T H E S I S

FATTENING LAMBS IN THE CORNFIELD UNDER COLORADO CONDITIONS

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INTRODUCTION

In recent years the acreage of corn raised in Colorado has increased very rapidly, especially in the irrigated sections. It is in these corn growing sections that most of the lamb feeding in Colorado is done, and the practice of fattening lambs in cornfields has increased very materially of late years. Naturally many new problems have arisen in connection with this practice.

Most of these questions have to do with systems of feeding, whether the lambs should run on corn alone, or whether it is advantageous to feed supplemental feeds such as alfalfa or soybeans. It was in order to answer some of these questions that the first test was planned in the fall of 1923.

HISTORY

Very little experimental work has been done in regard to fattening lambs in the cornfield. At only four stations has any work of this nature been attempted.

Farmers, however, have been fattening lambs in the cornfield for several years. On different farms, different methods of management are used. Some feeders run the lambs in the fields on corn alone, with no other supplemental feed. Other feeders try to improve this system by supplying various additional feeds such as alfalfa,

linseed oil meal, cottonseed meal, or by the use of supplementary crops such as rape, soybeans, or cowpeas.

EARLY EXPERIMENTS AT OTHER STATIONS

A. Ohio Experiments

Ball at the Ohio Agricultural Experiment (1) Station, in 1923, planned an experiment to study different methods of fattening lambs under cornfield conditions. He used eight lots of lambs, handled as follows: Lot I, Run in cornfield, no other feed. Lot II, Cornfield and clover hay. Lot III, Cornfield, clover hay, and linseed oil cake. Lot IV, Cornfield, rape, clover hay, linseed oil cake. Lot V, Cornfield, early soybeans, clover hay, linseed oil cake. Lot VI, Cornfield, late soybeans, rape, clover hay, linseed oil cake. Lot VII, Cornfield, late soybeans, clover hay, linseed oil cake. Lot VIII, Dry lot fed under open shed, shelled corn, clover hay, linseed oil cake. He reports that the lambs in Lot I did not make satisfactory gains, 1111.2 pounds of corn being required for 100 pounds of gain. The cost of 100 pounds of gain for this lot was $14.89. By adding clover hay to the cornfield ration (Lot II) the rate of gain was more than doubled and the cost of 100 pounds of gain was $9.45. By adding linseed oil cake (pea size) to the cornfield and clover hay ration in Lot III the rate of gain was slightly increased and the cost of 100 pounds of gain reduced to $8.39. In Lots IV and V

rape seeded at the last cultivation of corn, both alone and in combination with late soybeans, produced more rapid gains and cheaper gains than either early soybeans (Lot VI) or late soybeans (Lot VII) when seeded as supplements to corn.

B. Nebraska Experiments

In 1916 and 1917, Gramlich at the Nebraska Station (2) included some cornfield fed lots with his regular feeding experiments to determine the advisability of fattening lambs in the cornfield. In 1916 only one cornfield lot was fed. These lambs had as additional feed, .33 of a pound of linseed oil meal per day per head. After severe frosts started alfalfa was fed in a rack placed in the field, the lambs eating 1.27 pounds of hay per head daily.

Gramlich reports that cornfield feeding gave a larger daily gain than dry lot feeding on corn and alfalfa and reduced the cost of gain by $1.65 per 100 pounds and increased profits by 81 cents per head. The cornfield lambs carried the most flesh of any lot in the experiment and sold at the highest value per 100 pounds.

Table No. 1--Cornfield Feeding versus Dry Lot Feeding

Nebraska Experiment Station 1916

	Corn and Alfalfa in Dry Lot	Cornfield Alfalfa Hay Oil Meal
Average daily gain	.331	.358
Cost of 100 pounds gain	$ 7.45	$ 5.80
Selling price per cwt.	10.90	11.00
Profit per lamb	1.65	2.46
Dressing percentage	48.66	49.88

Gramlich concluded that on the basis of this test, cornfield feeding was worthy of considerable practice.

In 1917, the Nebraska Experiment Station (3) compared four lots of cornfield fed lambs with three lots fed in the dry lot and one lot fed corn, oil meal and alfalfa on a bluegrass pasture. The writer was in charge of the lambs in this test. A comparison of the principal lots is given below. The lambs weighed from 55.6 pounds to 58.5 pounds, the clipped lambs weighing 51.3.

Table No. 2--Cornfield Feeding versus Dry Lot Feeding

Nebraska Experiment Station 1917

Number in lot	Lot 1 35	Lot 4 35	Lot 5 35	Lot 6 35	Lot 7 35
Rations	Corn Alfalfa	Corn-field Alfalfa	Corn-field Alfalfa Clipped Lambs	Corn-field Oil Meal Alfalfa	Corn-field Cotton-seed nut cake Alfalfa
Av. final wt.	77.31	75.64	71.52	79.26	80.45
Av. initial wt.	58.47	55.68	51.31	55.6	58.2
Av. gain	18.84	19.96	20.01	23.66	22.25
Av. daily gain	.325	.324	.345	.408	.353
Av. daily ration lbs:					
Corn	.970	1.04	.87	1.04	1.09
Cottonseed nut cake					.16
Oil meal				.196	
Alfalfa hay	1.99	.527	.518	.541	.52
Lbs. feed required lb. gain					
Corn	2.98	3.224	2.71	2.68	2.99
Cottonseed nut cake					.43
Oil meal				.48	
Alfalfa hay	6.12	1.532	1.5	1.33	1.36
Cost of 100 lbs. gain	16.85	10.02	8.74	9.80	10.49
Initial cost @ $17.91 per 100 lbs.	10.47	9.97	9.19	9.96	10.42
Interest at 7%, 58 days	.108	.112	.103	.112	.117

(Continued)

Table No. 1--(Concluded)

	Lot 1	Lot 4	Lot 5	Lot 6	Lot 7
Number in lot	35	35	35	35	35
Rations	Corn Alfalfa	Cornfield Alfalfa	Cornfield Alfalfa Clipped Lambs	Cornfield Oil Meal Alfalfa	Cornfield Cotton-seed nut cake Alfalfa
Marketing cost	.278	.228	.228	.228	.345
Feed cost per lamb	3.164	2.00	1.75	2.319	2.334
Total cost per lamb	14.02	2.31	11.27	12.62	13.22
Selling cost per 100 lbs.	16.40	16.40	12.50	16.40	16.40
Receipts (3.77 lbs. shrink	12.06	11.78	10.09	12.54	12.57
Loss per lamb	1.96	.53	1.18	.08	.64
Nutritive ratio of ration fed	1:5.3	1:7.2	1:7	1:6.1	1:6.3

CONCLUSIONS BASED ON NEBRASKA EXPERIMENTS 1917

1. Fattening lambs in the cornfield with alfalfa hay in addition, in comparison with shelled corn and alfalfa hay fed in the dry lot, increased the daily gain by .018 of a pound and decreased the cost of 100 pounds of gain by $6.83.

