



Many commercial cow-calf operators enhance the profitability of their operations through thoughtful application of heterosis and breed complementarity made available through crossbreeding.

Since 1960, the Red Angus Association of America has promoted planned crossbreeding systems as a tool for sustainable and profitable commercial beef production. Red Angus' balance of economically relevant traits makes it a flexible, user-friendly component of any crossbreeding plan.

Today, Red Angus breeders fulfill this commitment by offering the beef industry's best objectively described seedstock and marketing programs designed to add value to their customers' calves. This profit-boosting combination has earned Red Angus the reputation as **The Common Denominator** in crossbreeding programs all across the country!

Crossbreeding Basics

#### **Merit of Component Breeds and Breed Complementarity**

For a planned crossbreeding system to be effective, careful consideration should be given to the breeds that will be used. No matter the system, animals with appropriate breed merit used in a crossbreeding system will always outperform one that does not give this proper consideration.

Breed complementarity occurs from combining the desirable characteristics of two or more genetically different breeds to achieve a higher frequency of desired genes among the crossbreds.

Different breeds excel in different traits. British breeds are traditionally categorized as maternal, efficient cattle that produce high quality carcasses. Continental cattle are known for producing lean carcasses with high red meat yield, while Zebu breeds can offer heat tolerance and increased insect resistance.

Breed differences exist in traits such as:

Growth Rate • Carcass Composition • Age at Puberty • Mature Size • Calving Difficulty • Milk Production

The "ideal cow herd" and breeding program varies depending on geography, production constraints and market goals. Once you have analyzed these aspects of your operation, you can design and implement a breeding program that will help you achieve your production goals.



Heterosis (hybrid vigor) results from an increase in the gene combination value of crossbred animals. Heterosis is defined as the percent of superiority expressed in a trait by crossbred progeny over the average of the parents used in the cross.

Percent heterosis is calculated by the following formula:

### <u>Crossbred Avg. - Straightbred Avg.</u> x 100 = % Heterosis Straightbred Avg.

Crossbreeding Basics

Example: Two parent breeds have weaning weight averages of 550 and 450 lb., respectively. Their expected progeny average would be 500 lbs. Yet, their crossbred progeny averaged 550 lb. The percent of heterosis would be determined as follows:

<u>550-525</u> 525 x 100 = 4.8%

#### **Heterosis and Heritability**

The degree of heterosis varies between traits and follows a general rule that it tends to be inversely proportional to that trait's heritability. In moderate to highly heritable traits, such as carcass composition, the level of heterosis is low, while traits of low heritability such as calving rate and weaning rate have higher levels of heterosis. Table 1 shows that heterosis obtained through crossbreeding is a powerful tool for increasing performance in traits with low heritabilities.

Table 1. Heritability and Heterosis Estimates for Some Economically Important Traits.		
Trait	Heritabilityª	Total heterosis <sup>b</sup> (%)
Calving rate	.0217	6
Calf survival to weaning	.1015	4
Weaning rate	.17	8
Birth weight direct	.31	6
Weaning weight direct	.24	11
Milk production	.20	9
Post-weaning gain	.31	3
Yearling weight	.33	4
Mature cow weight	.50	1
Feed conversion (TDN/gain)	.32	- 2
Dressing %	.39	0
Rib eye area	.42	2
% cutability/ retail product	.47	0
Marbling/ quality grade	.38	2
Tenderness	.29	0
<sup>a</sup> Koots et al. (1994). <sup>b</sup> Kress and Nelsen (1998).		









#### Individual vs. Maternal Heterosis

Individual heterosis is the increased performance a crossbred calf exhibits relative to its straightbred parents.

Maternal heterosis is expressed in the crossbred female's progeny, such as the increased weaning weight of crossbred females' calves due to the increased milk production of their crossbred dams.

Heterosis has been shown to increase lifetime production 20-25% in Bos taurus x Bos taurus cross cows. This increase results from cumulative benefits of heterosis across numerous cow herd traits to include: fertility, longevity, weaning

The table below compares increases in weight of calf weaned per cow exposed that may be expected with individual heterosis vs. both individual and maternal

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Crossbreeding Systems

Must be designed to fit the operation — herd size, number of pastures, existing cow herd genetics and other managerial constraints will determine the most appropriate crossbreeding system.

#### **Rotational Systems**

The goal of a rotational crossbreeding system is two-fold:

- 1) Generate females which combine the complementary cow herd traits of parent breeds while building acceptable levels of maternal heterosis into the cow herd.
- 2) Build "reputation" feeder cattle that excel in the feedlot and carcass traits that will keep buyers bidding aggressively.

**Rotational Crossbreeding Tip:** use breeds that are similar in birthweight, mature size and milk production to avoid large swings in biological type and input costs.

#### **Two-Breed Rotation**

Cows sired by Breed A (Red Angus) bred to Breed B bull (Hereford, Simmental, etc.). Resulting daughters bred back to Breed A for the rest of their lives. Daughters resulting from this cross are bred back to bull from Breed B. A female is always bred to a bull of a different breed than her sire. (Diagram below)

Sire selection objectives: Choose sires similar for calving ease, maternal traits and mature size. Must ID sires to daughters.

Number of sires:	2
Number of pastures:	2
Minimum number of cows:	50
% heterosis:	67%





Red Angus are especially well suited for rotational systems due to their balance of cow herd building traits with end product traits.

