

Summary

Eight lots of yearling steers were fed 154 days to compare soybean meal and a urea-milo-bone meal supplement, with and without additional trace minerals, and when used to supplement milo-sorghum silage or milo-cottonseed hull type rations. With either silage or hulls as the roughage, soybean meal proved superior to the urea supplement. This was especially true when cottonseed hulls were the roughage. Trace minerals did not improve steer performance or feed efficiency with either supplement. Little difference was noted between sorghum silage and cottonseed hulls when the rations were equalized as much as possible with respect to protein, energy, and minerals, and both were supplemented with vitamin A. Apparently other factors or conditions than those studied here are necessary for optimum use of high-urea supplements.

Effect of Feeding for Rapid Vs. Moderate Rates of Gain On Feed Efficiency and Carcass Composition of Steer Calves

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Beef is included in the diet more as a source of protein than for its energy value. Surveys indicate that the consumer is more calorie-conscious today than in the past, preferring trimmer, leaner cuts of meat. Flavor, tenderness, and juiciness are important considerations. Thus, feeding systems which will result in more lean beef (of acceptable palatability) at lower cost need to be developed.

To study the problem, a series of tests was initiated in the fall of 1956 to determine the effect of different rates of gain of steer calves on efficiency of feed conversion and the quality and quantity of beef produced. The results reported here cover the third trial which was started in the fall of 1958.¹

Procedure

Twenty-four weanling Hereford steer calves were selected for this study from the Fort Reno Experiment Station herd in October, 1958. Each treatment group contained two calves sired by each of a pair of half-brother bulls, and two calves sired by two other closely related bulls. Age and weight of the calves, treatment of dam, and feeder grade were also considered in allotment.

¹The results of the first (1956-57) and second (1957-58) trials are reported in Okla. Agr. Exp. Sta. Misc. Pub. MP-51 and MP-55, respectively. A fourth trial is now in progress.

The steers were individually-fed in stanchioned stalls, twice daily, during the trial. All calves were continued on test until they had attained 400 pounds of feedlot gain. Previous feeding trials at this station have shown that steer calves full-fed from weaning to market gain about this amount and produce a low choice carcass.

The four treatments used (6 calves per treatment) were as follows:

Lot 1—Rapid rate of gain (full-fed) for 400 lbs. of feedlot gain.

Lot 2—Rapid rate of gain for 200 lbs., then moderately for the remaining 200 lbs. feedlot gain.

Lot 3—Reverse of Lot 2, moderate rate of gain for the first 200 lbs., then rapidly.

Lot 4—Moderate rate of gain throughout.

To achieve the different rates of gain, approximately 2 lbs. of milo per cwt. were fed to calves on the high level of feeding, and about one-half this amount (1 lb. milo per cwt.) was given to the moderately-fed steers. In addition to rolled milo, the ration contained cottonseed meal, dehydrated alfalfa pellets, and cottonseed hulls, with minerals offered free-choice. The amount of roughage (cottonseed hulls) was increased somewhat for the calves receiving less grain (moderate-gaining groups).

Shrunk weights were used to determine feedlot gain. When each steer reached 400 lbs. gain, it was removed from test and slaughtered at the meats laboratory. Detailed physical and chemical tests were undertaken to determine the yield of wholesale cuts, their composition, and desirability.

The above procedure is essentially the same as used in the first two trials.

Results

Table 1 gives a summary of average daily gains, feed intake, and efficiency of feed conversion. Slaughter grade and carcass data including grade, yield, rib eye area, marbling, yield of wholesale cuts, chemical and physical composition of 9-10-11 rib cuts, and tenderness are shown in Table 2.

Lot 1 steers, fed to gain rapidly throughout, gained 1.70 lbs. per day, as compared to 1.28 lbs. per day for the moderately-fed group (Lot 4). The gains of both groups were slightly less than the gains obtained in the first two trials. Differences in gains between rapid and moderate

Table 1.—Average Feedlot Performance and Nutrient Intake of Individually-Fed Steer Calves Fattened at Different Rates (1958-59 Trial).

