bestrol implants (one in May and one in August) increased gains 36 lb. or nearly 13 per cent. There was some variation in losses of weight during the period from weaning in October to beginning of the winter test on November 5. In this approximately 30-day period, the losses varied from 24 to 36 lb.

In the wintering test, the calves in Lots 1 and 2 lost nearly the same amount of weight. This would be expected since there was practically no difference in gains during the previous summer. The calves which had been previously implanted lost slightly less weight during the winter. One of the purposes of this test was to determine whether or not the subsequent winter gain of cattle would be decreased when the calves had been implanted with stilbestrol during the summer. In this preliminary test the weight advantage present at weaning was increased during the wintering period. The total gains from the beginning of the summer to the end of the winter were 232, 276 and 227 lb. for Lots 1, 2 and 3, respectively.

Summary

The value of stilbestrol and urea in rations for wintering beef cattle and the subsequent performance of calves previously administered stilbestrol were studied in 6 trials.

Cattle fed a urea-containing supplement (40 per cent protein) did not gain as much as those fed pelleted cottonseed meal. The addition of trace minerals, aureomycin or certain B vitamins failed to increase the utilization of urea.

The feeding of 5 mg. of stilbestrol to calves fed prairie hay and cottonseed meal had little effect on winter gains. Implanting steer calves with 12 or 24 mg. of stilbestrol apparently slightly decreased winter weight losses of steer calves fed protein supplements while grazing native grass.

The subsequent winter weight loss of calves which had been implanted with stilbestrol during the previous summer was slightly less than the gains of those not previously implanted. This is in agreement with the results of fattening tests which are reported elsewhere in this publication.

Effect of Rapid vs. Moderate Rates of Gain on Feed Efficiency and Carcass Composition of Steer Calves

L. S. POPE, R. L. HENRICKSON, J. R. LeGENDRE AND GEORGE ODELL

Recent surveys suggest that consumers prefer leaner beef rather than fatter cuts. Flavor and tenderness are important considerations. Nutritive values for different grades of beef have been based principally on their caloric or energy value, and were established in an era in which larger and fatter cuts were preferred than are currently demanded by consumers. Today, beef is included in the diet more for its flavor and as a source of protein than for its energy value. Hence, feeding

regimes should be established that will result in the greatest amount of protein tissue at cheapest cost—and still retain flavor, tenderness and other desirable qualities.

Few studies have been undertaken to determine the effect of different rates of gain of fattening calves on the quantity and quality of beef produced. Hence, a pilot study was established in the fall of 1956 using individually fed steer calves which were fattened so as to gain at different rates until each had achieved 365 lb. of total feedlot gain. The effects of these treatments were evaluated in terms of economy of conversion of digestible nutrients to body weight and the physical and chemical composition of the carcass. A more extensive trial is now in progress and will be completed in July, 1958. This report gives the results of the first trial (1956-57).

Procedure

Sixteen, Hereford steer calves from the same Experiment Station herd were selected for this study in October, 1956. One-half of the calves were sired by one bull, the remaining calves by one of two half-brother bulls. The calves were approximately 8 months of age when started on feed. They were individually fed in stanchioned stalls, twice daily, during the trial. Allotment was made on the basis of sire, age, weight and feeder grade. All calves were fed for sufficient time to make 365 lb. total feedlot gain, which has been demonstrated in feeding trials at this station to be the average amount gained by steers full-fed from weaning to Choice slaughter grade. Four treatments were employed (4 calves per treatment) as follows:

Lot 1—Rapid rate of gain.

Lot 2—Rapid rate of gain until one-half of desired feedlot gain was obtained, then moderately for remainder of period.

Lot 3—Reverse of Lot 2—moderate for first half and then rapidly.

Lot 4—Moderate rate of gain throughout.

As stated above, it was believed that calves of Lot 1 would grade Choice after completing 365 lb. feedlot gain. All calves received rolled milo, cottonseed meal, dehydrated alfalfa meal pellets and cottonseed hulls, with minerals free-choice. To obtain the high rate of gain, a milo intake of approximately 2 lb. per cwt. was employed—which is essentially the grain intake achieved when cattle are full-fed. The moderate level was approximately one-half of this, or 1 lb. milo per cwt. per day.

Shrunk weights were taken initially and at the end of the trial. As each calf achieved the desired feedlot gain, it was removed and slaughtered at the meats laboratory. Detailed physical and chemical tests were conducted to determine the yield of wholesale cuts, their composition and desirability.

