

fattening type ration, it would probably be advisable to not only add cobalt and zinc, but supplemental iron, copper, manganese and iodine to supply adequate amounts with necessary safety margins.

Summary

In an "all-barley" ration supplemented with soybean meal, calcium and vitamin A, cobalt supplementation tended to increase weight gain and feed consumption, and improved carcass grade, marbling score and ribeye area. On the other hand zinc supplementation alone was without effect on growth performance and carcass traits. Combined cobalt-zinc supplementation interacted in such a way on feed/gain and ribeye area as to suggest that zinc becomes the limiting trace mineral when cobalt level is adequate.

These results indicate that an "all-barley" type fattening ration is deficient in cobalt and perhaps marginal in zinc.

The Performance of Western vs Dorset x Western Crossbred Ewes for Fall Lamb Production

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In the production of fall born lambs the breed of ewe is of utmost importance. Ewes of many breeds do not exhibit estrus (heat) during the spring and, consequently, cannot be used in such an enterprise.

Oklahoma sheepmen have traditionally purchased replacement ewes from Texas and, to a lesser extent, other western states. Most of the Texas ewes have been of Rambouillet breeding, but many of the imported ewes have been of mixed breeding of Columbia, Panama or Corriedale with Rambouillet. These mixed ewes have not lambed as well during the fall as have straight Rambouillet ewes. Further, neither group has been consistently efficient producers in terms of percent lambing during a short period of time nor the number of lambs born per ewe lambing.

The question might logically be asked: can one raise better ewes than he can buy? Since ewe lambs that are raised are usually worth more as fat lambs at five months of age than Western (Rambouillet and the mixed types mentioned above) yearling ewes cost, it is obvious that the ewe that is raised must be more productive on a lifetime basis than the ewe that is purchased.

This report is a preliminary summary of several years data bearing on the question posed above: can one raise better ewes than he can buy?

Materials and Methods

During the spring of 1955 an experimental ewe flock was established at the Ft. Reno Experiment Station. The initial flock was composed of 100 grade Rambouillet and 100 $\frac{1}{4}$ Panama- $\frac{3}{4}$ Rambouillet (RPR) yearling ewes. Purebred Dorset rams were mated to these ewes from 1955 through 1959. Dorset rams were used because a higher percentage of Dorset ewes will breed during May and June than will black faced ewes.

During each of the springs of 1957, 1958 and 1959, forty ewe lambs were raised and forty yearlings purchased. In each year the raised replacements were the first 20 ewe lambs to reach market weight from each group of ewes.

Purchased yearlings have included the following groups:

Designation	Breeding	Year Purchased
Panama	Panama	1957
N. Mex. Fine Wool	$\frac{3}{4}$ Ramb.— $\frac{1}{4}$ Merino	1957
Rambouillet	Rambouillet	1958
Market White Face	Mixed breeding ¹	1958
Columbia X	$\frac{3}{4}$ Ramb.— $\frac{1}{4}$ Columbia	1959
Flying H	Rambouillet	1959

¹ These ewes were part Columbia, Panama or Corriedale mixed with Rambouillet.

For purposes of simplicity in presenting results, all Dorset by Rambouillet and Dorset by RPR ewes were combined. Also, the Rambouillet, market white face, Columbia X and Flying H were combined as Western ewes and were considered to be typical of many of the ewes shipped into Oklahoma as replacements. The results relative to reproduction were kept separate for the Panama and the Rambouillet-Merino mixed ewes because it is obvious from their reproductive performance that they would not be recommended for fall lamb production.

The raised and purchased ewes for each year were placed together and were handled the same thereafter. During their first breeding season all replacement ewes were bred to small Hampshire rams. During later seasons, the rams may have been Hampshires, Dorsets, Suffolks, or Rambouillets but the raised and purchased groups to be compared were always mated to the same rams.

It should be noted that during 1957, the spring breeding season was for 32 days and cleanup breeding was attempted during 20 days in early

The breeding schedule used during the study was as follows:

Year	Breeding Dates	
	Spring	Cleanup
1957	June 3 — July 5	Aug. 3 — Aug. 23
1958	May 20 — June 29	Aug. 11 — Sept. 2
1959 and later	May 21 — June 30	Aug. 20 — Sept. 19

August. The poor spring breeding performance that resulted caused a change in management so that the breeding season was extended to 40 days during subsequent years. The cleanup breeding season was lengthened to 30 days after 1958 and moved toward the fall when most effective breeding is generally accomplished in sheep.

