

UNIVERSITY OF MISSOURI

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COLLEGE OF AGRICULTURE

Agricultural Experiment Station

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BULLETIN NO. 120



**Rations for Breeding Ewes**

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COLUMBIA, MISSOURI

October, 1914

UNIVERSITY OF MISSOURI  
COLLEGE OF AGRICULTURE  
**Agricultural Experiment Station**

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## RATIONS FOR BREEDING EWES.

HOWARD HACKEDORN.

The investigation here reported was conducted for the purpose, first, of comparing clover hay, timothy hay, corn stover and corn silage as roughages for pregnant ewes; second, to determine the advisability of feeding a grain ration in conjunction with the various roughnesses mentioned above for maintaining pregnant ewes during the time that they occupy winter quarters; and, third, to study the effect of the treatment of pregnant ewes upon the growth and vigor of the lambs.

### PLAN OF THE EXPERIMENT.

**Sheep Used.** The ewes in this experiment were purchased at the Kansas City stock yards in September, 1911. They were from two to four years old and were classified as Colorado Ewes. All had good mouths and udders. They averaged 86 pounds in weight in a medium condition of flesh. In the fall of 1912, all ewes with broken mouths, spoiled udders and those which had not raised lambs the previous year were culled out, so that the ewes in the experiment during the second year were a better lot of breeding ewes than those that were used during the first year.



ONE OF THE LOTS OF EWES.

This cut shows the general type, character, and quality of the ewes used in the experiment. They were all good, strong ewes, representative of the western range type.

**Lots and Rations.** The ewes were put into winter quarters the last week in November, and started on the various rations which were as follows:

Lot I.	Grain and corn stover.	1911.
Lot II.	Grain and clover hay.	1911.
Lot III.	Grain, clover hay and corn silage.	1911.
Lot IV.	Grain, clover hay and corn stover.	1911.
Lot V.	Grain and corn silage.	1911.
Lot VI.	Grain and timothy hay.	1911.
Lot VII.	Clover hay and corn silage.	1911.
Lot VIII.	Clover hay and corn stover.	1911.
Lot XI.	Grain and corn stover.	1912.
Lot XII.	Grain and clover hay.	1912.
Lot XIII.	Grain, clover hay and corn silage.	1912.
Lot XIV.	Grain, clover hay and corn stover.	1912.
Lot XV.	Grain and corn silage.	1912.
Lot XVI.	Clover hay.	1912.
Lot XVII.	Clover hay and corn silage.	1912.
Lot XVIII.	Clover hay and corn stover.	1912.

It was planned to have 17 ewes in each lot the first year of this experiment, but some of the ewes did not get with lamb and were taken out of the experiment, as this condition of barrenness could not be attributed to the feed. This accounts for the different number of ewes in the lots excepting in the case of the three lots which received corn silage. During the fourth week of the first year of this experiment, Lots III, V, and VII which were receiving silage in their ration were fed some mouldy silage through a mistake on the part of the feeder which resulted in the death of five ewes in each of Lots III and V, and one ewe in Lot VII. The three lots were continued on the same rations for three months after this trouble occurred, without any further bad results. The same rations were fed from December 10, 1912 to April 1, 1913, without any trouble, hence it would seem advisable in making comparisons not to consider the ewes which died as a result of the mouldy silage.

The ewes were charged with dead lambs in cases of abortion. The second year all ewes proved to be with lamb. This year all lots contained 10 ewes excepting Lot XI, in which one of the ewes had to be removed before the experiment began, as she was not in a normal condition of health. Special care was taken in both the years of this experiment to have all lots uniform as to size, quality and condition.

Other factors than the feed might affect the results of an experiment with breeding ewes. For this reason, special effort was made to keep all other factors as uniform as possible.



**Roughnesses.** The clover hay used in 1911 was choice hay. It was clear and bright with few weeds or foreign grasses in it. During the second year of the experiment it was impossible to obtain choice clover hay, most of it being slightly mixed with timothy hay. The hay was of good quality and well cured. Bales that were badly mixed with timothy were set aside. The timothy hay used for Lot VI was graded choice, being of a good, bright color containing very little foreign grasses or weeds. The yield of corn in 1911, was not normal on account of the extremely dry summer, the result was that the corn silage of that year contained a low per cent of grain and a little higher per cent of acid than good silage should contain. The silage made during 1912 was of good quality containing a normal per cent of grain and was not so sour as the silage of the previous year. The stover used was field cured, and from time to time the shocks were hauled in from the field and stacked near the feeding shed. The stover used the winter of 1911-12 was not of good quality, on account of the fall rains having caused some deterioration. The stover used during the second winter was of good quality.

**The Grain Ration.** The grain ration was the same for all lots. It consisted of six parts shelled corn, three parts wheat bran and one part pea-size linseed oil cake, by weight. The amount of grain fed the different lots varied, the object being to keep the ewes in good condition of flesh, hence it was necessary to feed some lots more grain than others as the roughnesses did not have equal feeding values. The corn used was good No. 2 shelled corn. The bran was first grade soft wheat bran and the linseed oil meal was old process meal and the best quality that could be obtained.

**Quarters.** The different lots were kept in yards of uniform size. They were fed in a shed open to the south, with an exercise yard sloping to the south. The covered space allowed to each lot was  $8\frac{1}{2} \times 22\frac{1}{2}$  ft., including feeding racks and water troughs. The adjoining exercise yard for each lot was  $8\frac{1}{2} \times 100$  ft.

