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COLLEGE OF AGRICULTURE AND MECHANIC ARTS.

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COLUMBIA, MO.

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**RATIONAL SHEEP FEEDING.**

BY  
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## RATIONAL SHEEP FEEDING.

(Frederick B. Mumford, Professor of Animal Husbandry, University of Missouri.)

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In any scheme of stock farm management the rations fed to the domestic animals are an important factor in the final result. This fact has been recognized not only by the practical farmer, but by the Experiment Stations of the United States. This is indicated by the very large number of feeding experiments which have been conducted at these institutions. It is probable that more experiments have been conducted in the feeding of farm animals than all other phases of animal production combined.

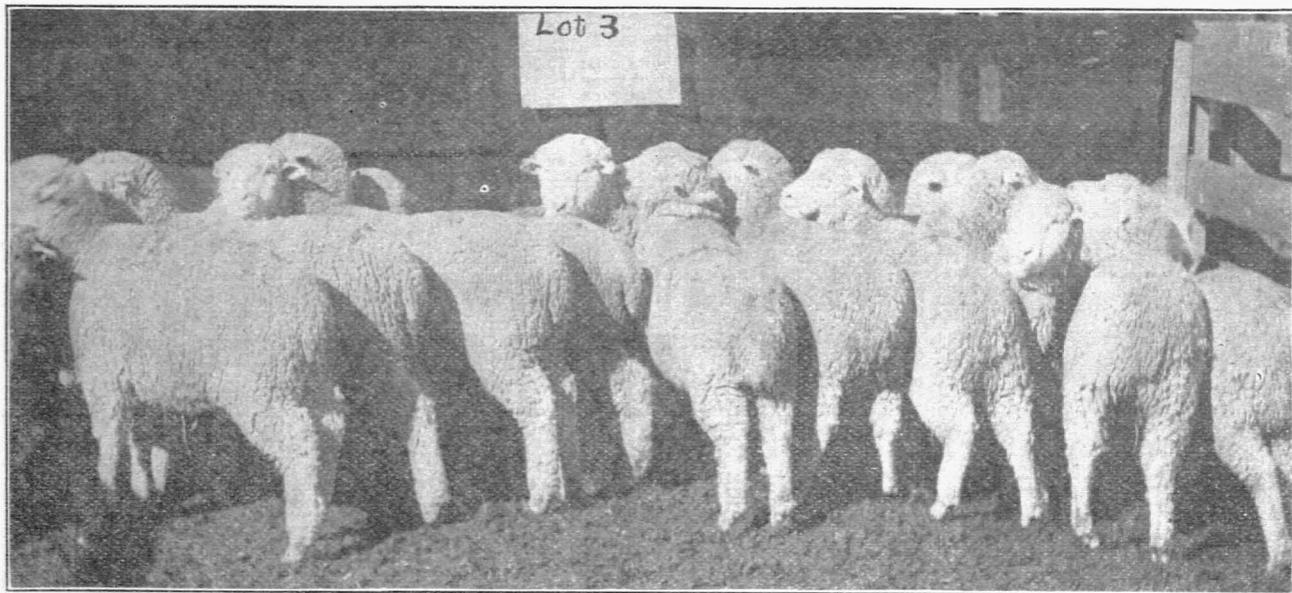
We have yet much to learn regarding the fundamental facts of animal nutrition. The farmer would like to know, for example, whether it is on the whole more profitable to feed calves, colts, lambs and pigs a generous ration of nutritious concentrates like grain, from birth to time of selling, or whether it may not be more profitable to feed animals on cheaper rations requiring a longer time to properly develop the animal. The feeder is also interested to know what is the profitable amount of grain above mere maintenance which can be fed profitably.

While there are still unsolved problems the stations have successfully established certain principles of feeding, which are of great value in determining the most profitable methods of feeding all kinds of domestic animals. It will not be possible in the limits of this article to cover completely the whole subject of sheep feeding. We can but hope to point out some of the principle facts which should govern our practices. In general, we may divide the subject of sheep feeding into three classes:

- (1) The feeding of breeding animals.
- (2) The feeding of young lambs.
- (3) The finishing of partly grown lambs or of wethers by full feeding with grain.

