

Cross-bred Lambs under Eastern Transvaal Conditions.

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INTRODUCTION.

THE experiments reported here are part of a series of cross-breeding experiments which have been carried out by the Department of Agriculture at various institutions. The main objects in these experiments have been to determine the most suitable types of cross-bred lambs for various conditions and to investigate the requirements of management or treatment necessary for rearing fat-lambs.

The eastern districts of the Transvaal are suitable for Merino sheep farming. Schuurman *et alia* (1932) sounded a warning against the danger of the deterioration in the quality of the country's wool as a result of indiscriminate cross-breeding, but well organized cross-breeding enterprises were advocated where conditions permit, such as in high rainfall areas in which were included the maize growing districts of the eastern Transvaal.

In the eastern Transvaal, the most influential factors in any type of sheep farming are feed and parasites. Merino farmers in these districts regulate most of their lambing to take place in the autumn, April and May. This practice is favoured largely because of the set back spring-born lambs experience due to internal parasites. If the same practice is applied to cross-breeding, the lambs have to be finished off during winter months when feed is scarce. On the other hand, cross-bred lambs born during the spring, September and October, have an abundance of natural pasture available during the stage of growth when the highest rates of gain are made, so that, when such lambs have attained a desirable weight at four or five months of age, they should receive special attention from all markets demanding genuine lamb during January, February and March. Lochner and Beyleveld (1932), in discussing the English mutton and lamb markets, point out that various grades of lamb demand two to three pence per pound more than do the corresponding grades of mutton. They also state that the best time for marketing lamb in England is during the English winter months, prices for genuine lamb being at the peak during March and April.

At present, in this country, the relative scarcity of the mutton breeds restricts the choice of breed of ram for cross-breeding purposes. However, it appears logical that, as the demand for particular breeds of rams develops, it will become economically possible for breeders in various parts of the country to cater to the particular demands of their districts.

Results have been recorded upon the use of Suffolk rams for cross-breeding purposes, but most of these experiments involve the use of Blackhead Persian and unimproved types of ewes. However, Maré (1934) reported results with Suffolk and Rowney Marsh rams mated to Merino ewes under Karroo conditions. Rose (1932) in considering a general policy, is of the opinion that while practically all the British breeds are suitable for mating to Merino ewes for mutton crosses, it would be well to confine choice to the white-faced, white-woolled breeds in order to maintain colour purity of fleece. Bartel and Johnstone (1934) studied the rearing of fat-lambs under Western Province conditions for which purpose they mated Merino ewes to the following breeds of rams: Dorset Horn, Texel, Border Leicester, German Merino, and Corriedale. Colebatch and Scott (1928) have studied in great detail the suitability of many types of lambs under South Australian conditions and their detailed comparisons are considered excellent guides. They concluded that half-bred long-wool-Merino ewes are best as mother stock and that, considering both lambs and wool, the most profitable returns can be obtained from Southdown \times Border Leicester-Merino and Dorset Horn \times Border Leicester-Merino crosses. When Merino ewes were the mother stock, the investigators found that the use of Border Leicester, English Leicester, and Lincoln rams proved most remunerative, and that the use of these rams on Merino ewes was infinitely more remunerative than the use of the short and medium woolled British breeds of rams on Merino ewes.

OBJECTS OF THE EXPERIMENT.

In view of the success of Border Leicester and Southdown rams for cross-breeding purposes in other countries, it was decided to include these breeds in the Department's scheme of cross-breeding experiments. While the use of Ryeland rams has not received much attention in the past, it is a breed of good mutton qualities; also, the breed is devoid of colour. It is very probable that this latter breed when bred to Merino ewes or to long-wool-Merino half-breds, will give satisfactory results.

The following are the main features of the experiments conducted at the Veterinary Research Station, Ermelo:—

1. A comparison of the following types of cross-bred lambs:—
 - (a) Border Leicester-Merino.
 - (b) Ryeland-Merino.
 - (c) Southdown-Merino.
 - (d) Merino (flock).
2. The possibility of rearing suitable fat-lambs from spring-born lambs when no supplementary feeding is practised.