#### **Three-Breed Rotation**

Cows sired by Breed A (Red Angus) bred to Breed B bull. Resulting daughters bred back to Breed C for the rest of their lives. Daughters resulting from this cross are bred back to bull from Breed A. A female is always bred to the sire she is least related to. (Diagram below)

Sire selection objectives: Choose sires similar for calving ease, maternal traits and mature size. Must ID sires to daughters.

Number of sires:	3
Number of pastures:	3
Minimum number of cows:	75
% heterosis:	.86%





# Crossbreeding Systems

#### Terminal Sire & Purchase F1 Replacement Females

This is perhaps the simplest, fastest, most effective way of using both heterosis and breed complementarity. Producers purchase F1 (two breed cross) replacement females, mate them to a terminal breed of bull and market all of the progeny — keeping no replacements.

#### Selection Objectives:

1. Select maternal breeds which fit specific production environment, and excel in cow herd profit traits of longevity, fertility, weaning rate, low labor inputs and low maintenance cost.

2. Select sires to fit marketing objectives, applying appropriate selection pressure to post weaning gain, feed conversion, marbling and yield grade.

Examples: • Red Angus x British cows bred to Continental or Red Angus x Continental F1 bulls

- Red Angus x Maternal Continental cows bred to Continental or Red Angus x Continental F1 bulls
  - Tiger-striped Braford cows bred to Red Angus bulls

No. of Sires:	1	Expected increase in lbs. of
No. of Pastures:	1	calf per cows exposed = 25%
Min. No. of Cows:	any size	
% Heterosis:	This system provides t	the opportunity to maximize use of individual and maternal heterosis.

Red Angus isn't often thought of as a terminal sire breed, but many producers find that Red Angus' rapid early growth, shorter days on feed and carcass quality adds maximum value to their calf crop.

Red Angus ... The Common Denominator

#### **Red Angus x Terminal Continentals**

Red Angus crossed with terminal Continental breeds, like Charolais and Limousin, produce feeders that can excel in both gain and conversion while reaping premiums for both Yield Grade and Quality Grade. While these Continentals are known to improve Yield Grade through increased leanness and larger rib eye areas, Red Angus complements with improved marbling and fewer days to finish.

#### **Red Angus x Maternal Continentals**

When crossed with maternal Continental breeds, such as Simmental and Gelbvieh, Red Angus can improve production efficiency. Through breed complementarity, Red Angus can lower birthweights, moderate mature size, decrease cow maintenance requirements, extend longevity and thus, improve the overall functionality of the replacement females resulting from such crosses.







## Red Angus Crossbreeding Tools

#### **Selection Simplified**

Crossbreeding does not replace the need for high quality purebred cattle. In fact, accurately described seedstock are the foundation of the success in crossbreeding programs. Ranchers using Red Angus in crossbreeding programs enjoy these benefits:

**Compare EPDs Across Breeds:** Growth (BW, WW, YW, MILK), carcass (MARB, YG, CW, REA, FAT) Calving Ease (CED, CEM), and Stayabilty EPDs for ALL animals in the members of International Genetics Solutions database may be compared directly, thus eliminating the need for complicated "cowboy math adjustments" when selecting bulls of varying breed makeups.

**Increased Accuracy:** Unmatched predictive power is achieved by combining the datasets of all IGS partner breed associations to form the world's largest multi-breed database.

**True Multi-breed EPDs Account for Heterosis and Breed Differences,** so progeny of varied breed composition can be accurately compared in terms of their genetic merit for any given trait.

**Powered by THR:** Total Herd Reporting requires that the production of every female in members' herds be reported annually, even dead calves and cows that did not breed. Collecting all the data — not just the ones good enough to register — ensures ranchers are provided with the most reliable EPDs to make selection decisions.

**Focused on Profit:** While some breeds focus on calculating as many EPDs as possible, Red Angus concentrates on describing reproduction, growth, feed costs and carcass characteristics using the fewest EPDs possible. By focusing on those traits that impact profitability (ERTs), ranchers can buy better bulls, while sorting through nonessential data.



#### **Red Angus x British Breeds**

The "Baldy" female is still a favorite for many commercial ranch environments, and the "Best Baldys" come from combining Red Angus and Hereford. Red Baldy cows are polled, pigmented, easy fleshing and docile, and they have the added benefit of red hides for reduced summer stress. The Red Angus component of baldy steers helps them reach Choice grade with fewer days on feed. Red Angus x British crosses are a natural fit for harsh environments where nutritional stress requires females with built in longevity and low maintenance requirements.

#### **Red Angus x Brahman Derivatives**

In regions where heat, humidity and insects require Brahman derivative or heat tolerant *Bos taurus* breeds, such as Senepol, it only makes sense to add an Angus component that comes with a "cooler" red hide. The replacements resulting from such crosses make adaptable, heat tolerant, easy fleshing brood cows, while their steer mates express improved carcass value due to Red Angus' superior marbling genetics. Additionally, higher levels of heterosis may be seen when Red Angus are used on cattle of such divergent origins.



## Red Angus ... The Common Denominator

### **Red Angus-Based Hybrid Bulls**

In addition to using straightbred Red Angus in crossbreeding programs, a growing demand is being met by Red Angus-based hybrid bulls. Through eliminating the need for multiple breed rotations and allowing producers to maintain their desired breed makeup without large swings in biological type, Red Angus-based hybrids provide the benefits of heterosis and breed complementarity in a convenient and userfriendly package. Furthermore, Red Angus-based hybrid bulls are the ideal choice for producers who desire to inject heterosis back into a high percentage Red Angus cowherd.

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