The calves in Lot 4 (high-level of wintering cows and creep-feeding calves) weighed considerably more on March 1 than the other calves. These are the oldest calves and some of the difference may be due to the unusually large number of steers in this lot. There is an unusually large number of heifers in Lot 2 and these calves are the youngest. No weight corrections due to differences in number of each sex and age of calves have been made in these data.

Further evaluation of the feeding method for each of the 4 groups of cattle will be made when the calves are sold in late June or early July.

Supplements to High-Silage Rations for Fattening Two-Year-Old Steers

L. S. POPE, R. D. HUMPHREY, LOWELL WALTERS and GEORGE WALLER

Much attention has been given to the development of complex protein supplements for fattening cattle. Increased use has been made of stilbestrol and other synthetic hormones in an attempt to increase gain and lower the feed requirements. Using the "artificial rumen" technique, it has been possible to show that a wide variety of feeds and other ingredients will improve the medium for rumen bacteria.

As important as these advances are, much remains to be learned as to the practical importance of the many feed additives now being used in beef cattle supplements. Small differences in rate and efficiency of gain may mean the difference between profit or loss to the cattle feeder. Yet it is generally true that the more complex the supplement the greater the cost of the fattening ration. Thus, practical feeding trials are necessary to show the possible beneficial effects of complex supplements as opposed to commonly used oil meals on a protein- and energy-equal basis.

To test certain feed additivies and complex supplements for fattening beef cattle, a project was initiated at the Fort Reno station in 1953. In these tests, long-yearling and two-year-old feeder cattle have been used. They have been fattened on high-silage rations, with limited amounts of ground milo and a protein supplement. This report gives the results of the 4th trial. To date, the tests have included comparisons of 12 supplements vs. soybean meal.

Procedure

Seventy, coming two-year-old steers from the Experiment Station herds at Guthrie and Lake Carl Blackwell were selected in August and September, 1956, for this study. Forty-two steers were obtained from the Guthrie station. These cattle had been purchased the previous fall from the Louis Ham Ranch at Paoli in the southern part of the state, and had been used in grazing trials at the Guthrie station. Twenty-eight of the steers used were from the Lake Blackwell station herd.

One-half of the cattle from the Blackwell group had been implanted with 45 mg. of stilbestrol in June, 1956, as reported elsewhere in this publication. Allotment to the feeding test at Fort Reno was made on the basis of source, previous treatment, summer gain, shrunk weight (off feed and water for 16 hours) and grade. The cattle were charged into the feeding pens at $18.50 per cwt.

A "two phase" feeding program was followed in which silage was fed **ad lib.** during the first 84 days, following which the steers were raised to a full-feed of grain (approximately 2 lbs. of grain per cwt.) plus silage and supplement for the last 100 days on test. During the entire test, the same amount of supplement was fed per steer daily as follows:*

Lot 1—2.0 lbs. soybean meal.
Lot 2—3.0 lbs. of a special mixture containing soybean meal, dried molasses, ground limestone, B-vitamin concentrate (Fortafeed), vitamin A and trace minerals.
Lot 3—3.45 lbs. of a urea-molasses mixture plus minerals.
Lot 4—Same as Lot 1 plus antibiotic (90 mg. aureomycin).
Lot 5—Same as Lot 2 plus antibiotic.
Lot 6—Same as Lot 3 plus antibiotic.
Lot 7—2.0 lbs. soybean meal, to which 150 mg. of a thyroid depressor was added during the heavy grain feeding phase (last 100 days).

The amount of supplement fed the experimental lots was adjusted to provide essentially equal protein intakes in all lots. The milo fed Lots 2 and 5 was reduced slightly to account for the higher energy content of the supplement fed.

All steers received 10 mg. stilbestrol per head daily, mixed with the protein supplement. A previous trial had shown that feeding stilbestrol throughout the fattening period would increase gains by 24%, and lower the feed required per cwt. gain by 15%. In Lots 3 and 6, the bone meal, trace minerals, stilbestrol and aurofac (Lot 6) were mixed with a small amount of ground milo, and the urea and molasses were mixed at each feeding.

