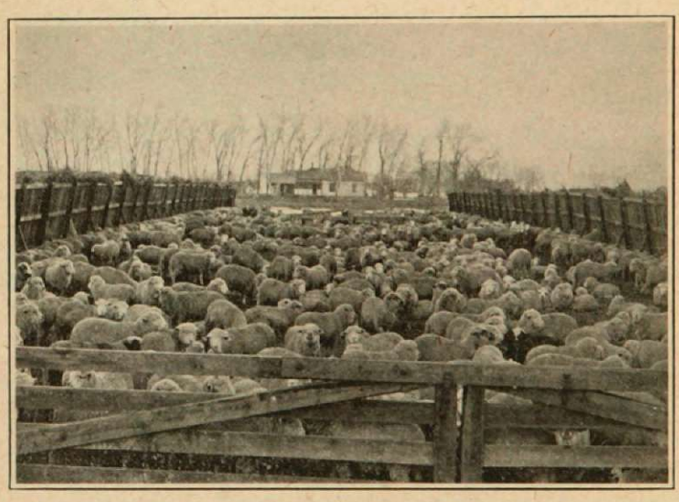
Bulletin 266 April, 1921

The Agricultural Experiment Station
OF THE
Colorado Agricultural College

BEET BY-PRODUCTS FOR FATTENING LAMBS

By E. J. MAYNARD
Specialist in Animal Investigations



Lambs in a Northern Colorado Feed Lot, Season of 1920-21.

PUBLISHED BY THE EXPERIMENT STATION
FORT COLLINS, COLORADO
1921

The Colorado Agricultural College

FORT COLLINS, COLORADO

THE STATE BOARD OF AGRICULTURE

		Term Expires
HON. H. D. PARKER	Greeley,	1923
MRS. AGNES L. RIDDLE	Denver,	1923
HON. J. C. BELL	Montrose,	1925
HON. E. M. AMMONS	Denver,	1925
HON. W. I. GIFFORD	Durango,	1927
HON. J. B. RYAN	Rocky Ford,	1927
HON. A. A. EDWARDS, President of the Board	Fort Collins,	1929
HON. J. S. CALKINS	Westminster,	1929

GOVERNOR OLIVER H. SHOUP } *Ex-Officio*
PRESIDENT CHAS. A. LORY }

L. M. TAYLOR, Secretary — G. A. WEBB, Treasurer

EXECUTIVE COMMITTEE

A. A. EDWARDS, Chairman

E. M. AMMONS — H. D. PARKER

OFFICERS OF THE EXPERIMENT STATION

CHAS. A. LORY, M.S., LL.D., D.Sc.	President
C. P. GILLETTE, M.S., D.Sc.	Director
LD CRAIN, B.M.E., M.M.E.	Vice-Director
L. M. TAYLOR	Secretary
ANNA T. BAKER	Executive Clerk

