Beef cattle breeding systems

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Regardless of the breeding system chosen, the breeder must struggle for genetic improvement in the traits identified as economically important for both the current and future performance of the herd.

The basic objective of animal breeding is to enhance the efficiency of production and the quality of the product for the end-consumer through planned genetic change.

Beef cattle breeding systems

The choice of whether to straight breed or cross breed will be related to your ability to match your cattle, the environment and the market.

Straight breeding programs

Straight breeding produces not only progeny for further finishing, but also replacement females for the herd. For this reason, many traits have to be selected in balance, as they contribute to the overall package. it is important to identify and select those cattle that are superior for specific traits.

Straight breeding programs

Straight breeding programs appeal to many beef breeders because they produce replacement females from within the herd. They are reasonably easy to manage because only one cattle breed exists on the property.

Straight breeding programs

Important points

BREEDPLAN estimated Breeding Values (EBVs) and $indexes are available for selecting both bulls and cows.

Breeding management options are simple and don't require you to select sires from different breeds or to mate different sires in different paddocks.

Straight breeding programs

Herds are self-replacing: breeder replacements are produced within the herd.

Turnoff animals are similar, with little variation.

Lines that 'look' even (i.e. for colour) may attract a premium.

Straightbred females continue to be in demand for use in crossbreeding systems.

Crossbreeding programs

Crossbreeding systems can bring together a desired combination of genes more rapidly than can be achieved through within-breed selection. Advantage can be taken of complementarity among breeds, but knowledge of individual breed characteristics is important.

Crossbreeding programs

The decision to crossbreed is also often related to the potential gains of hybrid vigour, an additional boost to production. Hybrid vigour, or heterosis, is the difference between the performance of the progeny and the average performance of the parents.

Crossbreeding programs

In general, the more distantly the parental breeds are related, the greater the amount of heterosis that can be expected. the greatest level of heterosis results from the crossing of the least related purebred Bos indicus and Bos taurus breeds. Heterosis is greater for some traits than others (e.g. fitness traits: parasite resistance, survivability, environmental adaptation etc.).

Crossbreeding programs

For greatest benefit in all crossbreeding programs, it is essential that the programs be based on straightbred animals of high genetic merit for economically important traits. Tools such as Breed Plan EBVs and $indexes can be used to select these animals.

Crossbreeding programs

Continuing improvement from a crossbreeding program depends on the genetic merit of the foundation animals used in the cross (i.e. the selection intensity in the populations in which they were bred) and the selection intensity placed on the subsequent crossbred generations.

Crossbreeding programs

Crossbreeding provides flexibility because it allows you to quickly alter particular characteristics of a herd for a specific purpose, such as to cater to a particular market, increase production or remedy a problem. there can be disadvantages with cossbreeding, such as management difficulties.

Planned crossbreeding systems

Although the potential gains from crossbreeding are large, most of the success depends on good planning and the use of superior genetics to provide the priority traits identified for a specific breeding enterprise. The following briefly outlines the key 'planned' approaches to crossbreeding.

Rotational crosses

Hereford and Angus rotational cross.

Rotational crosses

- ***Rotational crossing simply means that two or more different sire breeds are used in sequence over the female groups, which are grouped according to their sire breed. Two, three or even four sire breeds may be used.***

Rotational crosses

- ***In a simple system that uses two breeds, cows of breed A are mated to sire breed B, with the resulting heifers being joined back to sire breed A.***

A(f) X B(m)

F(f) X A(m)

Rotational crosses

- ***Within a three-breed rotation, the progeny of sire breed A over cow breed B are mated to sire breed C. The female progeny of the latter cross are mated back to sire breed A for the rest of their breeding lives. the minimum number of joining groups is equal to the number of sire breeds.***

A(f) X B(m)

F(f) X C(m)

Rotational crosses

An increase of 10 to 20 per cent in the weights of calves weaned per cow joined can be achieved from a two-breed rotation (criss-cross).

A greater increase in the weight of calves weaned per cow joined can be achieved from a three-breed rotation.

Rotational crosses

In a rotational cross system, each breed contributes its strengths and weaknesses equally to the production system over a number of years. The level of heterosis achieved depends on the number of breeds involved (i.e. the more breeds, the more heterosis).

However, in a rotational cross system variability among the progeny may make it more difficult to consistently meet a market specification. Therefore, the use of breeds that are not radically different is probably preferred.

Rotational crosses

- ***All animals in the herd benefit from hybrid vigour for both growth and maternal traits. All females from a rotational cross system are potentially available for selection as replacements; this increases the selection intensity and subsequent opportunities for genetic improvement.***

Rotational crosses

- ***Rotational systems consider the market animal and the future replacement breeders. Rotational crossbreeding may present some management difficulties in that specific breeder groups need to be mated to specific sire breeds.***

Important points of rotational crosses:

**The system generates its own replacement females.*

**Hybrid vigour is retained, giving a 10 to 20 per cent increase in weaning weight.*

**Cows can be run as one mob for most of the year, as they need to be separated by sire group only for joining.*

**Depending on the breed chosen, some variability will occur within the progeny.*

**Breeds with good maternal traits should be used, as the female progeny of all sire breeds are kept.*

Two-way cross (F1)

Brahman Hereford two-way cross.

