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Lamb Feeding in Sugar Beet Districts is a General Practice.

Fattening Lambs in Sugar Beet Districts

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†In cooperation with U. S. Dept. of Agriculture.
Fattening Lambs in Sugar Beet Districts

By

W. L. QUAYLE

In those districts of the state where the growing of sugar beets is an important phase of the agricultural program it is highly desirable that attention be given to the feeding of livestock. Sugar beet yields are best maintained when manure is applied to the land, and so most beet growers feed stock during the winter season. The feeding work utilizes on the farm the alfalfa and other roughages, the grain and the by-products from the sugar beets, such as tops, pulp, and syrup. Also, dependable help can be employed the year around, a fact that overcomes in some measure the objection to hiring new men every spring.

Cash returns over and above the cost of feed, labor, and other charges depend upon several factors. Not only is the spread between the cost and the selling price of the lambs to be considered but also the kind of lambs and their quality are important. The ability of the feeder to see at a glance the condition of the lambs and to know the effects of various rations is always vital to a successful feeding operation.

To determine the feeding value of different rations for lambs in sugar beet districts, two series of tests have been carried on by the Department of State Experiment Farms: one series was started on the Goshen County Experiment Farm in the Platte Valley near Torrington, and the other on the Washakie County State Experiment Farm in the Big Horn Basin near Worland. For the sake of brevity in this discussion these farms will be called the Torrington Farm and the Worland Farm, respectively. The data set forth in this bulletin are the results of experiments carried through several winter seasons. The work was started in the fall of 1925 on the Torrington Farm. On the Worland Farm some of the tests were started in the winter of 1923-24.

LAMBS USED

The lambs used in these feeding experiments in both districts were western range stock. The Department of Experiment Farms did not own the lambs but carried them through the feeding periods on the Torrington Farm on a “spread” basis. The State Board of Charities and Reform furnished the lambs for the experimental feeding at the
Worland Farm.* At the close of the feeding period the lambs were shipped to eastern markets by the owners as they saw fit.

**DURATION OF TESTS AND NUMBERS OF LAMBS**

At the Torrington Farm the first experiment continued through 80 days; the second through 84 days; and the third through 90 days. The later tests continued through 100 days each. In the first year's experiment the lots consisted of 45 lambs each, except one pen which had 25 lambs. In the second year's work four pens each had 50 head of lambs, and the remainder 60 head each. Since this time all work has been with pens of 50 head each.

At the Worland Farm all lots have started with 40 lambs each, excepting the season of 1925-26 when 50 lambs were used in each lot.

The length of the feeding period has varied from 78 to 100 days. Five of the tests have each lasted 100 days.

**LAMB WEIGHTS**

At the two state experiment farms where the feeding was done, from three to four times the number of lambs actually required for the tests was used in making the selections for the several lots. In these selections due attention was given to type, size, sex, thrift, and general vigor.

Each lot was weighed on three consecutive days. The average of these three weights was considered as the initial weight of the lot. The average of three consecutive weighings of each lot at the close of the feeding period was considered the final weight of the lot. The experimental feeding began at noon of the second initial weighing day and closed at noon of the second final weighing day.

The average initial weights of the lambs varied in the Torrington Farm tests from 56 to 70 pounds. In all trials except one the average initial weight per lamb was less than 70 pounds; and in all tests except two the average initial weight was under 60 pounds.

At the Worland Farm the average initial weights of the lambs varied from 53 to 70 pounds.

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*The work with livestock and with crops is carried on in cooperation with the State Board of Charities and Reform. Use of land, stock, feed, and labor is furnished by the State Board of Charities and Reform. The supervision and personal direction is supplied by the Department of Experiment Farms.*
FEED LOTS

All feeding pens at the Torrington Farm were divided into two parts, one being used exclusively for grain feeding, and the other part, 16 feet by 90 feet, was provided with alfalfa racks, salt, and fresh water. On the north end of the feeding pens an eight-foot fence served as a windbreak. Three of the lots had open sheds for protection. A section of the pens used on the Torrington Farm is shown on the front cover of this bulletin.

At the Worland Farm open corrals 40 feet square were used. They were arranged in two tiers with a feeding alley through the center. From this alley the concentrates and silage were fed in troughs just on the outside of the pens. Hay pannels were arranged on the opposite sides of the pens for the feeding of alfalfa.

In all cases ample straw was supplied for bedding, and clean water and salt were always available in the pens.

STARTING THE LAMBS

Before the lambs were divided into the various lots they were allowed a grazing period on alfalfa stubble, grain fields, and beet tops from two to four weeks. In some cases small amounts of cured roughage were given to the lambs in addition to the pasturage as a means of getting the animals well under way and ready for the feed lot tests.

From the time the lambs were put in the feed lots until the end of the feeding period they had free access to alfalfa hay at all times. All other feeds were given twice daily. The lambs were started with small amounts of the concentrates. These amounts were gradually increased until the lambs were on a full feed. The time required for this varied with different lots and with different years. Six weeks was usually required to get the lambs on full feed.

The gains made by the lambs in the season 1927-1928 at the Torrington Farm are considerably less than the gains from similar rations either before or since. Because the same grade of lambs has been used in all these tests and the same man fed and cared for the lambs several seasons before and after that year no particular reason is given for the low gains. Table ‘A’ on pages 8 and 9 sets forth the results of the feeding test in that season. This data is not included in the other tables used in this bulletin.
FEEDS USED

SHELLED CORN, which was used in the tests carried on at the Torrington Farm, consisted in the main of locally grown grain, some being irrigated and some being from dry-land sections. It was mostly yellow dent, and corresponded in grade to U. S. No. 3.

In the Worland Farm trials, the corn was imported from Nebraska. It usually graded as No. 3 Mixed.

WHOLE BARLEY was obtained from local sources for the experiments at the Torrington Farm, part from dry-land and part of it from irrigated areas. The greater portion of this barley has been the Trebi variety, and it varied in weight from 45 to 50 pounds per bushel.

A considerable portion of the barley used in the Worland Farm tests was grown in that vicinity, and a small amount was shipped in. This was of unusually high grade Trebi variety, and weighed about 50 pounds to the bushel.

WHEAT was obtained locally. It was hard red winter, and was fed in the same condition as it came from the grain separator or combine.

DRIED BEET PULP was described by the sugar companies producing it as a 20 per cent molasses mixture, approximately 20 per cent of its weight being sugar beet molasses.

SUGAR BEET MOLASSES. This was a by-product of the sugar factories obtained as a residue from the Steffen's process in the final recovery of marginal sugar.

WET BEET PULP was obtained from the local sugar factory for the Torrington Farm and was hauled approximately two miles. When only small amounts were being used it was sometimes stored in bins on the feed lots, and so haulings were not more frequent than every two or three days.

A six mile haul was necessary from the Worland factory. The pulp was hauled every day until the latter part of the season when a large amount was stored near the pens so as to have sufficient to carry the experiments through the required length of time.

CORN SILAGE was made from U. S. Selection 133, a yellow dent corn. It was cut with the corn binder and siloed in trench silos. When these were filled they were covered with straw and earth to a depth of about 2 feet. During the feeding season the silage was removed from one end of the pit by means of cutting off sections with a hay knife, or
CORN FODDER was made from U. S. Selection 133, a yellow dent corn. The grain was quite mature when the crop was cut. It was placed in shocks to cure near the feed lots and was cut with a silage cutter. The size of the pieces varied from $\frac{1}{2}$ to $\frac{3}{4}$ of an inch in length.

BEET TOP SILAGE was made by piling the wilted tops from beet fields in a trench silo. These tops, with crowns, were tramped until the silo was full and then covered with straw and earth. The silage was removed in the same manner as was the corn silage.

CULL BEANS were obtained from warehouses where beans, principally the Great Northerns, had been graded and cleaned. They consisted in the main part of splits and small kernels that were unsaleable as market grades.

COTTONSEED CAKE carried the guaranteed analysis of 43 per cent crude protein.

CUT ALFALFA was made from either the first or the second crop by running it through a hammer mill and reducing it to fine particles $\frac{1}{8}$ to $\frac{1}{2}$ of an inch in length.

ALFALFA HAY was from the various cuttings. Care was taken, however, that all lots were fed the same cutting at the same time. This was likewise true with reference to irrigated and dry-land grain whenever the two were used during any one test.

BEAN STRAW consisted of the vines and pod shells that were left after the grain had been threshed from the vines.

MINERALS. Ordinary sulphur block salt was available to all lots. In one test a commercial mineral mixture was used in comparison with the salt. The ingredients of this particular mineral are not known.

In the following pages the results from feeding the different rations are set forth in tabular form. Two or more rations are given in each table for the sake of comparison. The initial weight of the lambs, their rate of gain, and amounts of the different feeds in the ration used to produce one hundred pounds of lamb gain in the feed lot are indicated in the tables.

