Performance and Carcass Characteristics of Different Cattle Types

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Summary

Different cattle types were evaluated for growth, feed efficiency, and carcass and meat traits. Hereford (H), Angus (A), Red Poll (RP), Brown Swiss (BS), Gelbvieh (G), Maine Anjou (MA) and Chianina sires were mated artificially to Angus and Hereford cows to obtain different crossbred (X) cattle types. Two calf crops were born in March, April and May of 1973, and 1974, and weaned when 200 days old. All male calves (787) were castrated, fed out and slaughtered in a commercial plant. Carcasses were graded in the cooler and the right side was transported to KSU for detailed cutout and meat quality evaluations.

Feedlot A.D.G. and final slaughter weight were slightly higher for MAx followed in order by Gx, Cx, BSx, HAx, H & A and RPx with about .05 lb. difference in A.D.G. between each descending pair. The HAx controls were generally 55 to 100 lb. lighter at slaughter than BSx, Gx, Cx or MAx. Straightbred H & A required slightly less feed per lb. of gain, RPx required slightly more feed per lb. of gain and the remaining breed crosses were very similar to each other. Dressing percentages were essentially the same for all breed crosses.

The large type cattle (MAx, BSx, Gx and BSx) were slaughtered at later dates than small type cattle--in an attempt to slaughter all cattle at the same quality grade end point. However, Cx graded lowest among all groups, MAx and Gx were intermediate and H & A, HAx, RPx and and BSx graded highest. Yield grades and fat thicknesses were generally lowest in Cx followed by BSx, MAx and Gx which were all similar. Rib steaks evaluated by a taste panel were judged equal across all breed crosses. Warner-Bratzler shear values slightly favored H & A, HAx and RPx compared with the large breed types. Good nutritional background, young age and a long time on feed resulted in equal palatability among breed groups even with the variation in quality grades that existed.

Carcass fat trim varied more than the other two carcass components. The Cx generally had the highest retail product and lowest fat trim percentages; BSx, Gx and MAx were intermediate; H & A, HAx and RPx had the lowest retail product and highest fat trim percentages.

In general, the larger breed types fed longer can reach the same quality grade end point as smaller type cattle. The larger types will use feed as efficiently and will produce higher cutability carcasses.

Introduction

Two-year results from the U.S. Meat Animal Research Center's "cattle germ plasm evaluation program" are reported here. Dr. Keith Gregory, director of the Meat Animal Research Center (MARC), initiated the project. Kansas State University and the Standardization Branch, A.M.S., U.S.D.A. cooperated on the carcass and meat aspects of the study.

The project was designed to characterize breeds from different cattle types by important economic beef production traits.

Data on calving difficulty and pre-weaning performance resulting from the matings in this project were obtained. Also, data on reproduction and maternal traits of the female progeny were studied. This information can be obtained by writing for Progress Reports No. 2 and 4, 1975 and 1976 from the Germ Plasm Evaluation Program, U.S. Meat Animal Research Center, Clay Center, Nebraska 68933.

Experimental Procedure

Hereford and Angus females were artificially bred to Hereford, Angus, Brown Swiss, Red Poll, Maine Anjou, Gelbvieh and Chianina bulls. The two calf crops were born in March, April and May of 1973 and 1974 and were weaned when approximately 200 days old. All male calves were castrated and fed in a feedlot by sire breed groups to obtain growth and feed efficiency. The steers were fed a corn silage-and-concentrate ration that approximated 80% TDN (total digestible nutrients on a 100% dry matter basis) most of the feeding period for the 1973 calf crop ('73 calves) and 76% TDN for the 1974 calf crop ('74 calves).

Approximately one-third of the '73 straightbred Herefords (H) and Angus (A), Angus-Hereford crosses (HAx) and Red Poll crosses (RPx) were slaughtered at each of three slaughter times (220, 248 and 282 days on feed after weaning). Approximately one-third of the '73 Maine Anjou crosses (MAx), Chianina crosses (Cx) and Gelbvieh crosses (Gx) were slaughtered at each of three slaughter times (248, 282 and 338 days on feed). Brown Swiss crosses (BSx) were slaughtered at all four times. For the '74 calves, H & A, HAx and RPx were slaughtered at each of three slaughter times (254, 282 and 318 days on feed). The MAx, Cx and Gx were slaughtered at each of three slaughter times (318, 352 and 387 days on feed). BSx were slaughtered all five times. The later slaughter schedule for large type cattle (MAx, Gx, Cx and BSx) was an attempt to slaughter all cattle at a similar quality grade or carcass composition rather than at the same age.

Steers were slaughtered in a commercial slaughter plant and carcass data were obtained after a 24-hour chill. Carcasses were evaluated for yield grade and quality grade factors by representatives of the U.S. Meat Animal Research Center; Standardization Branch, A.M.S., U.S.D.A.; and Kansas State University.

The right side of each carcass was transported to Kansas State University for detailed cutout and meat quality evaluations. Each side was cut into essentially boneless, closely trimmed retail cuts. Rib steaks were cooked at 350°F to an internal temperature of 150°F and evaluated for

tenderness, flavor, juiciness and overall acceptability by an experienced taste panel; tenderness also was measured by Warner-Bratzler shear.

Results and Discussion

Results from this research are presented in a series of tables, but important observations are also discussed. We should emphasize that most comparisons are made only for slaughter dates common to all breed groups.

Slaughter weights and average daily gains (A.D.G.) are shown in tables 31.1and31.2 for the two calf crops. Maine Anjou crosses generally had the highest A.D.G.'s and final weights, and were followed by Gx, then Cx, then BSx. There was about .05 lb. difference in A.D.G. between each of these groups. The spread in slaughter weights was about 45 lb. from heaviest to lightest. The HAx controls averaged about .07 lb. less A.D.G. than BSx and about .20 lb. less than MAx. However, HAx final weights were about 100 lb. less than MAx, partially because HAx weaning weights were lower.

Red Poll crosses generally were lowest in A.D.G.'s and final weights of all breed crosses. Steers out of Hereford dams gained about .10 lb. more per day than steers out of Angus dams, but their final weights were essentially equal, primarily because steer calves out of Angus dams were heavier at weaning. The '73 calves generally had higher A.D.G.'s than '74 calves primarily because '73 calves were fed a higher energy ration, but there may also have been a year effect on A.D.G.