Results

A summary of average daily gains, feed consumption and feed required per cwt. gain are shown in Table 1. Carcass data relative to

Table 1.—Average feedlot performance and nutrient intake of individually-fed steer calves fattened at different rates

	Lot 1 High	Lot 2 High-moderate	Lot 3 Moderate-high	Lot 4 Moderate
No. of steers/treatment	4	4	4	4
Total days on feed	177	197	189	188
Av. weights (lb.)				
Initial	520	525	507	525
Final	885	882	872	893
Av. daily gain				
Phase I	2.60	2.48	2.18	2.23
Phase II	1.69	1.40	1.76	1.72
Total period	2.06	1.84	1.93	1.96
Ave. daily gain minus fill (lb.)[1]	1.68	1.39	1.53	1.40
Av. daily ration (lb.)				
Rolled milo	13.4	8.6	10.3	6.6
Cottonseed meal	1.0	1.2	1.2	1.4
Dehyd. alfalfa pellets	1.0	1.0	1.0	1.0
Cottonseed hulls	4.8	7.6	6.2	9.4
2-1 mineral mix	ad. lib.	ad. lib.	ad. lib.	ad. lib.
Feed required per lb. gain (lb.)[2]				
Concentrates	7.0	5.3	6.0	4.0
Roughage	2.8	4.6	3.7	5.3
TDN required per lb. gain (lb.)[2]	6.8	6.2	6.4	5.5
Feed cost per lb. gain (¢)[2]	21.7	19.6	20.2	17.4

[1] Contents of rumen, reticulum, omasum and abomasum determined at time of slaughter and deducted from live animal weight.
[2] Based on average live gain, with no consideration for differences in "fill" at slaughter.

yield, grade, rib eye area, marbling, yield of wholesale cuts, physical and chemical composition of ninth-, tenth-, and eleventh-rib cuts, and tenderness are given in Table 2. While the numbers involved in this test were small, the use of individual feeding techniques and the fact that nearly 100 observations were made on each carcass enhances the value of the data.

Steers of Lot 1, fed to gain rapidly throughout, made daily gains of 2.06 lb. per day, while those fed moderately gained 1.96 lb. per day. This was surprisingly good for the "moderates," although when the "fill" of the stomachs at slaughter time was removed, the moderately fed cattle lost some of this advantage. Even though final live weights in this experiment were taken after a 36-hour period off feed and water, there were considerable differences in "fill". When this difference is considered, a greater spread between Lots 1 and 4 in daily gain (0.28 lb. per day) becomes apparent. Such discrepancies point up the shortcomings of "live weight" as the means of evaluating ration effects.

Gains of Lot 2, fed on the high-moderate regime, were poorest of the four treatments. The poor performance of this group in respect

Table 2.—Live animal and carcass grades, and composition of carcasses of steers fattened at different rates of gain

	Lot 1 High	Lot 2 High-moderate	Lot 3 Moderate-high	Lot 4 Moderate
Final grade score on-foot[1]	12.5	16.0	12.5	15.0
Carcass grade score[1]	11.5	14.0	13.0	15.0
Dressing percent	63.5	61.2	62.3	61.1
Area of eye muscle (sq. in.)	8.69	8.30	8.79	9.14
Marbling score[2]	15.3	16.2	18.3	19.5
Wholesale cuts (%)				
Round	17.9	18.6	17.4	18.7
Rump	4.9	5.0	4.9	4.9
Rib	8.1	8.4	8.2	7.9
Loin	14.9	14.8	14.7	14.8
Chuck	25.3	26.0	25.4	26.0
Others[3]	28.8	27.1	28.6	27.5
Composition of 9-10-11th rib cut (%)[4]				
Fat	35.6	29.9	34.8	27.7
Muscle	51.5	56.0	52.8	57.4
Bone	14.1	15.3	14.1	15.8
Chemical composition of eye muscle (%)				
Water	69.84	69.98	69.80	71.31
Fat	6.83	6.82	6.41	5.77
Protein	22.28	21.98	22.46	22.55
Ash	1.08	1.02	1.10	1.07
Tenderness of loin steak (shear test, lb.)[5]	20.9	19.3	17.0	20.2

[1] High choice=8, Av. choice=10, Low choice=12, High good=14, and Av. good=16.
[2] Av. opinion of 3 judges; lowest value=best marbling.
[3] Includes yield of flank, kidney knob, plate, brisket and shank.
[4] Calculated from physical separation of 9-10-11th rib cut.
[5] Average of 9 shears per steak; least lb.=most tender.

to Lot 4 could have been due to increased maintenance requirements during the last half of the feedlot period. While the steers of Lot 3, fed on the moderate-high plan, appeared disappointing in average daily gain based on live weights, removing "fill" resulted in this group being the second best gainers.

