

containing 55 percent roughage and 45 percent concentrates, the cost of gain was higher than on the nonpelleted rations. When the rations contained 65 percent roughage and 35 percent concentrates, the pelleted ration containing sun-cured hay and corn produced the cheapest gains, followed by the nonpelleted ration. In this year's tests it should be noted that \$4 per ton for mixing and pelleting and \$2 per ton for sacks was charged above the cost of nonpelleted rations. This contrasts with charges in previous years when \$5 to \$8 was charged for grinding and transporting the pelleted feeds. All the lots sold for the same price, and there was little difference in carcass grades of the lambs fed the different rations.

Digestion trials were conducted with lambs, using rations similar to those used in the feed-lot tests, but the chemical analyses are not yet available. Results of these digestion trials will be reported later.

Adaptability of Breeds of Rams and Breed-Types of Range Ewes to Market Lamb Production in Kansas.

PROJECT 347

T. Donald Bell, Lewis A. Holland, and A. W. Gardner

Western ewes of the three predominant types (Texas ewes or fine-wools, Northwest Blackface Crossbreds, and Northwestern Whiteface Crossbreds) commonly found in Kansas were obtained as ewe lambs in the fall of 1951 and bred to Hampshire, Suffolk, Shropshire, and Southdown rams four seasons. A different set of rams has been used each year, and the ewes are being rotated so that no ewes are bred to the same breed of ram each year. Lamb-production and wool-production records are being obtained from the different types of ewes, and lamb-production figures are being obtained for the four sire groups.

Results

Lamb-production figures for the 1954-55 lamb crop are presented in Table 52 and the preliminary lambing data and lamb production for 1955-56 are shown in Table 53.

All of the lambs born on or before December 20, 1955, were separated with their mothers by sire groups and fed separately. The lambs born after December 20 could not be identified into sire groups and were fed as a single group. The ewes in all of the four sire groups were fed similar rations consisting of approximately 4 pounds of alfalfa hay, 4 3/4 pounds of silage, and 1 1/4 pounds of grain.

The lambs in each group were creep fed and a record was kept of the concentrate eaten. The creep concentrate mixture was made up of 2 parts oats, 1 part corn, 4 parts milo, 1 part alfalfa meal-corn pellets, 1 part bran, 1/2 part corn and molasses pellets, and 1/2 part soybean oil meal. Approximately 3 percent salt was added to this mixture during the later part of the feeding period. The gains and feed consumption of the different groups of lambs are shown in Table 54.

Table 55 gives the average body weights following lambing in the fall of 1955 and early part of 1956 as well as the grease wool shorn the spring of 1956.

Discussion and Observations

The Texas ewes have consistently bred and lambed earlier than the other two types of ewes in the four years that the tests have been conducted. This difference ranged from more than 30 days in the 1954-55 lambing season to an average of 10 days earlier than the Northwest Blackface ewes and 20 days earlier than the Northwest Whiteface ewes in the 1955-56 season. Contrary to popular opinion, the Northwest Blackface ewes have consistently averaged earlier lambing than the Northwest Whiteface ewes. Because of the earlier lambing date, lambs from these Texas fine-wool ewes usually reach market weights earlier than lambs from the other groups. The lambs from the other

Table 52
Lamb Production by Ewes of Different Types from Sires of Different Breeds in 1955.

Breed or breed-type	Number ewes bred	Number lambs weaned	% lambs weaned	Weight, 100 days of age	Average weaning weight	Pounds lamb weaned per ewe bred
Ewe types:						
Finewools	50	50	100	68.1	95.4	95.4
Northwest Whiteface	41	34	82.9	79.2	89.8	74.5
Northwest Blackface	50	57	114	76.3	90.6	103.3
Sire groups:						
Hampshire	34	46	135.3	74.3	88.95	120.4
Suffolk	36	43	129.4	80.7	101.34	121.0
Southdown	35	10	28.6	70.8	89.4	25.5
Shropshire	36	42	116.7	67.8	86.71	110.4
Total	141	141	100			

Table 53
1956 Lambing Data and Lamb Production from Ewes of Different Types and from Sires of Different Breeds.