Feed efficiencies (tables 31.3 and 31.4) among breed crosses did not differ greatly, primarily because breed crosses did not differ greatly in A.D.G.'s and they were compared at similar quality grade end points (except that Cx graded lower than the other breed crosses). The most consistent trends in feed efficiencies were that H & A straightbreds required somewhat less TDN per lb. of gain than all other breed crosses, while RPx required more TDN per lb. of gain than all other breed crosses. The remaining breed crosses had very similar feed efficiencies. The '74 calves were generally less efficient than '73 calves primarily because '74 calves had lower A.D.G.'s so more TDN was used just for their maintenance. Feed efficiency may also have been affected by a difference in year.

Dressing percentages for the two calf crops did not differ among breed crosses. Dressing percentages and meat palatability are the only traits presented in this paper that showed no significant differences.

The large type cattle (MAx, Gx, Cx and BSx) were slaughtered at later dates than small type cattle (H & A, HAx and RPx) in an attempt to slaughter all cattle when they had similar quality grades. As shown in tables 31.5 and 31.6 , quality grades were somewhat similar except that Cx graded lower than all breed crosses. Straightbred H & A, HAx, RPx and BSx were very similar in quality grade. Gelbvieh crosses and MAx were very similar in quality and both were about one marbling degree lower than H & A, HAx, RPx and BSx. The Cx were about 1½ marbling degrees lower than MAx and Gx. The MAx and Gx probably need to weigh 1250 to 1300 lb. for a high percentage to reach low choice, while Cx probably need to reach 1300 to 1400 lb. Breed crosses that were one-half Angus graded about one-third of a grade higher than crosses with no Angus breeding.

Yield grades and fat thickness were lowest in Cx followed by BSx, MAx and Gx which were all very similar. Straightbred H & A, HAx and RPx were all similar and were generally one-half yield grade higher than MAx, BSx and Gx. An interesting comparison between BSx and RPx shows BSx used feed more efficiently to the same quality grade end point and produced heavier carcasses with more desirable yield grades than RPx. That comparison illustrates the affect that superior performance and sufficient time on feed have on carcass merit.

Carcass yields of bone, fat trim and retail product percentages are shown in tables 31.7 and 31.8. The data indicate that carcass fat trim varied the most of the three carcass components. Fat trim percentage ranged about 7% from highest to lowest breed cross each year. Bone percentage ranged only about 2% and retail product percentage ranged about 4 1/2 %. There were significant differences between calf crops in percentages of retail product, fat trim and bone. Cx were highest in retail product percentage followed by BSx, GX and MAx which were all similar. HAx, H & A and RPx were all similar in retail product and lower than BSx, GX and MAx.

Rib steaks evaluated by a taste panel were judged equal across all breed crosses and all breed cross averages were judged as “moderately desirable.” Warner-Bratzler shear values slightly favored H & A, HAx and RPx compared with the large breed types. Even though quality grades varied among breed crosses, the good nutritional background, young age and long time on feed resulted in palatability for all breed crosses.

Table 31.1 Postweaning Average Daily Gains and Adjusted Final Weights for the 1973 Calf Crop.

Breed of Steer		No. Steers[a]					Postweaning Average Daily Gain[b]					Adjusted Final Weight[c]					
Sire	Dam	220	248	282	338	Total	220	248	282	338	Avg.[d]	220	248	282	338	Avg.[d]	Ratio[e]
Hereford	Hereford	4	4	5	..	13	2.53	2.33	2.29	....	2.31	969	986	1045	....	1016	99.1
Angus	Angus	8	7	7	..	22	2.37	2.30	2.24	....	2.27	951	974	1053	....	1014	98.9
	Average	12	11	12	..	35	2.45	2.32	2.26	....	2.29	960	980	1049	....	1015	99.0
Angus	Hereford	8	7	8	..	23	2.47	2.48	2.29	....	2.39	961	1010	1059	....	1035	101.0
Hereford	Angus	9	9	9	..	27	2.25	2.34	2.25	....	2.30	913	984	1047	....	1016	99.1
	Average	17	16	17	..	50	2.36	2.41	2.27	....	2.34	937	997	1053	....	1025	100.0
Red Poll	Hereford	9	7	8	..	24	2.25	2.46	2.19	....	2.33	914	1026	1035	....	1031	100.6
	Angus	8	9	9	..	26	2.10	2.02	1.93	....	1.98	898	943	991	....	967	94.3
	Average	17	16	17	..	50	2.18	2.24	2.06	....	2.15	906	985	1013	....	999	97.5
Brown Swiss	Hereford	4	5	4	7	20	2.61	2.48	2.54	2.55	2.51	998	1035	1156	1310	1096	106.9
	Angus	6	5	5	8	24	2.53	2.57	2.32	2.48	2.45	1010	1084	1099	1315	1092	106.5
	Average	10	10	9	15	44	2.57	2.53	2.43	2.52	2.48	1004	1060	1128	1312	1094	106.7
Gelbvieh	Hereford	..	8	6	7	21	....	2.49	2.48	2.49	2.49	....	1052	1120	1287	1086	106.0
	Angus	..	10	10	10	30	....	2.39	2.34	2.32	2.37	....	1052	1130	1241	1091	106.4
	Average	..	18	16	17	51	....	2.44	2.41	2.41	2.43	....	1052	1125	1264	1089	106.2
Maine Anjou	Hereford	..	3	4	7	14	....	2.63	2.59	2.33	2.61	....	1085	1186	1212	1136	110.8
	Angus	..	8	7	10	25	....	2.61	2.51	2.29	2.56	....	1126	1158	1213	1142	111.4
	Average	..	11	11	17	39	....	2.62	2.55	2.31	2.59	....	1105	1172	1213	1139	111.1
Chianina	Hereford	..	6	6	8	20	....	2.56	2.46	2.39	2.51	....	1084	1114	1264	1099	107.2
	Angus	..	7	7	8	22	....	2.51	2.24	2.38	2.38	....	1092	1105	1294	1099	107.2
	Average	..	13	13	16	42	....	2.53	2.35	2.38	2.44	....	1088	1110	1279	1099	107.2
Average	Hereford	25	40	41	29	135	2.47	2.49	2.41	2.44	2.45	960	1040	1102	1268	1071	104.5
All Sire	Angus	31	55	54	36	176	2.31	2.39	2.26	2.37	2.33	943	1036	1083	1266	1060	103.4
Breeds	Average	56	95	95	65	311	2.39	2.44	2.34	2.40	2.39	952	1038	1093	1267	1066	104.0

[a] Number of steers slaughtered after 220, 248, 282 and 338 days postweaning.
[b] ADG = (actual final wt. - actual weaning wt.) ÷ days on feed.
[c] Adj. final wt. = 200-day wt. + (postwn. ADG x days on feed postwn.).
[d] Average calculated only for dates common to all breed groups.
[e] Ratio relative to 1025 lb. average of Hereford-Angus crossbreds.

