

difficulty is probably more closely related to calf birth weight in relation to dam weight than to calf birth weight alone. Percent calving difficulty is the percentage of births requiring assistance from the herdsman. Calving scores of 3 or higher were classified as difficult births based on a scoring system ranging from 1 = no assistance to 5 = caesarian birth or abnormal presentation. Due to the substantially higher incidence of calving difficulty in 1978 over 1979 (11.3 percent vs. 6.4 percent), means are presented separately for the two years. The cows being a year older in 1979 likely accounted for the decrease in percentage of difficult births from the previous year. The means for the 2 years are averaged for comparison purposes. Calving difficulty averaged 8.9 percent across all crossbred cow groups. Simmental cross and Hereford-Angus cows required the most calving assistance (13.5 percent) followed by Angus-Hereford, Brown Swiss cross and Jersey-Hereford cows (6.7 percent). Only 3.7 percent of the Jersey-Angus cows required assistance calving.

### Literature Cited

- Belcher, C. G., R. R. Frahm, L. W. Knori and E. N. Bennett. 1978. Okla. Agr. Exp. Sta. Res. Rep. MP-103:105.
- Frahm, R. R., C. G. Belcher; L. Knori and E. N. Bennett. 1979. Okla. Agr. Exp. Sta. Res. Rep. MP-104:125.

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## Productivity Comparisons Among Various Two-Breed Cross Cow Groups

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### Story in Brief

Productivity was measured on eight different two-breed cross cow groups (Hereford-Angus, Angus-Hereford, Simmental-Angus, Simmental-Hereford, Brown Swiss-Angus, Brown Swiss-Hereford, Jersey-Angus and Jersey-Hereford) when mated to Charolais and Limousin bulls. Preweaning performance was analyzed on the three-breed cross calves produced by 404 cows in 1978 and 390 cows in 1979.

Brown Swiss cross and Simmental-Angus cows produced calves that were 67 lb (12.3 percent) heavier and Simmental-Hereford and Jersey cross cows produced calves 34 lb (7.2 percent) heavier at weaning than reciprocal Hereford-Angus cows. Conformation scores were average choice or higher for calves from all crossbred cow groups.

Herd productivity, measured as pounds of calf weaned per cow exposed to breeding, was similar for Simmental cross and reciprocal Hereford-Angus cows. Productivity was highest for Brown Swiss-Angus cows, exceeding that of reciprocal Hereford-Angus cows by 20.9 percent. Jersey cross and Brown Swiss-Hereford cows were more productive than reciprocal Hereford-Angus cows by 10.9 and 4.9 percent, respectively.

Cow efficiency, measured as the ratio of calf weaning weight to cow metabolic size, favored Jersey cross cows over reciprocal Hereford-Angus cows by 16.7 percent. Brown

Swiss cross and Simmental cross cows were more efficient than reciprocal Hereford-Angus cows by 9.4 and 4.0 percent, respectively.

## Introduction

Increasingly, crossbreeding is being utilized to increase efficiency in beef production. Considerable research has indicated planned crossbreeding systems can result in an increase in herd productivity of 20 to 25 percent. Over half of this increased productivity results from using crossbred cows. Consequently, an extensive research program is in progress at the Oklahoma Agricultural Research Station to compare lifetime productivity of various two-breed cross cows when mated to bulls of a third breed. The purpose of this study was to compare productivity of various two-breed cross cows when mated to Charolais and Limousin bulls.

## Experimental Procedures

Eight different two-breed cross cow groups (Hereford-Angus, Angus-Hereford, Simmental-Angus, Simmental-Hereford, Brown Swiss-Angus, Brown Swiss-Hereford, Jersey-Angus and Jersey-Hereford) were mated to Charolais and Limousin bulls to produce calves in the spring of 1978 and 1979. Eight different Limousin bulls were used each year and a total of 13 Charolais bulls were used over the two years, three of them being used both years. In 1978 the herd consisted of 404 three-, four- and five-year-old cows, and in 1979 the herd consisted of 390 four-, five- and six-year-old cows.