STATION STAFF

Agricultural Division

C. P. GILLETTE, M.S., D.Sc., Director	Entomologist
W. P. HEADDEN, A.M., Ph.D., D.Sc.	Chemist
G. H. GLOVER, M.S., D.V.M.	Veterinarian
W. G. SACKETT, Ph. D.	Bacteriologist
ALVIN KEZER, A.M.	Agronomist
G. E. MORTON, B.S.A., M.S.	Animal Husbandman
E. P. SANDSTEN, M.S., Ph.D.	Horticulturist
B. O. LONGYEAR, B.S.	Assistant in Forestry
I. E. NEWSOM, B.S., D.V.S.	Veterinary Pathologist
A. K. PEITERSEN, B.S., M.S., Ph.D.	Botanist
RALPH L. CROSMAN	Editor
R. E. TRIMBLE, B.S.	Assistant in Irrigation Investigations
EARL DOUGLAS, M.S.	Assistant in Chemistry
P. K. BLINN, B.S., Rocky Ford	Alfalfa Investigations
MIRIAM A. PALMER, M.A.	Delineator
J. W. ADAMS, B.S., Cheyenne Wells	Assistant in Agronomy, Dry Farming
RALPH L. PARSHALL, B.S.	U. S. Irrigation Engineer Irrigation Investigations
CHARLES R. JONES, B.S., M.S.	Assistant in Entomology
GEORGE M. LIST, B.S.	Assistant in Entomology
CARL ROHWER, B.S., C.E.	Assistant in Irrigation Investigations
CHAS. I. BRAY, B.S.A., M.S.	Assistant in Animal Husbandry
ELSA EISENDRATH, Ph. B.	Assistant in Bacteriology
E. J. MAYNARD, B.S.A., M.S.	Specialist in Animal Investigations
W. L. BURNETT	Rodent Investigations
HAROLD L. GAYMON, B.S.	Assistant in Horticulture
FLOYD CROSS, B.S., D.V.M.	Assistant Veterinary Pathologist
WM. H. FELDMAN, B.S., D.V.M.	Assistant Veterinary Pathologist
N. E. GOLDTHWAITE, Ph.D.	Home Economics
CAROLINE PRESTON	Artist
H. D. LOCKLIN, B.S., M.S.	Assistant in Horticulture
J. W. TOBISKA, B.S., M.A.	Assistant in Chemistry
C. E. VAIL, B.S., M.A.	Assistant in Chemistry
WILLIAM MAY, B. S.	Assistant in Botany
C. D. LEARN, B.S., M.A.	Assistant in Botany
DAVID W. ROBERTSON, B.S., M.S.	Assistant in Agronomy
LEON R. QUINLAN, B.S.	Assistant in High Altitude Horticulture
W. F. ALLEWELT, B.S., Denver	Market Investigations, Office of Markets

Engineering Division

LD CRANE, B.M.E., M.M.E., Chairman	Mechanical Engineering
E. B. HOUSE, B.S., (E.E.) M.S.	Civil and Irrigation Engineering
O. V. ADAMS, B.S.	Testing Engineer
G. A. CUMMINGS, B.S.	Assistant in Mechanical Engineering

BEET BY-PRODUCTS FOR FATTENING LAMBS

E. J. Maynard, Specialist in Animal Investigations

CONCLUSIONS

Beet Molasses becomes more valuable in the lamb fattening ration as the cost of corn increases. In the trial it decreased the feed cost 11 cents per head but increased the labor cost two cents per head, increased the shrink 0.5 per cent and decreased the selling price 10 cents per hundred. Beet molasses fed in this test with corn and alfalfa decreased the loss 4 cents per lamb.

Barley and Oats, which sold at higher prices per hundred than corn, did not prove to be as efficient as corn when fed with molasses and alfalfa.

Dried-Molasses-Beet-Pulp although not equal to corn, when fed alone with alfalfa, showed very favorable results when mixed half and half with corn. This mixture when compared to straight corn apparently shows the dried pulp more than equal to corn pound for pound in putting on gains. The dried pulp decreased the cost of feed 21 cents per head, and although it increased the shrink 1.5 per cent, at the same time it increased the selling price of the lambs 25 cents per hundred and decreased the loss per head 43 cents. A mixture of equal parts dried pulp and corn proved more economical than a combination consisting of 2-3 corn and 1-3 dried pulp.

Wet Beet Pulp:

The wet pulp fed lambs made the heaviest gains and at the cheapest feed cost. Their selling price was 10 cents per hundred below the check lot and 35 cents below the corn and dried pulp lots, so that with their heavier labor cost they lost 18 cents more per head than did the favorably fed corn and dried pulp lot. It is possible that the greater size of the wet pulp lambs was in part responsible for the lower selling price, they being heavier lambs. Had they been marketed earlier, it is probable that they would have commanded the top price in which case they would have been the most economically fed lot. The advantages of wet pulp depend largely on length of haul from factory and labor cost.