Table 31.2 Postweaning Average Daily Gains and Adjusted Final Weights for the 1974 Calf Crop.

Breed of Steer		No. Steers[a]						Postweaning Average Daily Gain[b]						Adjusted Final Weight[c]						
Sire	Dam	254	282	318	352	387	Total	254	282	318	352	387	Avg.[d]	254	282	318	352	387	Avg.[d]	Ratio[e]
Hereford	Hereford	9	10	10	..	..	29	2.12	2.06	2.05	....	....	2.06	928	972	1051	....	....	1012	96.7
Angus	Angus	12	13	13	..	..	38	1.99	1.97	1.94	....	....	1.96	929	980	1059	....	....	1020	97.4
	Average	21	23	23	..	..	67	2.06	2.02	2.00	....	....	2.01	928	976	1055	....	....	1016	97.0
Angus	Hereford	11	11	12	..	..	34	2.22	2.21	2.08	....	....	2.14	997	1033	1078	....	....	1056	100.9
Hereford	Angus	13	12	14	..	..	39	2.10	2.10	1.92	....	....	2.01	981	1030	1045	....	....	1038	99.1
	Average	24	23	26	..	..	73	2.16	2.16	2.00	....	....	2.08	989	1032	1062	....	....	1047	100.0
Red Poll	Hereford	6	6	6	..	..	18	2.04	2.07	1.98	....	....	2.02	931	1001	1054	....	....	1028	98.2
	Angus	13	13	14	..	..	40	1.94	1.92	1.90	....	....	1.91	916	965	1031	....	....	998	95.3
	Average	19	19	20	..	..	58	1.99	2.00	1.94	....	....	1.97	924	983	1042	....	....	1013	96.8
Brown Swiss	Hereford	6	7	6	6	7	32	2.22	2.13	2.24	2.24	2.22	2.18	1011	1060	1152	1221	1297	1106	105.6
	Angus	8	11	11	7	7	44	2.08	2.12	2.03	2.09	2.11	2.08	1026	1065	1095	1188	1270	1080	103.2
	Average	14	18	17	13	14	76	2.15	2.13	2.13	2.16	2.17	2.13	1019	1063	1123	1205	1284	1093	104.4
Gelbvieh	Hereford	..	6	6	5	5	22	....	2.31	2.34	2.38	2.28	2.32	....	1081	1189	1248	1277	1135	108.4
	Angus	..	10	11	8	7	36	....	2.27	2.20	2.17	2.28	2.24	....	1127	1184	1270	1362	1156	110.4
	Average	..	16	17	13	12	58	....	2.29	2.27	2.27	2.28	2.28	....	1104	1186	1259	1320	1145	109.4
Maine Anjou	Hereford	..	8	10	7	7	32	....	2.42	2.29	2.42	2.34	2.36	....	1107	1164	1239	1365	1136	108.5
	Angus	..	10	14	7	7	38	....	2.21	2.22	2.33	2.26	2.22	....	1107	1188	1307	1363	1148	109.6
	Average	..	18	24	14	14	70	....	2.31	2.26	2.37	2.30	2.29	....	1107	1176	1273	1364	1142	109.1
Chianina	Hereford	..	10	11	7	7	35	....	2.26	2.15	2.24	2.25	2.20	....	1057	1123	1208	1320	1090	104.1
	Angus	..	11	15	7	6	39	....	2.25	2.22	2.09	2.21	2.24	....	1103	1162	1227	1332	1132	108.1
	Average	..	21	26	14	13	74	....	2.25	2.18	2.17	2.23	2.22	....	1080	1143	1217	1326	1111	106.1
Average	Hereford	32	58	61	25	26	202	2.15	2.21	2.16	2.32	2.27	2.18	967	1044	1116	1229	1315	1080	103.2
All Sire	Angus	46	80	92	29	27	274	2.02	2.12	2.06	2.17	2.21	2.09	963	1054	1109	1248	1332	1082	103.3
Breeds	Average	78	138	153	54	53	476	2.09	2.16	2.11	2.24	2.24	2.14	965	1049	1113	1239	1323	1081	103.2

[a] Number of steers slaughtered after 254, 282, 318, 352 and 387 days postweaning.
[b] ADG = (actual final wt. - actual weaning wt.) ÷ days on feed.
[c] Adj. final wt. = 200-day wt. + (postwn. ADG x days on feed postwn.).
[d] Average calculated only for dates common to all breed groups (282 and 318 days).
[e] Ratio relative to 1047 lb. average of Hereford-Angus crossbreds.

Table 31.3. Feed Efficiencies and Dressing Percentages for the 1973 Calf Crop.

Breed of Steer		Feed Efficiency (TDN per lb. gain)					Dressing Percent[a]				
Sire	Dam	220	248	282	338	Avg.[b]	220	248	282	338	Avg.[b]
Hereford	Hereford						58.1	59.8	60.5	....	60.2
Angus	Angus						58.8	60.1	60.2	....	60.2
	Average	5.95	6.11	6.23	....	6.10	58.5	60.0	60.4	....	60.2
Angus	Hereford						58.7	59.0	59.6	....	59.3
Hereford	Angus						60.9	59.1	60.3	....	59.7
	Average	6.31	6.44	6.57	....	6.44	59.8	59.1	60.0	....	59.5
Red Poll	Hereford						58.5	58.9	59.7	....	59.3
	Angus						59.2	59.7	59.3	....	59.5
	Average	6.72	6.81	6.94	....	6.82	58.8	59.3	59.5	....	59.4
Brown Swiss	Hereford						58.3	59.2	59.5	60.2	59.4
	Angus						60.2	60.2	60.7	61.9	60.5
	Average	6.31	6.48	6.62	6.71	6.47	59.2	59.7	60.1	61.0	59.9
Gelbvieh	Hereford						....	59.2	59.3	59.8	59.3
	Angus						....	59.7	61.0	60.1	60.4
	Average	6.18	6.44	6.62	6.62	6.41	....	59.4	60.2	59.9	59.8
Maine Anjou	Hereford						....	59.7	60.7	60.7	60.2
	Angus						....	61.9	61.5	61.8	61.7
	Average	5.98	6.34	6.54	6.54	6.29	....	60.8	61.1	61.2	61.0
Chianina	Hereford						....	61.3	60.6	61.6	61.0
	Angus						....	61.8	60.4	62.5	61.1
	Average	6.44	6.65	6.82	6.88	6.64	....	61.5	60.5	62.0	61.0
Average All Sire Breeds	Hereford						58.4	59.6	60.0	60.6	59.8
	Angus						59.7	60.3	60.5	61.6	60.4
	Average	6.27	6.47	6.62	6.69	6.45	59.1	60.0	60.2	61.1	60.1

