BREED COMPARISONS IN THE GERMPLASM EVALUATION PROGRAM AT MARC[1,2]

Larry V. Cundiff, Ferenc Szabo[3], Keith E. Gregory, R. M. Koch,
M. E. Dikeman[4], and J. D. Crouse

Agricultural Research Service
U.S. Department of Agriculture
Roman L. Hruska U.S. Meat Animal Research Center
Clay Center, Nebraska 68933

Introduction

Breed differences in performance characteristics are an important genetic resource for improving efficiency of beef production. Diverse breeds are required to exploit heterosis and complementarity through crossbreeding and new composite breeds and to match genetic potential with diverse markets, feed resources and climates. This report presents results from the Germplasm Evaluation Program at the Roman L. Hruska U.S. Meat Animal Research Center (MARC) to characterize breeds of cattle representing diverse biological types for bioeconomic traits that influence quantity and value of production.

Germplasm Evaluation Program

Table 1 shows the mating plan for the first four cycles of the Germplasm Evaluation Program. Topcross performance of 26 sire breeds have been evaluated in F_1 calves out of Hereford, Angus or crossbred dams. Hereford-Angus reciprocal crosses were produced in each cycle of the program. Some of the Angus and Hereford sires used in cycle I, were repeated as reference sires in cycle II, III and IV to provide ties for analysis of data pooled over all four cycles.

---

[1]Presented at the Beef Improvement Federation 25th Anniversary Conference, May 26-29, 1993, Asheville, North Carolina.

[2]Appreciation is expressed to Gordon Hays, Wade Smith, Dave Powell, Patricia Beska, Dave Kohmetscher, Kay Theer, Jeff Waechter and their staff for operations support provided to this project; to Darrell Light for data analysis, and to Deborah Brown for secretarial support.

[3]F. Szabo, a visiting scientist from the Pannon University of Agriculture, Keszthely, Hungary, assisted with data analysis.

[4]M. E. Dikeman, Professor of Meat Science, Kansas State University, assisted with collection of carcass data at Kansas State University in 1971-1977 and at MARC in 1986-1991.

In cycle I, 32 Hereford (Horned and Polled), 35 Angus, 33 Jersey, 27 South Devon, 20 Limousin, 26 Charolais, and 27 Simmental sires were used by artificial insemination (AI) to produce progeny in 1970-1972. In cycle II, 16 of the Angus sires and 16 of the Hereford sires (reference sires repeated from Cycle I) and 16 Red Poll sires, 11 Brown Swiss sires (7 imported Braunvieh sires from Switzerland, 4 domestic), 11 Gelbvieh, 18 Maine Anjou, and 20 Chianina sires produced progeny in 1973-74. In cycle III, 13 Hereford and 14 Angus sires (reference sires repeated from cycle I) and 17 Brahman, 6 Sahiwal, 9 Pinzgauer, and 7 Tarentaise sires produced progeny in 1975-1976. In Cycle IV, semen from 14 Angus and 11 Hereford (reference sires repeated from Cycle I, born from 1963-1970), 30 current Angus (born 1982-1984), 32 current Hereford (14 horned and 18 polled, born 1982-1984), 29 Longhorn, 24 Piedmontese, 31 Charolais, 29 Salers, 31 Galloway, 22 Nellore, and 26 Shorthorn bulls produced progeny in 1986-1990. About 200 calves were produced by each sire breed. In cycle IV, following an AI period of about 45 days, one or two bulls each of Charolais, Gelbvieh, and Pinzgauer breeds were used each year by natural service in single-sire breeding pastures for about 21 days. These breeds were used in clean-up matings to increase ties to previous cycles and facilitate pooling of results over all four cycles.