The feeding racks consisted of eight-inch grain troughs with a V-shaped hay rack above, so arranged that the hay would feed down through the grain trough. The sides and ends of the rack were tight to prevent loss of hay.

**Method of Feeding.** The first year all rations were divided into two equal portions, one-half of which was fed in the morning and one-half in the evening.

The second year all the grain and part of the roughage was fed in the morning, the remainder of the roughage was fed in the evening.

The silage was always fed in the morning so that if any ill effects resulted it could be noticed more readily. Feeding was done at 7:30 in the morning and at 4:00 in the afternoon.

During the first year, the ewes and lambs were removed after lambing, from the lot in which they had been fed throughout the winter and placed in a lot where they were fed a ration of grain and alfalfa hay. The grain ration being the same as was fed before; corn six parts, wheat bran three parts and linseed oil meal one part. The ewes and lambs from all lots were placed in one yard and received such amounts of hay and grain as were necessary to keep them in good thrifty condition.

The second year the ewes, after lambing, were continued on the ration which they had been receiving, until they were turned out on rye pasture, April 2.

**Water and Salt.** All lots were supplied with fresh clean water from the deep wells of the University water system. Common barrel salt was kept before the ewes at all times.

#### WEIGHT RECORDS.

**Weights of Ewes.** The ewes and lambs were weighed every thirty days. The water was cut off the evening before each weigh day and the ewes were weighed in the morning before feeding. The final weights of the ewes were taken six to eight hours after lambing. Three successive weights were taken at the beginning of the experiment, the average of these three weights being used as the initial weight. The second day of the three successive weigh days is used as the base date for the beginning of the experiment.

**Weights of Lambs.** The birth weight of the lambs was taken as soon as the lambs were dry, which was six to eight hours after lambing. Lambs dropped during the night were weighed in the morning.

Both years the lambs were dropped in March and the first week in April. The final weights of each lot were taken when the lambs averaged thirty days of age. Thus some lambs were over thirty days of age while others were less than thirty days old, however, the extreme difference in the ages of the lambs was in no case, over three weeks.

**The Rams Used.** The first year of this experiment, eighteen of the ewes proved to be with lamb when purchased. The sire of these lambs was unknown. The remainder of the ewes were bred to yearling Hampshire rams. One was a large framed rough ram weigh-

ing 215 lbs. in medium breeding condition; the other ram was a smoother, more compact ram weighing 175 lbs. in breeding condition.

The second year, all the ewes were bred to the last mentioned ram.

**Grain Rations for Lambs.** Creeps were provided for the lambs, i. e., part of each lot was fenced off with a partition providing spaces just large enough for the lambs to crawl through, but small enough to keep the ewes out. In these creeps, the lambs were fed all the grain they would clean up. The grain ration fed the lambs was the same as that fed the ewes, except that coarsely ground corn was used instead of shelled corn.

**The Measure of Efficiency.** In experiments with fattening animals, the measure of efficiency of a ration is determined by the pounds of feed required to produce 100 lbs. of gain, the cost of the feed and the condition of the animals at the end of the feeding period. However, rations for maintaining breeding animals cannot be measured by the above standard. The purpose of all breeding animals is to produce young. Hence, the offspring is the most important factor in measuring the efficiency of a ration for wintering pregnant ewes.

The measure of efficiency in this experiment was, first, the weight and condition of the lambs at birth; second, the ability of the ewe to suckle the lambs—this being measured by the gain and general thrift of the lambs while suckling their dams; third, the general thrift and condition of the ewes throughout the trial; fourth, the cost of the ration.

#### CLOVER HAY VS. TIMOTHY.

Many farmers in Missouri produce timothy because it is a more certain crop and easier to grow than clover. Unfortunately, however, the crops which are produced with the least trouble are not always the best. From a soil fertility standpoint, clover is much superior to timothy, and from a sheep feeding standpoint, clover has proven a superior roughness. In order to study the relative merits of these two hays as roughnesses for wintering pregnant ewes, this trial was conducted. The results are recorded in Table I.

TABLE I.—CLOVER HAY VERSUS TIMOTHY HAY.

	Clover hay and grain.	Timothy hay and grain.
	Lot II 1911	Lot VI 1911
Number of ewes.	14	15
Average initial weight of ewes.	92.75	91.73
Average final weight of ewes.	99.28	84.06
Average loss or gain of ewes.	6.53	— 7.67
Total number of lambs.	16	17
Total number of strong lambs.	16	11
Total number of weak lambs.	0	5
Total number of dead lambs.	0	1
Average weight of live lambs.	8.98	8.48
Average daily rations of ewes.		
Grain.	.33	.35
Hay.	2.99	2.91
Average daily gain per lamb during first 30 days after birth.	.534(a)	.447(a)

(a) The ewes received a ration of grain and alfalfa hay after lambing.

From this table it is seen that the lot of ewes receiving clover hay produced the higher per cent of lambs. However, this difference is small and is not of as much importance as the difference in the condition of the lambs at time of birth and at the average age of thirty days. The ewes receiving timothy hay dropped five weak lambs and one dead lamb, while the lambs from the ewes fed on clover hay were all strong, thrifty lambs, which were fatter and better nourished at birth, averaging one-half pound more in weight.

