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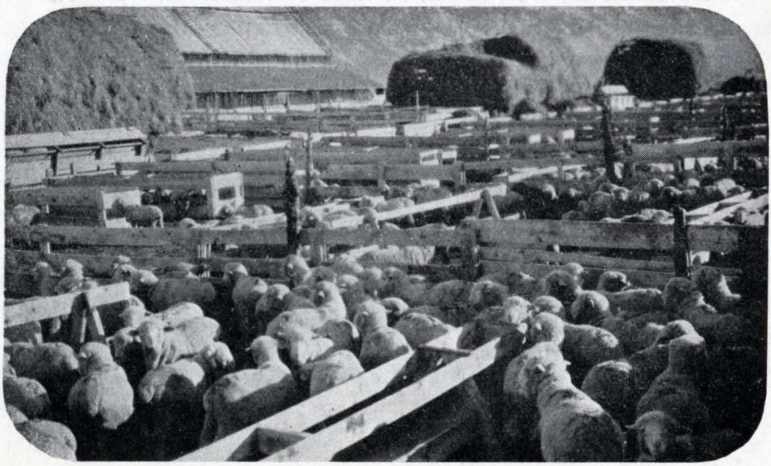

Whole barley and alfalfa hay form the basis of lamb-fattening rations in Utah. Supplements are needed, however, for quickest and cheapest gains.

UTAH AGRICULTURAL EXPERIMENT STATION
UTAH STATE AGRICULTURAL COLLEGE
LOGAN, UTAH

FOREWORD

This bulletin includes the results of Station Project 99—Fattening Lambs in Winter Drylot—which was begun at Monroe on November 15, 1928, and at Delta on November 13, 1929. The experiment was conducted for a period of four years at Monroe and for one year at Delta. Messers Alma and Milton Magelby of Monroe were closely associated with the Monroe experiment, furnishing the yards and the lambs as well as the feed used; the Monroe Lamb-feeders Association also cooperated in conducting this experiment. During the period that the Delta test was under way, Mr. J. F. Roe furnished the yards, the necessary lambs, and the feed supplies. Members of the Animal Husbandry Section of the Utah Agricultural Experiment Station have assisted in planning the experimental feeding work and have analyzed the results of the experiments.

SUMMARY

Monroe

1. General results secured in the feeding tests at Monroe indicate that while barley and alfalfa constitute an excellent basal ration for fattening lambs, supplemental feeds will materially increase gains and reduce fattening costs.

2. For fattening lambs there was no significant difference noted in the feeding value of alfalfa per pound from any crop grown under comparable conditions and cut at the same stage of maturity. Under conditions existing in the tests reported, first- and second-crop alfalfa cut at approximately the tenth-bloom stage was practically equal in feeding value. Third-crop alfalfa, cut at the bud stage of maturity, was worth about 30 per cent more per pound than the other crops.

3. A two-year comparison indicated an advantage in feeding lambs first-crop alfalfa during the first half of the fattening period, following this with the second-crop hay after the lambs had been brought up to a full feed of grain.

4. Brown-cured alfalfa proved more palatable than green-cured alfalfa of the same cutting. An average of two feeding tests showed the brown-cured hay to be worth slightly more per pound.

5. Although there was no significant difference noted in the gain-producing value of barley and wheat fed, wheat fattened 88.5 per cent of the lambs fed as compared with only 77 per cent of those fed on barley during the same period.

6. When fed with alfalfa hay, barley showed only 84.4 per cent the feeding value of shelled corn.

7. Sugar-beet molasses was equal in value to grain when spread in the grain trough and covered with grain. Each ton of molasses fed replaced 944 pounds of barley, 2636.4 pounds of alfalfa, and 38.6 pounds of salt. In addition, molasses raised the number of fat lambs from 77 to 96 per cent and increased their appraised valuation by 50 cents per hundred weight. Beet molasses proved instrumental in avoiding digestive disturbances.

8. Good corn silage fed at a rate not to exceed 1.5 pounds per head daily with barley and alfalfa was worth approximately one-half the value of alfalfa hay per ton.

9. The addition of cottonseed meal to a barley-alfalfa ration increased gain and finish, thereby enhancing the selling price per hundred weight of the lambs. Each ton of cottonseed meal replaced 1490.8 pounds of whole barley, 3514.5 pounds of alfalfa hay, and 52.1 pounds of salt.

10. Ground barley showed a distinctly lower feeding value than whole barley when fed to fattening lambs. It was noticeably less palatable than whole barley. Sheep with good teeth can grind their own grain.

11. Wrinkly lambs made comparable gains and at comparable feed costs with smooth lambs. Because of heavier pelts they are lower dressers; consequently, a slight price discrimination may be justified, in case the pelt is found to be worth less than the carcass.

12. Small young lambs, if thrifty, may be expected to produce slightly less but more efficient gains than larger older lambs.

Delta

1. Three groups of lambs in the single test at Delta were fattened on an average ration composed of 15.4 per cent barley and 84.6 per cent alfalfa hay. During different years, three groups at Monroe were fattened on a more concentrated ration composed of 32 per cent barley and 68 per cent alfalfa. The relative amounts of grain and alfalfa hay for optimum gains will depend on relative price of grain and hay used.

2. The customary relationship between shelled corn and whole barley was indicated by results secured at Delta.

3. The addition of cottonseed meal or a commercial protein concentrate increased unit feed costs per hundred weight gain but failed to increase gains.

4. Alfalfa chaff and barley straw produced low gains when fed without alfalfa hay.

5. Cottonseed meal proved more efficient than the commercial protein concentrate used when fed with grain and alfalfa chaff.

6. Re-cut alfalfa hay proved less valuable than whole alfalfa.

7. Wrinkly lambs showed little significant difference in gain or feed required per unit gain when compared with smooth-pelted lambs of the same breeding.

Lamb-Fattening Experiments in Utah[1]

E. J. Maynard, A. C. Esplin, and S. R. Boswell[2]

INTRODUCTORY

The fattening of range lambs with feeds grown on irrigated farms in Utah is an enterprise that offers a sound method for marketing home-grown grains, roughage, and by-products through livestock.

In attempting to secure the most efficient gains with feeds available certain problems have developed which it seems could best be solved by practical feeding experiments. For this reason the Utah Agricultural Experiment Station, in cooperation with certain Utah lamb feeders, assisted in the planning and supervision of a series of lamb-feeding experiments in which the lambs and feed were furnished by the individual feeders.

During the past decade there has been a gradual development in the lamb-feeding industry in certain sections of Utah, during which period farmers in these sections have become experienced lamb feeders.

The present extent of the lamb-feeding industry in the state as a whole is indicated by the distribution and numbers of lambs recorded on feed in the various fattening centers during the winter feeding season of 1930-31.

An abundant crop harvest in Utah during this season favored an extensive feeding program as a means of utilizing and marketing surplus feed to best advantage.

Table 1—Distribution of fattening lambs in Utah, winter-fattening season of 1930-31.

Location	Counties	No. on Feed
Northern Utah	(Boxelder, Cache)	67,000
North Central	(Weber, Davis)	82,000
Central	(Salt Lake, Utah)	16,000
Uintah Basin	(Duchesne, Uintah)	3,000
South Central	(Sanpete, Sevier)	41,000
South West	(Millard, Beaver, Iron)	30,000
South East	(San Juan)	6,000
	Total	245,000

Of the different lamb-feeding sections of the state, the development in the Sevier Valley and especially around Monroe has been noticeable. Lamb-feed-

Acknowledgments: The authors desire to express their appreciation to all those who have been associated in the prosecution of this project from the time of its beginning. They especially desire to express their appreciation to K. C. Ikeler, under whose supervision the project was begun; to Directors William Peterson and P. V. Cardon; to A. W. Magelby and Dan Larsen, respective chairmen of the Monroe Lamb-feeding Association for 1928-31 and 1931-32; to Alma and Milton Magelby; to J. F. Roe, representing the Pahvant Mercantile Investment Company; and to George Henderson, Royal Crook, Lamont Tueller, Martell Ellis, Mark Bennion, and Douglas Murdock.

[1]Contribution from Department of Animal Husbandry, Utah Agricultural Experiment Station.

[2]Station Animal Husbandman, Station Associate Animal Husbandman, and County Agricultural Agent of Sevier County, respectively.

Progress report of State Project 99: "Fattening Lambs in Winter Drylot."

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ing operations in this section have exerted a direct stimulus to grain and hay production.

Table 2 indicates the estimated number of lambs fed and amounts of feed produced in the Monroe district for the 10-year period of 1922-31, inclusive.

Table 2—Estimated amount of feed produced and number of lambs on feed at Monroe, Utah, 1922-31, inclusive.*

Year	Lambs Fed at Monroe	Barley (Bus.)	Alfalfa	
			Acres	Yield (Tons)
1922	20,000	**	26,360	3.0
1923	25,000	**	25,500	3.3
1924	28,000	10,000	28,600	2.8
1925	35,000	15,000	29,500	3.7
1926	44,000	18,000	29,500	3.5
1927	45,000	108,000	30,000	3.0
1928	46,000	161,437	30,000	2.8
1929	50,000	138,725	32,151	2.75
1930	35,000	109,039	**	**
1931	25,000	135,760	**	**

*Based on U. S. Bureau of Census reports. **Data not available.

OBJECTS OF DRYLOT FATTENING EXPERIMENTS

Monroe

Certain objectives, planned for the first feeding test conducted during the winter of 1928-29, at Monroe may be summarized as follows:

1. A comparison of first-, second-, and third-crop alfalfa hay when fed with whole barley to fattening lambs.
2. A determination of the relative efficiency in following first-crop with second-crop hay and second-crop with first-crop alfalfa hay in a fattening ration for lambs.
3. A comparison of mature hay and brown-cured hay.
4. A comparison of the fattening values of whole barley, shelled corn, and whole wheat when fed with alfalfa hay.
5. A determination of the fattening value of beet molasses when fed with whole barley and alfalfa and with shelled corn and alfalfa.
6. A comparison of whole and ground barley.
7. A determination of the value of kelp as a supplement to grain and alfalfa.

In the next feeding test conducted at Monroe during the winter of 1929-30, the beet-molasses comparisons with barley and with corn were discontinued as was also the experimental feeding test with kelp. The following new objectives were submitted:

1. A determination, in separate lots, of the value of cottonseed meal, corn, and rape silage and of a commercial mineral mixture when added to a barley-alfalfa combination.
2. A comparison of whole barley and shelled corn when fed with corn silage and alfalfa hay.

In a third feeding test conducted at Monroe during the winter of 1930-31, second-crop alfalfa and brown-cured hay were not included in the tests. New comparisons included the use of cottonseed meal in an oats-alfalfa ration, large vs. small lambs, wether vs. ewe lambs, and white-faced ewe lambs vs. black-faced ewe lambs.

A fourth and final feeding test was conducted at Monroe during the winter of 1931-32. In an effort to strengthen results secured, it was planned to duplicate some of the principal comparisons already made during the three previous tests. The objectives of this final test included:

1. A comparison of first-, second-, and third-crop alfalfa.
2. A comparison of barley, wheat, and corn.
3. A comparison of small, medium, and large lambs.
4. A comparison of smooth and wrinkly lambs.
5. A determination of the feeding value of beet molasses, corn silage, and cottonseed meal.
6. A determination of the value of grinding barley.

Delta

Objectives planned for the single feeding test conducted at Delta during the winter of 1930-31 were as follows:

1. A comparison of whole barley and shelled corn.
2. A comparison of smooth and wrinkled lambs.
3. A determination of the supplemental value of cottonseed cake and a commercial mixed feed.
4. A determination of the relative value of alfalfa chaff and straw when used to replace alfalfa hay for a part of the fattening period.
5. A comparison of recut and whole alfalfa.

Due to the fact that the feeding test at Delta was characterized by a much lighter grain feed and much heavier hay consumption than the series of tests at Monroe, the Delta results are not averaged in with results secured at Monroe but are reported separately.

PLANT AND EQUIPMENT USED

The feed-yards for the Monroe lamb-feeding experiment were located on the farm of Alma Magelby near Monroe. Twelve pens were constructed along the south side of a tight board fence. The pens were uniform in nearly every respect. They were approximately 60x20 feet, allowing about

Figure 1—Movable granary and hay scales used for weighing grain and hay in lamb-feeding experiments at Monroe.

23 square feet per lamb. There was no overhead shelter and the board fence on the west furnished a shelter from the prevailing winds which came from the southwest. Straw for bedding was used during the feeding tests.

The hay mangers were more or less varied in construction during the early tests. They varied in height from approximately 12 to 18 inches and in width from approximately 24 to 32 inches. It was observed that the height and width of the mangers influenced the amount of hay cleaned up, more being left in the higher, wider mangers than in the others, especially during the first part of the feeding tests. About 1.25 feet of hay manger space was allowed for each lamb. Mangers were open at the outer end so that the hay could be scattered evenly.

The feed-yards for the Delta lamb-feeding experiment were located on the ranch owned by the Pahvant Mercantile and Investment Company, near Delta.

Twelve pens were arranged in two rows of six each and were about 35x40 feet in size, accommodating 125 lambs per pen. Hay panels in the pens took up 140 square feet, leaving about 10 square feet of space per lamb, which was found to be ample. The lambs were grained in a single grain pen.

Hay panels were made from unfinished lumber. A 1x12 bottom board, an 8-inch feeding space, and two 1x6 boards with a 6-inch space between were used. These panels were 14 feet long and were set up with a 30-inch hay space between them for feeding hay. Straw was spread in the bottom to protect alfalfa hay fed.

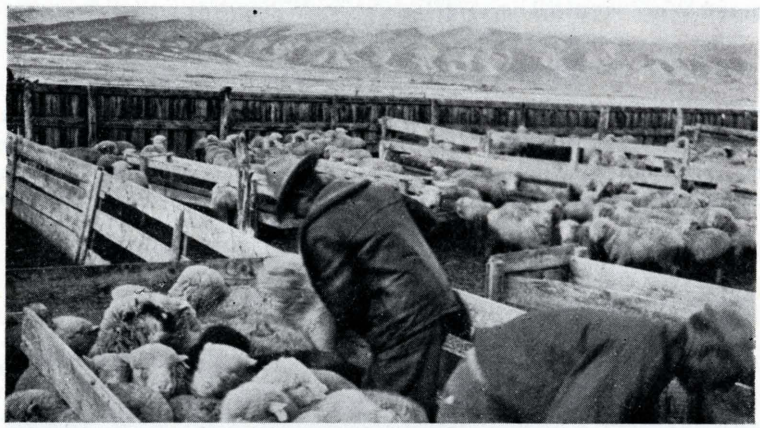

Figure 2—Groups being sorted into fat and feeder lambs at end of experiment. The valuation put on each group at this time was an important factor in determining relative value of the different rations.