Calves were born in the spring, beginning in March each year. Male calves were castrated within 24 hours of birth. Calves were creep fed (usually whole oats) from mid July or early August until weaning, usually in October (except in September, 1974 due to drought conditions). Following a postweaning adjustment period of about 25 to 40 days, steers were fed separately by sire breed in replicated pens for about 200 days. Averaged across years and feeding periods, the diet contained 1.27 MCal ME/lb, 12.8% crude protein, and 9.2% digestible protein. Representative samples of steers were slaughtered serially each year, in 3 to 4 slaughter groups spanning 56 to 84 days. The steers were slaughtered in commercial packing plants. Hot carcass weights were obtained and used to estimate dressing percent (100 X carcass weight/final live weight). After a 24-hour chill, USDA yield grade (fat thickness, ribeye area, estimated % kidney fat) and quality grade (marbling, maturity) data were obtained. The right side of each carcass was fabricated into boneless, retail product (including all steaks, roasts and lean trim {trimmed to 25% fat basis}), fat trim, and bone. Retail product, fat trim, and bone from the right side was doubled to estimate retail product yield from the carcass in terms of weight and as a percentage of cold carcass weight.

All F_1 females were retained to evaluate growth, age at puberty, reproduction and maternal performance through mature ages. Heifers, managed to be bred as yearlings and calve first at 2 years of age, were fed a diet of approximately 50% corn silage and 50% alfalfa or grass haylage plus protein or mineral supplement. Estrus was checked visually twice daily from an average age of about 250 days until the middle of the breeding season at about 420 days of age. Date at puberty was defined as date at first observed estrus confirmed by a subsequent estrus observed within 45 days. Females were mated to produce three-breed cross progeny. In cycle I, females were bred by AI to Hereford, Angus, Devon, Holstein and Brahman bulls to produce their first calves as 2-year-olds, by AI to Hereford, Angus, Gelbvieh, Maine Anjou, and Chianina sires to

produce their second calves as 3-year-olds, and by natural service to Brown Swiss sires for their subsequent calves. In cycle II, females were bred by AI to Hereford, Angus, Santa Gertrudis and Brahman bulls to produce their first calves as 2-year-olds, and by natural service to Simmental sires for their subsequent calves. In cycles III and IV, females were bred by natural service to Red Poll sires to produce their first calves as 2-year-olds and to Simmental sires to produce subsequent calves through at least seven years of age.

Data from two-breed F_1 crosses (Phase 2 progeny out of Hereford and Angus dams, Table 1) were analyzed with mixed model procedures (Harvey, 1985) considering appropriate fixed effects (e.g., birth year, cow age, sex, breed of sire, breed of dam, and breed of sire X breed of dam) and random effects (sire nested within breed of sire to test breed of sire and residual variance to test other fixed effects). Data for Devon, Brangus, Santa Gertrudis, and Holstein crosses (phase 3, three-way crosses out of F_1 dams, Table 1) were pooled with data from the separate analysis for two-breed F_1 crosses by adding the average difference from contemporary Hereford and Angus sired three-way crosses to the mean of Hereford-Angus reciprocal F_1 crosses from the pooled analysis of phase 2 progeny.

Breed group means are presented for F_1 crosses grouped into seven biological types based on relative differences (X lowest, XXXXXX highest) in growth rate and mature size, lean-to-fat ratio, age at puberty and milk production (Table 2). Although straightbred Hereford and Angus were produced, their results are not presented because they did not have the benefit of heterosis. Thus, breed group means for all traits are for F_1 crosses that benefit from effects of heterosis, averaged over both Hereford and Angus dams. Means for current samples of Hereford, Angus and Charolais sires (sires born since 1983) are estimated separately from those by original sires (born in 1970 or earlier).

Results

Breed group means are presented in Table 3 for gestation length, unassisted births (for cows calving at 4 years of age or older), calf survival from birth to weaning, birth weight and 200-day weaning weight. Data for unassisted births are for cows calving at 4 years of age or older to conform to cow ages available in all cycles. This was necessary because cow age X breed of sire interaction effects were significant for unassisted births in analysis of cycle I data and no 2-year-old cows were included in cycles II, III and IV and no 3-year-old cows were included in cycles II and III of the program. There were significant differences among breeds for all birth and weaning traits. Breeds with the heaviest weights at birth and weaning tended to have more calving difficulty than those with lower growth potential. Calf survival tended to be lower in breeds requiring more assistance at birth.