The results of the work done at the Torrington Farm are shown in Tables I to XIII inclusive. Tables XIV to XXX inclusive show the results of the feeding work as done on the Worland Farm.
## Table A

Showing the Results of Lamb Feeding for the Year 1927, and the Results from Feeding the Same Rations Averaged for All Other Years at the Torrington Farm

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average daily ration per lamb (lbs.)</td>
<td>Corn</td>
<td>.93</td>
<td>Corn</td>
<td>.87</td>
<td>D. Pulp</td>
<td>.93</td>
<td>Corn</td>
<td>.47</td>
<td>D. Pulp 1.44</td>
</tr>
<tr>
<td></td>
<td>Alf.</td>
<td>1.36</td>
<td>Alf.</td>
<td>1.48</td>
<td>Alf.</td>
<td>1.04</td>
<td>Alf.</td>
<td>1.11</td>
<td>Alf.</td>
</tr>
<tr>
<td>Alfalfa self fed to all lots</td>
<td>C. Cake</td>
<td>.23</td>
<td>C. Cake</td>
<td>.23</td>
<td>C. Cake</td>
<td>.23</td>
<td>C. Cake</td>
<td>.23</td>
<td>C. Cake</td>
</tr>
<tr>
<td>Av. initial wt. (lbs.)</td>
<td>66.80</td>
<td>66.81</td>
<td>66.77</td>
<td>66.77</td>
<td>66.76</td>
<td>66.74</td>
<td>66.72</td>
<td>Alf.</td>
<td>1.34</td>
</tr>
<tr>
<td>Av. final wt. in feed lot (lbs.)</td>
<td>82.90</td>
<td>86.90</td>
<td>92.15</td>
<td>89.95</td>
<td>85.15</td>
<td>81.90</td>
<td>86.97</td>
<td>85.80</td>
<td>91.22</td>
</tr>
<tr>
<td>Av. daily gain (lbs.)</td>
<td>.18</td>
<td>.22</td>
<td>.23</td>
<td>.26</td>
<td>.18</td>
<td>.17</td>
<td>.23</td>
<td>.21</td>
<td>.27</td>
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</table>

### Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn (lbs.)</td>
<td>522.4</td>
<td>390.1</td>
<td>159.5</td>
<td>107.0</td>
<td>478.0</td>
<td>209.0</td>
<td>222.7</td>
<td>88.5</td>
<td></td>
</tr>
<tr>
<td>Barley (lbs.)</td>
<td>103.1</td>
<td>81.0</td>
<td>89.1</td>
<td>126.4</td>
<td>531.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Cake (lbs.)</td>
<td>333.0</td>
<td>35.0</td>
<td>430.0</td>
<td>653.8</td>
<td>546.0</td>
<td>635.0</td>
<td>361.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet Beet Pulp (lbs.)</td>
<td>764.04</td>
<td>663.0</td>
<td>388.7</td>
<td>884.0</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death losses</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE A—Continued

1925-1931*

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average daily ration (lbs.)</td>
<td>Corn .96</td>
<td>Corn .98</td>
<td>Corn .77</td>
<td>D. Pulp .50</td>
<td>Bar. 1.0</td>
<td>W. Pulp 8.2</td>
<td>Corn .24</td>
<td>Bar. .24</td>
<td>D. Pulp 1.09</td>
</tr>
<tr>
<td>Alfalfa self fed to all lots</td>
<td>Alf. 1.53</td>
<td>Alf. 1.52</td>
<td>Alf. 1.15</td>
<td>Alf. 1.48</td>
<td>Alf. 1.41</td>
<td>Alf. 1.34</td>
<td>Alf. 1.29</td>
<td>Alf. 1.33</td>
<td>Alf. 1.42</td>
</tr>
<tr>
<td>Av. initial wt. (lbs.)</td>
<td>60.28</td>
<td>61.51</td>
<td>60.41</td>
<td>61.00</td>
<td>60.99</td>
<td>58.08</td>
<td>58.08</td>
<td>58.08</td>
<td>60.94</td>
</tr>
<tr>
<td>Av. final wt. (lbs.)</td>
<td>84.33</td>
<td>91.62</td>
<td>90.25</td>
<td>91.75</td>
<td>89.22</td>
<td>78.59</td>
<td>80.6</td>
<td>80.16</td>
<td>92.21</td>
</tr>
<tr>
<td>Av. daily gain (lbs.)</td>
<td>.39</td>
<td>.32</td>
<td>.36</td>
<td>.38</td>
<td>.30</td>
<td>.24</td>
<td>.27</td>
<td>.26</td>
<td>.32</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>Corn (lbs.)</th>
<th>Barley (lbs.)</th>
<th>C. Cake (lbs.)</th>
<th>Dry Beet Pulp (lbs.)</th>
<th>Wet Beet Pulp (lbs.)</th>
<th>Alfalfa (lbs.)</th>
<th>Death losses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>328.2</td>
<td>305.2</td>
<td>211.8</td>
<td>185.4</td>
<td>339.1</td>
<td>3374.5</td>
<td>1-1925</td>
</tr>
<tr>
<td></td>
<td>71.1</td>
<td>66.6</td>
<td>123.3</td>
<td>185.4</td>
<td>3374.5</td>
<td>3374.5</td>
<td>2-1930</td>
</tr>
<tr>
<td></td>
<td>453.0</td>
<td>465.2</td>
<td>316.4</td>
<td>426.5</td>
<td>466.2</td>
<td>551.4</td>
<td>1-1926</td>
</tr>
<tr>
<td></td>
<td>1-1926</td>
<td>1-1926</td>
<td>1-1928</td>
<td>1-1926</td>
<td>1-1926</td>
<td>481.3</td>
<td>1-1929</td>
</tr>
<tr>
<td></td>
<td>2-1930</td>
<td>2-1930</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>505.7</td>
<td>2-1930</td>
</tr>
</tbody>
</table>

COTTONSEED CAKE AND WET BEET PULP ADDED TO CORN AND ALFALFA (Table I)

Corn and alfalfa have for a long time been regarded as important feeds for fattening lambs. Other feeds also are generally used in combination with corn and alfalfa. The price determines to some extent the choice of feeds.

In this comparison it will be noted that the highest average daily gain resulted in Lot 2 when cottonseed cake was added to a ration of corn and alfalfa. The ration of corn and alfalfa made the next highest rate of gain. The average daily gain when corn, alfalfa and wet beet pulp constituted the ration was .27 pounds.

A ton of cottonseed cake, when this concentrate was added to a ration of corn and alfalfa, saved 749.3 pounds of corn and 1672.0 pounds of alfalfa hay.

When wet beet pulp was added to the ration of corn and alfalfa, each ton of wet beet pulp saved 190.0 pounds of corn less 9.6 pounds of alfalfa.

Only one death loss was recorded for this test. It was in the lot receiving cottonseed cake.

It is interesting to note that appraisals by representatives of a Denver commission house showed the percentage of fat lambs to be 80 per cent in the corn lot and also in the corn with wet pulp. The appraisal made for the lot on corn, cottonseed cake and alfalfa showed 90 per cent as fat lambs.

**TABLE I**
The Effect of Adding Cottonseed Cake and of Adding Wet Beet Pulp to a Ration of Corn and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>1 Year Average—1926</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>.97</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.36</td>
</tr>
<tr>
<td>Av. Initial Weight (lbs.)</td>
<td>58.36</td>
</tr>
<tr>
<td>Av. Final Weight (lbs.)</td>
<td>82.35</td>
</tr>
<tr>
<td>Av. Daily Gain</td>
<td>.29</td>
</tr>
<tr>
<td>Feed Used for 100 Pounds Gain</td>
<td></td>
</tr>
<tr>
<td>Corn (lbs.)</td>
<td>334.4</td>
</tr>
<tr>
<td>Cottonseed Cake (lbs.)</td>
<td>---</td>
</tr>
<tr>
<td>Wet Beet Pulp (lbs.)</td>
<td>---</td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>468.9</td>
</tr>
</tbody>
</table>
CORN vs. BARLEY FED WITH COTTONSEED CAKE (Table II)

A ration in which corn is the principle grain has been considered standard for fattening lambs. Only in recent years has barley taken a prominent place in lamb feeding operations.

A comparison of corn and barley when fed with cottonseed cake and alfalfa showed that the greatest daily gain, .32 pounds, was made by the ration of corn, cottonseed cake and alfalfa. When barley was used in place of corn the average daily gain was .30 pounds per head.

A comparison of the amounts of feed used for 100 pounds gain of these two lots showed that one ton of corn replaced 2222.4 pounds of barley and 39.6 pounds of cottonseed cake. The alfalfa used was approximately the same in both rations. Considering the grain used in each ration for a unit of lamb gain, the barley was about 90 per cent as efficient as the corn in making gains.

During the six years in which these two rations were used there is a recorded death loss of 3 head for the ration of corn, cottonseed cake and alfalfa, and 4 head for the ration of barley, cottonseed cake and alfalfa.

The appraisal for these two lots averaged for five years, shows that 96 per cent of the corn lambs were judged as fat, and 85 per cent of the barley lambs.

TABLE II
Comparison of Corn and Barley when Each is Fed in a Ration of Cottonseed Cake and Alfalfa Hay

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>2</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Corn</td>
<td>Barley</td>
</tr>
<tr>
<td></td>
<td>.98</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td>Cottonseed Cake</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>1.52</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>61.51</td>
<td>60.99</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>91.62</td>
<td>89.22</td>
</tr>
<tr>
<td>Average Daily Gain</td>
<td>.32</td>
<td>.39</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>2</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn (lbs.)</td>
<td>305.2</td>
<td>339.1</td>
</tr>
<tr>
<td>Barley (lbs.)</td>
<td>71.1</td>
<td>77.2</td>
</tr>
<tr>
<td>Cottonseed Cake (lbs.)</td>
<td>465.2</td>
<td>466.7</td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>466.7</td>
<td></td>
</tr>
</tbody>
</table>
CORN vs. BARLEY COMBINED WITH DRY BEET PULP AND COTTONSEED CAKE (Table III)

The rate of gain was .36 pounds per day for both lots. In comparing corn with barley it will be noted that one ton of corn was equivalent to 2092.8 pounds of barley, plus 30.3 pounds dry pulp, and 220.4 pounds of alfalfa. There was not a great deal of difference in the amounts of feed used. The lambs were a little better finished in the corn lot.

The condition of the lambs, according to the appraisers, was 90 per cent fat in the corn fed lot, and 80 per cent fat for the barley fed lot.

