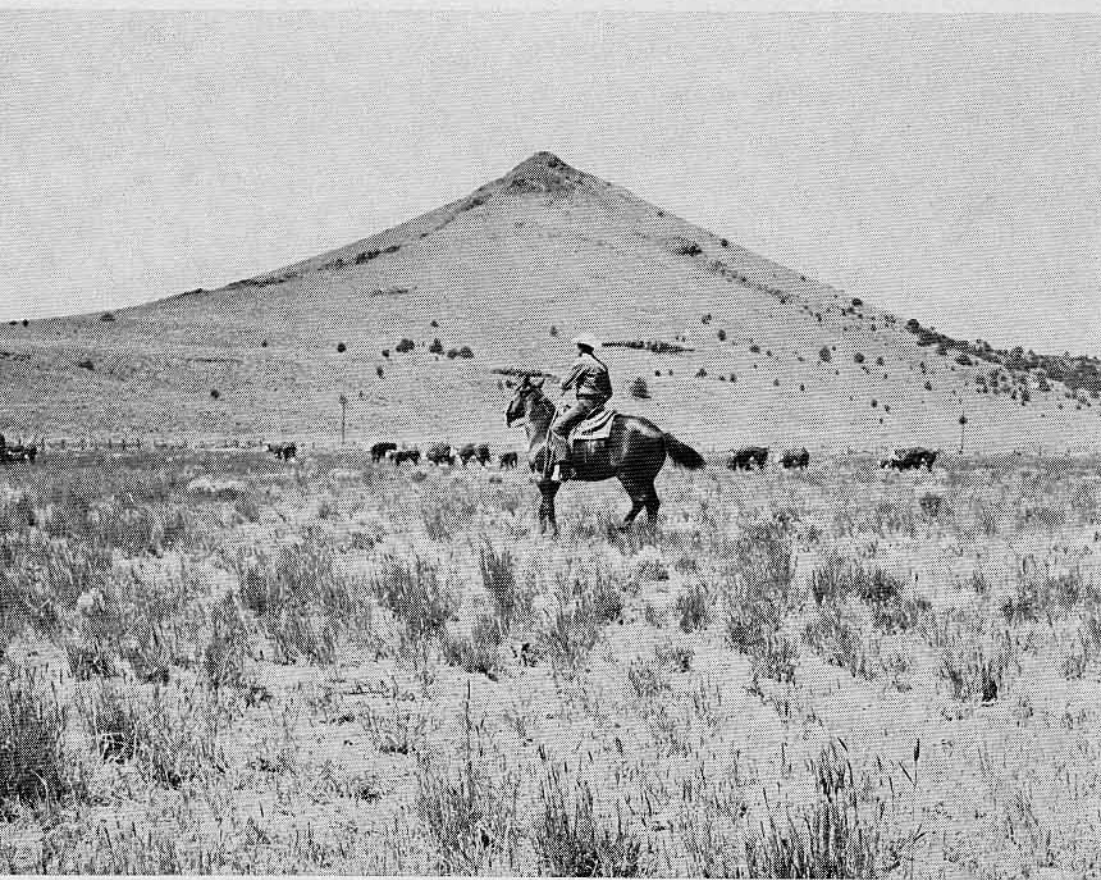


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Performance of Hereford and Charolais x Hereford Crossbred Cattle in Eastern Oregon



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Performance of Hereford and Charolais x Hereford Crossbred Cattle in Eastern Oregon

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Results of Trials

When Hereford cows were mated to a Charolais bull:

1. Crossbred calves were 8 pounds heavier at birth, 48 pounds heavier at weaning, gained .2 pound more per day during suckling period, but graded slightly lower at weaning than straightbred Hereford calves.
2. Crossbreds gained .3 pound more per day on a winter growing ration as weaners and .36 pound more per day on summer range as yearlings than Herefords.
3. Crossbred heifers that were sold off the range at approximately 16 months of age as feeders averaged 121 pounds heavier, brought less per hundredweight, but grossed \$14.75 per head more than Herefords.
4. Crossbred steers gained more (.3 pound) and consumed more feed on a finishing ration, but their net return out of the feedlot was slightly lower than Hereford steers.
5. Crossbred steer carcasses were heavier and leaner with a slightly higher estimated percent trimmed edible meat, but had lower marbling scores and consequently graded lower than Hereford steer carcasses.

