10$) were included in the model. Only significant ($P < .01$) breed x management system interactions are reported. The effect of age was nested within lambing year. Although not a truly nested effect, it explained the effects of age, lambing year, and their interactions. Ewe lambing date was analyzed by breed within management system to effectively evaluate lambing date in each location.

For lamb performance, traits evaluated were lamb birth weight (kg), lamb weaning weight (kg), and lamb survival (%). Lamb survival was calculated from the number of lambs born that were present at weaning. The model used to analyze lamb traits was similar to the ewe model, except in addition it contained sex of lamb and lamb birth type effects. A few quadruplet lambs were present in the data set and were combined with the triple-born lambs for analysis. A separate analysis for lamb survival was calculated in which 100% of bum lambs were assumed to survive to weaning. The result from this analysis would show the benefit of having a system of raising bum lambs. The GLM procedure of SAS (1985) was used to perform all analyses.

Results and Discussion

**Fertility.** Ewe fertility was similar ($P = .30$) between the FDT and T ewes (92.2 vs 91.0%; Table 1). Ercanbrack and Knight (1985) reported fertility rates of 93.2 and 92.7% for 1/4 Finn and purebred Targhee, Columbia, and Rambouillet ewes. Sagari et al. (1993) found Targhee and 1/4 Finn-1/4 Dorset-1/2 Targhee ewes to have fertility rates of 87 and 89%, respectively.

Management system, which in this study included different breeding dates, had a significant effect ($P < .001$) on ewe fertility. Range flock ewes had a higher fertility rate than farm flock ewes (94.5 vs 88.7%). Range flock ewes were exposed later in the breeding season than the farm flock ewes. As the breeding season progresses, more and more ewes should be cycling. Therefore, conception rate would be expected to be higher for range ewes.
Table 1. Least squares means and standard errors of ewe breed and management system for average annual fertility, prolificacy, and number of lambs born and weaned per ewe exposed.

<table>
<thead>
<tr>
<th>Main effect</th>
<th>No.</th>
<th>Fertility, %</th>
<th>Prolificacy, no.</th>
<th>Lambs born per ewe exposed, no.</th>
<th>Lambs weaned per ewe exposed, no.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ewe breed</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FDT</td>
<td>1,860</td>
<td>92.2 ± .82</td>
<td>2.11 ± .02c</td>
<td>1.94 ± .02c</td>
<td>1.41 ± .02c</td>
</tr>
<tr>
<td>Targhee</td>
<td>760</td>
<td>91.0 ± 1.1</td>
<td>1.75 ± .03d</td>
<td>1.59 ± .03d</td>
<td>1.18 ± .03d</td>
</tr>
<tr>
<td><strong>Management system</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm</td>
<td>1,282</td>
<td>88.7 ± .99c</td>
<td>2.00 ± .02c</td>
<td>1.77 ± .03</td>
<td>1.22 ± .02c</td>
</tr>
<tr>
<td>Range</td>
<td>1,338</td>
<td>94.5 ± .94d</td>
<td>1.86 ± .02d</td>
<td>1.76 ± .02</td>
<td>1.38 ± .02d</td>
</tr>
</tbody>
</table>

*aAverage annual production.

*bFDT = 1/4 Finn-1/4 Dorset-1/2 Targhee.

c,dMeans within a main effect lacking a common superscript differ (P < .001).

**Prolificacy.** Finn-Dorset-Targhee ewes had 21% higher (P < .001) prolificacy than T ewes (2.11 vs 1.75; Table 1). Other researchers have reported increased prolificacy rates for Finn-cross ewes, also. Ercanbrack and Knight (1985) reported a 24% higher prolificacy rate for mature (2 to 7 yr) 1/4 Finn ewes compared with purebred Targhee, Columbia, and Rambouillet ewes. Lewis and Burfening (1988) noted a 22% higher prolificacy rate for 1/4 Finn ewes compared with Columbia, Rambouillet, and Targhee ewes. Notter and McClaugherty (1991) found a 15% higher litter size for 1/4 Finn ewes than for Western ewes. Figure 1 shows the effect of ewe age on prolificacy. Finn-Dorset-Targhee ewes had a higher prolificacy rate at each age compared with the T ewes.

**Management system significantly affected (P < .001) ewe prolificacy.** Farm flock ewes produced more lambs than range flock ewes (2.00 vs 1.86, Table 1). Hohenboken et al. (1976) also reported significant management system effects on prolificacy, with ewes managed in hill pasture having lower prolificacy than ewes managed in irrigated pasture.