Breed group means for postweaning average daily gain, final weight, dressing percent, marbling score (slight = 400 to 499; small = 500 to 599) and percentage grading USDA

Choice or higher are shown in Table 4. Breed group means for carcass weight, fat thickness, rib eye area, and kidney-pelvic-heart fat percentage (estimated and actual) are presented in Table 5. Breed group means for retail product, fat trim and bone presented as a percentage of carcass weight are presented in Table 6. Weight of retail product, fat trim and bone adjusted to the average slaughter age of 450 days are also presented in Table 6. There were significant differences among all sire breeds for carcass and meat traits. Breeds that ranked highest for percentage retail product tended to have lower levels of marbling. Progeny by current sires versus progeny by original sires of the Hereford and Angus breeds indicate that live weights and retail product, fat trim and bone weights have increased significantly at a constant age. However, carcass composition (retail product, fat trim and bone expressed as a percentage of carcass weight) and other carcass traits have not changed in Herefords and Angus between the late 1960's and the mid 1980's.

Breed group means are presented in Table 7 for 400-day and 550-day weight, percent expressing puberty, age at puberty, and pregnancy rate. Actual age at puberty is for heifers expressing a first estrus (ranging from 58.5 to 100%). Adjusted age at puberty is adjusted to a 100 percent expression basis assuming an underlying normal distribution. Breed group means differed significantly for all growth and puberty traits of heifers. Heifers sired by bulls of breeds with large mature size (e.g., Charolais, Chianina) tended to be older at puberty than heifers sired by bulls of breeds with smaller mature size (Hereford, Angus). However, the relationship between mature size and age at puberty can be offset by associations with milk production. Breeds which have been selected for milk production reach puberty earlier than breeds of similar mature size and lean growth potential that do not have a history of selection for milk production (e.g., Braunvieh, Gelbvieh, Holstein, Simmental, and Salers versus Charolais and Chianina). Also, the Bos indicus breeds (Brahman, Sahiwal, and Nellore), which were older than all other breeds in age at puberty, appear to have been subjected to selection pressures that set them apart from Bos taurus breeds for age at which they exhibit their first estrus. Although age at puberty differed significantly among breeds, conception rate in yearling heifers did not differ consistently between breed groups reaching puberty at the oldest ages from those breed groups reaching puberty at the youngest ages. For example, conception rate of Brahman and Sahiwal cross heifers was very high in spite of their older age at puberty. Heifers in all breed groups were grown and developed under dry lot conditions on a moderately high energy diet (about 1.0 Mcal metabolizable energy [ME] per lb) and conception rate was not limited by variation observed among breed groups in age at puberty. Heifers developed more slowly on diets with lower energy density, have been shown to exhibit puberty at significantly older ages and have lower conception rates when exposed to breeding as yearlings than heifers developed more rapidly.

Breed group means for reproduction and maternal traits of F_1 females are shown in Table 8. It should be emphasized that results for females produced in cycle IV of the program are preliminary (i.e., females born in 1990 have only been evaluated as 2-year-olds, females born in 1989 have been evaluated as 2- and 3-year-olds, females

born in 1986 have been evaluated as 2- through 6-year-olds). Means for traits such as conception rate, percentage calf crop born and weaned, and percentage calvings unassisted are likely to change as additional data accumulate. The relationship between birth weight and unassisted calvings is much lower when evaluated as a maternal trait in F_1 daughters than when evaluated directly in F_1 progeny (Table 3) of diverse breeds. For example, progeny of Chianina, current Charolais, Salers, Maine Anjou, Braunvieh, and Shorthorn dams were relatively heavy at birth but above average in unassisted births. Also, progeny of Hereford-Angus cross females by current sires were heavier than those by original sires but calving assistance was similar. Females by Bos indicus sire breeds (Brahman, Sahiwal and Nellore) and by Jersey and Longhorn sires had progeny with relatively light birth weights and excelled in calving ease. Breed group differences in weaning weight of progeny are strongly associated with genetic potential for growth and milk production of the diverse biological types.