6. Crossbred carcass roasts required less cooking time, had smaller cooking losses, and were essentially equal in flavor qualities to roasts from Hereford carcasses.
7. Crossbred females averaged about 100 pounds heavier than Herefords from 1 year through 3½ years of age.

When first-cross Charolais x Hereford heifers were bred to Hereford sires:

1. Crossbred heifers had lower conception rates but also had lower mortality rates in their calves, and consequently had a higher weaning percentage than Hereford heifers.
2. Crossbred heifers' calves were 8 pounds heavier at birth, gained .43 pound more per day during the suckling period, and were 97 pounds heavier at weaning than calves from Hereford heifers.
3. Offspring of crossbred heifers gained at slightly higher rates as weaner calves and as yearlings, sold for the same price per hundredweight as feeders, and grossed \$18.12 more per head than offspring from Hereford heifers.

Introduction

One of the most controversial subjects among cattle producers is that of crossbreeding. Unfortunately, there is still a lack of information on many of the problems involved. The many different matings which are possible and their relationship to various environmental influences have hindered progress of research in this field.

Currently the beef industry is pressed by consumer demand to produce cattle which yield leaner carcasses and still maintain the desired tenderness and flavor. Consequently, cattlemen are looking for animals with superior muscling that yield a high percentage of retail cuts with a minimum of trim fat. Opinions on whether crossbreeding in beef cattle will lead to the development of more desirable carcass characteristics are quite diverse. The main concern among all cattle producers is that beef continue in its position of popularity among the different protein foods.

There are certain areas in the United States where no existing breed of cattle will perform satisfactorily in straight breeding programs. Crossbreeding has been and probably will continue to be popular in these areas. Another major reason for crossbreeding is that of capitalizing on hybrid vigor. A sound evaluation of hybrid vigor may be difficult to attain. Weight advantages to offspring which result from hybrid vigor should be measured on a per cow unit-weight basis. For example, it may be as economical to produce 360-pound weaner calves from 900-pound cows as to produce 480-pound calves from 1,200-pound cows.

In each case we obtain 40 pounds of calf weight per 100 pounds of dam weight. Hybrid vigor may also be expressed in factors other than increased growth rate, such as reduced mortality and increased mothering ability. In many cases crossbreeding programs, as well as other intensified breeding programs, have not been successful because: (1) there was a lack of sufficient long-time planning; (2) the program chosen was not manageable on the individual ranch; or (3) there was insufficient advantage to offset added costs of the program. No plan of breeding can substitute for a constructive program of selection and culling for productive traits.

In the past, crossbred cattle have been discounted by most stocker-feeder buyers mainly because of their lack of color uniformity. More recently, however, much of the market discrimination against crossbred cattle has seemingly disappeared. This appears to be especially true of crossbred cattle whose parental breeds are both of European origin.

The purpose of this bulletin is neither to advocate nor to discredit crossbreeding of beef cattle, but merely to report results of trials conducted under eastern Oregon conditions where performance of Hereford and Charolais x Hereford crossbred cattle were compared. The authors are fully aware that the basic plan of the experiment was by no means adequate to compare total populations of cattle, since all first cross Charolais x Hereford animals were from one sire.

Methods and Procedure

Fifty-six mature Hereford cows were stratified according to age and individual production records and randomly allotted to two groups in the spring of 1960. During the breeding season of 1960, cows in group one were bred to a Charolais bull while those in group two were bred to Hereford bulls in a multiple-sire breeding herd. During the 1961 breeding season the mating scheme of the two groups was reversed. Offspring from these matings were compared in pre-weaning and weaning traits, post-weaning performance on growing rations, and yearling performance on summer range. Steer calves from these groups were placed on a finishing ration about 60 days after weaning and fed for approximately 220 days. They were slaughtered at a commercial packing plant where carcass data were obtained. The 10-11th rib from the left side of each carcass was purchased for cooking and

flavor tests. Cooking tests were conducted on a rib roast from each carcass under standardized conditions by the Department of Food Science and Technology at Oregon State University. Following the cooking tests, lean and fat samples from each roast were scored by a trained flavor panel.

Part of the Hereford and crossbred females resulting from each year's mating of groups one and two were retained and bred back to Hereford bulls. These animals represented approximately the top 50 percent of each group each year. This phase of the study was conducted so that the productive ability of straightbred and crossbred females could be compared. The production data covering the first two calf crops (as two- and three-year-olds) were evaluated. Wherever possible, all data were statistically analyzed.