	Ewe types			Sire groups			
	Finewools	Northwest Whiteface	Northwest Blackface	Hampshire	Suffolk	Southdown	Shropshire
Number ewes bred	47	40	49	34	34	33	35
Number ewes lambing before December 20	42	23	35	26	27	25	22
Number ewes lambing after December 20	3	12	6	6	2	8	7
Av. lambing date	11-10	12-5	11-20	11-10	11-7	11-11	11-8
Birth wt., lbs.:							
Singles	9.9	10.1	8.8	9.6	9.5	8.3	9.6
Twins	7.9	9.4	7.0	7.3	7.6	8.3	7.6
% lambs born	127.6	110.0	116.3	105.9	105.9	87.9	85.1
Number lambs alive March 13	54	40	50	32	32	28	25
Av. wt. of lambs March 13	89.2	91.2	91.8	90.0	93.2	88.6	90.1
Number lambs sold March 13	22	14	23	14	20	13	12
Number lambs alive April 9	32	26	27	18	12	15	13
Av. wt. lambs April 6 ¹	90.0	90.2	91.9	92.3	91.1	89.1	90.1

1. Lambs born after December 20 not included.

Table 54
Feed Consumption and Lamb Production from Four Different Breeds of Rams and Three Ewe Breed-Types.

	Number of lambs	Daily concentrate consumption in creep	Av. daily gain in lbs.	Gain per lb. of creep feed consumed
Sire groups:				
Hampshire	33	1.57	.64	.41
Suffolk	33	1.58	.69	.44
Southdown	28	1.44	.66	.46
Shropshire	25	1.62	.68	.42
Ewe groups:				
Finewools	51		.67	
Northwest Whiteface	25		.66	
Northwest Blackface	41		.67	

Table 55
Body Weights and Wool Production from Ewes of Different Breed Types.

	Type of ewes 1956 grease wool production lbs. per ewe	Body wts. 1955-56 following lambing lbs. per ewe
Finewools	12.21	141.46
Northwest Whiteface	13.85	167.42
Northwest Blackface	10.46	167.29

groups, however, gain faster than the fine-wool lambs and are heavier at 100 days of age.

The Whiteface Crossbred ewes have generally produced the heaviest fleeces, followed by the finewools. There have been no consistent differences among the three types of ewes in lambing or weaning percentages. In two years of the test, lambs from the Blackface Crossbreds have graded a little higher when slaughtered than lambs from the other ewe groups.

Lambing and weaning data for the lambs sired by Hampshire, Suffolk, Southdown, and Shropshire rams have not been consistent. The Southdown lambs have usually averaged lighter weight at birth but the comparative rank in birth weights of the lambs from the other sires has varied from year to year. The Hampshire- and Suffolk-sired lambs have usually gained faster and have been heavier at weaning than the Southdown- and Shropshire-sired lambs. These differences are not so apparent this year, however, and there has been little difference in the rate of gain of lambs from the different sires. In 1954 and in 1955 lambs sired by Shropshire rams made larger gains per pound of feed consumed than lambs sired by the other breeds, but in 1956 the Shropshire-sired lambs ranked next to last in comparative feed efficiency. The Southdown-sired lambs have shown a slight advantage in carcass grade in some years but this superior quality has not been demonstrated consistently.

Breeding difficulties have been experienced with the experimental rams of all four breeds during the hot summer months. Yearling rams were used in 1952, 1953, and 1954. Because of the difficulty in securing conception during the hot summer months, both a yearling and an older ram were used in each of the breeding groups during the summer of 1955. This practice improved the lambing performance of the ewes, but did not entirely solve the problem. One hundred ewes lambed by December 20; there was a period of about 45 days during which no lambs were born; and then 21 more ewes lambed beginning about January 5, 1956. These later lambs were conceived after the ewes had been turned together with the four breeds of rams July 25, 1955. The sires of these lambs could not be determined and are not included in the lamb figures for the sire group in the 1956 tests.

