

## THE COLORADO EXPERIMENT STATION

### FORT COLLINS

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#### Feedlot Fattening Rations for Cattle

#### Progress Report of Livestock Feeding Experiment 1930

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1. Calves fattened on ground barley, cottonseed cake and alfalfa hay gained 1.83 pounds per head daily at a feed cost of \$10.01 per cwt.
2. The addition of siloed beet pulp to the basal ration increased gain, decreased feed cost \$1.52 per cwt. gain and increased selling price per cwt. Siloed beet pulp costing \$2.29 per ton delivered to the calves showed a feed replacement value of \$4.38 per ton fed.
3. The addition of corn silage to the basal ration increased gain, decreased feed cost 25 cents per cwt. gain but slightly decreased the selling price per cwt. Compared to the basal ration, corn silage showed a feed replacement value of \$8.18 per ton.
4. Cull potatoes of rather poor quality added to the basal ration showed a feed replacement value of \$3.79 per ton fed.
5. A potato-and-corn-fodder silage made in the spring and fed the following winter with the basal ration increased gains slightly, decreased the feed cost 12 cents per cwt. and decreased the selling price per cwt. slightly. This silage showed a feed replacement value of \$8.00 per ton.

#### Objects of the Experiment

1. To determine the comparative fattening value of cull potatoes, corn silage and siloed beet pulp when fed with a basal ration of ground barley, cottonseed cake and alfalfa hay.
2. To determine the value of cull potatoes ensiled with dry corn fodder in the spring and held as potato-and-corn-fodder silage for feeding the following winter.
3. To determine the value of cull potatoes when used as a partial substitute for wet beet pulp in a cattle fattening ration.
4. A study of storage losses in pressed pulp ensiled in trench and straw silos.

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### **Calves Used**

Sixty grade Hereford feeder calves grading good to choice in quality were used in the test and averaged 421.8 pounds at the start. They were sorted into 6 uniform pens of 10 head each and were fed different rations from November 19 to June 2, a period of 195 days.

### **Rations Fed**

- Lot 1. Barley, siloed beet pulp, cull potatoes, cottonseed cake, alfalfa hay.
- Lot 2. Barley, siloed beet pulp, cottonseed cake, alfalfa hay.
- Lot 3. Barley, cull-potato-and-corn-fodder silage, cottonseed cake, alfalfa hay.
- Lot 4. Barley, corn silage, cottonseed cake, alfalfa hay.
- Lot 5. Barley, cull potatoes, cottonseed cake, alfalfa hay.
- Lot 6. Barley, cottonseed cake, alfalfa hay.

### **Feeds Used and Methods of Feeding**

**Ground Colcess barley** was grown on the college farm. It weighed 47 pounds per bushel, tested 10.75 percent moisture and was graded No. 2. Calves were started on 1 pound per head daily, which was gradually increased to 7 pounds per head daily except in Lot 6, where 8 pounds per head daily were eaten on a full feed.

**Cull potatoes** tested 82.3 percent moisture and were of rather poor quality. With market potatoes high, a close sorting caused the culls to be distinctly lower in quality than in a year of moderate-priced market potatoes. The culls were sliced in a low priced, hand-power root cutter. The potatoes were stored in a frost-proof dugout but some of them were frozen when eaten. During the latter part of the feeding period, the potatoes sprouted very noticeably but no ill effects were noted in feeding frozen culls and later sprouted culls. From 18 to 20 pounds of cull potatoes were fed per head daily on a full feed.

**Wet beet pulp** was hauled from the silo of the local sugar factory and was stored in a small silo near the feedlots. The average moisture content during the feeding period was 89 percent and the cost fed to the cattle including a 50 cent handling charge and shrink was \$2.29 per ton. The calves consumed from 30 to 35 pounds of the wet beet pulp on a full feed.

**Corn silage** grown on the college farm was used in the test and was a good quality with well-matured grain. It had an average mois-

ture content of 72 percent. The calves consumed from 14 to 16 pounds per head daily on a full feed.

**Potato-and-corn-fodder silage.**—A mixture by weight of 18 percent dry corn fodder and 82 percent cull potatoes was cut into the silo during the spring of 1929. Cull potatoes on the verge of spoiling were stored in this manner for use the following feeding season. There was little waste and the resultant silage proved to be a very palatable feed. It contained 61.5 percent moisture as fed and was charged at a production cost of \$7.68 per ton.

**Alfalfa hay** was grown locally and was bright, leafy and of good quality. First and second cutting hay was used and was distributed equally thruout the pens. It was self-fed thru covered bunks.

**Mineral mixture.**—All lots were self-fed a simple mineral mixture composed of 30 percent steamed bonemeal, 60 percent limecake and 10 percent salt.

**Salt.**—All lots were self-fed No. 4 salt.

**Concentrates** were fed twice daily, morning and evening. Wet pulp, potatoes and silage were given in one feed daily at about 10 o'clock in the morning. Fed during the warmth of the day, there was less tendency for these high-moisture feeds to freeze in the troughs before being consumed.