### FEEDING OF BREEDING EWES.

There are certain fundamental principles which govern the care and handling of all breeding animals. It is a mistaken idea that sparse feeding is favorable to reproduction. It is, however,



Lot 3. Corn, linseed meal and clover. Twenty western yearlings. Feeding period, 14 weeks. Total grain, 2,420 pounds. Total hay, 3,314 pounds. Total gain, 495 pounds. Average daily gain, 0.25 pounds. Cost of one pound gain, 7 cents.

true that a method of feeding which induces excessive fatness is unfavorable to reproduction. A full and generous supply of food throughout the year is the best possible practice for handling the breeding ewe.

Another point that is often overlooked in the handling of the ewe flock, particularly in winter feeding, is exercise. It is in the highest degree unwise to take a flock from summer pasture, where they have enjoyed unlimited freedom and constant exercise, and shut them in a small yard and keep them there the entire winter. The ewe flock should be insured a constant and regular amount of exercise throughout the year.

#### SUMMER FEEDING OF BREEDING FLOCK.

Under ordinary conditions there is no need of feeding grain to breeding ewes in summer. The sheep is one of the most successful and persistent grazing animals on the farm. They will eat a much larger number of plants than either horses or cattle and are often useful in clearing a pasture of weeds and brush.

Ewes are ordinarily bred in the fall, and at this time the pastures are frequently short and the animals really suffer for a generous supply of good food. It is always desirable before mating to give the ewe flock a generous supply of food for at least two weeks before turning in the ram. If possible turn the ewes on fresh pasture. It is also a good idea to feed them heavily with grain during this time. This practice is called "flushing" by the English sheperds, and the claim is made, not without some reason, that this insures a larger number of lambs, that the ewes come in heat more uniformly, and that the lambs are stronger and healthier at birth.

When the ewes are taken from the pastures in the fall they may be infested more or less seriously with sheep ticks, and if they are not treated for this condition the parasites will interfere seriously with their thrift during the winter. It is always a good practice, therefore, to dip them in some good dip which will kill the ticks. This should be done before cold weather.

The ration for the winter should contain some grain;  $\frac{1}{2}$  pound of corn per sheep each day, together with all the clover, alfalfa or cowpea hay that the sheep will eat is a good ration for breeding ewes. Some corn stover is an excellent roughage, and will be relished by the ewes. In case it becomes necessary to feed the ewes through the winter without clover, alfalfa or cow pea hay, then the grain ration should be of corn and linseed meal, in the proportion of 5 of corn and one of linseed meal, or of corn and bran. This,

with stover, mixed hay and possibly some straw, will bring the ewes to lambing time in strong condition. Timothy hay is a very unsatisfactory roughage to feed to sheep. It is best to have the lambs come in February or March, provided warm quarters could be supplied. Otherwise April 15th to May 1st is perhaps a better time. After the lambs have been born the ewes should be fed heavily on grain, and in the writer's opinion the lambs should be fed from birth until time of selling. It is customary to provide a lamb creep (a small pen) in which the lambs may go to eat and find hay, and into which the older sheep cannot go. It is undoubtedly true that the grain fed to lambs at this time will yield a greater return in gains made than at any other time in the life of the lamb. If the lambs come in February or March and are full fed they should be sold in June. If they come in April or May they must be kept longer and will probably sell in the fall as fat, if they have been fed grain constantly, or as stocker lambs, if they have not been fed continuously.

#### THE FEEDING OF FATTENING LAMBS.

A practice which is becoming more and more common in the corn belt is the finishing of lambs or wethers during the winter months. In most cases the stocker lambs are purchased from the ranges of the west, weighing from 55 to 70 pounds. These are fed for 60 to 90 days and are sold as fat lambs on the market. There are varying methods of feeding to bring about this result.

A method which is now rather common is to buy these lambs rather early in the fall, run them on grass pastures with a little grain for 30 days, and then gradually put them on a full feed of grain.

