

Crossbreeding systems to target feeder steer markets

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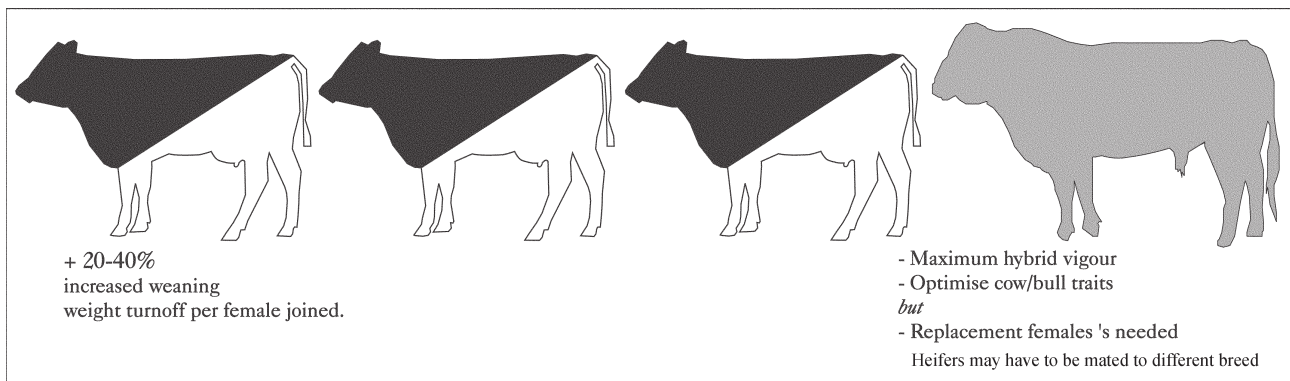
Supplementary S5