No one breed excels in all traits that are important to beef production. Crossbreeding systems that exploit heterosis and complementarity and match genetic potential with market targets, feed resources and climates provide the most effective means of breeding for production efficiency.

TABLE 1. SIRE BREEDS USED IN THE FIRST FOUR CYCLES OF THE GERMPLASM EVALUATION PROGRAM AT THE ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER

Cycle I (1970-72)	Cycle II (1973-74)	Cycle III (1975-76)	Cycle IV (1986-90)
F1 crosses from Hereford or Angus dams (Phase 2)			
Hereford	Hereford	Hereford	Hereford
Angus	Angus	Angus	Angus
Jersey	Red Poll	Brahman	Longhorn
S. Devon	Braunvieh	Sahiwal	Salers
Limousin	Gelbvieh	Pinzgauer	Galloway
Simmental	Maine Anjou	Tarentaise	Nellore
Charolais	Chianina		Piedmontese
			Charolais
			Gelbvieh
			Pinzgauer
3-way crosses out of F1 dams (Phase 3)			
Hereford	Hereford		
Angus	Angus		
Brahman	Brangus		
Devon	Santa Gertrudis		
Holstein			

[a]Hereford and Angus sires originally sampled in 1969, 1970 and 1971 (born in 1963-1970) were used throughout Cycles I, II, III and IV. In Cycle IV, a new sample of Hereford and Angus sires produced in 1982, 1983, and 1984 were used and compared to the original Hereford and Angus sires.

TABLE 2. BREEDS GROUPED INTO BIOLOGICAL TYPES FOR FOUR CRITERIA[a]

Breed group	Growth rate and mature size	Lean to fat ratio	Age at puberty	Milk production
Jersey (J)	X	X	X	XXXXX
Longhorn (Lh)	X	XXX	XXX	XX
Hereford-Angus (HAx)	XXX	XX	XXX	XX
Red Poll (R)	XX	XX	XX	XXX
Devon (D)	XX	XX	XXX	XX
Shorthorn (Sh)	XXX	XX	XXX	XXX
Galloway (Gw)	XX	XXX	XXX	XX
South Devon (Sd)	XXX	XXX	XX	XXX
Tarentaise (T)	XXX	XXX	XX	XXX
Pinzgauer (P)	XXX	XXX	XX	XXX
Brangus (Bn)	XXX	XX	XXXX	XX
Santa Gert. (Sg)	XXX	XX	XXXX	XX
Sahiwal (Sw)	XX	XXX	XXXXX	XXX
Brahman (Bm)	XXXX	XXX	XXXXX	XXX
Nellore (N)	XXXX	XXX	XXXXX	XXX
Braunvieh (B)	XXXX	XXXX	XX	XXXX
Gelbvieh (G)	XXXX	XXXX	XX	XXXX
Holstein (Ho)	XXXX	XXXX	XX	XXXXX
Simmental (S)	XXXXX	XXXX	XXX	XXXX
Maine Anjou (M)	XXXXX	XXXX	XXX	XXX
Salers (Sa)	XXXXX	XXXX	XXX	XXX
Piedmontese (Pm)	XXX	XXXXXX	XX	XX
Limousin (L)	XXX	XXXXX	XXXX	X
Charolais (C)	XXXXX	XXXXX	XXXX	X
Chianina (Ci)	XXXXX	XXXXX	XXXX	X

[a]Increasing number of X's indicate relatively higher values.

