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# Lamb and Wool Production from Purebred And Crossbred Ewes

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## SUMMARY

This bulletin reports on a 12-year study of wool and lamb production from Rambouillet, Panama, Targhee, Panama x Targhee (PxT) and Rambouillet x Panama x Targhee (RxPxT) ewes.

Grease fleece weights of the crossbred (PxT and RxPxT) ewes were significantly higher than any of the parental breeds. The PxT ewes produced the most estimated clean wool but not significantly higher than the Panama ewes. The RxPxT ewes ranked third, the Targhee ewes fourth, and the Rambouillet ewes last in estimated clean fleece weight. The PxT ewes had the longest fleeces but again the difference between them and the Panama ewes was not significant. Rambouillet ewes had the finest fleeces, the Targhee and RxPxT ewes next finest, and the Panama and PxT ewes had the coarsest wool.

Largest fleeces were produced at 3, 4, and 5 years of age, with younger and older ewes yielding lighter production.

There was little evidence of heterosis in body weight; the crossbred ewes were generally intermediate between the parental breeds in live weights. Total lamb production (average weaning weight x weaning percentage) was higher for the Panama and crossbred ewes than for the Targhee or Rambouillet ewes. This difference was caused primarily by a variation in weaning percentages. The weaning weights of the lambs from the various ewe groups were similar — with only the Rambouillet lambs significantly lighter at weaning than the lambs from the other groups. Two-year-old ewes and seven-year-old ewes produced significantly lighter lambs than ewes intermediate in age.

In weaning scores and wool length, Panama lambs ranked highest followed by lambs from the Targhee, the PxT, the RxPxT, and the Rambouillet ewes. These differences were smaller when the ewes were bred to Suffolk rams — and were larger when whiteface rams were used.

When bred to Suffolk rams, ewes from the different breeding groups produced lambs whose carcasses showed little difference in loin eye size or leg scores. Differences were noted in carcass fat, however. Lambs from the Rambouillet and the Targhee ewes had less fat than the Panama and crossbred lambs. Ram lambs had less fat than ewe or wether lambs.

## THE AUTHORS

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### AGRICULTURAL EXPERIMENT STATION

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# Lamb and Wool Production from Purebred And Crossbred Ewes

T. Donald Bell, C. W. Hodgson, Dale O. Everson

The primary objectives of this sheep breeding study were to compare lamb and wool production of Rambouillet, Panama, and Targhee purebred ewes with that of their crosses, and to determine if a system of rotational crossbreeding would provide continuous hybrid vigor and increased lamb and wool production compared with the purebreds.

Crossing blackface rams with whiteface ewes is a common practice of market lamb producers in Idaho and many other areas of the West. Dahmen et al. (1969) found that Suffolk-sired lambs from Panama ewes were heavier at birth and weaning than graded Panama lambs. Shelton and Carpenter (1970) reported that Hampshire, Suffolk, and Columbia-sired lambs out of Rambouillet ewes gained faster than the straightbred Rambouillet lambs. Sidwell and Miller (1971 a, b, c), working with several whiteface and blackface breeds of sheep, also reported advantages in fertility and weaning weights in the crossbred over the straightbred. Carcass qualities of the blackface x whiteface lambs have generally been found to be superior to the purebred whiteface lambs (Gates et al., 1964; Botkin, Riley and Field, 1971; Galgan et al., 1971).

Comparisons of purebred and crossbred lambs within the whiteface breeds such as the Rambouillet, Columbia, Panama, and Targhees are more limited and show less evidence of heterosis. Bell et al. (1967) found purebred Panama lambs had heavier weaning weights and more desirable weaning scores than Rambouillet or Targhee lambs or crosses of the three breeds. Purebred Columbia lambs had superior weaning performance compared to Rambouillet or Targhee lambs or crossbred lambs from these three breeds. However, no evidence of heterosis in weaning weights or scores was found by Bell, Madsen and Bennett (1950) or by Bennett, Knight and Mathews (1962). When these different breeds of ewes and their crosses were bred to Suffolk rams, the differences in weaning weights and scores were small and generally nonsignificant (Mathews, Madsen and Bennett, 1965). However, Ercanbrack, Van Horn and Blackwell (1970), working with crosses among Rambouillet, Targhee, and Columbia sheep, reported strong evidence of hybrid vigor in the crosses for weaning weight and staple length at weaning.