The Hereford cattle used in this experiment were from the commercial

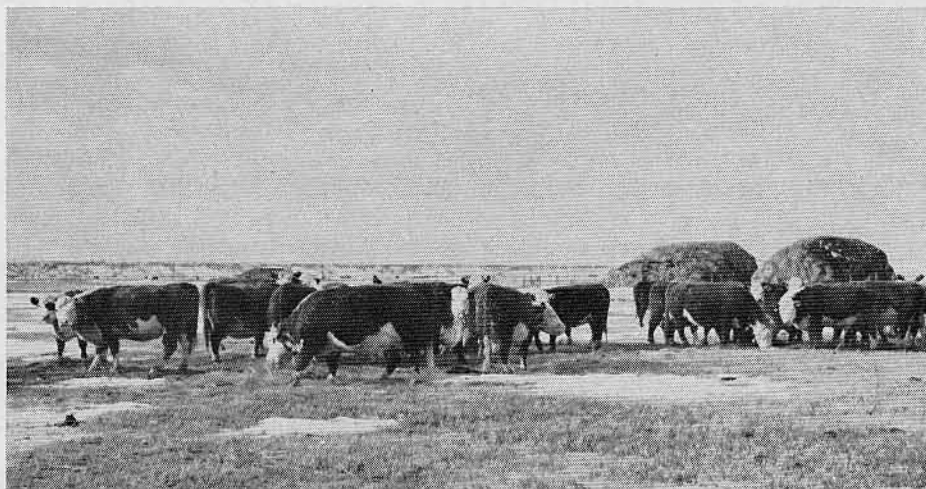


Figure 1. A representative group of cows from the Squaw Butte breeding herd, shown on winter feed grounds. Cows of uniform age and productive ability were selected for use in this study.

herd of cattle owned by Oregon State University and maintained at the Squaw Butte Experiment Station, located near Burns in southeastern Oregon. The herd was assembled in the mid-1930's, and since the late 1940's only one line of Hereford bulls (Prince line) has been used. Since the initial establishment, no outside females have been introduced. The Charolais bull used was leased from Keith Mets, Holtville, California.

As routine management, the cattle were maintained on native hay meadows from mid-October to late April each year and on desert range (sagebrush-bunchgrass type), where cattle were grazed on native or crested wheat-grass ranges, the remainder of each year. Cows were bred during a 60-day period in June and July and calves were dropped during March and April. The calves were weaned in mid-October and all calves involved in this study were graded by the same grader.

Average annual precipitation for the area is about 11 inches, which comes primarily in winter and spring. Aver-

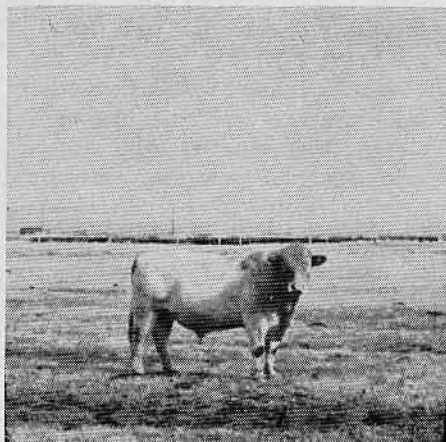


Figure 2. Charolais bull which was leased for two breeding seasons for use in this experiment.

age temperature for the three colder months of the year is 28° F, while the three warmer months have an average temperature of 64° F. However, temperatures from a low of -24° to a high of 100° F have been recorded on the station and there is no month which can be considered frost-free.

First Generation Cross

Birth to weaning

Comparisons of the traits of straightbred and crossbred calves from birth through weaning are summarized for both years in Table 1. Considering both male and female calves, the crossbreds averaged 8 pounds heavier at birth and 48 pounds heavier at weaning; however, Hereford calves graded slightly higher at weaning. As expected, the crossbred calves showed more early life vigor than Herefords, although actual losses from birth to weaning

were comparable between the two groups. Average daily gain during the suckling period favored crossbred calves over Herefords by .2 pound. Obviously, a certain amount of hybrid vigor would be expected from crossing a line (such as the Hereford line used in this study) with any other breed or even with another line within the breed. In fact, mating a group of cows from the Squaw Butte herd to a Hereford bull of the Lionheart line resulted in a substantial increase in