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

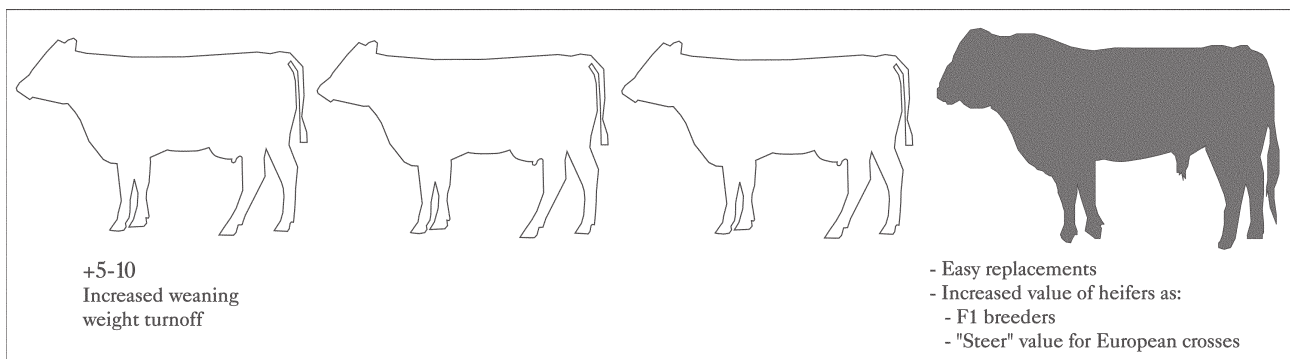
Terminal Over F1 Cows

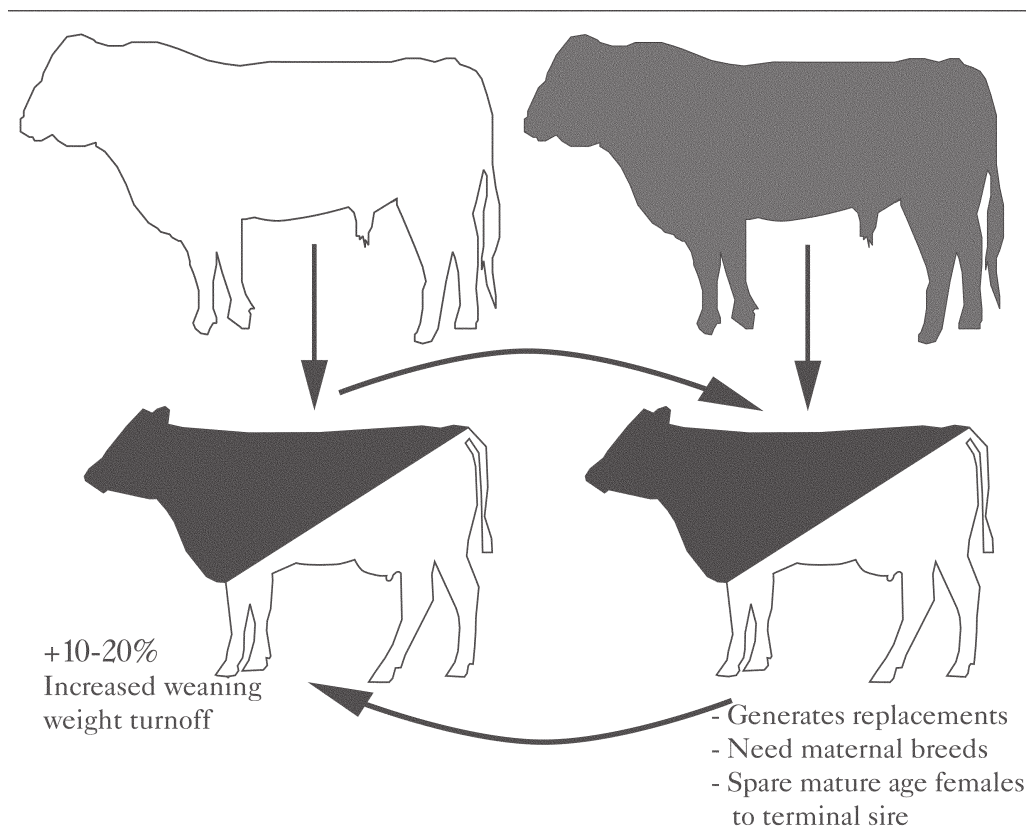
A third breed of bull is used over first cross cows: all progeny are sold for slaughter.



Topcross

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





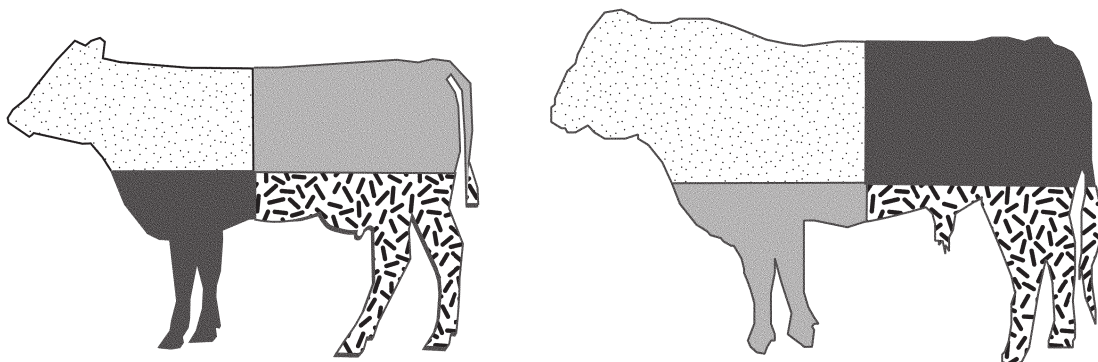
Composite Breeding

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.



Refer www.compositebeef.com.au for support for composite breeders. Ed

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 e.g. 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 for example:

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.

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 e.g. to get a 3/8 (37.5%) *Bos indicus* content in the final mix.

6. If you are going to keep the composite closed for a period i.e. 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. i.e. 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) e.g. 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 Vesteys 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.

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. (Further detail on MSA - paper 5a and on Composites - Supplementary S3).

