

OKLAHOMA  
AGRICULTURAL AND MECHANICAL COLLEGE  
AGRICULTURAL EXPERIMENT STATION  
C. P. BLACKWELL, DIRECTOR  
STILLWATER, OKLAHOMA

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## FATTENING WESTERN LAMBS

SELF-FEEDING VS. HAND-FEEDING  
GROUND ROUGHAGE VS. WHOLE ROUGHAGE

A. E. DARLOW  
Department of Animal Husbandry



These lambs were fed 70 days on whole darso heads.  
They grew but did not fatten.

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# FATTENING WESTERN LAMBS

A. E. DARLOW

Department of Animal Husbandry

## Introduction

The number of lambs fed on Oklahoma farms has shown a marked increase during the past few years. A great many of these feeder lambs are grazed on wheat pasture, either with or without grain in addition. Regardless of the method of handling during the grazing period, most of these wheat lambs require a finishing period of "dry lot" feeding.

A number of the questions coming to the Department of Animal Husbandry of the Oklahoma A. and M. College concern appropriate grain supplements for wheat-grazed lambs. Although the equipment available at the Experiment Station does not allow the feeding of lambs on pasture, nevertheless it is such that some of the problems concerning dry lot feeding can be investigated.

The method of feeding lambs and the preparation of roughages are among the things that have been claiming the attention of Oklahoma farmers during recent years. The three feeding tests summarized in this report were designed to answer some of the questions concerning these two problems.

The questions that were considered in planning these tests are:

1. Should alfalfa hay be ground when it is to be used in a ration for fattening lambs?
2. What is the most practical and economical method of feeding ground hay?
3. Can lambs be self-fed?
4. What is the comparative value of ground and whole hay when lambs are hand-fed? When they are self-fed?

## Previous Studies at Other Stations

**Value of Grinding Hay.** Bohstedt<sup>1</sup> and associates at the Wisconsin Station have reported the results of a comprehensive study of the value of grinding hay for livestock. Included in their publication is a rather complete bibliography which makes the inclusion of one here unnecessary.

The available evidence as summarized by Bohstedt is to the effect that chopping or grinding does not increase the digestibility of hay, and that the only merit which can be attributed to this processing is that it induces the livestock to consume the hay more completely. Hence one would expect that livestock consuming coarse or otherwise low quality hay would respond most favorably to a ration of ground hay. That this is indeed true is shown by results secured by Bohstedt and associates. They state that chopping hay is of value only in causing livestock to consume the coarser parts. They fed whole and ground soybean and alfalfa hay to dairy cows and found that grinding soybean hay increased its value 20 percent but that ground alfalfa hay was no more valuable than the whole hay. They further report that grinding has no advantage over cutting. It appears,

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<sup>1</sup> G. Bohstedt, B. H. Roche, I. W. Rupel and J. G. Fuller. F. W. Duffee. "Chopping Hay for Livestock." Wis. Agri. Exp. Sta. Res. Bul. No. 102. (Dec. 1930.)

then, that whether or not one can afford to grind roughage for livestock depends on the amount of roughage wasted or refused and on the cost of grinding.

Ground roughage has the advantage of being available for use when a mixture of roughage and concentrate is desired. Bohstedt suggests that in lamb feeding there is greater safety in mixing grain and hay. This is particularly true in feeding lambs if they are to be pushed rapidly or self-fed.

**Self-feeding.** Lambs appear to be more susceptible to digestive disorders when on feed than are other kinds of livestock. At least these digestive disturbances are more often fatal with lambs than is the case with hogs or steers. Hence lamb feeders are vitally interested in securing a ration that will result in rapid and economical gains and at the same time insure a minimum death loss.

There are as many "methods" of feeding lambs as there are feeders. but the fact is pretty generally recognized that the type of lamb and particularly the age and size must be given consideration in planning a feeding program.

Self-feeding is a method that appeals to many lamb feeders and it is practiced by a number of large operators. It is not more generally practiced because of a fear of heavy death losses that are known to follow the over-eating of grain.

Kammlade<sup>2</sup> reports a death loss of about 50 percent when lambs were self-fed corn and alfalfa hay in separate feeders. These lambs had been on feed about three weeks and were consuming about three-fourths pounds of grain daily when placed on the self-feeders. In a later study<sup>3</sup> he found that self-fed lambs gained faster but required more feed per unit of gain than hand-fed lambs. In this later study the self-fed lambs were fed a mixture of ground hay and grain and the hand-fed lambs received whole hay and grain. These data would be of more value in a comparison of hand-feeding and self-feeding if the lambs had all received the same ration; but, as will be noted, the item of preparation of feed as well as the method of feeding is involved.