PLAN OF THE EXPERIMENT.

Two rams of each of the British breeds, Border Leicester, Ryeland, and Southdown, were imported from England, and they were at this Experiment Station for three months before mating commenced. The Merino ram used was obtained from the Grootfontein School of Agriculture, Middelburg, Cape. All rams were about two years old when mated.

The intention was to mate fifty Merino ewes to each ram; therefore, a total of 350 ewes, varying in age from two years to aged, was drafted into the experiment. Due to the shortage of ewes, many of those used were too old for the purpose. The unsuitability of old ewes is discussed in this report.

In order to ensure successful lamb crops, the system of "hand" or controlled serving was practised. It will be seen from the results that a great deal of information was obtained by adopting this system of mating. The ewes were brought to the yards at 6 a.m. daily during the mating season of six weeks, for daily testing for oestrus which was done by means of vasectomised teasers. Ewes showing oestrus were kept for service during the day. The selection of ewes for the various rams was at random, no attention being paid to size and age. Each ewe was given one service. All ewes were tested daily for a recurrence of oestrus throughout the mating season and for a further twenty days subsequent to the termination of the mating season. During the mating season, ewes showing a recurrence of oestrus were, whenever possible, mated to their original rams.

The rams were kept in good vigorous condition; their monthly weights served as a guide of their condition.

The ewes were given what was considered good farm management. They were put on green oat grazing during the winter months and an attempt was made to improve the grazing as lambing time approached. Unfortunately, due to adverse weather conditions, the available green grazing was not sufficient to maintain the ewes in high condition, with the result that the old ewes showed considerable decline in condition and they proved detrimental in the interests of the experiment.

The ewes were dosed regularly at twenty-one day intervals with Government Wireworm Remedy until six weeks before lambing was to commence.

A lick consisting of two parts of bone meal and one part of salt was supplied to the flock at the rate of about five ounces per sheep per week.

The flock was well attended during the lambing season. Newly born lambs were identified by the ear tags and special body markings on the ewes; the latter marks were given at the time of mating. All lambs born were ear-tagged and weighed; this work was done daily.

Due to the shortage of green oat grazing, the ewes were lambed down on a "burn" which improved as lambing progressed. At the termination of lambing the grazing was good.

The lambs were castrated and docked in several batches when they were two to three weeks old.

The entire flock of ewes and lambs was run together. The lambs had access to the lick supplied to the ewes; the amount issued was increased when deemed necessary.

The dosing of the flock was resumed as soon as possible after the lambing season, when ewes and lambs were dosed with Government Wireworm Remedy at twenty-one day intervals.

The lambs were weighed at twenty-one day intervals; the weighing periods corresponded with dosing periods. At the commencement, the young lambs were starved for four hours before being weighed; the starvation period was subsequently extended to twelve hours.

Due to the danger of loss through Blue Tongue, all ewes and lambs were inoculated when the lambs were approximately ten weeks old. It proved to be an exceptionally bad blue tongue season; however, no lambs were lost through this disease.

All sheep on the Experiment Station were dipped for keds in an arsenical dip; the ewes and lambs were dipped when the latter were approximately three months old.

RESULTS.

Table I contains the results of controlled serving.

It is seen from Table I that abnormally large percentages of ewes were not impregnated at the first service.

These percentages were as follows:—

Ewes mated to Border Leicester rams	32·1 %
Ewes mated to Ryeland rams	37·9 %
Ewes mated to Southdown rams	70·6 %
Ewes mated to Merino ram	12·0 %

In the case of the Southdown rams the recurrences of oestrus after service are seen to have been very exceptional. In order to prevent overtaxing the Southdown rams, many of their ewes were not given a second service upon the recurrence of oestrus. However, if a second service had been given to all such ewes, the above percentage of 70·6 would have been larger. The two Southdown rams gave a total of 184 services and, as is seen in Table I, only three ewes were impregnated.

It is of interest to note that all the rams showed a marked keenness to mate and that the Southdown rams were particularly active in this respect. Ryeland ram No. 36448 developed an abscess on the ear and became reluctant to serve. The ram was withdrawn for a period, consequently the number of ewes served by this ram is small.