[a]Dressing percent equals hot carcass weight divided by final weight on feed and water (without shrink).

[b]Average calculated only for dates common to all breed groups.

Table 31.4 Feed Efficiencies and Dressing Percentages for the 1974 Calf Crop.

Breed of Steer		Feed Efficiency (TDN per lb. gain)						Dressing Percent[a]					
Sire	Dam	254	282	318	352	387	Avg.[b]	254	282	318	352	387	Avg.[b]
Hereford	Hereford							57.6	57.2	58.9	....	....	58.0
Angus	Angus							59.0	61.1	60.8	....	....	61.0
	Average	6.42	6.58	6.70	....	....	6.57	58.3	59.2	59.8	....	....	59.5
Angus	Hereford							57.7	59.3	60.1	....	....	59.7
Hereford	Angus							58.4	59.5	60.3	....	....	59.9
	Average	6.76	6.94	7.48	....	....	7.06	58.0	59.4	60.2	....	....	59.8
Red Poll	Hereford							58.1	59.1	59.0	....	....	59.0
	Angus							58.9	60.5	60.5	....	....	60.5
	Average	7.47	7.59	7.93	....	....	7.66	58.5	59.8	59.8	....	....	59.8
Brown Swiss	Hereford							56.8	57.6	59.4	60.2	62.0	58.5
	Angus							58.2	59.1	59.7	59.9	59.4	59.4
	Average	6.87	7.05	7.26	7.21	7.21	7.06	57.5	58.3	59.6	60.1	60.7	59.0
Gelbvieh	Hereford							....	58.6	59.1	60.4	60.1	58.8
	Angus							....	59.5	59.7	61.8	60.5	59.6
	Average	6.74	7.03	7.30	7.27	7.32	7.02	....	59.1	59.4	61.1	60.3	59.2
Maine Anjou	Hereford							....	59.4	58.8	60.1	60.5	59.1
	Angus							....	60.7	60.6	60.6	61.5	60.6
	Average	6.57	7.03	7.20	7.11	7.27	6.93	....	60.0	59.7	60.3	61.0	59.8
Chianina	Hereford							....	60.3	58.7	60.4	59.9	59.5
	Angus							....	60.4	59.6	62.3	59.5	60.0
	Average	6.62	6.90	7.10	7.25	7.08	6.87	....	60.3	59.1	61.3	59.7	59.7
Average	Hereford							57.6	58.8	59.2	60.3	60.6	59.0
All Sire	Angus							58.6	60.1	60.2	61.2	60.2	60.2
Breeds	Average	6.78	7.02	7.28	7.21	7.22	7.02	58.1	59.5	59.7	60.7	60.4	59.6

[a]Dressing percent equals hot carcass weight divided by final weight on feed and water (without shrink).

[b]Average calculated only for dates common to all breed groups (282 and 318 days).

Table 31.5 Quality Grades, Yield Grades and Fat Thicknesses for Carcasses from the 1973 Calf Crop.

Breed of Steer		U.S.D.A. Quality Grade[a]					U.S.D.A. Yield Grade					Fat Thickness, in.				
Sire	Dam	220	248	282	338	Avg.[b]	220	248	282	338	Avg.[b]	220	248	282	338	Avg.[b]
Hereford	Hereford	10.8	11.9	10.9	....	11.4	3.2	3.7	3.7	...	3.7	.53	.65	.63	...	.64
Angus	Angus	12.3	13.5	12.4	....	13.0	3.3	3.8	3.6	...	3.7	.53	.60	.60	...	.60
	Average	11.6	12.7	11.7	....	12.2	3.3	3.8	3.7	...	3.7	.53	.63	.62	...	.62
Angus	Hereford	12.0	11.1	12.8	....	12.0	3.2	3.6	4.1	...	3.9	.54	.55	.75	...	.65
	Angus	11.2	10.6	12.2	....	11.4	3.5	3.4	4.3	...	3.9	.54	.52	.82	...	.67
	Average	11.6	10.9	12.5	....	11.7	3.4	3.5	4.2	...	3.9	.54	.54	.79	...	.66
Red Poll	Hereford	10.4	10.1	11.8	....	11.0	3.1	3.6	4.0	...	3.8	.48	.54	.65	...	.60
	Angus	10.5	12.0	12.3	....	12.2	3.3	3.1	3.6	...	3.4	.47	.41	.52	...	.47
	Average	10.4	11.0	12.1	....	11.6	3.2	3.3	3.8	...	3.6	.47	.48	.59	...	.54
Brown Swiss	Hereford	10.1	11.0	11.8	12.0	11.4	2.7	3.0	3.2	3.8	3.1	.33	.39	.48	.63	.44
	Angus	11.2	12.2	12.7	12.5	12.5	2.9	3.2	3.3	4.1	3.3	.42	.53	.53	.70	.53
	Average	10.6	11.6	12.3	12.2	12.0	2.8	3.1	3.3	4.0	3.2	.38	.46	.51	.67	.49
Gelbvieh	Hereford	....	10.3	10.4	10.8	10.4	...	3.3	2.8	2.9	3.1	...	.44	.36	.46	.40
	Angus	....	10.8	11.8	11.9	11.3	...	2.9	3.8	3.8	3.4	...	.47	.55	.59	.51
	Average	....	10.6	11.1	11.3	10.9	...	3.1	3.3	3.4	3.2	...	.45	.46	.53	.46
Maine Anjou	Hereford	....	11.0	12.3	10.5	11.7	...	2.7	3.6	2.6	3.2	...	.36	.51	.33	.44
	Angus	....	11.2	12.2	12.5	11.7	...	3.1	2.7	4.1	2.9	...	.48	.41	.65	.45
	Average	....	11.1	12.2	11.5	11.7	...	2.9	3.2	3.3	3.1	...	.42	.46	.49	.44
Chianina	Hereford	....	9.1	9.9	10.1	9.5	...	2.9	2.8	3.1	2.9	...	.38	.37	.44	.38
	Angus	....	10.8	11.4	11.7	11.1	...	2.9	2.9	2.8	2.9	...	.43	.41	.39	.42
	Average	....	10.0	10.7	10.9	10.3	...	2.9	2.9	3.0	2.9	...	.41	.39	.42	.40
Average	Hereford	10.8	10.6	11.4	10.8	11.0	3.1	3.3	3.5	3.1	3.4	.47	.47	.54	.47	.51
All Sire	Angus	11.3	11.6	12.2	12.1	11.9	3.2	3.2	3.5	3.7	3.4	.49	.49	.55	.58	.52
Breeds	Average	11.0	11.1	11.8	11.5	11.5	3.2	3.2	3.5	3.4	3.4	.48	.48	.54	.52	.51

