

Study: Terminal Sheep Breeds for Use in Western Range Operations

Evaluation of Columbia, USMARC Composite, Suffolk and Texel rams as terminal sires in an extensive rangeland production system. Part I: Ewe productivity and lamb survival, growth and feed efficiency.

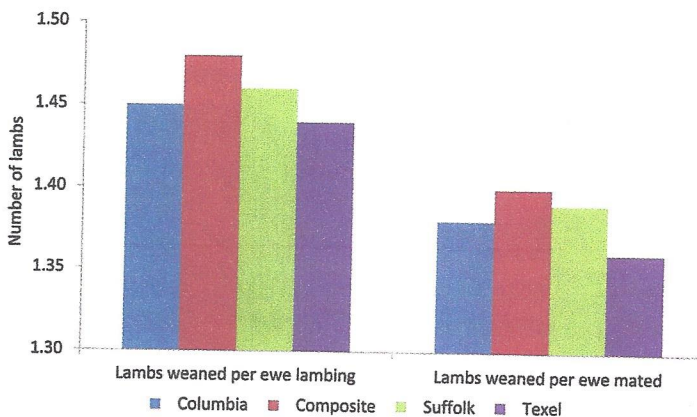
Mating systems involving crossing of terminal sire sheep breeds with superiority for production characteristics such as growth rate and feed efficiency with well-adapted maternal breeds provide opportunity to increase lamb carcass value while maintaining acceptable environmental adaptation in the crossbred lambs. Large, lean terminal-sire breeds such as the Suffolk and Columbia have been most typically used in extensive rangeland conditions found in much of the western United States. Intense selection in these breeds for adult body weight and frame size led to correlated increases in growth rate but also concerns regarding fitness and survival rates to weaning in resulting crossbred lambs, and other less-extreme terminal-sire types of most moderate size have been increasingly promoted as alternatives.

An experiment was therefore carried out at the U.S. Sheep Experiment Station (USSES), Dubois, Idaho, to compare Columbia, USMARC Composite, Suffolk and Texel sires in matings with Rambouillet ewes in an extensive rangeland production system. USMARC Composite rams were developed at the U.S. Meat Animal Research Center (USMARC), Clay Center, Neb., in the early 1970s from crosses among Columbia (50%), Suffolk (25%) and Hampshire (25%). The study included intensive characterization of ewe productivity and lamb survival, growth, composition and feed efficiency. Matings to produce experimental animals were made in 2005, 2006 and 2007.

Experimental Procedures

Columbia, Suffolk and Texel rams (n=22, 22, and 21, respectively) were sampled from industry and USSES flocks, and Composite rams (n = 22) were obtained from USMARC. Approximately one half of

Figure 1. Numbers of lambs weaned per ewe mated for Rambouillet ewes mated to Columbia, Composite, Suffolk, and Texel rams. Differences among sire breeds were not statistically significant.




Suffolk rams and one quarter of Columbia rams were obtained from flocks participating in the U.S. National Sheep Improvement Program and were selected for high estimated breeding values (EBV) for 120-day post-weaning weight. Most rams were purchased as yearlings and transferred to USSES in the summer preceding their first use in breeding. A few older rams were used in 2006 and 2007 to provide genetic connections between years.

Ewes were selected from the USSES Rambouillet flock and were 3 to 7 years old at lambing.

In each year, rams and ewes were joined in single-sire pens for 21 days beginning in mid-October. Ewes lambed in March and early April in outdoor lots under frequent surveillance. Ewes and lambs were placed in small pens for 24 to 48 hours and then comingled in outdoor lots. Male lambs were castrated at birth. Ewes and lambs were moved to sagebrush steppe in late April and herded on subalpine range beginning in early July. Lambs were weaned in early August at approximately 132 days of age. In each year, lambs were assigned, within sex and sire breed, to one of three replicated drylot pens and fed a series of diets over six weeks to facilitate transition from a pre-weaning forage diet to a high-energy (85% digestible) finishing diet. Feed was provided for free-choice intake in a single feeder in each pen to allow monitoring of feed intake, with a maximum of 16 lambs per pen. Lambs were scanned every two weeks using ultrasound during the postweaning period to monitor changes in fat depth and loin muscle area.