Fourteen-foot grain troughs with 1x12 bottoms and 1x4 sides were mounted on legs and set up at intervals of 8 feet in the grain pen.

At the start each lamb had 0.9 foot of space at the grain pen; at the close of the experiment, however, this had been increased to 1.35 feet. Lambs ate grain from both sides of the trough so that each running foot accommodated about two lambs. A pole suspended about a foot above the grain troughs kept the lambs from jumping in or over them.

Coarse salt was self-fed in boxes. Clean water was available in steel troughs. All hay was stacked on the north side of the pens as a windbreak. All hay, grain, and supplements fed were carefully weighed to the lambs.

Although lambs in the Monroe tests were grained in the hay pens, it is customary for best results to use a separate grain pen where the grain can be spread evenly before each pen of lambs is turned in to consume it.

In a regular lamb-feeding operation this procedure allows the lambs to be sorted into separate groups of small, medium, and large lambs and gives each group better opportunity to get a uniform share of grain with this cafeteria plan of grain-feeding. Excessive death losses may often be avoided by using this simple scheme.

Salt boxes at Monroe held about 25 pounds of salt and were kept filled. V-shaped wooden water troughs were used and clean water was available at all times. Each trough served two pens. The water, which was piped from a spring, was warm enough so that only occasionaly did the troughs freeze; it ran continuously.

Scales were located near the yards and were kept in good condition. Hay, grain, and other feeds were weighed as fed. During the first tests at Monroe the grain was measured in buckets after a close check upon the weights of the various grains. These measurements were checked frequently. During the last test all grain was weighed as fed to the lambs.

Hay was stacked near the pens and fed from the various stacks. As nearly as possible the lambs were handled and fed according to the prevailing custom of commercial lamb feeders.

LAMBS USED

The lambs used in the feeding tests at Monroe and Delta were native southern Utah feeder lambs, with Rambouillets predominating. From 1 to 2 per cent were distinctly wrinkled; during the last two tests the wrinkly lambs were sorted out and fed in separate lots. In later tests the smallest and largest lambs were sorted out and fed in separate pens.

In all tests where different rations were compared the pens of lambs used were uniform throughout in size, weight, and breeding. When conditions were favorable the lambs were allowed to run in alfalfa stubble and grain stubble fields for about a month in the fall before being put on feed in the drylot.

FEEDS USED

Barley and alfalfa hay constitute Utah's basal ration for fattening livestock. Barley production has increased almost 600 per cent during the past 30 years, representing a total of 1,453,021 bushels for the state in 1929.

Although wheat surpasses barley in production in the state, its lower acre-yield favors barley as a livestock fattening feed, while most corn grain used in the state must be shipped from eastern points. Although barley is recognized everywhere as an excellent fattening feed, experience has shown that to produce most efficient results some supplementary carbonaceous feed is required along with a straight barley and alfalfa ration. Barley and alfalfa hay alone exert a stronger growth-producing tendency than is de-

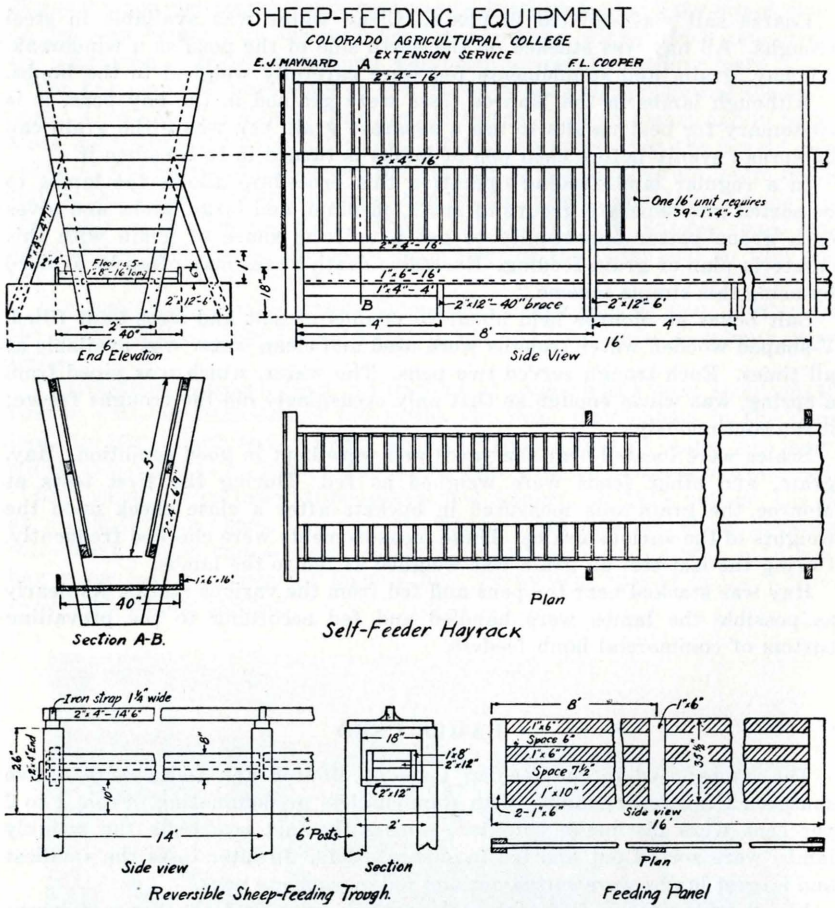

Figure 3—Plan for alfalfa-hay feeder, stationary reversible grain trough, and hay panel. Figure four lambs per running-foot for self-feeder and 1 foot panel space per lamb for hay; then each 14-foot grain trough will accomodate 28 lambs. (Courtesy, Colorado Agricultural Experiment Station.)

sirable in putting a quick market finish on lambs. One of the primary objectives of this experimental work has been to find supplements best adapted for improving the fattening qualities of the barley-alfalfa ration.

In Table 3, feeds used in the tests have been divided into two main groups: (1) Carbohydrate or fat- and energy-producing feeds and (2) protein- or growth-producing feeds.

Barley used in the feeding tests was produced locally and was characteristic of intermountain barley, in that the Trebi variety predominated and was bright and plump; it was not recleaned. Wheat was of good quality and uniform throughout. Most of the corn was of the No. 3 yellow grade, although some No. 2 white and No. 2 mixed were also used. When fed with alfalfa hay, which is rich in vitamin A, color is not considered as a factor in the feeding value of corn. Beet molasses, secured from the sugar factory,

was uniform throughout the tests. Corn ensilage was of fairly good quality but was immature. In the second test at Monroe it contained rape, but in the last test the ensilage was made from corn alone. At Monroe, first-crop alfalfa hay was generally of good quality, being bright, leafy, and fairly fine. Some of the first-crop alfalfa contained some grass. Second-crop alfalfa hay was coarser and stalkier and was less bright and with fewer leaves; it contained some mold. Third-crop alfalfa hay was bright, extremely fine, and extra leafy, containing a slight amount of mold.

Table 3—Chemical analyses of feeds used in lamb-feeding experiments, at Monroe and Delta.*

	Water	Ash	Crude Protein	Carbohydrate		Fat
				Fiber	N-free Extract	
Carbohydrates						
Concentrates						
Barley	11.31	3.43	10.91	5.85	66.64	1.86
Corn	13.14	1.62	9.65	3.12	68.30	4.08
Wheat	10.20	1.90	12.40	2.20	71.20	2.10
Oats	11.75	3.65	12.15	10.90	56.25	5.30
Molasses (beet)	19.80	10.40	9.30	0.00	60.50	0.00
Roughages						
Corn silage	75.39	1.86	1.96	6.56	13.02	1.21
Proteins						
Concentrates						
Cottonseed Meal (43% protein)	7.14	5.64	42.19	9.35	28.23	7.45
Roughages						
Alfalfa, 1st crop	8.5	8.8	13.9	30.9	36.2	1.7
Alfalfa, 2d crop	7.3	9.0	14.7	31.9	35.4	1.7
Alfalfa, 3d crop	8.9	9.5	14.6	28.4	36.8	1.8
Alfalfa Seed Chaff	5.6	4.9	6.3	54.4	27.9	0.9
Barley Straw	14.2	5.7	3.5	36.0	39.1	1.5

*Figures from: (1) Henry and Morrison, "Feeds and Feeding," Appendix.
(2) Colorado Agr. Exp. Sta. Bul. 379, p. 7.

Brown-cured or tobacco alfalfa was of the first crop and was fully as high in quality as the well-cured first-crop alfalfa hay fed. It had the characteristic aroma, was dry, with medium brown leaves, and was not easily shattered. It contained little mold, a little bright hay on the edges, and some cheat grass. No record was kept of the relative acre-yield of the different crops of hay used.

First- and second-crop alfalfa was cut at about the same stage of maturity throughout the tests, or when from one-tenth to one-fourth in bloom.

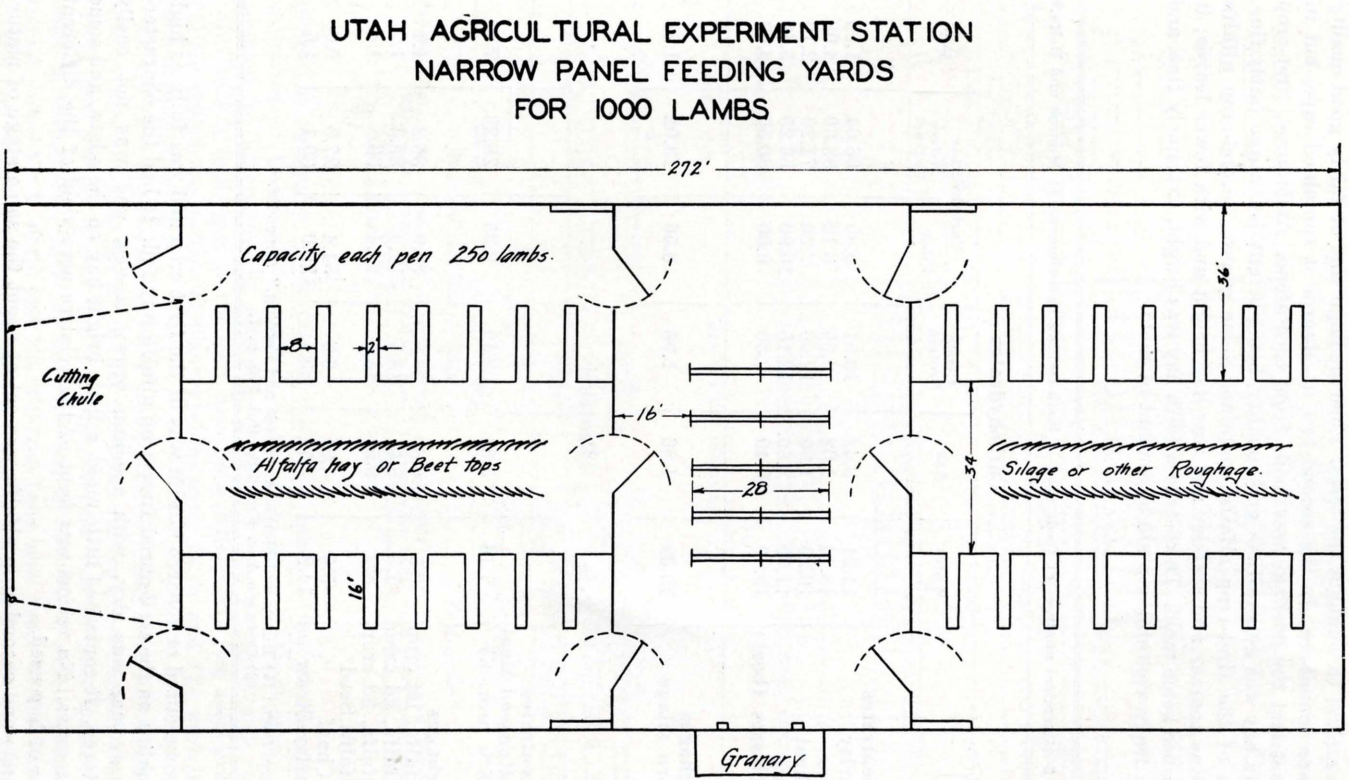

Figure 4—Narrow panel feeding yards for 1000 lambs.

Third-crop alfalfa was cut at an earlier stage of maturity, or when in the bud stage. Consequently, the feeding value per ton of the different cuttings, as indicated in the experiments, should be correlated with approximate acre-yields of the different cuttings to determine actual return per acre[3]. During the first part of the test at Delta, lambs were fed on fine, well-cured first-cutting alfalfa which was free from weeds and mold. Following this period the hay became poorer in quality and coarser with weeds and less leaves. Second-crop hay which was extremely coarse and contained a small amount of oat hay was fed during a portion of the latter part of the feeding period. None of the hay was graded.

Alfalfa-seed chaff varied in quality, some being extremely fine and other extremely coarse. Some contained an abundance of weed stems and a small quantity was infested with foxtail. Clean, bright barley straw, both coarse and fine, was fed. Lambs seemed to prefer the coarse straw. Barley used in the Delta test was for the most part clean and plump. Clean yellow corn was fed throughout the experiment. Cottonseed cake was of good quality and guaranteed 43 per cent protein. The commercial-mixed feed fed at the beginning and close of the test was good uniform feed; however, some used during the test appeared somewhat different in composition. Royal crystal stock salt was self-fed. Water was pumped from a well and was fairly warm.

Throughout the entire Delta test there was a shortage of water; however, this condition was more pronounced during the first 60 days of the test.

METHODS OF FEEDING

At Monroe, lambs were grained starting at 6:00 a. m. and again at 4:30 p. m. Hay was fed immediately after all lambs were grained. The amount

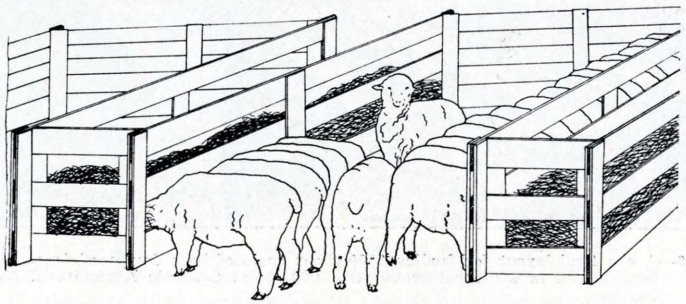

Figure 5—Detail of narrow panel method for feeding roughage to lambs. With this method lambs feed hay, pulp, or silage up to each other.

of hay allowed was determined by the manner in which the previous feed had been cleaned up. An attempt was made to make the lambs clean up practically all hay. They were started on 0.1 pound of grain per head daily, this amount being gradually increased until after about 30 days they were receiving 1 pound per head daily. Grain increases from then on were gradual and were regulated by the manner in which the lambs took their grain.

[3]These determinations were not made for this experiment.

FEED PRICES USED

The actual feed prices charged at Monroe during the four feeding trials are indicated in Table 4.[4]

Table 4—Actual feed prices charged at Monroe for four feeding experiments, 1928-32.