[a] U.S.D.A. Quality Grade as revised in 1976. 10 = average good, 11 = high good, 12 = low choice, 13 = average choice, etc.

[b] Average calculated only for dates common to all breed groups.

Table 31.6 Quality Grades, Yield Grades and Fat Thicknesses for Carcasses from the 1974 Calf Crop.

Breed of Steer		U.S.D.A. Quality Grade[a]						U.S.D.A. Yield Grade						Fat Thickness, in.					
Sire	Dam	254	282	318	352	387	Avg.[b]	254	282	318	352	387	Avg.[b]	254	282	318	352	387	Avg.[b]
Hereford	Hereford	9.5	10.1	9.9	....	....	10.0	2.9	3.2	3.2	...	...	3.2	.35	.43	.44	...	...	.44
Angus	Angus	11.7	11.8	12.5	....	....	12.1	3.2	3.4	3.6	...	...	3.5	.43	.49	.53	...	...	.51
	Average	10.6	11.0	11.2	....	....	11.1	3.0	3.3	3.4	...	...	3.4	.39	.46	.48	...	...	.47
Angus	Hereford	10.5	10.9	11.4	....	....	11.1	3.1	3.2	3.8	...	...	3.5	.42	.44	.59	...	...	.52
Hereford	Angus	10.9	11.5	11.3	....	....	11.4	3.2	3.3	3.6	...	...	3.4	.43	.46	.56	...	...	.51
	Average	10.7	11.2	11.4	....	....	11.3	3.2	3.2	3.7	...	...	3.4	.42	.45	.58	...	...	.52
Red Poll	Hereford	10.4	10.4	10.8	....	....	10.6	2.9	3.6	3.3	...	...	3.4	.36	.43	.42	...	...	.42
	Angus	11.1	11.1	11.3	....	....	11.2	3.1	3.0	3.6	...	...	3.3	.38	.38	.46	...	...	.42
	Average	10.8	10.7	11.0	....	....	10.9	3.0	3.3	3.5	...	...	3.4	.37	.40	.44	...	...	.42
Brown Swiss	Hereford	8.2	10.1	10.2	10.9	10.8	10.2	2.2	2.6	2.8	3.0	3.5	2.7	.18	.27	.27	.32	.47	.27
	Angus	10.6	9.9	11.6	11.2	12.2	10.8	2.8	2.9	3.0	3.1	3.6	3.0	.31	.36	.37	.39	.49	.36
	Average	9.4	10.0	10.9	11.0	11.5	10.5	2.5	2.8	2.9	3.1	3.5	2.8	.24	.32	.32	.35	.48	.32
Gelbvieh	Hereford	....	9.6	8.6	11.1	9.5	9.1	...	2.8	2.5	3.1	3.3	2.6	...	.28	.27	.39	.43	.28
	Angus	....	10.8	10.8	12.4	11.8	10.8	...	3.0	2.7	3.8	4.0	2.8	...	.32	.36	.51	.61	.34
	Average	....	10.2	9.7	11.7	10.6	10.0	...	2.9	2.6	3.4	3.6	2.7	...	.30	.31	.45	.52	.31
Maine Anjou	Hereford	....	9.1	9.9	9.8	10.0	9.5	...	2.7	2.5	2.7	3.2	2.6	...	.27	.26	.30	.44	.26
	Angus	....	10.2	11.1	11.5	11.6	10.6	...	3.0	3.1	3.5	3.5	3.0	...	.34	.39	.50	.48	.36
	Average	....	9.6	10.5	10.6	10.8	10.0	...	2.8	2.8	3.1	3.3	2.8	...	.31	.32	.40	.46	.31
Chianina	Hereford	....	8.3	8.5	8.6	9.6	8.4	...	2.3	2.2	2.5	3.2	2.2	...	.21	.20	.23	.39	.20
	Angus	....	9.5	8.6	10.9	10.7	9.0	...	2.7	2.4	2.8	3.1	2.6	...	.31	.29	.34	.43	.30
	Average	....	8.9	8.6	9.8	10.1	8.7	...	2.5	2.3	2.7	3.2	2.4	...	.26	.25	.28	.41	.25
Average	Hereford	9.7	9.8	9.9	10.1	10.0	9.8	2.8	2.9	2.9	2.8	3.3	2.9	.33	.33	.35	.31	.43	.33
All Sire	Angus	11.1	10.7	11.0	11.5	11.6	10.8	3.1	3.0	3.1	3.3	3.6	3.0	.39	.38	.42	.43	.50	.42
Breeds	Average	10.4	10.2	10.5	10.8	10.8	10.3	2.9	3.0	3.0	3.1	3.4	3.0	.36	.36	.39	.37	.47	.38

[a] U.S.D.A. Quality Grade: 10 = average good, 11 = high good, 12 = low choice, 13 = high choice, etc.
[b] Average calculated only for dates common to all breed groups.

Table 31.7Percentages of Bone, Fat Trim and Retail Product for Carcasses from the 1973 Calf Crop.