Table 1. Grease fleece weight and body weight of ewes — least squares means for all breeds, 1955-1968.\*

Mean	Number	Grease fleece weight	Body weight
		lb.	lb.
Total	1385	13.04	163
Age of ewe			
2 yrs	397	12.47c	155c
3 yrs	297	13.78a	166a
4 yrs	242	13.72a	167a
5 yrs	184	13.23ab	168a
6 yrs	135	12.88bc	167a
7 yrs	86	12.57c	163ab
8 & 9 yrs	44	12.68bc	160bc
Breed			
Rambouillet	265	12.60b	155d
Panama	194	12.50b	170a
Targhee	562	12.71b	162bc
PxT	262	13.79a	166ab
RxPxT	102	13.60a	159bcd

\*Figures with different subscripts are significantly different ( $P \leq .05$ ).

Table 2. Yield, length, and grade of wool from ewes — least squares means for all breeds, 1966-1968.\*

Mean	Number	Estimated clean yield	Wool grade	Wool length
Total	468	6.70	58.9	103.0
Age of ewe				
2 yrs	122	6.54bc	59.62a	100.21c
3 yrs	96	7.14a	59.29a	106.37a
4 yrs	77	7.25a	59.03a	102.19b
5 yrs	69	6.92ab	59.16a	101.32c
6 yrs	58	7.11a	58.92a	103.03bc
7 yrs	31	6.64bc	59.29a	98.98c
8 & 9 yrs	15	6.00c	58.41a	103.00bc
Breed				
Rambouillet	95	6.00d	63.19a	91.56c
Panama	97	7.10ab	56.22c	108.20a
Targhee	80	6.48cd	59.53b	101.82b
PxT	112	7.25a	56.49c	111.68a
RxPxT	84	6.66bc	59.02b	101.58b

\*Figures with different subscripts are significantly different ( $P \leq .05$ ).



Madsen, Mathews and Bennett (1965), comparing the wool production of yearling Rambouillet, Columbia, and Targhee ewes and their crosses, found the Columbias produced the most clean wool, followed by the Columbia x Targhee ewes. Little evidence of heterosis in wool production in the crossbreds was shown. Sidwell et al. (1971), however, working with several blackface and whiteface breeds, reported that heterosis in wool traits existed in some crosses but not in others.

## EXPERIMENTAL PROCEDURE

The purebred Rambouillet, Panama, and Targhee flocks at Moscow were included in a rotational breeding program to compare wool and lamb production from the purebred and crossbred ewes (1955-1968). The Targhee ewes were first bred to Panama rams (PxT). Ewe lambs were saved from this cross and bred as yearlings to Rambouillet rams to produce the three-way crossbreds (RxPxT). During the last two years of the study, all purebred and crossbred ewes were bred to Suffolk rams and their lamb production was compared. This system of breeding is typical of most northwestern farm and range flocks.

The ewes were lambled in barns during February and March. The lambs were creep-fed and remained with their mothers in the dry lot until they were weaned in June. Weaning weights, measurements and scores were obtained on all lambs. Carcass information was secured from most of the wether lambs and from representative samples of the ewe and ram lambs.

The sheep were shorn in late March and early April and wool weights, measurements, and estimates of grade and yield were made. Body weights were taken on the mature ewes and body weights and conformation scores taken on the yearling ewes following shearing.

## RESULTS AND DISCUSSION

### Wool Production

Grease fleece weights and body weights of ewes by breeding group and age are shown in Table 1. Evidence of hybrid vigor was clearly shown in grease fleece weights of the crosses as both the PxT and the RxPxT ewes produced significantly heavier fleeces than any of the parental breeds. There was little indication of heterosis in body weight, however, as the crosses were generally intermediate in weight between the weights of the parental breeds. Heaviest fleeces were produced at 3, 4 and 5 years of age with lighter production from 2-year-old ewes and from ewes past 5 years of age.

Estimates of clean wool yield of each fleece were made the last 3 years of the study using a "Neale Wool Squeeze" machine. These results along with average wool grades and lengths for the various groups of ewes are shown in Table 2. The PxT ewes produced the most estimated clean wool but not significantly more than the straight-bred Panamas. The clean wool production of the RxPxT

ewes dropped in relation to the P and PxT ewes because of the shorter staple and heavier shrink produced by the Rambouillet breeding.