	Feeding Trials				
	1928-29	1929-30	1930-31	1931-32	4-year Avg.
Whole barley (cwt.)	$ 1.75	$ 1.90	$ 1.50	$ 1.12	$ 1.58
Ground barley (cwt.)	1.85	2.00	*	1.24	1.70
Shelled corn (cwt.)	2.00	2.00	1.75	1.29	1.76
Wheat (cwt.)	1.67	1.66	1.25	1.09	1.42
Oats (cwt.)	1.75	*	1.25	*	1.50
Molasses (ton)	14.75	*	*	8.00	11.38
Ensilage (ton)	*	4.00	*	5.00	4.50
Cottonseed meal (ton)	*	60.00	70.00	27.00	52.33
Alfalfa (ton)	10.00	12.00	8.00	10.00	10.00
Alfalfa (2d-crop) (ton)	10.00	10.00	8.00	10.00	9.50
Kelp			no price		
Mineral mixture (ton)	*	69.00	*	*	69.00
Salt (ton)	20.00	15.00	12.00	10.00	14.25

*Specified feeds not used.

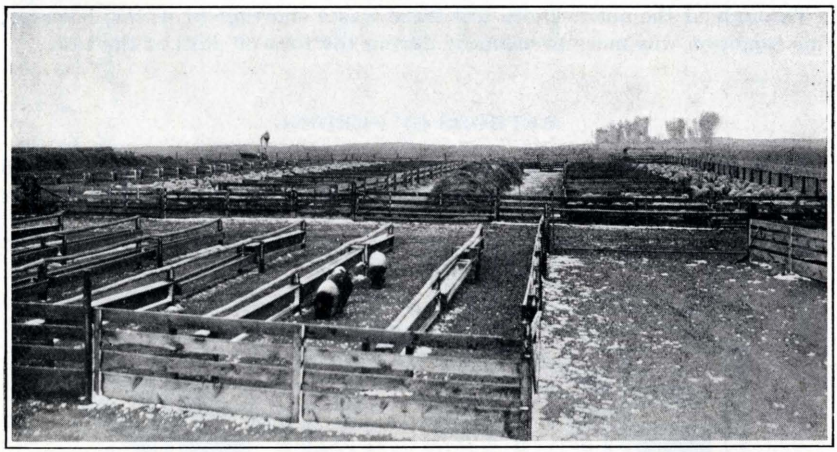

Figure 6—A practical layout for feeding 2100 sheep enclosed by a dog-proof fence. Reversible troughs are in a central grain pen. (Courtesy, Colorado Agricultural Experiment Station.)

In the first test beet-molasses was mixed with water at the rate of approximately four parts of molasses to one part of water, the mixture being spread on the hay. Most of the lambs seemed to relish the molasses when fed in this manner, but the stems of the hay seemed to be made less palatable by this treatment since many stalks were left even when the ration was decreased to where other lots were cleaning up every stalk. Especially during the latter part of this feeding test these lambs consumed considerably less hay covered with molasses than those fed straight hay at the same time, leaving more stems and other waste.

[4]Feed prices used at Delta are considered in discussion of Delta experiment.

In the last feeding test the beet molasses was spread in a thin ribbon down the center of the grain troughs and the grain allowance was spread over it. The lambs took this molasses much more readily than when it was fed on the hay.

Corn silage, cottonseed cake, and other supplemental feeds were fed with the grain in troughs.

At Delta the lambs were fed grain starting at 7:20 a. m. and again at 3:00 p. m. They were fed hay immediately after consuming their grain, which required about 15 minutes per pen. To insure uniform consumption grain was spread in the troughs before the lambs were turned into the grain pens.

Lambs were started on straight barley or corn at about 0.2 pound per head daily in two feeds and were increased rapidly to 0.6 pound.

The lots which received supplements were started on less grain, but the weight of supplement fed made up for the difference. Lambs were held at 0.6 pound of grain per head daily for some time, refusing more while quality of hay was good. With the poorer quality of hay fed during the latter part of the test they were gradually raised to a full feed of 1.2 pounds of grain per head daily, which was the maximum amount fed during the test.

As prices of feed used in the experiments fluctuated widely throughout the different trials, relative feed prices have been assumed based on the estimated present price of barley and first-crop alfalfa. As these feeds represent the basal ration in all tests this procedure permits the calculation of the relative feed replacement values for other feeds used. Prices per ton, assumed for the comparison, are:

All whole grain	$20	Alfalfa (all crops)	$ 8
Ground grain	22	Kelp	40
Beet molasses	8	Mineral mixture	60
Ensilage	4	Salt	10
Cottonseed meal	30		

This procedure allows a comparison of results secured during the different years of the experiment.

FEEDING VALUE OF DIFFERENT CROPS OF ALFALFA HAY

In attempting to determine the relative value of the different crops of alfalfa hay when fed with barley to fattening lambs, tests were conducted at Monroe during the seasons of 1928-29, 1929-30, and 1931-32. Each year three lots of lambs comparable in size, weight, and condition were fed a uniform amount of grain, while each lot received all the first- second-, or third-crop alfalfa they would clean up. Figures are not available to indicate the stage of maturity of the several crops of alfalfa when harvested during the first two trials, but it is assumed that this factor corresponds in a general way with the maturity of the different crops as indicated by records secured during the last trial.

In the 1931-32 test first-crop alfalfa was cut when the plants were approximately one-tenth in bloom; second-crop alfalfa was cut in early bloom or slightly ahead of first-crop hay in development; and third-crop alfalfa was harvested at a distinctly earlier stage of growth, commonly termed the bud stage.

The importance of these various stages of maturity as factors in influencing relative feeding value of alfalfa per pound has been indicated by pre-

vious studies conducted by McCampbell and Winchester of the Kansas Station[5] who found that the feeding value per pound of alfalfa decreases but that its acre-yield increases with advancing maturity of the plant. They found that the highest approximate feeding value per acre was secured with any crop of alfalfa when harvested in the one-fourth bloom stage (14).

Under Sevier County conditions in Utah there is usually little variation between stage of maturity of first- and second-crop alfalfa, when harvested, slight variations occurring either way, depending on weather conditions and availability of irrigation water; however, third-crop alfalfa is generally cut at an earlier stage of maturity than first- or second-, due to its shorter growing season.

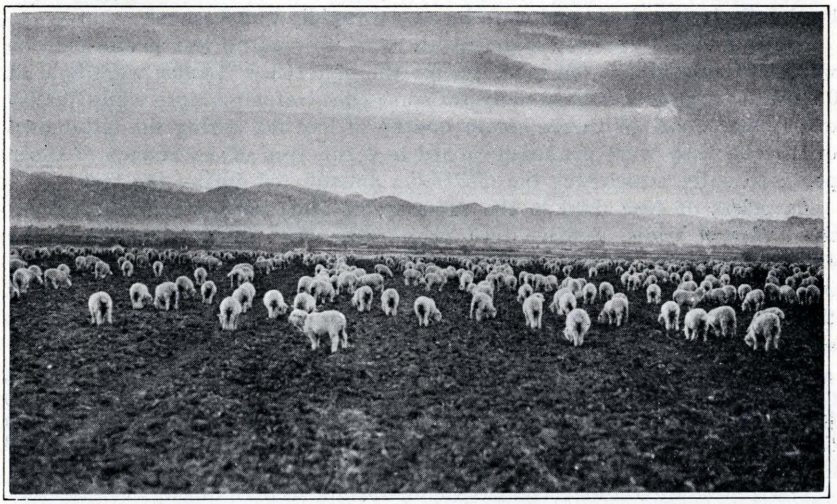

Figure 7—Pasturing beet tops is good practice during good weather; otherwise tops should be piled or stacked and fed in drylot. (Courtesy, Colorado Agricultural Experiment Station.)

In the 1928-29 test the comparisons indicate that each ton of first-crop alfalfa fed to the lambs plus 39.1 pounds of barley plus 0.8 pound of salt equalled or replaced 2106.2 pounds of second-crop alfalfa. In other words, with first-crop alfalfa worth $8 per ton, barley worth $1 per hundred weight, and salt worth $10 per ton, second-crop alfalfa had an equivalent value of $7.97 per ton; or second-crop alfalfa had 99.6 per cent the feeding value of first-crop alfalfa.

In the same test each ton of first-crop alfalfa plus 25.6 pounds of barley plus 1.3 pounds of salt replaced or was equal to 1900.5 pounds of third-crop alfalfa. Using the same values expressed above for first-crop alfalfa, barley, and salt, third-crop alfalfa had an equivalent value of $8.70 per ton; third-crop hay thus showed 108.8 per cent the feeding value of first-crop alfalfa.

In the second test conducted during the feeding season of 1929-30, second-crop alfalfa showed an exceptionally high feeding value as compared with first-crop alfalfa. As the relative maturity of these two crops was not recorded, it is not indicated whether this maturity factor might not have

[5]Henry, W. A. and Morrison, F. B.: "Feeds and Feeding," p. 490.

been responsible for differences noted. Third-crop alfalfa, however, showed even a higher feeding value than second-crop in this test.

Each ton of first-crop alfalfa plus 102.9 pounds of barley plus 2.2 pounds of salt was equal to or replaced 1755.7 pounds of second-crop alfalfa in this feeding trial. On the basis of feed prices used and with first-crop alfalfa hay valued at $8 per ton, second-crop alfalfa was worth $10.30 per ton, or 129 per cent the value of first-crop alfalfa.

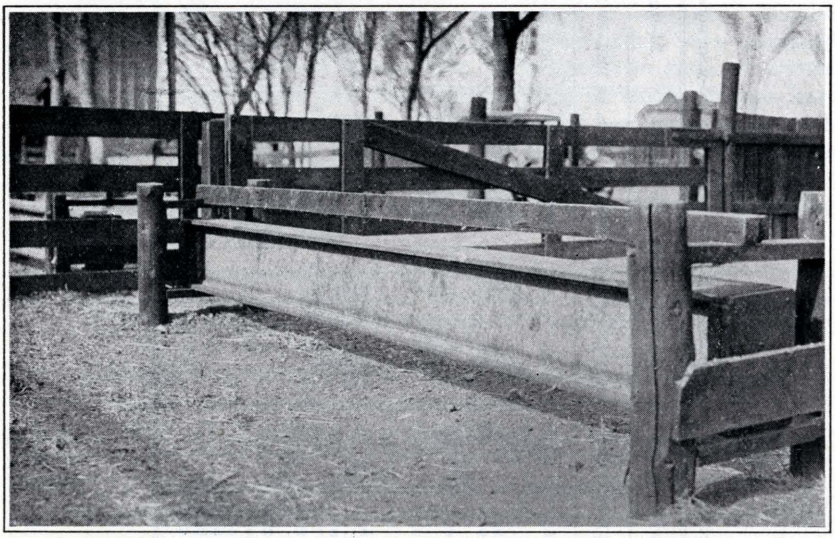

Figure 8—Reversible troughs insure clean feed for a minimum outlay of labor. (Courtesy, Colorado Agricultural Experiment Station.)

Each ton of first-crop alfalfa plus 165.9 pounds of barley plus 5.1 pounds of salt equalled 1660.5 pounds of third-crop alfalfa in this test, indicating a value of $11.66 per ton for third-crop alfalfa with first-crop alfalfa valued at $8 per ton.

In final comparisons made during the 1931-32 feeding trial, a record was kept of the stage of maturity of each crop when cut, which proved to be a dependable index to feeding value of hay per pound.

Each ton of first-crop alfalfa cut at a tenth-bloom stage of maturity plus 10.5 pounds of barley but minus 1.1 pounds of salt replaced 2001.7 pounds of second-crop alfalfa, cut at a slightly earlier stage of maturity; in other words, with first-crop alfalfa valued at $8 per ton second-crop alfalfa was worth $8.11 per ton.

Each ton of this first-crop alfalfa fed plus 203.6 pounds of barley plus 4.3 pounds of salt replaced 1750.5 pounds of third-crop alfalfa cut at the bud stage in this test. Using the customary feed values, this gives third-crop alfalfa in the final trial a value of $11.49 per ton with first-crop alfalfa valued at $8 per ton. A summary of values secured during three years and based on a standard value for first-crop alfalfa is expressed on a percentage basis in Table 5.

Table 5—Relative feeding value of different crops of alfalfa when fed with whole barley, for a 3-year period.

RATION FED	1st-crop Alfalfa with Barley				2d-crop Alfalfa with Barley				3d-crop Alfalfa with Barley			
YEAR	1928-29	1929-30	1931-32	Avg.	1928-29	1929-30	1931-32	Avg.	1928-29	1929-30	1931-32	Avg.
Initial Weight (lbs.)	63.9	68.8	55.0	62.5	62.5	63.6	53.9	60.0	63.5	68.2	52.9	61.5
Final Feed-lot Weight (lbs.) (With 4% Shrinkage)	93.0	89.7	74.8	85.8	90.4	87.2	73.7	83.8	94.0	93.6	78.6	88.7
Total Gain	29.1	21.0	19.8	23.3	27.9	23.6	19.9	23.8	30.5	25.3	25.7	27.2
Daily Gain	0.29	0.23	0.2	0.24	0.28	0.26	0.2	0.25	0.31	0.28	0.26	0.28
Daily Feed												
Grain	1.05	1.03	0.82	0.97	0.96	1.03	0.81	0.93	1.07	1.03	0.82	0.97
Alfalfa	2.25	2.11	1.85	2.1	2.27	2.09	1.86	2.1	2.24	2.12	2.11	2.16
Salt	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02	0.03	0.02	0.02	0.02
Feed Required for cwt. Gain (4% Shrinkage)												
Grain	361.1	441.7	415.2	406.0	346.0	395.0	410.3	383.8	351.2	366.4	319.8	345.8
Alfalfa	772.2	907.8	937.1	872.4	813.2	796.9	937.9	849.3	733.8	753.7	820.2	769.2
Salt	9.5	8.8	10.4	9.6	9.2	7.8	10.9	9.3	9.0	7.3	8.4	8.2
Feed Cost per cwt. Gain	6.75	8.09	7.95	7.60	6.76	7.18	7.91	7.28	6.49	6.72	6.52	6.58
Cost of Lambs at $3.75 cwt.	... *	...	2.06	...	...	...	2.02	...	...	...	1.98	...
Feed Cost per Lamb	...	...	1.57	...	...	...	1.57	...	...	...	1.68	...
Total Cost per Head	...	...	3.63	...	...	...	3.59	...	...	...	3.66	...
Number Fat Lambs out of 70	...	...	54	...	...	...	56	...	...	...	57	...
Valuation per cwt. (all lambs)	...	...	4.21	...	...	...	4.25	...	...	...	4.26	...
Gross Return	...	...	3.15	...	...	...	3.13	...	...	...	3.35	...
Net Return	...	...	—0.48	...	...	...	—0.46	...	...	...	—0.31	...
Dollars per cwt. to break even	...	...	4.86	...	...	...	4.89	...	...	...	4.66	...