Other regular management practices were as follows:

1. Ewes were sheared from five to ten days before the beginning of the spring breeding season. Yearling ewes that were purchased had been sheared before purchase and were not resheared.

2. All ewes were fed about one-half pound of grain daily for the six weeks before lambing began.

3. All ewes were tagged (crutched) and had their faces sheared about two weeks before fall lambing began.

4. Ewes were fed one pound of grain daily for six to nine weeks while on wheat pasture. They also each received about one pound of grass hay each day.

5. Lambs were self fed in a creep from two to three weeks of age until reaching a market weight of 90-95 pounds. The creep feed was a mixture of one-third chopped alfalfa hay and two-thirds cracked kafir grain or the same hay grain ratio with 5 percent molasses.

6. All of the fall born lambs were marketed for slaughter except for a few ewe lambs that were kept for replacements. Some of the slower gaining winter born lambs did not reach slaughter weight by June 1 and were sold as feeders or fed out during the summer.

7. After 1960, the lambs were weaned at approximately 10 weeks of age at which time they weighed from 46 to 60 pounds. They were continued on pasture with the creep feed available until they reached market weight. The January-February born lambs were weaned about April 15th each year.

Results

In the evaluation of ewes for commercial production purposes, several factors must be measured. The factors considered in this study were as follows:

1. Percent of ewes lambing from matings made during the 40 day period following May 20.
2. Percent of ewes not conceiving during above period that conceived during the 30 day period starting August 20.¹
3. Lambing rate (number of lambs born per 100 ewes lambing).
4. Percent lambs reared (number of lambs reared per 100 ewes in breeding flock).
5. Lamb birth weight.
6. Lamb 10-week weight—a good measure of the milk production of the ewe.
7. Lamb rate of gain from 10 weeks of age to market weight.
8. Wool production.

The first four factors are measures of reproductive efficiency and are of greatest importance when fall born lambs are desired because inefficient reproduction is the principal problem facing sheep producers who try to produce fall born lambs.

Rate of Reproduction

In comparing ewe lambs that were raised to purchased yearling ewes one should remember that the purchased ewes were 7-8 months older at the time that each performance measure was taken. The difference in performance was particularly striking in relation to reproduction during the first years. Table 1 presents the reproductive performance during the first year for the Dorset crossbred ewe lambs and for the purchased yearling Western ewes.

These results are about as might be expected. The age advantage of the Western ewes made them much more productive than the crossbred ewe lambs under the breeding system used in 1957, 1958 and 1959. The Panama ewes and the Rambouillet-Merino ewes also gave disappointing performances.

The fact that the Dorset crossbred ewe lambs did not breed well for fall lambs when they were about 7 months old and that the mortality of the lambs that they produced was fairly high resulted in a change in management in 1960. Since that time 122 Dorset crossbred ewe lambs have been reared and exposed to rams August 20-September 19. Seventy-nine of these ewes produced 90 lambs and the livability of the lambs has been as good or better than the average of the whole flock.

Table 2 summarizes the second year's performance of the same ewes. This is presented separately because the crossbred ewes were about 19-20 months old at breeding time whereas the Western ewes were 26-27 months old. The results indicate that the Dorset crossbred ewes were much more

¹ During 1957 and 1958 the period indicated in the Materials and Methods section was used.

Table 1. The Reproductive Performance During Their First Year of Dorset Crossbred, Western and Other Ewes.

	Dorset Crossbred	Western	Panama	Ramb.- Merino
No. of ewes	120	80	20	20
No. lambing (fall)	35	50	6	4
No. lambs	42	52	6	4
No. lambs reared	34	50	6	3
No. lambing (winter)	29	18	4	0
No. lambs	33	19	4	0
No. lambs reared	29	17	4	0
% Total lambs reared ¹	52	84	50	15

¹ Number of lambs raised per 100 ewes in the breeding flock.

Table 2. The Reproductive Performance During Their Second Year of Dorset Crossbred, Western and Other Ewes.

	Dorset Crossbred	Western	Panama	Ramb.- Merino
No. of ewes	115	79	20	19
No. lambing (fall)	104	57	16	16
No. lambs	138	71	19	17
No. lambs reared	125	65	17	17
No. lambing (winter)	9	14	1	2
No. lambs	13	21	2	2
No. lambs reared	9	18	2	2
% Total lambs reared ¹	117	105	95	100

¹ Number of lambs reared per 100 ewes in breeding flock.

productive of fall born lambs than were the Western ewes (109 percent reared vs 82 percent reared). (Any desired percentage figure can be obtained by making the appropriate calculation from the numbers given in the table.) This was due to a higher percent of the ewes lambing with a higher twinning rate of ewes lambing. It will be noted also that neither the Panama nor the Rambouillet-Merino ewes were very productive.

