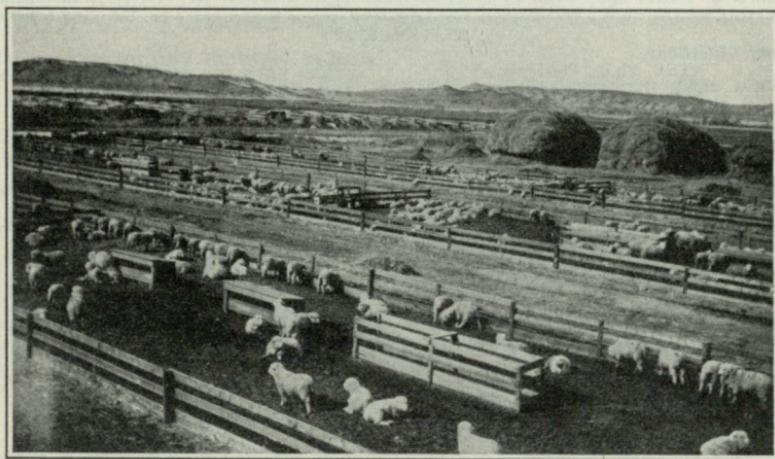

UNIVERSITY OF WYOMING
AGRICULTURAL
EXPERIMENT STATION



Lambs in Experimental Pens at the Industrial Institute near Worland.

SUGAR BEET BY-PRODUCTS FOR
FATTENING LAMBS

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SUGAR BEET BY-PRODUCTS FOR FATTENING LAMBS

Alden S. Ingraham

INTRODUCTION

The fattening of lambs in sections of Wyoming where sugar beets are grown has become a major industry. The importance of the sheep-feeding industry in the Big Horn Basin is attested by the fact that over 100,000 ewes and lambs were in feed lots during the fall and winter of 1935-1936. The value of livestock feeding as a part of a well balanced farm program in beet producing areas has been thoroughly demonstrated during recent years. Lambs have a particular appeal to many beet producers because of the short feeding season, the efficient use of beet by-products, and the small equipment outlay needed to carry on a sizeable feeding program.

The first by-product available on all beet producing farms is the tops from the sugar beets. Many questions arise as to the method of utilizing the tops. The most common practice is to pasture them as they lie in the field. Others, contending that this is a wasteful practice, pile their tops either to pasture in the field or to feed later in the dry lot. Still others report that satisfactory results are obtained by stacking the tops with alternate layers of straw and feeding the mixture as a supplementary roughage during the dry-lot period.

Due to the varying moisture content, which affects the weight of yield per acre, beet tops are customarily sold on the basis of the tons of beets which are harvested. Prices range from 25 cents to 50 cents per ton of harvested beets.

Another by-product of the sugar beet industry is beet pulp, either wet or dry. Beet growers who have farms too far from the factory to make the hauling of wet pulp practical make some use of dried molasses beet pulp to supplement their home-grown feeds.

In an effort to determine the comparative values of the several methods used in feeding sugar beet by-products to lambs, the Department of State Experiment Farms began a series of lamb feeding tests at the Wyoming Industrial Institute which is located in Washakie County, six miles south of Worland. The work was

begun in the fall of 1932 and has been carried on in cooperation with the State Board of Charities and Reform. The results set forth in the following pages cover three years.

RATIONS

The specific objects of the experiment were: (1) to find the value of barley and of alfalfa when fed to lambs that are pasturing on beet tops, (2) to find the value of cured beet tops when fed in the dry lot, (3) to compare the feeding value of wet beet pulp and dried molasses beet pulp. To this end the following rations were fed:

- Lot 1. Beet tops pasture for 38 days followed with a ration in the dry lot of barley, wet beet pulp, and alfalfa for 62 days.
- Lot 2. Beet tops pasture and alfalfa for 43 days followed with a dry-lot ration of 57 days similar to that in Lot 1.
- Lot 3. Beet tops pasture with alfalfa and barley for 46 days followed with a dry-lot ration of 54 days similar to that in Lot 1.
- Lot 4. Beet tops pasture with barley for 55 days followed with a dry-lot ration for 45 days similar to that used in Lot 1. (Lot 4 was in the test two years, 1934 and 1935.)
- Lot 5. Barley, wet beet pulp, and alfalfa fed in a dry lot for 100 days.
- Lot 6. Same as Lot 5 with cured beet tops added.
- Lot 7. Barley, dried molasses beet pulp, and alfalfa for 100 days.