*Data not available.

A consideration of the three years' work with the available records indicates no significant difference between the feeding value per pound of first- and second-crop alfalfa but a substantially higher value per pound for third-crop alfalfa, due apparently to the earlier stage of maturity when cut. The general results seem to bear out previous conclusions of Widtsoe and Stewart (19), Foster and Merrill (8), and Carroll (3), all formerly of the Utah Station, as well as of Sotola (18) of the Washington Station to the effect that there is little significant difference in the feeding value of alfalfa per pound from any crop, provided after having been grown under comparable conditions it is cut at the same stage of maturity. Results secured at the Wisconsin Station indicate the higher yields with increased maturity of crop. Moore and Graber (15) found that two crops of alfalfa cut at the full-bloom stage will yield as much hay as three cuttings harvested in the bud or tenth-bloom stage. The later cut hay, however, is much coarser and of poorer quality for feeding. The general consensus of opinion seems to indicate that the highest acre-feeding-value of alfalfa, which must consider both yield and feeding value per pound, may be obtained by cutting at about the fourth-bloom stage.

Table 6—Summary of relative feeding value of different crops of alfalfa hay fed with barley to fattening lambs (percentage of first-crop alfalfa), Monroe.

Year	Crop		
	First	Second	Third
1928-29	100	99.6	108.8
1929-30	100	128.8	145.8
1931-32	100	101.3	143.6
3-Year Average	100	109.9	132.7

The general results secured in these tests, as shown in Table 6, apparently indicate that stage of maturity at harvesting time is a definite factor in determining the value of different cuttings of alfalfa hay for fattening lambs.

Although data are not available to account for the exceptionally high feeding value shown by second-crop alfalfa in the 1929-30 test, general results indicate that first- and second-crop alfalfa harvested under similar conditions and at practically the same stage of maturity had practically the same feeding value, while third-crop alfalfa harvested at an earlier stage of maturity had approximately a 30 per cent higher feeding value per ton. The yield of third-crop alfalfa per acre was undoubtedly lower than that of first- or second-crop.

First-crop Followed by Second-crop Alfalfa versus Second-crop Followed by First-crop Alfalfa

Lamb feeders, anxious to avoid digestive disturbance in starting their lambs on feed, are confronted with the problem of which cutting of hay to use first. In a test covering two feeding trials a comparison was made

in which first-crop alfalfa was fed during the first half of the fattening period to one pen, while second-crop was fed to the other. The cutting of hay was then reversed so that each pen received the other cutting during the balance of the feeding period.

Table 7—Comparative results obtained from feeding first-crop followed by second-crop alfalfa and vice versa, Monroe, 1928-30.

RATION FED	1st-crop followed by 2d-crop Alfalfa			2d crop followed by 1st-crop Alfalfa		
YEAR	1928-29	1929-30	Avg.	1928-29	1929-30	Avg.
Initial Weight (lbs.)	62.8	66.1	64.45	63.7	65.0	64.35
Final Feed-lot Weight (lbs.)	92.6	90.3	91.45	91.8	86.5	89.15
Total Gain	29.8	24.2	27.00	28.2	21.5	24.85
Daily Gain	0.3	0.27	0.29	0.28	0.24	0.26
Daily Feed						
Grain	0.96	1.03	1.00	0.96	1.03	1.00
Alfalfa	2.34	2.13	2.24	2.25	2.12	2.19
Salt	0.03	0.02	0.03	0.03	0.02	0.03
Feed Required per cwt. Gain (4% Shrinkage)						
Grain	323.9	384.9	354.4	342.7	433.5	388.1
Alfalfa	752.5	790.9	771.7	800.7	887.6	844.2
Salt	9.0	7.6	8.3	9.0	8.6	8.8
Feed Cost per cwt. Gain	6.2	7.05	6.63	6.67	7.93	7.3

In the 1928-29 test first-crop alfalfa was fed with whole barley during the first 45 days of the test. Second-crop alfalfa was then fed with whole barley during the last 55 days of the trial. In a second lot, second-crop alfalfa was fed during the first 45 days followed by first-crop hay during the last 55 days. In the 1929-30 test this procedure was duplicated, except that each crop was fed during a 50-day period. The 2-year comparison indicates an advantage in feeding first-crop alfalfa before second-crop alfalfa.

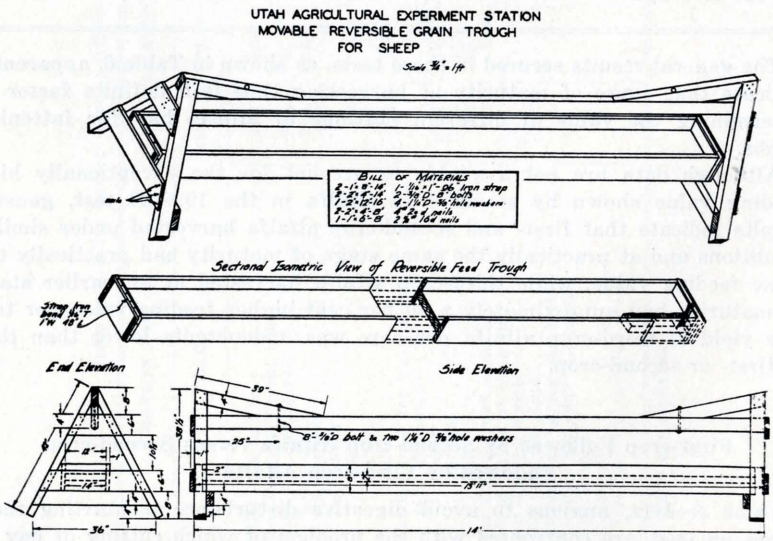

Figure 9—A movable reversible trough is handy for use in the field as well as in drylot.

Brown-cured Alfalfa versus Green-cured Alfalfa

Brown-cured alfalfa, due to an aromatic flavor brought about by fermentation in the stack, is more palatable than green-cured hay. Consequently, it is well liked by stock and is usually consumed with less waste than green-cured hay. The loss of nutrients, however, is claimed to be higher than in hay cured under normal conditions. Any comparison of feeding values should be accompanied by figures indicating relative acre-yield.

Table 8—Comparative results obtained from feeding brown-cured versus green-cured alfalfa with barley fed as a supplement, Monroe, 1928-30.

RATION FED	Brown-cured Alfalfa with Barley			Green-cured (1st crop) Alfalfa with Barley		
YEAR	1928-29	1929-30	Avg.	1928-29	1929-30	Avg.
Initial Weight (lbs.)	63.7	66.1	64.9	63.9	68.8	66.35
Final Feed-lot Weight (lbs.)	94.3	87.5	9.09	90.3	89.7	90.00
Total Gain	30.6	21.4	26.00	29.1	21.0	25.05
Daily Gain	0.31	0.24	0.28	0.29	0.23	0.26
Daily Feed						
Grain	0.96	1.02	0.99	1.05	1.03	1.04
Alfalfa	2.28	2.20	2.24	2.25	2.11	2.18
Salt	0.03	0.02	0.03	0.03	0.02	0.03
Feed Required per cwt. Gain (4% Shrinkage)						
Grain	315.7	430.7	373.2	361.1	441.7	401.4
Alfalfa	746.6	926.4	836.5	772.2	907.8	840.0
Salt	10.2	8.7	9.45	9.5	8.8	9.15
Feed Cost per cwt. Gain	6.19	8.06	7.13	6.75	8.09	7.42

In the 1928-29 test, 2000 pounds of well-cured first-crop alfalfa plus 117.6 pounds of barley less 1.81 pounds of salt equalled or replaced 1936.3 pounds of brown-cured first-crop alfalfa. At feed prices used, each ton of brown-cured alfalfa fed was worth $9.17, or 114.6 per cent the value of well-cured first-crop alfalfa.

In the 1929-30 test 2000 pounds of well-cured first-crop alfalfa plus 24.2 pounds of barley and 0.2 pound of salt replaced 2041 pounds of brown-cured first-crop alfalfa. At prices used each ton of the brown-cured alfalfa fed was worth $8.08, or 101 per cent of the feeding value of well-cured first-crop alfalfa. An average of the two tests shows brown-cured alfalfa to be worth 107.8 per cent the value of well-cured first-crop alfalfa.

Wheat versus Barley

In the 1928-29 test fed with alfalfa hay each ton of whole wheat plus 335.3 pounds of alfalfa plus 4.3 pounds of salt equalled or replaced 2209.2 pounds of whole barley in producing gain. With wheat worth $20 a ton, alfalfa worth $8 a ton, and salt worth $10 a ton, barley showed a replacement value of $19.34 a ton, or 96.7 per cent the value of wheat. In the 1929-30 test each ton of whole wheat fed plus 740.2 pounds of alfalfa plus 6 pounds of salt equalled or replaced 1698.9 pounds of barley. At feed prices quoted, barley in this test was worth $27.07 a ton, or 135 per cent the value of wheat. In the 1930-31 comparison each ton of whole wheat fed plus 221.1 pounds of alfalfa replaced 2044.8 pounds of barley. At prices quoted, barley was worth $20.43, or 102 per cent the value of wheat in producing gain.

Table 9—Relative feeding value of whole wheat and barley for a 3-year period.

RATION FED	WHEAT				BARLEY			
	1st-crop Alfalfa		2d-crop Alfalfa	3-year Avg.	1st-crop Alfalfa		2d-crop Alfalfa	3-year Avg.
YEAR	1928-29	1931-32	1929-30		1928-29	1931-32	1929-30	
Initial Weight (lbs.)	63.6	54.8	70.0	62.80	63.9	55.0	63.6	60.83
Final Feed-lot Weight (lbs.) (With 4% Shrinkage)	91.0	74.7	89.9	85.20	93.0	74.8	87.2	85.00
Total Gain	27.4	19.9	19.9	22.40	29.1	19.8	23.6	24.17
Daily Gain	.27	.20	.22	.23	.29	.20	.26	.25
Daily Feed								
Grain	.89	.81	1.03	.91	1.05	.82	1.03	.97
Alfalfa	2.26	1.95	2.14	2.12	2.25	1.85	2.09	2.06
Salt	.03	.02	.02	.02	.03	.02	.02	.02
Feed Required for cwt. Gain (4% Shrinkage)								
Grain	326.9	406.1	465.0	399.3	361.1	415.2	395.0	390.43
Alfalfa	827.0	982.0	969.0	926.0	772.2	937.1	796.9	835.40
Salt	10.2	10.4	9.2	9.9	9.5	10.4	7.8	9.23
Feed Cost per cwt. Gain	6.63	8.04	8.57	7.75	6.75	7.95	7.18	7.29
Cost of Lambs at $3.75 cwt.	...	2.05	...	...	...	2.06	...	..
Feed Cost per Lamb	...	1.60	...	...	...	1.57	...	..
Total Cost per Head	...	3.65	...	...	...	3.63	...	..
No. Fat Lambs out of 70	...	62	...	...	...	54	...	..
Valuation per cwt.	...	4.54	...	...	...	4.21	...	..
Gross Return	...	3.39	...	...	...	3.15	...	..
Net Return	...	—.26	...	...	...	—.48	...	..
Dols. per cwt. to break even	...	4.89	...	...	...	4.85	...	..

A summary of the three comparisons of wheat and barley is given in Table 10 showing the relative feed replacement values for barley in these tests.

Table 10—Summary of comparative results with wheat versus barley in producing gain on feeder lambs, Monroe.

Year	With Wheat at (ton)	Barley was worth (ton)	Barley Percentage of Value of Wheat
1928-29	$20	$19.34	96.7
1929-30	20	27.07	135.0
1931-32	20	20.43	102.0

It seems obvious from a study of this table that results secured in the 1929-30 test are "out of line"; consequently, these results have not been averaged with the others. An average of the results of first and last tests indicates that in producing gain each ton of whole wheat fed plus 278.2 pounds of alfalfa plus 2.15 pounds of salt replaced 2127 pounds of barley. With wheat at $20 per ton, barley had a feed replacement value of $19.86, or 99.3 per cent the value of wheat.

The production of gain alone in fattening lambs is not the final gauge of a feed. The quality of gain as indicated by growth or finish will always be an important point for consideration. It will be noted in the 1931-32 test that out of 70 lambs fed in each lot and showing practically the same average gain, only 54 were selected as "fat" in the barley-fed lot as against 62 in the wheat-fed lot after 100 days on feed. This advantage of wheat as a fattening rather than a growth-producing feed would more than offset the slightly greater efficiency for gains shown by barley in this comparison.

Shelled Corn versus Barley

In the 1928-29 test each ton of shelled corn less 331.4 pounds of alfalfa less 1.3 pounds of salt replaced 2355.5 pounds of whole barley. With shelled corn at $20 a ton, alfalfa hay at $8 a ton, and salt at $10 a ton, barley was

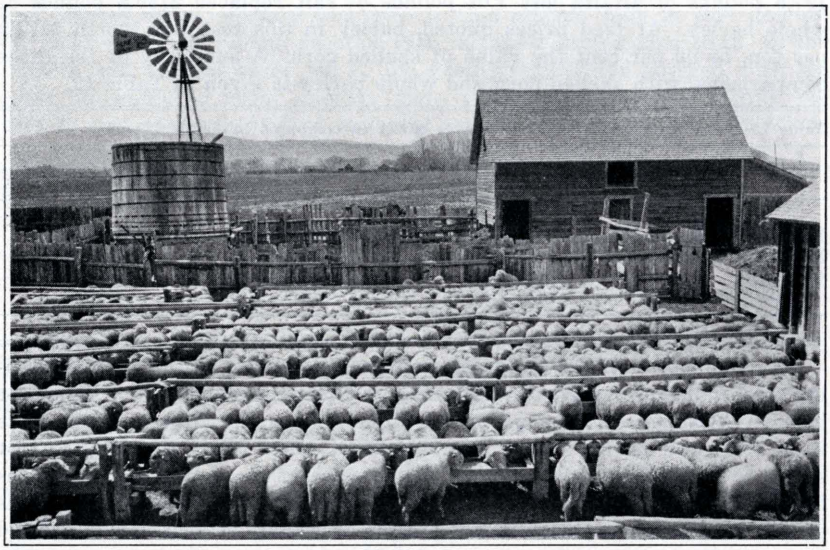

Figure 10—Lambs of uniform size have an equal chance at the trough. With the cafeteria system for feeding grain, there should be only enough trough space to accommodate lambs. Too much space induces over-eating and may cause death loss. (Courtesy, Colorado Agricultural Experiment Station.)

Table 11—Relative feeding value for a 3-year period of shelled corn versus barley fed with first- and second-crop alfalfa.