INTRODUCTION

To know the most economical rations and the comparative value of available Colorado feeds is a matter of extreme importance to the lamb feeder at the present time.

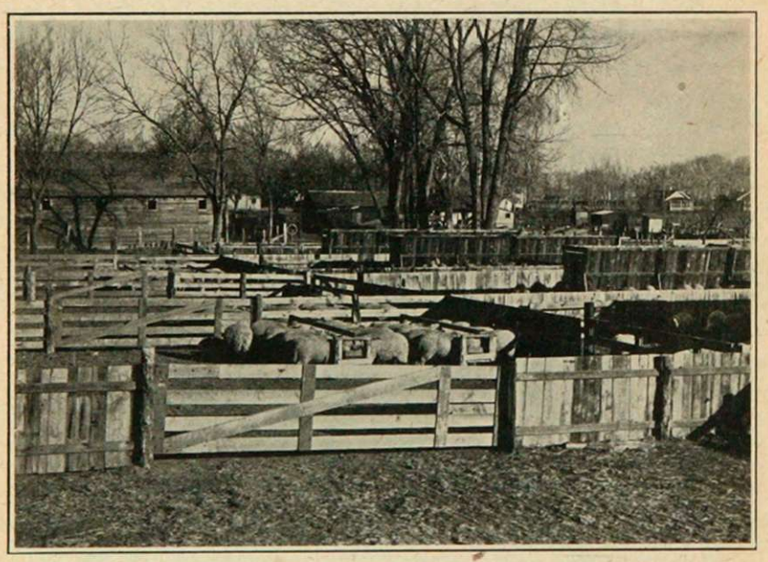
Narrow margins may be expected in the future, and it is extremely important that the feeder "leave no stone unturned" in securing the cheapest gains possible.

By-products from the manufacture of beet sugar play an important part in the lamb feeding industry of Colorado.

There have been many inquiries regarding the value of these by-products, and the best combinations to use in obtaining rapid and economical gains.

Wet pulp is being used more extensively than ever before in fattening lambs. Dried molasses beet pulp and beet molasses are available at low prices.

The results secured from the feeding test carried on this year are herein presented for the information of Colorado feeders.



Where the Experiment Was Conducted. Lamb Feeding Lots, Colorado Experiment Station.

OBJECTS OF THE TEST

1. To determine the value of beet molasses when fed in limited quantity with grain and alfalfa.

2. To test the comparative value of corn, barley and oats when fed along with beet molasses and alfalfa.

3. To compare dried molasses beet pulp with corn.

4. To determine an economical combination of dried molasses beet pulp and corn.

5. To test the value of wet pulp in partially replacing corn.

ANIMALS USED

The lambs used in the test were bought on the Denver market, October 27th. They came from southern Colorado, and were of good grade, representing the average type of feeder lamb found in the northern Colorado feed yards. About forty per cent were of fine wool foundation while the rest showed the Hampshire or Shropshire characteristics, having black faces and blocky forms.

METHODS USED IN TEST

The lambs were divided into eight lots of thirty-two each, care being taken to equalize the pens with regard to weight, sex, breeding and condition. The lots were kept in adjoining pens running north and south enclosed by a four-foot board fence, which with the hay self feeders served as a wind-break. Block salt and fresh water were kept before the lambs at all times.

At the beginning and end of the test, weights were taken on three consecutive days, the average of these being used. Individual weights were secured at the end of each thirty-day period.

RATIONS FED

Lot 1—Corn, alfalfa.

Lot 2—Corn, beet molasses, alfalfa.

Lot 3—Barley, beet molasses, alfalfa.

Lot 4—Oats, beet molasses, alfalfa.

Lot 5—Dried-molasses-beet-pulp, alfalfa.

Lot 6—Dried-molasses-beet-pulp 1-2, corn 1-2, alfalfa.