Workers at the Ohio Station<sup>4</sup> gave lambs a fill of clover hay and then turned them to a self-feeder. This resulted in the loss of 5 lambs, and at least half of the lambs were off feed. The feed was reduced for a time, and then when the lambs were consuming something over one and one-half pounds per head daily they were turned to self-feeders. They made rapid but not economical gains. The composition of the ration was changed from time to time; and two weeks after the lambs had been placed on a finishing ration there was a sudden heavy death loss. The heaviest loss resulted in the lots consuming the most grain and the least hay.

Brown,<sup>5</sup> at the Michigan Station, reports the results of a study in which lambs were started on 2 parts ground hay and 1 part cracked corn for 10 days. During the second 10 days, equal parts were fed; and thereafter the ration was 2 parts of corn and 1 of hay. Brown's conclusions from this study are as follows:

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<sup>2</sup> W. G. Kammlade, "Some Comparisons of Methods of Fattening Western Lambs." Ill. Agr. Exp. Sta. Bul. No. 388 (October, 1929), pp. 10-11.

<sup>3</sup> Ibid., p. 16.

<sup>4</sup> D. S. Bell, "Hand-feeding vs. Self-feeding Fattening Lambs." Ohio Agri. Exp. Sta. Bi-monthly Bul. No. 151 (July-August, 1931). p. 139.

<sup>5</sup> G. A. Bown, "Methods of Self-feeding Lambs." Mich. Agr. Exp. Sta. Rpt. (Michigan State College), June 30, 1934. pp. 175-176.

1. Lambs may be fattened as rapidly by hand-feeding as by self-feeding provided they are fed as much grain.
2. Self-fed lambs consume more grain and less hay per unit of gain than do hand-fed lambs.
3. There is less risk of death loss in hand-feeding. Hand-feeding for two or three weeks and then putting the lambs on self-feeders also reduced losses. There should be no heavy grains in the self-feeder for the first two or three weeks; thereafter they may be used. Lambs receiving a mixture of grain and ground hay do well from the start.

#### Procedure in Oklahoma Tests

The experiments at the Oklahoma Station were conducted in the fall and early winter of three successive years. The lambs were purchased in the range of west Texas and shipped directly to the Experiment Station. They were average west Texas lambs, i. e., white-faced lambs showing a preponderance of fine-wool breeding.

**Allotment of Lambs.** The lambs were ear-tagged on their arrival. They were weighed individually three successive days at the beginning and close of the experiment, the average of these weights being taken as the initial and final weights respectively. They were also weighed at 30-day intervals during the trial. The lambs were allotted as evenly as possible on the basis of weight and condition, with no distinction being made between ewe and wether lambs.

**Equipment.** All feeding was done in the experimental sheep barn, which is a frame structure open on the north to give the lambs access to outside paved brick lots. The hand-fed lots were fed in combination hay and grain racks. The concentrate in each case was fed first and the lambs were allowed about thirty minutes to consume this. These lots were allowed at all times all the hay they would consume without causing a reduction in grain consumption. The self-fed lots had feed before them at all times after they were started on self-feeders. Salt and water were available to all lots at all times during the experiment.

**Starting the Lambs on Feed.** For two or three days after arrival at the feed-yards the lambs were given all the alfalfa hay they would consume. They were then offered grain, starting with about one-fourth pound per head daily. The amount of grain was gradually increased until at the end of 15 to 20 days the lambs were consuming about 1 pound per head daily.

In Experiment I,<sup>6</sup> the self-fed lots were placed on the self-feeder when they had reached a daily consumption of about 1 pound of grain per head. This resulted in some death losses in the self-fed, free-choice lots.

In Experiments II and III, the self-fed lots were not put on self-feeders until they reached a grain consumption of about one and one-fourth pounds per head daily. The grain was placed in the feeder after the lambs had a fill of alfalfa hay. No death losses resulted when this procedure was followed. It was the plan to have the hand-fed lots consume as much grain as possible; therefore, after the lambs in these lots had reached a consumption of around one and one-fourth pound per day, the hay was gradually reduced while the grain was increased, until further reduction of hay did not result in increased grain consumption. The lambs were

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<sup>6</sup> The three successive years of the tests are hereafter designated, respectively, Experiment I, Experiment II, and Experiment III.

kept on this ration with occasional increases in the amount of grain offered. In an attempt to keep the lambs on feed at all times, care was taken that no grain was left in the trough.