# **CALF-FEEDING EXPERIMENT**

**Colorado Agricultural Experiment Station**

10 Calves per Lot—Fed 195 days, November 19, 1929-June 2, 1930

	1	2	3	4	5	6
<b>Ration fed</b>	Beet	Beet	Potato-	Corn	Cull	
<b>Alfalfa hay, mineral</b>	pulp	pulp	Corn	silage	potatoes	
<b>and salt fed in</b>	Cull		Fodder			
<b>all lots.</b>	potatoes	Barley	silage	Barley	Barley	Barley
	CS Cake	CS Cake	CS Cake	CS Cake	CS Cake	CS Cake
Feed lot wt. at start.....	418.8	421.2	421.2	420.8	424.8	424.4
Market wt. at Denver.....	794.0	794.0	781.5	780.0	752.0	781.6
Shipping shrinkage						
(percent) .....	4.57	3.64	3.46	4.88	3.77	2.98
Gain at market .....	375.2	372.8	360.3	359.2	327.2	357.3
Daily gain (market wt.)....	1.92	1.91	1.85	1.84	1.68	1.83
Daily feed fed (pounds)						
Ground barley .....	5.1	5.1	5.1	5.1	5.1	6.4
Siloed beet pulp .....	21.5	27.8				
Cull potatoes .....	8.5				15.5	
Potato-corn-fodder						
silage .....			13.7			
Corn silage .....				13.8		
Cottonseed cake .....	1.0	1.0	1.0	1.0	1.0	1.0
Alfalfa hay .....	5.2	5.0	5.0	4.7	6.2	9.8
Mineral mixture .....	.02	.02	.03	.03	.02	.02
Salt .....	.02	.02	.02	.02	.01	.03
Feed required per 100 lbs.						
Gain (at market)						
Ground barley .....	264.4	266.0	275.3	276.2	303.2	349.8
Siloed beet pulp .....	1115.9	1455.8				
Cull potatoes .....	439.8				922.2	
Potato-corn-fodder						
silage .....			740.7			
Corn silage .....				748.7		
Cottonseed cake .....	51.0	51.3	53.1	53.3	58.5	53.7
Alfalfa hay .....	268.6	262.1	269.9	252.5	367.1	537.3
Mineral mixture .....	1.2	1.3	1.4	1.8	1.1	1.1
Salt .....	.8	1.0	.9	1.3	.6	1.7
Feed cost per 100 lbs.						
gain at market .....	\$9.22	\$8.49	\$9.89	\$9.76	\$10.57	\$10.01
Cost of feeds used						
Ground barley .....				\$27.00	per ton	
Siloed beet pulp .....				2.29	per ton	
Cull potatoes .....				5.00	per ton	
Potato-corn-fodder silage .....				7.68	per ton	
Corn silage .....				7.50	per ton	
Cottonseed cake .....				51.00	per ton	
Alfalfa hay .....				14.50	per ton	
Mineral mixture .....				18.70	per ton	
Salt .....				15.00	per ton	

**FINANCIAL STATEMENT BASED ON AVERAGE FEED PRICES AND  
SALE OF CALVES**

	1	2	3	4	5	6
Ration fed Alfalfa hay, mineral and salt fed in all lots.	Beet pulp Cull potatoes Barley CS Cake	Beet pulp Barley CS Cake	Potato- Corn Fodder silage Barley CS Cake	Corn silage Barley CS Cake	Cull potatoes Barley CS Cake	Barley CS Cake
Cost per calf at feedlot @ \$12.00 per cwt. ....	50.26	50.54	50.54	50.50	50.98	50.93
Feed cost per calf .....	34.56	31.64	35.65	35.03	34.57	35.76
Est. fixed costs including interest, equipment and labor .....	7.93	7.81	7.98	7.96	7.96	8.01
Shipping and selling expense .....	2.52	2.52	2.48	2.47	2.38	2.48
Total cost at market (Denver) .....	95.27	92.51	96.65	95.96	95.89	97.18
Selling weight (Denver)....	794.0	794.0	781.5	780.0	752.0	781.6
Result of market sale						
No. of calves @ \$10.75...	5	8	5	4	2	5
No. of calves @ \$10.25...	5	2	5	6	8	3
Selling price per cwt. ....	10.50	10.65	10.51	10.46	10.36	10.57
Gross receipts per calf ....	83.37	84.56	82.14	81.59	77.91	82.62
Net return per calf .....	-11.90	-7.95	-14.51	-14.37	-17.98	-14.56
Dressing percentage .....	60.82	59.92	60.56	59.71	59.34	59.38
Selling price per cwt, needed to break even.....	12.00	11.65	12.37	12.30	12.75	12.43
Margin over purchase price per cwt. needed to break even .....	.00	-.35	+.37	+.30	+.75	+.43

## Results of Experiment

Altho ground barley, cottonseed cake and alfalfa produced very good gains at a reasonable cost, the addition of a cheap, bulky carbonaceous feed such as wet beet pulp or silage proved effective in checking digestive troubles, in increasing gains, decreasing feed cost per unit of gain and in this test in decreasing the loss per calf.