Lot 7—Dried-molasses-beet-pulp 1-3, corn 2-3, alfalfa.

Lot 8—Corn, wet pulp, alfalfa.

In all cases whole grain was fed. The lambs were fed twice daily, except for alfalfa which was self fed. Starting with one-fourth pound per head per day, thirty-eight days were taken to get the lambs in Lot 1 up to a pound of grain.

Molasses was fed by pouring it along the trough, and spreading the grain on it.

Starting with one-tenth pound of molasses per head, forty days were taken to get the lambs up to one-fourth pound.

The wet pulp was fed on the ground through panels.

FEEDS USED

Shelled Corn:

The shelled corn used was a No. 3 mixed.

Barley:

This grain was secured from local dealers and was No. 3 (warehouse grade). It weighed 44 pounds per bushel, was somewhat off in color and contained considerable foreign matter consisting mostly of other grains.

Oats:

The oats used in the test were Nebraska grown weighed 32.5 pounds per bushel. They were graded No. 4, but would have graded higher except that they contained impurities represented by other grains. Their weight was brought up by these impurities.

Dried-Molasses-Beet-Pulp:

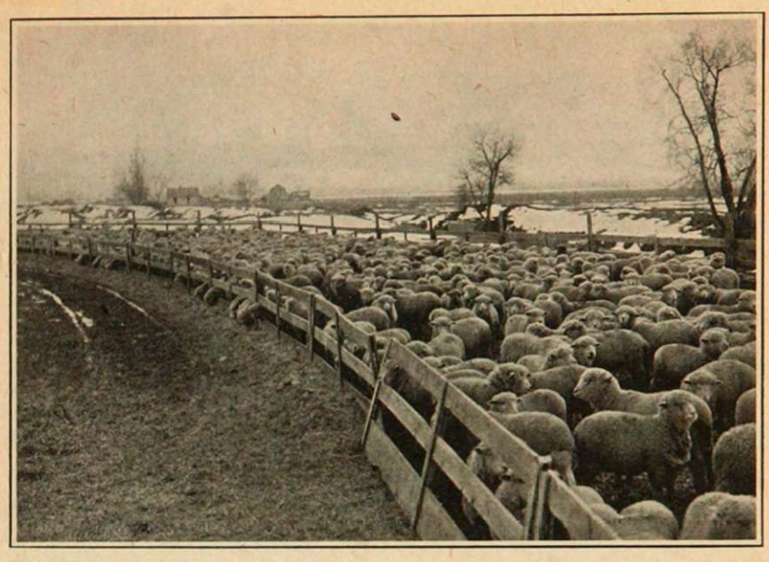
This feed is made by mixing and drying wet beet pulp and beet molasses so that 25 per cent of the dried substance is molasses. It was secured from the sugar company at a net price of $18.40 per ton which is the regular net market price.

Beet Molasses:

The molasses was hauled from the factory in a metal tank. Wooden tanks have generally proved unsatisfactory because hot molasses does not expand wood as water does, and will leak out where water will not. The present price of the beet molasses is $15.00 per ton.

Wet Beet Pulp:

Green pulp was fed during the first half of the test while during the last half the pulp was fairly well ripened.



An Easy Way to Feed Wet Beet Pulp—And the Lambs Like It.

Alfalfa:

All hay used was grown on the College farm and was of good quality. First, second and third cutting was fed according to the stack open at time of hauling. The lambs wasted more of the first cutting hay pulling out the heavy stalks and stems.

ANALYSIS OF FEEDS USED IN TEST

By E. L. Scott, Chemist

(Percent)

	Moisture	Crude Protein	Carbohydrates N. F. E.	Crude Fibre	Fat	Ash
Shelled Corn	14.81	9.45	67.71	1.28	5.55	1.20
Whole Barley	14.11	12.97	61.77	6.05	2.60	2.50
Whole Oats	11.75	12.15	56.25	10.90	5.30	3.65
Dried Molasses Beet Pulp	11.36	8.84	59.94	14.24	.....	5.62
Beet Molasses	19.80	9.30	60.50	.....	.....	10.40
Wet Beet Pulp	88.07	1.80	6.78	2.83	.13	.39
Alfalfa	9.50	14.95	36.96	27.21	1.83	9.55

The moisture analysis on wet pulp represents an average of tests during the feeding trial. Moisture varied from 90.2% to 87.1%.