RATION FED	CORN				BARLEY			
	1st-crop Alfalfa		2d-crop Alfalfa	3-year Avg.	1st-crop Alfalfa		2d-crop Alfalfa	3-year Avg.
YEAR	1928-29	1931-32	1929-30		1928-29	1931-32	1929-30	
Initial Weight (lbs.)	62.6	54.4	68.3	61.77	63.9	55.0	63.6	60.83
Final Feed-lot Weight (lbs.) (With 4% Shrinkage)	94.1	75.5	90.2	86.60	93.0	74.8	87.2	85.0
Total Gain	31.5	21.0	22.0	24.83	29.1	19.8	23.6	24.17
Daily Gain	.31	.21	.24	.25	.29	.20	.26	.25
Daily Feed								
Grain	.97	.82	1.05	.95	1.05	.82	1.03	.97
Alfalfa	2.27	1.89	2.13	2.10	2.25	1.85	2.09	2.06
Salt	.03	.02	.02	.02	.03	.02	.02	.02
Feed Required for cwt. Gain (4% Shrinkage)								
Grain	306.6	388.8	431.6	375.7	361.1	415.2	395.0	390.43
Alfalfa	721.4	898.7	873.5	831.2	772.2	937.1	796.9	835.40
Salt	9.3	10.2	8.4	9.3	9.5	10.4	7.8	9.23
Feed Cost per cwt. Gain	6.0	7.53	7.85	7.13	6.75	7.95	7.18	7.29
Cost of Lambs at $3.75 cwt.	...	2.04	...	...	...	2.06	...	...
Feed Cost per Lamb	...	1.58	...	...	...	1.57	...	...
Total Cost per Head	...	3.62	...	...	...	3.63	...	...
No. Fat Lambs out of 70	...	59	...	...	...	54	...	...
Valuation per cwt.	...	4.33	...	...	...	4.21	...	...
Gross Return	...	3.27	...	...	...	3.15	...	...
Net Return	...	—.35	...	...	...	—.48	...	...
Dols. per cwt. to break even	...	4.80	...	...	...	4.86	...	...

worth $15.85 a ton, or 79.3 per cent the value of shelled corn. In the 1929-30 comparison each ton of shelled corn fed plus 355 pounds of alfalfa plus 2.8 pounds of salt replaced 1830.4 pounds of whole barley. At feed prices given, barley was worth $23.41 per ton, or 117 per cent the value of shelled corn in producing unit gains. In the 1930-31 test each ton of shelled corn less 197.5 pounds of alfalfa less 1.02 pounds of salt replaced 2135.8 pounds of whole barley. At feed prices quoted, barley in this test was worth $17.99 per ton, or 90 per cent the value of shelled corn. A summary of the three comparisons, with shelled corn and whole barley is given in Table 12.

Table 12—Feed replacement value for whole barley as compared to shelled corn.*

Year	With Shelled Corn at	Barley was Worth	Barley Percentage of the Value of Corn
1928-29	$20	$15.85	79.3
1929-30	20	23.41	117.0
1931-32	20	17.99	90.0

*Alfalfa hay at $8 per ton.

An examination of the financial statement appended to the 1931-32 feeding trial indicates the greater fattening or finishing tendencies of corn over barley. Although an average of the figures from the first and last tests is in line with barley values reported from other trials the 1929-30 test seems to be distinctly out of line. An average of these two tests indicates that each ton of shelled corn fed less 264.5 pounds of alfalfa less 1.16 pounds of salt equalled or replaced 2245.7 pounds of barley, or that barley showed an average replacement value of $16.89 per ton, or 84.4 per cent the feeding value of shelled corn.

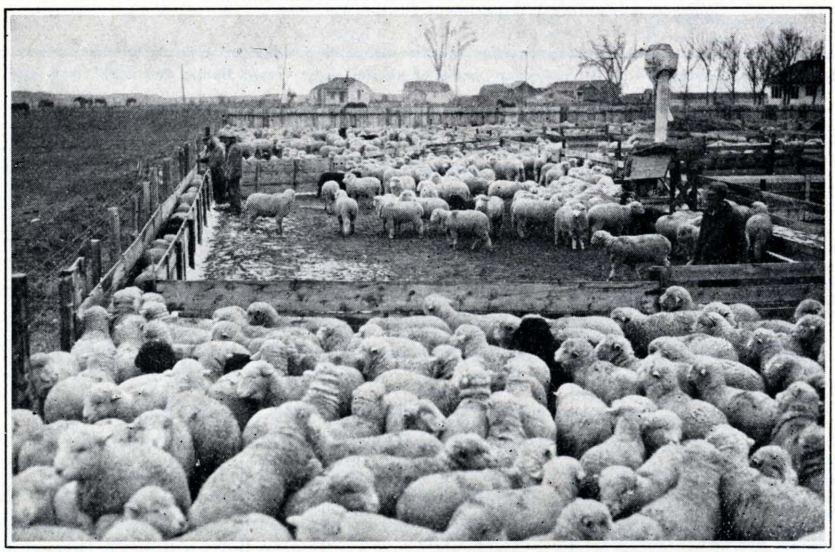

Figure 11—A well-planned cutting chute in connection with the fattening pens simplifies the sorting of fat lambs for market. (Courtesy, Colorado Agricultural Experiment Station.)

Beet Molasses

During the 1928-29 test, beet molasses, mixed with water (4 parts molasses to 1 part water), was fed spread on the alfalfa hay to the lambs. It was fed in this manner with both whole barley and shelled corn. A notation made at the time to the effect that a larger percentage of hay was refused when molasses was used in this manner may in part account for relatively poor results secured with molasses during this trial. In the 1931-32 test beet molasses fed in the grain troughs and covered with the grain allowance to avoid wastage gave much better results. During the 1928-29 test each ton of beet molasses spread on hay and fed with whole

Table 13—The value of beet molasses as a supplement to grain and alfalfa.

RATION FED	MOLASSES AND ALFALFA				ALFALFA			
	Barley	Corn	Barley	3-year Avg.	Barley	Corn	Barley	3-year Avg.
YEAR	1928-29	1928-29	1931-32		1928-29	1928-29	1931-32	
Avg. Initial Wgt. (lbs.)	62.6	62.9	53.7	59.73	63.9	62.6	55.0	60.50
Avg. Final Wgt. (4% Shrinkage)	92.9	93.2	77.9	88.0	93.0	94.1	74.8	87.30
Avg. Total Gain	30.3	30.5	24.2	28.27	29.1	31.5	19.8	26.80
Avg. Daily Gain	.30	.30	.24	.28	.29	.31	.20	.27
Avg. Daily Feed								
Grain	.96	.97	.82	.92	1.05	.97	.82	.95
Beet Molasses	.37	.37	.39	.38	...	...	...	...
Alfalfa	2.14	2.12	1.75	2.00	2.25	2.27	1.85	2.12
Salt	.02	.02	.02	.02	.03	.03	.02	.027
Feed Required for cwt. Gain								
Grain	317.5	318.8	339.4	325.23	361.1	306.6	415.2	360.97
Beet Molasses	123.7	123.2	160.6	135.33	...	...	...	...
Alfalfa	705.2	701.5	725.4	710.70	772.2	721.4	937.1	810.23
Salt	7.7	8.0	7.3	7.70	9.5	9.3	10.4	9.73
Feed Cost per cwt. Gain (4% Shrinkage)	6.53	6.53	6.97	6.68	6.75	6.0	7.95	6.90
Cost of Lambs at $3.75 cwt.	...	...	2.01	...	...	...	2.06	...
Feed Cost per Lamb	...	...	1.69	...	...	...	1.57	...
Total Cost per Head	...	...	3.70	...	...	...	3.63	...
No. Fat Lambs	...	...	67	...	...	...	54	...
Valuation per cwt.	...	...	4.71	...	...	...	4.21	...
Gross Return	...	...	3.67	...	...	...	3.15	...
Net Return	...	...	—.03	...	...	...	—.48	...
Dols. per cwt. to break even	...	...	4.75	...	...	...	4.85	...

barley, alfalfa hay, and salt replaced 704.9 pounds of barley, 1083.3 pounds of alfalfa, and 29.1 pounds of salt. With barley at $20 per ton, alfalfa at $8 per ton, and salt at $10 per ton, beet molasses showed a feed replacement value equal to $11.53 per ton. During the same test each ton of beet molasses spread on hay and fed with shelled corn, alfalfa hay, and salt replaced 323.1 pounds of alfalfa hay and 21.1 pounds of salt but required 198.1 pounds more grain to produce equal gains. In this test, with feed prices as quoted, beet molasses showed no feeding value (—.59 cents) per ton. In the 1931-32 test each ton of beet molasses fed in the grain troughs and covered with grain replaced 944 pounds of whole barley, 2636.4 pounds of alfalfa hay, and 38.6 pounds of salt. At feed prices quoted, molasses showed a feed replacement value in this test equal to $20.18 per ton.

The value of beet molasses in changing the growth-producing tendency of a barley and alfalfa ration to a fattening tendency is shown by the financial statement of the 1931-32 test. The addition of beet molasses raised the number of fat lambs from 77 to 96 per cent and increased the appraised valuation on lamb at the end of the test from $4.21 per hundred

weight to $4.71 per hundred weight or an increase of 50 cents per hundred weight.

Beet molasses fed in the grain trough and covered with grain showed a much higher feeding value than when fed on the hay.

A summary of the three comparisons shows the following feed replacement value for beet molasses:

	Feed replacement value of beet molasses per ton
1928-29 (fed on alfalfa with corn)	—.59
1928-29 (fed on alfalfa with barley)	11.53
1931-32 (fed in grain trough with barley)	20.18

An average of these three results indicates that each ton of beet molasses fed replaced 528.2 pounds of grain, 1470.9 pounds of alfalfa, and 30 pounds of salt, or that it had a feed replacement value of $11.31 per ton.

In four trials at the Colorado Agricultural Experiment Station (13) each ton of beet molasses hand-fed with shelled corn and alfalfa hay replaced 1133.9 pounds of shelled corn and 1469.9 pounds of alfalfa hay. At feed prices quoted in the Colorado bulletin, beet molasses was worth $17.22, or 86.1 per cent of the feeding value of grain.

Beet molasses proved slightly superior to cane molasses, while both were worth slightly more a ton than shelled corn in lamb feeding tests at the Iowa Agricultural Experiment Station (4). In addition to molasses, the lambs received shelled corn, linseed oil meal, and clover hay in these tests.

An interesting comparison is afforded by results secured in the 1931-32 test. On the basis of 1000 head, lambs fed 41 tons of barley, 92.5 tons of alfalfa, and 1 ton of salt produced 19,800 pounds of gain at a feed cost of $1570. In the molasses-fed lot, 41 tons of barley, 87.5 tons of alfalfa, 19.5 tons of beet molasses, and 1 ton of salt produced 24,200 pounds of gain at a feed cost of $1686. In other words, $116 worth of extra feed produced 4400 pounds of extra gain. The conditioning value of beet molasses was indicated in the 1931-32 test. Sore mouth in lambs is a common occurrence, generally appearing soon after the lambs have been penned up in drylots. It is usually attributed to a digestive disturbance resulting from the sudden change in the lamb's diet from dry range grass and ewe's milk to rich hay and grain. Resultant "cold sores" open avenues for infection, and necrobacillosis often follows. Although sore mouths were prevalent in all other lots during the test, not a single case was noted among the molasses-fed lambs.

Value of Corn Silage

In the 1929-30 test approximately 1 pound of corn and rape silage daily per lamb was fed with barley and second-crop alfalfa. In the same test an equal amount of silage was also fed with shelled corn and second-crop alfalfa. Fed with barley and alfalfa hay, the silage failed to show any feed replacement value, but each ton of corn and rape silage fed with shelled corn, alfalfa, and salt replaced 175.4 pounds of corn, 670.3 pounds of alfalfa, and 2.8 pounds of salt; in other words, at feed prices quoted the silage showed a feed replacement value equal to $4.45 per ton.

Table 14—Relative feeding value of silage when fed with barley and second-crop alfalfa, for a 2-year period.

RATION FED	Barley, Corn and Rape Silage, 2d-crop Alfalfa	Corn, Corn and Rape Silage, 2d-crop Alfalfa	Barley, Corn Silage, 2d-crop Alfalfa	3-year Avg.	Barley, 2d-crop Alfalfa	Corn, 2d-crop Alfalfa	Barley, 2d-crop Alfalfa	3-year Avg.
YEAR	1929-30	1929-30	1931-32		1929-30	1929-30	1931-32	
Initial Weight (lbs.)	67.5	67.7	53.9	63.0	63.6	68.3	53.9	61.9
Final Feed-lot Weight (lbs.) (With 4% Shrinkage)	89.9	91.1	75.0	85.3	87.2	90.2	73.7	83.7
Total Gain	22.5	23.4	21.0	22.3	23.6	22.0	19.9	21.8
Daily Gain	.25	.26	.21	.24	.26	.24	.20	.23
Daily Feed								
Grain	1.03	1.04	.81	.96	1.03	1.05	.81	.96
Silage	.92	.92	1.49	1.11	...	...	...	...
Alfalfa	1.98	1.97	1.28	1.74	2.09	2.13	1.86	2.03
Salt	.02	.02	.02	.02	.02	.02	.02	.02
Feed Required for cwt. Gain (4% Shrinkage)								
Grain	414.0	400.7	387.6	400.8	395.50	431.6	410.3	412.3
Silage	370.0	352.4	711.2	477.9	...	...	...	...
Alfalfa	790.3	755.4	608.9	718.2	796.9	873.5	937.9	869.4
Salt	8.2	7.9	10.3	8.8	7.8	8.4	10.9	9.0
Feed Cost per cwt. Gain	8.08	7.77	7.79	7.88	7.18	7.85	7.91	7.65
Cost of Lambs at $3.75 cwt.	...	...	2.02	...	...	...	2.02	...
Feed Cost per Lamb	...	...	1.64	...	...	...	1.57	...
Total Cost per Head	...	...	3.66	...	...	...	3.59	...
No. Fat Lambs out of 70	...	...	53	...	...	...	56	...
Valuation per cwt. (all lambs)	...	...	4.16	...	...	...	4.25	...
Gross Return	...	...	3.12	...	...	...	3.13	...
Net Return	...	...	—.54	...	...	...	—.46	...
Dols. per cwt. to break even	...	...	4.88	...	...	...	4.88	...

In the 1931-32 feeding test, corn silage of medium quality was fed daily with barley and alfalfa hay at the rate of approximately 1.5 pounds per head. In this experiment each ton of corn silage fed replaced 63.8 pounds of barley, 925.2 pounds of alfalfa, and 1.7 pounds of salt, or, at feed prices quoted, silage was worth $4.35 per ton. An average of two feeding tests conducted at the Colorado Agricultural Experiment Station (13) shows each ton of corn silage fed to fattening lambs, replacing 21 pounds of shelled corn and 810 pounds of alfalfa.

