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Germ Plasm Evaluation Program- Progress Report No. 6

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Germ Plasm Evaluation Program

Progress Report No. 6

Roman L. Hruska
U.S. Meat Animal Research Center

In cooperation with
Kansas State University
and the University of Nebraska

Agricultural Reviews and Manuals
Science and Education Administration
U.S. Department of Agriculture

ARM-NC-2
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The cattle Germ Plasm Evaluation Program at the Roman L. Hruska U.S. Meat Animal Research Center is designed to characterize different biological types represented by breeds varying widely in characteristics such as milk production, growth, mature size and carcass composition. A major objective is to characterize breeds representing different biological types in different feed environments and production situations for the full spectrum of biological traits relating to economic beef production.

A coordinated research effort is employed involving scientists from the disciplines of animal breeding, reproductive physiology, nutrition, meats and management systems. The program was initiated in 1969. Progress reports have been published annually summarizing current results from each cycle and phase of the program for traits of principal economic importance to the beef cattle industry.

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CATTLE GERM PLASM EVALUATION PROGRAM¹

PROGRESS REPORT NO. 6

ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER

The cattle Germ Plasm Evaluation Program has been conducted in three cycles. Cycle I involved breeding Hereford, Angus, Jersey, South Devon, Limousin, Simmental and Charolais bulls by artificial insemination (AI) to Hereford and Angus cows to produce three calf crops (Cycle I, Phase 2) in the spring of 1970, 1971 and 1972.

Cycle II, initiated with the 1972 breeding season, involved the Hereford and Angus cows used in the first cycle. These cows were bred by AI to Hereford, Angus, Red Poll, Brown Swiss, Gelbvieh, Maine Anjou and Chianina sires to produce two calf crops (Cycle II, Phase 2) in the spring of 1973 and 1974. In addition, in Cycle II, Phase 2, Red Poll and Brown Swiss cows were added to the program and mated to Hereford, Angus, Red Poll and Brown Swiss sires to form a four-breed diallel crossbreeding experiment.

Cycle III was initiated during the 1974 breeding season. In Cycle III, the Hereford and Angus cows used to initiate Cycles I and II were mated by AI to Hereford, Angus, Brahman, Sahiwal, Pinzgauer and Tarentaise sires to produce two calf crops (Cycle III, Phase 2) in the spring of 1975 and 1976.

Fifteen of the Hereford and 16 of the Angus sires used in Cycle I were also used in Cycle II and Cycle III to insure a more stable control population of Hereford and Angus reciprocal crosses that are used as a basis for comparison between different cycles and phases of the program. Within each cycle of sire breeds, foundation cows (Hereford and Angus, in Cycles I, II and III, plus Red Poll and Brown Swiss in Cycle II) are referred to as Phase 1. Their calves are called Phase 2 and the calves from Phase 2 cows are designated Phase 3. Specific mating plans for each cycle and phase of the program are given in the appendix.

Previous progress reports have presented completed data for Cycles I and II and are available by request. Progress Report No. 1 (ARS-NC-13, 1974) included birth and weaning traits of Cycle I, Phase 2, calves and postweaning growth, feed efficiency and carcass and meat traits of the steers. Progress Report No. 2 (ARS-NC-22, 1975) included the growth, reproduction and maternal performance of Cycle I, Phase 2, females through two years of age and, for Cycle II, Phase 2, the preweaning traits for both calf crops and the steer postweaning traits for the 1973 calf crop. Progress Report No. 3 (ARS-NC-41, 1976) presented a complete summary and discussion of Cycle I, Phase 2, results

¹Roman L. Hruska U.S. Meat Animal Research Center, Agricultural Research, Science and Education Administration, U.S. Department of Agriculture, Clay Center, Nebr. 68933; Standardization Branch, Agricultural Marketing Service, U.S. Department of Agriculture; Kansas State University, Manhattan; and the University of Nebraska, Lincoln, cooperating.

from birth through slaughter for steers and from birth through puberty for the heifers. Progress Report No. 4 (ARS-NC-48, 1976) included reproduction and maternal performance of Cycle I, Phase 2, cows as 3-year-olds, preweaning and postweaning information for Cycle I, Phase 3, calves, and postweaning steer data for the 1974 calf crop and postweaning heifer data for both calf crops of Cycle II, Phase 2, calves. For results on calving, reproduction and maternal performance of Cycle I, Phase 3, and Cycle II, Phase 2, cows as 2-year-olds, readers are referred to Progress Report No. 5 (ARS-NC-55, 1977). Progress Report No. 5 also included complete results for birth and weaning traits on Cycle III, Phase 2, calves.

This report provides reproduction and maternal performance data for Cycle I, Phase 2, cows as 4-, 5-, 6- and 7-year-olds, Cycle I, Phase 3, cows as 2-, 3-, 4- and 5-year olds, and Cycle II, Phase 2, cows as 3- and 4-year-olds. Postweaning growth and carcass data of steers and growth, puberty and conception data of heifers are reported for all Cycle II, Phase 3, progeny. Also, postweaning growth, feed efficiency and carcass and meats data of steers and growth, puberty and conception of heifers are reported from both calf crops in Cycle III, Phase 2. Reproduction and maternal performance data are presented on the first set of Cycle III, Phase 2, females (born in 1975) as 2-year-olds.

General releases of information on individual sires are not planned because erroneous conclusions may be drawn from the ranking of individual sires with the relatively small number of progeny per sire in this program. The objective of the program is to characterize breeds as representatives of different biological types. To do this effectively, a large sample of sires of each breed is necessary. Thus, the number of progeny per sire is generally low. A relatively large number of progeny per sire are required for a high level of accuracy in ranking individual sires on their breeding value for most economic traits.

CYCLE I, PHASE 2

Foundation Cows. The foundation Hereford and Angus cows used in the program were purchased as calves at weaning from commercial producers in Nebraska. The cows were 2 through 5 years of age, 2 through 6 years of age, and 3 through 7 years of age at calving in 1970, 1971 and 1972, respectively.

Sires. In Cycle I, 32 Hereford, 35 Angus, 33 Jersey, 28 South Devon, 20 Limousin, 28 Simmental and 26 Charolais bulls were used during the 1969, 1970 and 1971 breeding seasons. The Hereford and Angus bulls used in this program were sampled from bulls that had been selected on individual performance information, which was the basis for entering into the progeny testing programs of commercial artificial insemination organizations. The Jersey bulls were selected at random from two commercial AI organizations, and the South Devon bulls were sampled from an importation made in 1969 by a commercial organization. Simmental, Limousin and Charolais bulls were sampled from bulls available from commercial organizations and from the Canada Department of Agriculture for the Simmental and Limousin.

For a cooperative study with the Canada Department of Agriculture, Hereford x Angus, Jersey x Angus, Simmental x Angus and Charolais x Angus heifers were randomly selected at weaning time and shipped, 4 to 8 weeks after weaning, to the Research Station, Lethbridge, Alberta. There were 12 heifers per breed group in 1970 and 10 heifers per breed group in 1971 and 1972. These females, and their offspring were individually fed to evaluate efficiency of production.

Matings. Cycle I, Phase 2, yearling heifers were mated to Hereford, Angus, Brahman, Devon and Holstein bulls during a 45- to 46-day AI season and to Hereford and Angus bulls for a 21- to 24-day cleanup period in 1971, 1972 and 1973 (appendix table 3). As 2-year-old cows, they were mated to Hereford, Angus, Chianina, Gelbvieh and Maine Anjou bulls for a 42-to 45-day AI season and to Hereford and Angus bulls during a 22-day cleanup in 1972, 1973 and 1974. As 3- year olds and above the cows are being mated by natural service to Brown Swiss bulls for 63 days.

Data Analysis. Calving difficulty, calf mortality, calf birth weight and preweaning growth were analyzed by least-squares procedures for unequal subclass numbers using a model that included the effects of breed of cow's sire, breed of cow's dam, cow age-year, sex and two-way interactions. Birth and 200-day weight and preweaning growth rate were adjusted to a steer basis by adjustment factors calculated from the data and shown in the table footnotes. Unweighted means are presented for calf crop percentage, postpartum interval and pregnancy rate.

Calving Difficulty. Calving difficulty scores were assigned to each calf at birth on the basis of the following system:

Score

- | | |
|-------------------------|---|
| 1 No difficulty | - Calves unassisted. |
| 2 Little difficulty | - Assistance given by hand, but no jack or puller used; assistance actually may not have been required. |
| 3 Moderate difficulty | - Assistance given with jack or calf-puller; some difficulty was encountered even with the puller being used. |
| 4 Major difficulty | - Calf jack used and major difficulty encountered; usually 30 minutes or more required to deliver calf. |
| 5 Caesarean birth | - Performed after determination made that calf could not be delivered with a calf-puller. |
| 6 Abnormal presentation | - Assistance given: posterior, head back, leg back, and so forth. |

Summaries of calving difficulty in 2,043 births from 4-, 5-, 6- and 7-year-old cows are provided in table 1. For these summaries, scores of 1 and 2 were combined and are designated no difficulty and scores of 3 and 4 were combined and are designated calf-puller.

Reproductive and Maternal Performance. Information is presented on rebreeding performance of 4-, 5-, 6- and 7-year-olds in table 2. Least squares means for cow weight at fall palpation time and fall hip height measurements are also included in these tables. Prewaning growth and calf crop percentages are provided in table 1 for calves from these same cows.

CYCLE I, PHASE 3

Matings. The mating plans to produce Cycle I, Phase 3, calves are shown in appendix table 3. As yearling heifers, the Cycle I, Phase 2, females were bred by AI to 16 Hereford, 25 Angus, 14 Brahman, 12 Devon and 13 Holstein sires for 45 to 46 days followed by a 21- to 24-day cleanup mating period to Hereford and Angus sires to produce their first calf crops as 2-year-olds in the spring of 1972, 1973 and 1974. Birth, survival, preweaning growth and postweaning steer and heifer data for the Cycle I, Phase 3, calves were reported previously (ARS-NC-48, Progress Report No. 4, 1976). In addition, the females were retained and were evaluated for maternal and reproductive performance when mated naturally to Red Poll bulls. Calf birth survival and preweaning growth, cow size and cow rebreeding performance as 2-, 3-, 4- and 5-year olds are reported in tables 3 and 4 by breed of the cow's dam and in tables 5 and 6 by breed of the cow's sire.

Data Analysis. Calving difficulty, calf mortality, birth weight and preweaning growth were analyzed by least squares procedures for unequal subclass numbers using a model that included the effects of breed of cow's grandsire, breed of cow's granddam, breed of cow's sire, year-age, sex and two-way interactions. Birth and 200-day weight and preweaning growth rate were adjusted to a steer basis by adjustment factors calculated from the data and shown in table footnotes. Calf crop percentage, pregnancy rate and cow weights (tables 4 and 6) are least squares means from an analytical model similar to the one used for calf traits, except that sex was omitted.

CYCLE II, PHASE 2

Cows. The foundation Hereford and Angus cows used in Cycle I were continued in Cycle II of the program. The cows calving in 1973 were 4 to 8 years of age and in 1974 were 4 to 9 years of age. As previously indicated, mature Brown Swiss and Red Poll cows were added to these herds for the 1972 and 1973 breeding seasons.

Sires. In Cycle II, 15 Hereford, 16 Angus, 16 Red Poll, 11 Brown Swiss, 11 Gelbvieh, 18 Maine Anjou and 20 Chianina bulls were used during the 1972 and 1973 breeding seasons. The Hereford and Angus sires had also been used in Cycle I of the program and the other bulls were sampled from commercial organizations. The Brown Swiss sires included four domestic bulls and seven bulls imported into Canada from Switzerland and Germany.

Birth, Preweaning and Postweaning Data. Data on calving difficulty and preweaning growth for both calf crops produced (1973-74) and postweaning growth, feed efficiency and carcass and meat traits for the first calf crop of Cycle II, Phase 2, were summarized previously (ARS-NC-22, Progress Report No. 2, 1975). In addition, steer postweaning data from the second calf crop and heifer postweaning growth, puberty and conception for both calf crops were reported previously (ARS-NC-48, Progress Report No. 4, 1976). Data on calving difficulty, reproduction, maternal performance and size of 2-year olds was presented in Progress Report No. 5 (ARS-NC-55, 1977).

Calving and Rebreeding of 3- and 4-Year-Olds. Data on calving difficulty, calf crop percentage and birth and weaning weights of calves from 3- and 4-year-old dams (born in 1973-74) are presented in table 7 for cows out of Hereford and Angus dams. Data on rebreeding performance and size as 3- and 4-year-olds are given in table 8. Corresponding data are reported in tables 9 and 10 for the cows out of Hereford, Angus, Red Poll and Brown Swiss dams. The cows were bred as 2-, 3- and 4-year-olds by natural service to 3/4 Simmental bulls.

Calving difficulty, calf mortality, calf birth weight and preweaning growth were analyzed by least squares procedures for unequal subclass numbers using a model that included the effects of breed of dam's sire, breed of dam's dam, year-age of cow and two-way interactions. Birth and 200-day weight and preweaning growth rate were adjusted to a steer basis by adjustment factors calculated from the data and shown in table footnotes. Unweighted means are presented for calf crop percentage, postpartum interval and pregnancy rate.

CYCLE II, PHASE 3

Sires. The mating plans to produce Cycle II, Phase 3, calves are presented in appendix table 4. There were 13 Hereford, 14 Angus, 13 Santa Gertrudis and 14 Brangus sires used by AI to produce the two calf crops (1975-76). These sires were sampled from commercial organizations, with the Hereford and Angus sires being the same as used in other cycles and phases of the program. Calves resulting from cleanup matings to Hereford and Angus sires were also included in this summary. Calving difficulty, calf survival and preweaning growth were presented in Progress Report No. 5 (ARS-NC-55, 1977).

Postweaning Growth and Carcass. Postweaning growth and carcass data on both calf crops of steers are presented in tables 12, 13 and 14. Table 12 presents results according to breed of dam, and table 13 presents results according to breed of sire for steer progeny with Angus and Hereford maternal granddams. Table 14 presents corresponding data for 16 breed of dam groups involved in the four breed diallel (Angus, Hereford, Red Poll and Brown Swiss). Rations for the steers are presented in table 11.