**Siloed beet pulp** is a standard fattening feed available in beet-growing areas which has proved equally as effective in fattening calves as in fattening older cattle. When calves are first put on feed it is sometimes difficult to accustom them to eating wet pulp. It is a good plan to force them to the pulp as soon as possible by holding them off other feeds for a day or two. Otherwise they are apt to consume large quantities of alfalfa hay at first which may further delay the taking of a full pulp ration and which tends to increase the feed cost. Once accustomed to eating pulp the calves take to it readily.

Each ton of wet pulp fed in this experiment replaced 115.1 pounds of barley, 3.23 pounds of cottonseed cake, 378.1 pounds of alfalfa and 1 pound of salt altho requiring .3 pounds more mineral mixture. The feed replacement value of siloed beet pulp at feed prices quoted totaled \$4.38 per ton fed. The addition of 27.8 pounds of pulp per head daily to a ration of barley, cottonseed cake and alfalfa increased the gains 15.5 pounds per calf, decreased the feed cost \$1.52 per cwt. of gain, increased the selling price 8 cents per cwt. and decreased the net loss per head \$6.61.

**Corn silage** ranks next to wet beet pulp as a bulky succulent carbonaceous feed. It is successfully used in cattle fattening rations in sections of the state outside beet-growing areas where corn is grown and is also used to supplement a limited pulp supply in beet-growing areas.

Each ton of corn silage fed replaced 196.7 pounds of barley, 1.1 pounds of cottonseed cake, 760.1 pounds of alfalfa and 1.1 pounds of salt requiring 1.9 pounds more mineral mixture. At feed prices used, the silage fed showed a feed replacement value of \$8.18 per ton. The addition of 13.8 pounds of corn silage per head daily to a basal ration of ground barley, cottonseed cake and alfalfa increased the gain per calf 3 pounds per head, decreased the feed cost 25 cents per cwt. gain but decreased the selling price 11 cents per cwt. In this test, the feeding of corn silage decreased the net loss 19 cents per head.

A comparison of feed replacement values indicates that siloed beet pulp testing 89.0 percent moisture had 53 percent the value of the corn silage.

**Potato-and-corn-fodder silage** proved to be a palatable feed and furnished a satisfactory method for holding potatoes thru the summer to be fed the next winter.

Each ton of this silage replaced 201.2 pounds of barley, 1.5 pounds of cottonseed cake, 722.0 pounds of alfalfa and 2.2 pounds of salt, requiring 1 pound more of mineral mixture. It showed a feed replacement value of \$8.00 per ton.

The addition of 13.7 pounds of potato-and-corn-fodder silage to the basal ration increased the gain 3 pounds per calf, decreased the feed cost 12 cents per cwt., decreased the selling price 6 cents per cwt. and decreased the loss 5 cents per head.

**Cull potatoes** used in this test were rather poor quality being small in size and showing considerable spoilage. The fact that a fairly heavy feed of potatoes was used may have had some influence on the low-feed replacement value indicated.

Each ton of cull potatoes fed replaced 101.1 pounds of barley, 369.1 pounds of alfalfa and 2.5 pounds of salt but required 10.4 pounds more cottonseed cake and .1 pound more mineral. Based on the values of feeds used in the test the cull potatoes had a feed replacement value of \$3.79 per ton fed.

Feeders in beet-growing areas often find it convenient to supplement their pulp supply with cull potatoes especially during the spring. A daily mixture of 21.5 pounds of pulp and 8.5 pounds of cull potatoes fed with ground barley, cottonseed cake and alfalfa hay produced 17.5 pounds more gain per calf than the basal ration and at 79 cents per cwt. less feed cost. Cattle fattened on this ration sold at 7 cents per cwt. less than the check lot but lost \$2.66 per head less.

Experiments indicate that wet beet pulp at present prices and fed in a standard ration produces cheapest and most economical gains but that other succulent carbonaceous feeds such as corn silage or cull potatoes may be used to advantage to supplement a limited pulp supply altho their use will tend to raise the cost per cwt. of gain over that secured with wet pulp.

**Beet Pulp Storage.**—A comparison was made of storage losses on pressed beet pulp siloed in a dirt trench silo, in a straw silo and piled on the ground. Of 293.65 tons shipped to the Experiment Station from the Loveland factory, 13.5 miles away, 284.8 tons were weighed off the cars showing a 3.01 percent shrink.

The subsequent data is given in the accompanying table.

### Shrinkage of Stored Pulp

(Fed between November 18, 1929 and March 11, 1930)

	Dirt trench silo	Straw silo	Open pile on ground
Tons stored .....	96.68	95.62	92.51
Tons weighed out and fed .....	73.02	67.57	60.73
Percent loss .....	24.48	29.33	34.35

As the moisture content of the stored pressed pulp remains fairly constant under the surface, loss in weight apparently represents evaporation and surface decomposition. The pulp stored in an open pile would have undoubtedly shown even greater shrinkage had it been strung out in a long narrow pile rather than heaped up in a compact pile as was the case.

Previous studies at this station have indicated that trench silos are much more economical than straw silos for storage of pressed pulp.