A method which has found much favor in this section is to sow rape and cowpeas in the corn at the last cultivation, and about the first of September turn the lambs in on the corn. The lambs will clean up the under growth and weeds, and the lower blades of corn, but will not for a time injure the corn. Some feeders in Missouri have been able to pasture ten lambs per acre for eight weeks, and have secured a gain of 20 pounds on each lamb, or 200 pounds of mutton per acre, without in any way injuring the corn.

The most common method of feeding, however, is to put the lambs in feed yards with open sheds for shelter and feed them from 60 to 90 days on a ration of corn and hay.

The following tables give the results of a large number of experiments with different rations for finishing lambs.

In the tables following, the cost of the various food-stuffs used in the experiments are as follows:

Corn.....	\$0.40 per bu.
Oats.....	.32 per bu.
Wheat.....	.60 per bu.
Oilmeal.....	\$25.00 per ton.
Bran.....	14.00 per ton.
Roots.....	2.50 per ton..
Silage.....	2.50 per ton..
Clover hay.....	7.00 per ton..

### RATIONS FOR FATTENING LAMBS.

Especial attention is called in each case to the column headed "cost of 1 pound gain in cents," "the average weekly gain in pounds," and the "dry matter for 1 pound of gain in pounds." These columns contain the essential comparisons and indicate which of the rations fed were most efficient.

### EXPERIMENTS IN FATTENING LAMBS.

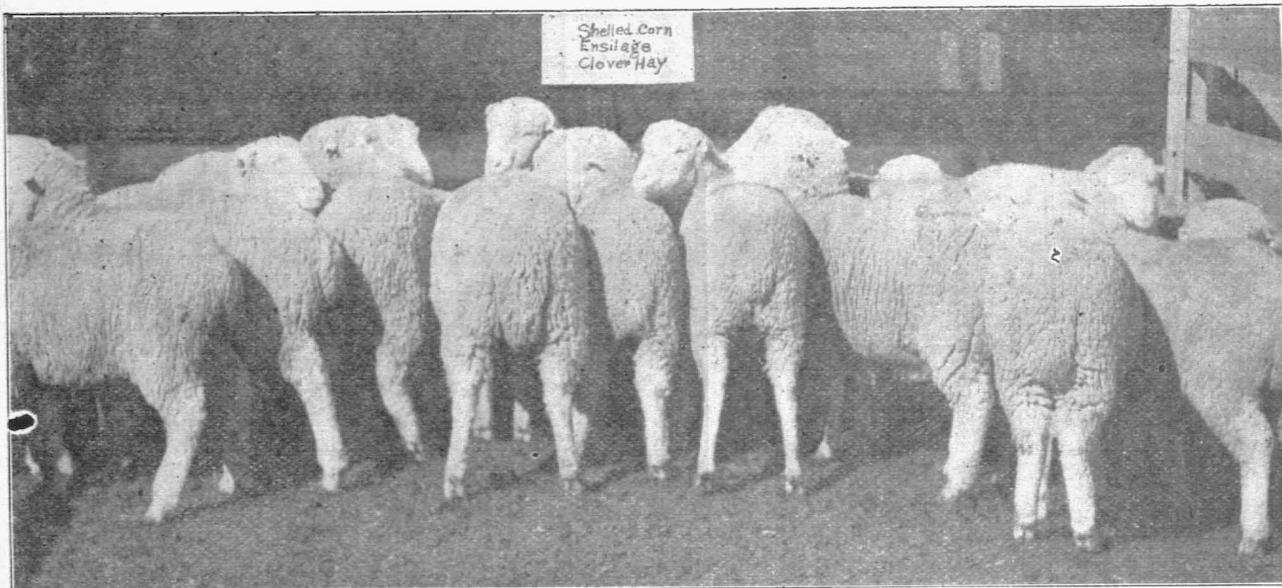
10 lambs in each lot.

Roughage ration, clover hay.