**Lambs Born Per Ewe Exposed.** Finn-Dorset-Targhee ewes gave birth to .35 (22%) more (P < .001) lambs than T ewes (1.94 vs 1.59; Table 1). Farm and range flock ewes had similar (P > .10) numbers of lambs born per ewe exposed (1.77 vs 1.76).

**Lambs Weaned Per Ewe Exposed.** Finn-Dorset-Targhee ewes weaned .23 more (P < .001) lambs than T ewes (1.41 vs 1.18; Table 1). This is in agreement with work reported by Lewis and Burfening (1988) that mature (2- to 6-yr-old) 1/4 Finn ewes had .24 more (P < .01) lambs at 60 d of age than Columbia, Rambouillet, and Targhee ewes (1.32 vs 1.08).

Range flock ewes weaned .16 more (P < .001) lambs than farm flock ewes (1.38 vs 1.22). Hohenboken et al. (1976) reported that ewes managed in hill pasture had greater lamb survival to weaning than ewes managed in irrigated pasture.

**Wool Production.** Targhee ewes produced 1.0 kg more (P < .001) wool per ewe per year than FDT ewes (4.5 vs 3.5 kg; Table 2). This is in agreement with other studies that found heavier fleece weights for Targhee ewes compared with Finn and Finn-cross ewes (Price, 1971; Oltenacu and Boylan, 1981b; Ercanbrack and Knight, 1985; Gallivan et al., 1987; Lewis and Burfening, 1988; Sagari et al., 1993).

**Figure 1. Effect of ewe age on prolificacy.** SEM = .04.
Table 2. Least squares means and standard errors of ewe breed and management system for average annual fleece weight, total lamb weight weaned, ewe body weight, and ewe efficiency

<table>
<thead>
<tr>
<th>Main effect</th>
<th>Fleece wt&lt;sup&gt;a&lt;/sup&gt;, kg</th>
<th>Total lamb wt&lt;sup&gt;a&lt;/sup&gt;, kg</th>
<th>Ewe body wt&lt;sup&gt;b&lt;/sup&gt;, kg</th>
<th>Relative efficiency&lt;sup&gt;c&lt;/sup&gt;</th>
<th>Efficiency percent, %</th>
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<tr>
<td><strong>Ewe breed</strong></td>
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<tr>
<td>FDT&lt;sup&gt;d&lt;/sup&gt;</td>
<td>3.5 ± .02&lt;sup&gt;e&lt;/sup&gt;</td>
<td>33.8 ± .54&lt;sup&gt;e&lt;/sup&gt;</td>
<td>67.9 ± .39&lt;sup&gt;e&lt;/sup&gt;</td>
<td>1.65 ± .04&lt;sup&gt;e&lt;/sup&gt;</td>
<td>100&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Targhee</td>
<td>4.5 ± .03&lt;sup&gt;f&lt;/sup&gt;</td>
<td>29.9 ± .76&lt;sup&gt;f&lt;/sup&gt;</td>
<td>70.6 ± .55&lt;sup&gt;f&lt;/sup&gt;</td>
<td>1.47 ± .05&lt;sup&gt;f&lt;/sup&gt;</td>
<td>89&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Management system</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Farm</td>
<td>4.2 ± .03&lt;sup&gt;e&lt;/sup&gt;</td>
<td>29.0 ± .65&lt;sup&gt;e&lt;/sup&gt;</td>
<td>70.7 ± .60&lt;sup&gt;e&lt;/sup&gt;</td>
<td>1.45 ± .05&lt;sup&gt;e&lt;/sup&gt;</td>
<td>87&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Range</td>
<td>3.8 ± .03&lt;sup&gt;f&lt;/sup&gt;</td>
<td>34.7 ± .65&lt;sup&gt;f&lt;/sup&gt;</td>
<td>67.8 ± .56&lt;sup&gt;f&lt;/sup&gt;</td>
<td>1.67 ± .03&lt;sup&gt;f&lt;/sup&gt;</td>
<td>100&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>Average annual production.

<sup>b</sup>Body weight at prebreeding.

<sup>c</sup>Relative efficiency = total lamb weight weaned per ewe exposed/ewe metabolic weight.

<sup>d</sup>FDT = 1/4 Finn-1/4 Dorset-1/2 Targhee.

<sup>e</sup><sup>f</sup>Means within a main effect lacking a common superscript differ (P < .001).

Farm flock produced .8 kg heavier (P < .001) fleeces than FDT ewes in the farm flock (4.6 vs 3.8 kg), whereas T ewes in the range flock produced 1.1 kg heavier (P < .001) fleeces than the FDT ewes in the range flock (4.4 vs 3.3 kg).

