Table 38 (Continued)

Blood analyses:				
Inorganic phosphate, mg. %				
3-14-56	7.68	....	8.00	....
	±0.12[2]	....	±0.40[2]	....
11-13-56	7.58	....	6.98	....
	±0.28	....	±0.21	....
3-13-57	7.65	7.82	6.30	7.40
	±0.27	±0.32	±0.42	±0.39
5-29-57	10.30	11.02	9.51	9.26
	±0.80	±0.95	±0.94	±1.50
Calcium, mg. %				
3-14-56	11.44	....	11.26	....
	±0.16	....	±0.10	....
11-13-56	11.31	....	11.37	....
	±0.27	....	±0.20	....
3-13-57	11.77	11.12	11.45	11.33
	±0.19	±0.15	±0.20	±0.16
5-29-57	10.60	10.20	10.66	11.31
	±0.08	±0.25	±0.67	±0.67

2. Standard error of mean.

The Use of Tranquilizer Compounds[1,2] in Wintering Rations for Steers (Project A-597).

B. A. Koch, E. F. Smith, D. Richardson and M. M. McCartor

Recent experimental work with chemical tranquilizers has indicated that these substances may be of value in the fattening ration of beef cattle under certain conditions. Theoretically at least, the chemical tranquilizers should calm the animals and thus reduce the amount of energy lost due to nervousness and unnecessary muscular activity. It is also possible that they have some other effect upon the animal which leads to increased weight gains and improved feed efficiency. The trial reported herein was designed to determine whether or not tranquilizer compounds will improve the performance of beef cattle on a wintering ration.

Experimental Procedure

Forty-eight steer calves weighing approximately 550 pounds each were divided into three groups (one group of 10, one group of 18 and one group of 20) at the beginning of the wintering period. Pre-selected animals will be removed from each of the larger groups after the wintering period for a pasture study. Ten calves in each group will be continued through a fattening study.

Two tranquilizer compounds, Paxital and Tran-Q, are being compared in the study. The compounds are mixed with the soybean oil meal portion of the rations fed.

The daily rations fed per animal were as follows: sorghum grain, 4 pounds; soybean oil meal, 1 pound; sorghum silage, 15 pounds; prairie hay, free-choice. All of the animals had access to a mixture of bonemeal and salt. They also had access to salt alone. Water was available at all times from heated automatic waterers. The cattle were in outdoor lots with no access to shelter.

Observations

1. At no time during the wintering period did any of the animals receiving either tranquilizer show any visible evidence of sedation or calming. This was also true in a very limited test conducted earlier in which animals received much higher levels of tranquilizer in their diet.

1. Paxital is the brand name of a tranquilizer furnished by S. B. Penick and Co. of New York.

2. Tran-Q is the brand name of a tranquilizer furnished by Chas. Pfizer and Co., Inc., Terre Haute, Ind.

2. Feeding the tranquilizers did not increase daily gain or improve feed efficiency significantly under the conditions of this study.
3. No undesirable effects of any kind were noted in any of the animals during the test period.

Table 39

The Use of Tranquilizer Compounds in Wintering-Type Rations for Steer Calves.

December 5, 1957, to March 25, 1958—110 days.

Treatment	Control	Paxital	Tran-Q
Lot number	22	18	19
Number steers	20	10	18
Av. initial wt., lbs.	548	544	559
Av. final wt., lbs.	708	719	718
Av. total gain, lbs.	160	175	159
Av. daily gain, lbs.	1.46±0.07[4]	1.59±0.08[4]	1.45±0.06[4]
Av. daily ration:			
Ground sorghum grain, lbs.	4.0	4.0	4.0
Soybean oil meal, lbs.	1.0	1.0	1.0
Prairie hay, lbs.	6.9	6.8	7.8
Sorghum silage, lbs.	13.1	13.1	12.4
Paxital, mgs.[1,2]		75	
Tran-Q, mgs.[1,3]			1.5
Feed per cwt. gain:			
Ground sorghum grain, lbs.	274.0	251.60	276.00
Soybean oil meal, lbs.	68.50	62.90	69.00
Sorghum silage, lbs.	897.35	823.99	855.60
Prairie hay, lbs.	472.65	427.72	538.20
Feed cost per cwt. gain, $[5]	14.22	13.01	14.59