From general results secured it is safe to assume that good corn silage fed with grain and alfalfa hay to fattening lambs is worth approximately one-half the value of alfalfa hay per ton.

Value of Cottonseed Meal

Although cottonseed meal is primarily a protein concentrate, its high mineral and nutrient content make it a desirable feed for use in some fattening rations. Fed at the rate of 0.2 pound per head daily in the 1929-30 test each ton of cottonseed meal fed with whole barley, alfalfa hay, and salt replaced 1329 pounds of barley, 2716.9 pounds of alfalfa, and 26.2 pounds of salt. In this test the cottonseed cake showed a feed replacement value in producing gain equal to $24.29 per ton.

In the 1931-32 test cottonseed meal was fed daily at the rate of 0.25 pound per head. Each ton of cottonseed meal fed with whole barley, alfalfa hay and salt replaced 1652.5 pounds of whole barley, 4312 pounds of alfalfa hay, and 78 pounds of salt. At feed prices used, cottonseed meal in this test had a replacement value of $34.16 per ton.

Table 15—Relative feeding value of cottonseed meal supplementing barley and first-crop alfalfa vs. no cottonseed meal, 1929-30 and 1931-32.

RATION FED	Cottonseed Meal			No Cottonseed Meal		
YEAR	1929-30	1931-32	2-year Avg.	1929-30	1931-32	2-year Avg.
Initial Weight (lbs.)	69.6	53.7	61.7	68.8	55.0	61.9
Final Feed-lot Weight (lbs.)	92.7	77.2	85.0	89.7	74.8	82.3
Total Gain	23.1	23.5	23.3	21.0	19.8	20.4
Daily Gain	0.26	0.24	0.25	0.23	0.20	0.22
Daily Feed						
Grain	1.03	0.81	0.92	1.03	0.82	0.93
Supplement	0.16	0.20	0.18	...	...	...
Alfalfa	2.11	1.78	1.95	2.11	1.85	1.98
Salt	0.02	0.02	0.02	0.02	0.02	0.02
Feed Required per cwt. Gain (4% Shrinkage)						
Grain	401.1	345.3	373.2	441.7	415.2	428.5
Supplement	61.1	84.6	72.9	...	...	...
Alfalfa	824.8	754.7	789.8	907.8	937.1	922.5
Salt	8.0	7.1	7.6	8.8	10.4	9.6
Feed Cost per cwt. Gain	8.27	7.78	8.03	8.09	7.95	8.02
Cost of Lambs at $3.75 cwt.	...	2.01	...	...	2.06	...
Feed Cost per Lamb	...	1.83	...	...	1.57	...
Total Cost per Head	...	3.84	...	...	3.63	...
Number Fat Lambs out of 70	...	64	...	...	54	...
Valuation per cwt. (all lambs)	...	4.67	...	...	4.21	...
Gross Return	...	3.61	...	...	3.15	...
Net Return	...	—.23	...	...	—.48	...
Dols. per cwt. to break even	...	4.99	...	...	4.86	...

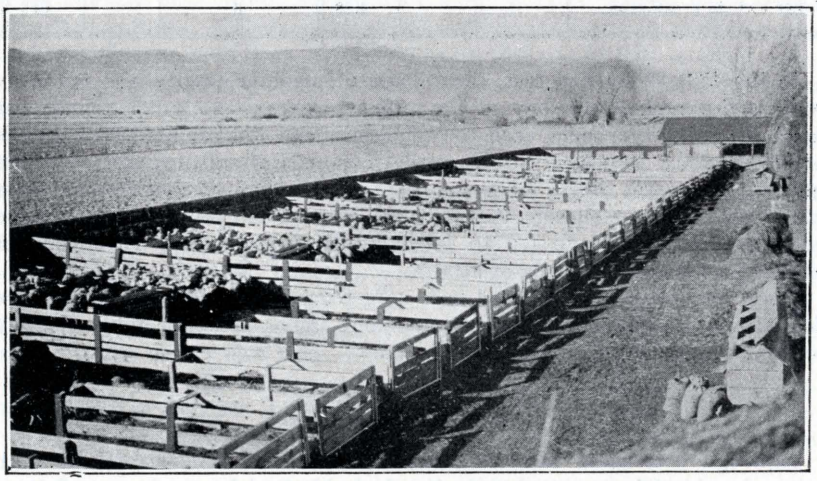

Figure 12—Pens in which sheep were fed, Monroe, Utah.

An average of these two tests indicates that each ton of cottonseed meal fed with whole barley, alfalfa, and salt equalled or replaced 1490.8 pounds of whole barley 3514.5 pounds of alfalfa hay, and 52.1 pounds of salt. With feed prices used, each ton of cottonseed meal had a replacement value of $29.23 per ton.

A study of the figures in Table 15 shows that cottonseed meal, in addition to increasing the gain, also increased the number of fat lambs and consequently enhanced the selling price of the lambs per hundred weight.

Whole versus Ground Barley

In three tests ground barley showed a distinctly lower feeding value than whole barley when fed to fattening lambs. Ground or chopped barley proved noticeably less palatable than whole barley; in each instance the lambs ate a smaller amount, producing much lower and more costly gains. Results secured in these tests are in line with results of similar tests conducted with whole and rolled barley at the Colorado Station (13). Apparently the old adage holds true that "sheep with good teeth can grind their own grain."

Table 16—Comparative results obtained from feeding whole versus ground barley with first- and third-crop alfalfa, for a three-year period.

RATION FED	Whole Barley with Alfalfa				Ground Barley with Alfalfa			
	1st-crop	3d-crop	1st-crop	3-year Avg.	1st-crop	3d-crop	1st-crop	3-year Avg.
YEAR	1928-29	1929-30	1931-32		1928-29	1929-30	1931-32	
Initial Weight (lbs.)	63.9	68.2	55.0	62.4	62.3	67.3	54.4	61.3
Final Feed-lot Weight (lbs.) (With 4% Shrinkage)	93.0	93.6	74.8	87.1	86.9	89.7	71.2	82.6
Total Gain	29.1	25.3	19.8	24.7	24.5	22.3	16.7	21.2
Daily Gain	.29	.28	.20	.26	.25	.25	.17	.22
Daily Feed								
Grain	1.05	1.03	.82	.97	.84	.97	.68	.83
Alfalfa	2.25	2.12	1.85	2.1	2.22	2.11	1.92	2.08
Salt	.03	.02	.02	.02	.02	.02	.02	.02
Feed Required for cwt. Gain (4% Shrinkage)								
Grain	361.1	366.4	415.2	380.9	342.5	390.7	405.0	379.
Alfalfa	772.2	753.7	937.1	821.0	907.5	849.9	1144.1	967.2
Salt	9.5	7.3	10.4	9.1	9.3	8.2	11.7	9.7
Feed Cost per cwt. Gain	6.75	6.72	7.95	7.14	7.44	7.74	9.09	8.09
Cost of Lambs at $3.75 cwt.	...	...	2.06	...	...	...	2.04	...
Feed Cost per Lamb	...	...	1.57	...	...	...	1.52	...
Total Cost per Head	...	...	3.63	...	...	...	3.56	...
No. Fat Lambs out of 70	...	...	54	...	...	...	41	...
Valuation per cwt. (all lambs)	...	...	4.21	...	...	...	4.00	...
Gross Return	...	...	3.15	...	...	...	2.85	...
Net Return	...	...	—0.48	...	...	...	—0.71	...
Dols. per cwt. to break even	...	...	4.85	...	...	...	5.00	...

Mineral Supplements.

The addition of either kelp or commercial mineral mixture had no noticeable effect in increasing gain, reducing cost of gain, or increasing net return.

Wrinkly versus Smooth Lambs

Lamb feeders prefer smooth-pelted lambs in the feedlot due to a general discrimination imposed by packers in the purchase of wrinkly lambs. This discrimination is based on the claim that wrinkly lambs may be expected to dress out about 5 per cent less of marketable carcass than smooth-pelted lambs. The value of the pelt as compared with the dressed carcass is, of course, a factor that will influence results in any comparison of this sort.

In the 1931-32 test wrinkly lambs produced gains at 98.8 per cent the feed cost of gains produced on smooth lambs, while smooth lambs gained only 92.1 per cent as much as the wrinkly lambs. Only 77 per cent of the smooth lambs were finished at 100 days as compared with 90 per cent of the wrinkly lambs.

Table 17—Relative feeding value of kelp and mineral mixture added to a barley and alfalfa ration vs. no kelp or mineral mixture, 1928-29 and 1929-30.

RATION FED	1st-crop Alfalfa, Barley, and Kelp*	3d-crop Alfalfa, Barley, and Mineral†	2-year Avg.	1st-crop Alfalfa, Barley, and No Kelp	3d-crop Alfalfa, Barley, and No Mineral	2-year Avg.
YEAR	1928-29	1929-30		1928-29	1929-30	
Initial Weight (lbs.)	62.5	64.1	63.3	63.9	68.2	66.1
Final Feed-lot Weight (lbs.)	90.8	84.7	87.8	93.0	93.6	93.3
Total Gain	28.4	20.5	24.5	29.1	25.3	27.2
Daily Gain	.28	.28	.28	.29	.28	.29
Daily Feed						
Grain	.96	1.08	1.02	1.05	1.03	1.04
Mineral Supplement	.03	.03	.03	...	...	...
Alfalfa	2.21	2.06	2.14	2.25	2.12	2.19
Salt	.02	.01	.02	.03	.02	.03
Feed Required per cwt. Gain (4% Shrinkage)						
Grain	340.3	386.0	363.2	361.1	366.4	363.8
Mineral Supplement	12.2	8.9	10.6	...	...	...
Alfalfa	779.9	732.9	756.4	772.2	753.7	763.0
Salt	7.2	4.2	5.7	9.5	7.3	8.4
Feed Cost per cwt. Gain	6.8	7.08	6.94	6.75	6.72	6.74

*Kelp charged at $2 per cwt.

†Mineral mixture charged at $3 per cwt.

Results secured in the single test reported indicate that the discrimination of $1 per hundred weight as feeders was not justified and that to have brought comparable returns an approximate discrimination of 25 cents per hundred weight would have been sufficient for the wrinkly lambs in this comparison.

Table 18—Comparison of wrinkly vs. smooth lambs fattened on a ration of whole barley and first-crop alfalfa, 1931-32.

	Wrinkly Lambs	Smooth Lambs
Initial Weight (lbs.)	58.8	55.0
Final Feed-lot Weight (lbs.) (With 4% Shrinkage)	80.3	74.8
Total Gain	21.5	19.8
Daily Gain	.22	.20
Daily Feed		
Grain	.84	.82
Alfalfa	2.09	1.85
Salt	.02	.02
Feed Required for cwt. Gain (4% Shrinkage)		
Grain	391.8	415.2
Alfalfa	971.3	937.1
Salt	8.9	10.4
Feed Cost per cwt. Gain	7.85	7.95
Cost per lamb at $2.75 wrinkly, $3.75 smooth	1.62	2.06
Feed Cost per Lamb	1.69	1.57
Total Cost Per Lamb	3.31	3.63
No. Fat Lambs out of 70	63	54
Valuation per cwt. (all lambs)	$3.96	$4.21
Gross Return	$3.18	$3.15
Net Return	—$0.13	—$0.58
Dols. per cwt. to break even	$3.90	$4.86

Large versus Small Feeder Lambs

It has been customary to purchase small feeder lambs weighing 0 pounds or less at a lower price per hundred weight than feeder lambs weighing 60 pounds or more in the fall. In the case of "bums" or culs that are weak and stunted through lack of mother's milk or proper care, such price discrimination may be entirely justified. On the other hand, younger lambs that have had proper care may be expected to respond to the general physiological law that "younger animals produce more efficient gains than older animals," and under such conditions the price discrimination may not be fair.

Table 19—Comparison of large vs. small lambs when fed third-crop alfalfa with barley, 1930-31 and 1931-32.

SIZE OF LAMBS	LARGE			SMALL		
RATION FED	3d-crop with Barley			3d-crop with Barley		
YEAR	1930-31	1931-32	2-year Avg.	1930-31	1931-32	2-year Avg
Initial Weight (lbs.)	74.1	63.9	69.0	46.9	40.9	43.9
Final Feed-lot Weight (lbs.) (With 4% Shrinkage)	102.9	89.0	96.0	72.4	63.9	68.2
Total Gain	28.8	25.1	27.0	25.5	23.0	24.3
Daily Gain	.32	.25	.29	.28	.23	.2
Daily Feed						
Grain	.88	.84	.86	.86	.73	.8
Alfalfa	2.30	2.20	2.25	1.80	1.68	1.7
Salt	.02	.02	.02	.02	.02	.0
Feed Required per cwt. Gain (4% Shrinkage)						
Grain	273.3	333.4	303.4	305.3	319.0	312.2
Alfalfa	714.9	876.7	795.8	634.4	730.5	682.5
Salt	6.9	9.7	8.0	6.1	7.3	6.7
Feed Cost per cwt. Gain	5.63	6.89	6.26	5.62	6.15	5.8
Cost of Lambs at $2.75 cwt. (small) (large) $3.75 cwt.	...	2.40	...	...	1.12	...
Feed Cost per Lamb	...	1.73	...	...	1.41	...
Total Cost per Lamb	...	4.13	...	...	2.53	...
No. Fat Lambs out of 70	...	70	...	...	24	...
Valuation per cwt. (all lambs)	...	4.75	...	...	3.69	...
Gross Return	...	4.23	...	...	2.36	...
Net Return	...	.10	...	...	—0.17	...
Dols. per cwt. to break even	...	4.65	...	...	3.96	...

An average of two feeding tests conducted at the Colorado Station (1) indicates that light lambs (41.25 pounds) when fed separately consumed approximately 80 per cent as much grain and alfalfa daily but gained nearly 94 per cent as much as medium weights (60.2 pounds) of the same breeding and quality. In these tests the light lambs produced gains at 87.5 per cent the feed cost of like gains secured with the same ration on the middle weights.

In the 1930-31 test at Monroe large lambs (74.1 pounds) consumed 89.5 per cent as much grain as small lambs (46.9 pounds) in producing equal gains; the small lambs, however, ate only 88.7 per cent as much alfalfa and 88.4 per cent as much salt as did the large lambs. The small lambs produced gain at 99.8 per cent the feed cost of gain on the large lambs; in this test they gained 97 per cent as much as the large lambs.

In the 1931-32 test, in producing equal gains, the small lambs (43.9 pounds) ate 95.7 per cent as much barley, 83.3 per cent as much alfalfa, and 62.9 per cent as much salt as large lambs (63.9 pounds). Although the

small lambs gained only 91.6 per cent as much as the large lambs, they produced gain at only 81.6 per cent the cost of gains in the large lambs.

General results indicate that small, thrifty lambs make smaller but cheaper gains than large lambs; consequently, they must usually be fed for a longer period than larger lambs in order to attain a proper market finish. With the fattening methods used it is essential that lambs be sorted according to size in order that small lambs have an equal chance at the grain trough.