WEIGHTS, FEED REQUIREMENTS AND FEED COST OF GAINS

8 Lots of 32 Lambs Each Fed 93 Days, November 28, 1920 to March 1, 1921
All Weights in Pounds
(On basis of one average Lamb)

Lot Number.....	1	2	3	4	5	6	7	8
Ration Fed*.....	Corn	Corn Molasses	Barley Molasses	Oats Molasses	Dried Molasses Beet Pulp	Corn (½) Dried Molasses Beet Pulp (½)	Corn (2-3) Dried Molasses Beet Pulp (1-3)	Corn, Wet Pulp
Initial Weight Ft. C.	70.7	71.0	71.1	71.1	71.2	70.8	70.9	71.3
Final Weight Ft. C.	101.8	103.3	100.3	101.2	100.4	103.5	102.3	105.5
Total Gain 93 Days	31.1	32.3	29.2	30.1	29.2	32.7	31.4	34.2
Daily Gain.....	.334	.347	.314	.323	.314	.351	.338	.367
Daily Feed								
Shelled Corn.....	1.03	.76				.52	.69	.52
Whole Barley....			.76					
Whole Oats.....				.76				
Dried Molasses, Beet Pulp.....					1.03	.52	.34	
Beet Molasses....		.30	.30	.30				
Wet Beet Pulp...								.556
Alfalfa.....	2.50	2.53	2.54	2.61	2.45	2.50	2.67	2.17
Feed for 100 lbs. Gain								
Shelled Corn.....	309.4	219.6				147.4	203.7	141.3
Whole Barley....			243.0					
Whole Oats.....				236.4				
Dried Molasses Beet Pulp					328.1	147.5	101.6	
Beet Molasses....		85.8	94.9	92.3				
Wet Beet Pulp...								1514.2
Alfalfa.....	749.0	726.5	808.1	808.9	781.4	711.5	790.7	591.5
Feed Cost per 100 lbs. Gain.....	9.57	8.84	10.18	10.06	8.64	8.47	9.38	7.11

*All Lots Self-fed Alfalfa Hay.

Shelled Corn.....	$1.35 Cwt.	Dried Molasses Beet Pulp.....	$18.40 per Ton
Barley.....	1.50 Cwt.	Wet Pulp.....	1.25 per Ton
Oats.....	1.50 Cwt.	Alfalfa.....	14.40 per Ton
Molasses.....	15.00 Ton		

FEED REQUIRED FOR GAINS

Corn:

Corn and alfalfa at the present time constitute the basal lamb fattening ration in Colorado. Figures on the value of other feeds used in the test are secured in a comparison with this ration.

Beet Molasses:

One hundred pounds of beet molasses replaced 104.7 pounds of corn and 26.2 pounds of alfalfa. Fed in limited quantities with corn and alfalfa the beet molasses proved more than equal to corn pound for pound in putting on gains.

Barley:

Where barley was fed with molasses and alfalfa, the lambs required approximately 10.7 per cent more grain, 10.6 per cent more molasses, and 11.2 per cent more alfalfa to make the same gain as those on the corn, molasses and alfalfa combination.

Oats:

The lambs fed oats required 7.7 per cent more grain, 7.6 per cent more molasses, and 11.3 per cent more hay per 100 pounds gain than lambs in the similarly fed corn lot.

Dried-Molasses-Beet-Pulp:

The combinations fed in the three lots receiving dried-molasses-beet-pulp were planned to throw some light on the value of this feed, when fed as a "lone" carbohydrate and also when mixed in different proportions with corn.