Wide differences in the amount of grain consumed can be seen in Table 1. Since live weight gains were so similar, concentrates required per 100 lb. gain favored the cattle fed moderately throughout (Lot 4), although somewhat more roughage was required. Applying current feed prices to these results reveals that Lot 1, followed closely by Lot 3, was most costly, with least costly gains for Lot 4. When Morrison's digestible nutrient values are applied to the average daily rations consumed, the least TDN was required per lb. of gain for the moderate (Lot 4) and most for the high (Lot 1) treatments, with other groups intermediate. It is apparent that the young, growing calves used in this trial could use

the moderate regime for very efficient gains, while attempts to fatten them above this level were distinctly inefficient.

From the carcass grades and slaughter data shown in Table 2, the following observations seem justified:

1. As would be expected, final live grades and carcass grades favored steers fed to gain rapidly (Lot 1). Those fed to gain moderately (Lot 4) were lowest in grade, with other treatments tending to reflect the level of grain fed during the last one-half of the trial.

2. Dressing percent favored the steers fed at the high or moderate-high levels (Lots 1 and 3). High level steers showed more abundant marbling, while moderately fed cattle, or those fed on the moderate-high regime, showed the least.

3. Area of rib eye muscle differed only slightly due to treatment, but tended to be largest for steers fed continuously at the moderate level (Lot 4) and least for those fed on the high-moderate regime.

4. Yield of wholesale cuts, when expressed as percent of carcass, showed only small differences as influenced by treatment. Yields of rump, rib and loin were essentially the same regardless of treatment. Yields of round and chuck tended to be higher, and other cuts lower, for those calves fed at the moderate or high-moderate levels.

5. Physical composition of the ninth-, tenth-, and eleventh-rib cut, which has been accepted as a reliable indication of carcass composition, revealed much higher fat content for calves fed to gain rapidly (Lot 1) or on the moderate-high program (Lot 3), with much less fat and more muscle tissue for those fed at the other two levels. The difference between Lots 1 and 4 in muscle content amounted to approximately 6 percent in favor of Lot 4, while fat differences approached 8 percent in favor of Lot 1. With other lots, these measurements tended to reflect the level of grain fed during the last half of the fattening period.

6. Moisture content of eye muscle was slightly higher for calves fed moderately, perhaps an association with greater protein deposition in this cut. Fat was decreased in calves fed the moderate level throughout, while protein and ash remained essentially the same.

7. Tenderness (Warner-Bratzler shear values) of loin steaks favored calves fattened at a moderate-high rate, and was less favorable for calves fattened rapidly. Shear values were not correlated with marbling scores, nor were they correlated with fatness of eye muscle as determined by chemical analysis.

Further comparisons have been made of selected tissues, and palatability studies are underway to determine flavor and acceptability of loin and round steaks from each carcass.

Summary

The results from the first in a series of fattening trials to determine the effect of different rates of gain on efficiency of feed conversion and carcass composition are reported. Sixteen steer calves were individually fed to make 365 lb. total feedlot gain. One group of 4 calves was fed so as to gain at each of the following rates: High throughout; high for one-half total feedlot gain and then moderately; moderately and then high, and moderately throughout. The high level of gain was achieved by feeding 2 lb. milo per cwt., while calves fed to gain at a moderate rate received 1 lb. per cwt.

Results of the first trial indicate that steer calves fed to gain rapidly for 365 lb. produced a higher grading carcass, with more marbling and a higher percentage of fat. Such treatment, however, resulted in less efficient conversion of digestible nutrients to gain, less round, smaller rib eye area and less lean tissue in the carcass. Gains and carcass desirability of the moderately-fed group proved very encouraging for this type of feeding regime. Changing from high to moderate, or the reverse, after one-half of the feedlot gain had been achieved, generally gave results intermediate to feeding for either high or moderate gains throughout. It appears that the high-moderate treatment may be the least desirable of the four methods studied.

Mixed Rations vs. the Free-Choice Feeding of Milo and Supplement for Growing and Finishing Pigs

J. C. HILLIER AND J. J. MARTIN

Does the feeding of a complete ration containing ground milo plus the protein, vitamin, mineral and antibiotic supplements to be fed, all mixed together, produce faster and/or more economical gains than would be obtained from a free-choice system of feeding? In the free-choice system, the ground milo is fed in one part of the feeder and the supplement containing the necessary protein, mineral, vitamin and antibiotic materials in another part of the feeder, with the pigs free to choose how much of each they eat.

The relative performance on these two systems is important to the feeder for the free-choice system requires the mixing of only about 25 percent as much feed as is required if a complete mixed ration is used. Information on this point is also important to the feeders in deciding whether to buy a complete mixed ration or a supplement and grain that could be fed free-choice.

The pigs used in these two trials were started on feed shortly after they were weaned, averaging nine to ten weeks of age. They were of Hampshire, Poland China and Yorkshire breeding with an equal number of each breed in each lot within trials. All of the pigs used were gilts.

The pigs were fed in concrete-floored pens of which approximately