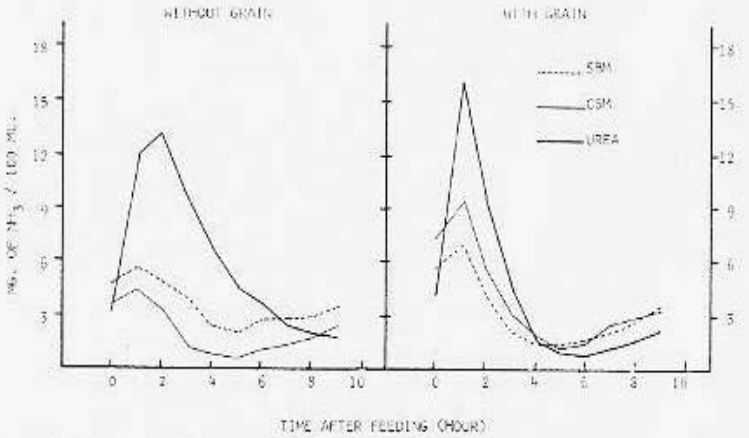

Fig. 2.—Average ammonia level of rumen liquor from three fistulated steers.

liver and subsequently excreted in the urine. A portion of the urea comes back into the rumen through the saliva.

Further evidence of loss of ammonia from urea is presented in Figures 3 and 4. Crude protein (protein nitrogen plus nonprotein nitrogen) and true protein (protein nitrogen) levels are much lower when urea is fed than when the ration is supplemented with either of the oil meals. That may be largely overcome with adequate grain in the diet.

Levels of crude protein and true protein were the same for soybean meal and cottonseed meal, which further indicates that, for all practical purposes, those protein sources are similar, so a combination would not be superior to one or the other.

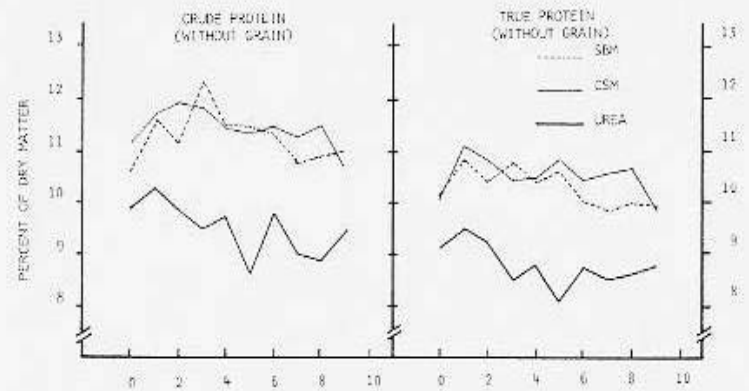

Fig. 3.—Average percentage of crude protein and true protein of dried rumen samples from three fistulated steers.

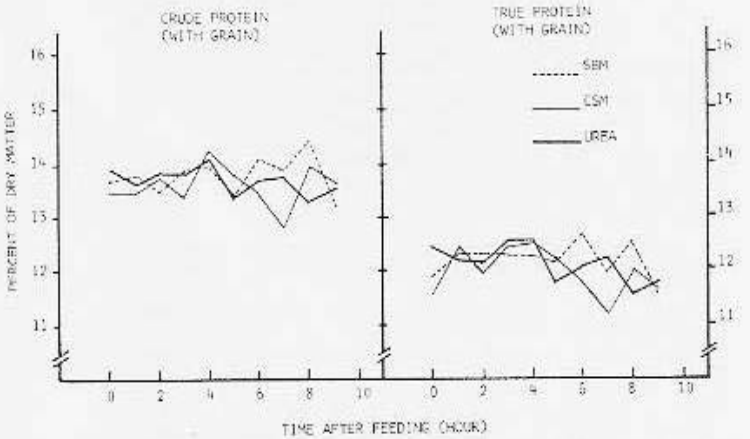

Fig. 4.—Average percentage of crude protein and true protein of dried rumen samples from three fistulated steers.

Table 40
Composition of rations.

Ingredients	Rations: Without added grain A	B	C	With added grain D	E	F
Prairie hay, lbs.	10	10	10	6	6	6
Corn, lbs.			1	6	6	6
Soybean meal, lbs.	1			0.73		
Cottonseed meal, lbs.		1.05			0.78	
Urea, grams			62			40
Basal ration, C.P.	0.56	0.56	0.56	0.97	0.97	0.97
Added C.P., lbs.	0.47	0.47	0.47	0.34	0.34	0.34
Total C.P., lbs.	1.03	1.03	1.03	1.31	1.31	1.31

C.P.: crude protein.

Influence of Breeding and Length of Feeding Period on Carcass Characteristics and Palatability of Beef (Project NC-58, Kansas 639).*

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Phase I. Sire Testing.