Not only did more of the Dorset crossbred ewes lamb during the fall than did any of the other breeding groups of ewes; but of those not lambing during the fall, a higher percentage of the Dorset crossbred ewes lambed during the winter. There were 2 of 115 Dorset crossbred, 8 of 79 Western, 3 of 20 Panama and 1 of 19 Rambouillet-Merino ewes that did not lamb during either period.

Table 3 presents the results to date for the same ewes relative to later reproductive performance. For the oldest ewes, their third through

Table 3. The Reproductive Performance During Their Third and Later Years of Dorset Crossbred, Western and Other Ewes.

	Dorset Crossbred	Western	Panama	Ramb- Merino
No. of ewes	434	266	85	93
% lambing (fall)	92	82	62	86
Lambing rate ¹	153	131	136	114
% lambs reared (fall) ²	129	98	84	78
No. lambing (winter)	17	29	24	6
Lambing rate ¹	159	155	158	133
% Total lambs reared ²	134	114	126	87

¹ Number of lambs born per 100 ewes lambing.

² Number of lambs reared per 100 ewes in the breeding flock.

eighth years' performance is combined with the third through seventh years for the second group and the third through sixth years for the youngest age group. The results in the upper part of Table 3 were given in percentages so that comparisons would be easier to make.

The underlined values in the fourth row of Table 3 quickly typifies the ewes of the various breeding groups relative to producing and raising fall born lambs. The Dorset crossbred (Dorset x Western) ewes were far superior to any of the other breed groups. A higher percent of the ewes lambing during the fall; they produced more twins and, in spite of producing more twins, raised a higher percent of lambs born than the Western ewes. (The difference in lambs raised of lambs produced was small and probably due to chance. It is significant, however, because it is usually found that the death loss is much greater among twin lambs.)

Although represented by only a small number of ewes, the results obtained from the Panama ewes are worthy of note. The Panama breed was based on a crossbred foundation of Rambouillets and Lincolns. To the best of our knowledge, Lincolns are seasonal breeders. Consequently, we would not expect that the Panama ewes would breed for fall lambing as well as the other ewes. They did not. Only 87 percent of them mated during the spring compared to 95-99 percent for the other breed groups in this study. Only 62 percent of the Panama ewes lambing during the fall compared to 81-92 percent of the other groups. Consequently, it is felt that ewes with too much Lincoln breeding should be avoided for fall lambing purposes. (There is considerable other evidence at O.S.U. and elsewhere to support this recommendation.)

Likewise, the Rambouillet-Merino ewes did not compare well with either the Dorset crossbred or the Western ewes. They lambing during the fall as well as the Western ewes but only 14 percent of the ewes lambing produced twins—far fewer than any other group.

The winter lambing results in the lower rows of the table complete the results on a year-long basis. It should be noted that lambing rates

were higher during the winter than the fall for all breed groups. This was as it should have been as many breeds have been found to be more productive when bred to lamb nearer the spring. The results presented in the bottom row of the table were those obtained when fall and winter lamb crops were combined. The Dorset crossbred ewes raised 134 percent lamb crop as compared to 114 percent for the Westerns. Their superiority was consistent throughout the study as far as reproductive performance was concerned.

Lamb Performance

Not only do the ewes produce the lambs but they also transmit one-half of their inheritance, and through their milk supply, govern the rate of growth and fattening up to about 70 days (10 weeks) of age more than any other single factor.

Table 4 summarizes the results that have been obtained over the years relative to birth weights, 70-day weights and rates of gain from 70 days of age to market weight (92-100 lb.) for the lambs produced by the Dorset crossbred ewes and the Western ewes. The Panama and Rambouillet-Merino ewe data were omitted because there were not many lamb records available and the values were similar to those presented. Each value presented in the table represents the average for over 125 lambs. Single and twin lamb data are presented separately because of the different growth pattern that is characteristic of each category. Single lambs are heavier at birth and at 70 days of age than twins. The values presented represent the average of all lambs falling in the particular class irregardless of the age of the ewe or whether the lamb was born during the fall or during the winter.

In comparing the lambs from Dorset crossbred ewes to lambs from the Western ewes, there were no birth weight differences of any great significance. At 70 days of age the single lambs from the Dorset crossbred ewes were 1.6 pounds heavier and the twin lambs 3.0 pounds heavier than the corresponding lambs from the Western ewes. The lambs from the crossbred ewes also gained .04 lb. per day faster after 70 days of age than did the lambs from the Western ewes.