There was one death loss for the corn ration and none for the barley ration.

| TABLE III |
| Comparison of Corn and Barley when Combined with Cottonseed Cake, Dry Beet Pulp and Alfalfa |

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>2 Year Average—1925-26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td></td>
</tr>
<tr>
<td>Corn</td>
<td>.77</td>
</tr>
<tr>
<td>Cottonseed Cake</td>
<td>.24</td>
</tr>
<tr>
<td>Dry Pulp</td>
<td>.45</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.15</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>60.41</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>90.25</td>
</tr>
<tr>
<td>Average Daily Gain</td>
<td>.36</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Corn (lbs.) | 211.8 |
| Barley (lbs.) | 221.7 |
| Cottonseed Cake (lbs.) | 66.6 |
| Dry Pulp (lbs.) | 123.8 |
| Alfalfa (lbs.) | 316.4 |

COMBINING DRY BEET PULP WITH CORN AND COTTONSEED CAKE (Table IV)

The addition of dry beet pulp to a ration of corn, cottonseed cake, and alfalfa increased the average daily rate of gain from .30 to .36, which is equivalent to 20 per cent. The use of the dry beet pulp increased the palatability of the ration.

In comparing the amounts of feed required for a unit of gain, it will be noted that one ton of dry beet pulp replaced 1499.4 pounds of corn, 181.0 pounds cottonseed cake, and 1521.0 pounds alfalfa.
The appraisers considered the lambs in both lots to be 90 per cent fat.

The death loss was one head in each of the two lots.

**TABLE IV**

The Effect of Combining Dry Beet Pulp with a Ration of Corn, Cottonseed Cake and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>2 Year Average—1925-1926</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Corn</td>
</tr>
<tr>
<td></td>
<td>Cottonseed Cake</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
</tr>
<tr>
<td></td>
<td>Dry Pulp</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>60.53</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>85.40</td>
</tr>
<tr>
<td>Average Daily Gain</td>
<td>.30</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| | Corn (lbs.) | 304.6 | 211.8 |
| | Cottonseed Cake (lbs.) | 77.8 | 66.6 |
| | Dry Beet Pulp (lbs.) | 175.5 | 123.8 |
| | Alfalfa (lbs.) | 410.5 | 316.4 |

**CORN vs. BARLEY FED WITH WET BEET PULP (Table V)**

The addition of about one-fourth of a pound of corn to a ration of wet beet pulp and alfalfa increased the daily rate of gain of the lambs 12 per cent. In comparing the first two lots in the above table, it is evident that one ton of corn had a replacement value of 17,947.0 pounds wet beet pulp plus 1565.6 pounds alfalfa hay.

The condition of the lambs at the end of the feeding period, according to the appraisers, showed that only 20 per cent of the pulp-alfalfa lambs rated as fat, while 80 per cent were so classed where the corn was added.

The addition of barley to the ration of wet pulp and alfalfa increased the average rate of daily gain approximately 8 per cent. The barley and corn were fed in similar amounts in the respective lots, .24 pounds per head daily.

It will be noted in comparing the lot getting barley and wet beet pulp with the lot getting alfalfa and wet beet pulp that one ton of barley added to a ration of wet beet pulp and alfalfa was equivalent in replacement value to 12,792.8 pounds of wet beet pulp and 1,002.5 pounds alfalfa hay.
The condition of the barley lambs was rated as only 20 per cent fat, the same as they were in the wet pulp-alfalfa lot. A larger grain feed would undoubtedly have made a better finish.

TABLE V
A Comparison of Corn and Barley when Added to a Ration of Wet Beet Pulp and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wet Pulp</td>
<td>8.20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.34</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Corn</td>
<td>.24</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wet Pulp</td>
<td>-</td>
<td>6.89</td>
<td>-</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>-</td>
<td>1.29</td>
<td>-</td>
</tr>
<tr>
<td>Barley</td>
<td>.24</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Wet Pulp</td>
<td>-</td>
<td>7.34</td>
<td>-</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>-</td>
<td>1.33</td>
<td>-</td>
</tr>
</tbody>
</table>

Av. Initial Weight (lbs.)
- 58.08
- 58.08
- 58.08
Av. Final Weight (lbs.)
- 78.50
- 80.66
- 80.16
Av. Daily Gain
- .24
- .27
- .26

Feed Used for 100 Pounds Gain

| Barley (lbs.) | --- | --- | 91.25 |
| Corn (lbs.) | --- | 89.6 | --- |
| Wet Beet Pulp (lbs.) | 3274.5 | 2570.9 | 2790.8 |
| Alfalfa (lbs.) | 551.4 | 481.3 | 505.7 |

COMPARISON OF CORN, BARLEY, AND DRY BEET PULP (Table VI)

The highest rate of gain was .32 pounds per day per lamb in the case of both the corn fed lot and the dry beet pulp lot. Barley and cottonseed cake with alfalfa produced the lowest gain, .30.

In comparing corn with barley it may be shown that one ton of corn based upon a unit of lamb gain, was equivalent to 2222.4 pounds of barley plus 39.8 pounds of cottonseed cake. The alfalfa consumption was practically the same in both lots.

Comparing corn with dry beet pulp it may be calculated that one ton of corn was equivalent to 2220.0 pounds of dried beet pulp, plus 3.8 pounds cottonseed cake. The alfalfa requirements with a ton of corn were 166.6 pounds more than when dried beet pulp was used in making gains.

The percentage of fat lambs, as appraised at the end of these tests, showed 96 per cent for the corn lot, 85 per cent for the barley lot, and 87 per cent for the dried beet pulp lot.

There were three death losses in the six trials for the corn ration, four in the barley ration, and one in the dried beet pulp ration.
Ordinarily dry beet pulp is equivalent to grain when used with grain in the same amount or less. In this test the rate of gain was equal to that made by corn, but the lambs were not finished as well.

**TABLE VI**

A Comparison of Corn, Barley and Dry Beet Pulp when Fed With Cottonseed Cake and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>2</th>
<th>5</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td>Corn</td>
<td>.98</td>
<td>Darley</td>
</tr>
<tr>
<td></td>
<td>C. Cake</td>
<td>.23</td>
<td>C. Cake</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>1.52</td>
<td>Alfalfa</td>
</tr>
<tr>
<td>Av. Initial Weight (lbs.)</td>
<td>61.05</td>
<td>60.99</td>
<td>60.94</td>
</tr>
<tr>
<td>Av. Final Weight (lbs.)</td>
<td>91.62</td>
<td>89.22</td>
<td>92.21</td>
</tr>
<tr>
<td>Av. Daily Gain</td>
<td>.32</td>
<td>.30</td>
<td>.32</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th>Feed</th>
<th>Corn (lbs.)</th>
<th>305.2</th>
<th>Barley (lbs.)</th>
<th>239.1</th>
<th>Dry Beet Pulp (lbs.)</th>
<th>338.7</th>
<th>Cottonseed Cake (lbs.)</th>
<th>71.1</th>
<th>Alfalfa (lbs.)</th>
<th>465.2</th>
</tr>
</thead>
</table>

**COTTONSEED CAKE vs. A PROPRIETARY FEED (Table VII)**

A proprietary feed, recommended by the manufacturers as a valuable supplement for the feeding of lambs, was used in this test in a comparison with cottonseed cake. The cottonseed cake had a guaranteed protein content of 43 per cent, and the proprietary feed had a stated protein content of 11 per cent.

The average daily gain of the lambs getting cottonseed cake was .32 pounds, and the proprietary feed lot showed a daily gain of .30 pounds.

In this test one ton of cottonseed cake replaced 2,192.9 pounds of the proprietary feed plus 938.9 pounds of barley, plus 1,208.3 pounds of alfalfa.

The condition of the lambs, according to the appraisers, was 94 per cent fat for lot 5, and 87 per cent fat for lot 12.

There was one death loss in each lot during the two years of the test.
TABLE VII
A Comparison of Cottonseed Cake and a Proprietary Feed When Fed with Barley and Alfalfa Hay

2 Year Average—1928-1929

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>5</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Cottonseed Cake .21</td>
<td>Proprietary feed .22</td>
</tr>
<tr>
<td>Barley</td>
<td>.99</td>
<td>Barley</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.66</td>
<td>Alfalfa</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>57.83</td>
<td>57.85</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>90.02</td>
<td>88.42</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.32</td>
<td>.30</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>Barley (lbs.)</th>
<th>Cottonseed Cake (lbs.)</th>
<th>Proprietary Feed (lbs.)</th>
<th>Alfalfa (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>307.4</td>
<td>65.0</td>
<td>71.3</td>
<td>515.2</td>
</tr>
<tr>
<td></td>
<td>337.9</td>
<td>554.5</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WET BEET PULP vs. DRY BEET PULP (Table VIII)

The highest average daily rate of gain was made by lambs getting wet beet pulp. Compared with the lambs having no pulp, this represents an increase in the rate of gain of nearly 20 per cent.

Comparing the two lots, it is evident that one ton of wet beet pulp had a replacement value of 277.2 pounds of barley plus 18.5 pounds of cottonseed cake, plus 94.8 pounds alfalfa.

The condition of the lambs in the wet beet pulp lot as appraised was 97 per cent fat, and 91 per cent fat in the lot on barley and cottonseed cake.

There was one death loss in the wet pulp lot, and three death losses in the lot receiving barley and cottonseed cake.

Dry beet pulp, when added to the ration of barley and cottonseed cake, increased the daily rate of gain from .30 to .31 pounds.

It is evident that one ton of dry beet pulp as fed to these lambs had a replacement value of 2,095.0 pounds of barley plus 43.9 pounds cottonseed cake plus 284.8 pounds alfalfa hay. The dry beet pulp, as fed in Lot 4, was approximately the same in weight as the barley. The substitution of this carbohydrate feed for barley improved the ration. The extent to which it could be profitably used would depend upon its price and the price of barley.