	Lot 1 High	Lot 2 High-Moderate	Lot 3 Moderate-High	Lot 4 Moderate ^a
Number of steers on treatment ¹	6	6	6	4
Total days on feed	239	279	241	310
Average weights (lbs.)				
Initial	445	447	448	431
Final	847	835	847	828
Average daily gain (lbs.)				
Phase I	2.24	2.09	1.94	1.62
Phase II	1.38	1.04	1.53	1.09
Total period	1.70	1.40	1.68	1.28
Avg. daily gain minus fill (lb.) ²	1.47	1.25	1.44	1.13
Avg. daily ration (lbs.)				
Rolled milo	11.6	8.2	9.1	6.4
Cottonseed meal	1.4	1.4	1.4	1.5
Dehyd. alfalfa pellets	0.9	1.0	1.0	1.0
Cottonseed hulls	4.4	5.1	5.4	5.8
2-1 mineral mix	ad. lib.	ad. lib.	ad. lib.	ad. lib.
Feed required per lb. gain (lb.) ³				
Concentrates	7.7	6.9	6.4	6.1
Roughages	3.2	4.4	3.8	5.3
TDN required per lb. gain (lb.) ³	7.5	7.4	6.7	7.2
Feed cost per lb. gain (ϕ) ³	18.2	18.2	16.4	17.8

¹Two steers in Lot 4 removed because of chronic bloat and poor performance.

²Contents of rumen, reticulum, omasum, and abomasum determined at time of slaughter and deducted from live animal weight.

³Based on average live gain, with no consideration for differences in "fill" at slaughter.

calves were to be expected because of the difference in energy content of the rations. Calves on the moderate treatment required 71 days longer on feed to make 400 lbs. gain. It was hoped that daily gains of 2 lbs. or more would be achieved with the full-fed calves. Lack of "competition" due to the individual feeding technique employed and a ration of only fair palatability may have been contributing factors. Also, the steers appeared to be of lower quality and less uniform than those used in earlier trials.

Calves fed to gain moderately, and then rapidly (Lot 3), made nearly as rapid gains overall as those full-fed throughout. Similarly, Lot 2 (high-moderate) steers gained only slightly faster than the group fed to gain moderately throughout (Lot 4). Although grain intake was adjusted on the basis of body weight, differences in maintenance requirements may have contributed to the relatively poor performance of

Table 2.—Live Animal and Carcass Grades, and Composition of Carcasses of Steers Fattened at Different Rates of Gain (1958-59 Trial).

	Lot 1 High	Lot 2 High-Moderate	Lot 3 Moderate-High	Lot 4 Moderate
Final grade score on-foot ¹	16.3	16.0	16.9	18.7
Carcass grade score ¹	15.8	15.6	17.6	19.8
Dressing percent	59.3	60.5	58.5	60.0
Area of eye muscle (sq. in.)	9.1	10.3	8.9	10.2
Marbling score ²	17.4	17.9	21.6	23.7
Wholesale cuts (%)				
Round	17.8	18.8	18.0	19.0
Rump	6.2	6.2	6.8	6.2
Rib	8.2	7.9	8.0	7.8
Loin	13.6	13.7	14.2	13.9
Chuck	26.0	25.3	25.9	26.0
Others ³	28.2	28.0	26.8	27.1
Composition of carcass (%) ⁴				
Fat	28.8	26.0	25.6	24.3
Muscle	58.8	60.7	60.6	62.3
Bone	14.0	14.7	15.1	14.8
Chemical composition of eye muscle (%)				
Water	71.28	71.36	72.76	73.44
Fat	3.09	3.87	2.79	1.64
Protein	21.55	20.98	21.22	21.55
Ash	1.14	1.13	1.12	1.12
Tenderness, shear test (lb.) ⁵				
Loin (Longissimus dorsi)	16.1	15.4	16.6	14.0
Round (Semimembranosus)	16.8	17.1	17.0	14.0

¹Avg. Choice=10, Low Choice=12, High Good=14, Avg. Good=16, Low Good=18, and High Standard=20.

²Avg. opinion of 5 judges; lowest value=best marbling.

³Includes yield of flank, kidney knob, plate, brisket, and shank.

⁴Calculated from physical separation of 9-10-11 rib cut.

⁵Average of 9 shears per steak; least lb. = most tender.

Lot 2 steers, and the more favorable gains of Lot 3 steers, during the second phase of the trial. These observations are in line with results obtained in previous tests.

Adjusting the gain data by removing weight of stomach contents ("fill") gave essentially no difference in average daily gain relationships in this trial.