The PxT ewes also had the longest fleece; again the difference between these and the Panama ewes was not significant, however. Wool fineness grades followed the pattern that would be expected with the Rambouillet ewes having the finest fleeces, the Targhee and RxPxT ewes the next finest, and the Panama and PxT ewes having the coarsest wool.

### Lamb Production — Birth and Weaning Data

Table 3 gives the average weaning percentage and the average lamb production per ewe (weaning percentage x average weaning weight of lambs) of the various breeding groups. While there was some yearly variation in the lamb production figures for the various breeding groups, the Rambouillet and the Targhee ewes were lowest in production all 8 years of the study. Panama ewes had the highest lamb production figures in 5 of the 8 years. They were followed by the RxPxT ewes when all groups were bred to whiteface rams.

Total lamb production is a reflection of both weaning percentage (Table 3) and weaning weight. Table 4 gives the adjusted birth and weaning weights of the lambs from all breeding groups from 1956 to 1968. The Rambouillet ewes produced the lightest lambs at weaning. The RxPxT and Panama ewes produced the heaviest lambs but their weights were not significantly higher than the weaning weights of lambs from the PxT and Targhee ewes. Targhee and RxPxT ewes produced lambs that were significantly heavier at birth.

Lambs from 2-year-old ewes (first lamb crop) and ewes 7 years old and over were significantly lighter than lambs from ewes 3 to 6 years of age (Table 4). Lambs from 2-year-old ewes were also lighter at birth than lambs from the older ewes.

Table 3. Lamb production of purebred and crossbred ewes, 1961-1968.

Breeding group	Years	Ewes bred and alive at lambing	Lambs Weaned	Weaning percentage	Annual production per ewe
		No.	No.	%	lb.
RxR	6	152	202	133	112.0
PxP	5	120	173	144.2	125.0
TxT	6	153	191	125	111.0
PxT	6	207	275	133	118.0
RxP-T	5	209	284	136	120.0
RxS	2	75	109	145	123.5
PxS	2	68	109	160	140.0
TxS	2	59	85	144	119.4
P-TxS	2	73	117	160	135.0
P-T-RxS	2	57	88	154	130.0



Table 4. Birth and weaning weights of lambs — least squares means for all breeds, 1956-1968.\*

Mean	Number	Birth weight	Weaning weight
		lb.	lb.
Total	2015	10.9	82.3
Sex of lamb			
Ram	698	11.8a	85.5a
Ewe	1016	10.4c	78.0b
Wether	301	11.2b	83.3a
Type birth of lamb			
Single	568	12.9a	91.8a
Twin/Single	62	10.5b	84.1b
Twin/Twin	1282	10.8b	78.0c
Triplet	103	9.4c	75.3c
Age of ewe			
2 yrs	482	10.4b	80.0b
3 yrs	442	11.0a	84.4a
4-6 yrs	889	11.1a	84.1a
7 yrs & over	202	11.1a	80.8b
Breed			
Rambouillet	399	10.6b	80.5b
Panama	300	10.6b	83.1a
Targhee	760	11.1a	81.5ab
PxT	413	10.7b	82.7ab
RxPxT	143	11.3a	83.7a

\*Figures with different subscripts are significantly different ( $P \leq .05$ )

Weaning scores and measurements from 1959 to 1968 are shown in Table 5; leg and shoulder scores at weaning from 1963 to 1968 are shown in Table 6. These two tables group all lambs born to the various breeding groups of ewes regardless of sire. Table 7 presents some of the more pertinent birth and weaning information for lambs produced by Suffolk rams.

When all lambs are considered, the Panama lambs ranked highest in type scores. They were followed by the Targhee, PxT, and RxPxT lambs — with the Rambouillet lambs ranking lowest in type scores. The same general pattern followed in condition, in face and neck folds scores, in wool length (Table 5), and in shoulder and leg scores (Table 6). However, when these ewes were bred to Suffolk rams, the differences became much less (Table 7). In fact, the adjusted weaning weight and the leg and condition scores of the lambs from the Rambouillet ewes bred to Suffolk rams were slightly higher than the weights and scores of the lambs from any of the other ewe groups bred to Suffolk rams.

Ram lambs were lower in condition (thinner) at weaning than ewe and wether lambs (Table 5). Wether lambs ranked slightly higher in weaning leg scores than the ewe or ram lambs (Table 6). The ewe lambs had slightly longer wool at weaning than the ram or wether lambs.

