

THE EFFECT OF THE PLANE OF NUTRITION OF PREGNANT EWES UPON
THEIR LAMB AND WOOL PRODUCTION

BY

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INTRODUCTION

Sheep were among the first animals domesticated by man, and have always been one of his most valuable beasts. Increasing efforts have been made to improve both wool and mutton, in order to give the greatest financial returns to the sheep grower.

Spring lamb production in Virginia constitutes about seventy-five percent of the total annual income from commercial flocks. To realize larger returns from the raising of sheep, among other things the flocks must be wintered in a manner so they will be able to give birth to a maximum of strong, vigorous lambs and be able to nurse them well. Heavy lambs on the early eastern markets will realize greater profits for the grower.

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REVIEW OF PREVIOUS INVESTIGATIONS

In recent years, the flockmasters and investigators have turned their attention to the effects of feeding and management of pregnant ewes on their lamb and wool production.

Bell (1929) concludes after a three year experiment with four lots of breeding ewes on various rations that ewes on a higher plane of nutrition produce heavier lambs at birth and at weaning time. Better fed ewes drop lambs with a lower mortality rate during the first ten days, and raise a higher percent to weaning time. Their yearling ewes and fattening wether lambs sheared heavier fleeces.

Bell (1926) found by feeding breeding ewes various proportions of concentrates to roughages that from the standpoint of both efficiency and economy of the ration, the best results were secured where the 1:3 proportion (medium concentrate allowance) was fed during the period of advance pregnancy; the 1:2 proportion (medium concentrate allowance) during the lambing period and the 1:1 proportion (heavy concentrate allowance) during the nursing period.

Chittenden, Dickson, and Barnum (1935) state after a test with four lots of grade Rambouillet ewes on winter range that "the average birth and weaning weights of the lambs were not

influenced by the addition of a protein supplement to the ewes ration. The fleece weights of the ewes were not increased by the addition of a supplement".

Hammond (1922), in experimenting with breeding ewes, found that a ration in which the silage was supplemented with a small amount of alfalfa (one-third of a pound daily per head) produced more satisfactory results than a ration of silage and corn stover. "The addition of linseed meal to a ration of corn, clover and silage caused the ewes to produce a more generous flow of milk and increased the gains produced by the lambs". In some cases at least, there was evidence to indicate that the character of the ration fed had some influence on the birth weight of the lambs, but this effect was much less noticeable than on their weight at ten days of age.

Report of the Illinois Station (1930 - 1931) states "seventy-eight range Corriedale ewes which had been bred to Southdown rams were divided into two lots of thirty-nine each. Lot 1 was fed only soybean hay and Lot 2, soybean hay and sheaf oats. The last weight before lambing was eighty-four days from the start of the feeding. During this time the ewes that were fed 1.02 pounds of sheaf oats instead of an equal amount of soybean hay gained 5.2 pounds more a head than the ewes fed only soybean hay. Lambs in both lots were of good size, vigorous and well developed at birth".

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Kammlade and Mitchell (1927 - 1928), found the average birth weight of lambs to be 8.80 pounds when their dam's grain ration was supplemented with alfalfa hay during pregnancy; 5.90 pounds when supplemented with timothy hay, and 7.43 pounds when supplemented with timothy hay and molasses. The ewes fed alfalfa had a noticeably larger milk flow than those fed timothy hay.

Montana Agricultural Experiment Station (41st Annual Report) 1934. Two lots of breeding ewes were fed eighty-four days. Lot 1 was full-fed hay and gained an average of 21.8 pounds for the period, while the limited fed ewes in Lot 2 gained 8.9 pounds. "The lambs from the full-fed ewes were 1.9 pounds heavier, and the fleece weights (shorn weights) were 0.66 of a pound heavier than those from the limited fed ewes. Their clean wool weights, however, were about the same. The increased lamb and wool production resulting from heavy feeding of hay did not pay for the extra feed required".