The Use of Management Techniques and Hormones with Ewes for Controlling the Time, Rate, and Regularity of Lambing.

PROJECT B.J. 441

T. Donald Bell, Walter Smith, John Wheat, Wendel Gardner,
V. E. McAdams, and Edward Nelson

One of the major factors in determining the economic success of a sheep enterprise is securing an optimum number of lambs born within a short interval, and at a time most advantageous to the producer. A majority of the commercial lamb producers in Kansas are following a fall lambing program, and one of their biggest problems is the failure of a varying number of ewes to lamb during the desired period. Extensive work at this station, (reported in Circulars 283, 1952; and 308, 1954) and at other experiment stations, has been conducted on the effects various hormones have upon the reproductive activity of ewes. Unfortunately, no hormone therapy has been found that will consistently cause ewes to lamb earlier or more uniformly. Additional information concerning the effects of hormones, singly and in combination, upon the physiological function and breeding behavior of ewes and rams should aid in a better understanding of the problems involved and might possibly lead to the successful use of hormones in improving the breeding performance of ewes and rams.

Limited studies in England and in the U.S. have shown that the breeding pattern of ewes may be altered by varying the proportions of light and darkness to which the ewes are exposed. Modification of experimental procedures, however, would be needed before this practice could be used under practical farm conditions.

Observations during the past three breeding seasons of the experimental flock at Kansas State College have shown that even though ewes may be sexually active, semen quality of rams may be so adversely affected by high temperatures that conception does not take place and lambing failures result. Studies at the Missouri and Kentucky Agricultural Experiment Stations have shown that possibly the semen quality of rams may be improved by providing artificially cooled quarters. Studies at Kansas State College have shown that there is considerable variation in reproductive activity of ewes and rams of different breeding, indicating the possibility of genetic selection for better breeding performance.

It is expected that the following lines of investigation may be continued or initiated as a part of this project.

1. The College purebred and experimental flocks will be used primarily for this study. Cooperators' flocks will be used if and when the experimental procedure can be facilitated by their use.

2. Lactating and non-lactating ewes will be observed for the occurrence of estrus throughout the year to determine the normal pattern of estrus in ewes of different breeding.

3. Rams of different breeds and ages will be checked for semen quality throughout the year to determine normal fluctuations in semen quality and to determine if differences exist in the semen quality of different breeds and ages of rams, particularly during the hotter summer months.

4. A group of ewes will be kept in an artificially cooled room during the hot summer months and their breeding performance compared with similar ewes handled under normal conditions.

5. The semen quality of rams kept in an artificially cooled room during the hot summer months will be compared with that of rams handled under normal conditions.

6. The effects of light upon the breeding activity of ewes and rams will be studied by providing exposure of ewes to varying periods of light and darkness.

7. Hormone treatment will be used if new developments warrant.

8. The lambing records of the College flocks and other flocks will be studied to determine the heritability of twinning, the early lambing trait, and regularity of lambing.

9. Other factors, such as plane of nutrition, will be studied if a need is indicated for this supplemental information.

Studies of the breeding behavior of ewes and rams in the College flock for the past three years have revealed facts that may be of value in better understanding the basic problems involved. These facts, which follow, may also suggest new possibilities for experimental work that could be of value in helping solve the problems.

1. Rambouillet or fine-wool ewes are sexually active during most months of the year. The period of least activity appears to be during February, March, and April. Blackface and whiteface crossbred ewes tend to follow the same pattern in breeding activity, but become sexually active later in the spring and may remain active for a shorter time.