Two-way cross (F1)

This is a simple system whereby a bull of one breed is joined to straightbred cows of another breed. All the progeny are sold (to slaughter or, in the case of females, as F1 breeders).

A(m) X B(f) (straightbred)

F_1 (m) (sloughter), F_1 (f) (sloughter or breeders)

Two-way cross (F1)

- ***Hybrid vigour is generated in the progeny only. Because the cows are straightbred there is no hybrid vigour generated at this level.***

Two-way cross (F1)

This system does not produce its own replacements, so replacements need to be purchased or bred in a separate enterprise.

This system offers the opportunity to produce and market specialised F1 females that are often highly sought after.

Two-way cross (F1)

Male progeny can be sold as weaners or feeder cattle; this could be into a specialist trade

Important points of two-way crosses:

**There is a 5 to 10 per cent increase in weaning weight turned off per cow mated.*

**Straightbred female replacements can often be purchased.*

**Heifer progeny have increased value as F1 breeders.*

**F1 steers have increased value for feeding or slaughter.*

Terminal sire joined to first-cross (F1) females

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Terminal sire joined to first-cross (F1) females

In this system, a third breed of bull is joined to first-cross (F1) cows and all progeny are sold, meaning that the system terminates at that point.

A (m) X B (f) (straightbred)

↓

F_1 (f) X C (m)

↓

F_2 (m), F_2 (f) (sold)

Terminal sire joined to first-cross (F1) females

This is the most productive system, as F1 females of the right breed groups can maximise maternal heterosis for fertility, milking ability and longevity. They can also be selected for environmental adaptation and medium size, meaning that their feed requirements are not too high. Sires can then be selected for their growth and carcase traits.

Terminal sire joined to first-cross (F1) females

The main problem with this system is that it doesn't generate its own replacement females: they must be sourced from outside the system. they can be bred on another part of the property, but this necessitates running a herd of purebred cows, which are often of lower productivity. Buying F1 females can be difficult, but longevity can mean that fewer replacements are needed.

Terminal sire joined to first-cross (F1) females

The environment in which the herd is to run needs to be considered when you are selecting the breeds that make up the F1 females.
If feed resources are plentiful and of high quality, breeds with high milking ability may be used and may even include the dairy breeds. Some possible combinations are;

Friesian × Hereford or Simmental × Angus.

Terminal sire joined to first-cross (F1) females

In poor environments, breeds that have more moderate size and milk production may be more suitable (e.g. angus × Hereford).
In tropical and sub-tropical areas, Bos indicus or Sanga breeds may be combined with British breeds, e.g.

Brahman × Hereford, Santa Gertrudis × Angus)

Terminal sire joined to first-cross (F1) females

The environment and the target market need to be considered when selecting the terminal sire.

It may be possible to use a high growth, high carcase yield breed such as the Charolais or Limousin in environments with adequate high quality feed. However, in lesser situations a 50:50 European British cross sire may be better suited (e.g. Charolais × Angus).

Terminal sire joined to first-cross (F1) females

In some situations, the terminal sire breed chosen for the main breeding herd may not be suitable for use over heifers having their first calves. This may mean having separate sires available.

Terminal sire joined to first-cross (F1) females

Important points of joining terminal sire to first-cross (F1) females:

****Maximum hybrid vigour is utilised.***

****There is a 20 to 50 per cent increase in weaning weight turned off per cow mated.***

****The breed can be selected to maximise complementarity.***

Terminal sire joined to first-cross (F1) females

**Cows can be selected to best suit the environment and sires selected to specifications.*

**Offers an opportunity to select sires by using EBVs and indexes.*

**Replacement females are needed from outside the system.*

**Heifers may need to be mated to bulls with low calving risk.*

Composites

European British composite bull.

Composites

An alternative to crossbreeding in some situations is to use a composite breed.

Composites

The development of a composite breed results from the crossing of two or more existing breeds and then selecting from within that population. Examples include Santa Gertrudis, Droughtmaster and Brangus. The key advantage is that after the formation stage, when the initial crosses are made, the management requirements are the same as for straight breeding.

Composites

There is tremendous opportunity to change direction as the market or other circumstances dictate, by incorporating another new breed or crossbreed with desirable characteristics that change the animal's performance only as much as necessary.

Composite breeding allows for the blending of characteristics from a number of breeds into a composite that considers the turnoff animal as well as the replacement females.

Composites

The level of hybrid vigour retained depends on the number of breeds used to develop the composite (e.g. a four-breed composite will retain 25% more hybrid vigour than a two-breed one).

Important points of using composites:

*A high percentage of hybrid vigour can be retained.
*Replacement heifers are generated in the herd.
*Breeds can be selected to give the optimum mix of traits in one animal.
*Neither maternal nor paternal traits should be in extreme, because they are often antagonistic between male and female.
*In small herds the management is as simple as running a straightbred herd.
*Success in designing a composite requires a large herd and the avoidance of inbreeding.
*Variation in progeny will occur over the first three generations until the composite is stabilised.