Postweaning Growth, Puberty and Conception. Postweaning growth, age at puberty and conception of yearling heifers born in 1975 and 1976 are presented in table 15 according to breed of dam (seven maternal grandsire

breeds, Hereford or Angus maternal granddams), table 16 (Hereford-Angus, Santa Gertrudis and Brangus sires) and table 17 (4 breed diallele for maternal grandsire and maternal granddam). The heifers were developed in the feedlot from weaning in mid-October until mid-April of each year. For heifers born in 1975, the postweaning ration was 50 percent corn silage, 30 percent alfalfa haylage and 20 percent sorghum silage fed free choice. The 1976 heifers were fed a 50 percent corn silage and 50 percent alfalfa haylage postweaning ration. The heifers grazed on cool- and warm-season pastures during a 63-day, breeding season that began May 17 in 1976 or May 16 in 1977. Breeding was by natural service to Shorthorn bulls.

Heifers were observed for estrus twice daily from an average of about 240 days of age through the end of the breeding season at about 16 months of age. Date of puberty was defined as the date of the first observed standing estrus confirmed by a second observed estrus within 45 days. Puberty weight was calculated by interpolation between the nearest two weights. Data on the postweaning growth, puberty and conception of these heifers were analyzed by least squares procedures using a model that included breed of sire, breed of maternal grandsire, breed of maternal granddam, year of birth and all two-way interactions.

CYCLE III, PHASE 2

Cows. The foundation Hereford and Angus cows used to produce Phase 2 calves in Cycles I and II were continued in Cycle III of the program (appendix table 5). The two calf crops in Cycle III, Phase 2, were produced in 1975 and 1976.

Sires. There were 13 Hereford, 16 Angus, 17 Brahman, 6 Sahiwal, 9 Pinzgauer and 7 Tarentaise sires used during the 1974 and 1975 breeding seasons. The Hereford and Angus bulls had also been used in Cycle I and Cycle II of the program, and the Brahman bulls were sampled from commercial organizations or purebred Brahman herds. Semen was available from only 2 Sahiwal bulls (imported from Australia) and 1 Tarentaise bull for the 1974 breeding season. Semen was available on 4 additional Sahiwal bulls and 6 additional Tarentaise bulls for the 1975 breeding season to produce the second Cycle III, Phase 2, calf crop in 1976.

A sample of about 32 heifers from each of the Angus-Hereford, Hereford-Angus, Brahman-Hereford, Brahman-Angus, Sahiwal-Hereford, Sahiwal-Angus, Pinzgauer, Hereford and Pinzgauer-Angus breed groups were transferred to the U.S. Department of Agriculture station at Brooksville, Fl., for an interregional study cooperative with the Florida Agricultural Experiment Station to evaluate genotype-environment interactions involving maternal traits. These heifers and those remaining at the Roman L. Hruska U.S. Meat Animal Research Center will be mated by natural service to bulls sampled from the same population of Red Poll (for first calf crop) and 7/8 Simmental (second through fourth calf crops) to evaluate reproduction and maternal performance in each environment. Calving traits and preweaning growth data for all calves born in 1975 and 1976 were presented in Progress Report No. 5 (ARS-NC-55, 1977).

Postweaning Growth and Feed Efficiency. Postweaning growth and feed efficiency data obtained on steers from the 1975 and 1976 calf crops are summarized in table 19. Rations are presented in table 18. The steers were serially slaughtered as described in the carcass and meats section.

The steers were weaned in late October at about 200 days of age. At weaning, steer calves with adjusted weaning weights more than three standard deviations below the mean for their breeding group were removed from the program. There were few calves in this category. The remaining steers were placed in the feedlot for a 40-day adjustment period in 1975 and 34-day adjustment period in 1976 and then separated into replicated pens by sire breed with the Hereford-Angus reciprocal crosses combined. In 1975, Hereford-Angus, Brahman and Pinzgauer crosses were fed in three pens; Sahiwal and Tarentaise crosses were fed in two pens. In 1976, there were two pens for each of the five sire breed groups.

The postweaning average daily gains were based on actual weaning weights (no weaning shrink) and final weights at slaughter. Final weights at slaughter were obtained as the average of two weights (on feed and water) taken on different days to reduce errors due to differences in fill. Average daily gains and final weights for the different slaughter groups were only for the steers slaughtered in that group. Feed efficiency for each breed group was obtained by dividing the cumulative average daily TDN consumption per steer by the average daily gain of the steers in each of the slaughter groups. The measurement of feed efficiency began after a 40-day conditioning period. Metabolizable energy (Mcal) was obtained by multiplying pounds TDN by 1.64. TDN contents of the diets were estimated by the use of TDN values for the component feedstuffs (National Research Council) and in most cases laboratory determined dry matter and crude protein.

Postweaning growth was analyzed by least squares procedures for unequal subclass numbers using a model that included the effects of slaughter group, year, sire-dam breed group and two factor interactions.

Carcass and Meats. The 1975-born steers were serially slaughtered in three groups after 192, 218 and 246 days on feed following the 40-day postweaning adjustment period. The 1976-born steers were serially slaughtered in three groups after 180, 208 and 236 days on feed following a 30-day postweaning adjustment period. Steers were transported to a commercial slaughter plant approximately 12 hours before slaughter. Carcass data were obtained after a 48-hour chill. Carcasses were evaluated for maturity, marbling and USDA Quality Grade (as revised, 1976) by representatives of the Roman L. Hruska U.S. Meat Animal Research Center; Standardization Branch, Agricultural Marketing Service, USDA; and Kansas State University. Rib eye area and 12th rib fat thickness were measured and USDA Yield Grade determined. These results are presented in tables 20 and 21.

After obtaining carcass cooler data, the right side of each carcass of an average of 24 steers per sire breed by slaughter group subclass for all sire breeds except Tarentaise (only 14 per slaughter group) was transported from the commercial slaughter plant to Kansas State University for detailed cut-out and meat quality evaluation. The right side was separated into wholesale cuts, which were processed into closely trimmed, boneless retail cuts,

except that dorsal and transverse spinous processes were left in short loin cuts and dorsal spinous processes and rib bones were left in rib cuts. No more than 0.30 inch of fat was left on any surface. The amounts of retail product, fat trim and bone were determined for each wholesale cut. These results are presented in table 22.

One steak was removed at the 11th rib from each carcass for Warner-Bratzler shear determinations of tenderness. The steaks were cooked at 350° F to an internal temperature of 150° F. After cooling for approximately 30 minutes at room temperature, one-half inch cores were removed for shear determination. Steaks were removed at the 10th rib from six representative carcasses per breed group per slaughter date, cooked at 350° F to an internal temperature of 150° F, and subjected to taste panel evaluation for tenderness, flavor, juiciness and overall acceptability by trained taste panelists. These results are presented in table 23.

The data for the carcass and meat traits were analyzed by least squares procedures for unequal subclass numbers using the same model as used for postweaning growth.

Postweaning Growth, Puberty and Conception. Postweaning growth, age at puberty and conception of yearling heifers born in 1975 and 1976 are presented in table 24. The heifers were developed in the feedlot from weaning in October until April 19, 1976, or April 21, 1977. For heifers born in 1975, the postweaning ration was 50 percent corn silage, 30 percent alfalfa haylage and 20 percent sorghum silage fed free choice. The 1976-born heifers were fed a 50 percent corn silage and 50 percent alfalfa haylage postweaning ration. The heifers grazed on cool- and warm-season pastures during a 63-day, natural-service breeding season that began May 17 in 1976 and on May 16 in 1977.

Heifers were observed for estrus twice daily from an average of about 240 days of age through the end of the breeding season at about 16 months of age. Date of puberty was defined as the date of the first observed standing estrus confirmed by a second observed estrus within 45 days. Puberty weight was calculated by interpolation between the nearest two weights. Data on the postweaning growth, puberty and conception of these heifers (table 24) were analyzed by least squares mixed model procedures using a model that included fixed effects of sire-dam breed group, age of dam and random effects of year within breed group and sire within year and breed group.

Reproduction and Maternal Performance. Data on calving difficulty, percentage calf crop and birth and weaning weight of progeny from 2-year-old Cycle III, Phase 2, females (born in 1975) are presented in table 25. Data on rebreeding performance and size as 2-year-olds are given for the corresponding breed group in table 26. The Cycle III, Phase 2, females were bred as yearlings by natural service to Red Poll sires, and as 2-year-olds to 7/8 Simmental sires. The calving and rebreeding data on the 1976 heifers born in Cycle III, Phase 2, are not yet available. Thus, the data presented in tables 25 and 26 are preliminary, representing that from only the first of two calf crops that will be obtained on females calving as 2-year-olds. These data were analyzed by least squares procedures using a model that included effects of sire-dam breed groups.

TABLE 1. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DIFFICULTY, CALF CROP PERCENTAGE, CALF MORTALITY, BIRTH WEIGHT, WEANING WEIGHT
AND WEANING WEIGHT RATIO OF CALVES FROM 4-, 5-, 6- AND 7-YEAR OLD COWS^a
CYCLE I, PHASE 2 - COWS BORN 1970-71-72

Breed of Cow		No. Calves Born	Type of Parturition, %				Calf Crop, % ^c		Calf Mortality, % ^d		Calf Wt., lb. ^e		200-Day ^f Wt. Ratio
Sire	Dam		No Diff. ^b	Calf- Puller	C- Section	Abn. Pre- sentation	Born	Weaned	Early	Late	Birth	200- Day	
Angus Hereford	Hereford	172	97.3	0.6	0.0	2.1	96.3	89.1	2.9	4.4	91.7	502	101.6
	Angus	182	94.5	3.6	0.6	1.3	96.2	89.3	4.4	1.5	91.9	487	98.6
	Average	354	95.9	2.1	0.3	1.7	96.3	89.2	3.7	2.9	91.8	494	100.0
Jersey	Hereford	168	98.4	1.5	0.0	0.2	95.4	89.4	4.3	2.0	86.3	512	103.6
	Angus	121	98.4	0.7	0.0	0.9	89.0	80.0	5.2	5.0	80.5	503	101.8
	Average	289	98.4	1.1	0.0	0.5	92.2	84.7	4.7	3.5	83.4	508	102.8
South Devon	Hereford	141	94.2	2.5	0.8	2.5	95.8	92.4	1.5	2.9	98.4	512	103.6
	Angus	127	94.7	2.0	0.0	3.3	95.0	91.7	2.1	1.3	92.6	509	103.0
	Average	268	94.5	2.3	0.4	2.9	95.4	92.0	1.8	2.1	95.5	510	103.2
Limousin	Hereford	195	97.0	1.8	0.2	1.0	94.5	83.8	6.8	2.3	94.1	505	102.2
	Angus	204	93.1	3.1	0.6	3.3	98.6	89.2	6.4	0.4	90.9	495	100.2
	Average	399	95.0	2.5	0.4	2.1	96.5	86.5	6.6	1.4	92.5	500	101.2
Simmental	Hereford	224	91.9	5.6	0.5	2.1	96.5	89.3	5.9	1.4	98.0	546	110.5
	Angus	182	93.3	3.2	0.0	3.4	93.3	85.4	7.1	2.1	93.7	539	109.1
	Average	406	92.6	4.4	0.2	2.7	94.9	87.3	6.5	1.7	95.9	542	109.7
Charolais	Hereford	204	90.5	5.4	2.1	2.1	95.9	85.7	6.9	3.9	97.9	525	106.3
	Angus	123	91.6	3.2	0.1	5.1	93.8	84.2	7.0	2.1	98.2	524	106.1
	Average	327	91.0	4.3	1.1	3.6	94.8	85.0	6.9	3.0	98.0	525	106.3
Average All Sire Breeds	Hereford	1104	94.9	2.9	0.6	1.7	95.7	88.3	4.7	2.8	94.4	517	104.7
	Angus	939	94.3	2.6	0.2	2.9	94.3	86.6	5.4	2.1	91.3	510	103.2
	Average	2043	94.6	2.8	0.4	2.3	95.0	87.5	5.0	2.5	92.9	513	103.9

^a Calves from these cows were sired by Brown Swiss bulls (appendix table 3).

^b No assistance or minor hand assistance.

^c Of cows alive at calving; cows removed from experiment only for serious injury, being open two successive years or by death.

^d Early mortality is within 72 hr of birth; late is from 72 hr after birth until weaning.

^e Adjusted to a steer basis. Least-squares adjustment factors for heifers were 6.8 lb. for birth weight and 32 lb. for 200-day weight.

^f Ratio computed relative to 494 lb. average for Hereford and Angus sired dams.