Breed of Steer		Bone, %					Fat Trim, %					Retail Product, %[a]				
Sire	Dam	220	248	282	338	Avg.[b]	220	248	282	338	Avg.[b]	220	248	282	338	Avg.[b]
Hereford	Hereford	12.7	12.1	11.8	....	12.0	18.9	22.7	22.4	....	22.6	68.4	65.1	65.8	....	65.5
Angus	Angus	11.8	11.2	11.2	....	11.2	20.6	23.7	23.5	....	23.6	67.6	65.1	65.3	....	65.2
	Average	12.3	11.7	11.5	....	11.6	19.8	23.2	23.0	....	23.1	68.0	65.1	65.5	....	65.3
Angus	Hereford	11.9	11.5	11.4	....	11.5	20.2	23.5	24.4	....	24.0	67.9	65.0	64.3	....	64.7
Hereford	Angus	12.5	12.0	11.0	....	11.5	20.0	21.9	25.1	....	23.5	67.6	66.1	63.9	....	65.0
	Average	12.2	11.8	11.2	....	11.5	20.1	22.7	24.8	....	23.8	67.7	65.6	64.1	....	64.9
Red Poll	Hereford	12.7	12.0	11.8	....	11.9	19.5	22.1	23.9	....	23.0	67.8	65.9	64.3	....	65.1
	Angus	12.2	12.6	11.8	....	12.2	19.2	20.2	23.9	....	22.1	68.6	67.2	64.2	....	65.7
	Average	12.5	12.3	11.8	....	12.1	19.3	21.1	23.9	....	22.5	68.2	66.6	64.3	....	65.4
Brown Swiss	Hereford	13.7	13.6	12.4	11.9	13.0	15.8	18.0	21.8	23.2	19.9	70.5	68.4	65.7	64.9	67.1
	Angus	13.2	12.6	11.7	11.5	12.2	18.0	20.6	22.2	25.1	21.4	68.8	66.8	66.1	63.4	66.5
	Average	13.5	13.1	12.0	11.7	12.6	16.9	19.3	22.0	24.1	20.7	69.7	67.6	65.9	64.1	66.8
Gelbvieh	Hereford	....	12.5	12.2	11.9	12.4	....	20.3	18.6	20.0	19.5	....	67.2	69.2	68.1	68.2
	Angus	....	11.9	11.8	11.3	11.9	....	19.3	22.3	23.5	20.8	....	68.8	65.8	65.1	67.3
	Average	....	12.2	12.0	11.6	12.1	....	19.8	20.5	21.8	20.2	....	68.0	67.5	66.6	67.8
Maine Anjou	Hereford	....	13.6	12.9	13.0	13.3	....	16.0	20.8	16.4	18.4	....	70.4	66.3	70.6	68.4
	Angus	....	12.3	12.0	11.6	12.2	....	20.1	19.5	24.1	19.8	....	67.5	68.6	64.3	68.1
	Average	....	13.0	12.4	12.3	12.7	....	18.1	20.1	20.3	19.1	....	69.0	67.4	67.4	68.2
Chianina	Hereford	....	14.2	14.1	12.6	14.2	....	16.5	15.6	19.5	16.1	....	69.2	70.3	68.0	69.8
	Angus	....	12.6	12.9	12.4	12.8	....	18.5	18.3	18.0	18.4	....	69.0	68.8	69.6	68.9
	Average	....	13.4	13.5	12.5	13.5	....	17.5	17.0	18.7	17.3	....	69.1	69.5	68.8	69.3
Average	Hereford	12.8	12.8	12.4	12.4	12.6	18.6	19.9	21.1	19.8	20.5	68.6	67.3	66.5	67.9	66.9
All Sire	Angus	12.4	12.2	11.8	11.7	12.0	19.4	20.6	22.1	22.7	21.4	68.1	67.2	66.1	65.6	66.7
Breeds	Average	12.6	12.5	12.1	12.0	12.3	19.0	20.2	21.6	21.2	20.9	68.4	67.3	66.3	66.7	66.8

[a] Retail Product, % = Actual yield of boneless, closely trimmed beef from the carcass.
[b] Average calculated only for dates common to all breed groups.

Table 31.8Percentages of Bone, Fat Trim and Retail Product for Carcasses from the 1974 Calf Crop.

