by the producer only under special circumstances like when there is particular concern about calving difficulty in first calf heifers or when Jersey cross heifers are desired for addition to the cow herd.

Performance to Weaning of Crossbred Calves from Angus Cows

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Story in Brief

Data were analyzed on 345 crossbred calves produced by Angus cows mated to Hereford, Simmental, Brown Swiss and Jersey bulls over a two year period. Simmental sired calves as compared to Hereford sired calves were 3.9 lbs. (5.1%) heavier at birth and 33 lbs. (7%) heavier at weaning. However, because of 3.7% fewer calves being weaned, there was only a 12 lb. (2.8%) advantage for Simmental sired calves in terms of pounds of calf weaned per pregnant cow in the herd. Brown Swiss sired calves were similar in birth weight to Hereford sired calves. However, the combined effects of a 7.4% higher calf liveability and 16 lbs. (3.4%) heavier weaning weights resulted in the Brown Swiss sired calves having a considerable advantage of 51 lbs. (11.8%) in terms of pounds of calf weaned per pregnant cow in the herd.

If Brown Swiss sired calves can be sold at weaning age for the same selling price as Hereford sired calves, $16.83 more income per pregnant cow can be achieved from using Brown Swiss bulls under current market conditions. Jersey sired calves were lightest at birth and weaning and resulted in 15 lbs. (3.5%) fewer lbs. of calf weaned per pregnant cow than Hereford sired calves. This combined with a lower selling price because of a lowered feeder calf grade at weaning resulted in $29.97 less income per pregnant cow than Hereford sired calves under current market conditions.

Introduction

Crossbreeding is being increasingly used in commercial beef production systems because of its beneficial effect on total productivity and production efficiency. Crossbreeding provides an opportunity to increase productivity by combining desirable traits from two or more breeds in a complementary manner and from heterosis. Extensive studies at several experiment stations involving crosses among British breeds have indicated raising crossbred calves from straightbred cows will increase the calf crop weaned percentage by 4.1% and weaning weight by 4.6%. The combined effect of these two traits would result in nearly a 10% increase in pounds of calf weaned per cow in the breeding herd over a straightbreeding program on the average. This increase in production can be doubled by keeping crossbred cows and breeding them to a bull of third breed.

Producers that decide to crossbreed are confronted with a large selection of breeds to choose from. The purpose of this study was to compare the performance to weaning of crossbred calves produced by mating Hereford, Simmental, Brown Swiss and Jersey bulls to Angus cows. These crosses were made as part of a comprehensive study designed to evaluate lifetime productivity of various two-breed cross cows when mated to bulls of a third breed. Hereford, Simmental, Brown Swiss and Jersey bulls were selected for use on Angus cows in order to produce crossbred cows of contrasting biological types. Primarily, these crosses are expected to result in crossbred cows varying in mature size and level of milk production.

Experimental Procedure

Hereford, Simmental, Brown Swiss and Jersey bulls were mated to a herd of Angus cows to produce crossbred calves in the spring of 1973 and 1974. The number of calves in each crossbred group are shown for each year in Table 1. There were a total of eight bulls used of each sire breed (four each year) in order to obtain as broad a genetic sample as possible of bulls representative of the breed.

Table 1. Number of Crossbred Calves Weaned from Angus Cows.

Sire Breed	Year 1973	Year 1974	Total
Hereford	45	40	85
Simmental	46	47	93
Brown Swiss	43	42	85
Jersey	43	39	82
Total	177	168	345

The cows were managed under range conditions at the Lake Carl Blackwell research range west of Stillwater. Calves were born during February, March and early April of 1973 and 1974 and remained with their dams without creep feed until they were weaned at an average age of 205 days. Each calf was evaluated at weaning time for conformation and condition (level of fatness) by a committee of at least three qualified individuals. Weaning weights were adjusted to 205 days of age and further adjusted for age of dam by multiplying the 205-day weights of calves from 2, 3 and 4 year old cows by 1.15, 1.10 and 1.05, respectively.

Results

Calving Difficulty

Ease of calving is an important economic trait and can be of special concern in crossbreeding systems that utilize bulls from breeds that are of larger size than the cow breed. Herdsmen carefully determined a calving difficulty score for each calf born and a summary of calving difficulty is presented in Table 2 for each year. The important information is the percentage of cows that calved unassisted, and of course, producers would like this to be 100%. This Angus herd consisted mostly of mature cows and nearly all had produced at least one calf prior to the start of this study. It was not necessary to assist any cows bred to Jersey bulls. There was slightly more calving difficulty (6% on the average) with Simmental sired calves than either the Brown Swiss or Hereford sired calves.

Calf Liveability

The number of calves that survived from conception to weaning is an important factor in determining income from a cow-calf operation.