The appraisal showed 93 per cent lambs fat on the dried beet pulp ration and 91 per cent of the lambs fat on the ration of barley, cottonseed cake and alfalfa.
During the four years the test was conducted there was one death loss in the dried beet pulp lot and three death losses in the check lot.

### TABLE VIII

Comparison of Wet Beet Pulp and Dry Beet Pulp when Added To a Ration of Barley, Cottonseed Cake and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>4 Year Average—1928-1931</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td>Barley .52</td>
</tr>
<tr>
<td></td>
<td>C. Cake 2.25</td>
</tr>
<tr>
<td>Dry Pulp</td>
<td>Barley .52</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.50</td>
</tr>
<tr>
<td>Av. Initial Weight (lbs.)</td>
<td>61.33</td>
</tr>
<tr>
<td>Av. Final Weight (lbs.)</td>
<td>92.87</td>
</tr>
<tr>
<td>Av. Daily Gain (lbs.)</td>
<td>.31</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>Barley (lbs.)</th>
<th>Cott. Cake (lbs.)</th>
<th>Dry Beet Pulp (lbs.)</th>
<th>Wet Beet Pulp (lbs.)</th>
<th>Alfalfa (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>165.6</td>
<td>341.4</td>
<td>341.4</td>
<td>341.4</td>
<td>476.4</td>
</tr>
</tbody>
</table>

COTTONSEED CAKE ADDED TO CORN

(Table IX)

Corn and alfalfa alone showed an average daily gain of .29 pounds per lamb. When a little less than one-fourth pound of cottonseed cake was added to the ration the rate of lamb gain was increased to .30 pounds per head daily.

A comparison of these two lots shows that one ton of cottonseed cake fed in this manner had a replacement value of 605.9 pounds corn, plus 1092.3 pounds alfalfa hay. At usual feed prices, the use of the cottonseed cake would increase costs of gain. Only the better finish of the lambs could be credited to the cottonseed cake.

Lambs in the corn lot were appraised as 80 per cent fat, and 90 per cent fat in the lot receiving cottonseed cake.

There were two death losses in the corn fed lambs, and one in the lot receiving cottonseed cake.

REPLACING CORN WITH WHEAT

(Table X)

When wheat is low priced or damaged it may be more profitable to market it through lambs than to ship it to elevators. This test was
made for the purpose of determining its feeding value. The picture on page 18 shows a pen of lambs getting started on a ration of corn, wheat, and cottonseed cake.

With a ration of 1.04 pounds of corn together with cottonseed cake and alfalfa hay the average daily gain for this test was .31 pounds per head.

When a grain ration of about the same weight, consisting of half wheat and half corn, was used, the average daily gain per lamb was .30 pounds.

Comparing the two lots, it may be calculated that one ton of corn had a replacement value of 2204.9 pounds of wheat, plus 39.2 pounds cottonseed cake, plus 293.5 pounds alfalfa hay.

The percentage of fat lambs, as appraised for the two years, was 98 per cent for Lot 2 and 97 per cent for Lot 13.

There was one death loss in the wheat lot and two death losses in the lot getting the corn ration.

Lambs Fattening on a Grain Mixture of Barley and Wheat.
TABLE IX
Showing the Effect of Adding Cottonseed Cake to a Corn and Alfalfa Ration

2 Year Average—1925-1926

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>1</th>
<th>2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Corn .96</td>
<td>Corn .92</td>
</tr>
<tr>
<td></td>
<td>Alfalfa 1.33</td>
<td>Alfalfa 1.24</td>
</tr>
<tr>
<td></td>
<td>Cottonseed Cake .24</td>
<td>Cottonseed Cake .24</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>60.25</td>
<td>60.53</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>84.33</td>
<td>85.40</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.39</td>
<td>.30</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Corn (lbs.) | 328.2 | 304.6 |
| Cottonseed Cake (lbs.) | 453.0 | 410.5 |

TABLE X
Showing the Effect of Replacing Part of the Corn by Wheat In a Ration of Corn and Cottonseed Cake

2 Year Average—1930-1931

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>2</th>
<th>13</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Corn 1.04</td>
<td>Corn .52</td>
</tr>
<tr>
<td></td>
<td>Cottonseed Cake .24</td>
<td>Cottonseed Cake .23</td>
</tr>
<tr>
<td></td>
<td>Alfalfa 1.54</td>
<td>Wheat .52</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>64.84</td>
<td>64.84</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>96.09</td>
<td>94.4</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.31</td>
<td>.30</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Corn (lbs.) | 332.4 | 174.3 |
| Cottonseed Cake (lbs.) | 76.0 | 75.1 |
| Wheat (lbs.) | 492.0 | 174.3 |

Alfalfa (lbs.) | 515.2 |

ADDING CORN TO WET BEET PULP

(Table XI)

Wet beet pulp and alfalfa as the sole ration shows one of the lowest average daily gains of any of the rations considered in this part of the discussion, the average daily gain of the lambs being .24 pounds per head.

Adding one-fourth of a pound of corn to this ration increased the daily rate of gain to .27 pounds per head daily.

In this test one ton of corn had a replacement value equivalent to 17,947 pounds wet beet pulp plus 1,565.6 pounds alfalfa hay.

At the conclusion of the test only 20 per cent of the pulp lambs were considered fat as against 80 per cent in the corn-pulp lot.

There were no death losses in either lot.
TABLE XI
Showing the Effect of Adding Corn to a Ration of Wet Beet Pulp and Alfalfa Hay

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Wet Pulp</td>
<td>Wet Pulp</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>Alfalfa</td>
</tr>
<tr>
<td></td>
<td>Corn</td>
<td>Corn</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>58.08</td>
<td>58.08</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>78.50</td>
<td>80.66</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.24</td>
<td>.27</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Corn (lbs.) | 3374.5 | 89.6 |
| Wet Beet Pulp (lbs.) | 2570.9 |
| Alfalfa (lbs.) | 481.3 |

DRY BEET PULP vs. WET BEET PULP WHEN FED WITH COTTONSEED CAKE (Table XII)

Although wet beet pulp is hauled by truck and rail a considerable distance from the sugar factory, yet its most economic use is within a relatively short distance from the factory. Dry beet pulp, of course, containing only about 10 per cent of moisture, is not restricted as is wet pulp to the distance it may be moved.

The average daily rate of gain where dried beet pulp and cottonseed cake were used, was .32 pounds per head, and where the wet beet pulp was used in place of the dry beet pulp the average daily rate of gain was .31 pounds per head.

A comparison of feeding values of wet beet pulp and dried beet pulp showed that one ton of dried pulp is equivalent to 18,412.1 pounds of wet beet pulp plus 21.3 pounds cottonseed cake, plus 54.8 pounds of alfalfa.

The appraised condition of the lambs getting wet pulp showed 91 per cent fat, and in the lot where dry beet pulp was used the condition showed 90 per cent fat.

There was one death loss recorded for each of these rations during the entire time they were carried.

CORN vs. BARLEY WHEN COMBINED WITH WHEAT (Table XIII)

In this test which represents one trial there were 50 lambs in the corn and wheat lot and 240 head in the barley and wheat lot. The lambs in Lot 14 were considerably larger than those in Lot 13, a fact
which tended to influence their response to feed, compared with Lot 13.

In the corn and wheat lot less feed was used, excepting the alfalfa, for a unit of gain.

One ton of corn as fed in this test replaced 2,382.5 pounds of barley, plus 408.8 pounds of wheat, plus 33.9 pounds of cottonseed cake, less 1,352.5 pounds of alfalfa hay.

The degree of finish, as evidenced by the appraisal, was in favor of the barley lambs. This lot was considered as being 100 per cent fat. The corn and wheat lot was 95 per cent fat.

There were four death losses in the barley-wheat lot and none in the other lot.

The remainder of this bulletin sets forth the results of the lamb feeding as it was done on the Worland farm. The data is shown in Tables XIV to XXX inclusive.

**TABLE XII**

Comparing Dry Beet Pulp and Wet Beet Pulp when Fed With Cottonseed Cake and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>1928-1931</th>
<th>1930-1931</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cottonseed Cake</td>
<td>.21</td>
<td>.22</td>
</tr>
<tr>
<td>Dry Pulp</td>
<td>1.02</td>
<td>9.27</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.56</td>
<td>1.56</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>61.34</td>
<td>61.35</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>93.04</td>
<td>92.58</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.32</td>
<td>.31</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>Cottonseed Cake (lbs.)</th>
<th>Dry Pulp (lbs.)</th>
<th>Wet Beet Pulp (lbs.)</th>
<th>Alfalfa (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>67.7</td>
<td>322.7</td>
<td>2970.8</td>
<td>490.2</td>
</tr>
<tr>
<td>Barley</td>
<td>71.2</td>
<td>499.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**CORNS vs. BARLEY WITH ALFALFA**

(Corn XIV)

Corn has generally been considered as essential to a satisfactory ration for fattening lambs. In recent years, however, the use of barley has come into considerable favor and relatively large acreages have been planted to this crop for the purpose of feeding.

This test showed the corn to make a slightly more rapid daily gain than did the barley, the rates of gain being .31 and .29 pounds per day, respectively. A comparison of the amount of feed used for 100 pounds
of gain shows that one ton of corn in this particular test was equivalent to 2,305 pounds of barley plus 268.9 pounds of alfalfa in putting on gains.

There were no death losses recorded in this test.

The lambs fed corn were appraised as 95 per cent fat and the barley lot as 93 per cent fat.