Putting it into Practice

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

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

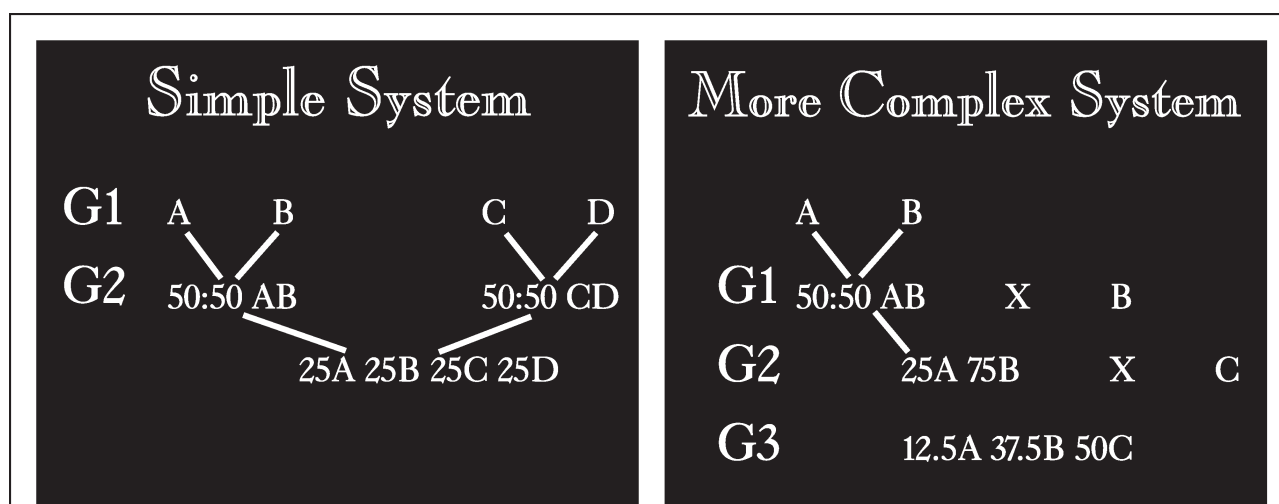
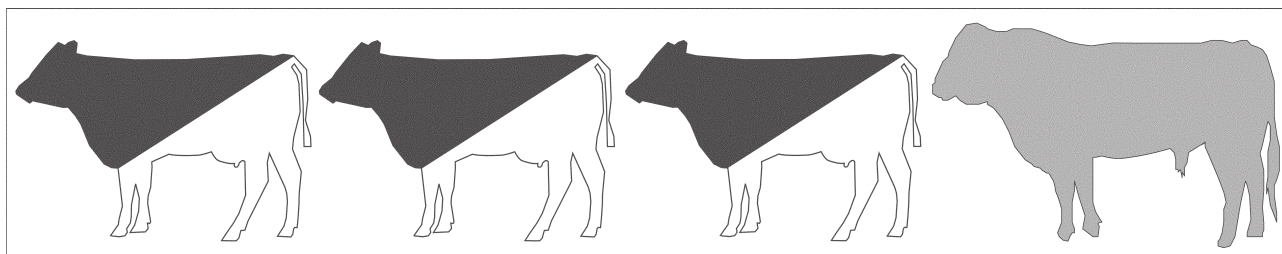


Figure 1. Systems of building composites

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

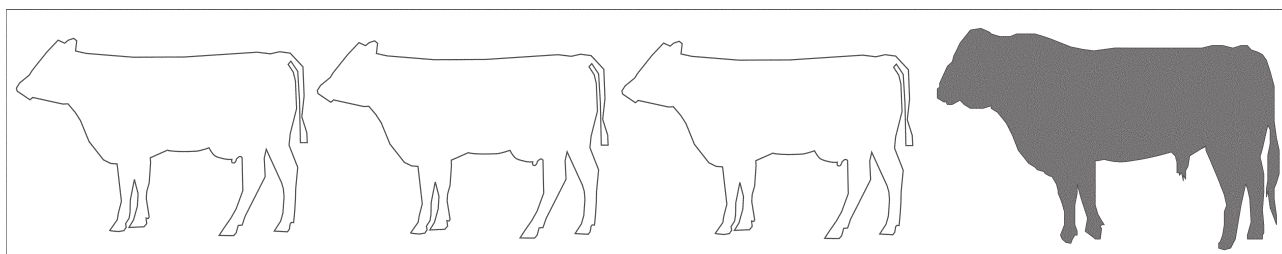
- A cow herd turning off weaners. As we are not trying to produce vealers, not too much milk is required. The cows, however, need good fertility under the higher stocking rates needed for efficient store weaner production. We need to balance the carcass requirements of the feedlot buyer, with the needs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