Table 2. Calving Difficulty Summary for Crossbred Calves from Angus Cows.

Sire Breed	1973			1974		
	No. calves born	Live calves %	Percent calving unassisted	No. calves born	Live calves %	Percent calving unassisted
Hereford	49	93.8	91.8	42	100	100
Simmental	53	92.4	84.6	49	98	95.9
Brown Swiss	44	97.7	93.2	42	100	100
Jersey	43	100	100	42	100	100
Total	189	95.8	92.0	175	99.4	98.9

Good management will help keep death losses to a minimum, however, it is also important to know whether various breed crosses differ in their ability to survive under the management system being used. Data on the liveability of each crossbred group are presented in Table 3. The number of pregnant cows was determined by pregnancy examination in the fall following breeding season. Many factors are involved in determining whether a calf survives to weaning or not and the differences among crossbred groups in percentage of pregnant cows weaning calves is the combined effect of all of these factors. Increased stress on the calf during calving may account for some of the lower liveability experienced with the Simmental sired calves. Brown Swiss sired calves had the highest liveability both years and was 7.4% higher than Hereford sired calves. Some of the fairly high liveability of Jersey sired calves may be due to less stress on the calf during calving.

A random sample of Angus cows was exposed to each sire breed. Thus, differences in reproductive performance (% cows bred) would not be expected unless there were differences in bull fertility among sire breeds. It was not possible to make a valid comparison of bull fertility among sire breeds because some sire breeds involved artificial insemination while others did not.

Crossbred Calf Performance

Average performances for various traits to weaning age are presented in Table 4 for each crossbred group. Performances have been averaged over sexes and years. Since Hereford x Angus is a popular cross and most producers have a fairly good idea how calves from this cross will perform, average performances for the other crossbred groups have been compared to the Hereford x Angus calves on a percentage basis.

Simmental sired calves were 3.9 lbs. (5.1%) heavier at birth than the Hereford x Angus calves and would explain some of the slightly increased calving difficulty experienced with the Simmental sired calves.

Table 3. Liveability to Weaning of Crossbred Calves from Angus Cows.

Trait	Sire Breed			
	Hereford	Simmental	Brown Swiss	Jersey
No. pregnant cows[1]	93	106	86	86
No. calves born	91	102	86	85
No. live calves	88	97	85	84
Live calves from pregnant cows, %	94.6	91.5	98.8	97.7
No. calves weaned	85	93	85	82
Calves weaned from pregnant cows, %	91.4	87.7	98.8	95.3

[1] Based on pregnancy diagnosis following the breeding season.

Table 4. Average Performances of Crossbred Calves from Angus Cows.[1]

Trait	Sire Breed			
	Hereford	Simmental	Brown Swiss	Jersey
No. Calves	85	93	85	82
Birth weight, lbs.	75.1(100)[3]	79.0(105.1)[2]	76.1(101.3)[3]	62.6 (83.4)[4]
Preweaning ADG, lbs./day	1.85(100)[4]	2.00(108.1)[2]	1.92(103.8)[3]	1.76(95.1)[5]
205-day weaning weight, lbs.	473(100)[4]	506(107.0)[2]	489(103.4)[3]	438(92.6)[5]
Weaning conformation[6]	13.4(100)[3]	13.9(103.7)[2]	12.9 (96.3)[4]	11.5 (85.8)[5]
Weaning condition[7]	6.0 (100)[2]	5.5(91.7)[3]	5.3 (88.3)[3]	5.4 (90.0)[3]
Ratio of calf weaning wt. to cow wt.	.508(100)[4]	.558(109.8)[2]	.534(105.1)[3]	.477(93.9)[5]

[1] Values in parenthesis are the ratio of that crossbred average to the Hereford x Angus average on a percentage basis.
[2,3,4,5] Averages in the same row with different superscripts are significantly different at the .05 probability level or less.
[6] Conformation scores: 11=high good, 12=low choice, 13=average choice and 14= high choice.
[7] Condition scores range from 1 for very thin to 9 for very fat with 5 being an average level of fatness.

Birth weights were similar for Hereford and Brown Swiss sired calves while the Jersey sired calves were 12.5 lbs. (16.6%) lighter at birth.

Simmental sired calves and Brown Swiss sired calves gained .15 lb./day (8.1%) and .08 lb./day (3.8%) more rapidly from birth to weaning than the Hereford sired calves while the Jersey sired calves gained .09 lb./day (4.9%) less rapidly.

Because of a heavier birthweight and a more rapid rate of gain, Simmental sired calves were 33 lbs. (7%) heavier at weaning than the Hereford sired calves, while the Brown Swiss sired calves were 16 lb. (3.4%) heavier. The Jersey sired calves, due to the combined effect of lighter birthweight and less rapid gain, were 35 lb. (7.4%) lighter at weaning.