TABLE 2. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DATE, REBREEDING PERFORMANCE AND SIZE OF COWS CALVING AS 4-, 5-, 6- AND 7-YEAR OLD COWS
CYCLE I, PHASE 2 - COWS BORN 1970-71-72

Breed of Cow		No. Calving as				Avg. Calving Date	Percent Preg. ^a	Cow Weight, lb.				Hip Height, in.			
Sire	Dam	4-Yr. Olds	5-Yr. Olds	6-Yr. Olds	7-Yr. Olds			4½ Yrs.	5½ Yrs.	6½ Yrs.	7½ Yrs.	4½ Yrs.	5½ Yrs.	6½ Yrs.	7½ Yrs.
Angus Hereford	Hereford	55	58	40	19	April 3	97.3	1023	1097	1155	1177	47.7	48.2	47.5	48.4
	Angus	60	61	39	22	April 7	96.2	1036	1101	1150	1268	47.7	48.2	48.3	48.7
	Average	115	119	79	41	April 5	96.7	1030	1099	1153	1223	47.7	48.2	47.9	48.5
Jersey	Hereford	52	47	46	23	March 31	97.0	899	993	1003	1084	48.1	48.4	48.6	48.8
	Angus	45	44	21	11	March 29	92.3	899	982	1009	1065	47.2	48.0	47.7	47.9
	Average	97	91	67	34	March 30	94.6	899	987	1006	1074	47.7	48.2	48.2	48.4
South Devon	Hereford	51	53	26	11	April 8	93.8	1068	1150	1205	1275	49.7	50.3	50.4	50.4
	Angus	40	42	32	13	April 2	95.7	1074	1159	1174	1266	49.5	49.9	50.1	50.6
	Average	91	95	58	24	April 5	94.8	1071	1154	1189	1270	49.6	50.1	50.2	50.5
Limousin	Hereford	67	68	36	24	April 7	95.5	1059	1151	1179	1261	50.0	50.5	50.2	50.7
	Angus	71	63	45	25	April 2	97.2	1046	1128	1164	1249	49.3	49.9	49.7	49.8
	Average	138	131	81	49	April 5	96.4	1052	1139	1171	1255	49.6	50.2	50.0	50.3
Simmental	Hereford	79	77	49	19	April 8	94.5	1092	1163	1214	1310	50.6	51.1	51.1	51.8
	Angus	59	59	46	18	April 3	94.5	1073	1156	1188	1306	49.8	50.4	50.3	50.5
	Average	138	136	95	37	April 5	94.5	1083	1159	1201	1308	50.2	50.8	50.7	51.1
Charolais	Hereford	68	67	45	24	April 6	95.3	1151	1234	1281	1352	50.3	50.7	51.0	51.1
	Angus	42	45	24	12	April 7	95.8	1157	1228	1264	1375	50.0	50.6	50.8	51.1
	Average	110	112	69	36	April 7	95.6	1154	1231	1273	1364	50.2	50.7	50.9	51.1
Average All Sire Breeds	Hereford	372	370	242	120	April 5	95.6	1049	1131	1173	1243	49.4	49.9	49.8	50.2
	Angus	317	314	207	101	April 3	95.3	1047	1126	1158	1255	48.9	49.5	49.5	49.8
	Average	689	684	449	221	April 4	95.4	1048	1129	1166	1249	49.2	49.7	49.7	50.0

^a Breeding period was 63 days by natural service to Brown Swiss bulls (appendix table 3). Percent pregnant = no. palpated as pregnant ÷ no. palpated, and only includes cows that calved prior to breeding.

TABLE 3. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DIFFICULTY, CALF MORTALITY, BIRTH WEIGHT, WEANING WEIGHT AND WEANING
WEIGHT RATIO OF CALVES FROM 2-, 3-, 4- AND 5-YEAR OLD COWS BY BREED OF DAM^{a,b}
CYCLE I, PHASE 3 - COWS BORN 1972-73-74

Breed of Dam of Cow		No. Calves Born	Type of Parturition, %				Calf Mortality ^d		Calf Wt., lb. ^e		200-Day Weight Ratio ^f
Sire	Dam		No Diff. ^c	Calf- Puller	C- Section	Abn. Pre- sentation	Early	Late	Birth	200 Day	
Angus Hereford	Hereford	43	88.3	5.2	6.7	0.0	5.2	0.0	81.0	446	99.8
	Angus	60	81.0	16.7	0.8	1.5	9.8	6.4	79.0	448	100.2
	Average	103	84.6	10.9	3.7	0.7	7.5	2.2	80.0	447	100.0
Jersey	Hereford	73	84.7	16.3	0.0	0.0	6.0	3.2	78.7	460	102.9
	Angus	61	77.1	18.8	2.1	2.0	12.3	0.9	76.6	444	99.3
	Average	134	80.9	17.6	0.8	0.7	9.2	2.1	77.7	452	101.1
South Devon	Hereford	46	94.6	4.3	0.0	1.7	9.0	1.0	77.5	455	101.8
	Angus	42	82.5	17.2	2.0	0.0	9.8	2.8	82.6	461	103.1
	Average	88	88.6	10.7	0.7	0.0	9.4	1.9	80.0	458	102.5
Limousin	Hereford	35	91.4	6.3	0.0	2.5	0.0	4.7	78.0	434	97.1
	Angus	70	88.2	12.4	0.0	0.0	6.0	1.0	77.7	441	98.7
	Average	105	89.8	9.3	0.0	1.2	2.2	2.9	77.9	438	98.0
Simmental	Hereford	66	80.6	13.1	3.3	2.9	6.4	7.4	82.5	474	106.0
	Angus	42	88.8	5.6	3.6	2.0	5.0	1.0	81.7	474	106.0
	Average	108	84.7	9.3	3.5	2.5	5.7	4.2	82.1	474	106.0
Charolais	Hereford	78	89.1	12.3	0.0	0.0	5.3	5.2	84.2	469	104.9
	Angus	35	76.3	22.6	1.7	0.0	3.1	0.5	83.9	455	101.8
	Average	113	82.7	17.4	0.5	0.0	4.2	2.9	84.0	462	103.4
Average All Sire Breeds	Hereford	341	88.1	9.6	1.3	1.0	5.1	3.3	80.3	456	102.0
	Angus	310	82.3	15.5	1.6	0.5	7.7	2.1	80.2	454	101.6
	Average	651	85.2	12.6	1.5	0.8	6.4	2.7	80.3	455	101.8

^a These cows were sired by Angus, Hereford, Brahman, Devon and Holstein bulls (appendix table 3).

^b Calves from these cows were sired by Red Poll bulls.

^c No assistance or minor hand assistance.

^d Early mortality is within 72 hr of birth; late is from 72 hr after birth until weaning.

^e Adjusted to a steer basis. Least-squares adjustment factors for heifers were 3.3 lb. for birth weight and 24 lb. for 200-day weight.

^f Ratio computed relative to 447 lb. average for Hereford and Angus sired dams.

TABLE 4. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALF CROP PERCENTAGE, CALVING DATE, REBREEDING PERFORMANCE AND SIZE OF COWS CALVING AS
2-, 3-, 4- AND 5-YEAR OLD COWS BY BREED OF DAM^a
CYCLE I. PHASE 3 - COWS BORN 1972-73-74

Breed of Dam of Cow		No. Calving as				Calf Crop, % ^b		Avg. Calving Date	Percent Pregnant ^c	Cow Weight, lb.			
Sire	Dam	2-Yr. Olds	3-Yr. Olds	4-Yr. Olds	5-Yr. Olds	Born	Weaned			2½ Yrs.	3½ Yrs.	4½ Yrs.	5½ Yrs.
Angus	Hereford	16	12	9	6	92.7	75.9	April 7	96.4	882	1013	1052	1155
Hereford	Angus	20	20	13	7	88.7	86.1	April 1	92.3	905	1014	1093	1160
	Average	36	32	22	13	90.7	81.0	April 4	94.4	894	1014	1072	1158
Jersey	Hereford	23	22	18	10	97.1	87.5	March 29	98.2	890	1002	1053	1158
	Angus	21	21	14	5	100.0	88.1	March 30	95.5	869	969	1087	1048
	Average	44	43	32	15	99.1	87.8	March 29	96.9	879	985	1070	1103
South Devon	Hereford	17	18	8	3	91.0	84.4	March 31	98.4	946	1017	1074	1250
	Angus	17	16	8	1	98.1	84.6	April 4	93.7	894	1005	1087	1023
	Average	34	34	16	4	94.6	84.5	April 2	96.0	920	1011	1080	1136
Limousin	Hereford	13	12	6	4	83.9	82.3	April 7	93.6	853	928	900	1159
	Angus	24	25	12	9	93.8	87.9	March 31	100.0	908	1011	1084	1142
	Average	37	37	18	13	88.8	85.1	April 3	96.8	881	969	992	1150
Simmental	Hereford	27	25	11	3	97.0	82.0	March 31	94.8	953	1056	1053	1172
	Angus	17	15	8	2	99.1	88.1	March 27	91.7	949	1074	1144	1071
	Average	44	40	19	5	98.1	85.0	March 29	93.3	951	1065	1099	1121
Charolais	Hereford	28	24	15	11	93.8	84.9	April 5	100.0	973	1087	1179	1236
	Angus	12	12	7	4	96.0	87.8	April 5	94.0	960	1050	1129	1020
	Average	40	36	22	15	94.9	86.3	April 5	97.1	966	1068	1154	1128
Average	Hereford	124	113	67	37	92.6	82.8	April 3	96.9	916	1017	1052	1188
All Sire	Angus	111	109	62	28	96.2	87.1	April 1	94.6	914	1021	1104	1077
Breeds	Average	235	222	129	65	94.4	85.0	April 2	95.7	915	1019	1078	1133

^a These cows were sired by Angus, Hereford, Brahman, Devon and Holstein bulls.

^b Of cows exposed to breeding and alive at fall palpation.

^c The average breeding period was 63 days by natural service to Red Poll bulls. Percent pregnant = no. palpated as pregnant ÷ no. palpated and reflects the rebreeding performance or conception rate of cows which had calved at 2, 3, 4 or 5 years of age.

TABLE 5. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DIFFICULTY, CALF MORTALITY, BIRTH WEIGHT, WEANING WEIGHT, PREWEANING AVERAGE DAILY
GAIN AND WEANING WEIGHT RATIO OF CALVES FROM 2-, 3-, 4- AND 5-YEAR OLD COWS BY BREED OF SIRE^{a,b}
CYCLE I, PHASE 3 - COWS BORN 1972-73-74

Breed of Cow		No. Calves Born	Type of Parturition, %				Calf Mortality ^d		Calf Wt., lb. ^e			
Sire	Dam		No Diff. ^c	Calf- Puller	C- Section	Abn. Presen- tation	Early	Late	Birth	200- Day	Prewn. ADG, lb.	200-Day Ratio ^f
Angus Hereford	Hereford-Crosses	116	84.9	11.9	2.6	0.7	11.5	0.8	79.5	432	1.76	101.2
	Angus-Crosses	127	73.6	20.8	4.9	0.7	3.6	1.5	79.6	423	1.72	99.1
	Average	243	79.2	16.3	3.7	0.7	7.5	1.1	79.6	427	1.74	100.0
Brahman	Hereford-Crosses	72	94.2	4.3	0.0	2.3	4.0	8.0	75.3	474	1.99	111.0
	Angus-Crosses	51	94.9	3.7	1.9	0.0	2.8	3.6	75.8	484	2.04	113.4
	Average	123	94.6	4.0	0.6	0.9	3.4	5.8	75.6	479	2.01	112.2
Devon	Hereford-Crosses	89	85.5	11.9	2.1	0.5	1.8	0.0	81.0	428	1.73	100.2
	Angus-Crosses	83	81.2	17.7	0.0	1.7	15.3	2.5	78.8	422	1.71	98.8
	Average	172	83.3	14.8	0.7	1.1	8.5	1.2	79.9	425	1.72	99.5
Holstein	Hereford-Crosses	64	88.0	10.2	1.5	0.3	2.9	4.3	85.5	492	2.03	115.2
	Angus-Crosses	49	79.4	20.0	0.3	0.2	9.0	0.8	86.7	487	2.00	114.1
	Average	113	83.7	15.1	0.9	0.3	6.0	2.6	86.1	490	2.02	114.8
Average All Sire Breeds	Hereford-Crosses	341	88.1	9.6	1.3	1.0	5.1	3.3	80.3	456	1.88	106.8
	Angus-Crosses	310	82.3	15.5	1.6	0.5	7.7	2.1	80.2	454	1.87	106.3
	Average	651	85.2	12.6	1.5	0.8	6.4	2.7	80.3	455	1.87	106.6

^a The dams of these cows were sired by Angus, Hereford, Jersey, South Devon, Limousin, Simmental and Charolais bulls.

^b These cows were bred to Red Poll bulls.

^c No assistance or minor hand assistance.

^d Early mortality is within 72 hr of birth; late is from 72 hr after birth until weaning.

^e Adjusted to a steer basis. Least-squares adjustment factors for heifers were 3.3 lb. for birth weight and 24 lb. for 200-day weight.

^f Ratio computed relative to 427 lb. average for Hereford and Angus sired dams.

TABLE 6. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALF CROP PERCENTAGE, CALVING DATE, REBREEDING PERFORMANCE AND SIZE OF COWS CALVING AS
2-, 3-, 4- AND 5-YEAR OLD COWS BY BREED OF SIRE^a
CYCLE I, PHASE 3 - COWS BORN 1972-73-74

Breed of Cow		No. Calving as				Calf Crop, % ^b		Avg. Calving Date	Percent Pregnant ^c	Cow Weight, lb.			
Sire	Dam	2-Yr. Olds	3-Yr. Olds	4-Yr. Olds	5-Yr. Olds	Born	Weaned			2½ Yrs.	3½ Yrs.	4½ Yrs.	5½ Yrs.
Angus Hereford	Hereford-Crosses	44	37	24	11	94.4	81.1	April 1	95.3	873	1002	1034	1125
	Angus-Crosses	46	44	27	10	93.4	89.4	April 1	93.2	870	972	1025	1039
	Average	90	81	51	21	93.9	85.3	April 1	94.2	871	987	1029	1082
Brahman	Hereford-Crosses	26	24	13	9	87.3	78.6	April 7	98.3	961	1029	1069	1201
	Angus-Crosses	17	17	12	5	96.3	88.5	April 2	99.3	940	1069	1129	1104
	Average	43	41	25	14	91.8	83.5	April 5	98.8	950	1049	1099	1153
Devon	Hereford-Crosses	29	30	18	12	92.0	84.7	April 4	95.5	882	989	1039	1167
	Angus-Crosses	28	28	16	11	93.1	83.2	March 29	95.0	907	995	1063	1107
	Average	57	58	34	23	92.6	83.9	April 1	95.3	895	992	1051	1137
Holstein	Hereford-Crosses	25	22	12	5	96.6	87.0	March 31	98.6	949	1049	1065	1260
	Angus-Crosses	20	20	7	2	100.0	87.2	April 1	90.6	940	1047	1198	1059
	Average	45	42	19	7	99.2	87.1	March 31	94.6	945	1048	1132	1159
Average All Sire Breeds	Hereford-Crosses	124	113	67	37	92.6	82.8	April 3	96.9	916	1017	1052	1188
	Angus-Crosses	111	109	62	28	96.2	87.1	April 1	94.6	914	1021	1104	1077
	Average	235	222	129	65	94.4	85.0	April 2	95.7	915	1019	1078	1133

^a The dams of these cows were sired by Angus, Hereford, Jersey, South Devon, Limousin, Simmental and Charolais bulls.