During 1962-63, in cooperation with the American Hereford Association, 70 head of Hereford steers, sired by four different bulls, were slaughtered in Kansas City and the rib cut from 40 (10 from each sire group) was purchased for detailed analyses and palatability tests, a procedure followed with all cattle on this phase of the project.

All cattle were classified as "choice" on foot, but dropped nearly one grade in carcass, due to lack of marbling. Final distribution of carcass grades was: Low choice, 3; high good, 4; average good, 13; low good, 46; high standard, 4.

* This project was supported by NC-58 funds and funds from the American Angus Association.

The next year the same cow herd, five (5) bulls (two repeats) and calves sired by two of these bulls, but from a different cow herd, was purchased and fed to find out if the cow herd was responsible for low marbling scores. Progeny of two bulls were also fed in two different feed lots to measure the influence of environment or feeding method.

With the few animals, differences from herd origin or feed lot practice were not significant. Further observations now are being made on herd origin, feed lot practice, and method of management (feeding out cattle as calves instead of yearlings). To date, only one sire has demonstrated a slight advantage in siring marbling. He now is being used more extensively to confirm that finding.

Phase II. Growth and Fattening with Particular Reference to Marbling.

Sixty-four head of Angus steer calves, all sired by the same bull, were purchased, after random selection, from Echo Ranch, Yates Center, Kansas. They were further randomly sorted into eight groups and placed on feed in a commercial feed yard. Eight were slaughtered at time of lotting, a second group 56 days later, and the remaining lots at 28-day intervals thereafter. All were slaughtered at a central packing plant, where slaughter and carcass data were collected. The right side of each carcass was shipped to our laboratory for further study.

Data collected on each steer included feed lot weight; daily gain for entire group, each slaughter group and each individual; yield, U.S. carcass grade; and detailed grade factors; muscle measurements at 16 points with marbling evaluation subjectively at each point; chemical analyses of samples from all 16 points. Earlier evidence indicated the fore-shank as a possible indicator of muscling or edible portion of the carcass. The fore-shank was therefore separated into fat, lean and bone for further study. Boneless weight of the four primal cuts, trimmed to one-fourth inch outside fat (some trim was necessary after 224 days feed), was determined, as were total weight of bone in each carcass, color and pH measurements of the longissimus dorsi.

Samples were also collected at four points of the carcass for later histological studies. Specimens from the cooked samples were preserved for future work. The 6th, 7th, and 8th rib cuts are used by the Department of Foods and Nutrition for palatability studies. Numerous other data are being recorded.

Data so far analyzed indicate that rate of gain was only average, with relatively low gain the last 28-day period. Highest gain was during the 6th period (140-168 days). Daily gain throughout feeding was only nominal, 2.3 pounds per day, but dressing percentage increased as the feeding period progressed.

There was a definite relationship between length of feeding period and carcass grade. Two hundred days on feed, 480 pounds gain, and slaughter weight of 830 pounds seem to be about minimums to produce choice grade carcasses, provided calves have that potential originally.

Area of the muscle with each group, with few exceptions, gradually increases. Increase in area over 224 days ranged from 80 to 160%. Greatest percentage increase is in the area of the semitendinosus or eye of round. Greatest increase of area in square inches is in the semimembranosus or inside round. Samples from all of those muscles are in storage for future histological studies.

First visible indication of marbling was after 84 days on feed. Marbling increased with feeding time. Most marbling was observed at the 12th rib on the longissimus dorsi, with the outside round or biceps femoris a close second.

Greatest change from group 7 to group 8 was increase in percentage of fat (196 to 224 days on feed).

Correlations among weight of the four lean cuts (trimmed), slaughter weight, carcass weight, and length of hind leg were highly significant. Wide variation between groups in several relationships is not understood. Differences are far greater between group 8 and other groups that can be explained by increased fat. The percent lean cuts (trimmed), retail yield as predicted by the Brungardt Formula, U.S.D.A. Cuttability Formula, and weight of lean from the 9th, 10th, and 11th cuts were

correlated with the same 10 measurements. Significant correlations were seldom found, and there was no pattern of significance for any carcass or other measurement.

Principal observations from the data are the novel progress of marbling, percentage fat at the 12th rib (chemical), grade, and percentage fat at 9th, 10th, and 11th ribs. The data indicate that a committee might apply satisfactory subjective standards for marbling.

Phase III

An additional 24 head of steers sired by the same bull were randomly selected and lotted at the same time as those in Phase II. The 24 were pastured in summer, roughed through winter, then eight were slaughtered and the remaining 16 placed on pasture. In August, 1964, eight were slaughtered off grass and the remaining eight placed on full feed. This program is essentially "deferred feeding," so the groups slaughtered in April, August, and January should offer comparable stages of growth to groups slaughtered in Phase II. Procedures and observations will be the same as on steers in Phase II.