TABLE 3. SIRE BREED OF CALF BREED GROUP MEANS FOR BIRTH AND WEANING TRAITS

Breed group	Number calves born	Gestation length days	Unassisted births %	Survival to wean. %	Birth weight lb	200-day weight lb
Jersey	301	282.0	101.8	94.0	66.1	408
Longhorn	200	286.8	97.9	91.4	66.1	406
Orig. HAx	1177	283.2	94.8	95.7	75.2	432
Curr. HAx	102	283.1	92.7	91.5	80.4	458
Red Poll	212	284.6	99.9	95.7	75.7	426
Devon	139	283.3	94.0	96.0	75.4	445
Shorthorn	181	284.0	97.6	91.9	82.4	460
Galloway	172	285.7	95.8	92.9	76.4	429
South Devon	240	286.0	90.0	90.3	79.7	435
Tarentaise	199	287.0	93.4	94.0	81.1	446
Pinzgauer	595	285.2	92.0	93.7	84.0	445
Brangus	119	284.7	93.8	94.7	77.4	439
Santa Gertrudis	109	285.2	93.2	93.7	82.3	443
Sahiwal	321	293.7	91.3	94.1	84.1	432
Brahman	343	290.9	88.6	92.6	89.0	460
Nellore	196	293.0	92.7	91.4	86.6	474
Braunvieh	260	284.1	94.5	95.1	82.7	453
Gelbvieh	438	285.6	94.1	91.0	83.8	456
Holstein	143	281.0	92.6	93.8	78.1	450
Simmental	421	286.4	89.2	88.8	84.9	458
Maine Anjou	218	284.8	79.4	88.9	88.0	456
Salers	189	284.8	95.2	91.7	80.9	464
Piedmontese	200	287.2	92.5	91.1	80.2	452
Limousin	387	288.1	91.8	90.8	80.6	443
Orig. Charolais	404	286.2	83.5	85.8	86.4	461
Curr. Charolais	90	285.8	86.8	89.5	86.5	479
Chianina	238	286.7	88.4	89.3	86.9	459

TABLE 4. BREED GROUP MEANS FOR GROWTH AND CARCASS TRAITS OF STEERS

Breed group	Number	Average daily gain lb	Final weight lb	Dress. pct. %	Marb-ling[a] sc	USDA Choice %
Jersey	130	2.35	1008	59.8	618	82.3
Longhorn	92	2.19	960	60.6	526	56.6
Orig. HAx	539	2.51	1068	61.1	551	74.5
Curr. HAx	34	2.74	1152	61.2	543	70.7
Red Poll	109	2.35	1025	60.9	535	61.8
Devon	55	2.32	1034	60.7	517	----
Shorthorn	95	2.73	1156	61.0	566	74.7
Galloway	75	2.39	1032	61.2	529	58.1
South Devon	95	2.63	1091	61.4	554	72.6
Tarentaise	102	2.49	1079	61.1	510	49.3
Pinzgauer	226	2.55	1090	60.0	540	61.4
Brangus	52	2.49	1067	60.9	531	59.1
Santa Gertrudis	62	2.62	1109	61.7	538	58.1
Sahiwal	140	2.30	1028	61.6	492	42.8
Brahman	126	2.49	1098	62.1	482	39.7
Nellore	97	2.44	1094	63.3	505	44.0
Braunvieh	116	2.60	1109	60.6	518	59.4
Simmental	172	2.73	1148	60.5	510	63.4
Holstein	72	2.59	1089	59.1	497	----
Gelbvieh	212	2.66	1129	60.8	507	45.2
Maine Anjou	106	2.72	1147	61.5	501	49.5
Salers	77	2.70	1148	61.4	515	44.5
Piedmontese	80	2.49	1086	62.7	510	41.7
Limousin	173	2.49	1080	61.7	477	43.8
Orig. Charolais	175	2.77	1160	61.1	528	64.7
Curr. Charolais	43	2.89	1219	61.0	523	58.9
Chianina	114	2.63	1124	61.6	448	27.5

[a]Slight = 400 to 499, Small = 500 to 599, etc.