The ewes in Lot II (those receiving clover hay) suckled their lambs much better than did the ewes in Lot VI as is indicated by the greater gain made by these lambs. The difference in weight does not rep-

resent as great a difference as could be seen in the lambs. The lambs in Lot II were fat and in the best of condition, while those in Lot VI lacked the flesh which is required to make good marketable lambs in the early summer.

It is of further interest to note that the eleven strong lambs in Lot VI did not make as high an average daily gain as did the lambs in Lot II, where all lambs were considered. This emphasizes the fact that the ewes fed on timothy hay were not in a condition to suckle their lambs as well as the ewes fed on clover. It should be remembered that after lambing, the ewes of both lots were fed on alfalfa hay and grain.

The two lots were fed practically the same amount of grain and hay during the period of pregnancy. The lot receiving timothy hay did not eat the hay with the keen appetite, however, which was noticeable with the ewes fed clover. Lot II (clover hay) refused only .02 lbs. of hay per head per day, while Lot VI (timothy hay) refused .17 lbs. per head per day.

There was very little difference in the cost of the two rations as choice timothy and choice clover are about the same in price.

Timothy hay proved to be such an inferior ration that it was not continued the second year.

#### CLOVER HAY AND GRAIN VS. CLOVER HAY.

Under systems of diversified farming, breeding ewes are kept to utilize the coarser feeds such as hays, fodders, etc. The more concentrated feed such as grains are either sold or fed to animals which can utilize them to better advantage than the breeding ewes. However, a small portion of the grain might be used to good advantage in feeding the breeding flock. Especially is this true when the pastures have been sparse so that the breeding flock goes into the winter in thin condition. In order to throw some light on this question, the trial which is reported in Table II was conducted.

TABLE II.—GRAIN AND CLOVER HAY VS. CLOVER HAY.

	Grain and clover hay, Lot XII.	Clover hay, Lot XVI.
	1912	1912
Number of ewes.	10.	10.
Average initial weight of ewes.	81.69	79.72
Average final weight of ewes.	84.90	76.70
Average loss or gain of ewes.	3.21	— 3.20
Total number of lambs.	11.	10.
Total number of strong lambs.	10.	9.
Total number of weak lambs.	1.	0.
Total number of dead lambs.	0.	1.
Average weight of live lambs.	8.98	8.16
Average daily rations of ewes.		
Grain.	.56	.....
Hay.	2.94	3.27
Average daily gain per lamb 30 days after birth.	.319(a)	.204(a)

(a) The ewes were continued on the same ration after lambing as they had been receiving before lambing excepting the amount was increased.

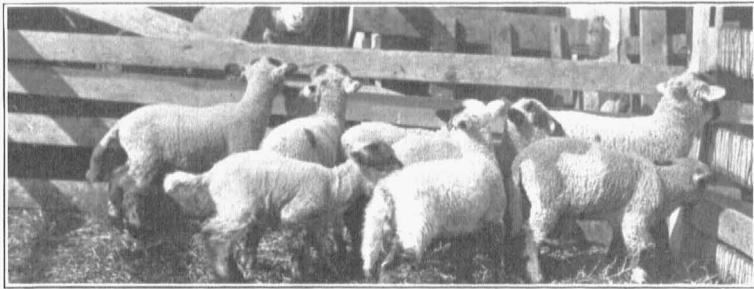
This trial was carried on in the winter of 1912-13. The ewes went into winter quarters in fair condition of flesh. Both lots were uniform as to size and condition.

The ewes fed clover hay and grain made an average gain of 3.21 lbs. prior to lambing while the ewes without grain lost practically that amount during the same period. This loss was not enough to be of serious consequence. The number and condition of the lambs produced was practically the same. The lambs from the ewes receiving grain weighed .82 lbs. more at birth than those from the ewes receiving clover hay only. The important advantage of grain feed-

ing is seen in the last line of this table. The wide difference in the average daily gain of the lambs for the first thirty days, indicates the relative ability of the ewes to suckle their lambs. The ewes receiving grain suckled their lambs much better than did the ewes receiving no grain, as is indicated by the greater daily gain per lamb. The ewes suckling lambs were given the same ration they had received prior to lambing except the amount given was increased. The difference in the value of the lambs indicates the advisability of feeding some grain to the ewes after lambing.



**LAMBS FROM LOT XII—EWES WERE FED GRAIN AND CLOVER HAY.**  
This lot of lambs was in better condition and was superior to those of Lot XVI, because their mothers received sufficient feed to produce abundance of milk.



**LAMBS FROM LOT XVI—EWES WERE FED CLOVER HAY.**  
The mothers of these lambs did not receive enough feed for the production of sufficient milk to keep the young lambs fat.

Table II indicates that clover hay alone is sufficient to carry pregnant ewes through the winter, providing they are in a good condition of flesh when they go into winter quarters. However, after lambing, if the ewes and lambs are kept in dry lot, grain feeding is advisable.

If the ewes are not fed grain during the winter, it is preferable to start feeding grain about a month before the lambing season begins, starting with a small amount—about one quarter of a pound of grain per head per day. This will get the ewes accustomed to grain feeding so that after lambing they can be fed sufficient grain to maintain milk flow without danger of digestive troubles which usually accompany sudden and heavy feeding of grain.