1. Mixed in the soybean oil meal.
2. Paxital cost estimated to be about .... per gm. by S. B. Penick and Co.
3. Tran-Q cost estimated to be about 0.80c per gm. by Chas. Pfizer and Co.
4. Standard error of mean.
5. Not including tranquilizer cost.

Relationship Among Live and Carcass Characteristics of Slaughter Steers.

John D. Weseli, D. L. Good and L. A. Holland

One of the major tools needed for a more accurate live animal evaluation is an objective method of determining the amount of muscle in a beef steer. We can come close to estimating dressing percentage and grade but these factors are not good indicators of the amount of red meat or "edible portion" that is in the carcass. Many prime cattle have less utility or true value than choice cattle because of excess fat and/or lack of muscle.

From the standpoint of the consumer as well as that of the packer, the most desirable carcass is one that has a large proportion of high-quality lean meat. After a steer is fat enough to attain a desired grade, additional finish is objectionable because the extra fat must be trimmed off. This extra fat is a problem to the processor and it is uneconomical for the feeder to produce overfinished cattle. The important problem is to be able to determine when the animal is correctly finished and to predict how much red meat he has under his hide. An experienced stockman, by handling and careful visual appraisal of an animal, can make a fairly good estimate of muscling. A more objective method, however, is needed to aid in the selection of superior market animals and breeding stock, particularly of herd sires, since the heritability of muscling in beef cattle is high.

This is a report of an exploratory study to find a possible live-animal measurement that would be useful in predicting superior muscling in beef cattle.

Experimental Procedure

The steers used in this study consisted of 73 Angus, 43 Herefords, and 37 Shorthorns, which were exhibited at the 1956 International Livestock Exposition held in Chicago. The group of 153 steers comprised the carcass contest held in conjunction with the International. The age range of the group was from 12 to 18 months and the weight varied from 800 to 1,300 pounds.

These steers were bred and fed by individuals from varied localities with the intent of entering them in the carcass contest. Consequently, this was a highly select group of cattle and the variability was not expected to be as great as if regular market cattle had been used in the study.

On November 22, 1956, four body measurements were taken of these steers immediately after leaving the scales for show-ring classification. A flexible steel tape placed around the forearm on a horizontal plane at the junction of the forearm and the brisket gave the circumference of the forearm in centimeters. The circumference of the left metacarpus was taken mid-way between the knee and pastern joint. At this same position a sliding vernier caliper was used in determining the frontal and lateral measurement of the cannon.

At the time of weighing, a visual estimation of bone size and a visual grade were placed on each steer by a committee of three appraisers. The average score of the committee was used for analyses. The score cards used in recording the visual grades were broken into three divisions for each grade: high prime received a score of 2, medium prime 4, low prime 6, high choice 8, etc. The visual scores on bone started with 2 being very rugged and higher scores indicate a decrease in size of bone.

The steers were classed according to age and breed, making a total of 12 classes. After being placed on foot, they were moved to Armour and Company for slaughter. At slaughter, the left metacarpus was salvaged and transported to Kansas State College for study.

The cannons were freed of all excess tissue. Circumference, lateral and frontal measurements were taken of the clean metacarpus in a fashion similar to that for the live measurement of the same region.

A tracing of the longissimus dorsi (rib eye) muscle of each steer was made at the 12th rib and a planimeter was used to determine the area in square inches. Marbling scores were assigned by meat experts according to Reciprocal Meat Conference Proceedings. The higher numerical scores on marbling are the more desirable. Fat thickness at the 12th rib was determined by an average of three measurements as outlined by the Reciprocal Meat Conference Proceedings.