The cattle were fed once daily in deep bunks beneath an open shed. A mineral mix of 2 parts salt and 1 part steamed bone meal was available to all cattle. At the completion of the trial, a final shrunk weight (16 hours off feed and water) was obtained and the cattle were sold the following day on the Oklahoma City market. Data were obtained on shrink to market, yield, carcass grade, marbling score of the rib eye, and carcass value based on dressed beef prices at Oklahoma City. From this information, an "on-foot' value per cwt., based on individual final weights at Fort Reno, was calculated and used in figuring net returns.

*The Aurofac and Fortafeed were obtained from American Cyanamid Corporation, Lederle Division, New York City; the vitamin A concentrate (Quadrex 30) was supplied by Nopco Chemical Co., Harrison, New Jersey; the urea was supplied by Allied Chemical and Dye, New York City; the trace minerals by Calcium Carbonate Company, Chicago, Ill., and the thyroid depressor (1-methyl-2-mercaptoimidazole) supplied by Eli Lilly and Co., Indianapolis, Indiana.

Results

The chemical composition of the feeds used in this trial are shown in Table 1. Average daily gains, rations fed, feed required per cwt. gain and its cost are shown in Table 2. Slaughter data and financial returns are shown in Table 3.

1. **Soybean meal vs. a complex supplement.** The relative value of soybean meal vs. a complex supplement containing soybean meal, dried molasses, calcium, trace minerals, B-vitamin supplement and vitamin A can be seen by comparing Lots 1 and 4 with Lots 2 and 5. Average daily gains were almost identical, and feed costs per cwt. gain therefore reflected the higher cost of the complex supplement fed to Lots 2 and 5. Under the prevailing prices of this trial, the cattle of Lots 2 and 5 needed to gain about 30 lbs. per head more than the controls to have paid for the additional feed cost due to the higher-priced protein supplement.

Carcass grades were somewhat higher for steers of Lots 2 and 5 and their on-foot market value was increased about $.50 per cwt; yield and marbling scores further reflected the better condition of these cattle. Financial returns were not improved due to high cost of the supplement.

2. **Soybean meal vs. urea-molasses.** Steers of Lots 3 and 6 fed a urea-molasses supplement fortified with bone meal and trace minerals gained significantly less than those of Lots 1 and 4 fed soybean meal. Carcass data showed little difference between the two groups, although the packer buyers actually bid $1.00 less for Lot 3 cattle than for the other lots. In terms of rate of gain and feed efficiency, the use of a urea-molasses mixture to supply all the crude protein for fattening steers was not justified. Further, the high price of molasses in this trial tended to make the substitution even more unprofitable. It would appear that the use of urea-molasses mixtures now being sold commercially in this area as the sole protein supplement for fattening cattle is unwise. Previous research has shown that urea can substitute for one-half of the protein of a supplemental mixture, but that substitution at a higher level may adversely effect feed efficiency and market value. Palatability is often a problem with urea supplements. However, with the urea-molasses mixture fed Lots 3 and 6 no adverse effect on palatability was noted.

3. **Effect of a thyroid-depressor.** The thyroid-inhibitor fed to Lot 7 cattle during the last 100 days was used in an attempt to improve carcass quality. Previous tests with stilbestrol have shown marked improvement in rate and economy of gain, but no improvement in carcass grade. Average daily gains were apparently not affected by use of the thyroid depressor in this trial. Also, yield, carcass grade and marbling scores taken from the rib eye showed essentially no difference. Thus, it appears that the product fed was either (1) not effective against cattle

Table 1.—Chemical composition of feeds, 1956-57 trial.

FEED	Moisture	Ash	Crude Protein	Fat	Fiber	N-Free Extract	Ca	P
Sorghum Silage	71.14	2.16	2.08	.82	5.85	17.95	.09	.06
Soybean Meal	9.58	5.79	48.48	1.11	5.71	29.33	.39	.33
Special Mixture[1]	8.95	8.29	35.99	1.00	5.74	40.03	1.57	.25
Urea[2]			262.00					
Milo	10.15	1.57	11.56	2.52	.99	73.21	.14	.27

[1] Special mixture fed Lots 2 and 5 supplied per steer daily (lbs.): 2.0 soybean meal; 0.83 dried molasses; 0.05 B-vitamin supplement; 0.1 ground limestone, 0.066 dry stabilized vitamin A (30,000 U. S. P. units), and 1 gram trace minerals.