The economic difference in wool production was estimated by breed and management system. Actual wool prices received were used and did not include incentive payments. The prices received over the course of the study were averaged by breed and management system. These prices (dollars per kg) were Targhee 1.76, FDT 1.52, range 1.80, and farm 1.45. Targhee ewes returned $2.60 more wool income per ewe per year than the FDT ewes. Although range ewes produced less wool, the prices received were higher for the range flock than for the farm flock. Therefore, range flock ewes returned $.75 more wool income per ewe per year than farm flock ewes.

Total Lamb Weight Weaned Per Ewe Exposed. Finn-Dorset-Targhee ewes weaned 3.9 kg more total lamb weight (P < .001) annually per ewe exposed than T ewes (33.8 vs 29.9 kg; Table 2). Other studies have found that Finn cross ewes weaned more total lamb weight than other breeds (Thomas and Whiteman, 1979; Magid et al., 1981; Oltenacu and Boylan, 1981a; Fogarty et al., 1984; Ercanbrack and Knight, 1985; Lewis and Burfening, 1988). In contrast, Sagari et al. (1993) found no difference in total lamb weight weaned per ewe exposed between 1/4 Finn ewes and Targhee ewes. Figure 3 shows the effect of ewe age on total lamb weight weaned. Finn-Dorset-Targhee ewes weaned more weight at each age than did the T ewes. Range flock ewes weaned 5.7 kg more total lamb weight (P < .001) annually per ewe exposed than farm flock ewes (34.7 vs 29.0 kg).

Using $1.43 (the average local price of feeder lambs during this period) per kilogram of feeder lamb weight, the FDT ewes returned $5.50 more per ewe per year than the Targhee ewes. Range flock ewes returned $8.10 more per ewe per year than the farm flock ewes.

Ewe Body Weight. Targhee ewes were heavier (P < .001) at prebreeding than FDT ewes (70.6 vs 67.9 kg; Table 2). Ewes managed in the farm flock were heavier (P < .001) than ewes managed in the range flock (70.7 vs 67.8 kg). Ewe body weight and management system interaction was significant (P < .001) for ewe body weight. Targhee and FDT ewes in the farm flock had similar (P > .10) prebreeding weights (70.7 vs 70.7 kg, respectively), whereas T ewes in the range flock were heavier (P < .001) than the FDT ewes (70.6 vs 65.2 kg).

Ewe Efficiency. Efficiency of each genotype was calculated by dividing total lamb weight weaned per ewe exposed by ewe metabolic body weight (Kleiber, 1975). Finn-Dorset-Targhee ewes produced 1.65 kg of lamb weight per unit of ewe metabolic body weight, whereas the T ewes produced 1.47 kg of lamb weight (Table 2). The efficiency of Targhee ewes was estimated relative to the FDT ewes. Therefore, FDT ewes were 11% more (P < .001) efficient than T ewes. Range flock ewes produced 1.67 kg of lamb weight per unit of ewe metabolic body weight compared with farm flock ewes, which produced 1.45 kg of lamb weight.

![Figure 2. Effect of ewe age on annual fleece weight. SEM = .06.](image-url)
Table 3. Least squares means and standard errors of average annual ewe lambing date (days after January 1)

<table>
<thead>
<tr>
<th>Ewe breed</th>
<th>Farm</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDT&lt;sup&gt;a&lt;/sup&gt;</td>
<td>59.1 ± .35&lt;sup&gt;b&lt;/sup&gt;</td>
<td>108.7 ± .24&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Targhee</td>
<td>61.6 ± .51&lt;sup&gt;c&lt;/sup&gt;</td>
<td>110.6 ± .32&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>FDT = 1/4 Finn-1/4 Dorset-1/2 Targhee.
<sup>b</sup,c</sup>Means within a main effect lacking a common superscript differ (P < .001).

Thus, range flock ewes were 13% more (P < .001) efficient than farm flock ewes.

**Lambing Date.** Ewe lambing date was analyzed for each location separately because ewes lambed at different dates by design (Table 3). Finn-Dorset-Targhee ewes lambed, on the average, 2 d earlier than T ewes in both management systems. This is in agreement with other studies that found earlier lambing dates (Cochran et al., 1984; Ercanbrack and Knight, 1985; Sagari et al., 1993) and shorter gestation lengths (Meyer and Bradford, 1973; Maijala and Osterberg, 1977) of Finn cross ewes compared with other ewes.