TABLE I.
Serving Data.

Breed of ram.	Ram No.	First service.	Second service.	Third service.	Recurrences not served.	Ewes supposedly settled.	Number of lambs born.	Number of ewes lost between mating, lambing.	Number of ewes supposedly settled that did not lamb.	Percentage of ewes supposedly settled that did not lamb.
Border Leicester.....	36445	58	17	2	1	57	39	2	16	28.07
Border Leicester.....	36446	51	18	1	2	49	31	2	16	32.65
Ryeland.....	36447	67	29	1	9	58	46	2	10	17.24
Ryeland.....	36448	28	7	0	11	17	10	2	5	29.41
Southdown.....	36449	45	32	11	36	9	2	0	—	—
Southdown.....	36450	47	33	16	41	6	1	0	—	—
Merino.....	35760	50	6	1	3	47	31	3	14	29.78

In work on the fundamentals of fertility in Merino sheep Quinlan, Maré, and Roux (1932) found that when ewes were served at various periods from the onset of oestrus up to thirty hours after the onset of oestrus, the fertility established ranged between 70 and 100 per cent. The authors also indicated what differences in fertilizing power might exist in mating clinically normal rams to clinically normal ewes. Even when the controlled service method of mating was employed with thirteen rams, it was found that the largest number of ewes fertilized at the first service was 84.6 per cent. In view of these findings, it must be considered that in the case of the matings with the Merino ram in this experiment, the 12 per cent. of unfertilized cases after the first service is not exceptional.

When it became obvious that an abnormally large number of ewes was returning for service, all the rams used in the experiment were sperm tested. However, when these tests were made, the Border Leicester, Ryeland, and Merino rams showed abundant and active normal spermatozoa in the microscopic examination of their semen. The breeding results confirmed the finding of the sperm tests, in that the percentages of pregnancies subsequently established by the above three breeds of rams were satisfactory. Apparently the Border Leicester and Ryeland rams were in a condition of temporary infertility at the commencement of the mating period and these rams developed a higher degree of fertility after a few weeks of serving. A similar experience of infertility with a Border Leicester ram was reported by Bartel and Johnston (1934), although in this case sperm tests were not carried out and the subsequent state of fertility of the ram was not reported.

The sperm tests of the two Southdown rams revealed that they were sterile due to scarcity of spermatozoa and there was also a disintegrated condition of the majority of the spermatozoa present. Throughout and subsequent to the mating period, these two rams were sperm tested and these tests revealed that no change in their condition of sterility had taken place.

A maximum lambing percentage is an important factor in an enterprise such as fat-lamb production, as high fertility in rams contributes a great deal towards the net return per hundred ewes. The unknown presence of a sterile ram reduces the proportion of rams to ewes; however, as ewes may show oestrus and may be served twice or thrice during the usual mating period of six weeks, the lambing results, considered from the point of view of the rams only, will depend upon the percentage of rams used and the activity and fertility of the remaining rams. Rams, and especially young rams, which have been imported from foreign countries or even from districts of marked physiographical differences may require acclimatization, or they may acquire normal fertility only after their sexual energies have been drawn upon for several days. If this irregularity is suspected, it would appear to be best to commence mating seven to fourteen days earlier than is the usual custom and to extend the mating period to eight weeks. Should there be a material difference between the earlier and the later born lambs, due to a low percentage

of fertility during the earlier part of mating or because of the prolonged period of mating, lambs could be disposed of in two or three even batches, as there is a considerable remunerative advantage in marketing pens or groups, the lambs of which are even in size and condition.

The fertility of rams can be assured only by trial breeding or by sperm tests.

The number of ewes which showed a recurrence of oestrus when mating was discontinued, is given in Table I. In spite of the fact that a number of ewes did not show oestrus, they eventually proved to be non-pregnant; this occurred in 24.11 per cent. of the ewes mated. The cause of such abnormal inactivity is not definitely known, but it may have been influenced greatly by the large number of aged ewes used in the experiment. It has been observed that Merino sheep at this Station show normal sexual activity during March, April, and May.