Cows were managed on native and bermudagrass pasture at the Lake Carl Blackwell Research Range west of Stillwater, with the exception of 35 cows maintained in drylot at the Southwestern Livestock and Forage Research Station at El Reno for the 1978 calf crop. Cows were exposed to breeding from May 1 to July 15 each year; thus, calves were born primarily in February and March. Calves remained with their dams without creep feed until weaning in the fall at an average age of 205 days.

All traits were analyzed by general least squares procedures. Production traits presented for each crossbred cow group have been adjusted for all significant main effects and two-factor interactions, as appropriate, based on preliminary analyses.

## Results and Discussion

Performance to weaning for the three-breed cross calves produced by each crossbred cow group are presented in Table 1. For ease of comparison, averages for each crossbred cow group are presented in actual units and also as a percentage of the average performance of the Hereford-Angus reciprocal crosses. Calves from Hereford-Angus reciprocal cross cows averaged 1.85 lb/day from birth to weaning. Higher levels of lactation achieved by Simmental, Brown Swiss and Jersey cross cows (Belcher *et al.*, 1980) resulted in 6.7 to 12.7 percent more rapid calf growth from birth to weaning. Most rapid gain was achieved by calves from Brown Swiss-Angus, Simmental-Angus and Brown Swiss-Hereford cows (averaged 2.06 lb/day). Calves from Jersey cross and Simmental-Hereford cows gained slightly less rapidly (averaged 1.99 lb/day).

The average 205-day weaning weight for all calves (averaged over two years and both sexes) was 500 lb. The more rapid preweaning growth rate of calves from Simmental, Brown Swiss and Jersey cross cows resulted in weaning weights ranging from 5.8 to 13.1 percent heavier at weaning time than the calves from reciprocal Hereford-Angus cross cows, which averaged 466 lb. Heavier birth weights also contributed to the heavier weaning weights of calves from Brown Swiss cross and Simmental cross cows. Calves from Brown Swiss-Angus, Simmental-Angus and Brown Swiss-Hereford cows were heaviest at weaning, averaging 523 lb (67 lb heavier than

**Table 1. Performance to weaning of calves produced by two-breed cross cows mated to Charolais and Limousin bulls<sup>1</sup>**

Crossbred cow group	No. calves	Prewaning ADG		205-day weaning weight <sup>2</sup>		Weaning score	
		lb/day	%HA,AH	lb	%HA,AH	conformation <sup>3</sup>	condition <sup>4</sup>
Hereford-Angus	66	1.82 <sup>d</sup>	98.1	462 <sup>e</sup>	99.1	13.7 <sup>c</sup>	5.1
Angus-Hereford	69	1.89 <sup>d</sup>	101.9	470 <sup>e</sup>	100.9	13.8 <sup>bc</sup>	5.1
Simmental-Angus	79	2.06 <sup>ab</sup>	111.1	523 <sup>a</sup>	112.2	14.2 <sup>a</sup>	5.2
Simmental-Hereford	56	2.01 <sup>bc</sup>	108.4	508 <sup>bc</sup>	109.0	14.0 <sup>b</sup>	5.1
Brown Swiss-Angus	70	2.09 <sup>a</sup>	112.7	527 <sup>a</sup>	113.1	13.9 <sup>bc</sup>	5.0
Brown Swiss-Hereford	59	2.04 <sup>abc</sup>	110.0	520 <sup>ab</sup>	111.6	14.0 <sup>b</sup>	5.0
Jersey-Angus	87	1.98 <sup>c</sup>	106.7	493 <sup>d</sup>	105.8	13.4 <sup>d</sup>	5.1
Jersey-Hereford	85	1.98 <sup>c</sup>	106.7	498 <sup>cd</sup>	106.9	13.5 <sup>d</sup>	5.1
Total or average	571	1.98	—	500	—	13.8	5.1

<sup>1</sup>Crossbred cow group means are presented in actual units and, for ease of comparison, are also presented as a percentage of the average performance of the reciprocal Hereford-Angus crosses.

<sup>2</sup>Weaning weights adjusted for age of dam and averaged over sexes.

<sup>3</sup>Conformation score: 13= average choice and 14= high choice.