^b Of cows exposed to breeding and alive at fall palpation.

^c The average breeding period was 63 days by natural service to Red Poll bulls. Percent pregnant = no. palpated as pregnant ÷ no. palpated and reflects the rebreeding performance or conception rate of cows which had calved at 2, 3, 4 or 5 years of age.

TABLE 7. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DIFFICULTY, CALF CROP PERCENTAGE, CALF MORTALITY, BIRTH WEIGHT, WEANING WEIGHT
AND WEANING WEIGHT RATIO OF CALVES FROM 3- AND 4-YEAR OLD COWS^a
CYCLE II, PHASE 2 - COWS BORN 1973-74

Breed of Cow		No. Calves Born	Type of Parturition, %				Calf Crop, % ^c		Calf Mortality, % ^d		Calf. Wt., lb. ^e		
Sire	Dam		No Diff. ^b	Calf- Puller	C- Section	Abn. Pre- sentation	Born	Weaned	Early	Late	Birth	200- Day	200-Day Wt. Ratio ^f
Angus Hereford	Hereford	48	92.7	5.2	0.0	2.2	85.5	83.8	2.0	1.9	84.4	473	100.9
	Angus	67	77.2	21.5	0.0	1.3	98.3	92.3	2.9	1.8	87.1	466	99.4
	Average	115	84.9	13.3	0.0	1.7	91.9	88.0	2.4	1.8	85.7	469	100.0
Red Poll	Hereford	46	75.5	22.0	0.0	2.5	93.0	87.3	4.3	1.8	89.5	498	106.2
	Angus	61	91.3	2.7	0.1	5.9	89.2	76.8	9.8	2.2	81.5	477	101.7
	Average	107	83.4	12.3	0.0	4.2	91.1	82.1	7.0	2.0	85.5	488	104.1
Brown Swiss	Hereford	82	82.3	13.5	1.4	2.8	91.8	85.2	4.6	1.4	92.6	522	111.3
	Angus	84	92.8	6.2	0.0	1.1	96.1	92.1	5.3	0.0	86.5	522	111.3
	Average	166	87.6	9.8	0.6	2.0	93.9	88.7	5.0	0.6	89.6	522	111.3
Gelbvieh	Hereford	57	82.5	14.2	0.2	3.0	96.5	90.9	4.1	1.9	92.2	532	113.4
	Angus	62	94.9	4.9	0.0	0.1	98.3	90.1	8.2	0.0	84.4	518	110.5
	Average	119	88.7	9.6	0.1	1.6	97.4	90.5	6.1	0.9	88.3	525	111.9
Maine Anjou	Hereford	55	91.1	7.2	0.0	1.7	93.5	84.8	3.5	5.7	96.8	516	110.0
	Angus	61	84.7	11.7	0.2	3.4	91.9	87.2	4.8	0.0	93.8	504	107.5
	Average	116	87.9	9.5	0.1	2.6	92.7	86.0	4.2	2.5	95.3	510	108.7
Chianina	Hereford	52	95.0	3.2	1.5	0.3	92.8	88.0	0.1	5.7	98.7	518	110.5
	Angus	58	91.2	8.1	1.0	0.0	96.8	88.2	5.6	1.0	92.4	505	107.7
	Average	110	93.1	5.7	1.3	0.0	94.8	88.1	2.8	3.3	95.5	512	109.2
Average All Sire Breeds	Hereford	340	86.5	10.9	0.5	2.1	92.2	86.7	3.1	3.0	92.4	510	108.7
	Angus	393	88.7	9.2	0.2	1.9	95.1	87.8	6.1	0.7	87.6	499	106.4
	Average	733	87.6	10.0	0.4	2.0	93.6	87.2	4.6	1.9	90.0	504	107.5

^a Calves from these cows were sired by 3/4 Simmental bulls (appendix table 4).

^b No assistance or minor hand assistance.

^c Of cows alive at calving; cows removed from experiment only for serious injury, being open two successive years or by death.

^d Early mortality is within 72 hr of birth; late is from 72 hr after birth until weaning.

^e Adjusted to a steer basis. Least-squares adjustment factors for heifers were 6.8 lb. for birth weight and 32 lb. for 200-day weight.

^f Ratio computed relative to 469 lb. average for Hereford and Angus sired dams.

TABLE 8. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DATE, REBREEDING PERFORMANCE AND SIZE OF COWS CALVING AS 3- AND 4-YEAR OLD COWS
CYCLE II, PHASE 2 - COWS BORN 1973-74

Breed of Cow		No. Calving as		Avg. Calving Date	Postpartum Interval, Days ^a	Percent Pregnant ^b	Cow Wt. at 3½	Hip Ht. at 3½	Cow Wt. at 4½	Hip Ht. at 4½
Sire	Dam	3-Yr. Olds	4-Yr. Olds				Yrs. of Age, lb.	Yrs. of Age, in.	Yrs. of Age, lb.	Yrs. of Age, in.
Angus	Hereford	33	15	March 28	62.3	93.6	1050	47.7	1117	48.0
Hereford	Angus	47	20	April 2	57.8	95.5	991	47.0	1069	47.6
	Average	80	35	March 31	60.1	94.5	1021	47.4	1093	47.8
Red Poll	Hereford	35	11	March 31	56.9	92.2	987	48.3	1011	47.6
	Angus	46	15	March 31	60.0	89.2	967	48.0	1054	47.9
	Average	81	26	March 31	58.5	90.7	977	48.1	1033	47.8
Brown Swiss	Hereford	58	24	April 2	63.0	93.1	1034	49.9	1105	50.2
	Angus	60	24	March 30	61.4	99.2	1021	49.3	1072	49.8
	Average	118	48	March 31	62.2	96.2	1028	49.6	1088	50.0
Gelbvieh	Hereford	37	20	April 5	57.4	96.3	1059	50.1	1148	50.2
	Angus	41	21	March 30	55.4	95.0	1051	49.4	1124	49.4
	Average	78	41	April 2	56.4	95.7	1055	49.7	1136	49.8
Maine Anjou	Hereford	35	20	March 30	60.3	94.7	1121	50.6	1245	51.2
	Angus	44	17	March 28	63.5	96.3	1119	49.9	1229	49.7
	Average	79	37	March 29	61.9	95.5	1120	50.2	1237	50.5
Chianina	Hereford	38	14	April 8	60.8	99.6	1143	54.0	1251	54.8
	Angus	42	16	April 3	61.2	95.8	1132	53.2	1229	53.6
	Average	80	30	April 5	61.0	97.7	1138	53.6	1240	54.2
Average	Hereford	236	104	April 2	60.1	94.9	1066	50.1	1146	50.3
All Sire	Angus	280	113	March 31	59.9	95.2	1047	49.5	1129	49.7
Breeds	Average	516	217	April 1	60.0	95.0	1056	49.8	1138	50.0

^a Interval from calving to first estrus.

^b Breeding period was 63 days by natural service to 3/4 Simmental bulls (appendix table 4). Percent pregnant = no. palpated as pregnant ÷ no. palpated, and only include cows that calved prior to breeding.

TABLE 9. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DIFFICULTY, CALF CROP PERCENTAGE, CALF MORTALITY, BIRTH WEIGHT, WEANING WEIGHT
AND WEANING WEIGHT RATIO OF CALVES FROM 3- AND 4-YEAR OLD COWS
CYCLE II, PHASE 2 - COWS BORN 1973-74

Breed of Cow		No. Calves Born	Type of Parturition, %				Calf Crop, % ^c		Calf Mortality, % ^d		Calf Wt., lb. ^e	
Sire	Dam		No Diff. ^b	Calf- Puller	C- Section	Abn. Pre- sentation	Born	Weaned	Early	Late	Birth	200- Day
Hereford	Hereford	53	69.2	26.7	0.3	3.7	94.7	82.3	9.8	4.3	88.5	445
	Angus	67	78.7	19.8	0.2	1.2	98.3	92.2	2.8	1.8	86.9	463
	Red Poll	27	80.9	15.2	0.3	3.5	93.4	90.5	0.0	0.0	91.2	461
	Brown Swiss	17	78.2	10.5	11.3	0.1	93.6	84.0	6.0	0.0	100.0	539
	Average	164	76.8	18.1	3.0	2.1	95.0	87.2	4.3	1.5	91.7	477
Angus	Hereford	48	92.1	6.0	0.0	2.1	85.5	83.5	2.1	1.9	84.2	472
	Angus	77	90.8	8.1	0.0	1.1	95.1	88.9	3.9	0.8	83.2	463
	Red Poll	26	87.4	12.7	0.2	0.0	86.2	76.4	8.1	3.5	85.1	474
	Brown Swiss	18	91.4	10.0	0.0	0.0	87.2	83.0	0.0	0.0	92.8	505
	Average	169	90.4	9.2	0.0	0.6	88.5	83.0	3.5	1.2	86.4	478
Red Poll	Hereford	46	75.9	21.8	0.0	2.7	92.7	86.6	4.6	1.6	89.5	499
	Angus	61	91.6	2.6	0.0	5.8	88.9	77.7	8.5	2.2	81.8	478
	Red Poll	33	75.3	22.3	3.2	0.0	94.3	75.2	10.8	7.1	93.2	504
	Brown Swiss	8	69.9	18.0	0.0	13.1	85.8	75.4	1.8	10.8	99.4	558
	Average	148	78.2	16.2	0.4	5.2	90.4	78.7	6.4	5.5	91.0	510
Brown Swiss	Hereford	82	82.1	14.1	1.2	2.6	91.7	84.6	5.3	1.3	92.7	522
	Angus	84	92.8	6.0	0.0	1.2	95.9	92.4	4.9	0.0	86.5	520
	Red Poll	22	81.5	18.6	0.0	0.3	96.1	87.2	9.6	0.0	95.1	539
	Brown Swiss	32	93.5	6.9	0.0	0.0	87.2	81.7	2.9	0.2	96.0	555
	Average	220	87.5	11.4	0.2	0.9	92.7	86.5	5.7	0.3	92.6	534
Average All Sire Breeds	Hereford	229	79.8	17.2	0.2	2.8	91.1	84.3	5.5	2.3	88.7	484
	Angus	289	88.5	9.2	0.0	2.4	94.6	87.8	5.0	1.2	84.6	481
	Red Poll	108	81.3	17.2	0.9	0.7	92.5	82.3	6.7	2.6	91.2	495
	Brown Swiss	75	83.3	11.3	2.3	3.1	88.4	81.0	2.6	2.4	97.1	539
	Average	701	83.2	13.7	0.9	2.2	91.7	83.9	5.0	2.1	90.4	500

^a Calves from these cows were sired by 3/4 Simmental bulls (appendix table 4).

^b No difficulty includes no assistance or minor hand assistance.

^c Of cows alive at calving; cows removed from experiment only for serious injury, being open two successive years or by death.

^d Early mortality is within 72 hr of birth; late is from 72 hr after birth until weaning.

^e Adjusted to a steer basis. Least-squares adjustment factors for heifers were 6.5 lb. for birth weight and 30 lb. for 200-day weight.

TABLE 10. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DATE, REBREEDING PERFORMANCE AND SIZE OF COWS CALVING AS 3- AND 4-YEAR OLD COWS
CYCLE II, PHASE 2 - COWS BORN 1973-74

Breed of Cow		No. Calving as		Avg. Calving Date	Postpartum Interval, Days ^a	Percent Pregnant ^b	Cow Wt. at 3½	Hip Ht. at 3½	Cow Wt. at 4½	Hip Ht. at 4½
Sire	Dam	3-Yr. Olds	4-Yr. Olds				Yrs. of Age, lb.	Yrs. of Age, in.	Yrs. of Age, lb.	Yrs. of Age, in.
Hereford	Hereford	35	18	April 4	62.1	88.6	987	47.2	1074	47.5
	Angus	47	20	April 2	57.8	95.2	991	47.0	1069	47.6
	Red Poll	17	10	April 4	57.9	96.5	1013	48.7	1125	49.1
	Brown Swiss	10	7	April 4	54.1	92.7	1088	50.9	1183	51.0
	Average	109	55	April 3	58.0	93.3	1020	48.5	1113	48.8
Angus	Hereford	33	15	March 28	62.3	93.6	1050	47.7	1117	48.0
	Angus	50	27	March 30	61.1	95.0	982	46.7	1073	47.1
	Red Poll	17	9	March 28	62.6	89.5	1061	48.4	1201	49.3
	Brown Swiss	11	7	April 1	60.5	91.9	1156	51.3	1154	51.3
	Average	111	58	March 30	61.6	92.5	1062	48.5	1136	48.9
Red Poll	Hereford	35	11	March 31	56.9	93.9	989	48.3	1011	47.6
	Angus	46	15	March 31	60.0	88.9	969	48.0	1054	47.9
	Red Poll	23	10	April 3	63.0	97.1	981	49.4	1078	49.6
	Brown Swiss	4	4	April 15	52.8	85.5	1114	52.0	1129	52.1
	Average	108	40	April 5	58.2	91.4	1013	49.4	1068	49.3
Brown Swiss	Hereford	58	24	April 2	63.0	93.6	1034	49.9	1105	50.2
	Angus	60	24	March 29	61.4	99.0	1023	49.4	1072	49.8
	Red Poll	15	7	April 2	56.0	100.0	1044	51.1	1114	51.9
	Brown Swiss	21	11	April 11	63.6	87.0	1062	52.6	1154	53.1
	Average	154	66	April 3	61.0	95.0	1041	50.7	1111	51.3
Average All Sire Breeds	Hereford	161	68	April 1	61.1	92.4	1015	48.3	1077	48.3
	Angus	203	86	March 31	60.1	94.6	991	47.8	1067	48.1
	Red Poll	72	36	April 1	59.9	95.8	1025	49.4	1130	50.0
	Brown Swiss	46	29	April 8	57.8	89.3	1105	51.7	1155	51.9
	Average	482	219	April 2	59.7	93.0	1034	49.3	1107	49.6

^a Interval from calving to first estrus.

