

# Considering Crossbreeding?

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High calf and feeder cattle prices during the past couple of years have helped many of Missouri's cow-calf producers achieve profitability. Even though many cattle producer's operations are profitable, work should continue to improve the economic position of the farm or ranch. Profitability may be enhanced by increasing the volume of production (i.e. the pounds of calves you market) and/or the value of products you sell (improving quality). The reduction of production costs, and thus breakeven prices, can also improve profitability. For commercial beef producers, the implementation of technologies and breeding systems that increase the quality and volume of production and reduce input costs is essential to maintain or improve the competitive position of the operation. More and more producers are finding that a structured crossbreeding system helps them achieve the goals increasing productivity and reducing production costs.

## *Why crossbreed?*

The use of crossbreeding offers two distinct and important advantages over the use of a single breed. First, crossbred animals have heterosis or hybrid vigor. Second, crossbred animals combine the strengths of the parent breeds. The term 'breed complementarity' is often used to describe breed combinations that produce highly desirable progeny for a broad range of traits.

## *What is heterosis?*

Heterosis refers to the superiority of the crossbred animal relative to the average of its straight bred parents. Heterosis results from the increase in the heterozygosity of a crossbred animal's genetic makeup. Heterozygosity refers to a state where an animal has two different forms of a gene. It is believed that heterosis is the result of gene dominance and the recovery from accumulated inbreeding depression of pure breeds. Heterosis is, therefore, dependant on an animal having two different copies of a gene. The level of heterozygosity an animal has depends on the random inheritance of copies of genes from its parents. In general, animals that are crosses of unrelated breeds, such as Angus and Brahman, exhibit higher levels of heterosis, due to more heterozygosity, than do crosses of more genetically similar breeds such as a cross of Angus and Hereford.

Heterosis generates the largest improvement in lowly heritable traits. Moderate improvements due to heterosis are seen in moderately heritable traits. Little or no heterosis is observed in highly heritable traits. Heritability is the proportion of the observable variation in a trait between animals that is due to the genetics that are passed between generations and the variation observed in the animal's phenotypes, which are the result of genetic and environmental effects. Traits such as reproduction and longevity have low heritability. These traits respond very slowly to selection since a large portion of the variation observed in them is due to environmental factors and a small percentage is due to genetic differences. Heterosis generated through crossbreeding can significantly improve an animal's performance for lowly heritable traits. Crossbreeding has been shown to be an efficient method to improve reproductive efficiency and productivity in beef cattle.

Improvements in cow-calf production due to heterosis are attributable to having both a crossbred cow and a crossbred calf. The two tables below detail the individual (crossbred calf) and maternal (crossbred cow) heterosis observed for various important production traits. These heterosis estimates are adapted from a report by Cundiff and Gregory, 1999, and summarize crossbreeding experiments conducted in the South-eastern and Mid-west areas of the US.

#### Individual Heterosis

<u>Trait</u>	<u>Units</u>	<u>% Heterosis</u>
Calving Rate, %	3.2	4.4
Survival to Weaning, %	1.4	1.9
Birth Weight, lb.	1.7	2.4
Weaning Weight, lb.	16.3	3.9
Yearling Weight, lb.	29.1	3.8
Average Daily Gain, lb./d	0.08	2.6

#### Maternal Heterosis

<u>Trait</u>	<u>Units</u>	<u>% Heterosis</u>
Calving Rate, %	3.5	3.7
Survival to Weaning, %	0.8	1.5
Birth Weight, lb.	1.6	1.8
Weaning Weight, lb.	18.0	3.9
Longevity, years	1.36	16.2

#### *Lifetime Productivity*

Number of Calves	.97	17.0
Cumulative Weaning Wt., lb.	600	25.3

#### *Why is it so important to have crossbred cows?*

The production of crossbred calves yields advantages in both heterosis and the blending of desirable traits from two or more breeds. However, the largest economic benefit of crossbreeding to commercial producers comes from having crossbred cows. Maternal heterosis improves both the environment a cow provides for her calf as well as improves the longevity and durability of the cow. The improvement of the maternal environment a cow provides for her calf is manifested in the improvements in calf survivability to weaning and increased weaning weight. Crossbred cows exhibit improvements in calving rate of nearly 4% and an increase in longevity of more than one year due to heterotic effects. Heterosis results in increases in lifetime productivity of approximately one calf and 600 pounds of calf weaning weight over the lifetime of the cow. Crossbreeding can have positive effects on a ranch's bottom line by not only increasing the quality and gross pay weight of calves produced but also by increasing the durability and productivity of the cow factory. Crossbred cows maybe the only free lunch in the world.

*How can I harness the power of breed complementarity?*

Breed complementarity is the effect of combining breeds that have different strengths. When considering crossbreeding from the standpoint of producing replacement females, one could select breeds that have complementary maternal traits such that females are most ideally matched to their production environment. Matings to produce calves for market should focus on complementing the traits of the cows and fine tuning calf performance (growth and carcass traits) to the market place.

There is an abundance of research that describes the core competencies (biological type) of many of today's commonly used beef breeds. Traits are typically combined into groupings such as maternal/reproduction, growth and carcass. When selecting animals for a crossbreeding system, their breed should be your first consideration. What breeds you select for inclusion in your mating program will be dependant on a number of factors including the current breed composition of your cow herd, your forage and production environment, your replacement female development system, and your calf marketing endpoint. All of these factors help determine the relative importance of traits for each production phase.

*What are the keys to successful crossbreeding programs?*

Many of the challenges that have been associated with crossbreeding systems in the past are the result of undisciplined implementation of the system. With that in mind, one should be cautious to select a mating system that matches the amount of labor and expertise available to appropriately implement the system. Crossbreeding systems range in complexity from very simple programs such as the use of hybrid genetics, which are as easy as straight breeding, to elaborate rotational crossbreeding systems with four or more breed inputs. The biggest keys to success are the thoughtful construction of a plan and the sticking to it! Be sure to set attainable goals. Discipline is essential.

Should you need more information or advice on the merits of various breeds, their usefulness in crossbreeding systems, or the planning and construction of effective mating programs, please contact your regional livestock specialist. You may also contact me directly at my office: S134A Animal Sciences Research Center, University of Missouri, Columbia, MO 65211. I can be reached by phone at 573-882-5479; email: WeaberR@missouri.edu.

*Literature cited:*

Cundiff, L. V., and K. E. Gregory. 1999. What is systematic crossbreeding? Paper presented at Cattlemen's College, 1999 Cattle Industry Annual Meeting and Trade Show, National Cattlemen's Beef Association. Charlotte, North Carolina, February 11, 1999.