Results and Discussion

Over three years, rams of the four terminal sire breeds were used

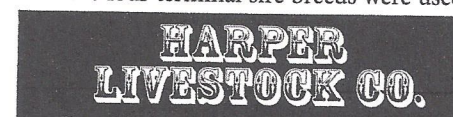


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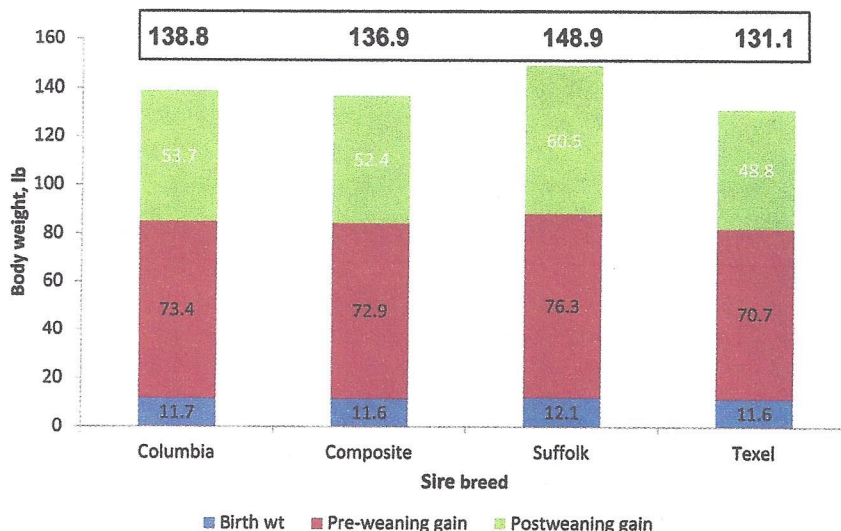
in 1,018 matings with Rambouillet ewes. These matings resulting in 908 lambings and produced 1,834 lambs. Weaning weights were recorded for 1,306 lambs, and 1,049 of these lambs were evaluated for postweaning performance.

Ewe Reproduction and Lamb Survival

The fertility of adult Rambouillet ewes in this project averaged 95%. The average number of lambs born per ewe lambing was 2.02. Numbers of lambs weaned per ewe exposed or per ewe lambing are shown in Figure 1. Production levels were broadly typical of commercial flocks in the region, with overall averages of 1.45 lambs weaned per ewe lambing and 1.38 lambs weaned per ewe exposed. No significant sire breed differences were observed for the percentage of ewes that lambled or for numbers of lambs born or weaned per ewe exposed or per ewe lambing.

Shed-lambing management protocols were designed to minimize death losses in the first 24 to 48 hours following lambing. However, ewes were subsequently managed under extensive conditions on desert or mountain range with minimal shepherding until weaning. The adult Rambouillet ewes used in this study were moderately prolific, with approximately 17% triplet births. Essentially all triplet litters had one lamb orphaned or fostered and a few twin litters

Figure 3. Body weights at birth, weaning, and 90 days postweaning for lambs sired by Columbia, Composite, Suffolk, and Texel rams. Values within shaded columns are birth weights and gains during the pre- and postweaning periods



were also reduced to a single lamb in cases where the milk supply of the ewe appeared insufficient to raise twins. Approximately 6% of the lambs were born dead and approximately 14% of the lambs were orphaned or fostered to other ewes. The proportions of lambs that were orphaned or fostered did not differ among sire breeds. Survival rates to weaning (including lambs that were dead at birth) were 92.5% for Suffolk-sired lambs,

and were significantly superior to survival rates recorded for Texel-sired lambs (86.4%) and Columbia-sired lambs (87.3%).

Our results, therefore, contradict previous studies that reported lower survival rates for Suffolk-sired crossbred lambs compared to lambs sired by Texel or Composite rams. Those studies used prolific Romanov-crossbred ewes and included ewes lambing at 1 and 2 years of age, and ewes were not monitored during the night. By contrast, our ewes were 3 to 7 years old and were closely monitored at lambing. Rambouillet ewes are also known to have relatively long gestations; the average birth weight for lambs in this study was nearly 12 lbs. (Figure 3).

