

# Crossbreeding systems to target feeder steer markets

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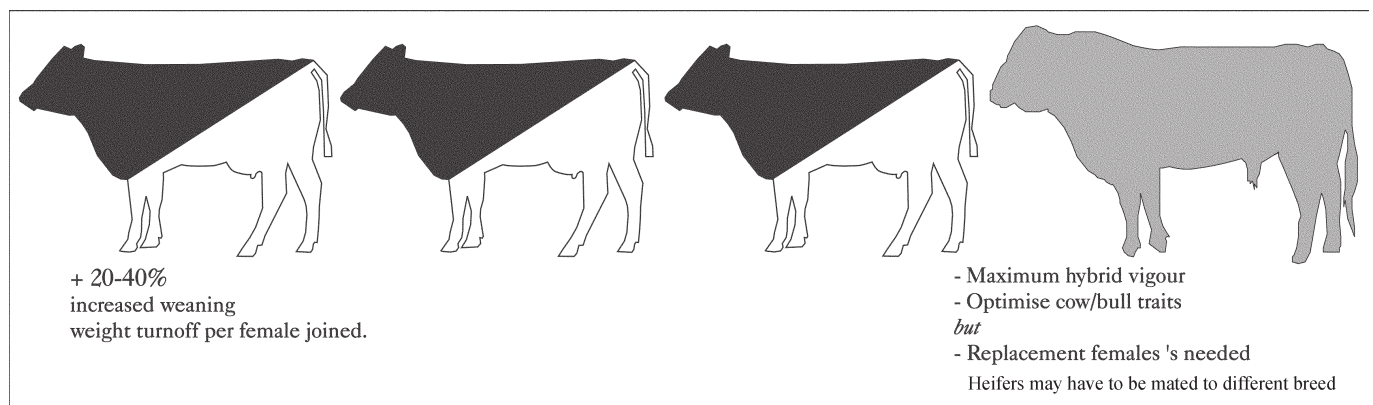
Reprinted from 2002 Armidale Feeder Steer School Proceedings.

This paper gives a brief summary of crossbreeding options. As not every breed can be discussed, we have preferred to use groups of breeds such as British, Continental European etc. Three popular crossing systems are first defined, then the alternative of composite breeding is given. Examples of these breed and breed groups which may suit systems are then given for various feedlot markets in either temperate or tropical areas.

## Three Popular Crossbreeding Systems

### Terminal Over F1 Cows

A third breed of bull is used over first cross cows: all progeny are sold for slaughter.



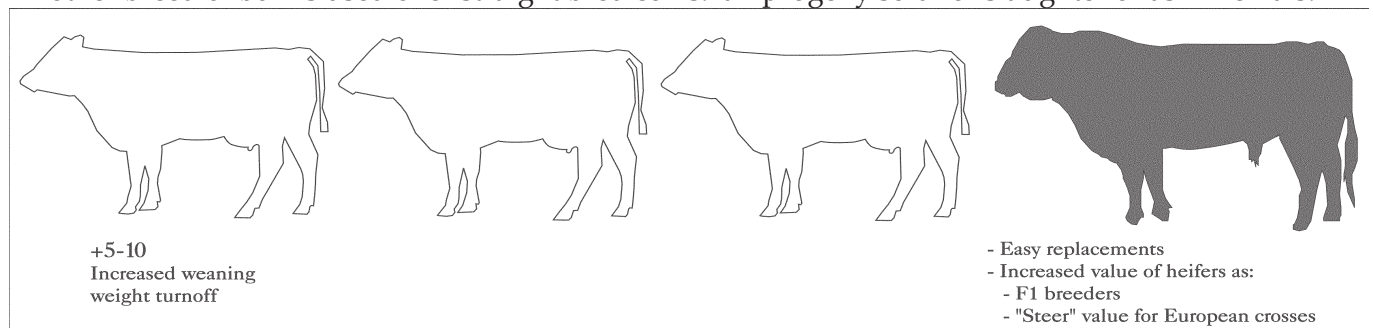
The diagram illustrates the Terminal Over F1 Cows system. It shows four cow silhouettes. The first three are white with black patches on their backs, representing F1 cows. The fourth is a solid grey silhouette, representing a terminal sire. Below the first three cows, text indicates a +20-40% increase in weaning weight turnover per female joined. Below the grey cow, text lists benefits: maximum hybrid vigour, optimised cow/bull traits, and replacement females needed, but notes that heifers must be mated to a different breed.