EQUIPMENT

Each lot of 40 lambs was fed in a pen 50 by 50 feet in size. Hay was fed through three 14-foot panels, arranged so as to make a U-shaped feeding inlet in each pen. Where two roughages were fed, a second inlet was provided.

Wet beet pulp and grain were fed in flat bottom bunks, 2 feet wide. In each pen there was one bunk 15 feet long and one 7 feet long. Lots which received a mixture of dried beet pulp and barley were fed in reversible grain troughs, 1 foot wide and 14 feet long. Two of these troughs were in each pen in which this mixture was fed.

Hydrant water was supplied in 12-foot troughs which were built between each two pens. Wagon scales were used to weigh the hay and wet beet pulp. The grain and dried beet pulp were weighed on a portable platform scale.

LAMBS USED

Lambs used in this experiment were good quality, western range lambs of both sexes. During the first and third years the lambs were Rambouillet-Hampshire crossbreds. The second year they were typical western Rambouillets. A few of the lambs were affected with sore mouth (stomatitis) during the early part of the first year's trial. These recovered within a short time and thereafter made normal progress.

FEEDS USED

Feeds were all locally grown with the exception of the dried molasses beet pulp which was shipped from the sugar beet factories at Sheridan, Wyoming, and Billings, Montana.

The barley used was of good quality, typical of that generally produced under irrigation in the intermountain region. It was of good color, but had not been re-cleaned and so contained some chaff and weed seed. The variety used for the most part was Trebi.

The alfalfa hay was mostly second and third crop of fair to good quality. Both green and slightly browned hays were fed. Though the type of hay was somewhat variable, all lots were treated alike in this respect.

Beet tops were home-grown, and those which were pastured were left just as they fell from the toppers' knives. Tops fed in the dry lot were allowed to cure partly in the field and then were piled with pitchforks. During the first year of the experiment the cured tops were hauled from the field and placed in windrows in a fenced lot. Snow drifted between the windrows, however, and caused considerable damage to the tops. During the second and third years, the tops were left piled in the field, and a few days' supply was hauled to the feed lots as needed.

Wet beet pulp was hauled daily from the local beet sugar factory and fed as soon as possible after delivery.

Plain block salt was always available to all lots.

FEED PRICES

The feed prices used in this bulletin do not represent the actual prices paid in any one year, but are approximate average prices of the feeds during the three-year period. Cost figures are used merely to give a basis of comparison of returns received from the beet tops under the various systems of management.

Feed prices used:

Alfalfa	\$ 8.00 per ton
Barley	20.00 per ton
Wet beet pulp	1.00 per ton
Dried beet pulp	20.00 per ton
Salt	27.00 per ton
Beet tops, pasture . . . . .	.35 per ton of harvested beets
Beet tops, cured . . . . .	.46 per ton of harvested beets

METHOD OF FEEDING

All roughages were fed morning and evening in amounts that the lambs would clean up readily. Any refused roughage was weighed back each week.

Whole barley was fed twice daily, preceding both the morning and evening feeds of roughage.

Dried molasses beet pulp was mixed with the barley before feeding. This mixture at the beginning of the experiment consisted of equal parts of dried pulp and barley. As the experiment progressed, it was gradually changed to two parts of barley to one of pulp.

Wet beet pulp was fed in bunks twice daily, at 10 a. m. and 1 p. m. The amount of feed was gauged by the appetite of the lambs. Pulp which froze in the bunks was removed whenever it had accumulated to the extent that it interfered with feeding. This pulp was weighed and credited to the lot from which it was taken.

Cured beet tops were fed through panels once each day. When plenty of feeding space was provided for the tops, the loss from pulling tops through the panels was kept low. A large loss of tops resulted when there was insufficient space for all lambs to eat at once.

Beet tops pastures were provided by laying off the areas before beet harvest. Each pasture contained 1.5 acres and the tops from 27.99 tons of marketed beets. As the beets were harvested, a record was kept of those removed from each pasture.

After all beets were harvested, the pasture producing the most beets was used as the standard. Other pastures were brought up to this level by hauling in tops from the experimental beet fields where tops were available in small plats from which known tonnages of beets had been harvested.

Local opinion differs as to whether it pays to pile the tops. Precipitation in the Big Horn Basin is normally very low during the months when most of the lambs are on beet tops pasture. In this experiment all three years were nearly ideal from the standpoint of weather. There was not sufficient precipitation to cause a material loss from trampling, and yet enough moisture fell to prevent the tops from becoming extremely dry.