^b Breeding period was 63 days by natural service to 3/4 Simmental bulls. (Appendix table 4). Percent pregnant = no. palpated as pregnant ÷ no. palpated, and only includes cows that calved prior to breeding.

TABLE 11. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
STEER POSTWEANING FEEDLOT RATIONS
CYCLE II, PHASE 3 - 1975-76 CALF CROPS

Year	Period	Ingredients				Ration Analyses, 100% D.M. Basis ^a			
		Corn Silage, %	Corn, %	Soybean Oil Meal, %	Supplement, % ^{b,c}	C.P., %	D.P., %	TDN, %	Mcal. M.E./lb.
1975	Oct. 14 - Dec. 2	60.0	36.0	2.0	2.0	11.91	8.76	82.55	2.98
	Dec. 3 - Dec. 30	80.0	14.0	3.0	3.0	13.45	9.81	76.52	2.77
	Dec. 31 - Jan. 27	75.0	19.0	3.0	3.0	13.32	9.78	78.08	2.82
	Jan. 28 - Feb. 24	70.0	24.0	3.0	3.0	13.21	9.75	79.48	2.87
	Feb. 25 - Slaughter	65.0	30.5	1.5	3.0	13.03	9.67	80.98	2.93
1976	Oct. 4 - Dec. 13	60.0	36.0	2.0	2.0	11.98	8.84	83.00	3.00
	Dec. 14 - Feb. 9	85.0	11.0	2.0	2.0	12.40	8.83	75.92	2.74
	Feb. 10 - Feb. 16	80.0	16.0	2.0	2.0	12.29	8.83	77.73	2.81
	Feb. 17 - Mar. 9	80.0	16.0	2.0	2.0	12.18	8.74	77.57	2.80
	Mar. 10 - May 4	75.0	21.0	2.0	2.0	12.10	8.76	79.16	2.86
	May 5 - Slaughter	70.0	28.0	-	2.0	10.48	7.41	80.93	2.92

^a Estimated composition based on proximate analysis.

^b Crude protein level (100% D.M. basis) in the supplement was 50.1% for ration used Oct. 14 to Dec. 2 and 46.31% for the ration used December 3 through slaughter in 1975-76.

^c Crude protein level (100% D.M. basis) in the supplement was 46.31% for the ration used Oct. 4 - Febr. 16 and 43.85% for those used from Feb. 17 through slaughter in 1976-77.

TABLE 12. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
STEER CARCASS DATA^a
CYCLE II, PHASE 3 - 1975-76 CALF CROPS

Breed of Dam of Steer			Post ^c	Adj. ^d	Final ^e	Hot	Dress ^f	USDA ^g	% ^h	Marb- ⁱ	USDA	Rib-	Fat	Est. ^j	Est. ^k
Sire	Dam	No. ^b	Wn. ADG lb.	Final Wt. lb.	Ratio %	Carc. Wt. lb.	ing %	Qual. Grade	Choice	ling Score	Yield Grade	eye Area sq.in.	Thick. in.	K,P&H Fat %	Cut. %
Angus Hereford	Hereford	12	2.40	1108	98.7	678	61.5	12.0	87.4	11.6	4.2	10.6	.78	2.9	47.5
	Angus	7	2.47	1138	101.3	701	62.1	11.5	65.1	10.8	4.7	10.0	.82	3.6	45.9
	Average	19	2.43	1123	100.0	689	61.8	11.8	76.2	11.2	4.5	10.3	.80	3.2	46.7
Red Poll	Hereford	7	2.28	1092	97.2	680	62.5	11.8	87.2	11.4	3.9	10.8	.63	3.6	47.6
	Angus	16	2.34	1102	98.1	682	62.8	12.0	79.0	11.8	3.8	11.0	.63	3.3	48.0
	Average	23	2.31	1097	97.7	681	62.7	11.9	83.1	11.6	3.9	10.9	.63	3.4	47.8
Brown Swiss	Hereford	21	2.50	1192	106.1	739	62.3	11.8	71.1	11.2	3.8	12.0	.69	3.2	48.0
	Angus	31	2.48	1191	106.1	742	62.2	11.8	72.2	11.2	3.8	11.8	.64	3.1	48.2
	Average	52	2.49	1191	106.1	740	62.3	11.8	71.6	11.2	3.8	11.9	.66	3.1	48.1
Gelbvieh	Hereford	15	2.39	1133	100.9	702	61.5	10.9	54.8	9.6	3.4	11.8	.57	2.8	49.2
	Angus	13	2.45	1176	104.7	723	61.4	11.4	74.1	11.0	3.4	11.9	.60	2.6	49.2
	Average	28	2.42	1155	102.9	713	61.4	11.1	64.4	10.3	3.4	11.9	.58	2.7	49.2
Maine Anjou	Hereford	8	2.65	1219	108.6	758	62.0	10.6	30.2	9.1	3.9	11.7	.66	3.2	47.8
	Angus	18	2.53	1173	104.5	729	62.4	10.7	46.3	9.3	3.6	11.3	.58	2.8	48.7
	Average	26	2.59	1196	106.5	743	62.2	10.6	38.2	9.2	3.8	11.5	.62	3.0	48.2
Chianina	Hereford	12	2.50	1157	103.0	708	62.2	11.3	55.8	10.1	3.3	11.5	.51	2.7	49.3
	Angus	14	2.72	1234	109.9	767	62.3	10.9	67.8	9.7	3.4	11.3	.43	2.7	49.1
	Average	26	2.61	1196	106.5	737	62.2	11.1	61.8	9.9	3.4	11.4	.47	2.7	49.2
Average All Sire Breeds	Hereford	75	2.45	1150	102.4	711	62.0	11.4	64.4	10.5	3.8	11.4	.64	3.1	48.2
	Angus	99	2.50	1169	104.1	724	62.2	11.4	67.4	10.6	3.8	11.2	.62	3.0	48.2
	Average	174	2.48	1160	103.3	717	62.1	11.4	65.9	10.6	3.8	11.3	.63	3.0	48.2

Table 12 Continued

- ^a These steers were sired by Hereford, Angus, Brangus and Santa Gertrudis bulls (see appendix Table 4).
^b Number of steers slaughtered after 284 or 306 days on feed (1975 and 1976 steers, respectively).
^c $ADG = (\text{actual final weight} - \text{actual weaning weight}) \div \text{days on feed}$.
^d $\text{Adjusted final weight} = ((\text{days on feed}) \times (\text{postweaning ADG})) + \text{adjusted 200-day wt.}$
^e Ratio relative to 1123 lb. average of progeny from Hereford-Angus reciprocal crossbred dams.
^f $\text{Dressing percentage} = \text{hot carcass weight} \div \text{final weight on feed and water (without shrink)}$.
^g USDA Quality Grade as revised in 1976. 10 = average good, 11 = high good, 12 = low choice, 13 = average choice, etc.
^h USDA Choice % denotes percentage of steers grading low choice or better.
ⁱ Marbling score: 9 = slight +, 10 = small -, ... 21 = slightly abundant +.
^j Estimated percentage kidney, pelvic and heart fat.
^k $\text{Estimated cutability} = 52.56 - 4.95 (\text{single fat thickness, adj. in.}) - 1.06 (\% \text{ KPH fat}) + 0.682 (\text{rib eye area, sq. in.}) - .008 (\text{carcass wt., lb.})$.

TABLE 13. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
STEER CARCASS DATA^a
CYCLE II, PHASE 3 - 1975-76 CALF CROPS

Breed of Steer			Post ^c	Adj. ^d	Final ^e	Hot	Dress ^f	USDA ^g	% ^h	Marb- ⁱ	USDA	Rib-	Fat	Est. ^j	Est. ^k
Sire	Dam	No. ^b	Wn. ADG lb.	Final Wt. lb.	Wt. Ratio %	Carc. Wt. lb.	ing %	Qual. Grade	Choice	ling Score	Yield Grade	eye Area sq. in.	Thick. in.	K, P&H Fat %	Cut. %
Angus	Hrfd.-X's	17	2.33	1119	98.2	706	62.4	12.0	79.0	11.4	3.8	11.8	.70	2.9	48.3
Hereford	Angus-X's	28	2.44	1158	101.7	731	62.6	11.7	62.9	11.1	3.8	11.6	.67	3.0	48.2
AI Sires	Average	45	2.38	1139	100.0	718	62.5	11.9	71.0	11.2	3.8	11.7	.69	2.9	48.3
Brangus	Hrfd.-X's	25	2.44	1160	101.8	724	61.7	11.1	52.3	10.2	3.8	11.4	.63	3.0	48.3
	Angus-X's	27	2.38	1131	99.3	709	61.9	11.2	64.4	10.3	3.8	11.0	.59	3.0	48.3
	Average	52	2.41	1146	100.6	717	61.8	11.2	58.4	10.2	3.8	11.2	.61	3.0	48.3
Santa	Hrfd.-X's	25	2.60	1204	105.7	748	62.0	11.0	54.0	10.1	3.8	11.5	.62	2.9	48.2
Gertrudis	Angus-X's	37	2.49	1171	102.8	746	63.2	11.4	61.1	10.8	4.1	11.0	.66	3.1	47.5
	Average	62	2.54	1187	104.2	747	62.6	11.2	57.5	10.4	3.9	11.3	.64	3.0	47.9
Angus	Hrfd.-X's	8	2.45	1118	98.2	665	61.8	11.5	72.2	10.4	3.7	10.9	.61	3.3	48.1
Hereford	Angus-X's	7	2.69	1217	106.9	709	61.1	11.2	81.3	10.4	3.5	11.2	.54	2.9	48.8
Clean Up Sires	Average	15	2.57	1167	102.5	687	61.5	11.4	76.7	10.4	3.6	11.1	.57	3.1	48.5
Average	Hrfd.-X's	75	2.45	1150	101.0	711	62.0	11.4	64.4	10.5	3.8	11.4	.64	3.1	48.2
All Sire	Angus-X's	99	2.50	1169	102.6	724	62.2	11.4	67.4	10.6	3.8	11.2	.62	3.0	48.2
Breeds	Average	174	2.48	1160	101.8	717	62.1	11.4	65.9	10.6	3.8	11.3	.63	3.0	48.2

^a The dams of these steers were sired by Angus, Hereford, Red Poll, Brown Swiss, Gelbvieh, Maine Anjou and Chianina bulls.

^{b, c, d, e, f, g, h, i, j, k} See footnotes for table 12.

TABLE 14. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
STEER CARCASS DATA^a
CYCLE II, PHASE 3 - 1975-76 CALF CROPS

Breed of Dam of Steer			Post ^c	Adj. ^d	Hot	Dress- ^f	USDA ^g	% ^h	Marb- ⁱ	USDA	Rib	Fat	Est. ^j	Est. ^k
Sire	Dam	No. ^b	Wn ADG lb.	Final Wt. lb.	Carc. Wt. lb.	ing %	Qual. Grade	Choice	ling Score	Yield Grade	eye Area sq.in.	Thick in.	K,P&H Fat %	Cut. %
Hereford	Hereford	11	2.50	1092	661	60.6	12.7	67.1	14.0	4.1	11.2	.83	3.0	47.7
	Angus	7	2.44	1141	721	62.9	10.9	60.1	9.6	4.8	9.7	.80	3.4	45.9
	Red Poll	9	2.36	1059	647	60.8	12.1	57.9	11.8	4.0	9.6	.59	3.2	47.6
	Brown Swiss	2	2.50	1231	757	61.5	12.8	45.8	14.1	3.7	11.4	.49	3.8	47.8
	Average	29	2.45	1131	697	61.4	12.1	57.7	12.4	4.2	10.5	.68	3.3	47.2
Angus	Hereford	12	2.37	1094	662	60.8	11.3	73.7	10.2	4.0	10.2	.69	2.5	48.2
	Angus	23	2.47	1126	696	61.8	13.6	91.0	15.4	4.0	11.3	.73	3.4	47.5
	Red Poll	8	2.50	1141	736	62.7	12.6	96.0	12.8	4.4	11.6	.83	3.6	46.6
	Brown Swiss	5	2.63	1259	810	63.0	13.7	100.0	17.0	4.8	11.8	.91	3.6	45.7
	Average	48	2.49	1155	726	62.1	12.8	91.7	13.8	4.3	11.2	.79	3.3	47.0
Red Poll	Hereford	7	2.33	1114	700	62.3	11.7	82.7	11.6	3.9	11.1	.66	3.3	47.7
	Angus	16	2.21	1069	679	63.2	12.4	80.2	12.9	3.9	11.2	.72	3.1	47.9
	Red Poll	5	2.51	1151	717	62.2	10.7	38.9	10.1	3.6	10.9	.47	3.7	48.0
	Brown Swiss	2	2.84	1267	796	63.1	12.0	100.0	11.0	3.6	12.8	.52	4.4	47.6
	Average	30	2.47	1150	723	62.7	11.7	79.4	11.4	3.8	11.5	.59	3.6	47.8
Brown Swiss	Hereford	21	2.55	1212	751	62.3	12.0	74.1	11.7	3.9	12.1	.70	3.2	48.0
	Angus	31	2.44	1176	739	62.2	12.1	80.0	12.1	3.9	11.6	.68	3.1	47.9
	Red Poll	7	2.61	1266	807	63.1	11.2	46.2	10.2	3.3	12.5	.43	3.6	48.7
	Brown Swiss	13	2.54	1233	784	62.3	11.2	45.7	9.5	3.5	12.2	.51	3.0	48.9
	Average	72	2.54	1222	770	62.5	11.6	61.5	10.9	3.6	12.1	.58	3.2	48.4
Average All Sire Breeds	Hereford	51	2.44	1128	694	61.5	11.9	74.4	11.9	4.0	11.2	.72	3.0	47.9
	Angus	77	2.39	1128	709	62.5	12.3	77.8	12.5	4.2	10.9	.73	3.3	47.3
	Red Poll	29	2.49	1154	727	62.2	11.6	59.7	11.2	3.8	11.2	.58	3.5	47.7
	Brown Swiss	22	2.63	1247	787	62.5	12.4	78.3	12.9	3.9	12.0	.61	3.7	47.5
	Average	179	2.49	1164	729	62.2	12.1	72.6	12.1	4.0	11.3	.66	3.4	47.6

a, b, c, d, f, g, h, i, j, k See footnotes for table 12.

