

A Closer Look At Crossbreeding

Beef cattle breeding herds A and B are similar in type, size, and management. Yet, at weaning time herd A produces 23 percent more pounds of calf per cow exposed to breeding.

The difference is that a well-planned system of crossbreeding is used in herd A, while herd B produces straightbreds of a single breed.

The herds are fictitious, but the potential advantage of crossbreeding is real, as indicated by long-term studies at the U.S. Meat Animal Research Center, Clay Center, Neb., in cooperation with the Nebraska Agricultural Experiment Station, Lincoln.

Crossbreeding can take advantage of heterosis or hybrid vigor, the response in an animal from the cross of parents carrying many unlike genes. The studies were initiated at Fort Robinson, Neb., in 1957 to determine the influence of

heterosis on economic traits in beef cattle over four generations of systematic crossbreeding.

Overall, the effects of heterosis significantly reduced the age when heifers reached puberty, reduced the interval from calving to first estrus, and advanced the average date of conception. Additional heterosis effects included these increases: in first-service conception rate, number of conceptions per service, pregnancy rate, percentage calf crop and weight of calf weaned per cow exposed to bulls in the breeding herd.

The first phase of the study compared straightbred Hereford, Angus, and Shorthorn calves with all possible crosses involving the three breeds. The effects of heterosis—the difference between averages of parent straightbreds and crossbreds—included a three percent increase in percentage of calves weaned and a 19.4 pound boost in

average weaning weight of calves at 200 days. An even more meaningful effect, reflecting the combined responses in reproduction, survival, and growth rate in crossbreds, is the average of 28.8 pounds or 8.5 percent, in average weaning weight per cow in the breeding herd.

The crossbred steers gained 2.9 percent more than straightbred steers in the feedlot and produced trimmed-boneless beef that netted \$8.81, or 4.2 percent, more per head over feed costs. Differences in feed efficiency and carcass composition were small.

Heifers from the first phase of the study were retained by geneticists Larry V. Cundiff, Keith E. Gregory, and Robert M. Koch for the second part of the study. Phase II involved 570 matings of straightbred cows and 687 matings of crossbred cows over six breeding seasons. Approximately half of the females were managed for calving as 2-year-olds and half as 3-year-olds.

Researchers determined the influence of heterosis as the difference between reciprocal crossbred females when both were mated to bulls of a third

breed. For example, females sired by Hereford bulls out of Angus cows and the reciprocal cross, females sired by Angus bulls out of Hereford cows, were compared with straightbred Hereford and Angus females when all were mated to the same Shorthorn bulls.

In Phase II, an increase of 50.8 pounds, or 14.8 percent, in weight of calves at weaning per cow exposed to breeding was attributed to the effects of heterosis. The calf crop weaned in Phase II was 6.4 percent more for crossbred than for straightbred cows because of higher pregnancy rates and first-service conception rates in the crossbreds. Crossbred cows also produced significantly more milk than straightbreds, as reflected in 4.3 percent heavier calf weights.

The cumulative influence in heterosis is the sum of individual heterosis in Phase I and maternal heterosis in Phase II. The 8.5 percent advantage in weight of calf weaned per cow exposed to breeding in Phase I plus the 14.8 percent advantage in Phase II combined to yield a cumulative advantage for crossbreds of more than 23

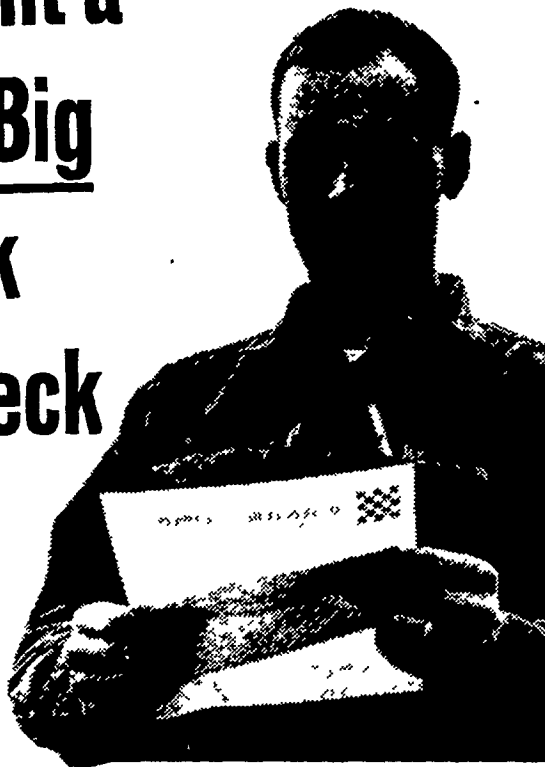
percent, or almost 79 pounds, in the study.

Differences in management significantly influenced heterosis effects in the first calf crop. Under management for first calving as 3-year-olds, the effects on percentages of calves alive at birth and at 2 weeks were significantly greater than under management for first calving as 2-year-olds. Differences between the two groups were small in sub-

sequent calving seasons as the cows advanced in age. Management for first calving as 2-year-olds therefore has the potential advantage of adding one calf to the cow's lifetime production.

The third phase of the experiment is comparing three systems of crossbreeding for commercial beef production, along with lines of the Hereford, Angus, and Shorthorn breeds.

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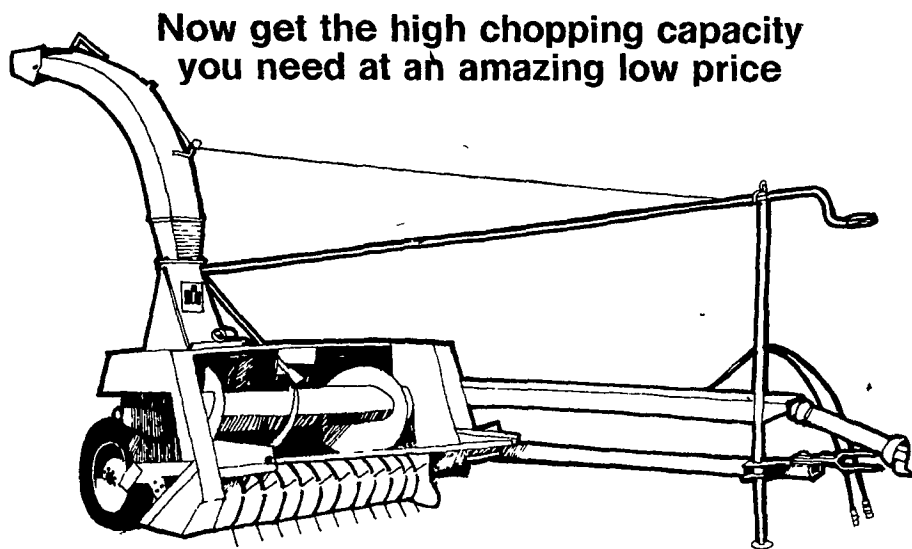
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