<sup>4</sup>Condition score: 1= very thin to 5= average to 9= very fat; differences among crossbred cow groups were not significant.

a,b,c,d,e,f Means in a column that do not share at least one common superscript are significantly different at the .05 probability level.

**Table 2. Herd productivity, cow weights and measures of cow efficiency<sup>1</sup>**

Crossbred cow group	Lbs of calf weaned per cow exposed		Avg cow weight <sup>2</sup>		Calf wn wt ÷ cow wt		Calf wn wt ÷ cow metabolic wt <sup>3</sup>	
	lbs	%HA,AH	lbs	%HA,AH	ratio	%HA,AH	ratio	%HA,AH
Hereford-Angus	361	104.9	929 <sup>cd</sup>	101.6	.488 <sup>f</sup>	97.6	2.69 <sup>f</sup>	98.0
Angus-Hereford	327	95.1	900 <sup>d</sup>	98.4	.512 <sup>de</sup>	102.4	2.80 <sup>de</sup>	102.0
Simmental-Angus	350	101.7	964 <sup>ab</sup>	105.4	.524 <sup>cd</sup>	104.8	2.91 <sup>cd</sup>	106.0
Simmental-Hereford	343	99.7	990 <sup>a</sup>	108.3	.500 <sup>ef</sup>	100.0	2.80 <sup>e</sup>	102.0
Brown Swiss-Angus	416	120.9	932 <sup>c</sup>	101.9	.550 <sup>b</sup>	110.0	3.04 <sup>b</sup>	110.7
Brown Swiss-Hereford	361	104.9	943 <sup>bc</sup>	103.1	.538 <sup>bc</sup>	107.6	2.97 <sup>bc</sup>	108.2
Jersey-Angus	387	112.5	795 <sup>e</sup>	86.9	.606 <sup>a</sup>	121.2	3.21 <sup>a</sup>	116.9
Jersey-Hereford	376	109.3	797 <sup>e</sup>	87.2	.603 <sup>a</sup>	120.6	3.20 <sup>a</sup>	116.6
Average	365	—	906	—	.540	—	2.95	—

<sup>1</sup>Crossbred cow group means are presented in actual units and, for ease of comparison, are also presented as a percentage of the average performance of the reciprocal Hereford-Angus crosses.

<sup>2</sup>Average of spring weights after calving and prior to breeding and fall weight after weaning.

<sup>3</sup>Metabolic cow weight equals cow weight raised to the .75 power.

a,b,c,d,e,f Means in the same column that do not share at least one common superscript are slightly different at the .05 probability level.

calves from reciprocal Hereford-Angus cows). Weaning weights of calves from Simmental-Hereford and Jersey cross cows averaged 34 lb heavier than calves from reciprocal Hereford-Angus cows.

In spite of the great diversity among crossbred cow groups, overall, the calves were very uniform and had acceptable conformation. Differences among crossbred cow groups, although significant, were not large (ranging from average to low choice). Apparently, Charolais and Limousin bulls are able to compensate for lack of muscling in some crossbred cow groups and produce growthy calves with adequate conformation to make them desirable as feeder cattle. Condition scores were similar for calves from all crossbred cow groups.

Cow weights, herd productivity and cow efficiency are presented in Table 2. Comparisons among crossbred cow groups in total productivity for the breeding herd were made by combining the percentage of cows exposed to breeding that weaned calves with the respective weaning weights to obtain pounds of calf weaned per cow exposed in the breeding herd. There was a rather large, unexpected and unexplainable difference of 34 lb in productivity of reciprocal Hereford-Angus crosses. In spite of this sizable difference, reciprocal Hereford-Angus crosses were averaged for purposes of comparison with other crossbred groups. On this basis the Simmental crosses and reciprocal Hereford-Angus crosses had similar productivity per cow exposed to breeding (averaged 345 lb). Herd productivity was highest for Brown Swiss-Angus, exceeding reciprocal Hereford-Angus cows by 20.9 percent. Jersey cross and Brown Swiss-Hereford cows were more productive than reciprocal Hereford-Angus cows by 10.9 and 4.9 percent, respectively.