2. Adding .2 of a pound oil meal to the cornfield and alfalfa ration increased the daily gain .064 of a pound and decreased slightly the feed cost per pound gain. The loss on these lambs was only 8 cents per lamb as compared to $1.96 loss for dry lot feeding and 53 cents for the cornfield and alfalfa lot.

The addition of .16 of a pound of cottonseed nut cake to the cornfield-alfalfa ration did not give as economical results as did the linseed oil meal. Compared to lot 4 (cornfield and alfalfa) the daily gains were higher but the financial loss was also greater.

As fall fed lambs often seem to suffer from heat, one lot of lambs was clipped before being turned into the cornfield. They were fed the same as lot 4. There was practically no difference in the rate of gain. The corn consumed by the unclipped lambs amounted to 1.04 pounds daily in contrast to but .87 of a pound in lot 5. The alfalfa consumption was practically the same, being .527 of a pound and .518 of a pound respectively.

Clipping lambs before feeding saved .51 of a pound of corn and .03 of a pound of alfalfa for each pound of gain. Due to this saving in feed requirements, the clipped lambs put on their gain for considerably less cost than did the unclipped ones, the costs being $10.02 and $8.74 respectively per 100 pounds gain on unclipped and clipped lambs respectively. The clipped lambs were discriminated against on the market, bringing only $12.50 per hundred while the lambs in lot 4 brought $16.40. The clipped lambs had sheared only 2.5 pounds of wool, consequently these lambs lost $1.18 per head in contrast to 5.3 pounds on unclipped lambs. It is evident from this trial that shearing fall lambs is unnecessary and uneconomical.

Griswold and Kuenning of the North Dakota Experiment Station (4) report that sixty spring lambs averaging 75 pounds in weight made average daily gains of .224 of a pound during a 49 day test in lambing down corn. They consumed an estimated average of 9.7 pounds of grain per pound of gain.

At the Bellefourche (South Dakota) Experiment Farm (5) Aune reports that lambs have usually been started on corn with alfalfa pasture about September 1 and have had access to beet tops after October 15. The results for seven years, 1916 to 1922 are averaged. There was an average of 35 lambs pastured per acre on corn yielding 50 bushels per acre. The average daily gain made was. 31. This method of harvesting corn and alfalfa proved very satisfactory.

In Illinois Extension Circular No. 21, Coffey concluded "Success in 'sheeping down' corn depends upon the preparation that is made for feed and care, on discrimination in purchasing the sheep and on the way in which they are managed". He recommended the sowing of cowpeas and rape along with corn, a shed where the sheep can take shelter from rains and wet snows, fencing off sections of a field at a time, plenty of fresh clear water and salt at all times. He also recommends that pigs be used to clean up the field after the lambs have finished. If this method is followed the lambs will not need to be forced to clean up so closely. He also stated that shotes might be run with the lambs.

CORNFIELD FEEDING AT COLORADO STATION

During the spring of 1923 the contract price offered for sugar beets was unsatisfactory to many Colorado growers. Accordingly, many farmers planted corn with the intention of fattening lambs in the cornfield. As this was rather a new system of feeding for this section of Colorado, many inquiries regarding management and methods of feeding came to this station. As there was little information available with which to answer these questions it was considered advisable to begin some experimental work along these lines. With the problems of the feeders in mind the following experiments were planned:

OBJECTS OF THE EXPERIMENT

The objects of this work were

1. To study the possibilities of lambing down corn in Colorado as compared to the regular method of dry lot feeding.

2. Whether lambs could be successfully employed to harvest the corn crop.

3. To make a study of cornfield rations to give the best results for fattening lambs.

4. To compare the cost of gains under cornfield conditions with the cost of gains made in the dry lot.

5. To determine the kind of lambs most suited to pasturing in the cornfield.

METHODS OF EXPERIMENTATION

First test, 1923-24

Types of Lambs

In the test in the fall of 1923 the lambs used were as follows:

20 Southerns

20 Grade Corriedales

20 Grade Rambouillets

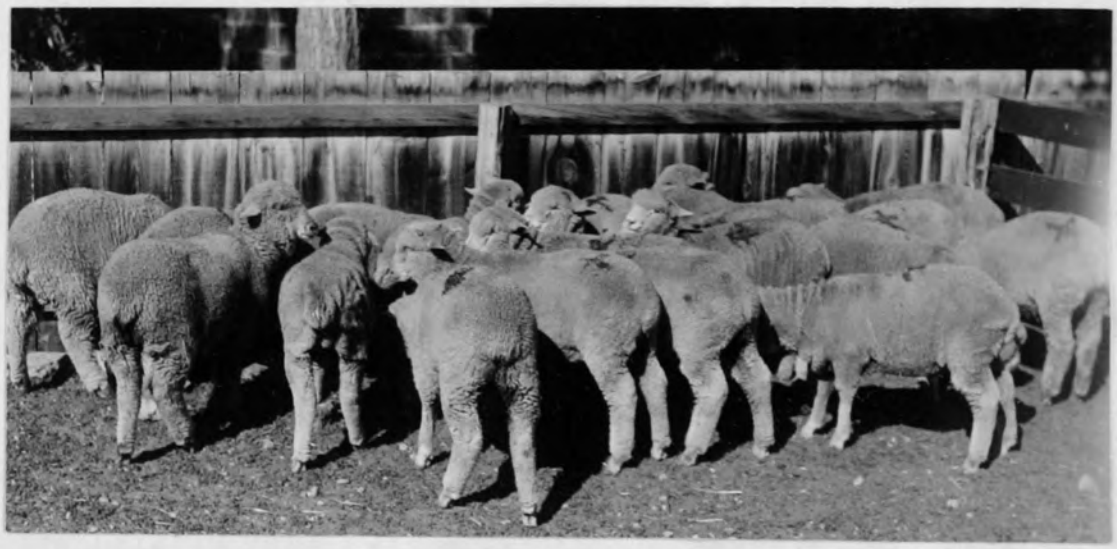
20 Grade Hampshires

Southerns

Natives

Grade Corriedales

Grade Hampshires



Grade Rambouillets

The Southern lambs were from New Mexico and were typical of that section, being rather rangy, light pelted, smooth bodied and showing a predominence of Merino blood.