Results

Averages of live-animal characteristics by breeds and weight groups are shown in Table 40. Differences between breed averages were statistically highly significant for cannon frontal measurement and circumference of cannon, the Herefords having the largest measurements. The differences between breed averages for the other live-animal measurements were not statistically significant. Weight of the animal did influence the magnitude of the live-animal characteristics; differences between weight groups within breeds were statistically significant or statistically highly significant for all the live-animal characteristics.

Averages of carcass characteristics by breeds and weight groups are listed in Table 41. The breeds differed significantly only in marbling score, Shorthorns and Angus having more marbling than Herefords. Differences between weight groups within breeds were statistically highly significant for loin eye area, fat thickness, dressing percentage, cannon frontal measurement, and cannon circumference. Differences between weight groups within breeds for marbling score and cannon lateral measurements were not statistically significant.

Correlations involving characteristics, neither of which differed significantly between breeds, were computed without regard to breed. Correlations involving characteristics which differed significantly between breeds were computed within each of the breeds.

Correlations of live cannon circumference with dressing percent and fat thickness are listed separately for each breed. Other individual breed correlations were judged not to differ significantly. Therefore, they were combined into pooled intrabreed correlation coefficients.

Two sets of correlation coefficients are presented in each of the correlation tables. Those not enclosed by parentheses are simple correlation coefficients which were computed between two variables, disregarding the wide range in live weight of the steers. Those enclosd by parentheses are partial correlation coefficients which indicate the relationship between two characteristics among steers of similar weight.

Correlations between live steer characteristics are listed in Table 42. The partial correlation between circumference of forearm and bone score, —.28, indicated that among steers of similar weight those scored as having more bone tended to have larger circumference of forearm. Steers having large cannon circumference measurements tended to have large circumference of forearm. The simple correlations of live grade with bone score, circumference of forearm, and cannon circumference indicate that steers that were scored more desirable in live grade tended to be those scored as having less bone, larger circumference of forearm, and larger cannon circumference. However, the correlations between live grade and other live measurements among steers of similar weight were small and not statistically significant.

The accuracy of bone score and cannon measurements on the live animal as indicators of carcass cannon measurements is indicated by the correlation coefficients listed in Table 43. The correlations, most of which are statistically significant or statistically highly significant, are small, indicating that the live-animal measurements were not as useful as indicators of the carcass cannon measurements as was expected when the measurements were taken.

Correlations of live steer characteristics with dressing percent, loin eye area, and fat thickness (Table 44) are small. Among steers of similar weight the only statistically significant indicator of dressing percent was bone score. The partial correlation between bone score and dressing percent was .27, indicating that steers scored as having larger bones tended slightly to have lower dressing percents. Loin eye area was not significantly correlated with any of the live characteristics among steers of similar weight.

The sole statistically significant live steer indicator of fat thickness among steers of similar weight was bone score. The partial correlation between bone score and fat thickness, .22, indicated that steers scored as having larger bone tended to have less fat thickness.

Significant differences between the individual breed simple correlations of live cannon circumference with dressing percent and fat thickness (Table 45) were observed. Those correlations within the Shorthorns were markedly different from those observed in the other two breeds and show that, within this set of Shorthorn cattle, larger live cannon circumference was associated with larger dressing percents and deeper fat covering. The partial correlations, though not statistically significant, tend to point to the same association of these characteristics among the Shorthorn cattle of similar weight. This result is quite different from what is believed to be the true association and may be peculiar to this particular sample of cattle and/or due to human error in measuring the live cannon. The individual breed correlations of carcass cannon measurement with dressing percent and fat thickness did not differ markedly.

Correlations between carcass characteristics are listed in Table 46. As fat thickness increased, loin eye area decreased. The partial correlation between fat thickness and loin eye area, —.44, is more than twice as large as the simple correlation (—.21). An explanation for this result is that the ratio of fat to loin eye area may vary considerably more among heavy-weight steers than among lighter-weight steers. This would tend to reduce the magnitude of the simple correlation between fat thickness and loin eye area. As fat thickness increased, dressing percent tended to increase, cannon circumference decreased (among steers of similar weight), and the very slight tendency toward more marbling was not statistically significant among steers of similar weight. Larger carcass cannon measurements tended to be associated with lower dressing percents.