Putnam and Blakeslee (1932) wintered three similar lots of ewes for a period of three years. Lot 1 was full-fed legume hay, Lot 2 three-fourths full-fed legume hay, and Lot 3 one-half full-fed legume hay plus an equal amount of oat straw. All lots received grain five weeks previous to lambing. While Lot 1 made a much larger gain during the gestation period, they lost more weight while lambing and gained less on pasture. All the lots weighed approximately the same when their lambs were weaned. There was a slight difference

in the birth weight of the lambs, but there was practically no difference in their strength and vitality, and they all made good gains from birth to weaning time.

Rochford and Maynard (1929) state that alfalfa hay and corn silage produced an average of 8 pounds increased gains on ewes over alfalfa hay alone, covering a period of one month before lambing, on to the end of the lambing season. Furthermore, the lambs produced in the silage lot weighed one-fourth to one-half of a pound more at birth than the lambs from the lot fed only alfalfa hay.

Skinner and Smith (1910) report that lambs weighing 0.19 of a pound heavier were produced by ewes fed a succulent ration (grain, hay, and corn silage) than those fed a dry ration (grain and hay). The ewes fed the dry ration produced 0.8 of a pound more wool than those fed the succulent ration, but they did not credit this increase to the difference in the rations.

Snell (1936) fed four lots of ten ewes each in dry lot for three years. Lot 1, full-fed; Lot 2, full-fed eight months and one-third full-fed four months; Lot 3, two-thirds full fed, and Lot 4, one-third full-fed. Ewes on a high plane of nutrition produce more lambs, are better mothers and are better producers of wool than ewes full-fed eight months and then fed on a very low plane of nutrition for four months. Ewes fed an extremely poor ration are poor mothers, poor milkers, poor breeders, have light lambs at weaning time, and shear light fleeces.

THE EXPERIMENTPurpose and Plan

The purpose of the experiment is to determine the effect of a higher level of nutrition for pregnant ewes than is ordinarily practiced on their lamb and wool production.

On the basis of the previous investigations reviewed above, and for further information concerning methods of wintering pregnant ewes in Southwest Virginia, this experiment was undertaken during the winter and early spring of 1938 - 1939.

Two groups of two to four-year-old grade ewes were selected for the experiment. One group of forty-two ewes was bred to purebred Hampshire rams, and the other group of forty ewes to purebred Southdown rams. The ewes in each group grazed comparable pastures from August 20 to November 1, at which time the ewes in each group were divided into lots as follows:

Lot 1a (21 ewes)	Ewes bred to Hampshire rams
Lot 2a (21 ewes)	
Lot 1b (20 ewes)	Ewes bred to Southdown rams
Lot 2b (20 ewes)	

The ewes in each group were paired off considering their weight, breed, and previous lambing record so as to have the lots as uniform as possible. Throughout the experiment Lot 1a is compared with Lot 2a and, similarly, Lot 1b with Lot 2b.

On November 3, Lot 1a and Lot 1b were put on pasture together and started on a grain ration. Lot 2a and Lot 2b were put on pasture together, but fed no grain.

From December 13 through lambing time, all lots were on pasture together and fed grain.

Difficulties Encountered

On November 22 and December 12, the ewes were attacked by sheep-killing dogs, resulting in inestimable damages. Only Lot 2a and Lot 2b were in the first attack, but all four lots were in the second attack. Twenty-nine ewes were either killed or wounded by the dogs and are not considered in the experiment.

Seven ewes failed to conceive and are not considered in the experiment, since the feeding was not the cause of this condition.

Two ewes died of "pregnancy disease" on February 17, and, likewise are not considered in the experiment.

The number of ewes remaining in each lot that are considered in the experiment are: Lot 1a, 10; Lot 2a, 11; Lot 1b, 13; Lot 2b, 10.

Weights and Weighing

One-day individual weights were taken of all ewes on August 20, September 27 and October 14.