The following table taken from the Holly Sugar Company's records at Worland shows the precipitation of the fall and winter months from 1925 to 1935.

INCHES OF PRECIPITATION			
	October	November	December
1935.....	.19	.19	.05
1934.....	.75	.13	.03
1933.....	T	.17	.30
1932.....	1.07	.31	.42
1931.....	1.02	.30	.06
1930.....	1.19	.00	.10
1929.....	.87	.48	.15
1928.....	.98	1.00	.20
1927.....	.03	.30	T
1926.....	.88	T	T
1925.....	1.53	.13	.30
Average.....	.77	.27	.15
3-year average			
1932-33-34.....	.61	.20	.25

This table indicates that there were very few years when pasturing would have been seriously interfered with by storms. There were years, such as 1928, when, due to storms, only a small pro-

portion of the tops could be used by pasturing. The weather records seem to indicate, however, that, if lambs were held off pasture during wet periods, they could be successfully pastured during October, November, and December nearly every year.

In sections where precipitation during the fall months is heavier, the hazard of pasturing tops becomes greater.

In many feeding operations management may determine to a large extent the return from any feed. Results in this experiment probably indicate about the maximum return from the tops, because pasturing occurred under nearly ideal conditions. The individual years of the tests did not show any marked difference from the averages, except as noted. Fresh water was available to the lambs at all times. Herding was unnecessary, as the lambs were confined 24 hours a day on the beet tops pastures. Unfortunately, this is rarely possible in large scale operations, due to the possible loss from coyotes, dogs, or other causes. Experience has shown many instances in which lambs barely maintained themselves on beet tops pasture because of too close herding, or insufficient time in the field for feeding. Although continuous confinement on pasture is usually impossible with larger flocks of lambs, yet diligence in keeping the lambs on feed as many hours as possible each day will be amply rewarded.

ADDING SUPPLEMENTAL FEED TO BEET TOPS PASTURE

Feeding alfalfa hay to lambs on beet tops pasture (Table I) increased the daily gain per lamb from .31 pounds for lambs not fed hay to .33 pounds where alfalfa was available. The addition of the alfalfa to the ration did not result in a decrease in consumption of beet tops. Where alfalfa was not fed, each lamb consumed daily the tops from 37.2 pounds of marketed beets. Lambs receiving alfalfa consumed each day the tops from 39 pounds of beets in addition to .4 pounds of alfalfa. During the first portion of the pasture period each year, the consumption of alfalfa was very light, but it increased more rapidly as the tops became more scarce.

In Lot 1 the tops from 6.28 tons of beets were required to produce 100 pounds of gain. The addition of 137 pounds of alfalfa,

TABLE I
THE EFFECT OF GIVING SUPPLEMENTAL FEED TO LAMBS ON BEET TOPS PASTURE
(EACH BEET TOPS PASTURE, 1.5 ACRES, CONTAINED THE TOPS FROM 27.99 TONS BEETS)

	3-year average			2-year average			
	1	2	3	1	2	3	4
Lot number.....	Beet tops	Beet tops	Beet tops	Beet tops	Beet tops	Beet tops	Beet tops
Pasture rations.....	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa	Alfalfa
Average dead lambs per year.....	Barley	Barley	Barley	Barley	Barley	Barley	Barley
Average days on pasture.....	0	7/8	7/8	0	7/8	7/8	1
	38	43	46	42	49	54	55
AVERAGE DAILY RATION—POUNDS PER HEAD							
Tons marketed beets, tops from.....	.02	.02	.01	.02	.01	.01	.01
Barley, pounds.....	.....	.....	.46	.....	.....	.54	.54
Alfalfa, pounds.....	.....	.44	.46	.....	.39	.37	.....
WEIGHTS AND GAINS (POUNDS)							
Average initial wt., 4% shrink.....	62.30	61.37	61.56	63.17	62.30	62.24	62.26
Average final weight, 6% shrink.....	73.65	74.46	77.40	73.73	75.65	78.47	75.02
Average daily gain.....	.31	.33	.37	.252	.279	.299	.244
POUNDS OF FEED PER 100 POUNDS GAIN							
Tons marketed beets, tops from.....	6.28	5.32	4.54	7.04	5.49	4.72	5.84
Barley, pounds.....	.....	.....	141.60	.....	.....	180.40	231.65
Alfalfa, pounds.....	.....	137.38	120.65	.....	133.10	110.50	.....

as fed in Lot 2, replaced the tops from .96 tons of beets. If the tops are valued at 35 cents per ton of beets, the alfalfa fed in this experiment was worth \$4.92 per ton.