Single lambs generally had higher scores than lambs from multiple births (Tables 5 and 6). Lambs from older ewes tended to score higher at weaning than the lambs from two-year-old ewes.

Table 5. Weaning scores and measurements of lambs — least squares means for all breeds, 1959-1968<sup>1</sup>.

Mean	Number	Type score <sup>2</sup>	Condition score <sup>3</sup>	Face score <sup>3</sup>	Body folds score <sup>2</sup>	Neck folds score <sup>2</sup>	Wool length (mm)	Wool grade (spinning counts)
Total	1868	10.2	9.7	4.9	13.8	13.6	37.4	58.6
Sex of lamb								
Ram	634	10.1a	9.5a	4.7b	13.7b	13.5b	36.7b	58.9a
Ewe	935	10.2a	9.8b	5.1a	13.8a	13.7a	38.6a	58.4b
Wether	299	10.1a	9.8b	4.8ab	13.8a	13.5b	37.1b	58.5ab
Type birth of lamb								
Single	530	10.3a	10.6a	4.9a	13.6b	13.4c	38.5a	58.9a
Triplet	55	10.4a	10.0b	5.0a	13.8a	13.5bc	37.2b	58.3b
Twin/Twin	1188	9.9b	9.2c	4.8a	13.8a	13.6ab	37.1b	58.6ab
Triplet	95	10.0ab	8.9c	4.9a	13.8a	13.8a	36.9b	58.6ab
Age of ewe								
2 yrs	433	10.0b	9.4b	4.7a	13.8a	13.5b	36.7b	58.9a
3 yrs	392	10.3a	9.9a	4.9a	13.7a	13.5b	37.7a	58.6ab
4-6 yrs	843	10.2a	9.9a	4.9a	13.7a	13.5b	37.5ab	58.6ab
7 yrs & over	200	10.2a	9.4b	5.0a	13.8a	13.7a	37.9a	58.2b
Breed								
Rambouillet	354	9.4c	9.1c	3.8c	13.7a	13.3c	34.2c	61.2a
Panama	293	10.9a	10.2a	5.7a	13.8a	13.8a	39.9a	57.1c
Targhee	672	10.4b	9.8ab	5.5a	13.8a	13.6b	38.0b	57.5c
PxT	409	10.2b	9.6b	4.5b	13.8a	13.5b	37.5b	58.4b
RxPxT	140	10.1b	9.6b	4.8b	13.7a	13.6b	37.6b	58.7b

<sup>1</sup> Figures with different subscripts are significantly different ( $P \leq .05$ ).

<sup>2</sup> Scores based on 15 as ideal; smaller numbers less desirable.

<sup>3</sup> Condition score of 15 is high prime; 12, high choice; 9, high good.



**Table 6. Weaning leg and shoulder scores of lambs — least squares means for all breeds, 1962-1968.<sup>1</sup>**

Mean	Number	Shoulder score <sup>2</sup>	Leg score <sup>2</sup>
Total	1339	11.0	11.2
Sex of lamb			
Ram	436	11.0a	11.1b
Ewe	671	10.9a	11.1b
Wether	232	11.1a	11.4a
Type birth of lamb			
Single	354	11.8a	11.8a
Twin/Single	39	11.1b	11.5a
Twin/Twin	857	10.6c	10.9b
Triplet	89	10.5c	10.7b
Age of ewe			
2 yrs	308	10.8b	11.0b
3 yrs	301	11.2a	11.3a
4-6 yrs	588	11.2a	11.4a
7 yrs & over	142	10.8b	11.2ab
Breed			
Rambouillet	246	10.5c	10.6c
Panama	248	11.5a	11.7a
Targhee	315	11.0b	11.1b
PxT	390	11.0b	11.2b
RxPxT	140	11.1b	11.3b

<sup>1</sup> Figures with different subscripts are significantly different ( $P \leq .05$ ).

<sup>2</sup> Scores based on 15 as ideal; smaller numbers are less desirable.

**Table 7. Lamb production of ewes bred to Suffolk rams — least squares means, 1967-1968.**

Breed of ewe	Number	Average birth weight	Average weaning weight	Average type score <sup>1</sup>	Average leg score <sup>1</sup>	Average condition <sup>2</sup>
		lb.	lb.			
Rambouillet	102	11.8	99.5	11.7	12.7	12.3
Panama	99	12.3	98.6	11.8	12.3	11.8
Targhee	82	11.9	98.2	12.2	12.2	12.2
PxT	113	12.0	96.9	12.1	12.6	12.1
RxPxT	99	12.8	97.5	11.3	12.6	11.9

<sup>1</sup> Scores based on 15 as ideal; smaller numbers less desirable.