**Longevity.** The numbers of ewes present at breeding by ewe breed, management system, and age of ewe are shown in Table 4. The percentage of ewes remaining for the fifth lambing as 6-yr-olds was higher (P < .01) in the range flock (53.3%) than in the farm flock (40.5%). A higher than expected rate of ketosis and subsequent death losses in the farm flock in 1988 account for part but not all of this difference. Finn-Dorset-Targhee ewes had greater longevity (P < .01) than T ewes (48.5 vs 43.0%). Ercanbrack and Knight (1989) reported Finn cross ewes remained in the flock at slightly, but not significantly, older ages than purebred Columbia, Rambouillet, and Targhee ewes in a range environment. The overall percentage remaining (47%) was similar to that reported by Busch and Slyter (1985) where 46% of the original experimental flock remained in the study after 6 yr.

**Lamb Birth Weight.** Targhee ewes produced heavier (P < .001) lambs at birth than FDT ewes (5.2 vs 4.6 kg; Table 5). This agrees with other studies that reported heavier lambs from Targhee ewes than from Finn cross ewes (Magid et al., 1981; Oltenacu and Boylan, 1981b; Notter et al., 1991; Sagari et al., 1993).

Lamb birth type significantly affected (P < .001) lamb birth weight. Single-born lambs were heavier than twin-born lambs (5.7 vs 4.9 kg), and twin-born lambs were heavier than triplet-born lambs (4.9 vs 4.0 kg). This is in agreement with other studies (Sidwell and Miller, 1971; Magid et al., 1981; Oltenacu and Boylan, 1981b; Sagari et al., 1993).

**Lamb Weaning Weight.** Targhee ewes weaned heavier (P < .05) lambs than FDT ewes (25.8 vs 25.4 kg; Table 5). Fogarty et al. (1984) reported higher lamb weaning weight for Targhee ewes than for Finn cross ewes. In contrast, Lewis and Burfening (1988) reported that, although the progeny of 1/4 Finn ewes were lighter at birth, lamb weaning weights at 60 d of age were not different from the progeny of Columbia, Rambouillet, or Targhee ewes.

Even though farm flock lambs were creep fed, lambs from range flock ewes were heavier (P < .001) at 70 d than lambs from farm flock ewes (26.2 vs 24.9 kg). Walker et al. (1993) reported ewes that lambed on the range had higher lamb weaning weights than ewes shed lambed. Hohenboken et al. (1976) reported hill pasture ewes to wean more kilograms per ewe lambing and per ewe exposed than irrigated pasture ewes.

Male lambs were 1.0 kg heavier (P < .001) than female lambs at weaning (26.1 vs 25.1 kg). Other studies also found male lambs to be heavier at weaning than female lambs (Oltenacu and Boylan, 1981b; Iniguez et al., 1986).

Lamb birth type affected (P < .001) lamb weaning weight. Single lambs were heavier than twin lambs (28.8 vs 24.5 kg), and twin lambs were heavier than triplet lambs (24.5 vs 23.4 kg). This is in agreement with other studies that found single-born lambs to be heavier than multiple-born lambs (Oltenacu and Boylan, 1981b; Iniguez et al., 1986).

Figure 3. Effect of ewe age on total lamb weight weaned annually. SEM = .72.
Table 4. Number and percentage of ewes retained at breeding by ewe breed, management system, and age of ewe

<table>
<thead>
<tr>
<th>Age of ewe</th>
<th>Farm</th>
<th></th>
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<th>Range</th>
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<tr>
<td></td>
<td>FDT</td>
<td>T</td>
<td></td>
<td>FDT</td>
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<tr>
<td>2</td>
<td>244 (100)</td>
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<td>230 (100)</td>
<td>106 (100)</td>
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<td>3</td>
<td>235 (96)</td>
<td>83 (82)</td>
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<td>214 (93)</td>
<td>103 (97)</td>
<td>635 (93)</td>
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<tr>
<td>4</td>
<td>204 (84)</td>
<td>68 (67)</td>
<td></td>
<td>187 (81)</td>
<td>92 (87)</td>
<td>551 (81)</td>
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<tr>
<td>5</td>
<td>159 (65)</td>
<td>48 (48)</td>
<td></td>
<td>157 (68)</td>
<td>70 (66)</td>
<td>434 (64)</td>
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<tr>
<td>6</td>
<td>107 (44)</td>
<td>33 (33)</td>
<td></td>
<td>123 (53)</td>
<td>56 (53)</td>
<td>319 (47)</td>
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</tr>
<tr>
<td>Total</td>
<td>949</td>
<td>333</td>
<td></td>
<td>911</td>
<td>427</td>
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</tbody>
</table>

$^a$FDT = 1/4 Finn-1/4 Dorset-1/2 Targhee; T = Targhee.
$^b$Number of ewes present followed by percentage of ewes beginning the study in parentheses.