TABLE 5. BREED GROUP MEANS FOR CARCASS TRAITS OF STEERS

Breed group	Number	Carcass weight lb	Fat thickness in	Rib eye area sq in	Kid. pelv. & heart fat estimated %	Kid. pelv. & heart fat actual %
Jersey	130	603	0.44	10.32	4.92	5.43
Longhorn	92	582	0.37	10.74	3.52	4.20
Orig. HAx	539	654	0.62	10.85	3.16	3.38
Curr. HAx	34	707	0.63	11.19	3.26	3.24
Red Poll	109	626	0.52	10.67	3.86	4.33
Devon	55	637	0.53	10.69	3.33	----
Shorthorn	95	707	0.49	11.08	3.42	3.71
Galloway	75	633	0.48	11.28	3.13	3.44
South Devon	95	672	0.50	11.33	3.72	4.14
Tarentaise	102	660	0.42	11.22	3.95	4.29
Pinzgauer	226	655	0.43	11.28	3.50	3.82
Brangus	52	653	0.54	10.35	3.26	----
Santa Gertrudis	62	683	0.57	10.45	3.26	----
Sahiwal	140	634	0.52	10.81	3.32	3.42
Brahman	126	683	0.53	11.10	3.60	3.61
Nellore	97	695	0.49	11.33	3.47	3.71
Braunvieh	116	673	0.41	11.65	3.35	4.42
Gelbvieh	212	686	0.39	12.00	3.40	3.62
Simmental	172	695	0.37	11.87	3.27	3.73
Holstein	68	661	0.40	10.75	2.74	----
Maine Anjou	106	705	0.38	12.28	3.11	3.37
Salers	77	707	0.41	11.96	3.40	3.57
Piedmontese	80	683	0.31	13.19	3.03	3.35
Limousin	173	667	0.39	12.28	3.26	3.54
Orig. Charolais	175	710	0.37	12.39	3.19	3.63
Curr. Charolais	43	747	0.36	12.56	3.39	3.53
Chianina	114	692	0.32	12.43	2.89	3.02

TABLE 6. BREED GROUP MEANS FOR CARCASS TRAITS OF STEERS[a]

Breed group	Number	Retail product %	Fat trim %	Bone %	Retail product lb	Fat trim lb	Bone lb
Jersey	130	66.9	20.7	12.4	389	121	72.1
Longhorn	92	69.4	18.0	12.6	390	103	71.0
Orig. HAx	539	67.1	21.0	12.0	422	135	75.2
Curr. HAx	34	67.2	20.4	12.3	461	141	84.1
Red Poll	109	67.4	20.1	12.5	407	124	75.0
Devon	55	68.5	----	----	419	----	----
Shorthorn	95	67.0	20.1	12.9	456	139	88.2
Galloway	75	69.7	17.8	12.5	426	110	76.0
South Devon	95	68.1	19.6	12.3	441	130	79.4
Tarentaise	102	69.2	18.3	12.4	441	119	78.9
Pinzgauer	226	69.3	17.7	13.0	437	114	82.0
Brangus	52	66.8	----	----	421	----	----
Santa Gertrudis	62	67.3	----	----	443	----	----
Sahiwal	140	69.2	18.5	12.3	424	115	75.2
Brahman	126	69.2	18.3	12.5	456	123	82.0
Nellore	97	69.2	18.4	12.4	465	125	82.7
Braunvieh	116	69.5	17.2	13.4	449	116	86.3
Gelbvieh	212	70.2	16.8	13.0	463	113	85.5
Holstein	68	71.8	----	----	478	----	----
Simmental	172	70.1	16.5	13.4	469	115	89.1
Maine Anjou	106	70.1	16.4	13.5	477	113	91.2
Salers	77	70.0	17.1	12.9	478	117	88.1
Piedmontese	80	73.4	14.3	12.3	485	94	80.4
Limousin	173	71.5	15.9	12.6	459	106	81.0
Orig. Charolais	175	71.1	16.0	12.9	486	113	88.3
Curr. Charolais	43	70.2	16.4	13.4	506	118	96.3
Chianina	114	71.9	13.9	14.2	479	96	94.0

[a]Estimates of retail product weight and percentage for Devon, Brangus, Santa Gertrudis and Holstein sired progeny were obtained from multiple regression prediction equations reported by Crouse and Dikeman (1976; J. Anim. Sci. 42:584).