+ 20-40%  
increased weaning  
weight turnover per female joined.

- Maximum hybrid vigour  
- Optimise cow/bull traits  
*but*  
- Replacement females 's needed  
Heifers may have to be mated to different breed

### Topcross

Another breed of bull is used over straight bred cows: all progeny sold for slaughter or as F1 females.



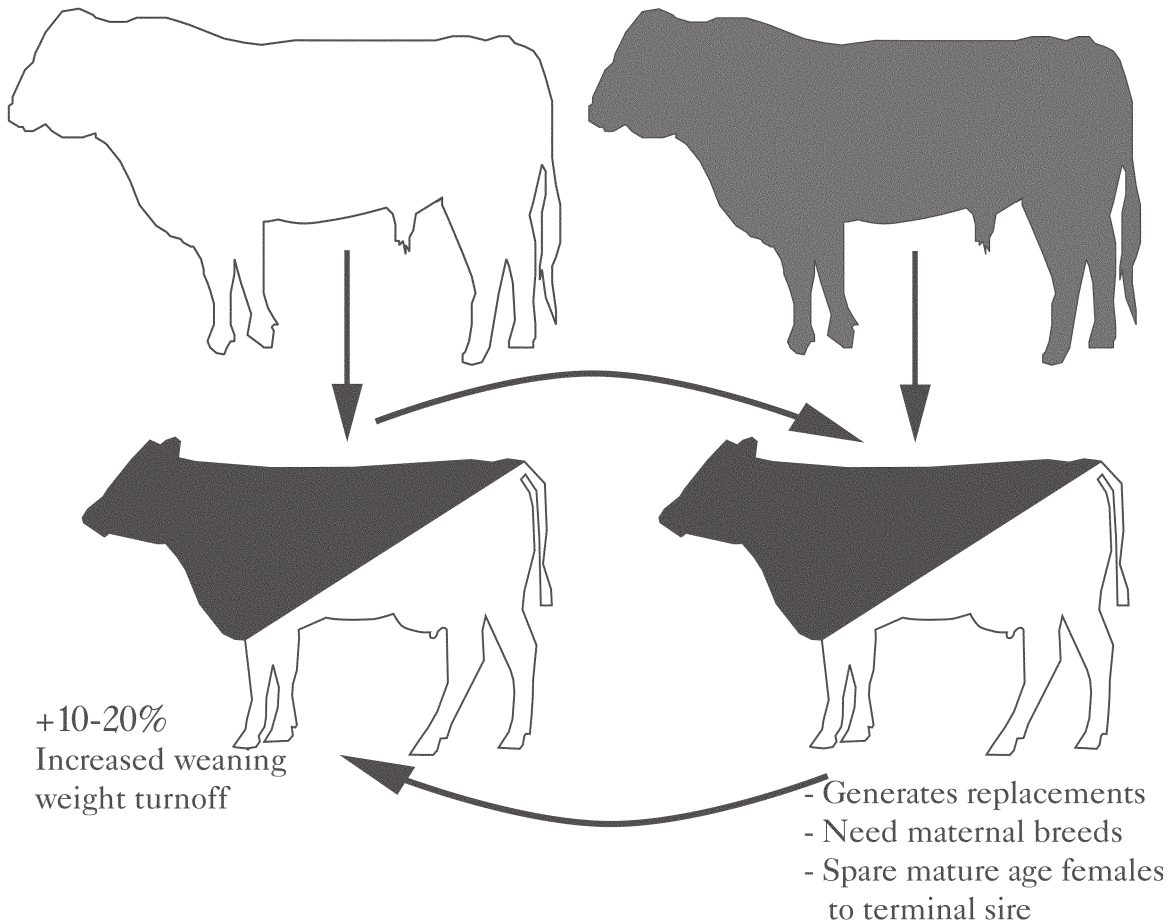
The diagram illustrates the Topcross system. It shows four cow silhouettes. The first three are white outlines, representing straight-bred cows. The fourth is a solid grey silhouette, representing a topcross sire. Below the first three cows, text indicates a +5-10% increase in weaning weight turnover. Below the grey cow, text lists benefits: easy replacements, increased value of heifers as F1 breeders, and a "Steer" value for European crosses.