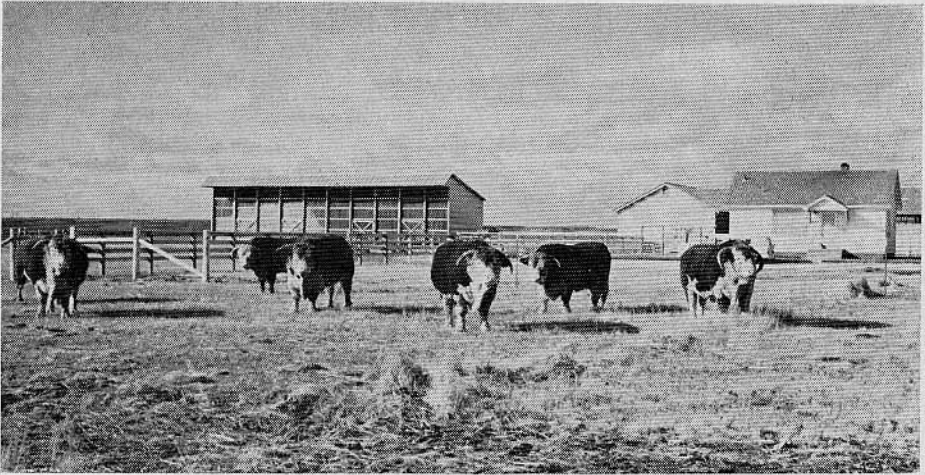


Figure 3. Hereford bulls used in the multiple-sire breeding program at Squaw Butte.



Figure 4. Newborn crossbred and straightbred calves from Hereford dams. Crossbred calves averaged 8 pounds heavier at birth and 48 pounds heavier at weaning than Hereford calves.

Table 1. Comparison of straightbred and first generation crossbred calves from birth to weaning, and conception and weaning percentages of their dams

Trait	Straightbred Hereford		Crossbred C. x H.	
	Male	Female	Male	Female
Avg. birth weight, lb.	81	75	90	83
Avg. suckling gain, lb./day	1.61	1.59	1.84	1.77
Avg. adjusted weaning weight, lb. ¹	411	401	467	446
Avg. feeder grade ²	14.1	13.7	13.7	13.3
Percent conception		95		100
Percent calves weaned ³		91		96

¹ Adjusted to 205 days of age.

² Medium 10-12; Good 13-15; Choice 16-18.

³ Percent of cows bred.

Table 2. Post-weaning and yearling performance, and gross return from straightbred and first generation crossbred heifers

Item	Straightbred Hereford	Crossbred C. x H.
<i>Average per head</i>		
Winter gain on growing ration, lb./day	0.78	1.09
Summer gain on native range, lb./day	1.05	1.41
Selling weight, lb.	661	782
Price received at auction, dollars per cwt.	23.50	21.75
Gross return, dollars	155.33	170.08

suckling gain and weaning weight of offspring when compared to the straight Prince line cattle in the herd. It is generally assumed, however, that crossing two breeds of cattle will result in more hybrid vigor than crossing two lines within a breed.

Conception rate was higher for cows bred to the Charolais bull than for those bred to Hereford bulls. This difference may be because cows mated to the Charolais bull were bred in smaller pastures. Percent calves weaned in this comparison reflects mainly the difference in conception rates between the two groups.

Post-weaning and yearling

First generation crossbred females gained .31 pound more per day as weaner calves during the winter and .36 pound more per day as yearlings on summer range than straightbred Hereford females (Table 2). Part of these animals from each group were retained for further studies and the rest were sold off range at approximately 16 months of age. The Hereford heifers which were sold averaged 661 pounds and brought an average of \$23.50 per hundredweight, while the crossbred heifers averaged 782 pounds and brought an average of \$21.75 per hun-