Feeding Barley With Pastured Beet Tops.

The addition of barley to a beet tops pasture ration was used in this experiment in 1934 and 1935. This ration was not included in the experiment during the first season when all lots made exceptionally good gains. The barley-fed lambs in Lot 4, Table I, did not show an average gain as great as those in the lot which was pastured solely on beet tops. In 1934, the barley-fed lot showed an average daily gain of .279 pounds per head, as compared to .273 pounds for the lot which received no barley. In 1935, lambs fed barley while on beet tops pasture gained only .21 pounds per day as compared to .23 pounds for the lot on beet tops pasture without any supplement.

In this experiment 232 pounds of barley replaced the tops from 1.2 tons of beets. If the tops from a ton of beets are worth 35 cents, the barley was worth slightly over 18 cents per hundred.

Addition of Alfalfa and Barley to Beet Tops Pasture.

This ration was satisfactory from the standpoint of gains produced. Table I shows that the lambs in this lot made an average daily gain of .37 pounds per head.

However, the gains of this lot were less economical than the gains from tops alone or from tops supplemented with alfalfa.

Comparing Lot 3 with Lot 2, it is evident that 142 pounds of barley replaced the tops from .78 tons of beets plus 17 pounds of alfalfa. Valuing the tops from a ton of beets at 35 cents and alfalfa at \$8.00 per ton would give, in this case, a value of 24 cents for each 100 pounds of barley as fed in Lot 3.

A comparison of Lots 3 and 4 shows that 110 pounds of alfalfa as fed in Lot 3 replaced the tops from 1.12 tons of beets plus 51 pounds of barley. Thirty-five cent tops and \$1.00 barley give alfalfa a replacement value of \$16.36 per ton. This does not represent a true value of the alfalfa, but it shows that the hay was more effective than the barley in supplementing the beet tops pasture.

The combination of barley and alfalfa fed in the beet tops pasture is even less favorable from the standpoint of economy. As fed in Lot 3, 142 pounds of barley and 121 pounds of alfalfa

replaced the tops from 1.74 tons of beets in comparison with Lot 1. This replacement of tops would give only 61 cents to pay for 142 pounds of barley and 121 pounds of hay.

THE DRY LOT PERIOD AS AFFECTED BY PRELIMINARY
PASTURING ON BEET TOPS

Table II shows data on the gains made by the four pasture lots after they were brought into the dry lot. These data show a marked difference in results obtained from lambs which were fed grain while on pasture and those which did not receive any

TABLE II
COMPARISON OF DRY LOT GAINS BY LAMBS PREVIOUSLY PASTURED ON BEET TOPS
(3-year average)*

Lot number—(40 head per lot).....	1	2	3	4*
Pasture ration.....	beet tops	beet tops alfalfa	beet tops alfalfa barley	beet tops barley
Average number dead lambs per year...	7%	1	2%	1/2
Average number days in dry lot.....	62	57	54	45
Average daily ration in dry lots—pounds per head daily				
Barley . . . . .	.681	.675	.972	.939
Wet pulp	6.651	6.599	5.652	5.976
Alfalfa	1.379	1.313	1.306	1.254
Salt . . . . .	.013	.014	.010	.016
Weights and gains				
Average initial weight	73.645	74.462	77.403	75.019
Average final weight	88.758	87.896	93.25	90.079
Average daily gain . . . . .	.244	.236	.293	.334
Feed used per 100 pounds gain				
Barley	279	286	331	281
Wet pulp	2703	2795	1930	1788
Alfalfa	564	556	446	376
Salt	5.3	5.9	3.4	4.8

*Lot 4, 2 years.

concentrate. Lots 1 and 2 received no grain while on pasture and made gains of .244 and .236 pounds per head daily after coming into the dry lot. Lots 3 and 4 received grain on pasture and came into the dry lot when consuming practically a full feed of barley. Consequently these lambs got off to a better start. Lot 3 shows an average daily gain in the dry lot of .293 pounds and Lot 4, .334 pounds. On the basis of feed costs, Lot 3 made dry lot gains at 5.7 per cent less than Lot 1 and 7.4 per cent less than Lot 2. Of all the lots on pasture Lot 4 made the poorest showing on pasture from the standpoint of economy, but in the dry lot these lambs gained 100 pounds at a saving in feed cost of 17.6 per cent, as compared to Lot 1, and a saving of 19 per cent when compared to Lot 2.