Simmental sired calves exhibited the most muscling and overall conformation, however, the Hereford and Brown Swiss sired calves also had quite acceptable quality as feeder calves with conformation being low to average choice. Jersey sired calves averaged high good in conformation mainly for lack of muscling in the hindquarters. The Hereford sired calves appeared to be a little fatter at weaning than calves from other crossbred groups.

The last trait shown in Table 4 is the average ratio of calf weaning weight to weight of the cow. Cow weight used in this calculation was the average of the cow's weight in April just prior to the start of the breeding season and her weight in the fall at weaning time. Larger values of calf weight to cow weight ratio indicate more efficient production on a per cow basis among cows weaning a calf. Since only Angus cows were used,

comparisons of this ratio among crossbred groups reflects primarily differences in average weaning weight. This ratio will be more useful to compare differences in production efficiency for crossbreeding systems involving different breeds of cows.

Profitability of Different Crossbred Calves

Income for a cow-calf operation is determined largely by the number of calves produced, calf weights and the quality of calf as it influences selling price. Table 5 compares the total income per pregnant cow expected from selling weaning age calves from Angus cows sired by Hereford, Simmental, Brown Swiss and Jersey bulls. Differences in calf survival (% calves weaned from pregnant cows) and average weaning weights were combined to determine the pounds of calf weaned per pregnant cow. Good liveability of calves and heavy weaning weights combine to give the Brown Swiss sired calves a 51 lb. (11.8%) advantage over the Hereford sired calves. Although Simmental sired calves were heaviest at weaning, their lower liveability resulted in only a 12 lb. (2.8%) advantage over Hereford sired calves. Easy calving perhaps contributed to high liveability for the Jersey sired calves and helped compensate for lower weaning weights to the extent that production per pregnant cow was only 15 lb. (3.5%) lower than for Hereford sired calves.

Selling price is the average price for steer and heifer calves typical of the January 1976 market. When these prices change or a producer believes other values to be more appropriate, sufficient data are presented so that producers can make their own economic comparisons based on whatever price structure they wish. The same selling price was used in this analysis for Hereford, Simmental and Brown Swiss sired calves

Table 5. Gross Income Per Cow from Sale of Weaning Age Crossbred Calves from Angus Cows.

Trait	Sire Breed			
	Hereford	Simmental	Brown Swiss	Jersey
Pounds of calf weaned per pregnant cow[1]	432 (100)	444 (102.8)	483 (111.8)	417 (96.5)
Selling price per lb.[2]	$0.33	$0.33	$0.33	$0.27
Gross income per pregnant cow[1]	$142.56 (100)	$146.52 (102.8)	$159.39 (111.8)	$112.59 (79.0)

[1] Values in parenthesis are the ratio of that crossbred average to the Hereford x Angus average on a percentage basis.
[2] Average price for steer and heifer calves based on January 1976 market ($0.37 and $0.29 for choice steers and heifers; $0.31 and $0.23 for good steers and heifers).

simply because they had conformation scores in the acceptable feeder calf grades of low to average choice. If a producer feels that these three crossbred groups would sell for different prices at the market he generally uses, comparisons can easily be made using whatever price differentials thought appropriate. Since the same price structure was used for Hereford, Simmental and Brown Swiss sired calves, comparisons in gross income are the same as for pounds of calf produced per pregnant cow. As long as the Brown Swiss sired calves can be sold for the same price as Hereford x Angus calves these data would suggest that total income would be increased by $16.83 (11.8%) by use of Brown Swiss bulls. In fact, in these data, use of Brown Swiss bulls would return the most money per cow so long as there were no more than three cents per pound discrimination in selling price for Brown Swiss sired calves. Total income per pregnant cow was quite similar for Hereford and Simmental sired calves. The very slight advantage of $3.96 (2.8%) in favor of Simmental sired calves could be easily offset by a one cent per pound premium for Hereford x Angus calves or the added risk of calving difficulty from Simmental sired calves. Jersey sired calves were hardly competitive as income producers and should be seriously considered by the producer only under special circumstances like when there is particular concern about calving difficulty in first calf heifers or when Jersey cross heifers are desired for addition to the cow herd.

Effects of Winter Supplement Level on Roughage Intake and Digestibility of Three Breeds of Cows in Drylot[1]

K. S. Lusby, D. F. Stephens, Leon Knori and Robert Totusek

Story in Brief

Thirty-five lactating 4-year-old Hereford, Hereford x Holstein (Crossbred) and Holstein cows maintained in drylot and individually fed were

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