CROSSBREEDING

with Simmentaler for more beef

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Genetic Improvement

SIMMENTALER

CREATIVE FOOD FOR THE WORLD

FEED THE WORLD

Simmentaler X Brahman F1 Crosses

Profitabil Crossbreeding

The economic climate of today's beef farming business is challenging. Commercial producers are faced with optimizing a number of economically important traits, while simultaneously reducing costs of production in order to remain competitive. Traits such as fertility, growth and maternal ability all influence productivity and profitability of the beef enterprise. Implementation of technologies and systems that both reduce costs and enhance productivity is essential. One of the oldest and most fundamental principles that have a positive influence on accomplishing these goals is crossbreeding.

There are two ways that crossbreeding can result in increased production levels:

- Crossbreeding provides the breeder the opportunity of combining the desirable characteristics of two or more breeds, thus achieving a higher overall performance level of desired traits among the crossbred animals than would generally be found within a given breed.
- The second way crossbreeding increases productivity is through the increased levels of performance for particular traits due to heterosis or hybrid vigour. Increased productivity can result through hybrid vigour exhibited by both the crossbred calf and the crossbred cow.

Heterosis/Hybrid Vigour

- Heterosis is the phenomenon that causes crossbred individuals to have an increased level of performance for certain traits over and above the average performance of their purebred parents.
- Heterosis is measured as the difference in performance of the cross-bred animals from the average performance of the pure bred animals of the breeds involved in the cross.

Maternal Heterosis: Advantage of the Crossbred Cow[1]

Trait	Observed Improvement	% Heterosis
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, year.	1.36	16.2
Cow Lifetime Production:		
No. Calves	0.97	17.0
Cumulative Wean. Wt., lb.	600	25.3

[1]Adapted from Cundiff and Gregory, 1999.

Individual Heterosis: Advantage of the Crossbred Calf[1]

Trait	Observed Improvement	% Heterosis
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
ADG, lb./day	0.08	2.6
Yearling weight, lb.	29.1	3.8

[1]Adapted from Cundiff and Gregory, 1999.

Simmentaler X Bonsmara F1 Cross

Why crossbreeding?

- Low heritable traits, for e.g. fertility – the most important aspect in beef production – that cannot be improved rapidly by selection, can be improved considerably by crossbreeding.
- Increased production, especially in the following traits, can be obtained:
  - with the correct combination of breeds the weaning weight of crossbred calves is approximately 16% above the average of the parent breeds;
  - depending on the breed combination and environmental factors the growth rate of the crossbred animal is 5 to 25% faster;
  - crossbred animals utilize their feed more efficiently;
  - the calf mortality of an European breed in Heartwater areas can be improved considerably by crossing with a Zebu breed.
- To improve the shortcomings in a herd within one generation through the use of bulls from another breed, which excel in those characteristics.
- For rapid changes in a breeding herd in order to meet new requirements. A breeding herd, which for instance is suitable for the production of steers that can be marketed from the veld at the age of three years, can be changed rapidly to possess all the necessary characteristics for the production of weaners.

Prerequisites for success when crossbreeding

- Use only good bulls and cows – one cannot breed calves from inferior parents simply by crossbreeding. Many disappointments stem from confusing crossbreeding with injudicious "mongrelization".
- Success mainly depends on the continuous use of good bulls selected based on estimated breeding values (EBV's) and structural soundness.
- The breeds that are used in a crossbreeding system must complement each other's shortcomings to produce a better combination of characteristics.
- The final product must be adapted to the environment.
- The crossbreds must be provided with adequate feed to enable them to express their higher potential.
- The management level must meet the requirements of the crossbred animals.
- The success of any crossbreeding programme is dependent on the quality of the parent breeds. It therefore makes sense to buy sires based on estimated breeding values (EBV's) and structural soundness. Crossbreeding without such information will always be a mediocre operation.

Which breeds must be crossed?

- Environmental factors such as climate, nutritional level and the standard of management as well as the production system, determine the requirements with which the crossbreds must comply.
- With crossbreeding you can find a combination best suited to your environment and production system.
- The greater the genetic variation between two breeds, the greater the effect of hybrid vigour.
- One of the most important reasons why the Simmentaler is used more and more for crossbreeding is because genetically the breed differs widely from the traditional breeds or breed combinations.
- In the extensive pasture regions of Southern Africa the best results with crossbreeding are obtained when a European breed (*Bos taurus*) is crossed with a Zebu breed (*Bos indicus*) or the Bonsmara (*Bos taurus africanus*).
- In most cases a dual purpose, of which Simmentaler is by far the best known, gives the best results due to a higher milk production and excellent growth rate.

Crossbreeding systems

Hybrid vigour is not heritable. To maintain it, crossbreeding must be planned correctly.