The amount of grain required per pound of gain was remarkably similar for the four treatments, in view of the wide differences in the amount fed per day. The similarity was due primarily to the extra days on feed required by the slower-gaining groups. In addition, more roughage was required per pound of gain for calves on the moderate level of feeding.

Application of Morrison's digestible nutrient values to the feed required per pound of gain showed that the least T.D.N. was required for steers on the moderate-high treatment. Differences between the other three groups were quite small. Steers fed moderately in phase 2 (Lots 2 and 4) required more feed per pound of gain than either of the other two groups. Again, the moderate-high regime was most efficient.

Feed cost per pound of gain clearly favored the moderate-high system (Lot 3), followed by the group fed to gain moderately throughout (Lot 4). Steers started on the full-feeding regime (Lots 1 and 2) were least economical in this regard.

It is apparent from the results presented in Table 2 that differences in grade and other measures of carcass merit between the various treatments were rather small. The full-fed steers graded average Good, as did the high-moderate group, while Lot 3 (moderate-high) graded low to average Good and the steers fed to gain moderately were a third of a grade lower (high Standard to low Good).

Steers fed for moderate gains in phase 2 (Lots 2 and 4) tended to have higher yields and larger rib eye area than calves full-fed in this same phase. The larger rib eyes may have been a reflection of age, since Lot 2 and 4 calves were on feed 55 days longer than Lots 1 and 3.

Marbling scores were decidedly in favor of Lots 1 and 2, with Lot 4 being most inferior in this respect.

Differences in yield of the various wholesale cuts were not great and no definite trends are apparent. Lots 1 and 3 had slightly less round, while Lots 1 and 2 had somewhat more of the cheaper (and fatter) wholesale cuts. Rump, rib, loin and chuck percentages showed no significant trends.

Carcass composition data, as determined by physical separation of the 9-10-11 rib cut, indicate considerably more fat for the full-fed group, with the moderately-fed group showing the least amount of fat, and the other two treatments (Lots 2 and 3) being intermediate to these extremes. Muscle content varied inversely with this, while percent bone showed less definite trends.

When feed efficiency (using T.D.N. values in Table 1) was expressed as pounds of T.D.N. required per pound of lean meat, the moderate-high group was most efficient (11.1 pounds), followed by moderate (11.6 pounds), high-moderate (12.2 pounds), and high (12.8 pounds), respectively. Also, the higher priced cuts (round, loin, and rib) contain a higher percentage of lean meat than some of the cheaper

cuts. Thus, actual value of carcasses produced by the moderate-high calves may have been greater than those from the full-fed calves. Slight differences in grade in favor of the high and high-moderate groups tended to offset this disadvantage in efficiency, however.

Chemical composition of lean tissue from the 9-10-11 rib cut indicated less moisture and more fat for the higher grading groups (Lots 1 and 2). Similarly, the Standard to Good carcasses from the moderate group had the least fat and highest moisture percentage. Relative differences in percent fat are further reflected in marbling score differences. Ash and protein content remained relatively constant.

Tenderness tests (Warner-Bratzler shear values) showed rather inconclusive results. The moderate group (Lot 4) appeared to be most tender, whether rib or round steaks were used, while differences in the other three treatments were less marked and less consistent. This was not expected, since lower grading carcasses are generally thought to be less tender. Preliminary results with taste panel data do not show any definite trends with respect to tenderness.

Summary

The results from the third in a series of fattening trials to determine the effect of different rates of gain of steer calves on feed efficiency, carcass composition and desirability of certain cuts are reported. Four groups of 6 steer calves were individually-fed to gain 400 pounds (1) rapidly; (2) rapidly for 200 pounds, then moderately; (3) moderately, then rapidly; and (4) moderately throughout. Full-fed groups received approximately 2 pounds milo per cwt. daily, while moderates received about one-half this amount. Steers fed to gain moderately received somewhat more roughage.

Results from the third trial indicate that steer calves fed to gain as rapidly as possible under the conditions of this experiment for 400 pounds produced a slightly higher grading carcass with a higher percentage of fat, on less total feed and in shorter time. Such treatment, however, resulted in less efficient feed conversion and less lean in the carcass. Also, no advantage in tenderness was detectable, indicating that quality differences may not have been large.

The moderate-high treatment appeared to be the most efficient under the conditions of this experiment. Although the high-moderate system showed promising results in this trial, the earlier tests gave evidence that it may be the least desirable of the four methods studied.