No. of Lot	Distinguishing rations.	Grain, lbs.	Hay, lbs.	Roots Rutabagas, lbs.	Total gain, lbs.	Average weekly gain, lbs.	Cost of one lb. gain, cts.	Dry matter for one lb. gain, lbs.
1..	Corn (shelled).....	1,757	1,675	1,190	443	2.6	4.5	6.95
2..	Oats.....	1,963	1,694	1,190	379	2.2	7.1	8.68
3..	Bran.....	1,779	1,728	1,190	242	1.4	8.25	12.9
4..	Corn $\frac{1}{2}$ , oats $\frac{1}{2}$ (Wt).....	1,735	1,711	1,190	436	2.6	5.1	7.11
5..	Corn $\frac{1}{2}$ , bran $\frac{1}{2}$ (Wt).....	1,973	1,698	1,190	358	2.1	6.0	9.14
6..	Oats $\frac{1}{2}$ , bran $\frac{1}{2}$ (Wt).....	1,957	1,722	1,190	361	2.1	6.7	9.13
7..	Corn $\frac{1}{2}$ , oats $\frac{1}{2}$ , bran $\frac{1}{2}$ (weight)....	1,968	1,654	1,190	387	2.3	5.8	8.37
8..	Roots (rutabagas).....	1,173	1,220	6,706	393	1.7	7.7	9.23
9..	Silage.....	1,173	987	*4,504	384	1.7	6.3	10.01
10..	Self feed, corn $\frac{1}{2}$ , oats $\frac{1}{2}$ and bran $\frac{1}{2}$ .....	2,120	528	1,360	260	2.17	8.0	9.45
11..	Corn.....	1,579	1,097	.....	328	2.18	4.6	7.02
12..	Corn and roots.....	1,612	964	2,720	397	2.64	4.6	6.41
13..	Corn $\frac{1}{2}$ , linseed meal $\frac{1}{2}$ and roots....	1,716	967	2,675	392	2.61	5.3	6.72
14..	Corn $\frac{1}{2}$ and linseed meal $\frac{1}{2}$ .....	1,735	1,158	.....	357	2.38	5.1	6.99
15..	Corn $\frac{1}{2}$ , and bran $\frac{1}{2}$ .....	1,703	1,124	.....	267	1.78	6.0	9.13
16..	Wheat $\frac{1}{2}$ and corn $\frac{1}{2}$ .....	1,485	1,118	.....	295	1.97	5.4	7.64
17..	Wheat $\frac{1}{2}$ and linseed meal $\frac{1}{2}$ .....	1,530	1,147	.....	291	1.94	6.3	8.04
18..	Corn (self feed).....	1,506	961	.....	248	1.65	5.5	8.57
19..	Corn $\frac{1}{2}$ and bran $\frac{1}{2}$ (self feed).....	1,838	959	.....	237	1.58	6.8	10.03
20..	Corn $\frac{1}{2}$ and wheat $\frac{1}{2}$ , (outdoors)....	1,196	1,087	.....	205	1.67	6.8	9.65
21..	Corn $\frac{1}{2}$ and wheat $\frac{1}{2}$ , (indoors)....	1,164	1,173	.....	230	1.77	6.1	8.77
22..	Corn.....	1,208	1,142	.....	233	1.80	5.4	8.12
23..	Wheat.....	1,201	1,199	.....	217	1.67	7.5	9.56
24..	Corn $\frac{1}{2}$ and wheat $\frac{1}{2}$ (lambs sheared December 1).....	1,266	1,336	.....	161	1.24	9.9	13.97
25..	Sugar beets.....	*5,685	1,181	.....	116	.89	8.7	15.60
26..	Corn, wheat, oats and bran (self feed).....	1,460	924	.....	206	1.58	7.6	10.04
27..	Corn and wheat.....	1,232	1,209	.....	249	1.91	5.9	8.43

\*Silage.

\*Sugar beets.



Lot 5. Ration: Corn, corn silage and clover hay. Twenty western yearlings. Feeding period, 14 weeks. Total grain eaten, 2,429 pounds.

Total silage eaten, 1,550 pounds. Total hay eaten, 2,498 pounds. Total gain, 533 pounds.

Average daily gain, 0.27 pounds. Cost of one pound gain, 5.9 cents.