TABLE 15. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
POSTWEANING GROWTH, PUBERTY AND CONCEPTION OF HEIFERS
CYCLE II, PHASE 3 - BORN IN 1975-1976

Breed of Dam of Heifer		No. Heifers	200-Day Postwn. ADG, lb.	Adj. 400-Day ^a Wt., lb.	Adj. 550-Day ^b Wt., lb.	Reaching Puberty, % ^c	Puberty Age, days	Puberty Wt., lb.	Percent ^d Pregnant
Sire	Dam								
Angus Hereford	Hereford	11	1.78	723	845	100.0	353	658	97.1
	Angus	12	1.67	695	803	100.0	340	612	95.3
	Average	23	1.72	709	824	100.0	346	635	96.2
Red Poll	Hereford	18	1.62	714	814	88.9	349	644	93.2
	Angus	16	1.66	734	811	100.0	354	665	79.0
	Average	34	1.64	724	813	94.1	352	654	86.1
Brown Swiss	Hereford	20	1.64	746	837	100.0	312	629	90.2
	Angus	15	1.67	771	876	100.0	345	699	87.8
	Average	35	1.66	758	857	100.0	329	664	89.0
Gelbvieh	Hereford	13	1.77	786	898	100.0	317	646	92.9
	Angus	15	1.78	804	893	100.0	330	701	95.1
	Average	28	1.78	795	896	100.0	324	674	94.0
Maine Anjou	Hereford	18	1.81	777	882	100.0	341	690	80.7
	Angus	15	1.74	755	862	100.0	385	728	94.0
	Average	33	1.77	766	872	100.0	363	709	87.4
Chianina	Hereford	16	1.67	756	897	100.0	337	661	100.0
	Angus	20	1.77	777	896	100.0	350	701	100.0
	Average	36	1.72	767	897	100.0	343	681	100.0
Average All Sire Breeds	Hereford	96	1.72	751	862	97.9	335	655	93.0
	Angus	93	1.71	756	857	100.0	351	684	91.9
	Average	189	1.72	753	860	98.9	343	669	92.4

^a Adjusted 400-day wt. = 200-day wt. + (200-day postweaning ADG x 200 days).

^b Adjusted 550-day wt. = 200-day wt. + (350-day postweaning ADG x 350 days).

^c Estrus was determined from weaning to an average of approximately 16 months of age (end of breeding).

^d The breeding period was 63 days by natural service to Shorthorn bulls for both 1976 and 1977.

TABLE 16. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
POSTWEANING GROWTH, PUBERTY AND CONCEPTION OF HEIFERS
CYCLE II, PHASE 3 - BORN IN 1975-1976

Breed of Heifer		No. Heifers	200-Day Postwn. ADG, lb.	Adj. 400-Day ^a Wt., lb.	Adj. 550-Day ^b Wt., lb.	Reaching Puberty, % ^c	Puberty Age, days	Puberty Wt., lb.	Percent Pregnant ^d
Sire	Dam								
Angus	Hereford-Crosses	26	1.70	749	851	100.0	329	651	81.1
Hereford	Angus-Crosses	23	1.61	729	804	100.0	319	628	93.2
AI Sires	Average	49	1.66	739	828	100.0	324	640	87.2
Brangus	Hereford-Crosses	34	1.75	765	871	100.0	346	687	92.1
	Angus-Crosses	29	1.77	767	866	100.0	357	701	86.6
	Average	63	1.76	766	868	100.0	351	694	89.4
Santa Gertrudis	Hereford-Crosses	21	1.73	758	884	95.2	353	689	99.8
	Angus-Crosses	20	1.75	784	884	100.0	362	731	93.6
	Average	41	1.74	771	884	97.6	357	710	96.7
Angus	Hereford-Crosses	15	1.68	730	843	100.0	313	592	98.8
Hereford	Angus-Crosses	21	1.72	744	874	100.0	366	676	94.2
Clean Up Sires	Average	36	1.70	737	859	100.0	339	634	96.5
Average	Hereford-Crosses	96	1.72	751	862	99.0	335	655	93.0
All Sire	Angus-Crosses	93	1.71	756	857	100.0	351	684	91.9
Breeds	Average	189	1.72	753	860	99.5	343	669	92.4

^a Adjusted 400-day wt. = 200-day wt. + (200-day postweaning ADG x 200 days).

^b Adjusted 550-day wt. = 200-day wt. + (350-day postweaning ADG x 350 days).

^c Estrus was determined from weaning to an average of approximately 16 months of age (end of breeding).

^d The breeding period was 63 days by natural service to Shorthorn bulls for both 1976 and 1977.

TABLE 17. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
POSTWEANING GROWTH, PUBERTY AND CONCEPTION OF HEIFERS
CYCLE II, PHASE 3 - BORN IN 1975-1976

Breed of Dam of Heifer		No. Heifers	200-Day Postwn. ADG, lb.	Adj. 400-Day Wt., lb. ^a	Adj. 550-Day Wt., lb. ^b	Reaching Puberty, % ^c	Puberty Age, days	Puberty Weight., lb.	Percent Pregnant ^d
Sire	Dam								
Hereford	Hereford	12	1.70	688	807	100.0	363	631	93.6
	Angus	12	1.74	731	818	100.0	337	645	100.0
	Red Poll	3	1.69	744	847	100.0	363	694	84.6
	Brown Swiss	8	1.75	780	903	100.0	363	721	84.6
	Average	35	1.72	735	844	100.0	356	673	90.8
Angus	Hereford	11	1.86	746	859	100.0	342	673	88.1
	Angus	14	1.52	658	765	100.0	370	626	100.0
	Red Poll	7	1.70	728	829	85.7	373	630	73.6
	Brown Swiss	3	1.48	696	772	100.0	304	570	89.3
	Average	35	1.64	707	806	97.1	347	625	88.3
Red Poll	Hereford	18	1.68	724	827	88.9	370	689	90.3
	Angus	16	1.65	718	795	100.0	334	626	74.7
	Red Poll	7	1.58	733	795	71.4	344	637	100.0
	Brown Swiss	2	1.92	881	948	100.0	229	618	75.1
	Average	43	1.70	764	841	90.7	319	643	90.1
Brown Swiss	Hereford	20	1.66	753	850	100.0	310	634	89.4
	Angus	15	1.64	767	876	100.0	347	698	90.0
	Red Poll	6	1.84	822	904	83.3	361	727	100.0
	Brown Swiss	7	1.74	823	917	100.0	292	660	84.3
	Average	48	1.72	791	887	97.9	327	680	93.0
Average All Sire Breeds	Hereford	61	1.73	728	836	96.7	346	657	90.3
	Angus	57	1.64	719	813	100.0	347	649	91.9
	Red Poll	23	1.70	756	843	82.6	360	672	96.6
	Brown Swiss	20	1.72	795	885	100.0	297	642	83.3
	Average	161	1.70	749	844	96.2	338	655	90.6

^a Adjusted 400-day wt. = 200-day wt. + (200-day postweaning ADG x 200 days).

^b Adjusted 550-day wt. = 200-day wt. + (350-day postweaning ADG x 350 days).

^c Estrus was determined from weaning to an average of approximately 16 months of age (end of breeding).

^d The breeding period was 63 days by natural service to Shorthorn bulls for both 1976 and 1977.

TABLE 18. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
STEER POSTWEANING FEEDLOT RATIONS
CYCLE III, PHASE 2 - 1975-76 CALF CROPS

Year	Period	Ingredients				Ration Analyses, 100% D.M. Basis ^a			
		Corn Silage, %	Corn, %	Soybean Oil Meal, %	Supplement, % ^{b,c}	C.P., %	D.P., %	TDN, %	Mcal. M.E./lb.
1975	Dec. 1 - Dec. 2	60.0	36.0	2.0	2.0	11.91	8.76	82.55	2.98
	Dec. 3 - Dec. 22	80.0	14.0	3.0	3.0	13.45	9.81	76.52	2.77
	Dec. 23 - Jan. 19	75.0	19.0	3.0	3.0	13.32	9.78	78.08	2.82
	Jan. 20 - Feb. 16	70.0	24.0	3.0	3.0	13.21	9.75	79.48	2.87
	Feb. 17 - Slaughter	65.0	30.5	1.5	3.0	13.03	9.67	80.98	2.93
1976	Nov. 18 - Dec. 13	60.0	36.0	2.0	2.0	11.98	8.84	83.00	3.00
	Dec. 14 - Feb. 9	85.0	11.0	2.0	2.0	12.40	8.83	75.92	2.74
	Feb. 10 - Feb. 16	80.0	16.0	2.0	2.0	12.29	8.83	77.73	2.81
	Feb. 17 - Mar. 9	80.0	16.0	2.0	2.0	12.18	8.74	77.57	2.80
	Mar. 10 - May 4	75.0	21.0	2.0	2.0	12.10	8.76	79.16	2.86
	May 5 - Slaughter	70.0	28.0	-	2.0	10.48	7.41	80.93	2.92

^a Estimated composition based on proximate analysis.

^b Crude protein level (100% D.M. basis) in the supplement was 50.1% for the ration used Dec. 1-2 and 46.31% for the rations used Dec. 3 through slaughter.

^c Crude protein level (100% D.M. basis) in the supplement was 46.31% for the rations used Nov. 18 - Dec. 17, 50.1% for the ration used from Dec. 18-20, 46.31% for the rations used from Dec. 21 - Feb. 16 and 43.85% for the rations used from Feb. 17 through slaughter.

TABLE 19. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
POSTWEANING ADG, FINAL WEIGHT AND FEED EFFICIENCY (FEED/GAIN)
CYCLE III, PHASE 2 - 1975-76 CALF CROPS

Breed of Steer		No. Steers ^a				Postweaning Average Daily Gain ^b				Final Weight					Feed Efficiency (TDN and Mcal ME) ^d			
Sire	Dam	S1	S2	S3	Total	S1	S2	S3	Avg.	S1	S2	S3	Avg.	Ratio ^c	S1	S2	S3	Avg.
Angus Hereford	Hereford	24	24	26	74	2.53	2.50	2.42	2.48	1011	1071	1119	1067	99.4				
	Angus	36	35	35	106	2.48	2.43	2.33	2.42	1030	1086	1128	1081	100.7				
	Average	60	59	61	180	2.51	2.46	2.38	2.45	1021	1079	1124	1074	100.0	5.93 (9.73)	6.13 (10.05)	6.37 (10.45)	6.14 (10.07)
Brahman	Hereford	17	17	18	52	2.56	2.50	2.48	2.51	1059	1113	1170	1114	103.7				
	Angus	34	34	33	101	2.40	2.36	2.41	2.39	1061	1125	1180	1122	104.5				
	Average	51	51	51	153	2.48	2.43	2.44	2.45	1060	1119	1175	1118	104.1	5.99 (9.82)	6.19 (10.15)	6.18 (10.14)	6.12 (10.04)
Sahiwal	Hereford	19	19	21	59	2.38	2.34	2.27	2.33	997	1045	1116	1053	98.0				
	Angus	32	32	31	95	2.22	2.13	2.11	2.15	984	1035	1084	1034	96.3				
	Average	51	51	52	154	2.30	2.24	2.19	2.24	991	1040	1100	1044	97.2	6.08 (9.97)	6.41 (10.51)	6.55 (10.74)	6.35 (10.41)
Pinzgauer	Hereford	22	23	23	68	2.65	2.54	2.51	2.57	1031	1090	1144	1088	101.3				
	Angus	36	36	36	108	2.48	2.42	2.30	2.40	1041	1096	1130	1089	101.4				
	Average	58	59	59	176	2.56	2.48	2.41	2.49	1036	1093	1137	1089	101.4	5.76 (9.45)	6.00 (9.84)	6.26 (10.27)	6.01 (9.86)
Tarentaise	Hereford	12	10	9	31	2.58	2.50	2.42	2.50	1042	1080	1141	1088	101.3				
	Angus	23	25	24	72	2.41	2.32	2.27	2.33	1043	1078	1137	1086	101.1				
	Average	35	35	33	103	2.50	2.41	2.35	2.42	1043	1079	1139	1087	101.2	5.86 (9.61)	6.18 (10.14)	6.37 (10.45)	6.14 (10.07)
Average All Sire Breeds	Hereford	94	93	97	284	2.54	2.48	2.42	2.48	1028	1080	1138	1082	100.7				
	Angus	161	162	159	482	2.40	2.33	2.28	2.34	1032	1084	1132	1082	100.7				
	Average	255	255	256	766	2.47	2.40	2.35	2.41	1030	1082	1135	1082	100.7	5.92 (9.71)	6.18 (10.14)	6.35 (10.41)	6.15 (10.09)

^a S1, S2 and S3 represent slaughter groups 1, 2 and 3. Steers born in 1975 were slaughtered after 192, 218 and 246 days on feed after a 40-day postweaning adjustment period. 1976 steers were slaughtered after 180, 208 and 236 days on feed after a 34-day postweaning adjustment period.

^b ADG = (actual final weight - actual weaning weight) ÷ days on feed.

^c Ratio relative to 1074 lb. average of Hereford-Angus reciprocal crosses.

^d Metabolizable Energy (ME) values shown in parentheses. TDN Efficiency = lb. TDN consumed per lb. gain. Mcal ME = 1b. TDN x 1.64. TDN and ME on a 100% dry matter basis.

