



Crossbreeding Beef Cattle, III

R.R. Frahm
Professor, Animal Science

British X British Crosses

The British beef breeds of major importance in this country are Angus, Hereford, and Shorthorn. Since their initial importation into this country, during the 1800s, these breeds have been selected for many of the same objectives. They differ greatly in appearance and can readily be identified by color, presence or absence of horns, conformation, behavior, etc. On the other hand, they are very similar in production traits such as growth, muscling, fat content, quality, and yield grade. This similarity in production limits the response to crossbreeding in these highly heritable traits (carcass and growth traits) but has no effect on the hybrid vigor response in maternal traits. Experiment stations in several states have had studies conducted for evaluating crossbreeding among Angus, Hereford, and Shorthorn cattle. Results from these states have differed slightly but they have all followed the same trend. This fact sheet is written to summarize the results from several states concerning the average responses measured for various production traits in crosses of Angus, Hereford, and Shorthorn cattle. Please keep in mind that these responses are averages and may not represent absolute responses observed in a specific herd.

These data are presented as ratios. Ratios different from 100 indicate that percent increase or decrease compared to the control in performance for that trait. For example, a ratio of 105 for weaning weight would mean a 5% increase in weaning weight over the control. If the control would normally have a 500 pound weaning weight under a given management condition or environment, then we would expect an increase of 25 pounds.

Heterosis is the correct name for the phenomenon that causes crossbred individuals to have an increased level of performance for certain traits over and above the average performance of their straightbred parents. Heterosis does not necessarily imply that the crossbred progeny will have increased performance over the most superior of the two straightbred parents.

Crossbreeding Definitions

There are a few terms commonly used in reference to crossbreeding which should be identified.

1. Crossbreeding—mating of two different breeds.
2. Two breed cross—mating of two different purebreds, also called an F1
3. Three breed cross—result of mating an F1 parent to a male of an unrelated breed.
4. Backcross—mating of an F1 parent back on one of the parent breeds.

Oklahoma Cooperative Extension Fact Sheets are also available on our website at:
<http://osufacts.okstate.edu>

Responses to Crossbreeding

Table 1 summarizes the influence crossbreeding has upon number of calves born, number of calves weaned, and the average weaning weight of calves weaned. These data indicate that straightbred Angus, Hereford, or Shorthorn cows bred to a bull of a different breed (Angus, Hereford, or Shorthorn) so as to produce a crossbred calf respond with only a slight increase in number of calves born (about 1%) but there is a 4% increase in number of calves weaned and they wean off at about 5% heavier than straightbred calves under the same management. The increase in numbers of calves born (4%) and weaned (4%) when crossbred is due to a greater liveability of the crossbred calf as compared to straightbred calves. Greater liveability of crossbred calves becomes obvious within the first week to ten days after birth. The crossbred calf, compared to a straightbred, is more hardy and aggressive. They stand, nurse earlier and are more resistant to the calfhood stresses such as chill and scours. Advantages of more aggressiveness also contributes to the increase in weaning weights of crossbred calves. Crossbred calves appear to stimulate the cow more than straightbred calves by more frequent and longer nursing. This leads to an increase in milk flow, which has the net result of heavier weaning weights.

Even larger advantages are seen for crossbreeding when the crossbred cow is used to produce backcross (mated back to one of the parent breeds) or three-bred cross calf (mated to a third breed of bull). These data are also presented in Table 1. Crossbred cows are more fertile than straightbred cows in that they have a greater percentage conceive to first service, they return to heat sooner after calving (under good

Table 1. Effects of crossbreeding Angus, Hereford, and Shorthorn cattle upon reproductive performance.

Breeding of Cow	Breeding of Calf	Calves Born	Calves Weaned	Weaning Weight
Straightbred	Straightbred	100	100	100
Straightbred	Crossbred	101	104	105
Crossbred	Crossbred	106	108	110

Source: JAS 30:694

management), and there is a greater survival of the embryo prior to birth. All of these advantages result into about a 6% increase in number of calves born over a straightbred cow. Again, the greater liveability of crossbred calves is present and it appears that threebreed cross calves have greater liveability than do twobreed crosses (about 2%); however, it is not as great as the advantage two breed crosses have over straightbred (about 4%). The crossbred cow also seems to be capable of responding to the heavy stimulation of crossbred calves and responds by giving additional milk. This results in heavier weaning weights of about 5% over two-breed cross calves and 10% over straightbred calves.

When the responses to crossbreeding are accumulated, 15 to 20% more pounds of calf can be weaned from crossbred cows producing three-breed cross calves than straightbred cows producing straightbred calves. A more dramatic way of viewing this is to realize that 80 to 85 crossbred cows can be expected to wean the same pound of calf as 100 straightbred cows.

Although most producers would agree that differences do exist between Hereford, Angus, and Shorthorn cattle in postweaning performance, these differences are not large. Table 2 illustrates the responses expected in gain, yield, and quality grade subsequent to crossbreeding.

Only a small response in heterosis for gain and yield grade (2%) occurs in two breed cross calves and there is no additional response in three breed cross calves. For all practical purposes, there is little if any, heterosis shown for quality grade in either two or three breed crosses.

Table 2. Effects of crossbreeding Angus, Hereford, and Shorthorn cattle upon post-weaning traits.

Breeding of Cow	Breeding of Calf	Post-weaning Gain	Yield Grade	Quality Grade
Straightbred	Straightbred	100	100	100
Straightbred	Crossbred	102	102	100
Crossbred	Crossbred	102	102	100

Source: JAS 25:311

The reason only a small amount of heterosis is observed in post-weaning traits is simply that these three breeds (Angus, Hereford, and Shorthorn) are so similar in genetic control of these highly heritable traits. In contrast significant responses in these traits would be expected if either Hereford, Angus, or Shorthorn cows were bred to a breed of bull vastly superior in muscling and gaining ability.

Cross breeding also seems to increase mature size (Table 3). This greater mature size of crossbred cows is not without confusion. Some researchers do not believe that crossbred cows are actually larger at final maturity, but merely reach maturity earlier and therefore reach heavier weights earlier in life. It is known that crossbreeding does enhance both sexual and physical maturity. Also, crossbred cows could be heavier because of superior adaptability to environmental conditions. In summary, crossing British beef breeds will combine desired characteristics of Angus, Hereford, and Shorthorn, but the major benefit will be accrued throughout the cumulative effects of heterosis on fertility, maternal ability, and growth rate. It appears conservatively to conclude that production of a commercial producer could be increased 15 to 20% by systematic crossing of British breeds. More than half of this advantage is dependent upon the use of the crossbred cow.

Three breed crosses yield more production than a two-breed cross or back cross. Also, heterosis is slightly greater between Hereford-Angus crosses and Hereford-Shorthorn crosses than Angus-Shorthorn crosses. This suggests a greater similarity in genetic makeup between Angus and Shorthorn cattle than either with Hereford.

Table 3. Effects of crossbreeding Angus, Hereford, and Shorthorn cattle upon mature body size.

Breeding of Cow	Mature Size
Straightbred	100
Crossbred	105

Oklahoma State University, in compliance with Title VI and VII of the Civil Rights Act of 1964, Executive Order 11246 as amended, Title IX of the Education Amendments of 1972, Americans with Disabilities Act of 1990, and other federal laws and regulations, does not discriminate on the basis of race, color, national origin, gender, age, religion, disability, or status as a veteran in any of its policies, practices, or procedures. This includes but is not limited to admissions, employment, financial aid, and educational services.

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 0704