## SHELTER FOR FATTENING SHEEP.

Experiments at this station and elsewhere have clearly demonstrated that warm barns for fattening sheep are not desirable. Sheep are naturally well protected, and the effect of dry cold is rather a tonic than otherwise. It certainly is not true that fattening sheep require more feed per pound of gain in cold weather than in warm-weather. One of the experiments in the series summarized in the table was undertaken for the express purpose of investigating the effect of feeding fattening sheep that were kept in a closed pen open to the south, in a barn with windows open on the south, as compared with another lot of lambs fed exactly the same ration but permitted the run of a large yard in connection with similar shelter. Lot 20, in the table, was permitted the run of a large yard outdoors and was allowed to go in and out of the barn at will. They were never shut in even during the severest weather, and they were consequently frequently drenched with rain or covered with snow. Lot 21 was fed exactly the same ration inside. The comparisons are given in the following table:

TABLE 2.

Distinguishing difference.	Lot	Grain	Hay	Water	Cost of 1 lb. gain cts.	Total gain	Average weekly gain.	Total dry matter.	Dry matter to 1 lb. gain.
Outdoor.....	20	1,197	1,087	1,228	6.8	205	1.57	1,978	9.65
Indoor.....	21	1,164	1,173	2,073	6.1	230	1.77	2,019	8.77

The results are not very definite nor conclusive, based as they are upon a single experiment, but the facts are that the sheep in the outdoor lot consumed a little more grain, and some less hay than the indoor lot. The increase in live weight was considerably in favor of the lot fed outside. The amount of dry matter required to produce a pound of gain was in favor of the indoor lot. Under the conditions governing this experiment the net profit from the sheep fed indoors was 12 cents per head greater than the lot fed outdoors.

In the writer's experience it seems to be undoubtedly true that sheep do not suffer from dry cold weather, and that providing they can be kept dry they can endure any amount of cold without discomfort. In humid regions, therefore, where rain and snow fall

frequently during the winter, it will be profitable to supply them with a dry shelter, but not necessarily warm.

#### SHEARING LAMBS IN FALL.

Lambs are sometimes shorn in the fall at the beginning of the feeding experiment. Such experiments as have been conducted where sheep have been shorn rather late in the fall have not proven entirely satisfactory. In other experiments where sheep have been shorn early in the spring toward the close of the fattening period the results have been quite uniformly successful.

In table 3 are recorded the results of an experiment in which one lot was shorn December 1st and another lot left unshorn and fed the same grain ration.

The shorn lambs were fed in the same barn with the other lots under experiment, and were subjected to the same conditions except that their pen was protected by a tight board partition extending to the ceiling and entirely enclosed the feeding pen. The pen was supplied with a window opening to the south like the other lots, but unlike the others, this window was kept closed continuously throughout the experiment. Notwithstanding this precaution the sheep gave evidence of suffering from the rigors of winter. It is possible that if still warmer quarters could have been given this lot the results here recorded (table 3) would have been less disparaging to the lot shorn in the fall.

The lots compared were lots 21 and 24.

TABLE 3. EFFECT OF SHEARING LAMBS IN THE FALL.

Distinguishing difference.	Lot.	Grain.	Hay.	Water.	Cost of 1 lb. gain cts.	Total gain.	Average weekly gain.	Dry matter to 1 lb. gain.
Unshorn.....	21	1,164	1,173	2,073	6.1	230	1.77	8.77
Shorn December 1.....	24	1,336	1,336	1,848	9.9	161	1.24	13.97

The shorn lambs (lot 24) made smaller gains, ate more food and consequently required more dry matter to produce one pound of gain than did the lambs fed in exactly the same manner and unshorn (lot 21). An examination of the financial statement in connection with lots 21 and 24 will reveal the fact that in this experiment at least there was no advantage, but, on the contrary, a decided disadvantage from fall shearing.

No one experiment can furnish sufficient data for definite and sweeping conclusions, but the above results are significant and probably point out the general result which may be expected from such practice.