TABLE 20. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
HOT CARCASS WEIGHT, DRESSING PERCENTAGE, U.S.D.A. QUALITY GRADE AND MARBLING SCORE
CYCLE III, PHASE 2 - 1975-76 CALF CROPS

Breed of Steer		Hot Carcass Wt., lb.				Dressing Percentage ^a				U.S.D.A. Quality Grade ^b				Marbling Score ^c			
Sire	Dam	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.
Angus Hereford	Hereford	603	643	686	644	59.8	60.4	61.5	60.6	11.4	12.3	12.7	12.2	10.0	12.2	13.5	11.9
	Angus	623	664	703	663	60.3	61.0	62.1	61.1	11.7	12.3	12.1	12.0	10.3	12.1	11.6	11.4
	Average	613	653	694	654	60.0	60.7	61.8	60.9	11.6	12.3	12.4	12.1	10.2	12.1	12.6	11.6
Brahman	Hereford	615	653	700	656	60.3	61.3	61.6	61.0	10.5	9.8	11.0	10.4	9.2	7.8	9.5	8.8
	Angus	638	685	720	681	61.6	62.6	62.5	62.2	10.6	11.1	11.3	11.0	8.8	9.7	10.1	9.5
	Average	627	669	710	668	60.9	62.0	62.0	61.6	10.5	10.4	11.1	10.7	9.0	8.8	9.8	9.2
Sahiwal	Hereford	569	609	656	612	59.9	60.8	61.7	60.8	10.3	10.2	11.0	10.5	8.5	8.4	9.4	8.8
	Angus	580	619	646	615	60.8	61.9	61.2	61.3	10.4	11.8	11.8	11.4	8.8	11.2	11.1	10.4
	Average	575	614	651	613	60.3	61.3	61.5	61.0	10.3	11.0	11.4	10.9	8.6	9.8	10.3	9.6
Pinzgauer	Hereford	590	638	669	632	57.8	59.5	59.7	59.0	10.7	11.4	11.2	11.1	8.9	10.9	9.9	9.9
	Angus	620	657	695	657	59.4	59.9	61.2	60.2	11.8	11.9	12.6	12.1	10.8	11.5	12.7	11.7
	Average	605	648	682	645	58.6	59.7	60.5	59.6	11.2	11.7	11.9	11.6	9.8	11.2	11.3	10.8
Tarentaise	Hereford	602	639	677	639	59.8	60.8	60.7	60.4	10.5	11.3	11.0	10.9	8.9	9.6	10.4	9.6
	Angus	624	658	691	658	60.7	61.5	61.6	61.3	10.9	11.4	12.1	11.4	9.5	10.0	11.5	10.3
	Average	613	649	684	649	60.2	61.2	61.1	60.8	10.7	11.3	11.5	11.2	9.2	9.8	10.9	10.0
Average All Sire Breeds	Hereford	596	636	678	637	59.5	60.6	61.0	60.4	10.7	11.0	11.4	11.0	11.1	9.8	10.5	9.8
	Angus	617	657	691	655	60.5	61.4	61.7	61.2	11.1	11.7	12.0	11.6	11.6	10.9	11.4	10.6
	Average	606	646	684	646	60.0	61.0	61.4	60.8	10.9	11.3	11.7	11.3	9.4	10.3	11.0	10.2

^a Dressing percentage equals hot carcass weight divided by final weight on feed and water (without shrink).

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

^c Marbling Score: 9 = slight+, 10 = small-, 21 = slightly abundant+.

TABLE 21. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
U.S.D.A. YIELD GRADE, RIBEYE AREA, FAT THICKNESS AND PERCENTAGE KIDNEY, PELVIC AND HEART FAT
CYCLE III, PHASE 2 - 1975-76 CALF CROPS

Breed of Steer		U.S.D.A. Yield Grade				Ribeye Area, sq. in.				Fat Thickness, in.				Est. Kidney, Pelvic and Heart Fat, %			
Sire	Dam	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.
Angus Hereford	Hereford	3.2	3.7	4.0	3.6	10.8	10.7	11.0	10.8	.52	.60	.68	.60	3.0	3.4	3.4	3.3
	Angus	3.6	3.9	4.2	3.9	10.6	10.8	11.0	10.8	.65	.68	.74	.69	2.8	3.3	3.5	3.2
	Average	3.4	3.8	4.1	3.8	10.7	10.8	11.0	10.8	.58	.64	.71	.65	2.9	3.3	3.4	3.2
Brahman	Hereford	3.2	3.3	3.8	3.4	10.5	10.9	10.8	10.7	.43	.49	.57	.50	3.1	3.1	3.7	3.3
	Angus	3.5	3.9	3.9	3.8	10.8	11.2	11.4	11.1	.52	.64	.63	.60	3.6	3.9	4.1	3.9
	Average	3.3	3.6	3.9	3.6	10.6	11.0	11.1	10.9	.48	.56	.60	.55	3.3	3.5	3.9	3.6
Sahiwal	Hereford	3.1	3.2	3.6	3.3	10.2	10.5	10.9	10.5	.45	.47	.54	.49	2.8	2.8	3.6	3.1
	Angus	3.3	3.6	3.6	3.5	10.5	10.9	11.2	10.9	.52	.61	.62	.58	3.4	3.5	3.7	3.5
	Average	3.2	3.4	3.6	3.4	10.4	10.7	11.0	10.7	.48	.54	.58	.53	3.1	3.1	3.6	3.3
Pinzgauer	Hereford	2.7	3.0	3.2	3.0	10.9	11.1	11.4	11.2	.33	.42	.48	.41	3.1	3.1	3.4	3.2
	Angus	3.1	3.4	3.7	3.4	11.1	11.5	11.7	11.5	.46	.51	.61	.52	3.4	3.9	4.2	3.9
	Average	2.9	3.2	3.5	3.2	11.0	11.3	11.6	11.3	.40	.47	.54	.47	3.3	3.5	3.8	3.5
Tarentaise	Hereford	2.9	2.8	3.7	3.1	10.7	11.3	11.1	11.0	.36	.33	.52	.40	3.4	3.4	4.1	3.6
	Angus	3.2	3.5	3.7	3.5	10.9	11.4	11.4	11.2	.41	.51	.52	.48	3.9	4.4	4.7	4.3
	Average	3.0	3.1	3.7	3.3	10.8	11.3	11.3	11.1	.38	.42	.52	.44	3.7	3.9	4.4	4.0
Average All Sire Breeds	Hereford	3.0	3.2	3.6	3.3	10.6	10.9	11.0	10.8	.42	.46	.56	.48	3.1	3.2	3.6	3.3
	Angus	3.3	3.6	3.8	3.6	10.8	11.2	11.3	11.1	.51	.59	.62	.57	3.4	3.8	4.0	3.7
	Average	3.2	3.4	3.7	3.4	10.7	11.0	11.2	11.0	.46	.53	.59	.53	3.3	3.5	3.8	3.5

TABLE 22. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
 ACTUAL CUTABILITY PERCENTAGE, RETAIL PRODUCT PERCENTAGE, FAT TRIM PERCENTAGE, BONE PERCENTAGE
 AND ACTUAL PERCENTAGE KIDNEY, PELVIC AND HEART FAT^a
 CYCLE III, PHASE 2 - 1975-76 CALF CROPS

Breed of Steer		Actual Cutability, % ^b				Retail Product, % ^c				Fat Trim, %				Bone, %				Actual Kidney, Pelvic and Heart Fat, %			
Sire	Dam	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.
Angus Hereford	Hereford	55.2	52.7	50.9	53.0	69.2	66.4	63.5	66.3	18.3	21.6	24.8	21.6	12.5	12.0	11.7	12.1	3.9	4.0	4.3	4.0
	Angus	53.7	51.9	50.3	52.0	67.3	65.0	62.8	65.0	20.6	23.3	25.8	23.2	12.1	11.7	11.4	11.8	3.5	3.9	4.0	3.8
	Average	54.5	52.3	50.6	52.5	68.3	65.7	63.1	65.7	19.4	22.5	25.3	22.4	12.3	11.9	11.6	11.9	3.7	4.0	4.2	3.9
Brahman	Hereford	57.1	56.1	54.0	55.7	70.5	69.3	66.3	68.7	16.0	17.8	21.1	18.3	13.5	12.9	12.6	13.0	3.5	3.7	4.4	3.9
	Angus	56.1	54.2	53.0	54.4	69.4	67.2	65.3	67.3	18.1	21.0	22.8	20.6	12.5	11.8	11.8	12.0	4.2	4.3	4.5	4.4
	Average	56.6	55.1	53.5	55.1	70.0	68.2	65.8	68.0	17.0	19.4	22.0	19.5	13.0	12.4	12.2	12.5	3.9	4.0	4.5	4.1
Sahiwal	Hereford	57.3	56.3	54.0	55.9	70.9	69.4	66.3	68.9	15.9	17.5	21.3	18.2	13.2	13.1	12.4	12.9	3.3	3.4	4.4	3.7
	Angus	56.3	54.4	52.7	54.5	69.4	67.6	65.3	67.4	18.2	20.8	23.1	20.7	12.4	11.6	11.6	11.9	3.9	4.1	4.4	4.1
	Average	56.8	55.3	53.4	55.2	70.1	68.5	65.8	68.1	17.1	19.2	22.2	19.5	12.8	12.4	12.0	12.4	3.6	3.7	4.4	3.9
Pinzgauer	Hereford	56.9	55.7	53.9	55.5	70.9	69.1	66.8	68.9	15.3	17.5	20.1	17.6	13.7	13.5	13.1	13.4	4.0	3.8	4.3	4.0
	Angus	55.5	54.3	51.7	53.9	69.3	67.6	64.5	67.1	17.7	19.6	23.6	20.3	13.0	12.9	12.0	12.6	4.1	4.9	5.2	4.7
	Average	56.2	55.0	52.8	54.7	70.1	68.3	65.6	68.0	16.5	18.5	21.8	19.0	13.4	13.2	12.5	13.0	4.0	4.3	4.7	4.4
Tarentaise	Hereford	56.4	56.2	53.3	55.3	70.1	69.4	66.1	68.5	16.7	17.2	22.0	18.6	13.1	13.4	11.9	12.8	4.1	4.5	5.2	4.6
	Angus	56.4	54.0	52.2	54.2	70.2	67.3	65.1	67.5	17.5	20.7	23.2	20.5	12.4	12.0	11.7	12.0	4.6	5.2	5.5	5.1
	Average	56.4	55.1	52.8	54.8	70.2	68.3	65.6	68.0	17.1	19.0	22.6	19.6	12.7	12.7	11.8	12.4	4.4	4.9	5.3	4.8
Average All Sire Breeds	Hereford	56.6	55.4	53.2	55.1	70.3	68.7	65.8	68.3	16.5	18.3	21.9	18.9	13.2	13.0	12.3	12.8	3.8	3.9	4.5	4.0
	Angus	55.6	53.7	52.0	53.8	69.1	66.9	64.6	66.9	18.4	21.2	23.7	21.1	12.5	12.0	11.7	12.1	4.1	4.5	4.7	4.4
	Average	56.1	54.6	52.6	54.4	69.7	67.8	65.2	67.6	17.4	19.7	22.8	20.0	12.9	12.5	12.0	12.5	3.9	4.2	4.6	4.2

^a Detailed carcass cutout data obtained on an average of 45 steers per sire breed by slaughter group subclass for all sire breeds except Tarentaise. An average of 34 Tarentaise steers were included in each slaughter group.

^b Actual Cutability, % = Actual yield of boneless, closely trimmed beef from the round, loin, rib and chuck.

^c Retail Product, % = Actual yield of boneless, closely trimmed beef from the carcass.

TABLE 23. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
 WARNER-BRATZLER SHEAR AND TASTE PANEL TENDERNESS, FLAVOR AND JUICINESS
 CYCLE III, PHASE 2 - 1975-76 CALF CROPS

Breed of Steer		W-B Shear lb. ^a				T.P. Tenderness ^b				T.P. Flavor ^b				T.P. Juiciness ^b			
Sire	Dam	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.	S1	S2	S3	Avg.
Angus Hereford	Hereford	7.2	7.4	6.5	7.0	7.4	7.3	7.6	7.4	7.2	7.3	7.3	7.3	7.3	7.3	7.5	7.4
	Angus	7.4	7.9	6.9	7.4	7.2	7.1	7.5	7.2	7.1	7.0	7.0	7.0	7.1	7.1	7.1	7.1
	Average	7.3	7.7	6.7	7.2	7.3	7.2	7.5	7.3	7.1	7.1	7.1	7.1	7.2	7.2	7.3	7.2
Brahman	Hereford	9.4	8.8	7.3	8.5	5.9	6.1	6.6	6.2	6.9	6.9	7.2	7.0	6.4	6.8	6.9	6.7
	Angus	9.4	8.6	7.5	8.5	6.5	6.4	7.0	6.6	7.0	7.0	7.0	7.0	7.0	7.1	6.8	7.0
	Average	9.4	8.7	7.4	8.5	6.2	6.3	6.8	6.4	6.9	7.0	7.1	7.0	6.7	7.0	6.8	6.8
Sahiwal	Hereford	9.9	10.1	8.3	9.4	5.6	4.9	6.1	5.5	6.8	6.8	6.9	6.9	6.8	6.8	6.9	6.8
	Angus	9.9	9.4	8.1	9.1	6.1	5.9	6.3	6.1	7.0	6.9	6.9	6.9	6.9	6.9	7.0	6.9
	Average	9.9	9.8	8.2	9.3	5.8	5.4	6.2	5.8	6.9	6.9	6.9	6.9	6.9	6.8	7.0	6.9
Pinzgauer	Hereford	8.4	7.3	7.0	7.6	7.0	7.0	7.4	7.1	7.2	7.3	7.3	7.2	7.2	7.1	7.3	7.2
	Angus	7.9	7.0	6.5	7.1	6.5	7.2	7.6	7.1	6.9	7.2	7.2	7.1	6.8	7.1	7.4	7.1
	Average	8.1	7.2	6.7	7.3	6.8	7.1	7.5	7.1	7.1	7.2	7.3	7.2	7.0	7.1	7.3	7.1
Tarentaise	Hereford	8.9	7.4	7.6	8.0	6.2	6.7	6.9	6.6	6.9	7.0	7.3	7.1	6.9	6.9	7.0	6.9
	Angus	9.4	8.2	7.0	8.2	6.2	6.9	7.2	6.7	7.1	7.3	7.1	7.2	6.9	7.0	7.1	7.0
	Average	9.1	7.8	7.3	8.1	6.2	6.8	7.0	6.7	7.0	7.2	7.2	7.1	6.9	7.0	7.0	7.0
Average	Hereford	8.7	8.2	7.3	8.1	6.4	6.4	6.9	6.6	7.0	7.1	7.2	7.1	6.9	7.0	7.1	7.0
All Sire	Angus	8.8	8.2	7.2	8.1	6.5	6.7	7.1	6.8	7.0	7.0	7.0	7.0	6.9	7.1	7.1	7.0
Breeds	Average	8.8	8.2	7.2	8.1	6.5	6.5	7.0	6.7	7.0	7.1	7.1	7.1	6.9	7.0	7.1	7.0

^a Warner-Bratzler shear is 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 measured on the same steers from which detailed carcass cutout data was obtained (table 22). This data was missing, however, on one Pinzgauer-Hereford 1976 steer.