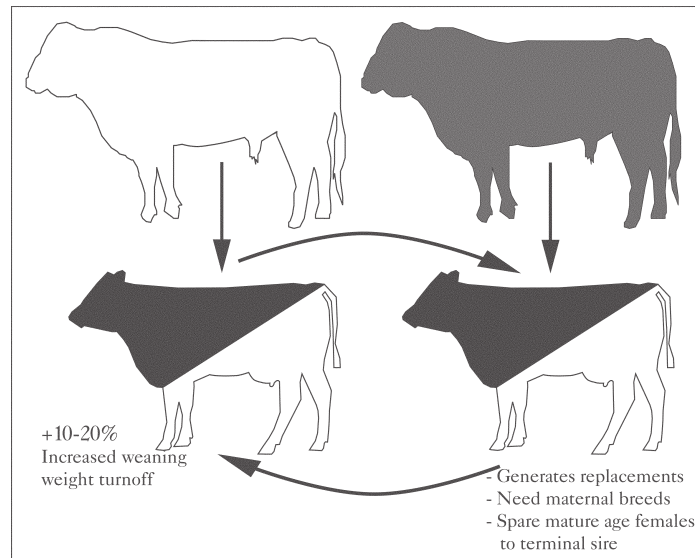
Market	Breed Groups		Example	
	Cow	Bull		
SHORT FED (+) (70-120)	British X British	x EURO	Hereford X Angus (Sub Tropical example) Belmont Red X British	x Charolais or Limousin x Charbray
MEDIUM (150)	British X British	x 1/2 EURO	M GREY x Hereford (Sub Tropical) Brahman X Hereford	1/2 Lim X Brangus
LONG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

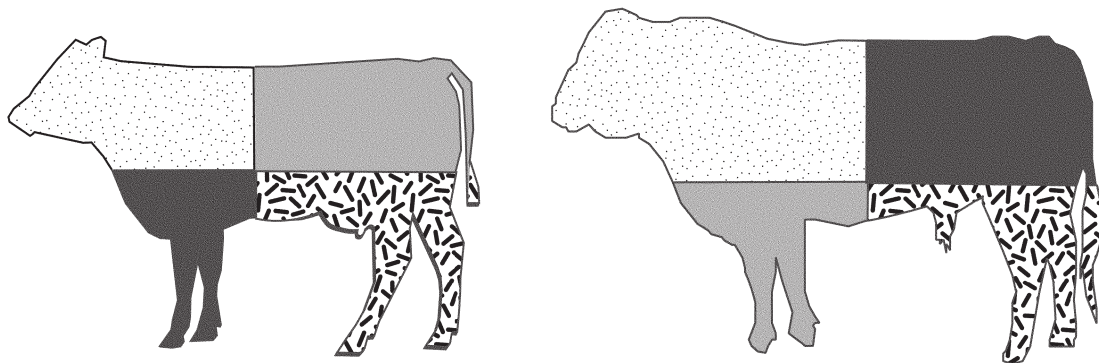
Top Cross



Market	Breed Groups	Example
SHORT FED	British x Euro	Hereford x Simmental
	Bos Indicus Derived x 1/2 Euro	(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 performance bulls

- BREEDPLAN

Be aware - too much continental European or dairy blood can lead to:

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

Extreme care in joining British heifers to continental European or *Bos indicus* bulls

Watch temperament

This summary table of necessity makes some broad generalisations about breed groups, when there is of course great variation within all breeds. Rather than worry too much about breeds when selecting sires for crossbreeding, bull buyers should concentrate on careful and accurate selection of individual bulls with the traits they need. This is becoming more possible as BREEDPLAN develops, and will improve further in future with common bases for some breeds in BREEDPLAN. In time we will have enough information on individuals to override breed generalisations. In the interim, it's still important to be guided, but not dominated, by breed averages.