At the beginning of the experiment on November 1, individual weights were taken three days in succession and the average considered as the actual weight.

8.

One-day weights were taken every fourteen days from November 1 to December 14, when three-day weights were again taken and the average considered as the actual weight.

One-day weights were taken every fourteen days after December 14 to the close of the experiment.

After grain feeding began, all weights were taken in the morning before the ewes were fed. Weights were taken to the nearest pound.

As the lambs were born, they were collected each morning and their birth weights taken to the nearest tenth of a pound. Weights were taken every fourteen days thereafter and to the nearest one-half of a pound.

Rations Fed

The following grain mixture was fed:

Cracked yellow corn	200 pounds
Whole oats	200 pounds
Cottonseed meal	100 pounds

This mixture, according to the analysis of feeds given in Morrison's "Feeds and Feeding", yields about 13.4 percent digestible protein.

From November 3 to December 13, Lot 1a and Lot 1b were fed, along with fifty-one purebred ewes, an average of 0.47 of a pound per head daily of the above grain mixture, in addition to pasture. During the same period, Lot 2a and Lot 2b were together on pasture comparable to that of Lot 1a and Lot 1b, but received no grain.

From December 13 to January 26, all four lots, along with forty-four purebred ewes, were together on pasture and fed an average of 0.51 of a pound of the grain mixture.¹

As the ewes advanced in pregnancy they were separated from the main group, put on similar pasture and continued on the grain ration.

Approximately 1,250 pounds of clover and 2,200 pounds of alfalfa hay were fed the four lots during the winter months. All the hay was fed in the barn where the ewes were kept at night after cold weather set in.

The clover hay was fed ad libitum to all lots, and being of very poor quality much of it was wasted. The alfalfa was of good quality and was fed alike to all lots in limited amounts from about February 1 through lambing time.

¹January 26 was the last weight taken of the ewes before lambing time.

EXPERIMENTAL RESULTSRecord of EwesGain or Loss in Weight

The two groups of ewes made considerable gain in weight while on pasture from August 20 until the beginning of the experiment on November 1. The average weights on November 1: Lot 1a, 128.1 lbs.; Lot 2a, 131.2 lbs.; Lot 1b, 135.6 lbs.; Lot 2b, 129.4 lbs.

Table 1 summarizes the average gain or loss in weight of each lot.

Table 1. Effect of Winter Feeding on Average Pounds Gain or Loss in Weight of Ewes

Period	Lot 1a	Lot 2a	Lot 1b	Lot 2b
	Lbs.	Lbs.	Lbs.	Lbs.
Aug. 20 to Nov. 1	+ 18.4	+ 16.3	+ 18.6	+ 16.4
Nov. 1 to Dec. 14	+ 0.6	- 6.8	+ 1.6	- 6.5
Dec. 14 to Jan. 26	+ 2.3	+ 7.4	+ 1.8	+ 6.3
Nov. 1 to Jan. 26	+ 2.9	+ 0.6	+ 3.4	- 2.2
Jan. 26 to Feb. 9	- 27.4	- 25.9	- 24.5	- 23.7

It is seen in Table 1 that Lot 1a gained an average of 0.6 of a pound from November 1 to December 14, while Lot 2a lost an average of 6.8 pounds. This difference is significant and is

credited to the grain fed to Lot 1a during this period.² During the same period, Lot 1b gained an average of 1.6 pounds, while Lot 2b lost an average of 8.5 pounds, and this difference is significant.

From December 14 to January 26, Lot 1a and Lot 2a gained an average of 2.3 pounds and 7.4 pounds respectively. For the same period, Lot 1b and Lot 2b gained an average of 1.6 pounds and 6.3 pounds respectively. Neither of these differences are significant.