The lambing data are given in Table II.

TABLE II.
Lambing Results.

Breed of ram.	Number of ewes mated.	Lambs born.		Deaths: birth to weaning.		Lambs weaned.	
		Number.	Percentage.	Lambs.	Ewes.	Number.	Percentage.
Border Leicester.	109	76	69.90	7	4	69	63.30
Ryeland.....	95	56	58.94	3	3	53	55.79
Southdown.....	92	3	3.27	0	0	3	3.27
Merino.....	50	31	62.00	3	4	28	56.00

The low lambing percentages reflected in the above table have been explained in the preceding paragraphs.

The deaths of lambs were due largely to the inability of old ewes to mother the lambs, while the majority of losses among the mature sheep were old broken-mouthed ewes.

Because of the small number of Southdown cross-bred lambs, these lambs are being disregarded in subsequent discussions.

It is of interest to demonstrate the effect of weight of sire and dam upon the progeny; Table III has been constructed for this purpose.

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TABLE III.

Weight of Sire and Dam in Relation to Weight of Lamb.

Breed of ram.	Weight of ram.	Range of ewe weights.	Average weight of ewes.	Number of ewes mated.	Number of lambs born.	Average birth weight of lambs.	Average weight of lambs at 3½ months.
	lb.	lb.	lb.			lb.	lb.
Border Leicester.	168	66-75	72.0	5	5	8.0	40.4
Border Leicester.	206		69.2	6	6	8.7	46.1
Ryeland.....	124		69.2	11	11	7.7	40.7
Ryeland.....	127		—	—	—	—	—
Merino.....	118		69.9	10	10	8.1	42.8
Border Leicester.	168	76-85	72.0	11	11	7.8	44.8
Border Leicester.	206		79.8	9	9	9.1	49.2
Ryeland.....	124		80.2	12	12	8.4	47.2
Ryeland.....	127		81.8	3	3	8.3	40.6
Merino.....	118		79.9	6	6	7.8	46.1
Border Leicester.	168	86-100	92.6	10	10	8.7	51.0
Border Leicester.	206		94.9	11	11	9.6	56.8
Ryeland.....	124		93.8	12	12	8.9	47.1
Ryeland.....	127		91.7	3	3	9.5	50.6
Merino.....	118		93.4	5	5	7.9	47.9

The weights of the rams and ewes were taken at the time of mating when they were in good condition. The analysis indicates that in the case of the British breeds of rams, heavy rams tend to produce heavy lambs and that the ewes exert a similar influence. In addition, it is revealed that the heavy lambs at birth retain the advantage of weight at three-and-a-half months of age. However, in the Merino breed these relationships were not as striking. There appears to be every justification to maintain that large roomy Merino ewes are most suitable for cross-breeding and that small stunted Merino ewes are undesirable.

The average weights of the three types of lambs are given in Table IV at three weekly periods and up to the age of twenty weeks, while the average daily gains are presented in Table V.

TABLE IV.
Average Weights of Lambs.

Type of lamb.	Birth weight.	6 weeks, 15/11/33.	9 weeks, 6/12/33.	12 weeks, 28/12/33.	15 weeks, 18/1/34.	18 weeks, 8/2/34.	20 weeks, 17/2/34.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Border Leicester-Merino.....	8.5 (70)	32.3 (70)	38.0 (69)	44.4 (68)	51.6 (69)	51.1 (68)	51.3 (67)
Ryeland Merino.	8.6 (56)	30.1 (56)	33.2 (56)	42.0 (55)	45.6 (54)	44.6 (53)	45.2 (46)
Merino (flock)...	7.8 (31)	25.0 (31)	32.1 (30)	40.0 (30)	44.3 (30)	41.6 (29)	38.0 (26)

NOTE.—In the above table the number of lambs involved in the averages is given in brackets.

TABLE V.
Average Daily Gain.