**TABLE XIII**

A Comparison of Corn and Barley when Fed with a Ration of Wheat, Cottonseed Cake and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>13</th>
<th>14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Corn</td>
<td>.48</td>
</tr>
<tr>
<td></td>
<td>Cottonseed Cake</td>
<td>.23</td>
</tr>
<tr>
<td></td>
<td>Wheat</td>
<td>.48</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>1.71</td>
</tr>
</tbody>
</table>

| Average Initial Weight (lbs.) | 70.03 | 77.23 |
| Average Final Weight (lbs.) | 99.27 | 110.00 |
| Average Daily Gain (lbs.) | .29 | .33 |

Feed Used for 100 Pounds Gain

| | Corn | 163.0 | Barley | 194.2 |
| | Cottonseed Cake | 77.1 | Cottonseed Cake | 78.8 |
| | Wheat | 163.0 | Wheat | 196.3 |
| | Alfalfa | 684.2 | Alfalfa | 474.0 |

**TABLE XIV**

A Comparison of Corn and Barley for Fattening Lambs when Fed with Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>2</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Corn</td>
<td>.90</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>1.43</td>
</tr>
</tbody>
</table>

| Average Initial Weight (lbs.) | 54.2 | 54.0 |
| Average Final Weight (lbs.) | 81.9 | 80.2 |
| Average Daily Gain (lbs.) | .31 | .29 |

Feed Used for 100 Pounds Gain

| | Corn | 293.1 | Barley | 337.5 |
| | Alfalfa | 469.7 | Alfalfa | 505.1 |

**CULL BEANS WITH BARLEY (Table XV)**

In a bean growing section such as the Big Horn Basin in Wyoming, the problem of utilizing the small and broken beans from the graders is important. Beans contain a large proportion of their protein...
in a digestible form. Their feeding value may vary greatly according to the amount of dirt mixed with the cull beans.

The picture on page 23 shows how eagerly the lambs ate the mixture of beans and barley.

When an average ration of cull beans amounting to one pound per day per lamb was used with free access to alfalfa, the average daily gain was a trifle more than one-fourth of a pound per lamb.

Reducing the cull beans to approximately one-half and substituting barley, as in Lot 1, with free access to alfalfa, the average daily gain was increased 12 per cent.

Barley, as added to the ration, shows that one ton had a replacement value, based upon a unit of lamb gain, of 2,268.3 pounds of cull beans plus 707.4 pounds of alfalfa.

The cull beans ration tended to scour the lambs, sometimes very severely, but there was never a time when the lambs in the cull bean lot refused to eat their ration. They apparently had good appetites for the beans at all times.

There was one death loss recorded in this lot for the two years of the test, and two death losses in the lot on barley and cull beans for the same period.

**CULL BEANS vs. COTTONSEED CAKE FED WITH BARLEY (Table XVI)**

An average daily feed of .28 pounds of cull beans when added to a ration of barley and alfalfa, Lot 1, increased the average daily
gain very little. In this case the feeding of cull beans showed that a ton of this grain had a replacement value equivalent to 2,047.6 pounds of barley, and 70.3 pounds of alfalfa.

The appraisal in one year of this test showed the lambs in Lot 1 to be estimated as 87 per cent fat, and in Lot 8 as 85 per cent fat. There were two death losses in Lot 1 and three recorded in Lot 8.

Cottonseed cake, when added to a ration of barley and alfalfa, Lot 8, increased the rate of gain three times as fast as did the beans when added to the same ration. On the basis of unit gains, a ton of cottonseed cake had a replacement value of 2,800.4 pounds of barley, plus 1,379.9 pounds of hay. Although the replacement value of the cottonseed cake is greater than the replacement value of the cull beans, it is probably not sufficient, considering the cost of different feeds, to pay for the extra cost of this concentrate. However, the fact should be kept in mind that the faster rate of gains had much to do with getting the lambs in a better and earlier finished condition than was possible with either of the other rations.

The appraisers estimated that 93 per cent of the lambs getting cottonseed cake were fat, 87 per cent of the barley-bean lot, and 85 per cent of the barley-alfalfa lot.

The death losses were three for Lot 8, two for Lot 1, and one for Lot 25.

TABLE XV
The Effect of Adding Barley to a Ration of Cull Beans and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>2 Year Average—1927-1928</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Beans</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>70.44</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>95.64</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.25</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>Barley (lbs.)</th>
<th>Beans (lbs.)</th>
<th>Alfalfa (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>388.0</td>
<td>784.8</td>
<td>187.7</td>
</tr>
<tr>
<td></td>
<td>185.1</td>
<td>718.4</td>
<td></td>
</tr>
</tbody>
</table>

ADDING MOLASSES TO CORN AND BARLEY
(Table XVII)
When one-fourth pound of molasses was added to a ration of corn and alfalfa the average daily gain was increased nearly 10 per cent.
TABLE XVI
The Effects of Adding Cull Beans and of Adding Cottonseed Cake to a Ration of Barley and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>8</th>
<th>1</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>.99</td>
<td>Barley</td>
<td>.74</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.89</td>
<td>Beans</td>
<td>.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Alfalfa</td>
<td>1.95</td>
</tr>
<tr>
<td>Av. Initial Weight (lbs.)</td>
<td>69.34</td>
<td>69.76</td>
<td>69.49</td>
</tr>
<tr>
<td>Av. Final Weight (lbs.)</td>
<td>93.46</td>
<td>96.50</td>
<td>96.42</td>
</tr>
<tr>
<td>Av. Daily Gain (lbs.)</td>
<td>.27</td>
<td>.28</td>
<td>.30</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley (lbs.)</td>
<td>365.3</td>
<td>263.3</td>
<td>264.4</td>
</tr>
<tr>
<td>Cottonseed Cake (lbs.)</td>
<td></td>
<td></td>
<td>71.7</td>
</tr>
<tr>
<td>Beans (lbs.)</td>
<td>99.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>697.4</td>
<td>693.9</td>
<td>647.9</td>
</tr>
</tbody>
</table>

In this test one ton of molasses had a replacement value equivalent to 100.7 pounds of corn plus 1,704.7 pounds of alfalfa.

The addition of one-fourth pound of molasses to a ration of barley and alfalfa increased the average daily gain proportionately more than it did when added to the corn and alfalfa. In this case a ton of molasses as fed in Lot 9 had a replacement value of 944.2 pounds of barley and 2,774.4 pounds of alfalfa hay.

The saving of feed was greater when molasses was added to the barley than when it was added to the corn ration. However, the difference in the rate of gain is a factor that should be taken into account when making these two comparisons since the more rapid rate of gain with the corn and molasses would probably offset, in part, the extra feed that was saved by the addition of the syrup to the barley ration.

For the two years of the test there was only one death loss recorded. It was in Lot 9.

CORN SILAGE vs. WET BEET PULP (Table XVIII)

The grain of the corn used for silage in these tests has been glazed and firm, with the foliage still green, when siloed. This has resulted in silage of high feeding quality.

With the use of trench silos the cost of making silage has been greatly reduced. The use of corn silage in lamb feeding sections is not general. Although it is an important succulent feed, yet where sugar beet pulp is available this by-product is usually favored by lamb feeders.
TABLE XVII
The Effect of Adding Sugar Beet Molasses to a Ration of Corn and Alfalfa and to Barley and Alfalfa for Fattening Lambs

2 Year Average—1924-1925

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>2</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td>Corn</td>
<td>.90</td>
<td>Corn</td>
<td>.99</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>.43</td>
<td>Molasses</td>
<td>.25</td>
</tr>
<tr>
<td>Av. Initial Weight (lbs.)</td>
<td>54.2</td>
<td>54.3</td>
<td>54.0</td>
<td>54.1</td>
</tr>
<tr>
<td>Av. Final Weight (lbs.)</td>
<td>81.9</td>
<td>85.1</td>
<td>80.2</td>
<td>83.5</td>
</tr>
<tr>
<td>Av. Daily Gain (lbs.)</td>
<td>.31</td>
<td>.34</td>
<td>.29</td>
<td>.33</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Corn (lbs.) | 293.2 | 289.5 |
| Molasses (lbs.) | --- | 73.1 |
| Barley (lbs.) | 485.8 | 403.5 |
| Alfalfa (lbs.) | --- | 506.1 |

Corn silage and alfalfa when fed alone as the sole ration for fattening lambs produced small gains.

Wet beet pulp and alfalfa as the sole ration made considerably larger gains.

Based upon a unit of lamb gain, it is evident from the table that one ton of wet beet pulp was equivalent to 8178.2 pounds of corn silage plus 21.5 pounds of alfalfa hay.

Where it is impractical to use beet pulp, corn silage can be used with good results, especially if combined with a grain feed.

In this test there were two death losses in Lot 12 for the period considered.

TABLE XVIII
A Comparison of Corn Silage and Wet Beet Pulp When Fed with Alfalfa

6 Year Average—1923-1928

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>3</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Corn Silage</td>
<td>3.27</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>1.11</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>62.90</td>
<td>64.76</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>81.50</td>
<td>92.33</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.21</td>
<td>.29</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Corn Silage (lbs.) | 1596.1 | 2767.6 |
| Wet Beet Pulp (lbs.) | --- | 2767.6 |
| Alfalfa (lbs.) | 542.9 | 613.8 |
CORN SILAGE, CORN FODDER, AND WET BEET PULP (Table XIX)

The yields for this one trial are especially low in Lots 3 and 4, the silage-alfalfa ration showing the lowest rate of gain. Wet beet pulp with alfalfa in this particular trial made more than twice the daily gain that the corn silage produced.

In replacement value, a ton of wet beet pulp was equivalent to 845.7 pounds of corn fodder plus 200.1 pounds of alfalfa hay.

The corn fodder, when compared with corn silage, showed that a ton of the fodder had a replacement value of 2,910.3 pounds of corn silage plus 409.7 pounds of alfalfa hay.