The grade Corriedales were from the United States Sheep Experiment Station at Dubois, Idaho and were of a type which they are trying to perfect by crossing Lincoln rams on Rambouillet ewes and then crossing these with the Corriedale. The lambs used in this test had from one to three top crosses of Corriedale blood.

The grade Rambouillets were from Wyoming and represented the average tight wooled range lamb raised in that state, showing quite marked Rambouillet characteristics. They had smooth bodies with some folds on the neck.

The grade Hampshires were from Utah. They were black faced and showed a preponderance of Hampshire blood.

CONDITION

All lambs were just off the range and were in good feeder condition and were in a thrifty and healthy condition at the beginning of the experiment.

PREVIOUS TREATMENT

The previous treatment of all the lambs was practically the same, as all of them came from the range and all were held in lots for forty-eight hours and fed alfalfa prior to the starting of the experiment.

ALLOTMENT CONSIDERATIONS

In allotting the lambs, the following factors were taken into consideration:

1. Breeding
2. Weight
3. Condition
4. Uniformity
5. Type

The lambs were divided into four lots as follows: Each lot had 5 Southerns, 5 grade Corriedales, 5 grade Hampshires, 5 grade Rambouillets, making 20 lambs in each lot. In making the allotment a great deal of care was taken that the groups would be as uniform as possible in every respect.

WEATHER CONDITIONS

From September 28 until the night of October 23, the weather was fairly pleasant. On the night of October 23 and the next day, six inches of wet snow fell and after this, the weather was unsettled.

GENERAL MANAGEMENT

Lot 1 was fed in dry lot in the usual way, alfalfa being self-fed and the corn fed morning and evening. The dry lot had a windbreak on the north.

Lot 2 was run in the cornfield with no supplementary feed.

Lot 3 was run on corn and soybeans. The soybeans were of the Ito San variety and had been sown with the corn at time of planting.

Lot 4 was run in the cornfield with alfalfa hay fed in a rack.

The cornfield in which the lambs were fed contained 2.379 acres, divided into three equal fields, giving .793 acres to each field. The lambs had access to salt and fresh water at all times.

Soybeans Growing on Corn Stalks

Showing Sparse Stand of Corn in 1923 Test

Lambs in Cornfield 1923

CORNFIELD FEEDING TEST IN 1923

The 1923 experiment began on September 28 and ended December 20, a period of 54 days. The lambs were not quite fat enough for market at the end of this period and were finished out in a dry lot on corn and alfalfa. Not all of the corn was out of the field by the 20th of December, but owing to weather conditions it was considered advisable to take the lambs out of the field. After the lambs were removed, hogs were used to clean up the corn which was left on the ground. The hogs gained 625 pounds but not a very definite estimate could be made of the amount of corn on this basis, as the hogs were of different ages and different sizes, ranging from mature sows to weaner pigs. An estimate of 4 pounds of grain for a pound of gain was used in determining the corn recovered by the hogs.

ESTIMATING THE YIELD OF CORN

The yield of corn was estimated by cutting a row of corn from each lot, shucking out the corn and weighing it. The yield was found to be 40 bushel per acre with a 14 percent moisture content.

RESULTS OF THE 1923 CORNFIELD EXPERIMENTS

Results secured in 1923 were by no means satisfactory. Several factors tended to destroy the value of this first test. To briefly enumerate these factors they were as follows: First, there was not an even yield of corn over all parts of the field due to the fact that there was a grove of trees on two sides. Second, during August, a

severe wind blew down a considerable portion of the corn. Possibly a third of the ears were either lying on the ground or touching it and the wet weather which followed caused a considerable amount of the corn to be wasted. Third, the wet weather and snow in October also had an adverse effect on the lambs generally. Fourth, dogs got in pen 4 one night, killing one lamb and frightening the others, causing them to jump out of their pen and leaving them in a frightened and nervous condition for several days. Fifth, death loss was so heavy that it was difficult to figure results with any degree of certainty. The results secured during this first test are shown in table 3.

Table No. 3--Results of the 1923 Work. All Lots

On Basis of One Average Lamb

Lots	Lot 1	Lot 2	Lot 3	Lot 4
Rations	Dry lot: Corn Alfalfa	Corn-field	Corn-field & soy-beans	Corn-field & Alfalfa
Initial weight per lamb	65.1	65.6	65.6	66.0
Final weight per lamb	77.0	74.2	75.4	74.6
Total gain of all lambs	213.0	122.0	145.7	128.3
Average daily gain per lamb	.22	.159	.181	.159
Average daily feed				
Corn	.634	.680	.730	.760
Alfalfa	1.814			.230
Feeds required for 100 lbs. gain				
Corn	294.4	511.6	401.9	481.8
Alfalfa	888.59			48.0
Cost per lamb at $10 per cwt	6.51	6.56	6.56	6.60
Feed cost per 100 lbs. gain	12.53	10.40	8.38	9.64
Feed cost per lamb	2.67	1.26	1.20	1.24
Necessary price per lamb to break even	9.18	7.72	7.76	7.84
Necessary price per cwt. to break even	11.91	10.40	10.29	10.64
Necessary margin to break even	1.91	.40	.29	.64

Costs of Feeds

Corn $2.00 per cwt.

Cornfield $38.00 per acre

Alfalfa $15.00 per ton

DISCUSSION OF RESULTS

1923 Test

Comparing lots 1 and 2 we find that lot 1 (dry lot, corn and alfalfa) made the largest daily gain, gaining .220 pounds per day while the gain made in lot 2 (cornfield) was only .159 pounds per day. In regard to feed required for 100 pounds gain, the lambs in lot 1 ate only a little more than half as much corn as the lambs in lot 2 but along with it they took 888.59 pounds of alfalfa hay. The lambs in the cornfield, no doubt, ate considerable roughage, but there is no way to estimate the amount eaten by them and no value is put on it. Had it not been eaten by the lambs it would have been wasted.

The cost of 100 pounds of gain in lot 1 was 12.53 which was quite a little higher than that in lot 2 where the cost of 100 pounds of gain was only $10.40. On lot 2 a margin of .40 was all that was necessary in order to break even while $1.91 would have been required in lot 1.