The following is a brief description of two long term crossbreeding systems:

1. "Criss-Cross" crossbreeding with two breeds, e.g. Bonsmara and Simmentaler. Divide the herd into two breeding herds for the two breeds of bulls. The daughters of the Bonsmara bulls are served by Simmentaler bulls and vice versa. If the type and performance of the original herd indicate that bulls from only one of the two breeds will supplement the shortcomings, only one breed is used for the first crossing. The first cross (F1) heifers are then mated to the other breed. Consequently two breeding herds originate one with Simmentaler bulls and one with Bonsmara bulls. In due course the crossbred heifers replace all the purebred cows. The "criss-crossing" may be continued for an indefinite period – the daughters of Simmentaler bulls go to the Bonsmara bull herd and vice versa.

2. If three breeding herds can be accommodated, a three-breed rotation crossbreeding system may be applied in the same way as the two-breed rotation or 'criss-crossing'. With the three-breed rotation more hybrid vigour is maintained than with two breeds.

In a three-breed rotation crossbreeding system the best results are obtained by combining a Zebu type, a dual purpose breed and a British beef breed. It is an excellent combination for intensive finishing off in the feedlot.

Simmentaler X Afrikaner F1 Cross

The Simmentaler in crossbreeding

Notwithstanding the fact that there is a wide genetical difference between the Simmentaler and the best known breeds in Southern Africa, which makes the breed suitable for cross-breeding, the Simmentaler possesses characteristics that eminently supplement defects in British beef breeds and Zebu breeds. It is especially the following proven characteristics of the Simmentaler which can be exploited efficiently for cross-breeding:

- **High milk production**
  In Europe for e.g., Simmentalers have already been tested for milk production for more than 95 years and every cow is milked.
- **Excellent growth rate**
  According to official South African performance test results the Simmentaler surpasses all other breeds that have been tested on a reasonably large scale.
- **Good muscling**
  It is visually perceptible.
- **High fertility**
  International studies and research results at Mara (South Africa) and Omatjenne (Namibia).
- **Little excess fat**
  The breed has been selected for little fat and there is an increased consumer's demand for less fat.

Simmentaler X Bonsmara F1 Cross

Afrikaner crows with Simmentaler cross-calves

- **Good adaptability in hot environment**
  This has been proved by research studies at Mara (South Africa) and Omatjenne (Namibia).
- **Genetic diversity**
  Since dual purpose (dairy/beef) Simmentaler actually represents a different cattle classification group than all other beef breeds, Simmentaler's great diversity will result in maximum heterosis if crossed with local Zebu/Sanga breeds or types.
- **Purebred**
  105 years of pure breeding. From day one our breed society has only registered animals which meet the strict type requirements of our technical advisors who inspect every animal before registration.
- **Availability**
  Simmentaler has more performance tested bulls in Southern Africa than the 2nd, 3rd and 4th British/Continental beef breeds together.
- **Performance**
  Simmentaler ranks number one in fertility, weaning weight, yearling weight and feedlot gain amongst all popular breeds. Perhaps the most important advantage of the Simmentaler for crossbreeding is maternal heterosis resulting in increased performance of progeny from the Sim-crossbred cow.

These characteristics enable the Simmentaler to breed replacement heifers with excellent maternal abilities as well as oxen with good growth and muscling.

Simmentaler x Bonsmara F1 Cross

Practical Use of Crossbreeding

- Crossbreeding is a system of mating that provides the commercial producer the opportunity of increasing total production of beef per cow in the breeding herd.
- Crossbreeding is not a substitute for good management, nor is it a cure-all for unproductive cattle. If anything, a good crossbreeding system will probably require a higher level of management in order to reap maximum benefits.
- The producer will need to be alert for possible changes in the herd's nutritional program as his herd becomes populated with more productive cattle.
- Some producers expect crossbreeding to do more than it really can. The same basic breeding principles should be applied to the selection of breeding animals for a crossbreeding system than would be used for a pure-bred program. In both cases, use of genetically superior breeding stock will result in progeny with above average performance.
- Once the decision has been made as to which breeds to involve in the crossbreeding program, the producer should select the best animals available from within these breeds.
- If a producer continues to use cattle of about the same relative genetic merit as he had under a purebred program, crossbreeding will increase overall production by approximately the amount of heterosis present for the production traits of interest.
- The combination of complementarity between the strains or breeds crossed and the added impact of heterosis makes crossbreeding a very important breeding system for commercial production systems.

The experimental evidence strongly indicates that the total kilograms of calf produced per cow in the breeding herd can be increased through a planned crossbreeding scheme.

To increase profitability commercial beef farmers use Simmentaler bulls for

Crossbreeding

- Maximum commercial profitability requires hybrid vigour which results in up to 25% more lifetime production per commercial female.
- The larger the genetic variation between breeds, the more hybrid vigour.
- The best results in Southern Africa are achieved by crossing British/European beef breeds with Zebu/Sanga.
- Crossbreeding will improve fertility.

The availability factor: Simmentaler is by far the most popular British/European breed in Southern Africa.

The performance factor: Simmentaler ranks number one in fertility, weaning weight, yearling weight and feedlot growth amongst popular British/European beef breeds.

The unrelated factor: Maximum genetic diversity is found between dual purpose Simmentaler and Zebu/Sanga breeds.

The no-guess factor: Simmentaler have twice as many performance tested animals with EBVs than the second ranked British/European beef breed.

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