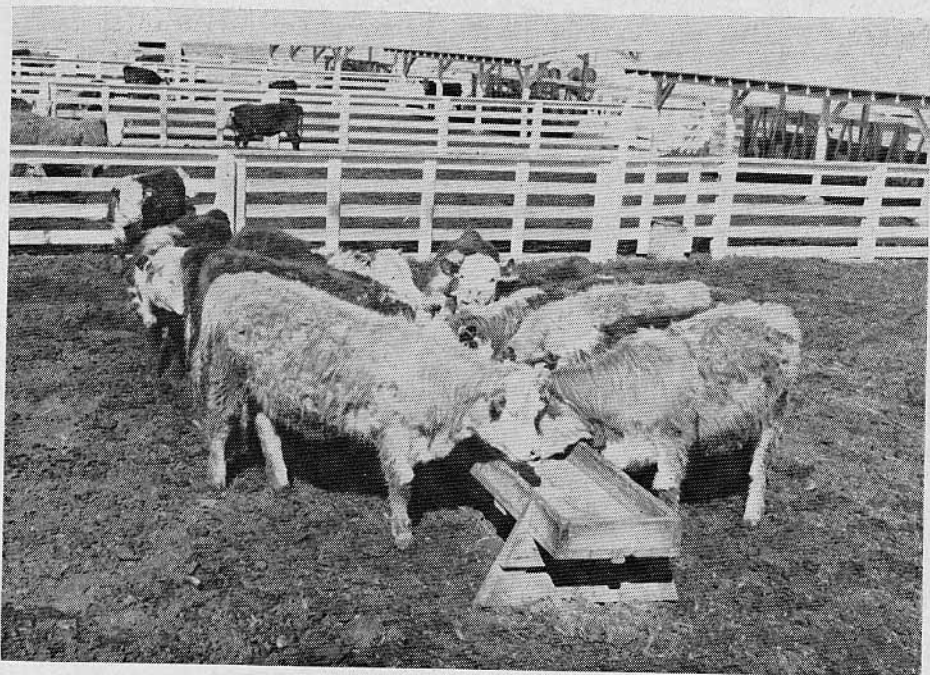


Figure 5. Performance of Hereford and crossbred weaner calves was compared on winter growing rations. Crossbred calves gained .3 pound more per day than Hereford calves.

dredweight through an auction ring in eastern Oregon. Some of the price spread per hundredweight was a reflection of the 121-pound weight difference between the two groups. Gross return figures favored crossbred heifers by \$14.75 per head.

Feedlot performance

Comparative feedlot performance, slaughter records, and financial return data are summarized in Table 3. The number of steer calves received in the first year's calf crop was limited and was further decreased by death loss due to bloat. Three Hereford steers and one crossbred steer died of bloat prior to the start of the finishing trial. Due to the limited numbers of Hereford and crossbred steers remaining, the two groups were fed together in

one lot during the finishing period. During the second year, one Hereford steer was removed from the study because of chronic bloat. During this trial the Hereford and crossbred steers were fed in separate lots.

Crossbred steers gained at a faster rate during both feedlot trials. During the second year, when it was possible to compare feed consumption, feed conversion, and feed costs, the crossbreds consumed more feed but Herefords appeared to have a slight (non-significant) advantage in terms of feed conversion and feed cost per pound of gain. Generally speaking, faster gaining cattle are also more efficient gainers, but in this case we must recognize that the crossbred steers had higher maintenance requirements because of their heavier weights. The maintenance factor alone would have made it neces-

Table 3. Feedlot performance of straightbred and first generation crossbred steers

	First year		Second year	
	Hereford	Crossbred	Hereford	Crossbred
Number of steers	5	6	11	12
Days on feed.....	207	207	228	228
Avg. performance, lb.				
Initial wt.	480	496	447	503
Final wt.	974	1,079	934	1,058
Daily gain.	2.38	2.82	2.13	2.43
Gain/day of age	1.93	2.20	1.79	2.06
(out of feedlot)				
<i>Steers fed in same lot</i>				
Avg. daily ration, lb. ¹				
Meadow hay	7.60		4.34	5.79
Rolled barley	12.20		11.22	12.88
Cottonseed meal	1.00		1.00	1.00
Pelleted alfalfa meal	1.00		1.00	1.00
Feed efficiency and costs				
Feed/lb. gain, lb.	8.32		8.24	8.51
TDN/lb. gain, lb.	5.54		5.73	5.82
Feed cost/lb. gain, dollars ²	0.168		0.180	0.181
Slaughter records				
Avg. dressing percent	60.3	61.7	61.2	59.7
No. of carcasses grading:				
Choice	0	0	1	0
Good	3	2	8	5
Standard	2	4	2	7
Avg. return (dollars/hd.)				
Gross return ³	239.90	265.95	226.29	237.93
Feed cost ² .....	.....	.....	87.66	100.45
Transportation cost .....	.....	.....	7.92	8.98
Net return .....	.....	.....	130.71	128.50

¹ All steers were given stilbestrol implants (12 mg. at start of trial and 24 mg. after 90 days) and received 20,000 I.U. of vitamin A per head daily each year.