In lot 3 (cornfield and soybeans) the addition of soybeans increased the daily gain slightly and decreased materially the cost per 100 pounds gain. The cost of 100 pounds of gain in lot 3 was $8.38 while in lot 2 it was $10.40 and the necessary margin to break even was 29 cents.

In lot 4 (cornfield and alfalfa) the daily gain was the same as in lot 2. The addition of alfalfa did not increase the daily gain but due to the fact that less corn

was required for 100 pounds gain, the cost was less, being $9.64 as compared to $10.40 in lot 2.

The lambs were not sold at this time as they were not finished but were all thrown together and fed out on corn and alfalfa in a dry lot. They were fed for 37 days longer.

SUMMARY OF 1923 WORK

This test showed favorable results for confield feeding under very adverse conditions. There is considerable risk in the lambing down of corn and much depends on the lambs and on the weather. One thing that the test clearly demonstrated is that for success in lambing down corn, the lambs must be of hardy stock and acclimated to the conditions under which they are being fed. The southern lambs did not do as well as the other types used, the preference being given to natives or to northern tight-wooled lambs.

DEATH LOSSES

An extended discussion of death losses and the causes of same was considered to be outside the scope of this paper. It is necessary, however, to make some mention of losses sustained.

In the 1923 test thirteen lambs died aside from one killed by dogs. The normal death loss in feed lots in northern Colorado according to Dr. Newsom (6) is about 2½ percent so this first year's loss of 16.25 percent was

excessively high and much above the normal. A post mortem was made by the Veterinary Department of the college on all dead lambs. The cause of death in all cases was considered by them to be due to over eating of corn (8). as shown by the chart, all lambs which died were lambs which were fed in the cornfield. The chart also shows that a heavy death loss took place October 27 to 29 inclusive. At this time a heavy wet snow fell which may have had something to do with the deaths at this time. No lambs died in any of the lots previous to getting on full feed.

The death loss among the Southerns was three times as heavy as with Corriedales and Rambouillets and twice as heavy as the Hampshires. This indicates that the southern lambs are not so well suited to lambing down of corn as are the northern or more tight-wooled and hardy lambs.

In the test conducted in the fall of 1924 only one death occurred. This was in the dry lot and was diagnosed as caused by over eating. This gave a death loss of only 1.25 percent which is very low.

In the 1925 test three lambs died. The cause of the deaths again was given as over eating. This made the percentage of loss 3.77 percent which is above the normal for dry lots. It must be noted, however, that with such small lots of lambs the death of one lamb raises the death rate very materially and may cause an erroneous conclusion to be drawn.

DEATH LOSSES IN CORNFIELD

Date	Lot 1 Corn Alfalfa	Lot 2 Cornfield	Lot 3 Cornfield & Soybeans	Lot 4 Cornfield & Alfalfa
Sept. 28	(Lambs in	Cornfield 54	days)	
29				
30				
Oct. 1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				Southern
13				
14				
15				
16				
17				
18				
19			Southern	
20				
21				
22				
23				
24				
25				
26		Hampshire		
27		Rambouillet	Hampshire	gr. Corriedale
28	Southern			
29			Rambouillet	
30				
31				
Nov. 1				
2				
3				Southern
4				
5				
6				
7				
8				
9				
10				
11				Southern
12				

(Continued)

DEATH LOSSES IN CORNFIELD (Concluded)

Date	Lot 1 Corn Alfalfa	Lot 2 Cornfield	Lot 3 Cornfield & Soybeans	Lot 4 Cornfield & Alfalfa
Nov. 13		Southern		
14			Hampshire	
15				
16				
17			gr. Corriedale	
18				
19				
20		End of Cornfield Experiment		
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				
Dec. 1				
2				
3				
4	gr. Corriedale			
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16		gr. Corriedale		
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				

SUMMARY OF DEATHS

According to breed

Southern	2 lambs
Corriedale	2 lambs
Hampshire	3 lambs
Rambouillet	2 lambs

DISTRIBUTION ACCORDING TO LOT ALONE

Lot	Ration	Number of Deaths
1	Dry lot, corn and alfalfa	2
2	Cornfield only	4
3	Cornfield and soubeans	5
4	Cornfield and alfalfa	4
	Total	15

According to lot and breed

	Corriedale	Southern	Hampshire	Rambouillet
Lot 1	1	1		
Lot 2	1	1	1	1
Lot 3	1	1	2	1
Lot 4	1	3		

CORNFIELD FEEDING TEST IN 1924

This second test was conducted on the same plan as the previous year's work with some minor changes. Much better results were secured than in 1923. The field used for this test was located on the college farm. An exceptionally even stand of corn was obtained. As it was impossible to obtain Southern lambs from New Mexico in time to start the test, native lambs from the college flock were used instead. The Southern lambs were started upon their arrival a month later.

ALLOTMENT

The lambs were allotted for the 1924 work as follows:

Lots 1, 2, 3 and 4 each contained the following types of lambs

5 grade Corriedales (from United States Sheep Experiment Station)

5 grade Rambouillets (from Utah)

5 grade Hampshires (from Wyoming)

5 natives (from college flock)

Lot 5

20 Southerns (from New Mexico)

RATIONS FED

Lot 1 Dry lot, corn and alfalfa

Lot 2 Cornfield and soybeans

Lot 3 Cornfield and alfalfa in rack

Lot 4 Cornfield only

Lot 5 Southerns, cornfield and alfalfa

In this test the lambs were not left on the corn at night as in 1923 but were brought in to dry lots every evening. One lot of corn was reserved for the Southern lambs which came in the last of October and were started on test November 1. The regular experiment started October 1. The Southern lambs were called Lot 5 and were run in the cornfield with alfalfa in racks at night. They were handled the same as lot 3 except that they were started a month later. The reason for starting these lambs later than the others was that feeder lambs from the South do not normally come on to the market until the latter part of October.