The grain used in this trial was 6 parts corn, 3 parts bran and 1 part linseed oil cake. It proved a very satisfactory grain ration.

#### CORN SILAGE VS. CORN STOVER.

The corn belt farmer of a few years ago did not consider the corn stalks of sufficient value to spend much time and expense in saving them for a winter feed. The stalk-fields were pastured, but no attempt was made to utilize them to any great extent. Cheap land and cheap feed made it more economical to utilize only the better quality of hays. The change in farm practices brought about by the higher prices of land and feeds has made advisable the utilization of all the feed grown. Corn stalks are being utilized to a greater extent as a part of the ration for wintering breeding and young stock. The following trials were conducted in order to determine the relative value of silage (which includes the stalk and the ear) as compared with stover (stalk cut and cured in the field with the ear removed). The data from this trial are presented in three tables.

**Corn Silage and Grain vs. Corn Stover and Grain.** The first of these tables, Table III, shows the results of feeding corn silage and grain as compared with corn stover and grain, the silage and the stover constituting the entire roughness. An effort was made to induce the ewes to eat as much of the roughness as was possible. In addition, grain was fed in such quantities as was necessary to keep the ewes in good, thrifty, breeding condition.



TABLE III.—CORN SILAGE AND GRAIN VS. CORN STOVER AND GRAIN.

	Corn silage and grain.			Corn stover and grain.		
	Lot V.	Lot XV.	Average.	Lot I.	Lot XI.	Average.
	1911	1912		1911	1912	
Number of ewes.	11	10	21	17	9	26
Average initial weight of ewes.	87.42	78.89	83.36	87.27	84.14	86.17
Average final weight of ewes.	88.00	80.75	84.54	88.53	79.33	85.34
Average loss or gain of ewes.	.58	1.86	1.18	1.26	-4.81	-.83
Total number of lambs.	11	10	21	18	10	28
Total number of strong lambs.	10	10	20	18	8	26
Total number of weak lambs.	1	0	1	0	0	0
Total number of dead lambs.	0	0	0	0	2	2
Average weight of live lambs.	9.79	9.	9.37	9.45	8.93	9.29
Average daily rations of ewes.						
Grain.	.30	.58	.43	.41	.73	.503
Silage.	3.50	3.34	3.42.	.....	.....	.....
Stover.	.....	.....	.....	6.22	5.97	6.16
Average daily gain per lamb 30 days after birth.	.530 (a)	.248 (b)	..... .....	.458 (a)	.319. (b).	..... .....

(a) The ewes received a ration of grain and alfalfa hay after lambing.

(b) The ewes were continued on the same ration after lambing as they had been receiving before lambing excepting the amount was increased.

From this table, it is seen that during the first year of this trial there was very little difference in the condition of the ewes. The percentage of the lambs in both lots was the same, 100 per cent.

The lambs in both lots were strong and thrifty, with the exception of one in Lot V, which later developed into a strong lamb. The lambs dropped by the ewes receiving silage averaged one-third of a

pound heavier than the lambs dropped in Lot I. The second year's results were practically the same excepting one ewe in Lot I aborted about the middle of the feeding period. The probable cause of this was injury received while weighing. During both years, more grain was required to maintain the desired condition of the ewes receiving corn stover than was required by the ewes receiving silage.

The ewes receiving the stover refused about half of the roughness given. The first year they were fed an average of 6.22 lbs. of stover per head per day and refused 2.39 lbs. and the second year 5.97 lbs. stover was fed and 2.35 lbs. refused.

During the first year of this trial the ewes and lambs after lambing were put on a ration of grain and alfalfa hay. The lambs from the silage-fed ewes made a greater gain than the lambs from the ewes fed on stover. During the second year when the ewes and lambs were kept on the same ration that they received through the winter, the lambs in Lot XI made the greater gain. The difference in the average daily gain made by the lambs was so small as to be of little significance. From Table III it can be seen that with corn stover as a roughness, from one-fourth to one-third more grain is required to winter breeding ewes than when silage is used. Otherwise there was little difference of practical consequence. It should be borne in mind that the death of five ewes in Lot V was attributed to mouldy silage.

**Corn Silage and Clover Hay vs. Corn Stover and Clover Hay.** The object of this experiment was to secure data upon a number of combinations of roughnesses in order to determine so far as possible those most desirable for Missouri conditions. Clover being a common hay crop on all the better farms of the state, combinations of clover and corn silage, and clover and corn stover were tested. The results of this work is reported in Table IV.

TABLE IV.—CORN SILAGE AND CLOVER HAY VS. CORN STOVER AND CLOVER HAY.

	Corn silage and clover hay.			Corn stover and clover hay.		
	Lot VII	Lot XVII	Average.	Lot VIII	Lot XVIII	Average.
	1911	1912		1911	1912	
Number of ewes.	15	10	25	17	10	27
Average initial weight of ewes.	91.64	79.43	86.75	85.62	83.39	84.80
Average final weight of ewes.	90.26	74.9	84.12	86.94	75.60	82.74
Average loss or gain of ewes.	-1.38	-4.53	-2.63	1.32	-7.79	-2.06
Total number of lambs.	19	10	29	19	10	29
Total number of strong lambs.	15	10	25	17	7	24
Total number of weak lambs.	4	0	4	2	2	4
Total number of dead lambs.	0	0	0	0	1	1
Average weight of live lambs.	8.57	8.70	8.62	8.51	7.77	8.27
Average daily rations of ewes. Hay.	2.07	1.59	1.87	2.56	1.62	2.31
Silage.	2.55	1.87	2.36	.....	.....	.....
Stover.	.....	.....	.....	2.05	3.04	2.32
Average daily gain per lamb 30 days after birth.	.452 (a)	.165 (b)	..... .....	.435 (a)	.181 (b)	..... .....