In this study, wherein most of the cattle graded choice and prime, the partial correlation between marbling score and fat thickness was only .14, indicating little or no relationship between covering of fat and marbling; that is, steers with a thick covering of fat did not necessarily have more marbling than cattle with a thinner covering of fat. In a group of cattle which includes a wider range of USDA grades, the relationship between fat thickness at the 12th rib and marbling may be different than that found in this study.

Summary

Under conditions of this study, the live-animal measurements were not correlated closely enough with loin eye area to indicate that they would be useful in selecting superior muscled animals. In this group of steers, most of which graded choice and prime, thickness of fat was not closely related to marbling, indicating that well-marbled steers need not have excessive covering of fat.

The steers with thicker fat covering over the 12th rib tended to have smaller loin eye areas and higher dressing percents.

Similar studies are being conducted at this station and will be reported at a later date.

Table 40

Averages of Live Animal Characteristics by Breeds and Weight Groups.

Breed	No.	Weight group (lbs.)	Live grade	Circum. of fore-arm (cms.)	Bone score	Cannon measurements (cms.) Frontal	Lateral	Circum.
Angus	26	1100-1280	5.85	48.2	6.77	5.09	6.47	19.2
Angus	25	1000-1085	6.56	47.4	7.08	5.08	6.47	18.9
Angus	23	800-990	9.74	45.9	7.87	4.83	6.21	18.5
All Angus	74		7.30	47.2	7.22	5.01	6.39	18.9
Hereford	12	1110-1300	4.00	49.4	5.08	5.57	6.80	21.0
Hereford	16	1000-1090	5.63	49.8	6.06	5.45	6.81	20.6
Hereford	15	855-980	6.80	48.0	6.33	5.29	6.60	20.3
All Herefords	43		5.58	49.0	5.88	5.43	6.73	20.6
Shorthorn	12	1110-1280	4.33	48.1	6.42	5.13	6.56	19.6
Shorthorn	12	1020-1100	5.33	47.1	6.25	5.07	6.40	19.3
Shorthorn	12	815-1000	6.67	42.0	7.75	4.83	6.20	18.1
All Shorthorns	36		5.44	45.4	6.81	5.01	6.39	19.0

Table 41
Averages of Carcass Characteristics by Breeds and Weight Groups.

Breed	No.	Weight group (lbs.)	Loin eye (sq. in.)	Fat thickness (ins.)	Marbling score	Dressing percent	Cannon measurements (cms.) Frontal	Lateral	Circum.
Angus	26	1100-1280	12.17	1.12	8.92	65.1	4.02	2.45	10.8
Angus	25	1000-1085	11.55	1.08	8.52	64.1	3.97	2.43	10.6
Angus	23	800-990	11.40	.88	8.96	64.2	3.90	2.36	10.4
All Angus	74		11.72	1.03	8.80	64.5	3.96	2.42	10.6
Hereford	12	1110-1300	12.07	1.10	8.17	64.7	4.37	2.53	11.4
Hereford	16	1000-1090	11.79	1.00	8.31	64.2	4.13	2.46	11.0
Hereford	15	855-980	11.10	.79	7.73	62.4	4.15	2.47	11.0
All Herefords	43		11.63	.95	8.07	63.7	4.20	2.49	11.2
Shorthorn	12	1110-1280	11.10	1.29	8.75	65.1	4.04	2.51	10.8
Shorthorn	12	1020-1100	10.19	1.09	9.08	64.4	3.99	2.47	10.8
Shorthorn	12	815-1000	9.86	.89	8.67	63.4	3.65	2.38	10.0
All Shorthorns ..	36		10.38	1.09	8.83	64.3	3.89	2.45	10.5

Table 42
Correlations Between Live Steer Characteristics.