Table No. 4--Results of the First Period of 1924 Work

66 Days in the Cornfield

Lots	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Rations	Dry lot: corn & Alfalfa	Corn-field soybeans	Corn-field Alfalfa	Corn-field	Corn-field Alfalfa
Av. initial wt. per head	72.05	72.20	72.10	72.30	59.40
Av. final wt. per head	95.34	87.00	89.50	87.00	72.80
Av. gain per head	.344	.221	.266	.237	.193
Lbs. feed required for 100 lbs. gain					
Shelled corn	288.97	651.55	578.50	606.00	844.00
Alfalfa	870.78		89.08		280.48
Cost of 100 lbs. gain	11.54	13.03	11.57	12.12	16.88
Initial cost per lamb at $12 cwt.	8.65	8.69	8.65	8.66	7.13
Feed cost per lamb	2.71	1.90	2.01	1.89	2.16
Necessary price per lamb to break even	11.35	10.59	10.66	10.55	9.29
Necessary price per cwt. to break even	11.91	12.17	11.91	12.13	12.50
Necessary margin per cwt. to break even	-.09	+.17	-.09	+.13	+.50

Costs of Feeds

Corn shelled $2.00 per cwt.

Alfalfa $15.00 per ton

Cornfield $38.00 per acre

EXPLANATION OF TABLE NO. 4

1924 Test

Between lots 1 and 4 we have a direct comparison between lambs fed in dry lot on corn and alfalfa, a well balanced ration, and lambs fed in the cornfield on a very wide ration. The daily gain was much higher in the dry lot, the gains being .344 and .237 pounds respectively or a difference of .097 or almost .1 pound in favor of the dry lot.

As regards feed for 100 pounds of gain, the lambs in the dry lot ate 288.97 pounds of corn and 870.78 pounds of corn, or the 870.78 pounds of alfalfa saved 317.03 pounds of corn. The cost of 100 pounds of gain was more in lot 4, the cornfield lot, by 58 cents, and the price per hundred necessary to break even was higher in lot 4 by 23 cents.

Lot 3 which was fed alfalfa in addition to the cornfield showed up better than any of the other cornfield lots. The average daily gain was higher in this lot, being .266 of a pound, but lower than the dry lot (Lot 1). The cost of 100 pounds of gain was lower in lot 3 than any of the other cornfield lots and only 3 cents higher than in the dry lot. The price necessary to break even was the same in lot 3 as in lot 1, being $11.91 in each case.

Comparing lot 3 with lot 4 as regards feed for 100 pounds of gain, the addition of 89.08 pounds of alfalfa hay saved 27.50 pounds of corn.

Lot 2 which had soybeans in addition to field corn did not show any advantage over the straight cornfield feeding (Lot 4). The gain per head was 14.80 pounds in lot 2 and 15.70 pounds on the straight cornfield. The average daily gain was .016 of a pound less in lot 2 than in lot 4. As regards amount of feed for 100 pounds, 651.55 pounds of corn was required in lot 2 and 606.00 in lot 4. The cost of 100 pounds of gain was also 91 cents higher for the soybean lot.

Lot 5 was composed of Southern lambs from New Mexico. These lambs are sometimes called Navajos. As a rule it is not possible to get them in until a month after other lambs from Wyoming, Utah, and Idaho are in the feed lots.

The purpose of lot 5 was to determine the advisability of using Southern lambs for lambing down corn, even though they cannot generally be put into the cornfield until a month later than lambs from Wyoming, Utah, and Colorado.

These Southerns were brought in the morning of October 31, one month after the other lambs were started on feed. This was the first shipment of these lambs into Fort Collins. These lambs as compared to the others, made fairly satisfactory gains but the gains were made at a high cost. It required 844.00 pounds of corn and 280.48 pounds of hay in the lot of Southern lambs as against 578.50 pounds of corn and 89.08 pounds of hay to make a hundred pounds of

gain in the cornfield and alfalfa lot. Due to this high feed consumption, the cost of 100 pounds of gain was high, being $16.88 as compared to $11.57 in lot 3. This is accounted for by the fact that these lambs went on feed so late that practically none of the forage in the field was utilized, the forage at that time being dry and unpalatable.

No charge was made in any of the cornfield lots for the roughage derived from the corn as there was no way to estimate the amount eaten. Very little, however, was eaten after the first frost as it was then dry and unpalatable. Neither was there any charge made against any of the lots for labor. In the cornfield lots, less labor is required in feeding and caring for the lambs, and there is no no manure to haul out after the feeding operations are over, neither is so much equipment required in cornfield feeding.

LAST 24 DAY PERIOD

After the lambs had been in the cornfield for 66 days they were moved to the dry lot to be finished as the corn in the field was gone and they were not yet carrying enough condition for the market. The object here was to see what effect the previous treatment would have on the amount and economy of gains of the lambs.

Table No. 5--Last 24 Day Period 1924 in Dry Lot

Original Rations	Dry lot: Corn & Alfalfa	Corn-field soybeans	Corn-field Alfalfa	Corn-field	Corn-field Alfalfa
Lots	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Rations	Corn Alfalfa	Corn Alfalfa	Corn Alfalfa	Corn Alfalfa	Corn Alfalfa
Av. initial wt. per head	97.95	87.00	89.50	87.00	72.28
Av. final wt. per head	103.57	93.50	97.30	95.30	83.40
Av. gain per head	8.13	6.49	7.76	8.30	11.13
Lbs. daily gain per head	.338	.270	.323	.346	.464
Lbs. feed required for 100 lbs. gain					
Shelled corn	393.61	449.92	376.29	351.80	238.43
Alfalfa hay	1366.04	651.00	534.79	536.14	314.60
Cost of 100 lbs gain	18.11	13.87	11.54	11.06	7.13
Feed cost per lamb	1.28	.90	1.22	.92	.79

The striking thing about this period is the cheapness with which all the cornfield lots made their gain as compared to the dry lot. It is not possible to account for the fact that so much less hay was eaten by lots 2, 3, 4 and 5. However, the fact that so little was eaten accounts for the cheapness of their gains. It may be due to the fact that the cornfield lambs having been used to a heavy corn ration did not have time to accustom themselves to consuming large amounts of hay.

Table No. 6--This table combines the results of the 66 days in the cornfield and the 24 days in the dry lot.