(a) The ewes received a ration of grain and alfalfa hay after lambing.

(b) The ewes were continued on the same ration after lambing as they had been receiving before lambing excepting the amount was increased.

The first year of this trial, the ewes in both lots practically maintained their condition up to lambing time, as can be seen by comparing the initial and final weights. The fifteen ewes in Lot VII produced four pairs of twin lambs, while only two pairs of twin lambs were dropped in Lot VIII. The twin lambs in all cases were weak at birth. Hence the larger number of weak lambs in Lot VII which

received clover hay and corn silage is accounted for by the larger per cent of lambs dropped and should not be attributed to the difference in the feed.

Throughout the first year's work, there was very little difference in the value of the two rations. The lambs were of practically the same average birth weight, and after lambing when both lots were put on a ration of grain and alfalfa hay the ewes suckled their lambs equally well, as is indicated by the average daily gain of the lambs for the first thirty days after birth. The most important difference is seen in the average daily ration. The ewes in Lot VIII required about one-half pound more of clover hay per head per day than did the ewes in Lot VII which received the clover hay and corn silage.

During the second year of this trial, the silage proved a better roughness than the stover. The silage in this test was of much better quality, containing a larger amount of grain than did the silage which was used in the trial the first year. The ewes receiving the silage more nearly maintained their condition and produced stronger and heavier lambs than the ewes receiving the corn stover. The ewes in Lot VII which received the corn silage suckled their lambs better than those receiving the stover.

The table shows that the lambs in Lot XVIII made a little greater gain than those of Lot XVII. This is accounted for by the fact that six of the ewes in Lot XVIII did not produce sufficient milk to keep the lambs alive and they died before the end of the third week. Thus, only four of the strongest lambs were left. The ewes of Lot XVII were able to raise all their lambs, which gives them a decided advantage.

Averaging the two years' work, there was little difference in the efficiency of the rations up to lambing time. After lambing, the corn silage and clover hay proved the superior ration.

**Corn Silage, Clover Hay and Grain vs. Corn Stover, Clover Hay and Grain.** The results of feeding grain and clover with corn silage and corn stover respectively were recorded in tables III and IV. In Table V, the results of feeding small amounts of both grain and clover, with silage and corn stover respectively are presented.

TABLE V.—CORN SILAGE, CLOVER HAY AND GRAIN VS. CORN STOVER, CLOVER HAY AND GRAIN.

	Corn silage, clover hay and grain.			Corn stover, clover hay and grain.		
	Lot III	Lot XIII	Average.	Lot IV	Lot XIV	Average.
	1911	1912		1911	1912	
Number of ewes.	10	10	20	14	10	24
Average initial weight of ewes.	95.36	81.13	88.24	90.78	83.86	87.89
Average final weight of ewes.	98.30	86.5	92.40	90.04	83.6	87.58
Average loss or gain of ewes.	2.94	5.37	4.26	-.74	-.20	-.31
Total number of lambs.	14	11	25	16	10	26
Total number of strong lambs.	13	11	24	13	10	23
Total number of weak lambs.	1	0	1	3	0	3
Total number of dead lambs.	0	0	0	0	0	0
Average weight of live lambs.	8.23	9.27	8.698	8.96	9.05	9.00
Average daily ration of ewes.						
Grain.	.33	.57	.450	.30	.58	.397
Hay.	2.00	1.64	2.079	2.00	1.57	1.86
Silage.	1.80	1.87	2.09	.....	.....	.....
Stover.	.....	.....	.....	2.00	3.08	2.35
Average daily gain per lambs 30 days after birth.	.418 (a)	.378 (b)	.....	.485 (a)	.284 (b)	.....

(a) The ewes received a ration of grain and alfalfa hay after lambing.

(b) The ewes were continued on the same ration after lambing as they had been receiving before lambing excepting the amount was increased.

A study of this table shows that the ewes receiving the corn silage gained slightly in weight while the ewes receiving the corn stover lost some in weight. There was very little difference in the average daily allowance of grain and clover. During the first year, the lambs in the lot receiving corn stover averaged a little heavier at birth (.73 lbs.) than did those in Lot III. The ewes in Lot III produced a higher per cent of lambs which would account for their lower average weight. The first year's results show that the lambs in Lot IV (corn stover, clover hay and grain) made slightly greater gains. This small difference again can be accounted for by the greater per cent of lambs in Lot III. The second year's results show that corn silage proved more efficient than corn stover. The lot of ewes receiving silage produced a higher per cent of lambs, which averaged heavier and made better gains than the lambs dropped by the ewes receiving the corn stover. This difference is not large, and taking an average of the two years' work the rations are of about equal value. The corn silage proved slightly superior as a larger per cent of lambs was raised in this lot. Greater care must be taken in feeding silage than stover because of the dangers of mouldy silage.