2. Temperatures may play a smaller role in affecting the breeding behavior of ewes than many have thought. Observations made at Kansas State College during the extremely warm summers of 1953 and 1954 show that 60 to 80 percent of the fine-wool ewes came into heat during each of three months: June, July, and August. The accumulative total for the three months would have included between 90 and 95 percent of the ewes. The figures were somewhat lower for the cross breed.

3. Temperatures apparently affect breeding behavior and ability in rams more than in ewes. The semen quality of all the rams used in the experimental flock during the summers of 1953 and 1954 deteriorated to the point that they were virtually sterile during late July and early August.

4. While there may be some variation in temperature tolerance among rams of different breeds and ages, so far the differences have been largely individual, in Kansas studies.

The Effect of Stilbestrol Implants on Fertility in Adult Male Guinea Pigs.

PROJECT 93

J. D. Wheat, C. S. Menzies, and L. A. Holland

July 6, 1955, two adult guinea pig males each was implanted with 24 milligrams of stilbestrol. A young female that previously had given birth to a litter was placed in the cage with these males, but for some time they showed no interest in the female. One male died during the latter part of the summer but the other male remained in the colony until February 29, 1956. The female was kept in the cage with the implanted male and she gave birth to a litter about February 1, 1956. The average gestation length in the guinea pig is 68 days so the implanted male must have recovered from the effect of the stilbestrol and sired this litter by about November 24, 1955, approximately 4½ months after the implant was administered.

This indicates that adult guinea pig males can recover sufficiently from large dosages of stilbestrol to sire progeny.

Stilbestrol in a Guinea Pig Ration.

PROJECT 93

J. D. Wheat, C. S. Menzies, and L. A. Holland

This study was to determine the response of young guinea pigs to stilbestrol added to the basic ration of ground oats, tankage, bonemeal, ground alfalfa hay, and freshly-cut, green alfalfa. Eight litters of guinea pigs, each consisting of two pigs of the same sex, were used. These pigs ranged from 3 to 5 weeks of age and the initial weights ranged from 220.7 to 368.6 grams. Four of the litters were males and four were females. One male from each of the male litters was placed

in the control cage and the other pig from each litter was placed in the treatment cage. The female litters were divided in a similar manner and an effort was made to equalize the initial weights in the control and treatment cages for each sex.

The four animals in each treatment cage received 80 milligrams of stilbestrol-fortified premix daily in addition to the same amount of the basic ration received by the animals in the control cages. Each pig in the treatment cages received approximately 9 micrograms of stilbestrol, mixed with its feed, per day. The experiment began June 7, 1955, and ended August 9, 1955 (9 weeks). The gains, in grams, made by litter mates and the differences in gains made by these litter mates are shown in Table 56.

Table 56
Gains Made by Guinea Pig Litter Mates with and without Stilbestrol in the Ration (in Grams).

Litter number	Initial av. wt. for litter mates	Control ration	Control plus stilbestrol	Difference between gains
Males				
1	286.5	308.3	155.2	153.1
2	260.3	321.8	256.0	65.8
3	267.2	274.2	197.5	76.7
4	304.0	268.8	260.0	8.8
Total		1173.1	868.7	304.4
Av.		298.3	217.2	76.1
Females				
5	242.0	268.4	220.9	47.5
6	288.2	202.8	155.1	47.7
7	300.5	149.3	87.6	61.7
8	345.2	227.8	135.7	92.1
Total		848.3	599.3	249.0
Av.		212.1	149.8	62.2

The gains were analyzed statistically and those made by the pigs receiving no stilbestrol in the ration were significantly higher than those made by pigs receiving stilbestrol. The males made significantly higher gains than the females but the addition of stilbestrol to the ration affected the two sexes similarly, as there was no statistical evidence of a different response caused by sex. Among the animals receiving stilbestrol an increase in teat length and size was observed in both sexes as early as the end of the fifth week of the experiment.