THE EFFECT OF BEET TOPS PASTURE WITH DIFFERENT
SUPPLEMENTS ON THE ENTIRE FEEDING PERIOD

The ultimate value of any method of pasturing tops cannot be fully determined at the close of the pasture period. Probably the more accurate determination of the value comes when the pasture data are combined with those of the subsequent period in the dry lot during which the lambs are finished for market. In Table III the data on the pasture and on the dry lot periods are combined for Lots 1 to 4. Lot 5 was in the dry lot for the entire time without pasture. The ration in the dry lot was the same for all lots: Whole barley, wet beet pulp, and alfalfa.

When the pasture and dry lot periods are considered together, the feeding of alfalfa hay to lambs on beet tops pasture as in Lot 2 showed no significant advantage the first and third years. The second year, a slight increase in the rate of gain resulted. For a three-year average, Lot 1, which received no hay while on beet tops pasture, made a daily gain per lamb of .26 pounds. This was equal to the gain made by Lot 2. The lot which received hay while on pasture consumed 30 pounds more alfalfa and the tops from .028 tons more beets for each 100 pounds of gain than did Lot 1. However, this additional alfalfa and tops resulted in the use of 180 pounds less wet beet pulp, so that when the two ration costs are balanced at the prices quoted, the alfalfa fed in Lot 2 showed a value of \$16.34 per ton.

TABLE III
 COMBINED PASTURE AND DRY LOT PERIODS COMPARED WITH
 DRY LOT FEEDING WITHOUT PASTURE
 (3-year average.)*

Lot number—(40 head per lot)	1	2	3	4*	5
Aver. number dead lambs per yr.	1/3	1 1/3	3	1 1/2	2
Weights and gains					
Average initial weight	62.266	61.37	61.557	61.756	61.01
Average final weight	88.758	86.896	93.25	90.079	93.573
Average daily gain . . . . .	.261	.263	.309	.277	.323
Pounds of feed used per 100 pounds gain (100 days)					
Barley	161.596	145.17	244.85	264.840	233.899
Wet beet pulp	1577.50	1397.59	980.731	1019.151	2369.003
Alfalfa	327.304	357.119	291.347	196.741	431.353
Tons marketed beets—pasture	2.729	2.757	2.369	2.715	.....
Salt	3.00	2.996	2.459	3.644	4.323

*Lot 4, 2 years.

A comparison of Lot 1, which had a preliminary pasture period, and Lot 5, which was in the dry lot for the entire period, shows that the tops from 2.72 tons of beets replaced 72 pounds of barley, 791 pounds of wet beet pulp, and 104 pounds of alfalfa. At the prices used in this publication, the feed replacement value of the tops was 56 cents per ton of beets.

A comparison of Lots 2 and 5 (Table III) shows that the tops from 2.76 tons of beets as eaten by the lambs in Lot 2 replaced 89 pounds of barley, 971 pounds of wet beet pulp, and 74 pounds of alfalfa. This made a replacement value of 61 cents for the tops from one ton of beets.

Two factors in regard to feeding alfalfa with beet tops pasture are worthy of mention. In localities where lambs on a straight beet tops ration are inclined to scour, it is customary to give hay in order to lessen the digestive disturbances. Practically no scouring occur-

red in any of the pasture lots considered in these experiments, hence no benefit can be attributed to the hay for this reason. Another advantage to feeding hay with beet tops is that if storms prevent pasturing, the lambs are already accustomed to eating hay.

Appraisal of the lambs showed Lot 1 to be 81 per cent fat the first year while Lot 2 was only 67 per cent fat. During the second year's test the lots were each appraised 92 per cent fat. The final year showed no appreciable difference in the two lots, although most of the lambs were ready for slaughter.

BARLEY WITH THE PRELIMINARY BEET TOPS PASTURE PERIOD
AS IT EFFECTS THE ENTIRE PERIOD
(2 years average)

Gains in Lot 3 compare very favorably with gains made by the lambs of Lot 5.