Lamb Growth

Growth rates before and after weaning clearly favored Suffolk-sired lambs (Figure 3). Lambs sired by smaller-framed Texel rams were lightest at weaning and after 90 days in the feedlot. Columbia- and Composite-sired lambs were similar in weaning weight, but lambs sired by the larger-framed Columbia rams grew more rapidly after weaning compared to Composite-sired lambs. Suffolk-sired lambs were thus 3 to 5 lbs. heavier at weaning and 10 to 18 lbs. heavier at 90 days after weaning than lambs sired by rams of the other breeds.

Feed Efficiency

Efficiency of feed conversion was assessed as the ratio of pounds of gain achieved relative to Mcal (calories x 1,000) of metabolizable energy consumed. Results are expressed as a percentage of the overall mean, and higher values indicate more efficient growth. Suffolk-sired lambs grew most efficiently to all harvest endpoints. This result largely reflected their more rapid postweaning gain and greater leanness. Differences in efficien-

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cy of feed conversion among remaining sire breeds were small at 90 days on test. However, Columbia- and Texel-sired lambs tended to be less efficient than Composite-sired lambs at both 132 lb and 0.25 inches of ultrasonic backfat. This result can be explained by the slower growth and greater fatness of Texel-sired lambs. However, Columbia-sired lambs were also relatively inefficient despite their large adult body size, relatively rapid gains and tendency to stay lean.

Reasons for observed differences in feed conversion efficiency among sire breeds were investigated in greater detail by calculating residual feed intake (RFI) for each breed group during the feeding period. The RFI is derived as the difference between the observed feed intake and that predicted from the average body weights (i.e., average maintenance requirements) and daily gains of the lambs. Lambs that gain rapidly relative to body weight normally have greater feed conversion efficiency, although poor efficiency of Columbia-sired lambs in this study demonstrated that is not always the case. Adjustment of observed feed intake for body weight and average daily gain provides an indication of inherent differences in efficiency resulting from possible breed differences in things such as maintenance requirements at comparable body weights, energy lost due to differences in voluntary activity, lower energy density (i.e., less fat) in the gain, and greater efficiency in digestion and metabolism of nutrients. Negative values for RFI are desirable, indicating that less feed was required to maintain comparable body weights and achieve comparable rates of gain.

Columbia-sired lambs consistently required more feed to maintain body weight and achieve a fixed level of gain. Differences among remaining breeds were small but

tended to favor Texel-sired lambs. Our results suggest relatively poor efficiency of feed use in Columbia-sired lambs, but remaining breed differences appear to mainly reflect difference in growth rates relative to body size and maintenance requirements.

Conclusions

Suffolk rams were superior to rams of other breeds as sires of crossbred market lambs in this extensive rangeland production system. As expected, Suffolk-sired lambs grew more rapidly before and after weaning and were superior in efficiency of feed conversion. Suffolk sires were also equal or superior to rams of other breeds in ewe fertility and prolificacy and lamb survival.

Composite-sired lambs were equal or superior to the remaining breeds for most measured traits, but grew more slowly and less efficiently than Suffolk-sired lambs. Composite sires have been recommended for use in relatively stressful production conditions such as pasture lambing, summer mating, lambing of yearling ewes and use of prolific ewes, but were not superior to Suffolk sires in lamb survival or ewe productivity under our conditions.

Texel-sired lambs grew more slowly than lambs sired by the other breeds, but generally had favorable residual feed intake values. This result suggests opportunity to develop new composite lines that can capitalize on favorable effects of the Suffolk on growth rate and possible favorable effects of the Texel on feed efficiency.

These results suggest that more intense selection for growth rate and efficiency of feed conversion are required in order for the Columbia to compete directly with the Suffolk as a terminal sire. Columbia breeders thus need to consider the relative merits of the breed's existing dual-purpose role in extensive rangeland sheep production compared to opportunities to develop more specialized

maternal or terminal-sire lines.

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