When the dried-molasses-beet-pulp was fed alone with alfalfa, the lambs required 6 per cent more dried pulp and 4.3 per cent more alfalfa to put on the same gains secured by corn and alfalfa. Where one-third of the grain mixture was dried pulp, 100 pounds of the pulp saved 104.4 pounds of corn, but the lambs ate 41.3 pounds more alfalfa. When dried-molasses-beet-pulp was fed, mixed in equal proportion with corn, 100 pounds of the dried pulp replaced 109.7 pounds of corn and 25.4 pounds alfalfa.

Wet Beet Pulp:

One ton of wet pulp replaced 222.1 pounds of corn and 208.0 pounds of alfalfa in putting on gains.

BUSINESS STATEMENT

November 27, 1920 to March 9, 1921
Based on Actual Receipts of Lambs
(Data for One Average Lamb)
All weights in pounds

Ration Fed*.....	Corn	Corn Molasses	Barley Molasses	Oats Molasses	Dried Molasses Beet Pulp	Corn (½) Dried Molasses Beet Pulp (½)	Dried Molasses Beet Pulp (1-3) Corn (2-3)	Corn, Wet Pulp
Lot Number.....	1	2	3	4	5	6	7	8
Av. Initial Weight, Fort Collins.....	70.7	71.0	71.1	71.1	71.2	70.8	70.9	71.3
Av. Final Wt. Ft. C.	101.8	103.3	100.3	101.2	100.4	103.5	102.3	105.5
Av. Final Wt. at Kansas City.....	92.8	93.8	90.3	90.9	89.7	92.8	92.8	95.0
Percent Shrink, Ft. C. to Kansas City	8.79	9.25	9.93	10.10	10.65	10.32	9.24	9.93
Total Gain.....	22.1	22.8	19.2	19.8	18.5	22.0	21.9	23.7
Cost at Feed Lot Per Cwt.....	11.28	11.28	11.28	11.28	11.28	11.28	11.28	11.28
Initial Cost at Feed Lot.....	7.98	8.01	8.02	8.02	8.03	7.99	7.99	8.04
Cost of Feed 93 Days**.....	2.97	2.86	2.97	3.02	2.53	2.76	2.95	2.43
Cost of Labor.....	.26	.28	.28	.28	.26	.26	.26	.56
Int on Invest. 8%..	.22	.22	.22	.23	.22	.22	.22	.22
Int. on Equip. 6%..	.05	.05	.05	.05	.05	.05	.05	.06
Shipping & Selling Expense #.....	.76	.77	.74	.74	.73	.76	.76	.78
Total Cost at K. C..	12.24	12.19	12.28	12.34	11.82	12.04	12.23	12.09
Selling Price per Cwt	8.75	8.65	8.00	8.50	8.25	9.00	9.00	8.65
Selling Price per Lamb.....	8.12	8.11	7.22	7.73	7.40	8.35	8.35	8.22
Net Return per Lamb.....	—4.12	—4.08	—5.06	—4.61	—4.42	—3.69	—3.88	—3.87
Necessary Selling Price per Cwt. K. C. to break even..	13.19	13.00	13.60	13.58	13.18	12.97	13.18	12.73
Dressing Percent....	50.6	50.4	49.7	49.0	49.0	51.3	50.5	51.8

*All Lots Self-fed Alfalfa Hay.

**Shelled Corn..$1.35 per Cwt.
Barley..... 1.50 per Cwt.
Oats..... 1.50 per Cwt.
Molasses.....15.00 per Ton
Dried Molasses Beet Pulp. ....$18.40 per Ton
Wet Pulp..... 1.25 per Ton
Alfalfa..... 14.40 per Ton

#Freight was paid to river on original car of lambs.