**Rations Fed.** The rations fed for the three tests were as follows (with the exception that Lot V in Experiment II was fed whole hay and whole corn with the addition of cottonseed meal):

- Lot I. Ground alfalfa hay and whole yellow corn; self-fed; free-choice.
- Lot II. Ground alfalfa hay and whole yellow corn mixed; self-fed.
- Lot III. Ground alfalfa hay and whole yellow corn; hand-fed.
- Lot IV. Whole alfalfa hay and whole yellow corn; hand-fed.
- Lot V. Ground alfalfa hay and whole yellow corn mixed; hand-fed.
- Lot VI. Whole alfalfa hay and whole yellow corn; self-fed; free-choice.

#### **Experiment I, 1932-33**

The results of the first year's test are shown in detail in Table I. The principal findings may be summarized as follows:

1. Lot I, receiving ground hay and whole corn, self-fed, free-choice, required 12 pounds less grain and 17 pounds more hay for 100 pounds gain than did Lot VI which received whole hay and corn self-fed, free-choice.
2. Lot III, which was hand-fed whole corn and whole alfalfa hay, required 28 pounds less grain and 34 pounds more hay per 100 pounds gain than Lot VI which was fed whole corn and whole alfalfa hay free-choice.
3. The self-fed, free-choice lots showed a higher average finish than the hand-fed lots.
4. The hand-fed lot receiving chopped hay made the poorest showing on the basis of feed per 100 pounds gain. These lambs were off feed during part of the test and did not consume as much grain as the other lots.
5. If the hay is of poor quality, lambs will eat it more readily when it is ground.
6. The self-fed lambs ate an average of .16 pound more grain and .03 pound less hay per head daily than the hand-fed lambs.
7. Three lambs of the 40 in Lots I and VI, which were self-fed corn and hay in separate feeders, died the first day on the self-feeder. This is a loss of 7½ percent as compared to a normal death loss of 3 to 5 percent. No lambs were off feed in either lot after the first day on the self-feeder. These lambs were eating 1 pound of corn per head daily, and had been receiving grain about three weeks when they were put on the self-feeder.

TABLE I.—90-Day Feeding Trial, 1932-1933.

Lot No. ....	I	II	III	IV	V	VI
No. Lambs per lot ....	20*	20	20	20	20	20**
Method of feeding	Corn, ground hay; self-fed free choice	Corn, ground hay; mixed, self-fed	Ground hay, corn; hand-fed	Whole hay, corn; hand-fed	Ground hay, corn; mixed, hand-fed	Corn, whole hay; self-fed free choice
Average daily ration entire period						
Grain .....	1.25	1.21	1.13	1.02	1.06	1.24
Hay .....	1.13	1.20	1.12	1.13	1.21	1.04
Average daily ration last 60 days on self-feeders						
Grain .....	1.58	1.51	1.40	1.25	1.30	1.57
Hay .....	1.16	1.16	1.15	1.15	1.18	1.03
Initial weight per head .....						
	60	58	59	59.1	58.5	58.7
Gain in weight .....						
	28.9	30.8	27.3	25.2	27.0	27.8
Average daily gain ..						
	.328	.350	.310	.286	.307	.316
Feed per 100 lbs. gain						
Grain .....	382	347	366	360	348	394
Hay .....	346	344	363	393	393	329
No. thin lambs .....						
	2	3	3	5	3	1

\* One lamb died the first day on self-feeder.

\*\* Two lambs died the first day on self-feeder.

#### Experiment II, 1933-34

In Experiment II, Lot I was self-fed, free choice, a ration consisting of ground alfalfa hay and whole corn. This lot required 4 pounds more hay and 84 pounds less grain per 100 pounds gain than Lot VI, which was self-fed a ration of whole alfalfa hay and whole corn.

The difference in results between these two lots is much more marked than it was in Experiment I. Part of this difference can probably be attributed to the difference in the proportion of hay and grain consumed.

Lot II, which was self-fed a mixture of ground alfalfa hay and whole corn, showed the lowest feed requirement per unit of gain of any of the lots. This was true in Experiment I also.