DISCUSSION OF RESULTS OF DELTA EXPERIMENT[6]

The twelve pens of 125 lambs each fattened in the single Delta experiment all consumed a ration composed of less grain and more roughage than was fed in the Monroe experiments. As was to be expected, these lambs showed a heavier shipping shrinkage than was estimated for Monroe lambs, which were sold for the most part with an estimated shrinkage of 4 per cent at the fattening pens. The shipping shrinkage to Los Angeles recorded on the twelve pens of Delta lambs averaged 8.72 per cent and ranged from 6.3 per cent for the pen fattened on corn and alfalfa to 11.4 per cent for the pen of lambs fattened on whole barley, a commercial protein, and alfalfa.

At the time the Delta lambs were sold it was noted that "because of lack of fill in transit the shipping shrink was abnormally heavy." The actual shrinkage experienced accounts for a difference in average final feedlot weights at Delta and market weights at Los Angeles of 8.5 pounds per head, or a reduction in average weight of fat lambs from 96.9 pounds at the feedlot to 88.4 pounds at market.

Since three pens of lambs in the Delta test were fattened on a basal ration composed of whole barley, alfalfa, hay, and salt (Lots 1, 11 and 12, Appendix, Table 5), it would seem permissible to compare these results with those secured on three pens of lambs fattened during different years at Monroe with a noticeably greater proportion of grain to hay than was used for the Delta group.

As indicated in Table 20, Delta lambs required an average of 257.7 pounds of barley, 1421.7 pounds of alfalfa, and 6.2 pounds of salt for each hundred weight of market gain produced, which at feed prices used cost $8.30 per cwt.

Monroe lambs required an average of 390.4 pounds of barley, 835.4 pounds of alfalfa, and 9.2 pounds of salt per hundred weight of market gain produced, which at feed prices used cost $7.28 per cwt.

The relative efficiency of these two methods for fattening lambs will depend on the relative price of barley and alfalfa hay. Table 6 (Appendix) indicates at what feed prices one would be more efficient than another, provided the relationship of shrinkage to market remained constant with figures indicated in these tests.

In a comparison of shelled corn and whole barley the customary relationship in values between these grains was noted.

The addition of cottonseed meal or a commercial protein concentrate increased unit feed costs but failed to increase gains, probably on account

[6]Discussion of results secured in lamb-feeding experiment conducted at Delta in which 125 lambs per lot were fed for 91 days (from November 13, 1929 to February 12, 1930). For details of experiment see Appendix, Table 5.

Table 20—Relative feed requirements for unit gain at Delta and Monroe.

	DELTA, 1929-30 TEST With Actual Shrinkage to Market				MONROE SUMMARY With Estimated 4% Shrinkage to Market			
	Lot 1	Lot 11	Lot 12	Avg.	1928-29	1929-30	1931-32	3-year Avg.
% Shrinkage to Market	8.5	8.0	9.4	8.6	4.0	4.0	4.0	4.0
Avg. Daily Gain (lbs.)	.27	.25	.23	.25	.29	.26	.20	.25
Avg. Daily Feed								
Whole Barley	.64	.64	.64	.64	1.05	1.03	.82	.97
Alfalfa Hay	3.49	3.49	3.59	3.52	2.25	2.09	1.85	2.06
Salt	.02	.02	.02	.02	.03	.02	.02	.02
Feed Required per cwt. Gain								
Whole Barley	241.0	254.2	278.0	257.7	361.1	395.0	415.2	390.4
Alfalfa Hay	1312.2	1387.0	1565.8	1421.7	772.2	796.9	937.1	835.4
Salt	5.8	6.1	6.6	6.2	9.5	7.8	10.4	9.2
Feed Cost per cwt. Gain	7.69	8.12	9.07	8.30	...	...	...	7.28

Feed Used—Cost per Ton: Grain, $20; alfalfa, $8; and salt, $10.

of the abundance of protein supplied in the large amount of alfalfa hay consumed.

Lambs fed alfalfa chaff or barley straw without alfalfa hay during a part of the fattening period made noticeably low gains, even though protein concentrates were included. Cottonseed meal showed up to better advantage than commercial concentrate when used with alfalfa chaff.

Although it is advisable to have alfalfa chaff or straw available for lambs during a fattening period and although they will consume a considerable amount, forcing lambs to eat these low-grade roughages to the exclusion of good alfalfa hay is not recommended. Lambs generally prefer coarse, bright straw to fine, chaffy straw.

Re-cut alfalfa fed during 48 days of the fattening period proved less valuable than whole alfalfa.

Extremely wrinkled lambs showed little significant difference in gain or feed required per unit gain when compared with smooth-pelted lambs of the same breeding.

REFERENCES

(1) Buffum, B. C., Griffith, C. F.
1902 Lamb-feeding experiments, 1900-1902. Colo. Agri. Exp. Sta. Bul. 75.

(2) Carlyle, W. L., Iddings, E. J.
1913 Lamb-feeding and sheep husbandry in Idaho. Idaho Agr. Exp. Sta. Bul. 77.

(3) Carroll, W. E.
1913 A comparison of first-, second-, and third-crop alfalfa hay for milk production. Utah Agr. Exp. Sta. Bul. 126.

(4) Evvard, J. M., Culbertson, C. C., Wallace, Q. W.
1923 Cane and beet molasses for fattening lambs. Iowa Agr. Exp. Sta. Bul. 215.

(5) Faville, A. D.
1909 Lamb-feeding for 1908-09. Wyo. Agr. Exp. Sta. Bul. 81.

(6) ———————
1910 Feeding experiments, 1909-10. Wyo. Agr. Exp. Sta. Bul. 85.

(7) ———————
1913 Corn versus barley in lamb rations: Methods of feeding barley to lambs. Wyo. Agr. Exp. Sta. Bul. 103.

(8) Foster, L., Merrill, L. A.
1899 Alfalfa or Lucern: The cutting time; its feeding value. Utah Agr. Exp. Sta. Bul. 61.

(9) Hart, E. B., Steenbock, H., Morrison, F. B.
1923 Minerals for livestock. Wis. Agr. Exp. Sta. Bul. 350.

(10) Henry, W. A. and Morrison, F. B.
1923 Feeds and Feeding (18th ed.) Published by Henry-Morrison Company, Madison, Wisconsin. p. 490.

(11) Linfield, F. B.
1903 Sheep-feeding, winter of 1902-03. Mont. Agr. Exp. Sta. Bul. 47.

(12) ———————
1905 Sheep feeding for the years 1904 and 1905. Mont. Agr. Exp. Sta. Bul. 47.

(13) Maynard, E. J., Morton, G. E., Osland, H. B.
1931 Colorado drylot fattening rations for lambs. Colo. Agr. Exp. Sta. Bul. 379.

(14) Mitchell, H. H.
1924 The feeding of mineral supplements to livestock. Ill. Agr. Exp. Sta. Cir. 281.

(15) Moore, R. A., Graber, L. F.
1922 Make alfalfa a sure crop. Wis. Agr. Exp. Sta. Bul. 349.

(16) Morton, G. E.
1913 Feeding experiments with lambs, 1908-09, 1909-10, 1910-11. Colo. Agr. Exp. Sta. Bul. 187.

(17) Salmon, S. C., Swanson, C. O., McCampbell, C. W.
1925 Experiments relating to the time of cutting alfalfa. Kan. Agr. Exp. Sta. Tech. Bul. 15.

(18) Sotola, J.
1927 Feeding alfalfa hay. Wash. Agr. Exp. Sta. Bul. 220.

(19) Widtsoe, J. A., Stewart, J.
1898 The chemical life history of lucerne, Part II. Utah Agr. Exp. Sta. Bul. 58.

(20) Wilson, J. W., Skinner, H. G.
1904 Fattening range lambs. S. Dak. Agr. Exp. Sta. Bul. 86.

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APPENDIX

Table 1—Lamb-feeding Experiment, Monroe, 1928-29: 70 lambs per lot fed from November 18, 1928, to February 25, 1929—100 days.

(Table based on one average lamb)

LOT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12
	BARLEY AND ALFALFA						ALFALFA					
RATION FED	1st-crop	2d-crop	3d-crop	1st and 2d-crops	2d- and 1st-crops	Brown-cured	Beet Molasses, 1st crop	Corn, 1st-crop	Wheat, 1st-crop	Corn, Beet Molasses, 1st-crop	Ground Barley, 1st-crop	Barley, Kelp, 1st-crop
Number Lambs Died												
Dietary	1	0	0	1	..	..	1	..	1	1	0	0
Other Causes	0	1	1	2	..	..	0	..	0	0	1	1
Total	1	1	1	3	0	0	1	0	1	1	1	1
Initial Weight (lbs.)	63.9	62.5	63.5	62.8	63.7	63.7	62.6	62.6	63.6	62.9	62.3	62.5
Final Feed-lot Weights (lbs.) (With 4% Shrinkage)	93.0	90.4	94.0	92.6	91.8	94.2	92.9	94.1	91.0	93.2	86.9	90.8
Total Gain	29.1	27.9	30.5	29.8	28.2	30.6	30.3	31.5	27.4	30.3	24.5	28.4
Daily Gain	.29	.28	.31	.30	.28	.31	.30	.31	.27	.30	.25	.28
Daily Feed												
Grain	1.05	.96	1.07	.96	.96	.96	.96	.97	.89	.97	.84	.96
Supplement	...	...	...	...	...	...	.37	...	...	.37	...	.03
Alfalfa	2.25	2.27	2.24	2.34	2.25	2.28	2.14	2.27	2.26	2.12	2.22	2.21
Salt	.03	.03	.03	.03	.03	.03	.02	.03	.03	.02	.02	.02
Feed Required for cwt. Gain (4% Shrinkage)												
Grain	361.1	346.0	351.2	323.9	342.7	315.7	317.5	306.6	326.9	318.8	342.5	340.3
Supplement	...	...	...	...	...	...	123.7	...	...	123.2	...	12.2
Alfalfa	772.2	813.2	733.8	752.5	800.7	747.6	705.2	721.4	827.0	701.5	907.5	779.9
Salt	9.5	9.2	9.0	9.0	9.0	10.2	7.7	9.3	10.2	8.0	9.3	7.2
Feed Cost per cwt. Gain	6.75	6.76	6.49	6.20	6.67	6.20	6.53	6.00	6.63	6.53	7.44	6.80

In Lot 4, 1st-crop alfalfa was fed during the first 45 days; 2d-crop alfalfa during the remainder of the period.

In Lot 5, this procedure was reversed. A charge of 10 cents per cwt. was made for grinding grain. A small amount of whole oats was used in all but the corn lots to start lambs on feed.

Feed Prices Used: Whole grain, $1 cwt; ground barley, $1.10 cwt.; alfalfa, $8 ton; molasses, $8 ton; kelp, $2 cwt.; Salt, $10 ton.

Table 2—Lamb-feeding Experiment, Monroe, 1929-30: 70 lambs per lot fed from November 21, 1929, to February 19, 1930—90 days.

(Table based on one average lamb)

LOT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13
	BARLEY							CORN					
RATION FED Alfalfa in All Lots	1st-crop	Cottonseed Meal, 1st-crop	Brown-cured	1st- and 2d-crops	2d- and 1st-crops	2d-crop	Corn, Rape Silage, 2d-crop	Rape Silage, 2d-crop	2d-crop	Wheat, 2d-crop	Barley, 3d-crop	Ground Barley, 3d-crop	Barley, Mineral Mixture 3d-crop
Number Lambs Died													
Dietary	..	1	2	1	..	1	1	1	..	..	0	..	..
Other Causes	..	0	1	0	..	0	0	0	..	..	1	..	..
Total	..	1	3	1	..	1	1	1	..	..	1	..	..
Initial Weight (lbs.)	68.8	69.6	66.1	66.1	65.0	63.6	67.5	67.7	68.3	70.0	68.2	67.3	64.1
Final Feed-lot Weights (lbs.) (With 4% Shrinkage)	89.7	92.7	87.5	90.3	86.5	87.2	89.9	91.1	90.2	89.9	93.6	89.7	84.7
Total Gain	21.0	23.1	21.4	24.2	21.5	23.6	22.5	23.4	22.0	19.9	25.3	22.3	20.5
Daily Gain	.23	.26	.24	.27	.24	.26	.25	.26	.24	.22	.28	.25	.28
Daily Feed													
Grain	1.03	1.03	1.02	1.03	1.03	1.03	1.03	1.04	1.05	1.03	1.03	.97	1.08
Supplement	...	.16	...	...	...	...	.92	.92	..	...	...	...	.03
Alfalfa	2.11	2.11	2.20	2.13	2.12	2.09	1.98	1.97	2.13	2.14	2.12	2.11	2.06
Salt	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.01
Feed Required for cwt. Gain (4% Shrinkage)													
Grain	441.7	401.1	430.7	384.9	433.5	395.0	414.0	400.7	431.0	465.0	366.4	390.7	386.0
Supplement	...	61.1	...	...	...	...	370.0	352.4	...	...	...	...	8.9
Alfalfa	907.8	824.8	926.4	790.9	887.6	796.9	790.3	755.4	873.5	969.0	753.7	849.9	732.9
Salt	8.8	8.0	8.6	7.6	8.6	7.8	8.2	7.9	8.4	9.2	7.3	8.2	4.2
Feed Cost per cwt. Gain	8.09	8.27	8.06	7.05	7.93	7.18	8.08	7.77	7.85	8.57	6.72	7.74	7.08

Feed Prices Used: Grain, $1 cwt.; ground barley, $1.10 cwt.; cottonseed meal, $1.50 cwt.; corn and rape silage, $4 ton; alfalfa, $8 ton; mineral mixture, $3 cwt.; salt, $10 ton.

Table 3—Lamb-feeding Experiment, Monroe, 1930-31: 70 lambs per lot fed from November 1, 1930, to January 30, 1931—91 days.