Tables III, IV and V show that there is not a great difference in the value of corn stover and corn silage when it is used to reduce the consumption of the more expensive feeds such as grain and clover hay. The corn silage proved slightly superior in all cases. The two disadvantages attending the feeding of silage are, first, a flock of 50 to 150 ewes cannot use enough silage to make the silo a profitable investment unless sufficient stock of other classes are available which may also be fed silage; second, mouldy and extremely sour silage is a dangerous feed for sheep.

On many farms where much of the corn stover is wasted it could be utilized as one of the roughnesses for breeding ewes if fed in limited quantities.

#### FEEDING CORN SILAGE TO BREEDING EWES.

The question of feeding silage to the breeding flock has become an important one in the last few years. Especially, are the methods of silage feeding of interest to those who have sufficient live stock to economically use a silo. In Table VI the results of the various methods of feeding silage tested at the Missouri Experiment Station are presented.

TABLE VI.—FEEDING CORN SILAGE TO BREEDING EWES.

	Corn silage, clover hay and grain.			Corn silage and grain.			Corn silage and clover hay.		
	Lot III.	Lot XIII.	Average.	Lot V.	Lot XV.	Average.	Lot VII.	Lot XVII.	Average.
	1911	1912		1911	1912		1911	1912	
Number of ewes.	10	10	20	11	10	21	15	10	25
Average initial weight of ewes.	95.36	81.13	88.24	87.42	78.89	83.36	91.64	79.43	86.75
Average final weight of ewes.	98.30	86.5	92.40	88.00	80.75	84.54	90.26	74.9	84.12
Average loss or gain of ewes.	2.94	5.37	4.26	.58	1.86	1.18	-1.38	-4.53	-2.63
Total number of lambs.	14	11	25	11	10	21	19	10	29
Total number of strong lambs.	13	11	24	10	10	20	15	10	25
Total number of weak lambs.	1	0	1	1	0	1	4	0	4
Total number of dead lambs.	0	0	0	0	0	0	0	0	0
Average weight of live lambs.	8.23	9.27	8.698	9.79	9	9.37	8.57	8.70	8.62
Average daily rations of ewes.									
Grain.	.33	.57	.45	.30	.58	.43	.....	.....	.....
Silage.	1.80	1.87	2.09	3.50	3.34	3.42	2.55	1.87	2.36

TABLE VI—Continued.

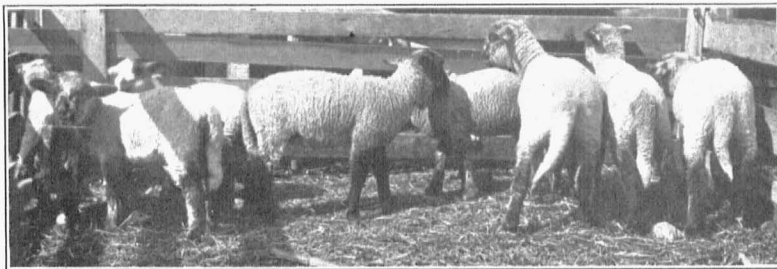
	Corn silage, clover hay and grain.			Corn silage and grain.			Corn silage and clover hay		
	Lot III.	Lot XIII.	Average.	Lot V.	Lot XV.	Average.	Lot VII.	Lot XVII.	Average.
	1911	1812		1911	1912		1911	1912	
Hay.	2.00	1.64	2.07	.....	.....	.....	2.07	1.59	1.87
Average daily gain per lamb 30 days after birth.	.418 (a)	.378 (b)	.....	.53 (a)	.248 (b)	.....	.452 (a)	.165 (b)	.....

(a) The ewes received a ration of grain and alfalfa hay after lambing.

(b) The ewes were continued on the same ration after lambing as they had been receiving before lambing excepting the amount was increased.

A study of this table shows that during the first year of these trials there was little difference in the three lots. The ewes in all lots practically maintained their condition. There was a slight change in the average weight of the ewes in the various lots. However, the difference was so small as to be of little significance.

The first year the ewes were put on a ration of grain and alfalfa hay after lambing. On this ration the lambs in Lot V made the largest gains; those in Lot VII were second in the amount of gain per



LAMBS FROM LOT XIII—EWES WERE FED CORN SILAGE, CLOVER HAY AND GRAIN.

This ration proved to be one of the most satisfactory rations for breeding ewes.





**LAMBS FROM LOT XV—EWES WERE FED CORN SILAGE AND GRAIN.**

The mothers of this lot of lambs required from one-fourth to one-third more grain to maintain them in good breeding condition than did the ewes receiving corn silage, clover hay and grain.

head per day and those in Lot III ranked last. This difference in the gains made by the lambs is probably not due so much to the feed the ewes received prior to lambing as to the difference in the number of lambs the ewes suckled. The number of lambs raised by the various lots is represented by the following percentages: Lot III, 140 per cent; Lot VII, 114.28 per cent; Lot V, 100 per cent.

During the second year of this test when the ewes were fed the same ration after lambing as they had received before the lambs were dropped, the ration of corn silage, clover hay and grain proved the most efficient. The lot of ewes receiving this ration gained more in weight and condition, produced a higher per cent of lambs, and suckled them better than the ewes in the other two lots.



**LAMBS FROM LOT XVII—EWES WERE FED CORN SILAGE AND CLOVER HAY.**

This lot of lambs was the poorest of the three lots. The ewes receiving silage and clover hay did not give sufficient milk to keep the lambs in good condition of flesh.