Table 4. Lamb Birth Weights, 70-day Weights and Rates of Gain From 70 Days of Age to Market Weight as Related to Breed Group of Ewes.

	Dorset Crossbred		Western	
	Singles	Twins	Singles	Twins
Birth weight (lb.)	9.6	7.9	9.7	8.3
70-day weight (lb.)	54.8	46.9	53.2	43.9
Gain/da. after 70 da.	0.55	0.56	0.51	0.52
Av. age at 95 lb.	143.0	156.0	152.0	168.0

The heavier lambs from the Dorset crossbred ewes at 70 days of age were probably the result of greater milk production by these ewes as compared to the Westerns. The faster rate of gain of the lambs from the crossbred ewes after 70 days of age probably was not due to milk production because most of the lambs were weaned at about 70-75 days of age. Neither will transmitted gaining ability from their sires explain the increase because all lambs were sired by the same rams.

Although the differences in 70-day weight and rate of gain after 70 days of age were not great, the lambs from the crossbred ewes reached a market weight of 95 pounds about 10 days sooner than the lambs from the Western ewes.

Wool Production

The Western ewes used in this study were from 75 to 100 percent Rambouillet. Although variable in wool production, they sheared heavier fleeces of generally higher quality than the Dorset crossbreds. Dorset wool is very dry and more brittle than Rambouillet wool usually. The Dorset crossbred ewes in this study sheared drier, lighter weight fleeces.

Table 5 summarizes the wool production during the second and later years of the Dorset crossbred and Western ewes. The wool values are presented as grease wool (as it comes from the ewe) and clean wool (as estimated by the use of a Neale squeeze machine.) Although the Western ewes sheared 1.6 pounds more grease wool per head per year, the difference in the estimated pounds of clean wool was insignificant. The Dorset crossbred wool had a higher yield (percent of the grease weight that is actually wool). Wool buyers frequently pay more for the crossbred wool because of its higher yield although the amount of the difference varies from year to year due to marketing conditions.

Summary and Discussion

The results discussed herein were gathered from 120 Dorset crossbred, 80 Western, 20 Panama and 20 Rambouillet-Merino ewes during the period from 1957 to 1964. The crossbred ewes were sired by 20 different Dorset rams and their dams were similar in breeding and performance to the Western ewes in this study. The 80 Western ewes were from four different ranches in Texas and New Mexico and were thought to be as

Table 5. A Comparison of the Wool Production (Grease and Estimated Clean Weight) of Dorset Crossbred and Western Ewes.

	Dorset Crossbred	Western
Grease fleece wt.	8.8	10.4
Clean fleece wt.	4.7	4.5

good or better than the usual yearling ewes that are brought into Oklahoma for breeding purposes. The Panama ewes were purchased to determine how well ewes that were one-half Lincoln would breed for fall lambing. The Rambouillet-Merino ewes are similar in breeding to the fine wool Debouillet ewes of Texas and New Mexico.

These results clearly demonstrate that after the first year the Dorset X Western crossbred ewes (1) will lamb more readily during a lambing period from October 15 to November 25, (2) produce more twins, (3) raise at least as high a percentage of lambs born, (4) breed more readily from August 20 to September 19 if they do not conceive during late May and June and (5) produce lambs that are as heavy at birth, heavier at 70 days of age and that gain faster during the rest of the period to market than will the kind of Western ewes to which they were compared. They sheared less wool but it was usually worth more per pound as grease wool. The ewes are still being compared, therefore, a final conclusion as to expected years of production is not presently available.

The Effect of Sex on Feedlot and Carcass Traits in Swine*

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Swine producers have observed that barrows grow faster and reach market weight at an earlier age than gilts, but gilts tend to yield more desirable carcasses. However, the size of these differences between the performance of barrows and gilts has not been thoroughly investigated.

Significant sex differences could greatly affect the accuracy of records used in swine improvement programs. Boars possessing the ability to sire pigs with superior carcasses are selected on the basis of their progeny's slaughter test. However, unequal numbers of barrows and gilts are often included in samples for evaluating potential herd boars. If sex differences exist, then the progeny test information may be biased depending on the sex ratio tested.

The present study was initiated to investigate the magnitude of the differences in performance between barrows and gilts and to study the possible existence of interactions between sire and sex. A sire-sex interaction means that the difference in performance between barrows and gilts is not the same for the progeny of all sires.

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