^b 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 an average of 6 steers per sire-dam breed group per slaughter date.

TABLE 24. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
POSTWEANING GROWTH, PUBERTY AND CONCEPTION OF HEIFERS
CYCLE III, PHASE 2 - BORN IN 1975-76

Breed of Heifer		No. Heifers	200-Day Postwn. ADG, lb.	Adj. 400-Day ^a Wt., lb.	Adj. 550-Day ^b Wt., lb.	550-Day ^c Ht., in.	Reaching Puberty, % ^d	Puberty Age, days	Puberty Wt., lb.	Percent Pregnant ^e
Sire	Dam									
Angus Hereford	Hereford	31	1.60	743	833	46.9	96.8	331	650	74.5
	Angus	70	1.50	749	827	46.7	100.0	321	652	90.5
	Average	101	1.55	746	830	46.8	98.4	326	651	82.5
Brahman	Hereford	42	1.52	749	884	50.7	97.6	402	731	89.4
	Angus	61	1.49	788	896	50.4	100.0	394	754	96.8
	Average	103	1.50	768	890	50.6	98.8	398	742	93.1
Sahiwal	Hereford	32	1.47	714	827	49.2	100.0	390	668	97.3
	Angus	55	1.35	721	805	48.3	100.0	376	673	98.3
	Average	87	1.41	718	816	48.7	100.0	383	671	97.8
Pinzgauer	Hereford	45	1.63	762	864	49.0	100.0	319	646	99.1
	Angus	69	1.52	774	846	48.3	100.0	287	633	88.9
	Average	114	1.57	768	855	48.6	100.0	303	640	94.0
Tarentaise	Hereford	33	1.63	762	876	49.3	100.0	335	661	97.3
	Angus	52	1.55	771	829	47.9	100.0	301	643	84.4
	Average	85	1.59	766	853	48.6	100.0	318	652	90.9
Average	Hereford	183	1.57	746	857	49.0	98.9	355	671	91.5
All Sire	Angus	307	1.48	761	841	48.3	100.0	336	671	91.8
Breeds	Average	490	1.52	753	849	48.7	99.4	346	671	91.7

^a Adjusted 400-day wt. = 200-day wt. + (200-day postweaning ADG x 200 days).

^b Adjusted 550-day wt. = 200-day wt. + (350-day postweaning ADG x 350 days).

^c Height at hips.

^d Estrus was determined from weaning to an average of approximately 16 months of age (end of breeding).

^e The breeding period was 63 days by natural service to Red Poll bulls.

TABLE 25. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DIFFICULTY, CALF CROP PERCENTAGE, CALF MORTALITY, BIRTH WEIGHT, WEANING
WEIGHT AND WEANING WEIGHT RATIO OF CALVES FROM 2-YEAR-OLD COWS^a
CYCLE III, PHASE 2 - COWS BORN IN 1975

Breed of Cow		No. Cows Calving	Type of Parturition, %				Calf Crop, % ^c		Calf Mortality, % ^d		Calf Wt., lb. ^e		200-Day ^f Wt. Ratio
Sire	Dam		No Diff. ^b	Calf- Puller	C- Section	Abn. Pre- sentation	Born	Weaned	Early	Late	Birth	200- Day	
Angus Hereford	Hereford	14	57.2	43.0	0.2	0.0	66.7	66.7	0.3	0.0	74.9	416	102.5
	Angus	46	41.3	54.3	4.3	0.0	88.2	78.4	8.7	2.2	71.1	397	97.8
	Average	60	49.3	48.7	2.3	0.0	77.5	72.5	4.5	1.0	73.0	406	100.0
Brahman	Hereford	27	82.7	9.8	0.8	6.6	87.1	83.9	3.2	1.2	73.0	477	117.5
	Angus	36	97.0	3.1	0.0	0.0	87.8	85.4	2.7	0.1	71.8	485	119.5
	Average	63	89.9	6.4	0.4	3.3	87.5	84.6	2.9	0.7	72.4	481	118.5
Sahiwal	Hereford	11	93.3	6.7	0.4	0.0	84.6	84.6	1.1	0.6	66.4	451	111.1
	Angus	19	81.4	12.4	0.1	6.1	100.0	89.5	9.4	0.2	60.6	434	106.9
	Average	30	87.4	9.6	0.3	2.8	92.3	87.0	5.3	0.4	63.5	443	109.1
Pinzgauer	Hereford	29	38.2	51.3	6.9	3.6	90.6	68.8	20.2	7.0	85.3	452	111.3
	Angus	45	50.1	38.9	6.5	4.5	88.2	76.5	10.4	2.2	77.5	438	107.9
	Average	74	44.2	45.1	6.7	4.0	89.4	72.6	15.3	4.6	81.4	445	109.6
Tarentaise	Hereford	17	56.7	43.4	0.5	0.0	100.0	94.1	5.2	0.0	78.9	470	115.8
	Angus	15	49.9	44.6	5.9	0.0	71.4	61.9	14.4	0.0	74.7	441	108.6
	Average	32	53.3	44.0	3.2	0.0	85.7	78.0	9.8	0.0	76.8	455	112.1
Average All Sire Breeds	Hereford	98	65.6	30.8	1.8	1.8	85.8	79.6	6.0	1.6	75.7	453	111.6
	Angus	161	63.9	30.7	3.4	2.0	87.1	78.3	9.1	0.9	71.1	439	108.1
	Average	259	64.8	30.7	2.6	1.9	86.5	79.0	7.6	1.3	73.4	446	109.9

^a Calves from these cows were sired by Red Poll bulls.

^b No assistance or minor hand assistance.

^c Of cows alive at calving; cows removed from experiment only for serious injury, being open two successive years or by death.

^d Early mortality is within 72 hr of birth; late is from 72 hr after birth until weaning.

^e Adjusted to a steer basis. Least-squares adjustment factors for heifers were 2.0 for birth weight and 17.2 lb. for 200-day weight.

^f Ratio computed relative to 406 lb. average for Hereford and Angus sired dams.

TABLE 26. ROMAN L. HRUSKA U.S. MEAT ANIMAL RESEARCH CENTER GERM PLASM EVALUATION PROGRAM
CALVING DATE, REBREEDING PERFORMANCE AND SIZE OF COWS CALVING AS 2-YEAR-OLDS
CYCLE III, PHASE 2 - COWS BORN IN 1975

Breed of Cow		No. Calving as 2-Year-Olds	Avg. Calving Date	Postpartum Interval, Days ^a	Percent Pregnant ^b	Cow Wt. at 2½ Yrs. of Age, lb.	Hip Ht. at 2½ Yrs. of Age, in.
Sire	Dam						
Angus Hereford	Hereford	14	March 11	66.4	100.0	1012	47.9
	Angus	46	March 16	62.3	94.1	963	46.7
	Average	60	March 14	64.3	97.1	988	47.3
Brahman	Hereford	27	March 25	67.4	96.8	1008	51.0
	Angus	36	March 20	65.7	87.8	1012	50.8
	Average	63	March 22	66.5	92.3	1010	50.9
Sahiwal	Hereford	11	March 16	71.9	100.0	967	50.2
	Angus	19	March 20	64.4	100.0	871	48.2
	Average	30	March 18	68.2	100.0	919	49.2
Pinzgauer	Hereford	29	March 16	56.4	90.6	1033	49.8
	Angus	45	March 14	56.2	84.3	985	48.7
	Average	74	March 15	56.3	87.5	1009	49.3
Tarentaise	Hereford	17	March 19	51.4	76.5	968	48.9
	Angus	15	March 19	51.9	76.2	972	48.3
	Average	32	March 19	51.6	76.3	970	48.6
Average All Sire Breeds	Hereford	98	March 17	62.7	92.8	998	49.6
	Angus	161	March 18	60.1	88.5	960	48.6
	Average	259	March 17	61.4	90.6	979	49.1

^a Interval from calving to first estrus.

^b Breeding period was 63 days by natural service to 7/8 Simmental bulls. Percent pregnant = no. palpated as pregnant ÷ no. palpated, and only includes cows that calved prior to breeding.

APPENDIX

TABLE 1. MATING PLANS TO PRODUCE CYCLE I, PHASE 2 CALVES

1969, 1970, 1971 Breeding Seasons

Dam Breeds ^a	Sire Breeds						
	Hereford	Angus	Jersey	South Devon	Limousin	Simmental	Charolais
Hereford	X	X	X	X	X	X	X
Angus	X	X	X	X	X	X	X

^a The cows were 1, 2, 3 and 4-year-olds in 1969; 1, 2, 3, 4 and 5-year-olds in 1970; and 2, 3, 4, 5 and 6-year-olds in 1971.

APPENDIX

TABLE 2. MATING PLANS TO PRODUCE CYCLE II, PHASE 2 CALVES

1972 and 1973 Breeding Seasons

Dam Breeds ^a	Sire Breeds						
	Hereford ^b	Angus ^b	Red Poll	Brown Swiss	Gelbvieh	Maine Anjou	Chianina
Hereford ^c	X	X	X	X	X	X	X
Angus ^c	X	X	X	X	X	X	X
Red Poll	X	X	X	X			
Brown Swiss	X	X	X	X			

^a The cows were 3, 4, 5, 6 and 7-year-olds in 1972; and 3, 4, 5, 6, 7 and 8-year-olds in 1973.

^b Sample of same Hereford and Angus sires used in Cycle I, 1969, 1970 and 1971 breeding seasons.

^c Cows used for GPE Cycle I, 1969, 1970 and 1971 breeding seasons.

APPENDIX

TABLE 3. MATING PLANS TO PRODUCE CYCLE I, PHASE 3 CALVES

Breed Group ^a						Sire Breeds					3rd and 4th Calf Crops ^d
	First Calf Crop ^b					Second Calf Crop ^c					
	Here-ford ^e	Angus ^e	Brah-man	Devon	Hol-stein	Here-ford	Angus ^e	Gelb-vieh	Maine Anjou	Chia-nina	
H x H A x A	X	X				X	X				X X
A x H H x A			X X	X X	X X			X X	X X	X X	X X
J x H J x A	X	X	X X	X X	X X	X	X	X X	X X	X X	X X
SD x H SD x A	X	X	X X	X X	X X	X	X	X X	X X	X X	X X
L x H L x A	X	X	X X	X X	X X	X	X	X X	X X	X X	X X
S x H S x A	X	X	X X	X X	X X	X	X	X X	X X	X X	X X
C x H C x A	X	X	X X	X X	X X	X	X	X X	X X	X X	X X

- ^a Females of each breed group distributed equally among cells marked "X" for each calf crop.
^b Each group of heifers bred as yearlings to produce one calf crop as 2-year-olds by these breeds.
^c Each group of cows bred as 2-year-olds to produce one calf crop as 3-year-olds by these breeds.
^d Each group of cows bred to produce at least two calf crops by this breed.
^e Sample of same sires used in Cycle I, 1969-70-71 breeding seasons.

APPENDIX

TABLE 4. MATING PLANS TO PRODUCE CYCLE II, PHASE 3 CALVES

Female Breeding Groups ^a	Sire Breeds				2nd, 3rd and 4th Calf Crops ^c
	First Calf Crop ^b				
	Hereford ^d	Angus ^d	Brangus	Santa Gertrudis	Simmental
Hereford		X	X	X	X
Angus	X		X	X	X
Red Poll	X	X			X
Brown Swiss	X	X			X
H x A & Recip.			X	X	X
H x R.P. & Recip.		X	X	X	X
H x B.S. & Recip.		X	X	X	X
A x R.P. & Recip.	X		X	X	X
A x B.S. & Recip.	X		X	X	X
R.P. x B.S. & Recip.	X	X			X
Gelbvieh x Hereford		X	X	X	X
Gelbvieh x Angus	X		X	X	X
Maine Anjou x Hereford		X	X	X	X
Maine Anjou x Angus	X		X	X	X
Chianina x Hereford		X	X	X	X
Chianina x Angus	X		X	X	X

^a Females of each breed group distributed equally among the cells marked "X" for each calf crop.

^b Each group of heifers bred as yearlings to produce one calf crop as 2-year-olds by these breeds.

^c Each group of cows mated to produce at least three calf crops by 3/4 or 7/8 Simmental bulls.

^d Sample of same Hereford and Angus sires used in Cycle I, Phase 1, 1969, 1970 and 1971 breeding seasons.

APPENDIX

TABLE 5. MATING PLANS TO PRODUCE CYCLE III, PHASE 2 CALVES^a

1974 and 1975 Breeding Seasons

Female Breeds ^b	Male Breeds					
	Hereford ^c	Angus ^c	Brahman	Sahiwal	Pinzgauer	Tarentaise
Hereford		X	X	X	X	X
Angus	X		X	X	X	X

^a Approximately 1600 calves will be produced from these matings with 256 heifers (32 of each breed group, except Tarentaise) located at Brooksville, Florida, and the remainder located at the U.S. Meat Animal Research Center. These F₁ heifers will be bred naturally to Red Poll bulls for their first calf-crop and to Simmental bulls for their three subsequent calf-crops.

^b Cows used for GPE Cycle I, Phase 1.

^c Sample of same Hereford and Angus sires used in Cycle I, Phase 1 1969, 1970 and 1971 breeding seasons.