The last line of Table VI shows that the lambs of Lot XIII made the highest average daily gain of the three lots. A further study of the second year's results shows that a ration of grain and silage was more efficient in maintaining the condition of breeding ewes than a ration of clover hay and corn silage. The former ration also proved to be much the better ration for ewes suckling lambs than did the ration of clover hay and corn silage.

The table shows that during both years the difference in the efficiency of the three rations up to lambing time is so small as to be of little consequence. After the lambs had been dropped a ration of grain, clover hay and silage proved to be the best ration for ewes suckling lambs. The ration of grain and silage ranked second, and clover and corn silage ranked last.

**Silo Capacity for Sheep Feeding.** The weight of corn silage per cubic foot is not constant. It will vary with the maturity of the corn when put into the silo, with the amount of water added when the corn is put in, with the manner in which it is scattered and tramped and many other factors. For most practical purposes 40 lbs. per cubic foot is accurate enough in estimating the capacity of a silo. In Table A the capacity of the silo is calculated on this basis.

TABLE A.

Diameter of silo.	Height of silo.	Estimated capacity tons.	Acreage of corn required to fill silo, 12 tons per acre.	Number of sheep required to utilize silage in 150 days 2 lbs. per head per day.	Number of sheep required to utilize 3 in. of silage per day.
10	28	44.9	3.7	300	392
10	30	47.1	3.9	311	392
10	32	50.2	4.1	331	392
10	34	53.3	4.4	356	392
10	36	56.5	4.7	377	392
10	38	59.6	4.9	398	392
10	40	62.8	5.2	420	392
12	28	63.2	5.3	422	565
12	30	67.8	5.6	452	565
12	32	72.3	6.0	483	565
12	34	76.8	6.4	513	565
12	36	81.3	6.7	543	565
12	38	85.8	7.1	573	565
12	40	90.4	7.5	603	565
14	28	85.9	7.1	574	817
14	30	92.1	7.6	614	817
14	32	98.2	8.1	655	817
14	34	104.5	8.7	698	817
14	36	110.5	9.2	737	817
14	38	116.6	9.7	778	817
14	40	122.8	10.2	819	817

TABLE A.—Continued.

Diameter of silo.	Height of silo.	Estimated capacity tons.	Acreage of corn required to fill silo, 12 tons per acre.	Number of sheep required to utilize silage in 150 days 2 lbs. per head per day.	Number of sheep required to utilize 3 in. of silage per day.
16	28	112.5	9.3	751	1005
16	30	120.6	10.	804	1005
16	32	128.6	10.7	858	1005
16	34	136.6	11.3	912	1005
16	36	144.7	12.	966	1005
16	38	152.8	12.7	1019	1005
16	40	160.8	13.4	1072	1005
18	30	152.4	12.7	1016	1270
18	32	162.5	13.5	1083	1270
18	34	172.7	14.3	1152	1270
18	36	182.8	15.2	1220	1270
18	38	193.0	16.	1287	1270
18	40	202.2	16.9	1355	1270
18	42	212.3	17.7	1423	1270
18	44	223.5	18.6	1490	1270
18	46	233.6	19.4	1558	1270
20	30	188.4	15.7	1256	1570
20	32	200.9	16.7	1327	1570
20	34	213.5	17.7	1424	1570
20	36	226.0	18.8	1508	1570
20	38	238.6	19.8	1591	1570

TABLE A.—Continued.

Diameter of silo.	Height of silo.	Estimated capacity tons.	Acreage of corn required to fill silo, 12 tons per acre.	Number of sheep required to utilize silage in 150 days 2 lbs. per head per day.	Number of sheep required to utilize 3 in. of silage per day.
20	40	251.2	20.9	1675	1570
20	42	263.7	21.9	1759	1570
20	44	276.3	23.0	1843	1570
20	46	288.8	24.	1926	1570
20	48	301.4	25.1	2010	1570
20	50	314.0	26.1	2093	1570

If a silo was filled about one-half to two-thirds full and then allowed to settle for two or three days, and then filled to the top and allowed to settle and again refilled no doubt the silo would hold nearly its estimated capacity. This method of filling the silo is not practical under most farming conditions. The silo is usually filled in one to three days depending on its size. Under these conditions the amount of silage fed out the silo will be about two-thirds to seven-



LAMBS FROM LOT XI—EWES WERE FED CORN STOVER AND GRAIN. Corn stover can be successfully utilized as a roughness for breeding ewes providing sufficient and proper concentrates are fed in addition.



**LAMBS FROM LOT XIV—EWES WERE FED CORN STOVER, CLOVER HAY AND GRAIN.**

This ration proved to be the most satisfactory method of utilizing the corn stover for breeding sheep.

eighths of its estimated capacity. For this reason the figures in the last column of the table should be reduced by one-eighth to one-third, as these figures are based upon the supposition that the silo will hold as much silage as it is estimated to hold.

**FEEDING CORN STOVER TO BREEDING EWES.**

Corn stover alone is not recommended as a feed for breeding stock of any kind because it does not contain sufficient quantities of muscle and blood building nutrients. It also has a tendency to constipate breeding ewes, which frequently leads to more serious troubles. In order to utilize the corn stover to the best advantage, it should be fed in connection with a protein feed and one of a laxative nature. In these trials a grain ration of six parts shelled corn, three parts bran and one part linseed oil cake by weight was used and proved very satisfactory.