	Circum. of forearm	Cannon circum.	Live grade
Bone score	−.38**(−.28**)	−.04(.16)	−.31**(−.16)
Circum. of forearm		.42**(.30**)	−.27**(−.12)
Cannon circum. ..			−.27**(−.06)

** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 43
Correlation of Bone Score and Cannon Measurements on the Live Animal with Carcass Cannon Measurement.

	Carcass cannon measurements: Frontal	Lateral	Circumference
Bone score	−.51**(−.43**)	−.20*(−.13)	−.49**(−.33**)
Live cannon measurements			
Frontal	.44**(.32**)		
Lateral		.30**(.22*)	
Circumference			.43**(.31**)

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 44
Correlations of Live Steer Characteristics with Dressing Percent, Loin Eye Area and Fat Thickness.

Live steer characteristics	Dressing percent	Loin eye area	Fat thickness
Live grade	−.12(.08)	−.05(.12)	−.36**(−.17)
Circum. of forearm	.16*(.02)	.22**(.12)	.06(−.14)
Bone score	.09(.27**)	−.20*(−.10)	.00(.22*)
Cannon circum.	−.01	.30**(.18)	.03

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 45
Correlations of Live Cannon Circumference with Dressing Percent and Fat Thickness within Each Breed.

	Live cannon circumference: Angus	Hereford	Shorthorn
Dressing %	.10(−.01)	−.09(−.37*)	.47**(.13)
Fat thickness	.05(−.11)	.00(−.36)	.51**(.12)

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Table 46
Correlations Between Carcass Characteristics.

	Fat thickness	Dressing %	Cannon circum.	Marbling score
Loin eye area	−.21**(−.44**)	.08(−.05)	.22**(.11)	.03(.00)
Fat thickness ..		.44**(.31**)	−.03(−.27**)	.17*(.14)
Dressing %			−.34**(−.57**)	.02(−.02)

* Significant at the .05 level.
** Significant at the .01 level.
( ) = partial correlation coefficients.

Fundamental Studies of Sorghum Roughages and Grains. I. A Study of the Value of Pelleting Sorghum Grain. II. A Study of the Value of Levels of Hormone and Synthetic Hormonelike Substances (Project 222).

D. Richardson, E. F. Smith, B. A. Koch and R. F. Cox

Previous work has shown that rate of gain and carcass quality are essentially the same with sorghum grain and corn when self-fed in a beef fattening ration (Kansas Agricultural Experiment Station Circulars 308, 320, and 335). However, the animals eat more sorghum grain than corn per pound of gain. Because of its relatively small size, uniform preparation of the sorghum grain is more difficult than for the larger corn grain.

This is a preliminary test to evaluate grinding sorghum grain to a meal and then making it into a pellet. Source and level of hormones and synthetic hormonelike substances used as implants are also being studied.

Experimental Procedure

Thirty-six of the heaviest Hereford steer calves purchased for experimental work were assigned to this test. Since lot space was not available, they were fed together in a group until the test started. They were divided on the basis of weight and conformation into three lots of 12 animals each, January 15, 1957. At that time they were consuming 5 pounds of grain per day and their average weight was about 540 pounds.

The daily ration for all animals consisted of grain, 1 pound soybean oil meal, 2 pounds alfalfa hay, and all of the sorghum silage they would clean up. Equal quantities of grain were fed as follows: Lot 1, rolled corn; lot 2, finely ground pelleted sorghum grain; and lot 3, rolled sorghum grain. It should be observed that silage was the only ingredient not kept on an equal weight basis between lots. The calves were hand-fed in the morning and afternoon.

The animals in each lot were assigned to four groups of three animals each on the basis of weight. One group served as the control, one group had 24 mgs. of stilbestrol implanted under the skin of the ear, and another group received 36 mgs. The fourth group received the Synovex implant (1000 mgs. progesterone and 20 mgs. estradiol benzoate). This gave three animals in each lot per treatment or a total of nine on each treatment. The calves were implanted 28 days after starting the test. They had been on a full feed of grain (10 pounds daily) for several days at that time.