The tops from 2.37 tons of beets plus 11 pounds barley, as fed in Lot 3, replaced 1388 pounds of wet beet pulp and 140 pounds of alfalfa. In this comparison the value of feed replaced by the tops from one ton of beets was 49 cents.

Appraisal of the relative conditions of these lots showed a very slight margin in favor of Lot 5. The first year Lot 3 was appraised 91 per cent fat as compared to 94 per cent in Lot 5. Both lots were rated 100 per cent fat the other two years, although the appraiser rated Lot 5 as being slightly better finished at the close of the final year's test. The difference in appraisal was so slight and the margin of sale price between the feeder and fat lambs taken from these lots was so small, that there was very little difference in actual values.

Lot 4, which received barley while on pasture, made an average daily gain of .28 pounds during the entire period of the experiment, as compared with .32 pounds made by Lot 5 in the dry lot during the same length of time.

The tops from 2.715 tons of beets plus 31 pounds of barley, Lot 4, replaced 1350 pounds of wet beet pulp and 234 pounds of alfalfa as fed in Lot 5. At the prices used the tops from one ton of beets replaced other feeds worth 48 cents.

Lot 4 was appraised 95 per cent fat at the close of the 1933-1934 test, and Lot 5 was appraised 100 per cent fat. At the close of the 1934-1935 test, Lot 4 was rated slightly below Lot 5, although all the lambs were judged fit for slaughter.

A comparison of Lots 1 and 2, to which no barley was fed on pasture, with Lots 3 and 4, which received barley, shows that grain fed in the preliminary pasture period materially increased the rate of gain and produced fatter lambs. Although the total cost of feed per pound of gain was increased by using a barley supplement with the pastured tops, yet in most cases this might be balanced by an increased selling price of the lambs.

CURED BEET TOPS

Feeding beet tops in the dry lot after they have been cured and piled in the field has been recommended as a more efficient method of utilization. Advantages of this system of feeding tops include: (1) a more certain return from the tops regardless of weather; (2) a succulent roughage that is a valuable addition to the dry lot ration, improving the appetite of the animals and replacing a considerable amount of hay.

Some of the factors which tend to discourage the practice are: (1) curing and piling of the tops requires extra labor; (2) fall ploughing is not possible, if the tops are left in the field.

The yield of cured tops from a ton of sugar beets is a variable factor depending for the most part upon the moisture content, but also upon fertilizer and cultural practices used. The weights of a considerable acreage of tops used each year in these experiments have averaged 264 pounds delivered to the feed lots from one ton of beets, as delivered to the sugar factory. The condition of these tops varied from quite moist to well cured.

Results of this experiment show that the addition of cured tops to the dry lot ration gave a favorable increase in gain over the check lot, two out of the three years, and in the other year the gain was equal to the check lot.

The three-year comparison of this experiment is shown in Table IV. Lot 6 received the tops in the dry lot and made an aver-

age daily gain of .345 pounds per head. The check lot, number 5, gained .323 pounds per head during the same period.

TABLE IV
THE ADDITION OF CURED BEET TOPS TO A RATION OF BARLEY,
WET PULP AND ALFALFA
(3-year average)

Lot number—(40 head per lot)	5	6
Rations	Barley Wet pulp Alfalfa	Barley Wet pulp Alfalfa Cured tops
Average number dead lambs per year.....	2	2
Average daily ration in dry lot		
Barley . . . . .	.754	.768
Wet beet pulp	7.534	7.279
Alfalfa	1.407	1.187
Cured beet tops . . . . .	.....	1.421
Salt . . . . .	.014	.008
Weights and gains		
Average initial weight	61.01	61.673
Average final weight	93.573	96.394
Average daily gain . . . . .	.323	.345
Feed used per 100 pounds gain		
Barley	233.899	222.961
Wet beet pulp	2369.003	2144.955
Alfalfa	431.353	341.246
Cured beet tops, pounds . . . . .	.....	410.912
Salt	4.323	2.455

Feeding the cured tops resulted in a greater total feed consumption, a fact which probably accounts for the increase in gain. It was necessary, however, to limit the tops fed, as well as the hay, because a large consumption of roughage interfered with the eating of grain and pulp.

The lambs in Lot 6, fed cured beet tops, averaged slightly fatter than Lot 5 for the three years, although the appraiser on the final year ranked them below several other lots because of their wasty middles. This criticism could probably be given this lot each year.