Breed of Steer		Bone, %						Fat Trim, %						Retail Product, %[a]					
Sire	Dam	254	282	318	352	387	Avg.[b]	254	282	318	352	387	Avg.[b]	254	282	318	352	387	Avg.[b]
Hereford	Hereford	13.6	13.4	13.3	....	....	13.4	13.3	15.2	15.6	....	....	15.4	73.1	71.4	71.0	....	....	71.2
Angus	Angus	12.4	12.2	11.9	....	....	12.0	15.3	17.7	18.0	....	....	17.8	72.3	70.2	70.1	....	....	70.2
	Average	13.0	12.8	12.6	....	....	12.7	14.3	16.4	16.8	....	....	16.6	72.7	70.8	70.6	....	....	70.7
Angus	Hereford	12.9	12.8	12.3	....	....	12.6	15.4	15.6	18.2	....	....	16.9	71.7	71.5	69.4	....	....	70.4
Hereford	Angus	12.7	12.6	12.2	....	....	12.4	15.3	15.8	17.8	....	....	16.8	72.0	71.7	70.0	....	....	70.8
	Average	12.8	12.7	12.2	....	....	12.5	15.4	15.7	18.0	....	....	16.8	71.8	71.6	69.7	....	....	70.6
Red Poll	Hereford	13.5	13.5	13.0	....	....	13.2	14.1	16.4	16.9	....	....	16.6	72.4	70.1	70.1	....	....	70.1
	Angus	13.3	12.9	12.5	....	....	12.7	15.0	15.5	18.0	....	....	16.8	71.7	71.6	69.5	....	....	70.6
	Average	13.4	13.2	12.8	....	....	13.0	14.6	15.9	17.4	....	....	16.7	72.0	70.9	69.8	....	....	70.4
Brown Swiss	Hereford	14.7	14.9	14.6	13.7	13.5	14.8	10.8	12.0	12.5	16.0	16.4	12.2	74.5	73.2	72.9	70.3	70.1	73.0
	Angus	14.1	13.7	13.4	13.0	12.8	13.6	12.6	14.1	15.1	16.7	17.1	14.6	73.2	72.3	71.6	70.2	70.0	72.0
	Average	14.4	14.3	14.0	13.3	13.2	14.2	11.7	13.0	13.8	16.4	16.8	13.4	73.9	72.7	72.2	70.3	70.1	72.5
Gelbvieh	Hereford	....	14.0	14.2	13.7	13.1	14.1	....	12.6	13.0	15.6	16.4	12.8	....	73.4	72.8	70.7	70.5	73.1
	Angus	....	13.0	13.3	12.0	12.0	13.2	....	14.9	13.9	19.7	19.0	14.4	....	72.0	72.7	68.4	69.0	72.4
	Average	....	13.5	13.8	12.8	12.6	13.6	....	13.8	13.5	17.6	17.7	13.6	....	72.7	72.8	69.5	69.8	72.8
Maine Anjou	Hereford	....	14.5	14.4	14.0	13.2	14.4	....	13.1	13.2	14.2	15.9	13.2	....	72.5	72.5	71.7	70.9	72.5
	Angus	....	13.5	13.3	12.9	12.9	13.4	....	15.0	16.0	18.0	16.7	15.5	....	71.5	70.6	69.1	70.3	71.0
	Average	....	14.0	13.9	13.5	13.1	14.0	....	14.0	14.6	16.1	16.3	14.3	....	72.0	71.6	70.4	70.6	71.8
Chianina	Hereford	....	15.0	15.5	15.2	14.3	15.2	....	10.4	9.7	11.2	13.6	10.0	....	74.6	74.8	73.6	72.1	74.7
	Angus	....	14.3	14.4	13.7	13.5	14.4	....	12.5	11.1	14.3	14.8	11.8	....	73.2	74.5	72.0	71.7	73.8
	Average	....	14.7	15.0	14.4	13.9	14.8	....	11.5	10.4	12.8	14.2	11.0	....	73.9	74.6	72.8	71.9	74.2
Average	Hereford	13.7	14.0	13.9	14.1	13.5	14.0	13.4	13.6	14.2	14.3	15.6	13.9	72.9	72.4	71.9	71.6	70.9	72.2
All Sire	Angus	13.1	13.2	13.0	12.9	12.8	13.1	14.6	15.1	15.7	17.2	16.9	15.4	72.3	71.8	71.3	69.9	70.3	71.6
Breeds	Average	13.4	13.6	13.5	13.5	13.2	13.6	14.0	14.3	14.9	15.7	16.2	14.6	72.6	72.1	71.6	70.8	70.6	71.9

[a] Retail Product, % = Actual yield of boneless, closely trimmed beef from the carcass.
[b] Average calculated only for dates common to all breed groups (282 and 318 days).

Table 31.9 Percentages of Cutability, Warner-Bratzler Shear Values and Taste Panel Evaluations for Carcasses from the 1973 Calf Crop.

Breed of Steer		Actual Cutability, %[a]					Warner-Bratzler Shear, lb.[b]					Taste Panel Acceptability[c]				
Sire	Dam	220	248	282	338	Avg.[d]	220	248	282	338	Avg.[d]	220	248	282	338	Avg.[d]
Hereford	Hereford	55.5	52.5	52.3	....	52.4	7.6	7.0	6.9	...	7.0	6.8	8.0	7.6	...	7.8
Angus	Angus	53.6	51.4	51.6	....	51.5	7.0	6.9	6.1	...	6.5	6.9	7.9	7.9	...	7.9
	Average	54.5	51.9	51.9	....	51.9	7.3	7.0	6.5	...	6.8	6.9	7.9	7.7	...	7.8
Angus	Hereford	54.3	52.0	51.0	....	51.5	6.5	7.0	6.5	...	6.8	7.5	7.9	7.6	...	7.8
Hereford	Angus	54.4	53.1	50.4	....	51.8	6.6	7.9	7.1	...	7.5	7.4	7.2	7.8	...	7.5
	Average	54.3	52.5	50.7	....	51.6	6.5	7.5	6.8	...	7.2	7.5	7.5	7.7	...	7.6
Red Poll	Hereford	54.5	53.3	51.3	....	52.3	6.9	7.4	6.8	...	7.1	7.8	7.6	7.6	...	7.6
	Angus	54.8	54.2	51.2	....	52.7	7.3	7.7	7.2	...	7.5	6.7	7.3	7.6	...	7.5
	Average	54.6	53.7	51.3	....	52.5	7.1	7.6	7.0	...	7.3	7.3	7.4	7.6	...	7.5
Brown Swiss	Hereford	57.0	55.6	52.7	52.3	54.2	7.8	8.4	7.4	6.1	7.9	7.3	7.3	7.6	7.7	7.5
	Angus	55.8	53.9	52.9	50.6	53.4	6.5	6.8	7.6	6.9	7.2	7.4	7.8	7.6	7.8	7.7
	Average	56.4	54.8	52.8	51.5	53.8	7.1	7.6	7.5	6.5	7.6	7.4	7.6	7.6	7.7	7.6
Gelbvieh	Hereford	....	54.1	55.5	54.9	54.8	...	8.0	6.6	6.3	7.3	...	7.2	7.2	7.7	7.2
	Angus	....	54.7	52.6	52.1	53.7	...	7.3	7.4	6.2	7.4	...	7.4	7.6	7.5	7.5
	Average	....	54.4	54.1	53.5	54.3	...	7.7	7.0	6.3	7.4	...	7.3	7.4	7.6	7.4
Maine Anjou	Hereford	....	57.0	53.5	56.9	55.3	...	6.7	6.5	6.8	6.6	...	7.4	7.6	7.7	7.5
	Angus	....	54.3	55.2	51.2	54.8	...	6.8	6.9	6.9	6.9	...	7.5	7.5	7.7	7.5
	Average	....	55.7	54.3	54.1	55.0	...	6.8	6.7	6.9	6.8	...	7.5	7.5	7.7	7.5
Chianina	Hereford	....	56.8	57.1	55.3	57.0	...	8.3	7.5	6.1	7.9	...	7.3	7.2	7.5	7.3
	Angus	....	55.8	55.7	56.4	55.8	...	7.3	6.6	6.5	7.0	...	7.7	7.5	7.7	7.6
	Average	....	56.3	56.4	55.9	56.4	...	7.8	7.1	6.3	7.5	...	7.5	7.3	7.6	7.4
Average	Hereford	55.3	54.5	53.3	54.9	53.9	7.2	7.6	6.9	6.3	7.2	7.3	7.5	7.5	7.6	7.5
All Sire	Angus	54.7	53.9	52.8	52.6	53.4	6.8	7.2	7.0	6.6	7.1	7.1	7.5	7.6	7.7	7.6
Breeds	Average	55.0	54.2	53.1	53.7	53.7	7.0	7.4	6.9	6.5	7.2	7.2	7.5	7.6	7.7	7.5

[a] Actual Cutability, % = Actual yield of boneless, closely trimmed beef from the round, loin, rib and chuck.