#### ECONOMY OF A SELF-FEEDER.

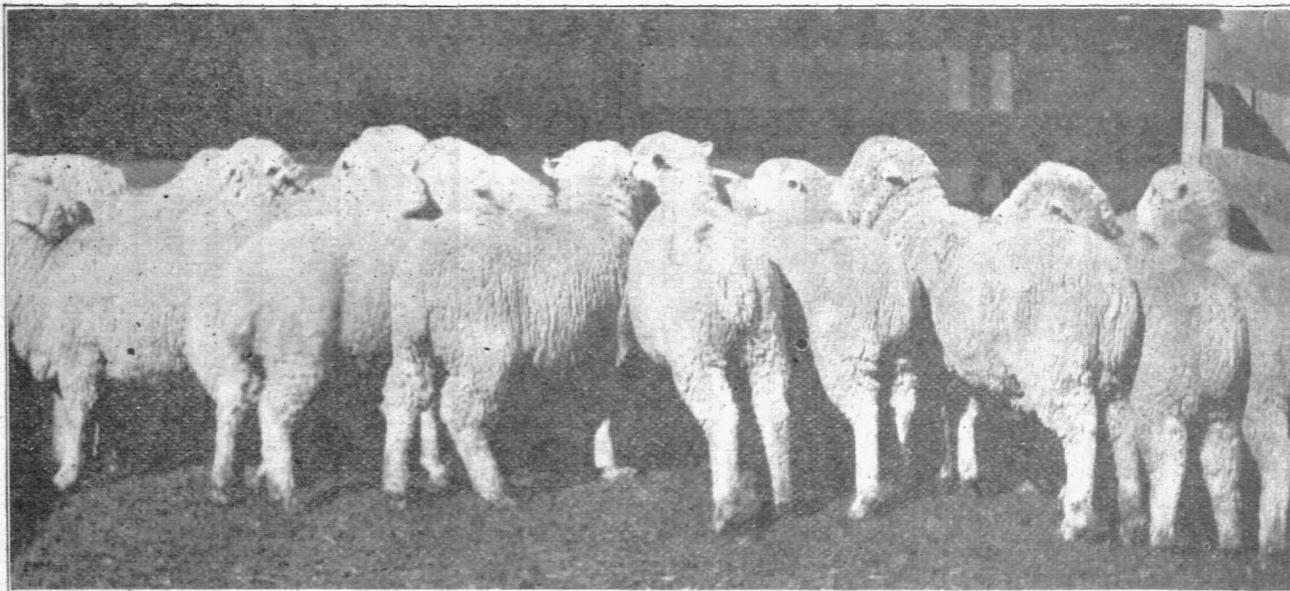
A self feeder is an arrangement by which animals may supply themselves with grain at all times. The usual method of feeding is to fill the grain racks once in three or four days, or perhaps only once each week. The practice differs somewhat in different localities, some feeders supply the grain to the fattening animals as described above, while others clean the feeding troughs daily, furnishing no more food than will satisfy the animals until the next feeding time. The two practices are essentially the same in character and results. This method of fattening is popular, especially with those feeding a large number of animals, requiring the attention of several feeders; but we have found it in common use among those who fatten but a small number annually. An investigation of this practice draws attention to two points: 1. Effect on the gain in live weight. 2. The relative amount of dry matter required to produce the gains made.

Below will be found a table which includes the data collected in our investigation of this point in the season, 1894-5:

TABLE 4. ECONOMY OF A SELF-FEED—1894-5.

Distinguishing rations.	Lots.	Grain.	Hay.	Water.	Cost of 1 lb. gain, cts.	Gain.	Average weekly gain.	Dry matter to 1 lb. gain.
Regular feeding.....	21	1,164	1,173	2,073	6.1	230	1.77	8.77
Self feed.....	26	1,460	924	2,547	7.6	206	1.58	10.04

In the above table, lot 21 was fed twice each day, as described in previous pages of this bulletin. The ration of lot 21 was composed of equal parts by weight of corn and wheat mixed, and clover hay. Lot 26 was fed by means of four self-feeders, one containing corn, another bran, another wheat, and still another oats. These self-feeders were kept filled with grain, but were so constructed that the food worked its way down to the feeding trough no faster than the animals ate it from below. In previous experiments we have mixed the grain for the animals and supplied



Lot 6. Ration: Corn and clover hay. Twenty western yearlings. Feeding period, 14 weeks. Total grain eaten, 2,988 pounds. Total hay eaten, 2,501 pounds. Total gain, 481 pounds. Average daily gain, 0.24 pounds. Cost of one pound gain, 6.9 cents. (Automatic feeder—self-feed.)

it to them through one rack, but we believe the arrangements described above is preferable.