The lots on silage and on corn fodder were in very ordinary condition, and were rated as feeders at the close of the feeding period. The lambs in Lot 12 getting wet beet pulp and alfalfa were rated as 80 per cent fat.

There were no death losses recorded in any of these lots.

Corn fodder is used to a less extent even than corn silage. In this trial both the silage and the fodder were of poor quality. The lambs did not relish the roughage and a considerable proportion of the feed offered was refused by the lambs.

TABLE XIX
A Comparison of Corn Silage, Corn Fodder, and Wet Beet Pulp when Fed with Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>3</th>
<th>4</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td>Corn Silage 2.27</td>
<td>Corn Fodder 1.80</td>
<td>W. Beet Pulp 8.23</td>
</tr>
<tr>
<td></td>
<td>Alfalfa 1.57</td>
<td>Alfalfa 1.21</td>
<td>Alfalfa 1.52</td>
</tr>
<tr>
<td>Av. Initial Weight (lbs.)</td>
<td>61.58</td>
<td>58.16</td>
<td>66.33</td>
</tr>
<tr>
<td>Av. Final Weight (lbs.)</td>
<td>73.50</td>
<td>71.79</td>
<td>92.79</td>
</tr>
<tr>
<td>Av. Daily Gain (lbs.)</td>
<td>.13</td>
<td>.15</td>
<td>.29</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Corn Silage (lbs.) | 1746.2 |
| Corn Fodder (lbs.) | 1200.0 |
| Wet Beet Pulp (lbs.) | 1053.8 |
| Alfalfa (lbs.) | 805.0 |

WET BEET PULP vs. CORN SILAGE WITH BARLEY (Table XX)

In the lamb feeding sections near sugar beet factories one of the standard rations is grain, wet beet pulp and alfalfa. The nutritive value of the pulp increases with aging. As the ripening of pulp pro-
gresses it is eaten more eagerly by the lambs and results in more efficient gains. It improves the palatability of the ration.

Wet beet pulp, when added to a ration of barley and alfalfa, increased the average daily gain approximately 26 per cent over the lot receiving barley and alfalfa.

In terms of feed requirements for a unit gain, a ton of the wet beet pulp, as fed in Lot 10, was equivalent to 195.3 pounds barley and 384.6 pounds of alfalfa hay.

When corn silage was added to the ration of barley and alfalfa, as in Lot 11, the replacement value of the silage, compared with Lot 8, showed that a ton of corn silage was equivalent to 184.2 pounds of barley plus 878.1 pounds of alfalfa.

In the ration of barley and alfalfa 85 per cent of the lambs were rated as fat. In the ration where silage was used 89 per cent were considered fat, and where wet beet pulp was used 95 per cent were so classed.

There were three death losses in Lot 8, two in Lot 10, and one recorded for Lot 11.

**TABLE XX**

A Comparison of Wet Beet Pulp and Corn Silage when Added To a Ration of Barley and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>8</th>
<th>10</th>
<th>11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td>Barley</td>
<td>.99</td>
<td>.80</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>1.89</td>
<td>4.62</td>
</tr>
<tr>
<td>Av. Initial Weight (lbs.)</td>
<td>69.34</td>
<td>70.45</td>
<td>70.06</td>
</tr>
<tr>
<td>Av. Final Weight (lbs.)</td>
<td>101.12</td>
<td>.27</td>
<td>.34</td>
</tr>
<tr>
<td>Av. Daily Gain (lbs.)</td>
<td>365.3</td>
<td>233.2</td>
<td>297.6</td>
</tr>
</tbody>
</table>

**Feed Used for 100 Pounds Gain**

<table>
<thead>
<tr>
<th></th>
<th>Barley (lbs.)</th>
<th>Wet Beet Pulp (lbs.)</th>
<th>Corn Silage (lbs.)</th>
<th>Alfalfa (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>365.3</td>
<td>1352.7</td>
<td></td>
<td>697.4</td>
</tr>
</tbody>
</table>

**WITHHOLDING DRINKING WATER (Table XXI)**

It was thought that wet beet pulp contained sufficient moisture to meet the water requirements of the fattening lambs, and that if free water was withheld it would induce the lambs to eat more of the pulp and put on faster gains.
A portion of this pen of lambs is shown in the picture on page 30, with practical lamb feeders discussing the merits of such a ration.

It will be noted that the average daily ration of the pulp was slightly more in the pen which received no water and also that the consumption of alfalfa was just a little greater.

It is evident from the table that a greater amount of wet beet pulp was required for a unit of gain where the water was withheld and that also a slightly less amount of alfalfa was used in this pen.

With ordinary feed prices, the alfalfa saved in Lot 6 in making 100 pounds of gain would not offset the additional wet pulp used by that lot.

The death losses for the two year period were one for the lot having access to water and two in the no-water pen.

### TABLE XXI
The Effect of Withholding Water in a Ration of Wet Beet Pulp and Alfalfa Hay

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>5 Water</th>
<th>6 No Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wet Beet Pulp</td>
<td>Wet Beet Pulp</td>
</tr>
<tr>
<td></td>
<td>Alfalfa</td>
<td>Alfalfa</td>
</tr>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>8.33</td>
<td>8.88</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>67.52</td>
<td>68.85</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>94.28</td>
<td>96.36</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.31</td>
<td>.33</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Wet Beet Pulp (lbs.) | 2655.3 | 2722.3 |
| Alfalfa (lbs.) | 522.3 | 516.9 |

### LONG ALFALFA vs. CUT ALFALFA (Table XXII)

It has been claimed by some people that alfalfa when cut into short pieces would produce greater gains when fed to livestock than would the same amount of alfalfa uncut. It was contended that the coarser portions of the stems which are usually refused by lambs would be eaten and thus effect a saving of feed. This test was made to determine the value of cutting alfalfa for lambs. At the time this test was made the price of custom cutting was from $2.25 to $3.00 per ton. The loss due to handling is not taken into account.

The lambs receiving cut alfalfa had free access to the hay in panels and used a little more per day than did those eating the long al-
falfa, but they consumed slightly less wet beet pulp. The average daily gain for the lot on cut alfalfa was one-fourth greater than it was for the lot on long alfalfa.

A comparison of the long alfalfa with the cut alfalfa shows that a ton of cut alfalfa was equivalent, in terms of lamb gains, to 2341.3 pounds of long alfalfa plus 2363.3 pounds of wet beet pulp.

Eighty per cent of the lambs in the cut alfalfa pen were rated as fat, and 77 per cent were so classed in the long alfalfa lot.

**TABLE XXII**

A Comparison of Long Alfalfa and Cut Alfalfa when Fed With Wet Beet Pulp

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>5</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Wet Beet Pulp 7.78</td>
<td>Long Alfalfa 1.47</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>71.47</td>
<td>71.94</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>95.75</td>
<td>101.89</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.24</td>
<td>.30</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Wet Beet Pulp (lbs.) | 3181.0 | 2570.4 |
| Cut Alfalfa (lbs.) | 516.7 |
| Long Alfalfa (lbs.) | 604.9 |
ADD! G COTTONSEED CAKE TO COR SILAGE

The use of cottonseed cake as fed in this test increased the rate of gain, as shown in Lot 3, more than 38 per cent. Only when this concentrate is relatively very low in price would its use prove profitable. Usually grain can be used more economically.

Corn silage and alfalfa as a ration for fattening lambs is unsatisfactory. Usually gains are slow and lambs lack finish.

The addition of cottonseed cake to a ration of corn silage and alfalfa increased the daily rate considerably.

In this test it is evident that, based upon a unit gain, a ton of cottonseed cake, as fed above, was equivalent to 7683.9 pounds of silage plus 2642.8 pounds of alfalfa.

There were two death losses recorded for the lot on corn silage and cottonseed cake, and none for the silage lot.

TABLE XXIII

The Effect of Adding Cottonseed Cake to a Ration of Corn Silage and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>3</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Corn Silage 3.46</td>
<td>Corn Silage 5.14</td>
</tr>
<tr>
<td></td>
<td>Alfalfa 1.19</td>
<td>Alfalfa 1.68</td>
</tr>
<tr>
<td></td>
<td>Cottonseed Cake .44</td>
<td></td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>68.86</td>
<td></td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>88.05</td>
<td></td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.21</td>
<td></td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Cottonseed Cake (lbs.) | 152.2 |
| Corn Silage (lbs.) | 1671.4 |
| Alfalfa (lbs.) | 574.8 |

COR SILAGE vs. WET BEET PULP FED WITH BARLEY AND COTTONSEED CAKE

The addition of corn silage improved the ration only slightly when it is compared with the addition of wet beet pulp to the same ration. Compared with the usual price paid for wet beet pulp, the cost of producing and siloing a corn crop is considerable, especially when an overhead silo is used. However, wet beet pulp can be used most efficiently only within reasonable limits of the sugar factory. Corn silage can be produced wherever corn is grown.
Comparing Lots 25 and 19, it may be shown that for a unit of lamb gain one ton of corn silage as fed to Lot 19 had a replacement value of 118.5 pounds of barley plus 17.8 pounds of cottonseed cake plus 732.2 pounds of alfalfa hay.

Comparing Lots 27 and 25, on the basis of a unit of gain, one ton of wet beet pulp, as fed in Lot 27, had a replacement value of 124.1 pounds of barley, plus 28.1 pounds of cottonseed cake, plus 440.4 pounds of alfalfa hay.

Considering the faster rate of gain for the pulp lot and the usual difference in prices of the corn silage and the wet beet pulp, it is evident that the latter feed was more economical.

The appraisal showed that 93 per cent of the lambs were rated as fat in Lot 25 and 90 per cent in Lot 19. In Lot 27, 98 per cent of the lambs were considered fit for killers.

There was a total of two death losses in this test, one recorded for Lot 25 and one for Lot 27.