[b] A measure of the pounds of force required to shear one-half inch cores of steaks cooked at 350°F to 150°F internal temperature and cooled for 30 minutes at room temperature. Warner-Bratzler shear was obtained from all 311 steers.

[c] Taste panel scores are based on a 9-point hedonic scale, with higher scores indicating greater acceptability.

[d] Taste panel traits were measured on steaks from 4 steers per sire-dam breed group per slaughter date. Average calculated only for dates common to all breed groups.

Table 31.10 Percentages of Cutability, Warner-Bratzler Shear Values and Taste Panel Evaluations for Carcasses from the 1974 Calf Crop.

Breed of Steer		Actual Cutability, %[a]						Warner-Bratzler Shear, lb.[b]						Taste Panel Acceptability[c]					
Sire	Dam	254	282	318	352	387	Avg.[d]	254	282	318	352	387	Avg.[d]	254	282	318	352	387	Avg.[d]
Hereford	Hereford	58.3	57.1	56.6	....	....	56.8	7.2	9.0	8.7	...	...	8.8	6.7	6.3	6.4	...	...	6.4
Angus	Angus	57.4	55.5	55.1	....	....	55.3	6.4	7.6	7.2	...	...	7.4	7.3	7.4	6.9	...	...	7.1
	Average	57.8	56.3	55.8	....	....	56.0	6.8	8.3	8.0	...	...	8.1	7.0	6.8	6.6	...	...	6.7
Angus	Hereford	57.3	57.1	54.7	....	....	55.9	7.0	7.8	7.7	...	...	7.8	6.9	6.5	7.1	...	...	6.8
Hereford	Angus	57.8	57.6	55.2	....	....	56.4	7.6	8.1	8.3	...	...	8.2	7.2	7.0	6.8	...	...	6.9
	Average	57.6	57.4	55.0	....	....	56.2	7.3	8.0	8.0	...	...	8.0	7.1	6.8	7.0	...	...	6.9
Red Poll	Hereford	58.0	56.1	56.0	....	....	56.0	10.1	7.2	7.8	...	...	7.5	6.8	7.5	6.8	...	...	7.2
	Angus	57.1	57.4	55.2	....	....	56.3	7.0	8.2	8.3	...	...	8.2	7.4	7.3	6.7	...	...	7.0
	Average	57.6	56.8	55.6	....	....	56.2	8.6	7.7	8.1	...	...	7.9	7.1	7.4	6.8	...	...	7.1
Brown Swiss	Hereford	60.1	59.2	58.7	56.8	56.2	58.9	9.7	8.9	7.8	8.6	7.3	8.4	6.8	6.8	6.7	6.6	7.3	6.8
	Angus	58.9	58.3	57.2	56.7	56.2	57.8	7.6	9.5	8.3	9.3	7.9	8.9	6.2	6.7	7.4	6.4	7.4	7.0
	Average	59.5	58.7	57.9	56.8	56.2	58.3	8.6	9.2	8.0	9.0	7.6	8.6	6.5	6.8	7.0	6.5	7.3	6.9
Gelbvieh	Hereford	....	59.2	58.8	57.2	57.0	59.0	...	9.3	8.8	8.2	6.3	9.0	...	7.2	6.6	6.8	7.0	6.9
	Angus	....	57.8	58.4	54.2	54.4	58.1	...	8.8	8.9	7.7	8.0	8.8	...	6.7	6.6	7.2	6.8	6.6
	Average	....	58.5	58.6	55.7	55.7	58.6	...	9.0	8.8	7.9	7.2	8.9	...	7.0	6.6	7.0	6.9	6.8
Maine Anjou	Hereford	....	58.7	58.1	58.2	57.3	58.4	...	8.4	8.4	8.7	7.4	8.4	...	6.8	7.1	6.4	7.1	7.0
	Angus	....	57.5	55.4	55.1	56.2	56.4	...	8.5	8.8	8.6	7.0	8.6	...	6.5	6.5	6.7	7.4	6.5
	Average	....	58.1	56.8	56.6	56.7	57.4	...	8.5	8.6	8.6	7.2	8.5	...	6.7	6.8	6.5	7.2	6.8
Chianina	Hereford	....	61.3	61.0	60.2	58.3	61.2	...	7.7	9.3	8.8	7.8	8.5	...	7.3	7.3	5.8	7.5	7.3
	Angus	....	59.7	60.3	58.0	57.9	60.0	...	9.0	8.9	8.4	7.9	9.0	...	6.3	6.7	6.9	6.8	6.5
	Average	....	60.5	60.6	59.1	58.1	60.6	...	8.4	9.1	8.6	7.9	8.8	...	6.8	7.0	6.3	7.1	6.9
Average	Hereford	58.4	58.4	57.7	58.1	57.2	58.0	8.5	8.3	8.3	8.6	7.2	8.3	6.8	6.9	6.9	6.4	7.2	6.9
All Sire	Angus	57.8	57.7	56.7	56.0	56.2	57.2	7.1	8.5	8.4	8.5	7.7	8.4	7.0	6.8	6.8	6.8	7.1	6.8
Breeds	Average	58.1	58.0	57.2	57.0	56.7	57.6	7.8	8.4	8.4	8.5	7.5	8.4	6.9	6.9	6.8	6.6	7.1	6.8

[a] Actual Cutability, % = Actual yield of boneless, closely trimmed beef from the round, loin, rib and chuck.
[b] A measure of the pounds of force required to shear one-half inch cores of steaks cooked at 350°F to 150°F internal temperature and cooled for 30 minutes at room temperature. Warner-Bratzler shear was obtained from all 476 steers.
[c] Taste panel scores are based on a 9-point hedonic scale, with higher scores indicating greater acceptability. Taste panel traits were measured on steaks from 4 steers per sire-dam breed group per slaughter date.
[d] Average calculated only for dates common to all breed groups (282 and 318 days).