+5-10  
Increased weaning  
weight turnover

- Easy replacements  
- Increased value of heifers as:  
- F1 breeders  
- "Steer" value for European crosses

## Criss Cross

Two or three breeds used in rotation: retain heifers



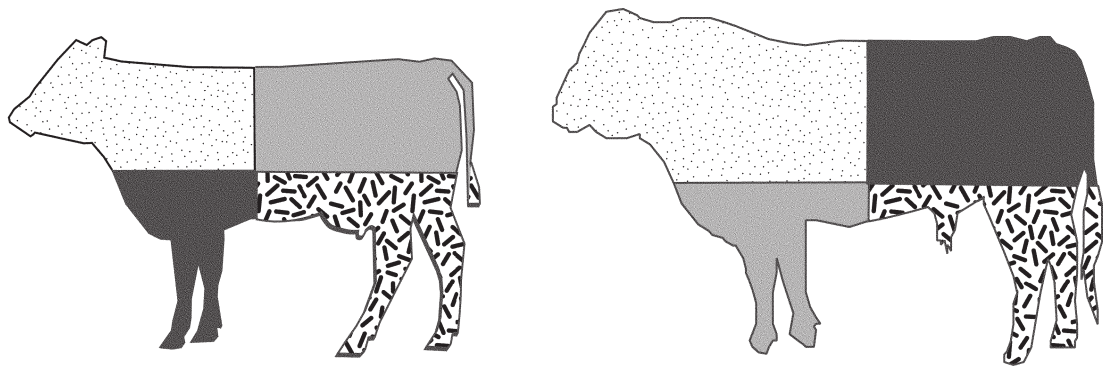
## Composite Breeding

### Composite Breeding

An alternative to crossbreeding for some situations is the use of a composite breed.

Composite breeding allows the blending of positive economic characteristics from a few breeds into a new breed. Once the final breed mix is in place, the composite is run as a straightbred herd with normal selection practices.

As long as there is not heavy selection for type and bloodline etc. hybrid vigour is retained in the composite, proportional to the number of breeds involved and the proportions of these breeds used (see Table 1). Many bulls per breed must be used in each generation to minimise inbreeding in the final mix if it is a closed composite.



**Table 1** Expected retention of hybrid vigour in various crossbreeding and composites programmes

Source: Adapted from Gregory and Cundiff (1980) *Journal of Animal Science* 51: 1124 Note: \*Hybrid vigour retention similar in a 3 breed rotation.

Crossbreeding Systems	% of maximum hybrid vigour
Straightbreds	0
3-breed cross	100
Two-breed composite	
1/2A 1/2B	50
5/8A 3/8B	47
3/4A 1/4B	37.5
Four-breed composite*	
1/4A 1/4B 1/4C 1/4D	75
1/2A 1/4B 1/8 1/8D	66

While creation of new breeds by the blending of two or more breeds has been around for a long time eg. Brahman and even Hereford, a renewed interest has been fostered by some large operators in Australia and North America committing themselves to large composite projects eg.

**Santa Cruz** - King Ranch, Texas have a Santa Gertrudis-based sub-tropical composite with Gelbvieh representing the Continental European breeds and Red Angus representing the British breeds. They have reported increases in branding percentage of >5%, increasing yield % >1% and 16% increase in % of steers hitting Choice grade compared to straight Santa Gertrudis (H Hawkins pers, comm). The final mix has a 20% bos indicus content.

**Leachman Stabilizer** - The Leachman Cattle Co., Billings, Montana, USA have developed a 4-breed composite. The final mix comprises 1/4 Red Angus, 1/4 Hereford, 1/4 Gelbvieh and 1/4 Simmental - a 50/50 British/European composite. This mix is aimed to blend the British breeds' early maturity type and carcass quality with the Continental European's growth and muscle.