Lamb Survival. Lambs from FDT dams had a higher (P < .01) survival rate than lambs from T dams (75.6 vs 71.4%; Table 6), although FDT ewes had a higher prolificacy rate. Oltenacu and Boylan (1981a) reported a higher survival rate for Finn lambs than for Targhee lambs. In contrast, others have found no difference in lamb mortality by ewe breed (Thomas and Whiteman, 1979; Ercanbrack and Knight, 1985). Busch (1985) observed a 25% lamb death rate of lambs from Targhee, Targhee-Suffolk, or Targhee-Finn sheep ewes, which is similar to the results obtained in this study. Yearling production data reported previously showed no difference (P > .10) in lamb survival between lambs from T and FDT dams or between the farm and range management systems (Iman and Slyter, 1993).

Management system had a significant effect (P < .001) on lamb survival. Lamb survival from birth to weaning was higher for range flock lambs than for farm flock lambs (76.6 vs 70.4%). Range ewes spent only a few days in confinement with crowded conditions. Range lambs grazed native range with their dams until weaning. On the other hand, lambs from farm flock ewes were in a semi-confinement situation until weaning. Thus, lambs in the farm flock system may have had a higher probability of exposure to diseases. In addition, the frequently cold and wet environmental conditions during early spring lambing in eastern South Dakota could have had a generally negative effect on survivability. Hohenboken and Clarke (1981) reported higher lamb survival in ewes managed in irrigated pasture vs ewes managed in hill pasture, although the difference was not significant.

The ewe breed and management system interaction was significant (P < .01) for lamb survival. Lamb survival was similar (P > .10) for lambs from FDT dams and lambs from T dams in the range flock (76.6 vs 76.6%). In contrast, lambs from FDT ewes had higher (P < .001) survival rates than lambs from T dams in the farm flock (74.6 vs 66.1%).

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

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

$^a$FDT = 1/4 Finn-1/4 Dorset-1/2 Targhee.
$^b,c,d$Means within a main effect lacking a common superscript differ (P < .001).
$^e,f$Means within a main effect lacking a common superscript differ (P < .05).
Sex of lamb had no effect (P > .10) on lamb survival, although female lambs had a numerically higher survival rate than male lambs (74.1 vs 72.8%). Other researchers reported higher survival for female lambs than male lambs (Oltenacu and Boylan, 1981a; Lewis and Burfening, 1988; Bunge et al., 1993; Sagari et al., 1993). In contrast, others reported no difference in lamb survival by sex (Dickerson et al., 1975; Notter and Copenhagen, 1980; Ercanbrack and Knight, 1985).

Single-born lambs had a higher (P < .001) survival rate than twin-born lambs (84.1 vs 79.7%). In turn, twin-born lambs had a higher survival rate than did triplet-born lambs (79.7 vs 56.6%). This is in agreement with other studies that reported a decrease in lamb survival as litter size increased (Dickerson, 1977; Magid et al., 1981; Oltenacu and Boylan, 1981a; Iniguez et al., 1986; Castonguay et al., 1990; Sagari et al., 1993).

Table 6 shows the least squares means and standard errors of lamb survival for all lambs including the bum lambs. When 100% of bum lambs were assumed survived to weaning, overall lamb survival increased about 10%. For a 100-ewe flock, an additional .2 lambs per ewe per year (or 20 lambs) could be weaned if all bum lambs were raised to weaning.

### Implications

Finn-Dorset-Targhee ewes produced more total lamb weight and less wool than straightbred Targhee ewes under both management systems. However, the loss in wool was less economically important than the gain in lamb production. Using lamb and wool prices actually received during this study, 1/4 Finn-1/4 Dorset-1/2 Targhee ewes were 5.5% more productive in their lifetime compared with Targhee ewes. It is important to note that, because the ewes in the study were restricted to rear only two lambs, this practice may have limited highly productive ewes (i.e., 1/4 Finn-1/4 Dorset-1/2 Targhee cross ewes) from performing up to their genetic potential. Therefore, had the ewes been allowed to rear all their lambs, the difference between the breeds might have been greater. Although lambs from 1/4 Finn-1/4 Dorset-1/2 Targhee dams were lighter at birth than lambs from Targhee dams, weaning weights were similar and survivability was higher. Results from this study indicate that 1/4 Finn-1/4 Dorset-1/2 Targhee crossbred ewes provide a greater financial total return than Targhee ewes in both range and farm flock production systems.

### Literature Cited