<sup>2</sup> Score of 15 is high prime; 12 is high choice; 9 is good.

Table 8. Carcass traits of lambs from purebred and crossbred ewes bred to Suffolk rams — breed means, 1967.

Cross	Sex	Number	Carcass weight	Dressing	Carcass grade	Leg score <sup>1</sup>	Loin-eye area	Fat thickness	Carcass lean	Carcass fat
			lbs.	%			sq. in.	in.	%	%
SxR	Wether	5	51.8	49.1	11.4	11.4	2.5	.21	48.5	24.6
	Ewe	2	49.9	49.5	12.5	13.0	2.3	.25	53.9	27.3
SxP	Wether	5	52.3	52.2	12.3	12.4	2.4	.22	52.3	27.9
	Ewe	5	51.5	51.1	12.3	12.2	2.3	.17	52.2	30.4
SxT	Wether	3	47.8	47.8	11.0	10.7	2.6	.16	52.5	25.8
	Ewe	6	51.6	51.2	12.2	12.3	2.3	.33	48.3	31.0
SxP-T	Wether	4	53.5	51.1	13.0	13.0	2.4	.26	53.1	27.9
	Ewe	4	51.8	50.5	12.5	12.5	2.2	.29	50.7	31.4
SxR-P-T	Wether	3	46.9	48.7	11.0	11.0	2.3	.22	53.2	26.1
	Ewe	5	52.9	53.5	12.6	12.6	2.8	.24	50.1	29.9

<sup>1</sup> Scores based on 15 as ideal; smaller numbers less desirable.

Table 9. Carcass traits of lambs from purebred and crossbred ewes bred to Suffolk rams — breed means, 1968.

Cross	Number	Carcass weight	Dressing	Carcass grade	Leg score <sup>1</sup>	Loin-eye area	Fat thickness	Carcass lean	Carcass fat
		lb.	%			sq. in.	in.	%	%
SxR	12	49.0	52.8	11.2	12.0	2.4	.14	28.8	12.8
SxP	12	50.4	53.8	11.2	12.2	2.2	.20	28.1	14.2
SxT	12	47.6	51.8	11.0	11.2	2.1	.16	26.0	12.8
SxP-T	12	48.0	52.2	11.3	11.7	2.2	.16	27.8	13.6
SxR-P-T	12	49.9	54.1	11.2	11.6	2.2	.15	28.0	14.7

<sup>1</sup> Scores based on 15 as ideal; smaller numbers less desirable.



## Carcass Studies

Bell et al. (1967) reported on carcass characteristics of lambs from these purebred and crossbred ewe groups mated to whiteface rams. The Panama and Panama x Targhee lambs had the highest conformation and overall carcass grades and the Rambouillet lambs the lowest. The Panama and PxT carcasses yielded significantly heavier legs than the Rambouillet and Targhee purebreds and the Panama and PxT lambs also had the heavier individual muscles. Purebred Panama and Targhee lambs had significantly more carcass fat than the Rambouillet or the PxT and RxPxT lambs.

Tables 8 and 9 give the slaughter and carcass information of lambs sired by Suffolk rams in 1967 and 1968. In the 1967 studies both ewes and wether lambs were slaughtered. The small number of lambs killed limited positive conclusions because of so much individual variation in numbers within breeds. The Panama, P-T, and R-P-T lambs tended to have a higher percentage of carcass fat and the Rambouillet lambs the least amount of carcass fat. There were no consistent differences in the loin eye area or leg scores of the 1967 carcasses.

Carcass information was obtained from 6 wether lambs and 6 ewe lambs in each of the 5 breeding groups in 1968. The lambs were slaughtered at similar weights, although the SxP carcasses were heavier because of the higher dressing percentage. All of the lambs graded Choice and the various groups had an average carcass grade of Middle or Average Choice. The SxP and the SxR-P-T lambs had the largest percentage of carcass fat and SxR and the SxT the least percentages. The SxT lambs had the lowest percentage of carcass lean as well as the lowest leg scores. Carcass leg scores were slightly higher for the SxP and SxR lambs than for the SxP-T and SxR-P-T lambs.

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