Lot III, which was hand-fed a ration of whole corn and ground alfalfa hay, required more feed per 100 pounds gain than did Lot II which was self-fed a mixture of hay and corn; but Lot III made more economical gains than either Lot I self-fed corn and ground hay or Lot IV hand-fed corn and whole hay.

A comparison of Lots IV and VI indicates that self-feeding of whole hay and grain is not advisable, especially when hay of the quality used in this experiment is available.

Lot VI, which had access to whole alfalfa hay and corn at all times, ate a very small amount of hay, which perhaps resulted in an unbalanced ration during the self-feeding period.

Lot V, which in this one experiment was fed hay and a concentrate ration of 8 parts corn and 1 part cottonseed meal, required more feed per unit of gain than Lot IV, which received the same ration without cottonseed meal. This one test cannot be considered as conclusive proof, but it certainly indicates that lambs receiving a ration of equal parts alfalfa hay and corn do not require additional protein.

The self-fed, free choice lots in this experiment were taken up to a consumption of about 1¼ pounds of grain per head daily before they were placed on self-feeders. There were no death losses and the lambs did not go off feed during the test.

TABLE II.—76-Day Feeding Trial, 1933-1934

Lot No. ....	I	II	III	IV	V	VI
No. Lambs per lot ....	17	17	17	17	17	17
Method of feeding	Ground hay, corn; self-fed, free choice	Ground hay, corn; mixed, self-fed	Ground hay, corn; hand-fed	Whole hay, corn; hand-fed	Whole hay, Corn (8) C.S.M. (1); hand-fed	Whole hay, corn; self-fed, free choice
Average daily ration first 42 days before self-feeding						
Grain .....	.92	.92				.91
Hay .....	1.57	1.61				1.32
Average daily ration last 34 days on self-feeder						
Grain .....	1.34	1.34				1.58
Hay .....	1.03	1.21				.88
Average daily ration entire period						
Grain .....	1.12	1.11	1.13	1.18	1.18	1.21
Hay .....	1.34	1.43	1.34	1.37	1.47	1.13
Initial weight per head .....						
Gain in weight .....	53	53	51	53	52	54
Average daily gain	.27	.30	.28	.27	.26	.23
Average daily gain						
Grain .....	.355	.394	.368	.355	.343	.302
Feed per 100 lbs. gain						
Grain .....	317	282	306	327	345	401
Hay .....	378	362	359	380	432	374



## Experiment III, 1934-1935

The results of the third year's test are shown in Table III. The principal findings may be summarized as follows:

1. Lot II, which was self-fed a mixture of ground alfalfa hay and whole corn, ranked third in rate of gain and equaled Lot III (which was hand-fed the same ration) in economy of gain.
2. Lot III, hand-fed ground alfalfa hay and whole corn, ranked first in rate of gain and tied with Lot II for first place in economy of gain.
3. Lot I, self-fed, free choice, a ration of whole corn and ground alfalfa hay, had a high feed requirement per unit of gain and consumed a proportionately greater amount of corn than the hand-fed lots.
4. Lot VI, hand-fed, free choice, a ration of whole alfalfa hay and whole corn, gave results about equal to those secured in Lot I.
5. Lot IV, which was hand-fed a ration of whole alfalfa hay and whole corn, ranked second in rate of gain; but the feed requirement per unit of gain was considerably higher than for Lots II or III.

TABLE III.—88-Day Feeding Trial, 1934-1935

Lot No. ....	I	II	III	IV	V	VI
No. Lambs per lot....	20	20	20	20	20	20
Method of feeding	Corn, ground hay; self-fed, free choice	Corn, ground hay; mixed, self-fed	Ground hay, corn; hand-fed	Whole hay, corn; hand-fed	Ground hay, corn; mixed hand-fed	Corn, whole hay; self-fed, free choice
Average daily ration first 26 days						
Hay .....	1.61	1.62	1.62	1.63	1.61	1.54
Grain .....	.823	.823	.790	.823	.823	.823
Average daily ration last 62 days						
Hay .....	.93	1.01	1.20	1.33	1.20	.976
Grain .....	1.50	1.18	1.41	1.44	1.42	1.57
Average daily ration entire period						
Hay .....	1.02	1.19	1.32	1.42	1.25	1.09
Grain .....	1.22	1.08	1.23	1.26	1.25	1.28
Initial weight per head .....	54	54	54	54	54	54
Gain in weight...	31	31.3	35.3	32.4	30.4	30.8
Average daily Gain	.352	.356	.401	.368	.345	.350
Feed per 100 lbs. gain						
Hay .....	321	334	329	385	362	328
Grain .....	384	304	306	342	361	384

6. Lot V was hand-fed a mixture of ground alfalfa hay and whole corn. This lot made the lowest rate of gain and in feed requirement per unit of gain was exceeded only by Lots I and VI, the free choice lots.

