

The Common Denominator

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 (RAAA) 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 which help producers harvest the full value of their investment in superior Red Angus influenced genetics.



**Red Angus
Crossbreeding
Solutions**

Crossbreeding Tools

**Genetic Change =
Heritability x Selection Pressure**

Heritability is the proportion of an animal's genetic merit that is - on average - transmitted to their offspring. Heritability varies for different traits, (see Table 1 – opposite page). Reproductive traits tend to have low heritabilities, while growth traits are moderate and carcass characteristics typically have higher heritabilities. In practice, most selection pressure involves utilizing bulls whose genetic merit (for those traits the producer seeks to improve) is superior to the average of the cows they will breed. In Crossbreeding, genetic variation comes from both the selected variation within a breed and the genetic variation between selected breeds.



Breed Complementarity...

..occurs from combining the desirable characteristics of two or more breeds to achieve a higher frequency of desired genes among the crossbreds than could be found within a single breed. In other words, the beneficial additive genes of one breed can be used to compensate for the lack thereof in another.

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, and Zebu breeds can offer heat tolerance and increased insect resistance.

**Large 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 “nonadditive” gene effects. Heterosis is defined as the percent of superiority expressed in a trait by crossbred progeny over the average of the parents’ breeds in the cross.

Heterosis is calculated by the following formula:

$$\frac{\text{Crossbred Avg.} - \text{Straightbred Avg.}}{\text{Straightbred Avg.}} \times 100 = \% \text{ Heterosis}$$

Example: Two parent breeds have weaning weight averages of 575 and 475 lb respectively. Their expected progeny average would be 525 lb. Yet, their crossbred progeny averaged 550 lb. The percent of heterosis would be determined as follows:

$$\frac{550 - 525}{525} \times 100 = 4.8\%$$

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.



This polled and pigmented Red Angus sired calf out of a dehorned Hereford cow is an example of individual heterosis.

Table 1. Heritability and Heterosis Estimates for Some Economically Important Traits.

Trait	Heritability ^a	Total heterosis ^b (%)
Calving rate	.02 - .17	6
Calf survival to weaning	.10 - .15	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

^a Koots et al. (1994).
^b Kress and Nelsen (1998).

Heterosis...

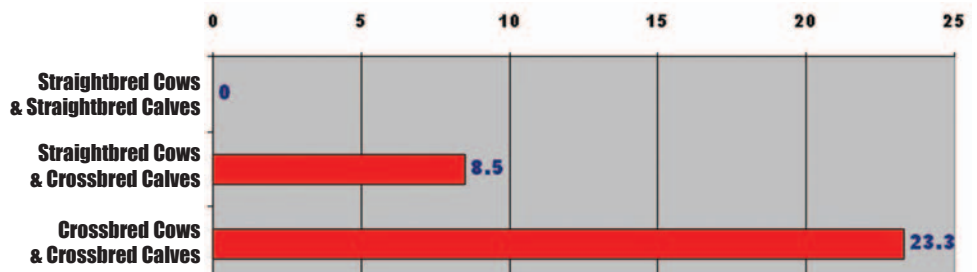
Individual vs. Maternal Heterosis

Individual heterosis is the increased performance a crossbred calf exhibits relative to its straightbred parents for traits such as growth to weaning, or yearling weight.

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 rate, etc.

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 heterosis.



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 twofold:
 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.

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

Two-Breed Rotation

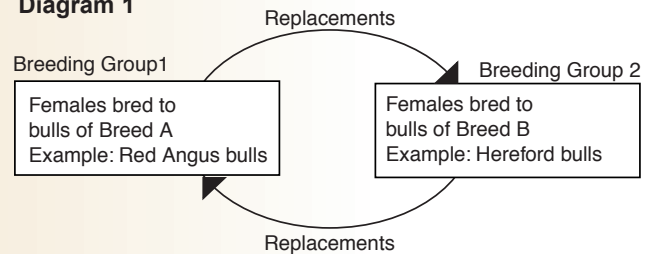
Cows sired by Breed A (Red Angus) bred to Breed B bull (Hereford, Simmental, etc.). Resulting daughters bred back to Breed A for the rest of their lives. Daughters resulting from this cross are bred back to bull from Breed B. A female is always bred to a bull of a different breed than her sire. (Diagram 1)

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

No. of Sires: 2
 No. of Pastures: 2
 Min. No. of Cows: 50
 % Heterosis: 67%

Expected increase in lbs of calf per cow exposed = 16%

Diagram 1



Three-Breed Rotation

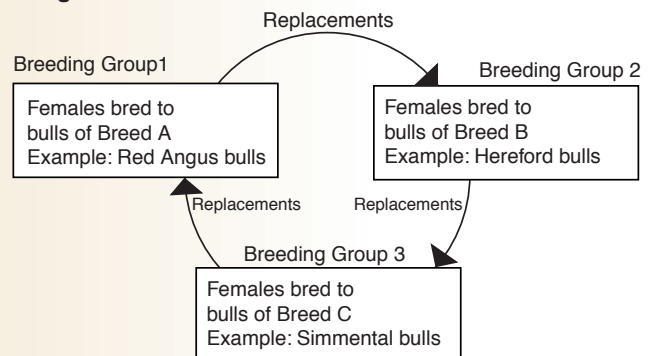
Cows sired by Breed A (Red Angus) bred to Breed B bull. Resulting daughters bred back to Breed C for the rest of their lives. Daughters resulting from this cross are bred back to bull from Breed A. A female is always bred to the sire she is least related to. (Diagram 2)

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

No. of Sires: 3
 No. of Pastures: 3
 Min. No. of Cows: 75
 % Heterosis: 86%

Expected increase in lbs of calf per cow exposed = 20%

Diagram 2



“User Friendly” Crossbreeding Tools...