Type of lamb.	Birth to 6 weeks.	6-9 weeks.	9-12 weeks.	12-15 weeks.	15-18 weeks.	18-20 weeks.	Birth to 20 weeks.
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Border Leicester-Merino.....	0.57	0.27	0.30	0.34	-0.02	0.01	0.28
Ryeland-Merino.	0.51	0.14	0.41	0.17	-0.04	0.04	0.24
Merino (flock)...	0.41	0.34	0.38	0.20	-0.12	-0.25	0.20

It is seen from the above two tables that the growth of the lambs of all types was erratic and unsatisfactory. It was explained previously that inoculation and dipping were necessary. The lambs were inoculated on 6th December, 1933, and they were dipped on 12th January, 1934, and 2nd February, 1934. It is not considered that these operations had a serious adverse effect upon the growth of the lambs. However, a factor which must have inhibited growth seriously was worm infestation. The lambs were found to be heavily infested with tape worms during the latter part of December and, as the season was a wet one, considerable difficulty was experienced in keeping the lambs free of worms. In spite of an abundance of pasture during January and February, the lambs made no progress.

Measures for overcoming adverse influential factors and for stimulating the growth rate will be made under the heading "Summary and Conclusions".

The data presented in Table IV and V clearly indicate that the Border Leicester-Merino lambs made the most satisfactory gains and that the Ryeland-Merino lambs made considerably better gains in weight than did the Merino flock lambs.

The results of transporting, slaughtering, and marketing the wether lambs are reflected in Table VI.

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TABLE VI.
Market Results.

Type of lamb.	Per cent. lambs fit,* dispatched.	Weight before dispatch.	Weight at abattoir.	Loss in transit.	Carcass weight.	Dressing per cent.	Carcass grade frequencies.			Sale price.
							Good.	Medium.	Common.	
Border Leicester-Merino.....	96	lb.	lb.	per cent.	lb.					s. d.
		57.6	50.8	11.9	24.1	47.5	4	17	15	12 0
Ryeland-Merino.....	86	50.4	47.9	5.0	22.4	46.7	0	7	12	11 2
Merino (flock).....	83	49.0	45.1	7.9	20.8	46.1	0	1	9	10 6

* NOTE.—1. Only wether lambs were sent for the slaughter tests; the ewe lambs were retained for further work.
2. The abattoir weights were taken 48 hours after dispatch.

While the majority of the lambs had not attained a desirable market weight at twenty weeks, it was the object to obtain marketing and slaughtering results of such lambs off pasture and without supplementing feeding. All lambs above a minimum weight of 40 pounds were despatched.

By consulting Table VI, it is seen that the Border Leicester-Merino lambs showed a decided advantage with respect to the percentage of lambs fit for despatch, and while their percentage loss in transit was highest, this type was superior in carcass grades. In this latter respect, the Merino flock lambs were particularly poor.

The dressing percentages of both cross-bred types were poor for lambs of their breeding, but this undoubtedly was due to lack of "condition".

The lamb carcasses were sold on the open market and prices from $5\frac{1}{2}$ d. to $6\frac{1}{2}$ d. per pound were realised. Due to the method of selling, the prices indicated in the above table are not good indications of condition and quality.

Blemishes which were sufficient to disqualify carcasses for export purposes were found on many of the carcasses. The awns of *Trachypogon polymorphus* had penetrated the skin and become lodged in the subcutaneous tissues, resulting in large bruise-like patches and in many instances abscesses.

The carcasses were graded after they were allowed to "set", after which each carcass was examined with respect to conformation, finish, and shape of hindquarters, a definite scale of points being used for the classification. The results of such examinations are reflected in Table VII.

TABLE VII.
Examination of Carcasses.
Frequencies of Scale of Points.

Type of lamb.	Confirmation.							Finish.						Shape of hindquarters.					
	2	3	4	5	6	7	8	3	4	5	6	7	8	3	4	5	6	7	8
Border Leicester-Merino.	0	3	6	8	11	6	2	5	5	7	12	4	3	2	9	8	13	2	2
Ryeland-Merino.....	1	2	6	5	2	3	0	4	7	3	3	2	0	3	4	8	1	3	0
Merino (flock).....	0	5	3	1	1	0	0	5	1	3	0	1	0	4	5	0	1	0	0

The mean values of the three features for which the carcasses were examined are given in Table VIII.