**TABLE XXIV**

A Comparison of Corn Silage and Wet Beet Pulp when Added To a Ration of Barley, Cottonseed Cake and Alfalfa

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>25</th>
<th>19</th>
<th>27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley (lbs)</td>
<td>.80</td>
<td>.70</td>
<td>.70</td>
</tr>
<tr>
<td>C. Cake (lbs)</td>
<td>.22</td>
<td>.21</td>
<td>.20</td>
</tr>
<tr>
<td>Alfalfa (lbs)</td>
<td>1.85</td>
<td>1.24</td>
<td>1.41</td>
</tr>
<tr>
<td>Corn Silage (lbs)</td>
<td>2.17</td>
<td>4.60</td>
<td></td>
</tr>
<tr>
<td>Wet Pulp (lbs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Av. Initial Weight</td>
<td>69.49</td>
<td>70.18</td>
<td>70.04</td>
</tr>
<tr>
<td>Av. Final Weight</td>
<td>96.42</td>
<td>92.22</td>
<td>103.40</td>
</tr>
<tr>
<td>Av. Daily Gain</td>
<td>.30</td>
<td>.31</td>
<td>.37</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>Barley (lbs)</th>
<th>Corn Silage (lbs)</th>
<th>Alfalfa (lbs)</th>
<th>Wet Beet Pulp (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>264.4</td>
<td>71.7</td>
<td>647.9</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>223.8</td>
<td>65.6</td>
<td>394.9</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>188.4</td>
<td>54.4</td>
<td>378.9</td>
<td>1299.5</td>
</tr>
</tbody>
</table>

**COMPARISON OF CORN SILAGE, BEET TOP SILAGE AND WET BEET PULP FED WITH BARLEY**

(Table XXV)

Beet tops, including the crowns, as gathered from the beet fields, were siloed in trenches in much the same way as was the corn. The quality of such silage depends to a large extent upon the amount of soil adhering to the tops when they are put in the trench. As fermentation
progresses the adhering soil becomes mud and reduces the feeding value accordingly.

The highest rate of gain in these three lots was recorded for the ration of barley, wet beet pulp and alfalfa. The lowest rate is recorded for the ration of barley, beet top silage and alfalfa.

Comparing beet top silage with corn silage for a unit of gain, it may be calculated that one ton of corn silage was equivalent to 2,897.4 pounds of beet top silage plus 76.4 pounds of barley, plus 103.9 pounds of alfalfa.

Comparing the wet beet pulp with the beet top silage for a unit of lamb gain, one ton of wet beet pulp had a replacement value of 1,693.4 pounds of beet top silage plus 62.1 pounds of barley, less 55.1 pounds of alfalfa.

The death loss in this test was one, for Lot 11.

Lots 10 and 11 were appraised as 95 per cent fat. The lambs getting beet top silage were considered 93 per cent fat.

TABLE XXV
A Comparison of Corn Silage, Beet Top Silage and Wet Beet Pulp when Added to a Ration of Barley and Alfalfa Hay

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>11</th>
<th>20</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td>Barley .60</td>
<td>Barley .59</td>
<td>Barley .59</td>
</tr>
<tr>
<td>Corn Silage</td>
<td>3.04</td>
<td>B. T. Silage 3.66</td>
<td>W. Beet Pulp 5.53</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>.78</td>
<td>Alfalfa .78</td>
<td>Alfalfa 1.15</td>
</tr>
<tr>
<td>Av. Initial Weight (lbs.)</td>
<td>63.59</td>
<td>64.14</td>
<td>62.34</td>
</tr>
<tr>
<td>Av. Final Weight (lbs.)</td>
<td>90.29</td>
<td>86.29</td>
<td>90.75</td>
</tr>
<tr>
<td>Av. Daily Gain (lbs.)</td>
<td>.27</td>
<td>.22</td>
<td>.28</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| | Barley (lbs.) | 224.7 | 268.2 | 207.7 |
| Better Top Silage (lbs.) | ---- | 1648.6 | ---- | 1947.1 |
| Beet Pulp (lbs.) | ---- | ---- | ---- |
| Corn Silage (lbs.) | 1188.0 | 1188.0 | 1188.0 |
| Alfalfa (lbs.) | 292.1 | 351.3 | 404.9 |

COTTONSEED CAKE vs. BARLEY (Table XXVI)

From a practical standpoint, a ration, as fed in Lot 26, is not justified. It is deficient in carbohydrates and is too expensive. The lot was carried on this ration to answer certain questions pertaining to lamb feeding.

Both lots made exactly the same rates of gain.
A comparison of these lots shows that a ton of the barley had a replacement value of 1,435.3 pounds of cottonseed cake, plus 590.2 pounds of alfalfa hay.

The percentage of fat lambs was recorded as 85 per cent for the lot on barley and alfalfa, and 98 for the lot on alfalfa and cottonseed cake.

There were three death losses on the barley ration, and one on the cottonseed cake ration.

In the three tests there were no bad effects shown from the feeding of cottonseed cake and alfalfa, except for one lamb that "slipped" its wool in the first year of the test.

**TABLE XXVI**
The Effect of Feeding Barley and of Feeding Cottonseed Cake with Alfalfa Hay

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>8</th>
<th>26</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>Barley 1.99</td>
<td>Cottonseed Cake 2.15</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>69.34</td>
<td>69.46</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>93.46</td>
<td>95.46</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.27</td>
<td>.27</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th></th>
<th>365.3</th>
<th>262.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barley (lbs.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cottonseed Cake (lbs.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>697.4</td>
<td>805.2</td>
</tr>
</tbody>
</table>

**BEAN STRAW vs. ALFALFA (Table XXVII)**

Where beans are an important crop from the standpoint of acreage, the utilization of the bean straw demands attention. This is particularly true where alfalfa and other roughages are limited. The use of bean straw in the Big Horn Basin of Wyoming for livestock feeding is gaining favor. When fed to lambs a considerable portion of the stems are refused, especially when these stems are coarse and hard.

In this test the lambs in each lot had free access to their respective roughages. It will be noted that there was a slightly less amount of bean straw consumed per head than of alfalfa hay. The average daily gains were less in the case of the bean straw lot.

In this test the comparison of the two rations shows that a ton of alfalfa, based on a unit of lamb gain was equivalent to 2,572.7 pounds of bean straw, plus 2,897.2 pounds of wet beet pulp.

No losses were reported during the period.
TABLE XXVII
A Comparison of Bean Straw and Alfalfa Hay when Fed With Wet Beet Pulp

2 Year Average—1927-1928

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>24</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Wet Beet Pulp</td>
<td>Bean Straw</td>
</tr>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>7.97</td>
<td>1.46</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>71.27</td>
<td>90.68</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>.19</td>
<td>.25</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Wet Beet Pulp (lbs.) | 4108.2 | 3250.8 |
| Bean Straw (lbs.) | 752.5 | 584.9 |
| Alfalfa (lbs.) | | |

BARLEY ADDED TO COTTONSEED CAKE
(Table XXVIII)

Reducing the cottonseed cake, as fed in Lot 26, 70 per cent and adding barley to the ration increased the average daily gain 11 per cent. This change made a very much more practical ration so far as costs are concerned.

The comparison of feed used for a unit of gain shows that one ton of barley had a replacement value of 1,440.3 pounds of cottonseed cake, plus 1,276.1 pounds of alfalfa. This gives a high value to the barley, mainly because a large amount of cottonseed cake was used in Lot 26 and also because the amount of feed used for 100 pounds of gain was high.

The percentage of fat lambs in Lot 26 was 98 and in Lot 25 it was 93.

There was one death loss in each lot.

TABLE XXVIII
The Effect of Adding Barley to a Ration of Cottonseed Cake and Alfalfa

3 Year Average—1929-1931

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>26</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cottonseed Cake</td>
<td>Barley</td>
</tr>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td>.70</td>
<td>.90</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>.80</td>
<td>.22</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>69.46</td>
<td>69.49</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>.27</td>
<td>.30</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| Barley (lbs.) | 262.2 | 264.4 |
| Cottonseed Cake (lbs.) | 265.2 | 71.8 |
| Alfalfa (lbs.) | 636.5 | |
COTTONSEED CAKE ADDED TO BARLEY AND WET BEET PULP (Table XXIX)

A ration of barley, wet beet pulp, and alfalfa is one that is quite generally used by lamb feeders. It is a combination that makes satisfactory gains at reasonable costs. Adding cottonseed cake to such a ration may increase gains and also increase feed costs.

When cottonseed cake was added to the ration of barley, beet pulp and alfalfa in the amount of approximately one-fifth of a pound per lamb per day, the gain was brought up to .37 pounds per head.

In replacement value per unit of gain, a ton of cottonseed cake, as fed in Lot 27, was equivalent to 1,643.9 pounds of barley, plus 4,490.9 pounds of wet beet pulp, plus 2,219.8 pounds of alfalfa hay.

The lambs in Lot 10 were appraised as 95 per cent fat and in Lot 27 as 98 per cent fat.

The death losses recorded for the test in Lot 10 were two. There was one death loss for Lot 27.