Cow weights are the average of spring weight after calving and prior to breeding and fall weight after weaning. Thus, only cows weaning a calf are included in the calculation of cow weights. Average cow weights were lightest for Jersey cross cows (796 lb) followed by Brown Swiss cross and reciprocal Hereford-Angus cows (averaged 926 lb). Simmental cross cows were heaviest at 977 lb. Since these cow weights are the average of 1978 (based on 3-, 4- and 5-year-old cows) and 1979 (based on 4-, 5- and 6-year-old cows), mature weights for each crossbred cow group will likely be heavier than these values.

Larger cows require more feed for body maintenance, and, thus, need to wean larger calves in order to be competitive with smaller cows in efficiency of production. Two different measures of cow efficiency are presented in Table 2. Both measures rank the crossbred cow groups in exactly the same order.

One measure of cow efficiency is the ratio of calf weaning weight to cow weight. Larger ratios are indicative of more efficient cows. On this basis, Jersey cross cows were most efficient, weaning calves 60.4 percent of their body weight followed by Brown Swiss cross cows that weaned calves 54.6 percent of their body weight. Simmental cross and reciprocal Hereford-Angus cross cows were similar and weaned calves 50.6 percent of their body weight on the average.

Nutritional requirements to maintain a cow of a particular size depend upon the metabolic body size of the animal, which can be estimated as the animal's weight taken to the 0.75 power. Since differences in feed requirements among crossbred cow groups should be estimated with more precision when based on metabolic cow size, the ratio of calf weaning weight to cow metabolic body weight was calculated as a second measure of cow efficiency. On this basis, Jersey cross cows were most efficient (16.7 percent more efficient than Hereford-Angus crosses). Brown Swiss cross and Simmental cross cows were 9.4 and 4.0 percent more efficient than reciprocal Hereford-Angus cows.

These data suggest some relatively large differences in herd productivity among crossbred cows approaching maturity. These differences in herd productivity and

measures of cow efficiency are similar to what was obtained when these cows were younger (Belcher *et al.*, 1978; Frahm *et al.*, 1979, for productivity of 2- and 3-year-old cows, respectively).

### Literature Cited

- Belcher, C. G., R. R. Frahm, L. W. Knori and E. N. Bennett. 1978. Okla. Agr. Exp. Sta. Res. Rep. MP-103:105.
- Belcher, C. G., R. R. Frahm, D. R. Belcher and E. N. Bennett. 1980. Okla. Agr. Exp. Sta. Res. Rep. MP-107:6.
- Frahm, R. R., C. G. Belcher, L. Knori and E. N. Bennett. 1979. Okla. Agr. Exp. Sta. Res. Rep. MP-104:125.
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# Performance to Weaning of Three-Breed Cross Calves Sired by Charolais and Limousin Bulls

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## Story in Brief

Various two-breed cross cow groups were mated to Charolais and Limousin bulls to produce a total of 574 three-breed cross calves over a two-year period. Average birth weights were 81.2 lb and 76.2 lb for calves produced from Charolais and Limousin sires, respectively. Calving assistance was required for 12.4 percent of Charolais-sired calves and 4.0 percent of the Limousin-sired calves. Charolais-sired calves outgained Limousin-sired calves by .11 lb/day from birth to weaning (2.04 vs. 1.93 lb/day) and were 29 lb heavier at weaning (515 vs. 486 lb). At weaning, calves from both sire breeds were very uniform and had quite acceptable conformation scores.

## Introduction

Previous research has well established that systematic crossbreeding can substantially increase efficiency of beef production. An extensive research program is in progress at the Oklahoma Agricultural Experiment Station to evaluate lifetime productivity of various two-breed cross cows when mated to bulls of a third breed. The breed of sire used in this type of system is important to produce growthy, efficient three-breed cross calves which will perform adequately in the feedlot and have desirable carcasses. The purpose of this study was to compare the performance to weaning of three-breed cross calves sired by Charolais and Limousin bulls.

## Experimental Procedure

Charolais and Limousin bulls were mated to eight different crossbred cow groups (Hereford x Angus, Angus x Hereford, Simmental x Angus, Simmental x Hereford,