TABLE VIII.
Mean Values of Carcasses.

Type of lamb.	Conformation.	Finish.	Shape of hindquarters.
Border Leicester-Merino.....	5·47	5·358	5·276
Ryeland-Merino.....	4·74	4·579	4·842
Merino (flock).....	3·80	4·100	3·800

The significance of the differences of the above mean values have been obtained by further statistical analysis, and the results may be summarised as follows:—

1. *Conformation.*

- (a) Differences between B. Leicester crosses and Ryeland crosses were not quite significant.
- (b) Differences between B. Leicester crosses and Merinos were highly significant.
- (c) Differences between Ryeland crosses and Merinos were significant.

2. *Finish.*

- (a) Differences between B. Leicester crosses and Ryeland crosses were significant.
- (b) Differences between B. Leicester crosses and Merinos were highly significant.
- (c) Differences between Ryeland crosses and Merinos were insignificant.

3. *Shape of Hindquarters.*

- (a) Differences between B. Leicester crosses and Ryeland crosses were insignificant.
- (b) Differences between B. Leicester crosses and Merinos were highly significant.
- (c) Differences between Ryeland crosses and Merinos were significant.

In the above summary, the term “significant” means that the probability that the difference could be due to chance (random sampling) is less than five per cent., while “highly significant” indicates that the probability is less than one per cent.

SUMMARY AND CONCLUSIONS.

1. Controlled serving revealed irregularities with regard to fertility in rams and ewes.

The fertility of a ram can be assured only by breeding trials or by sperm tests.

Old Merino ewes are unsatisfactory and uneconomical for cross-breeding purposes. Large framed, roomy ewes give best results.

While controlled or "hand" serving is advocated in order to obtain maximum results, it is considered that free mating in small camps may be practised with advantage when facilities permit. The latter system of mating has been employed during the 1934 mating season in the continuation of these experiments.

2. The lambs of all types did not attain a desirable weight at twenty weeks of age.

The Border Leicester-Merino wether lambs weighed 57.6 lb. at twenty weeks of age and 96 per cent. were fit for despatch; they dressed 47.5 per cent. and 11.1 per cent. of the carcasses were graded as "good", 47.2 per cent. "medium" and 41.7 per cent. "common".

The Ryeland-Merino wether lambs weighed 50.4 lb. at twenty weeks of age and 86 per cent. were fit for despatch; they dressed 46.7 per cent. and none of the carcasses were graded as "good", 36.8 per cent. were "medium", and 63.2 per cent. "common".

The Merino flock wether lambs weighed 38.0 lb. at twenty weeks of age and 83 per cent. were fit for despatch; they dressed 46.1 per cent. and none of the carcasses were graded as "good", while 10 per cent. were "medium" and 90 per cent. "common".

There was no significant difference between the conformation and the shape of hind quarters of the Border Leicester and the Ryeland crosses, but the former crosses were significantly better in finish.

The Border Leicester crosses were infinitely superior to the Merino flock lambs with respect to conformation, shape of hindquarters, and finish.

There was no significant difference between the finish of the Ryeland crosses and the Merino flock lambs, although the former were superior in conformation and shape of hind quarters.

3. Drastic control measures against internal parasites, especially wireworms and tapeworms, are essential if September lambing is to be a success under eastern Transvaal conditions.

The use of copper sulphate and tobacco extract as advocated by Mönning (1932) is recommended. This treatment will be given a thorough test during the next season.

4. Due to the poor finish of lambs reared on grass, it appears that a supplementary feeding period will be warranted. Results indicate that supplementary feeding may be commenced when the lambs are twelve weeks old. Systems of supplementary feeding will be conducted with the 1934 lamb crop.

5. The experiment reported must be considered as the preliminary work of experiments which will be extended over a number of years.

The experiments during the next year will include the use of Corridale rams.

When the half-bred ewes, which have been retained, are fit for breeding, they will be included in the further work at this Station.

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