Lots	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Rations	Dry lot 90 days	Cornfield & soybean 66 days Dry lot 24 days Corn & Alfalfa	Cornfield & Alfalfa 66 days Dry lot 24 days Corn & Alfalfa	Cornfield 66 days dry lot 24 days	Cornfield & Alfalfa 66 days Dry lot 24 days Corn & Alfalfa So. lambs
Av. initial wt. per head	71.23	72.42	72.10	71.30	59.40
Av. final wt. per head	103.58	93.49	97.26	95.30	83.40
Av. gain per head	31.18	21.07	24.00	25.16	24.00
Av. daily gain per head	.346	.234	.266	.264	.266
Lbs. feed required for 100 lbs. gain					
Shelled corn	304.96	807.59	731.20	770.63	776.33
Alfalfa hay	748.43	200.47	252.28	181.55	306.76
Cost of 100 lb. gain	$12.92	$13.29	$11.56	$11.81	$12.31
Initial cost per lamb at $12 per cwt	8.55	8.69	8.65	8.56	7.13
Feed cost per lamb	3.65	3.72	4.15	4.02	4.27
Interest on investment (feed and lambs) at 8%	.2440	.2440	.2440	.2440	.2440
Shipping and selling expenses per lamb	.81	.81	.81	.81	.81

(Continued)

Table No. 6--(Concluded)

Lots	Lot 1	Lot 2	Lot 3	Lot 4	Lot 5
Total cost back at market	13.25	13.46	13.85	13.63	12.45
Receipts per lamb at $16 per cwt.	16.57	14.96	15.56	15.25	13.34
Necessary margin to break even	.79	2.40	2.25	2.30	2.93
Labor return per lamb	3.32	1.50	1.71	1.69	.99

EXPLANATION OF TABLE NO. 6

In table No. 6 the results of table 4 and 5 have been combined and show what they were for the entire 90 days.

It will be noted that none of the cornfield lambs showed up as well in any case as the dry lot lambs except in regard to amount of feed required for 100 pounds gain. A comparison of the dry lot and the cornfield alfalfa lot shows a difference of daily gain of .080 of a pound in favor of the dry lot. The gain per head was much greater in the dry lot, being 31.18 pounds compared to 24 pounds in lot 2 (cornfield and soybeans). In the dry lot 1053.19 pounds of feed was required for 100 pounds of gain as against 983.48 pounds in the corn and soybean lot. In the dry lot 304.96 pounds of corn and 748.43 pounds of hay was required for 100 pounds of gain as against 252.28 pounds of hay and 731.20 pounds of corn in the cornfield and soybean lot. As regards the cost of 100 pounds of gain, the cornfield and alfalfa ration

proved superior in this respect, being more economical by $1.46.

The supplementing of the cornfield ration with soybeans in lot 2 did not prove as satisfactory as alfalfa in lot 3. The gain per head on the cornfield and soybeans was 21.07 pounds as against 24.00 pounds in lot 3. The cost of 100 pounds of gain was $13.29 in lot 2 (cornfield and soybeans) and only $11.56 in lot 3. Lot 3 also showed a higher labor return of 21 cents, this being due largely to the fact that 76.39 pounds less corn was required for 100 pounds of gain. Lot 3, however, ate 52.81 pounds of hay more than lot 2.

Comparing the cornfield lot with lot 2 (cornfield and soybeans) we find that soybeans did not prove to be of any advantage in cornfield feeding. The decrease of the daily gain in this lot was .02 of a pound per day less than in the straight cornfield lot. The cost of 100 pounds gain was 48 cents more due to the better gains made in lot 4. The receipts were lower in the soybean lot by 29 cents than they were in lot 4 and the labor return was 12 cents less.

Lot 4 (cornfield) showed up in most cases inferior to lot 3 (cornfield and alfalfa) which tends to prove that the cornfield ration should have some supplement. In this test alfalfa proved to be much more efficient. The addition of alfalfa slightly increased the daily gain, lowered the

cost of 100 pounds of gain by 25 cents, and the necessary margin in order to break even was 6 cents higher in lot 4.

Lot 5, the Southern lambs, which were put in the cornfield 30 days later than the other lots showed up well in gains per head, equalling the corn and alfalfa lot, but they required 54.38 pounds more alfalfa and 45.13 pounds more corn to produce a 100 pounds gain. The labor return was the lowest of any of the lots, being only .99 per lamb.

SUMMARY OF THE 1924 TEST

This experiment clearly demonstrates the necessity of supplementing the cornfield ration. In this test alfalfa proved to be a better supplement than did soybeans. At the end of this first period the margin necessary to break even was the same in both the cornfield and alfalfa lot and the dry lot although the daily gain was somewhat higher in the dry lot.

The planting of soybeans proved to be less economical than running the lambs on the straight corn although the difference was slight. One would judge, however, from the results of this experiment that the planting of soybeans in with the corn was not worth while.

The Southern lambs in lot 5 demonstrated their inability to pasture corn efficiently. Their gains were small and expensive as compared with any of the other lots. The fact that they were one month behind the others in going into the cornfield, is no doubt one of the principal factors in their poor showing.

EXPERIMENTAL WORK IN 1925

In the third year's work some changes were made in the general plan of the work and very reliable results were secured.

OBJECTS OF THE 1925 TEST

The objects of the 1925 test were

1. To compare cornfield feeding with the dry lot method.

2. To determine the value of half-sugar beets for fattening lambs when added to cornfield and alfalfa feeding.

3. To determine the value of ground corn fodder as compared to corn in the field when fed with half-sugar beets and alfalfa hay for fattening lambs.

The field used for this year's work was located on the college farm. The yield of corn was rather light, being 21.5 bushel per acre. The half-sugar beets yielded well, making 18.8 tons per acre. One important change which was made was the addition of a lot in which mangels were added to a cornfield ration. These were the variety known as half-sugars. The lambs used were from three sources. Eleven of them were farm raised lambs from an eastern Colorado dry land farm, showing black faces, seventeen were some grade lambs from the college flock, showing the white face, and the remaining fifty-two were bought on the Denver market and came from Wyoming and by their black faces showed Hampshire breeding. The lambs were allotted for the 1925 work as follows:

ANIMALS USED

There were twenty lambs fed in each of the four lots in the experiment. It was not possible to continue the breed studies of the previous two years. Of the lambs used, eleven were grade Hampshires from the Akron Experiment Station at Akron, Colorado, seventeen were grade Rambouillets from the college experimental flock and fifty-two were grade Hampshires from the Wyoming range.

Lot 1, 3 and 4

3 natives (from Akron)

4 natives (from college flock)

13 from Wyoming

Lot 2

2 natives (from Akron)

5 natives (from college flock)

13 from Wyoming

RATIONS

Lot 1 Dry lot, Corn and Alfalfa

Lot 2 Cornfield and Alfalfa

Lot 3 Cornfield, Half-sugar beets and Alfalfa

Lot 4 Ground corn fodder, Half-sugar beets and Alfalfa

At night all the lambs were shut in a lot and had free access to alfalfa in a rack. In lot 2 the lambs were run in the corn during the day. In lot 3 the lambs were run on the half-sugar beets for an hour morning and evening. The rest of the day they spent in the cornfield. In lot 4

the lambs were also run on the beets for an hour morning and evening and the rest of the day they were in the dry lot where they had free access to ground corn fodder and alfalfa hay.