**Leachman Rangemaker** - Leachmans have another composite called the Rangemaker for the more extensive grazing situation. The three breeds involved are South Devon, Salers and Red Angus in the proportions 1/2, 1/4, 1/4 respectively.

The above composites were designed to match US grazing resource with market end point. A number of Australian businesses are involved in composite breed development for our temperate and tropical zones. See Tables 2e and 2f and [www.compositebeef.com.au](http://www.compositebeef.com.au).

#### Recommendations For Anyone Building a Composite

1. Research and know where you are going in terms of environmental constraints, market requirements and qualitative traits required.
2. Select breeds which offer the traits you want in the final mix, based on comparative research eg. Struan Crossbreeding Trial or Clay Centre, CRC, USA.
3. In each breed choose animals based on EBVs for the traits of interest. For some traits you may have to

resort to overseas data available on AI sires.

4. AI is a convenient way to develop the early stages of the composite.
5. An appropriate design for each stage of the composite is needed to balance or optimise the final mix. If you use pure breeds you tend to end up with 1/2s or 1/4s of a breed contributing to the final mix which is simpler.  
  
More complex designs are possible eg. to get a 3/8 (37.5%) bos indicus content in the final mix (see Figure 7g-1).
6. If you are going to keep the composite closed for a period ie. with interbreeding of males and females of the first and second generations, then it is advised to use a large number of sires per breed (10 - 20). This prevents build-up of inbreeding and adequate sampling of the genes available in that breed - avoid concentrating on a few famous bulls. ie. Large numbers are required to develop a composite. After the first generation at least 25 sires per generation are required to prevent inbreeding as much as possible. The reality is that a herd of 500 cows is about the minimum to develop a composite properly.
7. An alternative to closed composite herds, is open composites. Here 'alliances' of breeders with similar composites may exchange bulls. These could vary a little in breed content, but be basically the same. Eg, 1/4 Gelbvieh, 3/4 British into a 1/4 Simmental 3/4 British herd.
8. There will be some variation between the generations and within crosses in the first three generations of interbreeding the crosses. Thereafter the variation will decrease and the composite will stabilise.
9. After the composite is stabilised you must continue to avoid inbreeding but the important factor now is selection. By the time you have reached this stage Multibreed EBVs will be a reality.

#### Benefits of Composites

- A percentage of hybrid vigour can be retained
- Replacement heifers are generated from the herd.
- Breeds can be blended to come up with the optimum mix for market and environment.

#### Disadvantages

- Herds have to be large >500 females, or inbreeding will compromise benefits.
- It takes a long time and there will be variation between generations until stabilised.
- Some uncertainty about levels of retention of hybrid vigour in bos indicus - based composites.
- Females have to carry all traits. This differs from the crossbreeding optimum - cows for country - bulls for market.

## Composites for the Tropics

A number of larger businesses operating in the tropics are developing composites. In the tropics there has to be a balance between selection for adaptation and selection for production traits. With the large Brahman base in northern Australia, composites may include Sanga breeds (Adapted *bos taurus* breed or Adapted Taurines as they are sometimes called) eg. Belmont Red and Tuli. This increases the hybrid vigour effect in crosses over the Brahman base while still using a bull adapted to the country.

The Leachman Company, in a joint venture with Vestey's in Brazil, is developing a number of tropical composites. Pastoral companies such as NAPCO and AACo in Australia are developing composites too. With increasing vertical integration or vertical coordination with feedlots in the pathway to market, these companies are attempting to blend paddock performance in a sometimes harsh environment with flexibility of turnoff through feedlots to many markets. Conventional crossbreeding systems are not applicable to their extensive operations.