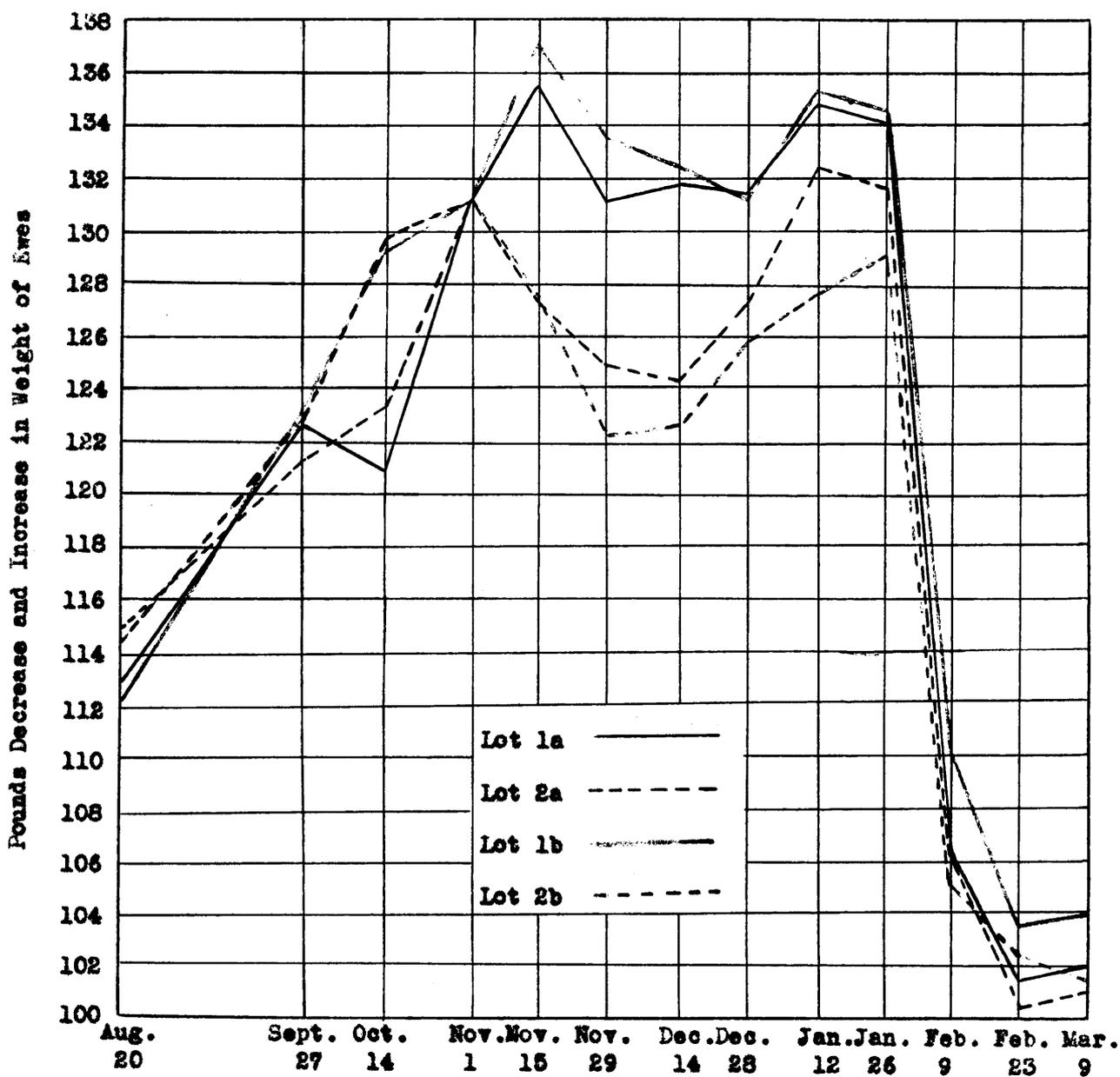
No significant difference in weight exists between Lot 1a and Lot 2a and, also, between Lot 1b and Lot 2b before or after lambing, even though Lot 1a and Lot 1b were wintered on a higher level of nutrition than Lot 2a and Lot 2b.³

By referring to Chart 1, it may be seen that Lot 2a and Lot 2b lost more weight during the first of the gestation period, but gained more weight as lambing time approached than did Lot 1a and Lot 1b. Also, Lot 2a and Lot 2b lost relatively less weight while lambing than did Lot 1a and Lot 1b.