Table V shows that 411 pounds of cured beet tops replaced 11 pounds of barley, 224 pounds of wet beet pulp, and 90 pounds of alfalfa. This is equivalent to 39 cents for the tops from one ton of beets and would not pay the usual market price for the tops and leave sufficient margin to pay piling and hauling charges.

DRIED BEET PULP

Table V shows the results of a 3-year comparison of dried molasses pulp and wet pulp averaged for three years.

The lambs in Lot 7 were fed the dried pulp and made a three-year average daily gain of .27 pounds. Lot 5 fed wet pulp made .32 pounds daily gain. The dried pulp lot used 163.8 pounds of dried pulp, 13 pounds of barley, and 290 pounds of hay to replace 2364 pounds of wet pulp. The feed replacement value of dried pulp as fed in these experiments was so low that its substitution for wet pulp would not be economical when the latter is readily available. However, Lot 7 was also used as a check lot in another experiment, and the grain and pulp allowance was necessarily kept low in order to make conditions comparable to the other lots. Possibly a more liberal allowance of the dried pulp would have produced more rapid and more economical gains. Dried beet pulp appears to offer a worth-while addition to rations in districts which are remote from sugar factories. Hay and grain prices are often low in places where wet pulp is not available, thus offering the possibility of making a ration containing dry pulp which will produce gains that are no more expensive than those in which the wet pulp is combined with more expensive hay and grain.

TABLE V
DRIED BEET PULP COMPARED WITH WET BEET PULP
(3-year average)

Lot number—(40 head per lot)	5	7
Rations	Barley Wet pulp Alfalfa	Barley Dry pulp Alfalfa
Average number dead lambs per year.....	2	1
Average daily ration in dry lot		
Barley . . . . .	.754	.679
Wet beet pulp	7.534	.....
Dried beet pulp . . . . .	.....	.448
Alfalfa	1.407	1.962
Salt . . . . .	.014	.005
Weights and gains		
Average initial weight	61.01	61.736
Average final weight	93.573	89.540
Average daily gain . . . . .	.323	.274
Pounds of feed used per 100 pounds gain (100 days)		
Barley	233.899	246.927
Wet beet pulp	2369.003
Dried beet pulp	163.835
Alfalfa	431.353	721.584
Salt	4.323	1.705

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SUMMARY

1. Beet tops, when fed by pasturing without any supplementary feed, make a highly satisfactory ration unless difficulty from scouring arises, as it does in some localities. There were no digestive troubles in using this ration during the course of these experiments.

2. Supplementing beet tops with alfalfa hay produced slightly faster gains. If the lambs had been sold at the close of the pasture period, the addition of the alfalfa would not have increased the profits.

3. Feeding barley, either with or without hay, to lambs pastured on beet tops, increased the rate of gain, and also improved the finish on the lambs, but increased materially the cost of the gains obtained while the lambs were on pasture.

4. The customary selling price of beet tops is below their value based on the feed that they will replace in the fattening process. Weather hazards which make pasturing uncertain are largely responsible for this low selling price.

5. The tops from one acre of beets yielding 18.65 tons, when pastured without other feed, provided ample feed for 1000 lambs for one day.

6. When lambs were fed about one-half pound of barley and one-half pound of alfalfa each day, while pasturing beet tops, the carrying capacity of an acre of tops yielding 18.65 tons of beets was 1140 lambs for one day.

7. Lambs which received barley while on beet tops pasture made larger and more economical gains in the dry lot than the lambs which received no grain while on pasture.

8. Considering the pasture and dry lot periods together, there were no outstanding benefits obtained from feeding supplements to lambs while they were on pasture. Feeding grain while lambs are on pasture does assist in finishing them in a shorter time and increases the carrying capacity of the pasture without materially increasing the cost of the finished lambs.

9. Pasturing beet tops in the field without piling was satisfactory during this experiment. Unless sufficient stock is available to clean up the tops within four to six weeks after the close of the beet harvest, it is probably advisable to pile a portion of the tops for later feeding.

10. The average yield of cured tops from a ton of marketed beets was 264 pounds.

11. Feeding cured tops to lambs in the dry lot increased the rate of gain. When the additional labor is considered, only about one-half as much was received from the cured tops as when they were pastured. The feeding of cured tops extends their use over a longer period and is an insurance against unfavorable pasturing weather.

12. Dried molasses beet pulp, barley, and alfalfa produced satisfactory gains and well finished lambs but at a higher cost than when wet beet pulp was fed in place of the dried pulp.