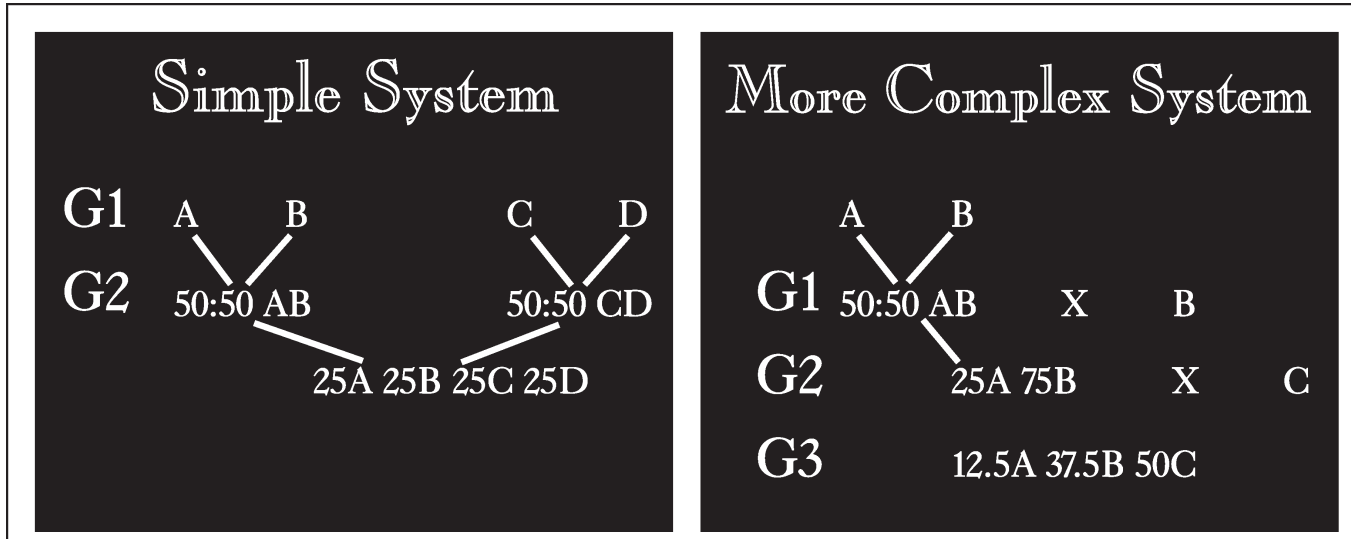


Figure 1. Systems of building composites

### Breed Issues and Meat Standards Australia (MSA)

The MSA Beef Grading Scheme is progressively being introduced in Australia. It has some breed criteria in its specifications. These may change as pathways utilising different breed/nutritional/abattoir systems are tested, however it is clear that crossbreeders in tropical areas need to take these breed criteria into consideration in their planning.

Since *Bos indicus* content (Brahman, Sahiwal, Boran and Nellore) is in the determining criteria, we could see the incorporation of more Adapted Taurine breeds in crossbreeding and composite programmes. These are tropically adapted breeds with no *Bos indicus* content. These include Tuli, Africander, Belmont Red, Bonsamara and Senepol. With their *Bos taurus* backgrounds these breeds have beef with tenderness more akin to the British rather than the *indicus* but do not necessarily have the adaptation traits of the *Bos Indicus* needed in harsher tropical areas. Adapted Taurines may also have a greater propensity to marble in hotter climates.

#### Putting it into Practice

Now, let's see how the 3 crossing systems, and composites, suit various feeder steer markets:

SHORT FED	70-120 days
MEDIUM	
LONG FED	180+ days

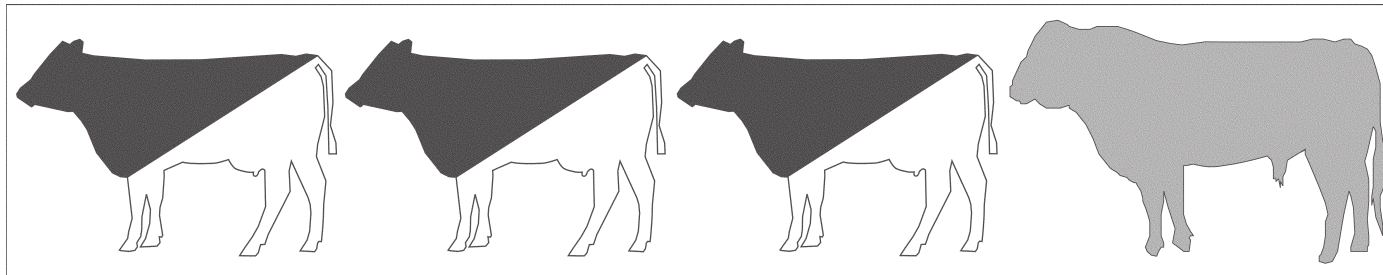
Remember: with feeder steer breeding, there really are two enterprises:

- A cow herd turning off weaners. As we are not trying to produce vealers, not too much milk is required. The cows, however, need good fertility under the higher stocking rates needed for efficient store weaner production. We need to balance the carcass requirements of the feedlot buyer, with the needs of the breeder's herd.
- A system to grow out the weaners as feeder steers. This can of course be some mix of pasture, or conserved fodder.



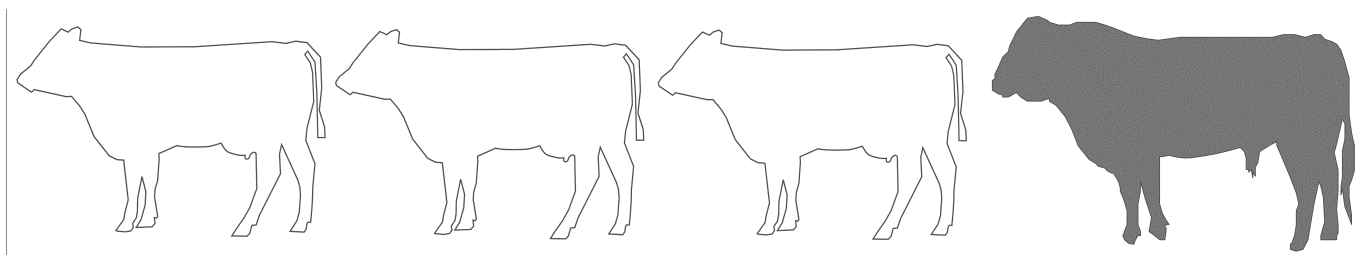


## First Cross x Terminal



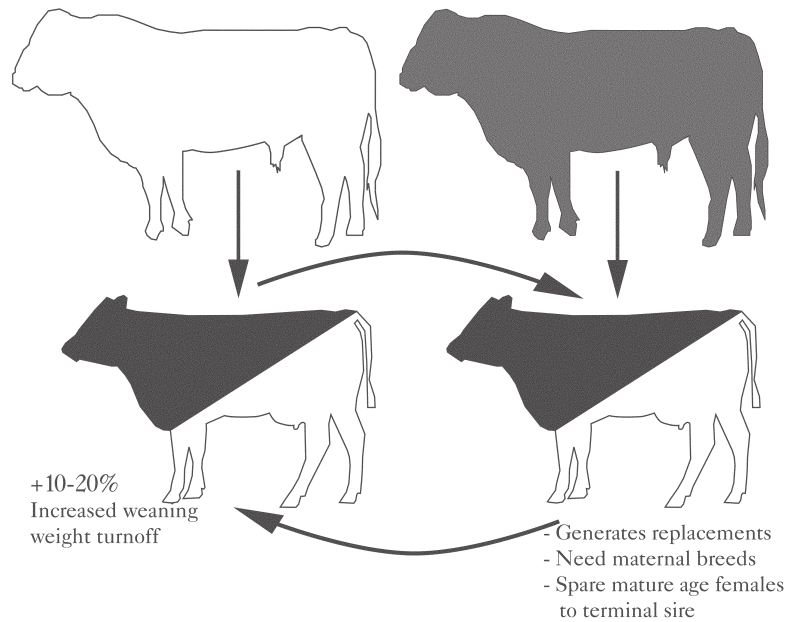
Market	Breed Groups		Example	
	Cow	Bull		
SHORT FED (+) (70-120)	British X British	x EURO	Hereford X Angus (Sub Tropical example) Belmont Red X British	x Charolais   x Charbray
MEDIUM (150)	British X British	x 1/2 EURO	M GREY x Hereford (Sub Tropical) Brahman X Hereford	1/2 Lim   X Brangus
LONG (180+)	British X British	x British	Devon/S'horn x Angus	

Note: (+) With some crosses (eg containing 50% Euro blood), cattle can be difficult to sell at full value in regular store markets. ideally have retained ownership, alliances or forward contracts before going into really specialised crossing systems.