[2] Urea-molasses mixture fed Lots 3 and 6 supplied 3.0 lbs. molasses and 0.35 lb. urea per steer daily. In addition, 0.1 lb. steamed bone meal and 1 gm. commercial trace mineral mixture was added to the ground milo fed daily. Substitution of urea-molasses for soybean meal was made by step-wise replacement during the first 21 days of the test.

Table 2.—Weight gains, rations fed and feed required per cwt. gain (183 days on test, 10 steers/lot)[1]

Lot Number	No Antibiotic			With Antibiotic			
	1	2	3	4	5	6	7
Supplement Fed	S.B. Meal	Special Mix	Urea-Mol.	S.B.M. + Aurofac	Spec. Mix + Aurofac	Urea-Mol. + Aurofac	S.B.M. + Thy. Depressor
Av. weights (lbs.):							
Initial 9-21-56	790	790	789	784	790	791	789
Final 3-24-57	1266	1280	1215	1276	1260	1236	1263
Av. daily gain	2.60	2.68	2.33	2.69	2.57	2.43	2.59
Av. daily ration (lbs.), all cattle received 10 mg. stilbestrol.							
Milo	12.6	11.9	12.6	12.2	11.9	12.7	12.6
Soybean meal	2.0		.9[3]	2.0		.9[3]	2.0
Special mix[2]		3.0			3.0		
Urea-molasses[2]			3.3			3.3	
Aurofac				.05	.05	.05	
Thyroid depressor[4]							150mg.
Silage	38.3	38.8	38.6	40.2	37.3	38.0	39.0
Minerals (2-1-mix)	.08	.08	.08	.08	.05	.08	.08
Feed required/cwt. gain (lbs.)							
Milo	484	444	541	469	463	522	486
Supplement	77	112	140	76	119	136	77
Silage	1472	1449	1658	1492	1452	1563	1506
Feed cost/cwt. gain ($)	22.42	24.46	26.96	22.55	25.73	26.36	22.66

[1] One steer removed from Lot 4, December 10, for coccidiosis.
[2] For composition, see foot-note to Table 1.
[3] Ave. daily amount fed during the first 21 days when soybean meal was gradually replaced by the urea-molasses supplement.
[4] Thyroid depressor was fed only during the last 100 days (heavy grain phase).

Table 3.—Marketing data, carcass grades and financial results.

Lot number	No Antibiotic			With Antibiotic			
	1	2	3	4	5	6	7
Supplement fed	S.B. Meal	Special mix	Urea-Mol.	S.B.M. + Aurofac	Spec. Mix + Aurofac	Urea-mol. + Aurofac	S.B.M. + Thy. Depressor
Slaughter data:							
Shrink to Market (%)	3.95	3.52	3.95	3.45	3.77	2.18	2.73
Yield (%)[1]	59.6	60.2	59.7	60.0	60.5	60.6	59.6
Carcass grades:[2]							
Top choice						1	
Av. choice		1	1		5		2
Low choice	3	5	4	3	1	4	2
Top good	6	3	5	4	3	4	5
Av. good	1	1		2	1		
Marbling score[3]	6.8	5.6	6.3	6.8	5.9	5.2	6.4
Financial results ($)							
On-foot value/cwt.[4]	19.97	20.40	20.20	20.06	20.61	20.62	20.11
Feed cost/steer[5]	106.74	119.86	114.86	110.95	120.92	117.32	107.39
Total steer + feed cost[6]	252.89	266.01	260.83	255.99	267.07	263.66	253.36
Net return per steer	—0.07	—4.89	—15.40	—0.02	—7.38	—8.80	+0.63

[1] Hot carcass weights shrunk 2½%, values based on final Ft. Reno weights.
[2] Carcass grade lost on one steer in Lot 6.
[3] Marbling score: 1= abundant, 7=average or moderate, 13= very slight.
[4] On-foot value computed from carcass grade, yield and value, based on final Ft. Reno weight.
[5] Cost of Special supplement, $107.80 per ton; urea-molasses plus minerals, $66.20. No charge made for thyroid depressor used in Lot 7.
[6] Does not include costs of transportation, labor, spraying or marketing. Initial cost of steers into feedlot, 18.5¢ per lb.

of this age and weight at the levels fed, or (2) may have been altered or destroyed in the rumen before its action could become effective.