Terminal Sire & purchase F1 Replacement Females...

perhaps the simplest, fastest and most effective way of utilizing 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 the opportunity to maximize use of individual and maternal heterosis	



The cumulative effect of fertility, calving ease, optimal milk flow, fleshing and foraging ability, longevity, and low maintenance costs make Red Angus the obvious cornerstone of any cow/calf operation. To find Red Angus replacements, visit Red Angus Stockyards at www.redangus.org

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.



Artificial Insemination (A.I.) Advancements in synchronization protocols have made AI more manageable, and broadened producers' access to high accuracy, proven sires - allowing for breed complementarity to be utilized with greater precision. **A.I. Strategies that benefit from Heterosis and Breed Complementarity:**

- Use proven, high CED Red Angus bulls on Continental, Brahman derivative, or non-Angus British heifers.
- Use proven, low maintenance, high stayability Red Angus bulls on mature Continental or Zebu cows to produce more profitable replacements.
- A.I. mature Angus herds to high maternal continentals or hybrids to produce F1 replacements.
- Utilize Red Angus bulls in “Clean Up” roles behind an A.I. program - even when using a terminal A.I. sire. Calves sired by a Red Angus pasture bull will make outstanding replacements.



Get Heterosis and Breed Complementarity in One Package...

Many Red Angus Breeders offer Red Angus based Hybrid bulls for sale. Red Angus may be paired with a terminal continental, maternal continental, British, or Bos indicus breed to build Red Angus hybrids for targeted needs.

Using Red Angus based Hybrid bulls in a rotational cross with Red Angus, increases maternal heterosis over straight Angus cow herds, without large swings in biological type of replacements. Furthermore, the steer siblings produced average 3/4 Red Angus, 1/4 Continental, and demand premiums from cattle feeders.

Retained Heterosis: Using unrelated F1 bulls of the same breed (A-B, A-B) can result in a retention of 50% of maximum possible heterosis. Rotating F1 bulls that have one breed in common (A-B, A-C) can result in 67% heterosis. Rotating F1 bulls that have no breeds in common (A-B, C-D) can offer 83% of maximum heterosis.

Selection Simplified...

Crossbreeding does not replace the need for high quality purebred cattle. In fact, accurately described seedstock resources are paramount to the success of a crossbreeding program. Red Angus combines true multi-breed genetic evaluation, Total Herd Reporting, and a focus on Economically Relevant Traits to provide bull customers with the most reliable genetic predictions in the industry.

Cooperation Benefits Bull Customers: The Multi Breed EPD model shared through long term agreement between Simmental and Red Angus allows both breeds the following benefits:

- Increased accuracy, through combining the databases of American Simmental, Red Angus Association of America, and Canadian Angus Association (Red and Black), the multi-breed database includes over 9 million animals, with more than a million in common between Simmental and Red Angus.
- Accounts for heterosis, so progeny of varied breed composition can be accurately compared in terms of genetic predisposition for a given trait.
- Values breed differences through incorporation of external EPDs from other breeds, i.e. A Charolais, Hereford or Black Angus sire can be used and receive full value for his rank within his respective breed.

Making all the data count: 16 years ago, Red Angus adopted Total Herd Reporting (THR), an inventory based data reporting system that has since been endorsed by the Beef Improvement Federation. THR requires that the production of every female in members' herds be reported annually - Even Dead Calves, Even Cows that did not breed. THR also requires performance through weaning be recorded on every calf. Depend on THR to ensure the most reliable EPDs.

Bred for Profit: While some breeds focused on calculating as many EPDs as possible, Red Angus concentrated on describing reproduction, growth, feed costs and carcass characteristics using the fewest EPDs possible. By focusing on those traits that impact profitability, ranchers can buy better bulls, while sorting through less extraneous data.



The Red Angus Formula

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 ribeye 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 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 is 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 should 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.



Various biotypes of cattle ranked by cost of gain.

Biotype	% Choice ^a	%YG 1 & 2 ^a	Feed ^b Conversion	Cost of gain ^b /cwt ^c
1/4 Continental 3/4 British	66	52	6.52	\$54.00
1/2 Continental 1/2 British	56	56	6.49	\$54.80
100% British	70	38	6.76	\$57.50
100% Continental	30	89	6.78	\$59.80
3/4 Continental 1/4 British	43	83	6.72	\$60.10

^a Adapted from U.S. MARC data (Cundiff, 1999).

^b Swift & Co. and Gelbvieh Alliance data (T. Schiefelbein, 2003 and D. Schiefelbein, 1998).

^c Includes interest.

Ranch Tested. Rancher Trusted.

Carcass & Conversion

"Our steers graded 95% Choice and over 70% qualified for Premium Products, and that's on 171 head - every steer we raised."

"You can't just concentrate on carcass or any single trait. And that's why we really like the balance of the Red Angus breed."

*Bruce & Lynette Durheim,
Ellendale, North Dakota,
discussing the grid performance
of the Red Angus sired calves
produced from their Simmental x
Red Angus cowherd.*

Building Better Beef...

Red Angus

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