The lambs (lot 26) ate five hundred and fifty-six pounds of corn, four hundred and sixty-seven pounds of bran, two hundred and forty-seven pounds of oats and one hundred and eighty-nine pounds of wheat. This is seemingly a very favorable showing for corn, as the main food in the fattening ration. Referring again to table 4, it will be observed that the self-fed lambs ate considerably more grain, a little less hay, drank more water, and made a smaller total gain than lot 21 fed in the ordinary way. The point of greatest significance, however, is the amount of dry matter required to produce a pound of increase in live weight, and this is manifestly greatly in favor of lot 21, receiving its food regularly at stated times. Lot 26, fed by means of self-feeders, required 10.04 pounds of dry matter to produce one pound of gain, while lot two required but 8.77 pounds. In this experiment the results are clearly against the use of the self-feeder. The total gains made and the amount of food required to produce a given increase in weight all seem to be distinctly favorable to the practice of regular and systematic feeding conducted with judgment on the part of the attendant.

TABLE 5.

THREE YEARS FEEDING WITH A SELF-FEEDER.

Year,	Grain.	Hay.	Roots.	Total gain.	Average weekly gain.	Dry matter to 1 lb. gain.
1892-3.....	2,120	528	1,360	260	2.17	9.5
1893-4.....	1,503	713	.....	212	1.77	9.57
1894-5.....	1,341	854	.....	208	1.73	9.66
Average.....	1654.6	698.3	.....	226.6	1.89	9.57

TABLE 6.

THREE YEARS FEEDING CORN—REGULAR FEEDING.

Year.	Grain.	Hay.	Total gain.	Average weekly gain.	Dry matter to 1 lb. gain.
1892-3.....	1,123	1,225	300	2.5	6.76
1893-4.....	1,253	914	286	2.38	6.58
1894-5.....	1,132.3	1,056	237	1.97	7.57
Average.....	1,169.3	1,065	274.3	2.28	6.97

Tables 5 and 6 contain the average results of three years' experiments with lambs fed corn and clover hay and supplied in the ordinary manner. The results are reduced to the uniform period of twelve weeks. In every instance the lambs fed at regular intervals (table 6) made the greatest gains and produced those gains at the least expense of dry matter. The experiments are quite conclusive, extending as they do over a period of three years under varying conditions and with different lots of sheep. We are led to the conclusion that fattening lambs by means of a self-feeder is an expensive practice, and that economy of production requires more attention to the variation in the appetites of the animals than can be given by this method.

#### FEEDING ON RAPE AS A PREPARATION FOR WINTER FATTENING.

Rape has been somewhat extensively used at this Station and throughout the State for the fall pasturage of sheep intended for winter fattening. It has rapidly grown in favor, since it produces a large amount of forage to the acre, and the efficiency of this material for fattening sheep and the ease with which it may be grown, all commend it to the practical sheep man. It may be used as a catch crop after oats and peas, which have been cut for hay, or even after an ordinary hay crop. As a rule, lambs may be pastured on rape from September 15th to November 15th at the rate of fifteen or twenty lambs per acre, and they should gain in this time twenty pounds each.

The experiments with rape at this Station have indicated that rape-fed lambs were in much better condition at the beginning of winter than those pastured on grass. This fact has led us to consider whether more profitable gains might not be made by lambs in poorer condition at the beginning of the fattening period. To test this matter an average lot of lambs was selected from the flock and placed upon a second growth timothy and blue grass meadows, for comparison with the main flock, which had been turned on rape. The rape-fed lambs gained much more rapidly from the first than those upon the meadow and at the time of placing in the barns for the winter's experiments, ten of the rape-fed lambs weighed 851 pounds, while the same number of pasture-fed lambs weighed only 799 pounds. The following table illustrates the main points of difference between the two lots from the beginning of the winter period of fattening to its close:

TABLE 7.