4. **Effect of an antibiotic.** The performance of steers of Lots 1, 2 and 3 receiving no antibiotic can be compared with those fed 90 mg. of aureomycin per steer daily in the crude product (Lots 4, 5 and 6). Average daily gains for the two groups were nearly identical, as were feed efficiency values and carcass merit. In a previous trial, the antibiotic had given a slight response—but in this trial with larger numbers the effect was not apparent. It would appear that under the conditions of this trial, adding an antibiotic to the supplement was of no benefit. A number of experiment stations have reported similar results. However, a number of large commercial feeders who fatten cattle in the same pens throughout the year and who buy cattle from many sources, argue that the antibiotic will improve gains, particularly during the early part of the feeding period. Such differences in response between the experimental pens and the commercial feedlots may exist. Each feeder may need to conduct tests to determine the effect of antibiotics under his own conditions.

5. **Effect of previous implantation with stilbestrol on feedlot gains.** It was possible in this test to so allot the Blackwell cattle that the performance of 14 steers which had been implanted with 45 mg. stilbestrol in June could be compared to a like number from the same herd which served as controls. Gains during the feeding test were essentially the same (2.66 lbs. per head daily for the controls vs. 2.63 lbs. for cattle previously implanted), hence no adverse effect of implantation on subsequent feedlot performance was apparent. However, the summer gains of the two groups indicated little response to stilbestrol and it is possible where no improvement due to stimulation occurs, subsequent performance on fattening rations will not be affected.

Summary

Seventy yearling steers were divided into 7 uniform lots and used to test the effect of different supplements vs. soybean meal in high-silage rations. The supplements included a complex vitamin and mineral mixture, a urea-molasses mixture fortified with minerals, an antibiotic (aureomycin) added to each of three supplements, and a thyroid-depressor added to one lot during the last half of the fattening period. None of the supplements tested appeared to improve rate of gain or feed efficiency, although certain of the supplements improved carcass grade slightly. The urea-molasses mixture was inferior to soybean meal as a protein supplement in this type of fattening ration.

The results from four trials in which 12 supplemental mixtures have been compared to soybean meal on a protein- and energy-equal basis have indicated that the simple protein is apparently sufficient to

meet the needs of rumen bacteria, as measured by steer performance. Thus, when silage of good quality is the roughage, selection of the protein supplement should be based on cost per unit of protein. Urea-molasses mixtures as the entire supplement are not equal to soybean meal.

Fattening Trials with Western Feeder Lambs

ROBERT L. NOBLE, RICHARD PITTMAN, and GEORGE WALLER, Jr.

A lamb feeding enterprise during the fall and winter can fit into many farm programs in Oklahoma. Lambs make excellent utilization of wheat pasture. Lambs also can be finished in dry-lot to a satisfactory slaughter grade on a lower-concentrate higher-roughage ration than most meat producing animals. The proximity of an adequate supply of feeder lambs, reasonably mild winters, ready market for the finished lambs and the usual supply of home grown feeds make lamb feeding an enterprise worthy of consideration.

The study reported here was initiated at Ft. Reno Station with the following objectives:

(1) To study the feeding value of sorghum silage in a lamb-fattening ration.

(2) To test alfalfa in various forms as a supplement to sorghum silage.

(3) To study the effect of stilbestrol implant in lambs on a high roughage and also on a high grain ration.

(4) To determine the value of uncombined milo and winter grass for lambs.

(5) To study a deferred feeding system with lambs, thus marketing at a later date.

Procedure

Two hundred and ninety-two Southwestern feeder lambs were used. These lambs were purchased in the range area of New Mexico. They were shipped via rail from Artesia, New Mexico, and were received at the Ft. Reno Station, October 15. The lambs grazed Bermuda grass pasture around the Station Headquarters until November 8. During this period the lambs were handled as follows:

October 26, 27—all lambs were sheared.
" 27—vaccinated against enterotoxemia.

November 1—weighed individually, to check shrinkage and for preliminary allotment.