TABLE 7. BREED GROUP MEANS FOR GROWTH AND PUBERTY TRAITS OF HEIFERS

Breed group	Number	400-day weight lb	550-day weight lb	Puberty expressed %	Age at puberty days	Preg. rate %
Jersey	114	650	735	97.4	317	88.4
Longhorn	82	633	742	82.0	370	90.9
Orig. HAx	414	706	799	92.2	365	87.9
Curr. HAx	55	747	850	97.3	366	80.1
Red Poll	93	672	768	90.2	353	83.6
Devon	67	711	805	93.0	364	89.4
Shorthorn	73	769	867	95.8	359	89.0
Galloway	76	688	777	95.1	365	80.7
South Devon	118	726	813	96.0	352	84.5
Tarentaise	83	713	821	97.6	358	94.4
Pinzgauer	209	736	839	94.5	343	93.9
Brangus	63	735	823	92.2	385	85.5
Santa Gertrudis	41	739	838	90.0	391	92.7
Sahiwal	86	657	780	92.3	427	102.0
Brahman	101	733	865	93.5	439	94.3
Nellore	82	727	846	58.5	412	89.9
Braunvieh	129	720	826	90.0	346	91.6
Gelbvieh	185	725	836	87.1	341	87.4
Holstein	50	750	863	92.2	347	94.8
Simmental	155	749	844	94.4	360	86.4
Maine Anjou	88	753	861	90.6	370	92.8
Salers	90	763	873	101.0	365	89.0
Piedmontese	89	703	805	98.2	348	95.5
Limousin	155	717	797	88.0	391	83.7
Orig. Charolais	126	744	849	87.0	393	81.0
Curr. Charolais	36	781	903	96.3	361	79.0
Chianina	94	734	854	83.8	400	84.0

TABLE 8. BREED GROUP MEANS FOR REPRODUCTION AND MATERNAL PERFORMANCE OF CROSSBRED COWS

Breed group	Number births	Born %	Weaned %	Calvings unassisted %	Birth wt lb	200-day weight per calf weaned lb	200-day weight per cow exposed lb
Jersey	628	90	84	93	79	493	417
Longhorn	266	95	86	94	82	465	399
Orig. HAx	1,685	91	84	87	86	475	401
Curr. HAx	169	88	79	87	88	504	399
Red Poll	461	90	79	86	89	502	396
Devon	242	91	85	91	87	476	405
Shorthorn	183	93	87	90	94	529	460
Galloway	240	87	78	90	84	460	357
South Devon	603	88	85	85	91	492	419
Tarentaise	369	91	85	90	88	524	445
Pinzgauer	508	93	85	87	91	509	432
Brangus	238	90	86	86	87	495	425
Santa Gertrudis	170	90	82	94	84	504	413
Sahiwal	431	95	89	98	76	502	446
Brahman	519	94	86	99	83	539	463
Nellore	254	93	83	97	79	523	434
Braunvieh	681	92	85	92	91	534	454
Gelbvieh	429	95	87	89	90	533	464
Holstein	171	93	92	85	92	535	492
Simmental	872	89	83	83	91	521	433
Maine Anjou	468	94	86	89	96	522	449
Salers	263	92	86	92	90	527	453
Piedmontese	294	93	84	84	88	498	417
Limousin	851	89	82	88	88	484	397
Orig. Charolais	693	88	80	85	93	503	403
Curr. Charolais	264	89	80	91	91	507	404
Chianina	475	93	86	92	95	523	450