The average weight of the four lots on November 1 is 131.1 pounds and all weights shown in Chart 1 are adjusted to this figure.

²Student's method of determining significant differences is used throughout the experiment.

³February 9 was the first weight taken after the ewes had lambed.



Date and Number of Days Between Weighings From August 20, 1938 to March 9, 1939

Chart 1. Showing the Effect of the Plane of Nutrition of Pregnant

Ewes as Indicated by the Average Weight at Different Periods.

Fleece Weights

Referring to Table 2, it is seen that Lot 2a and Lot 2b sheared heavier fleeces than Lot 1a and Lot 1b, even though the latter were fed on a higher level of nutrition during pregnancy. No significant difference was found to exist between Lot 1a and Lot 2a, and similarly between Lot 1b and Lot 2b.

	Lot 1a	Lot 2a	Lot 1b	Lot 2b
	Lbs.	Lbs.	Lbs.	Lbs.
Average Fleece Weights	4.49	4.74	4.35	4.45

Feed Cost

The grain mixture fed during the experiment is valued as follows:

Yellow corn	\$20.00 a ton
Whole oats	\$25.00 a ton
Cottonseed meal	\$32.00 a ton

Table 3 summarizes the amount and cost of the grain mixture fed each lot during the experiment.

	Lot 1a	Lot 2a	Lot 1b	Lot 2b
Nov. 3 to Dec. 13	40	--	40	--
Number days grain fed:				
Dec. 13 to Jan. 26	45	45	45	45
Nov. 3 to Dec. 13	0.47	---	0.47	---
Pounds grain fed daily:				
Dec. 13 to Jan. 26	0.51	0.51	0.51	0.51
Nov. 3 to Dec. 13	\$ 0.24	---	\$ 0.24	---
Grain cost per head:				
Dec. 13 to Jan. 26	\$ 0.29	\$ 0.29	\$ 0.29	\$ 0.29
Total cost per head	\$ 0.53	\$ 0.29	\$ 0.53	\$ 0.29

⁴All lots were fed alike from lambing time to shearing on May 5.

It may be seen from Table 3 that it cost \$0.53 per head to grain feed Lot 1a and Lot 1b, and \$0.29 to grain feed Lot 2a and Lot 2b up to lambing time.

Record of Lambs

Birth Weights

The number and average birth weights of the lambs in each lot are given in Table 4.

	Lot 1a		Lot 2a		Lot 1b		Lot 2b	
	S*	T**	S*	T**	S*	T**	S*	T**
Total per lot	: 7	: 9	: 7	: 6	: 10	: 6	: 9	: 0
Ave. birth weights in pounds	: 9.90	: 5.88	: 9.86	: 7.80	: 9.26	: 7.03	: 9.49	: 0

* Singles

**Twins

No significant differences are found to exist between the single and twin lambs in Lot 1a and Lot 2a. This is also true of the single lambs in Lot 1b and Lot 2b.

Since no twins were born in Lot 2b, no comparison can be made with the twins born in Lot 1b.

Death Losses

Table 5 gives the percent of lambs born and raised in each lot.

	Lot 1a	Lot 2a	Lot 1b	Lot 2b
	Percent	Percent	Percent	Percent
Born in each lot	145.45	130.00	123.07	100.00
Raised in each lot	118.18	120.00	100.00	80.00

Three lambs died at birth in Lot 1a, and in Lot 2a one lamb died of infection when a month old.

One lamb was born dead, one died of infection following castration and one was killed accidentally in Lot 1b. One lamb was born dead and one died of infection in Lot 2b.