Beets in Lot 3. Taken October 21

Beets in Lot 4. Taken October 21

Table No. 7--Results of the 1925 Work. All lots

Lots	Lot 1	Lot 2	Lot 3	Lot 4
Rations	Dry Lot	Corn-field Alfalfa	Corn-field ½ acre Mangels ½ acre Alfalfa	Ground Corn fodder Mangels ½ acre Alfalfa
Av. initial wt. per head	75.27	75.27	74.98	75.01
Av. final wt. per head	99.48	97.24	98.09	90.15
Av. gain per head (feed lot)	24.21	22.9	23.01	15.14
Av. daily gain per head	.323	.293	.307	.202
Total gain	484.20	458.0	460.20	302.8
Av. daily ration				
Corn	1.091	.8	.27	
Corn fodder				1.452
Beets				12.53
Beet tops			5.09	7.60
Alfalfa hay	1.42	.577	.816	1.482
Feeds per 100 pounds gain				
Corn	337.8	546.8	614.5	
Corn fodder				712.6
Beets			2718.7	6208.72
Beet tops			1658.2	3764.80
Alfalfa hay	438.4	196.93	233.2	669.8

(Continued)

Table No. 7--(Concluded)

Lots	Lot 1	Lot 2	Lot 3	Lot 4
Cost of 100 pounds gain				
Corn	5.067	9.04	4.52	
Corn fodder				5.344
Beets			3.248	6.234
Beet tops			1.369	3.109
Alfalfa	3.288	2.949	1.799	5.235
Total cost of 100 lbs. gain	$8.355	$11.989	$10.933	$19.922
Initial cost per lamb at $13.50 per cwt.	10.1615	10.158	10.1221	10.1263
Feed cost per lamb	2.022	2.745	2.517	3.0148
Interest on investment (feed and lambs) at 8%	.974	1.032	1.011	1.071
Shipping and selling expense per lamb	.82	.82	.82	.82
Total cost back at market	13.973	14.754	14.470	15.032
Receipts per lamb at $15.25	15.1707	14.8298	14.9587	13.4787
Labor return per lamb	+1.1977	+.0758	+.4887	-1.5333
Necessary margin to break even	.54	1.66	1.25	2.99

Costs of Feeds

Half-sugar beets $2.39 per ton (Production Cost)

Corn $1.50 per cwt.

Cornfield $31.20 per acre

Alfalfa $15.00 per ton

Tops 50 cents per ton of beets

EXPLANATION OF TABLE NO. 7

1925 Test

In comparing the dry lot with the cornfield and alfalfa lot the principal thing noted is the small amount of feed eaten in lot 2 as compared to lot 1. The fact that they ate so little is contrary to results secured in the past. Generally the lambs in the cornfield are heavy consumers of corn. The fact that so little corn was eaten in the cornfield and alfalfa lot probably accounts for the lower gains made in this lot, the average daily gain being .293 of a pound as against .323 in the dry lot. The total cost of 100 pounds of gain was also higher in the cornfield, alfalfa lot. The dry lot made a great deal more profit per lamb than was made in lot 2. The profit in lot 1 was $1.19 per lamb and in lot 2 only 7 cents per head. The corn in lot 1 was charged to the lambs at $1.50 per hundred.

In lots 3 and 4 we have a direct comparison between the feeding value of ground corn fodder and the pasturing of the cornfield. The daily gain in the lot fed corn fodder was noticeably smaller than in lot 3, being .105 of a pound in favor of lot 3. The amount of feed consumed in lot 4 was abnormally high and was not sufficiently concentrated to make gains comparable with the other lots. The total gain per head in lot 4 was materially lower than lot 3, being 15.14 pounds in lot 4 and 23.01 pounds in lot 3. The cost of 100 pounds gain was also very high in lot 4, being $19.922 as against $10.933 in

lot 3. Due to this high cost of gain lot 4 was the only lot to sustain a loss, the loss being $1.353 per lamb. This test indicates that the feeding of ground corn fodder as the sole source of concentrates to lambs being pastured on beets is an unprofitable practice.

The lambs in the cornfield lots were charged $31.20 per acre for their corn, which was the actual cost of production.

In lot 3 the lambs had access to one-half an acre of half-sugar beets and to one-half an acre of corn. They were pastured on the beets one hour morning and evening. This lot made a little higher daily gain than the corn and alfalfa lot but also consumed much more feed daily. The feed required for 100 pounds of gain was also higher than in lot 2. When the feed in lot 3 is figured on a dry basis the amount of feed eaten is not unreasonably high. The addition of the mangels to the ration lowered the cost of gains $1.056 per 100 pounds. Due to these somewhat cheaper gains in the lot fed on the cornfield, alfalfa and half-sugar beets, this lot was able to show a little more profit than even the dry lot lambs. Results seem to indicate that the feeding of beets in limited amounts is a good practice.

SUMMARY OF THE 1925 WORK

The test indicates that ground corn fodder in combination with mangels was unsatisfactory for fattening lambs. The gains in lot 4 were small and expensive.

In lot 3 the addition of mangels to a cornfield and alfalfa ration only slightly increased the daily gain and decreased the cost of feed per lamb by 23 cents.

None of the lots proved quite as economical in the cost of gains as the dry lot. The gains were also higher in the dry lot than in any of the other lots.

QUESTIONAIRES SENT TO COLORADO FEEDERS

In the spring of 1926 the following questionaire was sent out to all feeders who were known to have fattened lambs in the cornfield in the fall of 1925. The aim of this questionaire was to find out what practical feeders had concluded in regard to cornfield feeding, what their methods were, what additional feeds they fed with corn, and what results had been obtained. The following replies show the returns from three representative systems of management.

Question No. 1. How many sheep did you feed?

Answer. 1240 head.

Question No. 2. What was their average weight into the feed lot?

Answer. About 64 pounds.

Question No. 3. How many days did you run them on the cornfield?

Answer. 40 days.

Question No. 4. What was their average weight back at market?

Answer. Didn't market off corn.

Question No. 5. What death losses did you have?

Answer. About 5 percent.

Question No. 6. Did you feed other feeds besides the corn?

Answer. Yes. Alfalfa hay, cottonseed meal, and a few beet tops.