TABLE XXIX
The Effect of Adding Cottonseed Cake to a Ration of Barley, Sugar Beet Pulp and Alfalfa

3 Year Average—1929-1931

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>10</th>
<th>27</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Daily Ration (lbs.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barley</td>
<td>.80</td>
<td>.70</td>
</tr>
<tr>
<td>Wet Beet Pulp</td>
<td>4.62</td>
<td>4.59</td>
</tr>
<tr>
<td>Alfalfa</td>
<td>1.50</td>
<td>1.41</td>
</tr>
<tr>
<td>Cottonseed Cake</td>
<td></td>
<td>.20</td>
</tr>
<tr>
<td>Average Initial Weight (lbs.)</td>
<td>70.45</td>
<td>70.04</td>
</tr>
<tr>
<td>Average Final Weight (lbs.)</td>
<td>101.12</td>
<td>103.45</td>
</tr>
<tr>
<td>Average Daily Gain (lbs.)</td>
<td>.34</td>
<td>.37</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

| | Barley (lbs.) | 233.2 | 188.5 |
| | Wet Beet Pulp (lbs.) | 1552.7 | 1230.5 |
| | Cottonseed Cake (lbs.) | | 54.4 |
| | Alfalfa (lbs.) | 437.3 | 376.9 |
The commercial mineral used in this test was guaranteed by the manufacturer's representative to stimulate the appetites of the lambs and to keep them in a thrifty and healthy condition. The mineral was furnished free for this test.

Four rations with the ordinary stock salt were compared with four similar rations except that instead of the ordinary stock salt the commercial mixture was used. No analysis was given of the mineral mixture. The lambs had free access to both salt and the mineral mixture in their respective lots.

The lots had rations as follows: Wet beet pulp and alfalfa; corn silage and alfalfa; barley and alfalfa; corn and alfalfa. There were two lots on each ration.

It will be noted from the table that in all cases except in the corn silage ration, there were slightly faster gains made for the lots where the commercial mineral mixture was used as compared with the ordinary stock salt. In all cases except the one where corn silage was used, less feed was required for 100 pounds of lamb gain with the use of commercial mineral mixture than where ordinary stock salt was used.
TABLE XXX
A Comparison of Ordinary Stock Salt with a Commercial Mineral Mixture

<table>
<thead>
<tr>
<th>LOT NUMBER</th>
<th>12 Salt</th>
<th>13 Mineral</th>
<th>14 Salt</th>
<th>15 Mineral</th>
<th>16 Mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Av. Daily Ration (lbs.)</td>
<td>W. Pulp 9.10</td>
<td>W. Pulp 9.07</td>
<td>C. Silage 4.29</td>
<td>C. Silage 4.46</td>
<td>Barley 1.06</td>
</tr>
<tr>
<td></td>
<td>Alfalfa 1.33</td>
<td>Alfalfa 1.20</td>
<td>Alfalfa .54</td>
<td>Alfalfa .36</td>
<td>Alfalfa 1.41</td>
</tr>
<tr>
<td>Av. Initial Wt. (lbs.)</td>
<td>53.8</td>
<td>53.9</td>
<td>54.4</td>
<td>53.9</td>
<td>53.2</td>
</tr>
<tr>
<td>Av. Final Wt. (lbs.)</td>
<td>77.5</td>
<td>79.5</td>
<td>74.7</td>
<td>78.5</td>
<td>77.7</td>
</tr>
<tr>
<td>Av. Daily Gain (lbs.)</td>
<td>.30</td>
<td>.33</td>
<td>.26</td>
<td>.25</td>
<td>.29</td>
</tr>
</tbody>
</table>

Feed Used for 100 Pounds Gain

<table>
<thead>
<tr>
<th>W. Beet Pulp (lbs.)</th>
<th>3003.0</th>
<th>2765.2</th>
<th>1656.0</th>
<th>1784.0</th>
<th>368.0</th>
<th>339.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn Silage (lbs.)</td>
<td>-----</td>
<td>-----</td>
<td>358.3</td>
<td>331.2</td>
<td>358.3</td>
<td>331.2</td>
</tr>
<tr>
<td>Barley (lbs.)</td>
<td>-----</td>
<td>-----</td>
<td>358.3</td>
<td>331.2</td>
<td>358.3</td>
<td>331.2</td>
</tr>
<tr>
<td>Corn (lbs.)</td>
<td>438.9</td>
<td>365.8</td>
<td>207.6</td>
<td>344.0</td>
<td>489.5</td>
<td>467.0</td>
</tr>
<tr>
<td>Alfalfa (lbs.)</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
<td>-----</td>
</tr>
</tbody>
</table>

W. Pulp—Wet Beet Pulp. C. Silage—Corn Silage.
GENERAL SUMMARY

1. Fattening lambs is a general practice in districts where sugar beets are grown. The feeding of lambs helps to make efficient use of the farm plant and offers a market through lambs for the grain, roughage, and beet by-products.

2. Results of experimental feeding of lambs as carried on at the Torrington Farm are reported from 1925 to 1931, and as carried on at the Worland Farm from 1923 to 1931.

3. Cottonseed cake, when added to a ration of corn and alfalfa, increased the rate of gain, but with present feed prices would increase the cost of gain.

4. Reducing the corn allowance to one-fourth and giving the lambs all the wet beet pulp and alfalfa they would eat resulted in smaller gains than a full feed of corn and alfalfa.

5. Barley, when fed with cottonseed cake and alfalfa, made smaller gains than did corn fed in a similar combination. The barley was about 87 per cent as efficient as corn in making lamb gains.

6. Barley, when fed with cottonseed cake, dry beet pulp and alfalfa, made the same rate of gain as did corn used in a similar combination. In the case of barley more feed was required for a unit of gain.

7. Adding dry beet pulp to a ration of corn, cottonseed cake, and alfalfa increased the rate of gain 20 per cent. A ton of dry beet pulp replaced three-fourths of a ton respectively of corn and alfalfa and 213 pounds of cottonseed cake.

8. A fourth of a pound of corn when added to a ration of wet beet pulp and alfalfa was only slightly better in making gains than was the same amount of barley. The increase in the rates of gain made by adding these grains was approximately 12 per cent.

9. Corn and dry beet pulp, each when fed with cottonseed cake and alfalfa, produced the same rate of gain with no practical difference in the feed required for gains.

10. Wet beet pulp, when added to a ration of barley, cottonseed cake, and alfalfa, increased the rate of gain 20 per cent. Dry beet pulp, when added to the same ration, increased the rate of gain 3 per cent. The wet pulp lambs were appraised as the best in condition.

11. Replacing half of the corn by wheat in a ration of corn, cottonseed cake, and alfalfa reduced the rate of gain 3 per cent and required more feed for one hundred pounds of gain.
12. Adding one-fourth of a pound of corn to a ration of wet beet pulp and alfalfa increased the rate of gain and showed four times as many fat lambs at the end of the test.

13. Dry beet pulp fed with cottonseed cake and alfalfa made gains very little faster than did a full feed of wet beet pulp fed in a similar combination. A little more feed was used for gains when the wet beet pulp was used.

14. A mixture of barley and wheat with cottonseed cake and alfalfa made faster gains and required more feed per unit of gain than did a mixture of corn and wheat with cottonseed cake and alfalfa.

15. Satisfactory gains were made with corn and with barley when fed with alfalfa. The barley ration gave smaller gains and was 87 per cent as efficient as corn.

16. Cull beans with alfalfa were less satisfactory than a ration of equal parts of cull beans and barley with the alfalfa or a ration in which cull beans were one-fourth of the grain mixture.

17. Sugar beet molasses added to a ration of corn and alfalfa or barley and alfalfa improved the palatability and increased the rate of gain.

18. Wet beet pulp fed with alfalfa made faster gains and required less feed for gains than did corn silage fed with alfalfa. Corn fodder fed with alfalfa was unsatisfactory for fattening lambs.

19. Corn silage and wet beet pulp, each when added to a ration of barley and alfalfa, improved the palatability and increased rate of gains.

20. When drinking water was withheld from lambs on a ration of wet beet pulp and alfalfa, a little more feed was eaten and faster gains were made than when drinking water was supplied.

21. Feeding cut alfalfa with wet beet pulp resulted in greater gains than did the feeding of long alfalfa.

22. Corn silage and alfalfa was not a satisfactory ration for fattening lambs.

23. Wet beet pulp added to a ration of barley, cottonseed cake and alfalfa increased the rate of gain and improved the quality of lambs.

24. Beet top silage fed with barley and alfalfa resulted in considerably smaller gains than when either corn silage or wet beet pulp was used in place of the beet top silage.
25. A ration of cottonseed cake and alfalfa produced the same rate of gain as did a ration of barley and alfalfa, and at a higher cost.

26. Bean straw fed with wet beet pulp made smaller gains than a ration of alfalfa and wet beet pulp and required considerably more feed for gains.

27. Cottonseed cake added to a ration of barley, wet beet pulp and alfalfa increased the rate of gain. This increase was not sufficient, at usual feed prices, to show a profit for the cottonseed cake.

ACKNOWLEDGEMENTS

To the men who had direct charge of the work of feeding and caring for the lambs much credit is due.

Axell Christensen, superintendent of the Goshen County State Experiment Farm until 1931, had charge of the feeding work at the Torrington Farm, from 1925 to 1931. Wesley Roath, the present superintendent, had charge of the lamb feeding work for the year 1931.

J. F. Peterson, superintendent of the Washakie County State Experiment Farm, had charge of the work at the Worland Farm from 1923 to 1930. Percy S. Ingham, who became superintendent of the farm July, 1930, had charge of the feeding work for one season, 1930-1931. In 1931 the feeding work was in charge of Franklin Jones.

All of these men were extremely careful and conscientious in their operations, not only in the feedlots, but also in recording the data accurately.
The following publications of the Wyoming Experiment Station may be had upon request. (Revised list December, 1932.)

**ANNUAL REPORTS**—
12th to 40th, inclusive (1901-2 to 1928-31, inclusive).

**INDEX BULLETINS**—
C, D, E and G.

**HORTICULTURAL BULLETINS**—
Special Bulletins, Volume 1, Nos. 3 and 6, inclusive.
Biennial Reports, Third to Seventh, inclusive.

No. **STATE FARMS BULLETINS**—
4. Some results from Agricultural Stations over the State from 1923 Report.
7. The Service of the State Experiment Farms.

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