Results and Observations

The results of this test are shown in Tables 47 and 48. The calves receiving corn were the first to reach a full feed of grain followed by those receiving pelleted sorghum. Lot 3 calves (rolled sorghum grain) would have consumed more grain than the others; however, grain consumption was kept the same in all lots. Lot 3 calves consumed more silage. After about 60 days on test, the calves on pelleted sorghum grain seemed reluctant to eat for a few days. No apparent reason for this was observed and normal feed consumption was resumed.

Rate of gain, feed efficiency and carcass grade were best for rolled corn followed by pelleted sorghum grain and then rolled sorghum grain. Based upon prevailing feed costs, pelleted sorghum produced gains for the lowest feed cost. The animals fed pelleted sorghum produced larger rib eyes. The reason for this is not apparent. Even though this test indicates beneficial effects from fine grinding and pelleting of sorghum grain, further work must be done to confirm or reject these apparent beneficial results.

Animals receiving implants of hormone or hormonelike substances gained faster than non-implanted animals. The highest rate of gain was produced by animals implanted with 24 mgs. of stilbestrol. Stilbestrol tended to lower the carcass grade, whereas Synovex apparently did not. Size of rib eye tended to increase as size of animals increased. Thus, the ones having gained faster, in general, had larger rib eyes. Side effects such as high tailhead, weak loin and teat development were more pronounced with the 36-mg. level of stilbestrol implantation. These results indicate that 24 mgs. is the desired level of implantation for steers of this weight when being fattened for market.

Table 47
Comparative Results with Rolled Corn, Pelleted Sorghum Grain and Rolled Sorghum Grain in Beef Steer Calf Fattening Rations.
January 15 to July 12, 1957—178 days.

Lot number	1	2	3
Number calves per lot	12	11[1]	12
Av. initial wt., lbs.	541.3	537.3	538.8
Av. final wt., lbs.	968.3	954.1	933.7
Av. daily gain per calf, lbs.	2.40	2.34	2.22
Av. daily ration, lbs.:			
Sorghum silage[2]	9.0	8.6	10.6
Alfalfa hay	2.4	2.3	2.4
Soybean oil meal	1.0	1.0	1.0
Rolled corn	12.0	....	....
Pelleted sorghum grain	....	12.0	....
Rolled sorghum grain	....	....	12.0
Lbs. feed per cwt. gain:			
Sorghum silage	375.6	369.5	478.9
Alfalfa hay	100.6	99.5	107.8
Soybean oil meal	41.7	42.7	45.1
Rolled corn	501.8	....	....
Pelleted sorghum grain	....	511.3	....
Rolled sorghum grain	....	....	542.5
Av. feed cost per cwt. gain,[3] $	18.65	18.15	19.16
Carcass data:			
Av. hot carcass wt.	591.3	571.1	551.7
Av. hot carcass dressing %[4]	63.3	62.6	60.4
Av. hot dressing % based on final feed lot wts.	61.1	59.9	59.1
Av. carcass grade:[5]			
Before ribbing	12.6	12.3	11.5
After ribbing	12.9	12.2	12.0
Av. finish:			
Fat thickness[6]	3.2	4.0	3.8
Fat distribution[7]	1.6	3.0	2.8

1. One animal removed because of urinary calculi.
2. Sorghum silage discontinued May 8.
3. Feed cost per 100 lbs.: Sorghum silage, \$0.50; alfalfa hay, \$1.00; soybean oil meal, \$3.50; rolled corn, \$2.85; pelleted sorghum grain, \$2.70; rolled sorghum grain, \$2.60.
4. Based on selling weight.
5. Based on top choice 15, av. choice 14, low choice 13, top good 12, av. good 11, and low good 10.
6. Based on very thick 1, thick 2, moderate 3, modest 4, slightly thin 5.
7. Based on very uniform 1, uniform 2, moderately uniform 3, modestly uniform 4, slightly uneven 5.