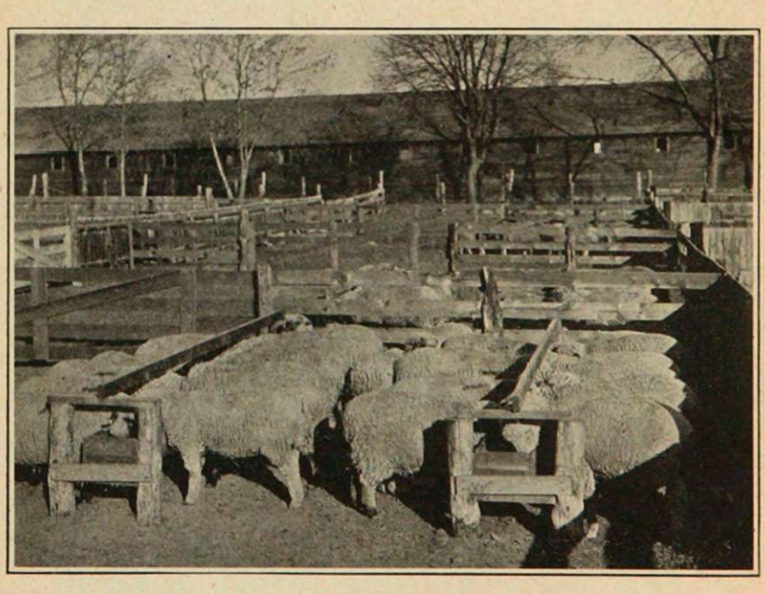
SHIPPING SHRINK

The lambs were unloaded twice en route to Kansas City. They were fed hay at North Platte and were held three days on hay and grain at Bismark Grove. On account of poor conditions met with at Bismark Grove and because the lambs had to be separated into the different lots before being sold, the shrink is probably greater than would appear under ordinary conditions. All lots were treated exactly alike, however, in order to obtain a true comparative shrink.

LABOR ESTIMATE

The cost of labor, where different rations are fed, is an important consideration. Labor costs, of course, must depend largely on distances feed must be hauled. Under ordinary conditions, where the hay fed is raised on the place and the grain haul is reasonably short, one man and team can haul and feed hay and grain to 1,750 lambs. Under similar conditions two men with one team can feed about 4,000 lambs.

When molasses is added to a grain-alfalfa ration and a three-ton tank is used, an additional man and team will be necessary every sixth day during the feeding period to haul



Doing Their Best to Make Cheap Gains. A Representative Lot on Feed at the Experiment Station.

molasses. With this force 4,000 lambs can be fed a quarter of a pound of molasses in addition to grain and hay.

When wet pulp is fed along with corn and alfalfa, one man and team ought to haul and feed grain and hay to 3,500 lambs, while two men with teams should haul twelve tons of pulp daily up to about four miles. This estimate considers that the lambs would only need about a half ration of corn and alfalfa when fed nearly seven pounds per head of the wet pulp. These figures are taken from data secured from observation and inquiry and represent an average which can be influenced by distance and ability of the men concerned.

There should be no extra labor cost over that of the check lot in feeding the dried-molasses-beet-pulp in addition to the corn.

SELLING PRICE PER CWT.

The lambs fed corn and dried pulp mixtures brought the highest price per pound on the market. The lambs in the check lot fed corn and alfalfa sold for 25 cents per cwt. less, because of several lambs that had not finished as well as those on the mixtures.

In the lots fed barley and oats the lambs did not show the finish secured in the corn fed lots. The lambs fed wet pulp were cut in price due to their heavier appearance and would doubtless have commanded a top price had they been nearer the handyweight size. In this case their loss would have been only $3.54 per head.

DRESSING PERCENT

The wet pulp lambs were the heaviest dressers, being followed by the half and half corn and dried pulpers. An examination of the lambs after they were slaughtered seemed to indicate that the wet pulp as well as the corn and dried pulp lambs were just as firmly fleshed as were those fed the straight corn ration.