The results of feeding trials of corn stover and grain, corn stover and clover hay; and corn stover, clover hay and grain, are presented in Table VII.



**LAMBS FROM LOT XVIII—EWES WERE FED CORN STOVER AND CLOVER HAY.**

The mothers of these lambs received a ration which did not contain enough nutriment to keep up a flow of milk sufficient to maintain the lambs.

TABLE VII.—FEEDING CORN STOVER TO BREEDING EWES.

	Corn stover and grain.			Corn stover, clover hay and grain.			Corn stover and clover hay.		
	Lot I. 1911	Lot XI. 1912	Average.	Lot IV. 1911	Lot XIV. 1912	Average.	Lot VIII. 1911	Lot XVII. 1912	Average.
Number of ewes.	17	9	26	14	10	24	17	10	27
Average initial weight of ewes.	87.26	84.14	86.17	90.78	83.86	87.89	85.62	83.39	84.80
Average final weight of ewes.	88.53	79.33	85.34	90.04	83.6	87.58	86.94	75.60	82.74
Average loss or gain of ewes.	1.26	-4.81	-.83	-.74	-.2	-.31	1.32	-7.79	-2.06
Total number of lambs.	18	10	28	16	10	26	19	10	29
Total number of strong lambs.	18	8	26	13	10	23	17	7	24
Total number of weak lambs.	0	0	0	3	0	3	2	2	4
Total number of dead lambs.	0	2	2	0	0	0	0	1	1
Average weight of live lambs.	9.45	8.93	9.29	8.96	9.05	9.0	8.51	7.77	8.27
Average daily rations of ewes.									
Grain.	.41	.73	.50	.30	.58	.397	.....	.....	.....
Hay.	.....	.....	.....	2.00	1.57	1.86	2.56	1.62	2.31

TABLE VII.—Continued.

	Corn stover and grain.			Corn stover, clover hay and grain.			Corn stover and clover hay.		
	Lot I. 1911	Lot XI. 1912	Average <sup>a</sup> .	Lot IV. 1911	Lot XIV. 1912	Average.	Lot VIII. 1911	Lot XVII. 1912	Average.
Stover.	6.22	5.97	6.16	2.00	3.08	2.35	2.05	3.04	2.32
Average daily gain per lamb 30 days after birth.	.458 (a)	.319 (b)	.....	.485 (a)	.284 (b)	.....	.435 (a)	.181 (b)	.....

(a) The ewes received a ration of grain and alfalfa hay after lambing.

(b) The ewes were continued on the same ration after lambing, as they had been receiving before lambing excepting the amount was increased.

The results of the various feeding trials with corn stover carried on by the Missouri Experiment Station show that grain with corn stover as the only roughness is more satisfactory than the corn stover with a limited amount of clover hay. In both years of this experiment, the ewes were fed such amounts of grain and clover hay as was necessary to maintain them in thrifty, breeding condition. During the first year there was little difference in the two lots of lambs at birth. Afterwards when both lots were fed a ration of grain and alfalfa hay no great difference was noticeable. The second year, there was an appreciable difference in the condition and thrift of the lambs at birth in favor of the lambs in Lot XI (grain and corn stover). The lambs in Lot XI at the end of the first thirty days had made greater average daily gains and were uniformly a superior lot of lambs. Six of the ten ewes on the ration of corn stover and clover hay were unable to suckle their lambs the second year when the lots were continued on a ration of grain and corn stover.

The first year Lot IV, which received grain, corn stover and clover hay produced lambs superior to those in Lot I. The second year the lambs in Lots XIV and XI were of practically the same quality and condition at birth.

The ewes in Lot XIV receiving the ration of grain, clover hay and corn stover suckled their lambs a little better than did the ewes in Lot XI receiving a ration of grain and corn stover. This is indicated by the greater average daily gain made by the lambs in Lot XIV.



The difference is not large. It would probably have been greater if a grain ration of straight corn had been used.

The conditions of this experiment made it necessary to feed the stover in racks. This method of feeding stover is not commonly used. It is preferable to scatter the stover out on a pasture whenever the weather and condition of the ground will permit it. It is essential for the health of the flock that the breeding ewes have an opportunity to take plenty of exercise. When this method is followed the breeding ewes will take sufficient exercise to keep them in good healthy condition. Also, by this method the labor of handling the manure is avoided.

#### GENERAL SUMMARY.

1. Clover hay and grain proved more efficient as a ration for breeding ewes than timothy hay and grain.
2. Clover hay alone was sufficient to maintain pregnant breeding ewes up to lambing time. After lambing, the addition of grain to the ration proved advisable.
3. Corn silage when fed with clover hay, with grain, and with both clover hay and grain, proved a slightly better roughage than corn stover fed with the same combination of grain and clover hay.
4. Mouldy or extremely sour corn silage is a dangerous feed for sheep. Eleven ewes were lost in this experiment in one week from accidentally feeding mouldy silage.
5. A ration of corn silage, clover hay and grain proved to be the most efficient means of utilizing silage.
6. A ration of grain and corn stover gave very satisfactory results when sufficient and proper kinds of concentrates were used.
7. Corn stover, clover hay and grain proved to be the most satisfactory method of utilizing stover.
8. Corn silage and stover both proved to be better roughages than timothy hay when fed with grain.