(Table based on one average lamb)

LOT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12
RATION FED Alfalfa in All Lots	Oats, Cottonseed Meal, 1st-crop	BARLEY 1st-crop	BARLEY 1st-crop	Wheat, 1st-crop	BARLEY 3d-crop	BARLEY 3d-crop	BARLEY 3d-crop	BARLEY 3d-crop	BARLEY 1st-crop	Corn, 3d-crop	BARLEY Cottonseed Meal, 1st crop	BARLEY 3d-crop
DESCRIPTION OF LAMBS	White-faced Wethers	Wrinkly Lambs	White-faced Wethers	White-faced Wethers	Large White-faced Wethers	Black-faced Wethers	Small White-faced Wethers	Black-faced Wethers	Black-faced Wethers and Ewes	White-faced Wethers	White-faced Wethers	White-faced Wethers
Number Lambs Died												
Dietary	0	5	..	0	..	1	1	..	..	1	1	..
Other Causes	2	0	..	2	..	0	0	..	..	0	1	..
Total	2	5	..	2	..	1	1	..	..	1	2	..
Initial Weight (lbs.)	59.7	67.7	61.4	60.5	74.1	67.7	46.9	67.0	64.1	59.7	61.2	62.1
Final Feed-lot Weights (lbs.) (With 4% Shrinkage)	85.0	89.7	82.4	84.6	102.9	96.0	72.4	90.4	85.5	83.5	87.1	91.9
Total Gain	25.3	22.0	21.0	24.1	28.8	28.3	25.5	23.4	21.4	23.8	25.9	29.8
Daily Gain	.28	.24	.23	.27	.32	.31	.28	.26	.24	.26	.29	.33
Daily Feed												
Grain	.88	.88	.88	.86	.88	.88	.86	.88	.88	.88	.88	.88
Supplement	.1	...	...	...	...	...	...	...	...	...	.1	...
Alfalfa	2.0	2.0	2.0	2.0	2.3	2.1	1.8	2.0	2.0	2.0	2.0	2.1
Salt	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
Feed Required for cwt. Gain (4% Shrinkage)												
Grain	311.5	358.2	374.9	319.9	273.3	278.8	305.3	336.8	367.5	330.4	304.0	264.4
Supplement	34.0	...	...	...	...	...	...	...	...	...	33.2	...
Alfalfa	709.3	832.8	860.3	758.6	714.9	651.5	634.4	782.8	845.7	761.3	701.5	637.3
Salt	6.4	9.2	9.3	7.1	6.9	5.7	6.1	7.0	7.1	8.2	7.2	6.1
Feed Cost per cwt. Gain	6.49	6.96	7.24	6.27	5.63	5.42	5.62	6.53	7.09	6.39	6.38	5.22

Feed Prices Used: Grain, $1 cwt.; cottonseed meal, $1.50 cwt.; alfalfa, $8 ton; salt, $10 ton.

Table 4—Lamb-feeding Experiment, Monroe, 1931-32: Table based on 1 average lamb, 12 lots of 70 lambs each fed from October 16, 1931, to January 24, 1932—100 days.

LOT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12
RATION FED Alfalfa in All Lots	BARLEY							1st Crop				3d Crop Barley (Medium Lambs)
	3d Crop		2d Crop		1st Crop							
	(Small Lambs)	(Large Lambs)	No Sup.	Silage	Wrinkly	Cotton-seed Meal	Beet Molasses	Wheat	Ground Barley (Check)	Barley (Check)	Shelled Corn	
Initial Weight (lbs.)	40.9	63.9	53.9	53.9	58.8	53.7	53.7	54.8	54.4	55.0	54.4	52.9
Final Feed-lot Wgt. (with 4% Shrinkage—lbs.)	63.9	89.0	73.7	75.0	80.3	77.2	77.9	74.7	71.2	74.8	75.5	78.6
Total Gain (100 days)	23.0	25.1	19.9	21.0	21.5	23.5	24.2	19.9	16.7	19.8	21.0	25.7
Daily Ration Fed												
Grain	.73	.84	.81	.81	.84	.81	.82	.81	.68	.82	.82	.82
Corn Silage	...	...	...	1.49	...	...	...	...	...	...	...	...
Beet Molasses	...	...	...	...	...	...	.39	...	...	...	...	...
Cottonseed Meal	...	...	...	...	...	.20	...	...	...	...	...	...
Alfalfa	1.68	2.20	1.86	1.28	2.09	1.78	1.75	1.95	1.92	1.85	1.89	2.11
Salt	.017	.024	.022	.022	.019	.017	.018	.021	.020	.021	.021	.022
Feed for cwt. Gain (4% Shrinkage)												
Grain	319.0	333.4	410.3	387.6	391.8	345.3	339.4	406.1	405.0	415.2	388.8	319.8
Corn Silage	...	...	...	711.2	...	...	...	...	...	...	...	...
Beet Molasses	...	...	...	...	...	...	160.6	...	...	...	...	...
Cottonseed Meal	...	...	...	...	...	84.6	...	...	...	...	...	...
Alfalfa	730.5	876.7	937.9	608.9	971.3	754.7	725.4	982.0	1144.1	937.1	698.7	820.2
Salt	7.3	9.7	10.9	10.3	8.9	7.1	7.3	10.4	11.7	10.4	10.2	8.4
Feed Cost cwt. Gain	6.15	6.89	7.91	7.79	7.85	7.78	6.97	8.04	9.09	7.95	7.53	6.52
Financial Statement:												
Cost per Lamb	1.12	2.40	2.02	2.02	1.62	2.01	2.01	2.05	2.04	2.06	2.04	1.98
Feed Cost per Lamb	1.41	1.73	1.57	1.64	1.69	1.83	1.69	1.60	1.52	1.57	1.58	1.68
Total Cost (Lambs and Feed)	2.53	4.13	3.59	3.66	3.31	3.84	3.70	3.65	3.56	3.63	3.62	3.66
Number Fat Lambs	24	70	56	53	63	64	67	62	41	54	59	57
Fat Lambs at dollars per cwt.	4.00	4.75	4.40	4.35	4.00	4.75	4.75	4.65	4.30	4.40	4.45	4.40
*Valuation per cwt.	3.69	4.75	4.25	4.16	3.96	4.67	4.71	4.54	4.00	4.21	4.33	4.26
Selling Weight (4% Shrinkage)	63.9	89.0	73.7	75.0	80.3	77.2	77.9	74.7	71.2	74.8	75.5	78.6
Gross Return	2.36	4.23	3.13	3.12	3.18	3.61	3.67	3.39	2.85	3.15	3.27	3.35
Net Return	—.17	+.10	—.46	—.54	—.13	—.23	—.03	—.26	—.71	—.48	—.35	—.31
Dollars per cwt. to break even	3.96	4.64	4.87	4.89	4.12	4.97	4.75	4.89	5.01	4.85	4.80	4.66

*Prices of Feeds used in Test (per ton): Alfalfa, $8; Silage, $4; Beet Molasses, $8; Cottonseed Meal, $30; Salt, $10; Grain, $20; Ground grain, $22. Cost per Lamb (per cwt.): Medium Weights and Heavies, $3.75; Light and Wrinkly Lambs, $2.75. Prorated in weight with feeder and at $3.50 cwt.

Table 5—Lamb-feeding Experiment, Delta, 1930-31: 125 lambs per lot fed from November 13, 1929, to February 12, 1930—91 days.

LOT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12
RATION FED	Barley, Alfalfa	Shelled Corn, Alfalfa	Barley, Cotton-seed Meal, Alfalfa	Alfalfa, Barley, Com. Protein Concen.	Barley & Alfalfa Chaff. (60 days) Alfalfa (31 days) Cotton-seed Meal	Barley & Alfalfa Chaff. (60 days) Alfalfa (31 days) Com. Protein Concen*	Barley, Alfalfa Chaff 29 days) C. S. Meal, Alfalfa (63 days)	Barley, Barley Straw 28 days) C. S. Meal, Alfalfa (63 days)	Barley, Cut Alfalfa (48days) Alfalfa (43days)	Barley, Alfalfa (Wrinkled lambs)	Barley, Alfalfa	Barley, Alfalfa
Number Lambs Died												
Dietary	0	0	..	..	0	1	0	1	..	1	..	1
Other Causes	1	1	..	..	1	2	1	1	..	1	..	1
Total	1	1	..	..	1	3	1	2	..	2	..	2
Initial Weight (lbs.)	67.5	67.6	69.3	67.3	67.9	68.4	68.2	67.8	69.4	67.8	67.2	68.2
Final Feed-lot Weights (lbs.)	100.2	97.7	99.5	101.2	91.1	91.8	95.3	92.8	96.8	100.4	98.0	98.4
Shrinkage to Market (L. A.)	8.5	6.3	8.2	11.4	7.0	10.9	8.4	9.1	7.9	9.5	8.0	9.4
Weight at Market	91.7	91.6	91.4	89.7	84.7	81.8	87.3	84.4	89.2	90.9	90.1	89.1
Gain at Market	24.2	24.0	22.1	22.4	16.8	13.4	19.1	16.6	19.7	23.1	22.9	20.9
Average Daily Gain	.27	.26	.24	.25	.18	.15	.21	.18	.22	.25	.25	.23
Daily Feed												
Grain	.64	.59	.59	.60	.68	.68	.55	.62	.62	.62	.64	.64
Supplement	...	...	.12	.15	.15	.16	.10	.13	...	...	...	...
Chaff or Straw	...	...	...	...	2.22	2.27	.87	.68	...	...	...	...
Alfalfa Hay	3.49	3.48	3.54	3.61	1.11	1.13	2.48	2.58	1.48	3.52	3.49	3.59
Cut Alfalfa	...	...	...	...	...	...	...	...	2.13	...	...	...
Salt	.02	.02	.02	.02	.01	.01	.01	.01	.02	.02	.02	.02
Feed Required for cwt. Gain (4% Shrinkage)												
Grain	241.0	224.7	243.3	244.8	366.5	464.4	262.2	339.2	285.7	243.4	254.2	278.0
Supplement	...	...	49.1	61.7	81.7	109.1	49.4	69.1	...	...	...	...
Chaff or Straw	...	...	...	...	1200.1	1540.1	412.5	371.5	...	...	...	...
Alfalfa Hay	1312.2	1318.7	1459.4	1471.2	602.9	767.7	1182.9	1417.0	682.7	1385.2	1387.0	1565.8
Cut Alfalfa	...	...	...	...	...	...	...	...	983.7	...	...	...
Salt	5.8	5.9	6.0	6.3	6.9	9.4	6.1	7.4	7.0	6.0	6.1	6.6
Feed Cost per cwt. Gain	7.69	7.55	9.04	9.29	9.89	12.67	9.0	10.29	10.18	8.0	8.12	9.07

*Commercial protein concentrate.

Feed Prices Used: Whole grain, $1 cwt.; cottonseed meal, $1.50 cwt.; commercial protein concentrate, $1.50 cwt.; alfalfa chaff, $3.78 ton; straw, $.89 ton; alfalfa hay, $8 ton; recut alfalfa, $9.25 ton.

Table 6—Lamb-feeding Experiments, Delta and Monroe, Utah: Relative feed cost per hundred weight gain.

DELTA						
Avg. Daily Feed (lbs.): Barley, 64; Alfalfa, 3.52; Salt, 0.02. Feed per cwt. Gain (lbs.): Barley, 257.7; Alfalfa, 1421.7; Salt, 6.2.						
Alfalfa per Ton at	$4	$5	$6	$8	$10	$12
Barley per cwt. at						
40c	3.90	4.61	5.33	6.75	8.17	9.59
45c	4.03	4.74	5.46	6.88	8.30	9.72
50c	4.16	4.87	5.59	7.01	8.43	9.85
55c	4.29	5.00	5.72	7.14	8.56	9.98
60c	4.42	5.13	5.85	7.27	8.69	10.11
65c	4.55	5.26	5.98	7.40	8.72	10.24
70c	4.67	5.38	6.10	7.52	8.84	10.36
75c	4.80	5.51	6.23	7.65	8.97	10.49
80c	4.93	5.64	6.36	7.78	9.10	10.62
85c	5.06	5.77	6.49	7.91	9.23	10.75
90c	5.19	5.90	6.62	8.04	9.36	10.88
95c	5.32	6.03	6.75	8.17	9.49	11.01
$1.00	5.45	6.16	6.88	8.30	9.62	11.14
$1.10	5.70	6.41	7.13	8.55	9.87	11.39
$1.20	5.96	6.67	7.39	8.81	10.13	11.65
$1.25	6.09	6.80	7.52	8.94	10.26	11.78
$1.30	6.22	6.93	7.65	9.07	10.39	11.91
$1.50	6.74	7.45	8.17	9.59	10.91	12.43
$1.75	7.38	8.09	8.81	10.23	11.55	13.07

MONROE						
Avg. Daily Feed (lbs.): Barley, 97; Alfalfa, 2.06; Salt, 0.02. Feed per cwt. Gain (lbs.): Barley, 390.4; Alfalfa, 835.4; Salt, 9.2.						
Alfalfa per Ton at	$4	$5	$6	$8	$10	$12
Barley per cwt. at						
40c	3.28	3.70	4.12	4.95	5.79	6.62
45c	3.48	3.90	4.32	5.15	5.99	6.82
50c	3.67	4.09	4.51	5.34	6.18	7.01
55c	3.87	4.29	4.71	5.54	6.38	7.21
60c	4.06	4.48	4.90	5.73	6.57	7.40
65c	4.26	4.68	5.10	5.93	6.77	7.60
70c	4.45	4.87	5.29	6.12	6.96	7.79
75c	4.65	5.07	5.49	6.32	7.16	7.99
80c	4.84	5.26	5.68	6.51	7.35	8.18
85c	5.04	5.46	5.88	6.71	7.55	8.38
90c	5.23	5.65	6.07	6.90	7.74	8.57
95c	5.43	5.85	6.27	7.10	7.94	8.77
$1.00	5.62	6.04	6.46	7.29	8.13	8.96
$1.10	6.01	6.43	6.85	7.68	8.52	9.35
$1.20	6.40	6.82	7.24	8.07	8.91	9.74
$1.25	6.60	7.02	7.44	8.27	9.11	9.94
$1.30	6.80	7.22	7.64	8.47	9.31	10.14
$1.50	7.58	8.00	8.42	9.25	10.09	10.92
$1.75	8.55	8.97	9.39	10.22	11.06	11.89

Salt estimated at $10 per ton.

Table 7—Lamb-feeding Experiment, Monroe: Meteeorological record based on Richfield observations, November 18, 1928, to February 25, 1929, inclusive.

No. Clear Days	49
No. Partly Clear Days	19
No. Cloudy Days	32
Total Precipitation (in.)	1.8
No. days with 0.01 inch or more precipitation	16
Total No. Inches Snow	17
Maximum temperature (°F.), December 27, 1928	67
Minimum temperature (°F.), February 9, 1929	—17

	Summation of Temperature		Mean Maximum	Mean Minimum
	Maximum	Minimum		
November 18-30, 1928	631	251	48.5	19.3
December 1-31, 1928	1324	388	42.7	12.5
January 1-31, 1929	1251	326	40.4	10.5
February 1-25, 1929	922	278	36.9	11.1
Totals	4128	1243		

Mean maximum, 100 days ..... 41.28°
Mean minimum, 100 days ..... 12.43°
Mean temperature, 100 days ..... 26.85°

41.28
+12.43
2 | 53.71
26.86=Mean Temperature for 100 Days

Sevier County is especially well adapted for winter livestock-fattening operations because of low snowfall and abundance of sunshine. November, December, and January, the months best adapted to livestock fattening operations and when the lambs are in the feedlot, are low in moisture. During these three months the records taken over a number of years have indicated plenty of sunshine.

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