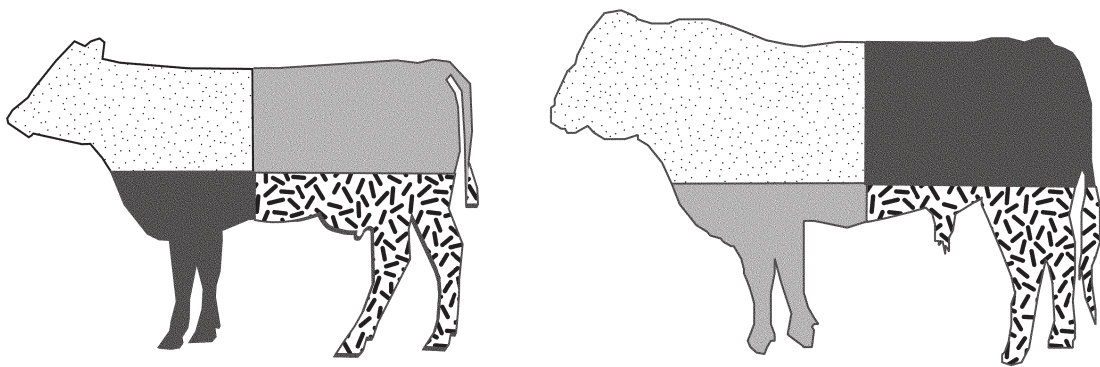


## Top Cross

Market	Breed Groups	Example
SHORT FED	British x Euro  Bos Indicus Derived x 1/2 Euro	Hereford x Simmental  (Sub Tropical) Droughtmaster x 1/2 Lim
MEDIUM	British x 1/2 Euro	Shorthorn x charolais  (Tropical) Brahman x Romagnola
LONG	British x British	Shorthorn x Angus Angus x Wagyu



Market	Breed Groups	Example
SHORT FED (+) (70-120)	British x British British x Derived bos indicus  British x 1/2 Euro (milk)	Hereford x Angus Shorthorn x Santa  M. Grey x 1/2 Simmental Devon
MEDIUM (150)	British x British	hereford x Shorthorn (Sub Tropical) Belmont Red x Brangus
LONG (180+)	British x British	Shorthorn x Angus



	MARKET		EXAMPLE	
	TEMPERATE	TROPICAL	TEMPERATE	TROPICAL
SHORT	1/4 Euro (Milk) 1/4 euro (Milk) 1/4 British 1/4 British	1/4 Bos indicus 1/4 Sango 1/4 British 1/4 euro	Gelbvieh Simmental Hereford Murray Grey	Brahman Tuli Hereford Galbvieh
MEDIUM	1/4 Euro (Milk) 1/4 British 1/4 British 1/4 British		Simmental Shorthorn Angus South Devon	Brahman Charolais Shorthorn Belmont Red
LONG	1/4 British (Marbling) 1/4 British (Marbling) 1/4 Large British 1/4 Specialist (Marbling)		Angus Shorthorn South Devon Wagyu	

## **Cross Breeding Checklist**

### **Plan**

- Markets including:
  - MSA Pathways
  - saleability of stock in drought
- on-farm finishing options if feeder steer markets change
  - Replacements

### **Recognise breed strengths and weaknesses**

- Maternal/Terminal
  - Growth
  - Fertility
  - Temperament
- Muscling / Fatness

### **Buy optimum performancne bulls**

- BREEDPLAN

### **Beware too much continental European or dairy blood**

- Big cows / late finishing steers
- Consider part European sires in some situations
- Lean and/or high milk cows may have reduced drought intollerance

### **Extreme care in joining British heifers to continental European or bos Indicus bulls**

### **Watch temperament**

Composite Beef Breeders Australia - a support group for  
composite breeders  
[www.compositebeef.com.au](http://www.compositebeef.com.au)