## RAPE AS A PREPARATION FOR WINTER FEEDING.

Distinguishing.	Lot.	Grain ration, corn and wht. lbs.	Fodder ration hay, lbs.	Water lbs.	Cost of 1 lb. gains.	Gain, lbs.	Weekly gain, lbs.	Dry matter gain, lbs.
Rape-fed.....	21	1,164	1,173	2,073	6.1	230	1.77	8.77
Grass-fed.....	27	1,232	1,209	2,191	5.9	249	1.91	8.48

The grass-fed lambs (lot 27) ate rather more grain and hay, drank more water, made somewhat larger gains and required a larger amount of dry matter for each pound of gain than the rape-fed (lot 21) lambs. A comparison of the financial statements for these lots will reveal the fact that the lot fed on rape were more profitable under the conditions existing in these experiments; but the financial results are not justly comparable from the fact that the live weight of lot two was considerably greater than lot six at the beginning of the experiment.

Had the lots at that time been of equal weight, not only the gains and amount of dry matter required to produce a pound of gain, but the financial results would have shown a slight advantage in favor of the grass-fed lambs. The difference, however, is very slight, and we must conclude from this experiment that the rape-fed lambs are not to be considered less desirable for winter fattening than those pastured on grass.

## THE VALUE OF ROOTS IN A RATION.

Feeders who have employed roots largely in a fattening ration are quite unanimous in the opinion that the dry matter in roots is more equal effective than an equal amount of dry matter in fodders and grains.

The results of the experiments here recorded agree with practical experience. In one experiment in which roots were fed largely, and grain, corn and bran limited to one pound daily, it required 5.36 pounds of dry matter to produce one pound of gain. The following winter one lot fed exactly the same grain mixture, but given all they would eat and only one pound of roots daily, required 9.22 pounds of dry matter to produce one pound of gain.

TABLE 8.

Lot	Distinguishing rations.	Grain, lbs.	Hay, lbs.	Roots, lbs.	Total gain, lbs.	Average weekly gain.	Cost of 1 lb. gain, cts.	Dry matter to produce 1 lb. gain.
11..	Corn.....	1,579	1,079	.....	328	2.18	4.6	7.02
12..	Corn and roots.....	1,612	964	2,720	397	2.64	4.6	6.41
13..	Corn, linseed meal and roots..	1,716	967	2,675	392	2.61	5.3	6.72
14..	Corn and linseed meal.....	1,735	1,158	.....	357	2.38	5.1	6.99

It will be seen from table 8, that the lambs receiving roots in their ration ate less hay, made considerably better gains and made gains on less dry matter than the lambs fed no roots.

The results may be briefly summarized as follows:

#### CONCLUSIONS.

1. Lots receiving corn in the fattening ration, either in whole or in part, produced the best gains, were apparently in better finish and in general were fed at a greater profit than the lots fed any other ration. (See lots 1, 4, 5, 10, 11, 12, 22, etc.)

2. A grain ration made up exclusively of wheat bran proved to be inferior for fattening lambs. (See lot 3.)

3. Feeding by means of a "self-feeder" is an expensive method of fattening, and is not to be recommended either from the standpoint of total gains made or the amount of dry matter required to produce a given gain. (Compare lots 7 and 10; 11 and 18; 15 and 19, and 21 and 26.)

4. Wheat bran costs more, pound for pound, than corn, and hence can not be fed profitably in this State, except when it approaches very closely the value of corn.

5. When roots are fed in a ration better gains are made and less dry matter is required to produce one pound of gain.

6. Shearing lambs late (March 8) in winter during the feeding period increases the rate of gain.

7. Shearing in fall (December 1) was not followed by good results and in these experiments was not as profitable as feeding unshorn lambs. (Compare lots 21 and 24.)

8. The animals fattened on rape during the fall and in good condition at the beginning of the experiment were essentially as successful feeders as those in poorer condition that were pastured

on grass during the same fall period. (Compare lots 21 and 27.)

9. Small gains are not necessarily unprofitable nor are large gains a sure index of profitable food consumption.

10. Roots were a valuable addition to every ration to which they were added.