Considering that no twin lambs were born in Lot 2b, no great differences are found in the number of lambs raised in each lot.

In several cases where a ewe lost a lamb, it was replaced by a twin lamb from a ewe in a different lot. Where this is the case the birth weight and credit for raising the lamb is given to the lot from which the lamb was taken. On the other hand, the daily gain is credited to the lot the lamb was transferred.

Average Daily Gains

As seen in Table 6, the single lambs in Lot 1a gained an average of 0.015 of a pound more than the single lambs in Lot 2a. However, the twin lambs in Lot 2a out-gained the twin lambs in Lot 1a on an average of 0.037 of a pound. Neither of these differences, however, is significant.

Table 6. Average Daily Gains of Lambs from Birth to March 23

	Lot 1a		Lot 2a		Lot 1b		Lot 2b	
	S*	T**	S*	T**	S*	T**	S*	T**
Total number lambs	10	2	6	6	8	8	8	0
Average number days	45.3	47.0	40.8	43.7	48.6	49.3	42.3	0
Pounds average daily gain	0.529	0.336	0.514	0.373	0.467	0.512	0.502	0

*Singles

**Twins

The single lambs in Lot 2b gained 0.035 of a pound more than the single lambs in Lot 1b, but this difference is not significant.

Even though Lot 1a and Lot 1b were wintered on a higher level of nutrition than Lot 2a and Lot 2b, their lambs did not out-gain the lambs in the latter lots.

DISCUSSION

At the start of the experiment on November 1, the two groups of ewes were paired off to form two pairs of similar lots. It was planned to determine the differences between the lots by comparing the results of a ewe in one lot with the results of a similar ewe in another lot. Due to difficulties encountered during the experiment, application of statistical methods to determine if significant differences exist between the lots by using similar pairs of ewes was impossible. Instead, interpretation of the experimental results is made by determining if significant differences exist between the lots considered as a whole.

Only one significant difference is found in the experiment as a result of the extra grain fed to Lot 1a and Lot 1b from November 3 to December 13. This difference is in the heavier weights on December 14, of Lot 1a and Lot 1b as compared to the weights of Lot 2a and Lot 2b at this time. No other significant differences are found between these lots, either in the weights of the ewes or in their lamb

and wool production.

It is probable, however, had the original number of ewes been carried throughout the experiment, other differences between the lots may have been found.

CONCLUSION

The results of this experiment indicate that a grain supplement during the last twelve weeks of pregnancy, in addition to pasture, does not produce any significant increases in either lamb or wool production over ewes receiving a grain supplement for only six weeks previous to lambing, in addition to pasture.

SUMMARY

1. Two groups of grade ewes were selected for this experiment. One group was bred to Hampshire rams and the other group to Southdown rams. Each group was divided into lots; those bred to Hampshire rams designated as 1a and 2a, and those bred to Southdown rams designated as 1b and 2b.

2. Lot 1a and Lot 1b fed grain, in addition to pasture, from November 3 to December 13 made slight gains in weight, while Lot 2a and Lot 2b receiving only pasture lost 6.8 lbs. and 8.5 lbs. respectively. The differences are significant.

3. All four lots fed grain from December 13 to lambing time gained in weight. Lot 2a and Lot 2b made larger gains during this time than did Lot 1a and Lot 1b.

4. Lot 1a did not show a significant difference in weight before or after lambing from Lot 2a, and similarly for Lot 1b and Lot 2b.

5. The sheared fleece weights of Lot 1a and Lot 1b were no heavier than Lot 2a and Lot 2b.

6. Lambs born in Lot 1a and Lot 1b were no heavier at birth than lambs born in Lot 2a and Lot 2b.

7. Death losses of lambs were no lower in Lot 1a and Lot 1b than in Lot 2a and Lot 2b.

8. The average daily gains of lambs in Lot 1a and Lot 1b were no larger than in Lot 2a and Lot 2b.

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