Question No. 7. Is running lambs in the cornfield more profitable than dry lot feeding?

Answer. No.

Question No. 8. Do you consider it a practical method of fattening lambs?

Answer. My experience.

Question No. 9. How many lambs can one man take care of under cornfield conditions?

Answer. 2000

Question No. 10. Do you run the lambs on the cornfield continuously?

Answer. No.

Question No. 11. Or do you pen them up at night?

Answer. Yes.

Question No. 12. If you pen them up at night do you feed them, if so what do you give them?

Answer. Alfalfa hay.

Question No. 13. Did you run the lambs on a small portion of the field at a time, or did you give them the run of the whole field?

Answer. A small portion at a time.

Question No. 14. Did the lambs do a good job of cleaning up the field, or was ther considerable waste of the corn?

Answer. They practically ate everything.

Question No. 15. Any other information you can give me will be greatly appreciated.

Answer. Excepting the coarse stalks, there seemed to be no waste. I believe if one would make a business of it and put a man or men in the field with them and not leave them out over twenty or thirty minutes at a time and no guess work it would be a profitable business, feeding them in the fields.

(Signed) R. M. Hutchinson

Question No. 1. How many sheep did you feed?

Answer. 1200

Question No. 2. What was their average weight into the feed lot?

Answer. 67 pounds.

Question No. 3. How many days did you run them on the cornfield?

Answer. 65

Question No. 4. What was their average weight back at market?

Answer. 89½

Question No. 5. What death losses did you have?

Answer. 4%

Question No. 6. Did you feed other feeds besides the corn?

Answer. Yes. 1 pound alfalfa hay a day per lamb and one-sixth of a pound cottonseed meal a day per lamb.

Question No. 7. Is running lambs in the cornfield more profitable than dry lot feeding?

Answer.

Question No. 8. Do you consider it a practical method of fattening lambs?

Answer. Yes and no.

Question No. 9. How many lambs can one man take care of under cornfield conditions?

Answer. 1500

Question No. 10. Do you run the lambs on the cornfield continuously?

Answer. No.

Question No. 11. Or do you pen them up at night?

Answer. Yes.

Question No. 12. If you pen them up at night do you feed them, if so what do you give them?

Answer. Hay and cottonseed cake.

Question No. 13. Did you run the lambs on a small portion of the field at a time, or did you give them the run of the whole field?

Answer. A small portion.

Question No. 14. Did the lambs do a good job of cleaning up the field, or was there considerable waste of the corn?

Answer. They will clean up good if weather conditions are normal.

Question No. 15. Any other information you can give me will be greatly appreciated.

Answer. No. 8. This means I believe a fleshy lamb that will weigh 70 to 75 pounds that can be put back on the market in 60 to 75 days can be fattened cheaper than in dry lot, otherwise thin lambs are hard to finish in the cornfield on account of long feed which is not practical in the field. Oats is a good feed once a day while running in field as it keeps them from scouring and saves hay.

(Signed) J. E. Sellers

Johnstown, Colorado

Question No. 1. How many sheep did you feed?

Answer. 2600

Question No. 2. What was their average weight into the feed lot?

Answer. 71 pounds

Question No. 3. How many days did you run them on the cornfield?

Answer. 60 days

Question No. 4. What was their average weight back at market?

Answer. 91 pounds. 2 loads of tops

Question No. 5. What death losses did you have?

Answer. 1%

Question No. 6. Did you feed other feeds besides the corn?

Answer. Yes. Alfalfa hay and beet tops.

Question No. 7. Is running lambs in the cornfield more profitable than dry lot feeding?

Answer. Cannot tell

Question No. 8. Do you consider it a practical method of fattening lambs?

Answer. Yes.

Question No. 9. How many lambs can one man take care of under cornfield conditions?

Answer. 3000

Question No. 10. Do you run the lambs on the cornfield continuously?

Answer. No.

Question No. 11. Or do you pen them up at night?

Answer. Yes.

Question No. 12. If you pen them up at night do you feed them, if so what do you give them?

Answer. A little barley and oats at first.

Question No. 13. Did you run the lambs on a small portion of the field at a time, or did you give them the run of the whole field?

Answer. Whole field.

Question No. 14. Did the lambs do a good job of cleaning up the field, or was there considerable waste of the corn?

Answer. Practically no waste.

Question No. 15. Any other information you can give me will be greatly appreciated.

Answer. My results of 4 years in pasturing lambs in the cornfields have been good but feel that cutting the corn and grinding fodder and corn is a safer and more practical way of feeding the corn.

SUMMARY OF THE QUESTIONAIRES

In looking over the three questionaires, one is struck by the lack of unanimity of opinion in regard to management and methods of feeding lambs under cornfield conditions. One of the men considers cornfield feeding a practical method of fattening lambs, another considers it unsatisfactory, while a third considers it satisfactory only under certain restrictions.

The death loss in two cases was above the 2½ percent normal, while in the other instance it was below. All three men agree that the lambs should not run in the cornfield continuously but should be shut in at night and given a supplementary feed, preferably alfalfa. Two of the men restrict the lambs to a portion of the field at a time while the other man gives them the run of the whole field. The difference of opinions which these questionaires reveal indicates the need of some reliable information regarding the feeding of lambs in cornfields.

GENERAL SUMMARY

Variations in the results indicate that additional work should be done before definite conclusions can be drawn and these deductions are made with this limiting factor in mind.

1. The cost of gains in cornfield feeding is much decreased by the feeding of alfalfa.

2. Daily gains are increased by feeding alfalfa.

3. Lambs pastured in cornfields, even when certain supplementary feedstuffs are given, do not make as large gains as when fed corn and alfalfa in the dry lot, under Colorado conditions.

4. The planting of soybeans in the cornfield slightly decreases the daily gains and increases the cost of 100 pounds of gain by $1.09.

5. Southern lambs reach this section too late to make the best utilization of a cornfield.

6. Lambs fed in the cornfield reach market earlier than lambs fed in the ordinary way.

7. For lambing down corn, lambs must be hardy and acclimated to the conditions under which they are being fed.

8. Native or northern tight-wooled lambs should be given preference.

9. Lambs should be put into the cornfields as early as possible so as to derive the greatest benefit from forage.

10. Lambs cannot be expected to do well under very adverse weather conditions.

11. The addition of mangels increases the profits $.413 per head over the cornfield and alfalfa lot.

12. The feeding of ground fodder in combination with half-sugar beets and alfalfa proves unprofitable.

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