² Feed costs used were: meadow hay, \$20 per ton; barley, \$50 per ton; cottonseed meal, \$80 per ton; and alfalfa pellets, \$40 per ton. Costs of vitamin A and stilbestrol were not included.

³ Steers were sold to Swift & Co., Portland, on carcass grade and yield basis each year. Prices received the first year were: Good, \$0.42/lb. and Standard, \$0.39/lb. Prices the second year were: Choice, \$0.43/lb.; Good, \$0.40/lb. and Standard, \$0.36/lb.

sary for crossbred steers to consume more feed than Herefords to make an equivalent gain. Another factor which should also be mentioned is that Prince line cattle have been exceedingly efficient in feed conversion when compared to other Hereford lines in earlier studies. Dressing percent favored

crossbred steers the first year and Hereford steers the second year, but carcass grades were slightly higher for Hereford steers both years. In the second year, after total feed and transportation costs were deducted from gross returns, the Hereford steers averaged \$2.21 more net return per head.



Figure 6. Steers from Hereford and crossbred groups after 200 days on a finishing ration. Crossbred steers gained faster in the feedlot, but Herefords produced carcasses with more marbling.

Carcass characteristics

A summary of the carcass comparisons covering both years is shown in Table 4. The higher marbling score was the primary factor in establishing the slightly higher grade for Hereford carcasses as compared to crossbred carcasses. Crossbred steers produced heavier, leaner carcasses which were slightly higher in estimated percent of trimmed edible meat. The loin eye area was larger in crossbred carcasses than Herefords, but in terms of square inches of loin eye per 100 pounds of carcass weight the two groups were equal.

Cooking tests and flavor evaluations

Differences found in the cooking test were small but of some significance (Table 5). These were primarily attributed to variations in original weight and fat content of the roasts. Roasts from Hereford carcasses required

longer cooking time (minutes per pound to reach the same internal temperature) and also had greater cooking losses, especially in percent drip.

Flavor scores indicated essentially no difference in eating quality of roast beef from the two groups of cattle.

Weight comparisons of females

The average weight of Hereford and first generation crossbred females up to $3\frac{1}{2}$ years of age is shown in Table 6. These weights were taken on heifers retained for the purpose of comparing calf production ability. Beginning with the average yearling weight and extending through the average weight at $3\frac{1}{2}$ years of age, crossbred animals were from 75 to 114 pounds heavier than Herefords. At this writing about half of the animals in each group are $4\frac{1}{2}$ years of age, and on these animals the average weight difference is only 50 pounds.

Table 4. Average carcass data for straightbred and first generation crossbred steers

Item	Straightbred Hereford	Crossbred C. x H.
Carcass weight, lb.	576	642
Conformation score ¹	16.4	16.2
Marbling score ²	7.9	5.7
USDA grade ¹	13.5	12.4
Fat thickness, in./cwt. carc. wt.	0.059	0.044
Loin eye, square in./cwt. carc. wt.	1.81	1.81
Yield grade ³	3.0	2.7

¹ 11 = Avg. standard; 14 = Avg. good; 17 = Avg. choice.

² 6 = Avg. traces; 9 = Avg. slight amount.

³ 2 = 53.1% and 3 = 50.8% trimmed retail cuts from the round, loin, rib, and chuck.

Table 5. Cooking tests and flavor evaluation of rib roasts from straightbred and first generation crossbred steer carcasses

Test	Measure	Straightbred Hereford	Crossbred C. x H.
Cooking	Raw weight, lb.	5.19	5.28
	Cooked weight, lb.	3.98	4.20
	Percent total loss	22.50	21.33
	Percent drip	8.13	6.02
	Percent volatile loss	14.37	14.31
	Cooking time, min./lb.	53.50	52.70
Flavor ¹	Tenderness	4.65	4.42
	Juiciness	5.04	4.77
	Flavor of lean	5.17	5.13
	Flavor of fat	4.82	4.78
	Overall score	4.88	4.62

¹ Flavor factors scored by flavor evaluation panel on a 1 to 7 scale, with 1 the lowest and 7 the highest possible score.