**TABLE IV.—Average of Three Years, 1933-1934-1935**  
Average length of trial, 85 days

Lot No. ....	I	II	III	IV	V*	VI
No. Lambs per lot....	19	19	19	19	20	19
Method of feeding	Corn, ground hay; self-fed free choice	Corn, ground hay; mixed, self-fed	Ground hay, corn; hand-fed	Whole hay, corn; hand-fed	Ground hay, corn; mixed, hand-fed	Corn, whole hay, self-fed, free choice
Average daily ration entire period						
Grain .....	1.16	1.14	1.18	1.15	1.16	1.25
Hay .....	1.17	1.27	1.25	1.30	1.23	1.09
Average daily ration while on self-feeder						
Grain .....	1.39	1.36	1.44	1.39	1.36	1.57
Hay .....	1.02	1.09	1.10	1.19	1.19	.93
Average initial weight per head....						
	57	55	54.6	55	56	56
Average gain in weight .....						
	29	31	30	28	28	27
Average of average daily gain .....						
	.345	.367	.359	.336	.326	.323
Feed per 100 lbs. gain						
Grain .....	350	313	332	345	355	394
Hay .....	350	347	349	387	378	343

\* Two-year average; 1934 excluded.

### Summary and Discussion

Averages of results of the three tests are shown in Table IV. Seven major points apparently are indicated by these averages, as follows:

1. Lot II, which was self-fed ground hay and whole corn mixed, made the most rapid and cheapest gains. There were no death losses in this lot and none of the lambs were off feed during any of the trials. This confirms a suggestion made by Bohstedt relative to the safety of mixing grain and hay for lamb feeding.
2. The lowest rate of gain and highest cost was in Lot VI, which was self-fed whole hay and corn, free choice. The extra cost of gain in this lot is partially due to the fact that the lambs consumed a greater proportion of corn than did the lambs in any of the other lots. This agrees in part with the statement made by Kammlade; namely, that self-fed lambs gain faster but require more feed per unit of gain than hand-fed lambs. It also confirms the work of Brown, in which he found that self-fed lambs consumed more grain and less hay than did hand-fed lambs.
3. Results secured in these tests would indicate that the free choice method of feeding is not advisable unless a pound of grain can be purchased as cheaply as a pound of hay.
4. Comparison of the results in Lots I and VI, both of which were self-fed, free choice, show that the ground-hay lot made 100 pounds gain 66 cents cheaper than the whole-hay lot. This can be partially explained by the differences in the proportions of hay and grain consumed in the two lots. The lambs receiving the ground hay consumed an average of 1.02 pounds per head daily while on self-feeder. The lambs receiving whole hay consumed only .93 pounds. As suggested earlier in this report, the hay was of rather poor quality and lambs apparently consumed it more readily when it was ground. The advantage in grinding would appear to be that suggested by Bohstedt and his associates; namely, the lambs consume the ground hay more readily than they do the whole hay.
5. The cost<sup>7</sup> of gain was 28 cents per 100 pounds in favor of the ground-hay lot when the lambs were hand-fed. In the hand-fed lots the rations were kept more nearly alike and the lambs receiving whole hay consumed a trifle more hay per head than did those receiving ground hay.
6. On a basis of the average gain in the feed lot, the self-fed lambs receiving ground hay would show 23 cents greater profit per head than the lambs receiving whole hay. When lambs are hand-fed, the advantage of the lambs receiving ground hay would be 9 cents per head. The cost of gain in the lot that was hand-fed a mixture of ground hay and corn was the second most expensive in the entire test.
7. These figures would indicate that if whole hay is to be fed it should be hand-fed, and further that if ground hay is to be fed it will prove more economical to mix it with the concentrates and place it in a self-feeder than to either hand-feed or self-feed, free choice.

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<sup>7</sup> In this report no charge is made for grinding hay.