Table 6. Comparative weights of Hereford and first generation crossbred heifers at different ages

Age	Hereford	Crossbred
	lb.	lb.
Birth	75	83
Weaning	400	446
Yearling	540	642
18 months	754	829
2½ years	860	966
3½ years	966	1,080

Second Generation Cross

Calf production comparisons

Calf production data for Hereford and crossbred heifers covering their first two years of production are shown in Table 7. The variation due to sire difference was eliminated in these comparisons by mating all heifers (Hereford and crossbred) within each age group to the same Hereford sire.

Although conception rate was higher for Hereford heifers, the percent calves weaned was higher for crossbred heifers. The higher mortality rate of calves at birth (or shortly after birth) from the Hereford heifers accounted for this difference. The increase in suckling gains and heavier weaning weights which second generation crossbred calves exhibited over Hereford calves was greater than that shown by first generation crossbred calves over Hereford (Table 1). This is undoubtedly a reflection of superior milking ability of crossbred dams over Herefords. Second generation calves also graded higher at weaning time than Herefords.

In terms of pounds of adjusted weaning weight produced over 100 pounds of dam weight, crossbred females exceeded Herefords by 6.6 pounds when the weights of all heifers were used and by 6.3 pounds when the computation was based only on those heifers weaning calves.

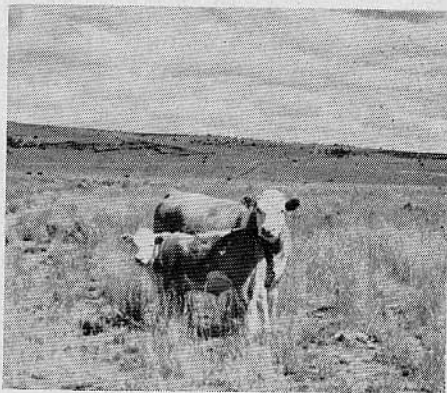


Figure 7. Crossbred heifer with a 5-month-old calf on crested wheatgrass range. In this study, crossbred heifers had a higher percent calf crop and weaned heavier calves than Hereford heifers.

Table 7. Comparison of calf production data from two- and three-year-old Hereford and crossbred heifers mated to Hereford bulls¹

Item	Hereford	Crossbred
Percent conception	94	87
Percent calves weaned ²	79	82
Avg. birth weight of calves, lb.	71.1	78.8
Avg. suckling gain, lb./day ³	1.45	1.88
Avg. adjusted weaning wt., lb. ³	368	465
Avg. feeder grade ⁴	12.1	14.7
Lb. adj. weaning wt./100 lb. dam wt., lb. (based on weights of all heifers)	32.4	39.0
Lb. adj. weaning wt./100 lb. dam wt., lb. (based only on those heifers weaning calves)	40.5	46.8

¹ Each year Hereford and crossbred heifers within an age group were mated to same Hereford bull.

² Percent of heifers bred.

³ Corrected for sex of calf and age of dam effects. Weaning weights adjusted to 205 days of age.

⁴ Medium 10-12; Good 13-15; Choice 16-18.

Table 8. Post-weaning and yearling performance and gross return from straightbred and second generation crossbred offspring

Item	Straightbred Hereford	Crossbred C. x H.
<i>Average per head</i>		
Winter gain or growing ration, lb./day	0.71	0.80
Summer gain on native range, lb./day	1.62	1.84
Selling wt., lb.	648	738
Price received at auction, dollars per cwt.	19.75	19.85
Gross return, dollars	127.98	146.10

Post-weaning and yearling performance

A summary of the performance of straightbred Hereford and second generation crossbred offspring as weaner calves on a growing ration and as yearlings on summer range is presented in Table 8. Rates of gain during both the winter and summer showed some advantage for the second-cross animals over Herefords; however, the differences were not as pronounced as those where first-cross animals were com-

pared with Herefords under similar circumstances (Table 2).

The prices received (per hundred-weight) for these animals when sold at approximately 16 months of age were essentially the same for Herefords and crossbreds but, as a result of their weight advantage, the crossbred animals brought an average of \$18.12 more gross return per head. Since a major part of this weight advantage was attained during the suckling period, we consider it as a reflection of milking ability of the dam rather than hybrid vigor of the offspring.