Selecting an AI bull

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Elite Artificial Insemination (AI) bull

With the average beef herd size in Wales being 24 cows, a level that can easily be covered by one bull, the choice of animal will generally be one that concentrates on meat production with favourable Estimated Breeding Values (EBVs) for terminal sire traits. Although replacements may be kept from this bull, they may not necessarily have the best maternal characteristics or afford the opportunity to introduce hybrid vigour. The use of AI allows access to a greater selection of bulls that can be used to match your selection objectives and compliment your herd in terms of improving growth, muscularity or maternal ability.

Advantages of using AI

- Ability to introduce high genetic merit sires at a lower cost
- Specific terminal traits (e.g. weight and growth) can be selected to improve sale value
- Access to well proven sires with high accuracy of EBVs
- Bull fertility guaranteed
- Less disease risk
- Opportunity to incorporate hybrid vigour through cross breeding
- Characteristics such as maternal calving ease can be selected
- No need to consider hire of bull to use on current sire's daughters
- Current herd sire can have a longer life in the herd
- Ability to optimize breeding strategy

In particular, **producing home-bred replacements through the use of AI** is becoming an increasingly attractive option allowing the following benefits:

- Minimises disease risk through introducing purchased replacements
- Hybrid vigour has a greater impact on fertility, milk yield and longevity
- Selecting a bull that excels in maternal genetics
- Selecting a bull with good maternal calving ease
- Allows option of using EBVs/breed to modify mature size of cows
- Knowledge of breeding records of dams allows informed choice of which heifers/dam lines to breed from
- The opportunity to utilise female sexed semen
  - easier calving (lower birth weight)
  - ability to breed heifers to calve at 24 months of age
  - halves number of matings required to produce replacements.
  - Better choice of heifers, rather than depending on what's available

For more information on using sexed semen in a suckler herd please refer to HCC Factsheet "Breeding replacement heifers from heifers using sexed semen" available online at www.hccmpw.org.uk.

Selection for maternal characteristics

Maternal traits are characteristics only expressed by females but also carried by the genetics of the bull. Examples include milk production and traits related to female fertility such as age at first calving and calving interval.

The use of **maternal trait EBVs** can identify bulls whose daughters

- Calve successfully at 2 years of age
- Calve easier
- Have shorter calving intervals
- Show increased longevity in the herd
- Wean heavier calves as a result of better milking cows

What maternal trait EBVs are available?

As with growth and carcase traits, the exact definition of the maternal trait EBVs varies depending on the breed of bull and the organisation the breed society uses to produce their EBVs. Currently there are two different organisations producing EBVs for UK beef breeds - the UK based Signet and the Australian organisation BreedPlan. Both use the same methodologies through the BLUP (Best Linear Unbiased Prediction) system but produce EBVs with slightly different trait definitions. The following table lists the maternal EBVs currently produced by each system.

	Signet (UK)	BreedPlan (Australia)
Calving Ease	✔ (Maternal Calving Ease)	✔ (Calving Ease Daughters)
200 day Milk	✔	✔
Age at first calving	✔	
Scrotal Size	✔	✔
Fertility	✔ (Calving Interval)	✔ (Days to calving)
Size		✔ (Mature Cow Weight)
Longevity	✔	

Definition of current maternal trait EBVs

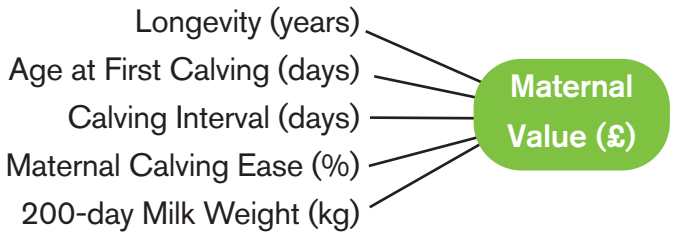
Maternal Calving Ease (Signet) or **Calving Ease Daughters** (BreedPlan)	Identifies females which due to their own characteristics (pelvic area) will calve easily. This should not be confused with Calving Ease Direct which predicts calf factors (size)
Measurement	%
Interpretation	Positive values mean more unassisted calvings
200 Day Milk	Identifies how well heifers will perform when they become mothers e.g. the potential milk yield of the cow
Measurement	Kg of calf weight at 200 days of age
Interpretation	Positive values identify females which rear heavier calves at weaning
Age At First Calving (Signet only)	Identifies heifers which are more likely to calve at a younger age given the mating opportunity
Measurement	Proportion calving earlier given the opportunity (e.g. 0.1 = 10%)
Interpretation	Negative values mean heifers will potentially get pregnant at a younger age when given the opportunity
Scrotal Size	An indicator of male fertility with regards to semen quality and quantity. There is also a small favourable correlation with age of Puberty in female progeny
Measurement	cm
Interpretation	Positive values indicate higher fertility in males and earlier puberty in females
Cow/Heifer Fertility **Calving Interval** (Signet) **Days To Calving** (BreedPlan)	Both EBVs measure the cow's ability to get back in calf again quickly post calving
Measurement	Days.
Interpretation	Negative values indicate heifers/cows that get back in calf more quickly (i.e. are more fertile)
Mature Cow Weight	An estimate of the genetic difference in cow size/ live weight at 5 years of age
Measurement	Kg of cow weight when the calf is weaned (200 days of age)
Interpretation	Positive values indicate cows that are heavier when their calves are weaned
Longevity (Signet only)	Predicts the length of an animal's breeding life in the herd
Measurement	Parities
Interpretation	Positive values indicate a longer breeding life

Maternal Indexes

Both Signet and Breedplan produce indexes for maternal characteristics. An index combines EBVs for several traits weighted by their economic importance into a single value to enable selection for a defined breeding objective.

Maternal Value (Signet only)

An index predicting the overall economic value of an animal's genetic ability to produce breeding females.

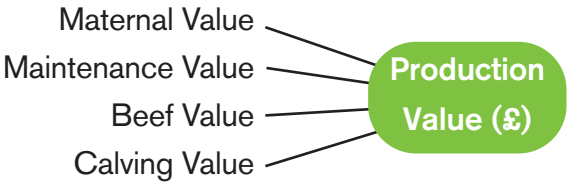


Positive values indicate more productive, fertile and longer living cows.

A bull with a Maternal Value of 12, for example, will be worth £6 more per cow mated than a bull with a value of 0, half of which will be realised in his progeny.

Maternal Production Value (Signet) **Self Replacing Index** (BreedPlan)

Although slightly different between the two organisations and for each breed within each organisation, both indexes are similar in that they value an animal's ability to produce both breeding females and high quality carcases from the male offspring. Terminal and maternal traits have approximately the same emphasis. e.g.



This Index is calculated from Maternal Value, Beef Value and Calving Value, while also taking into account Maintenance Value (the costs associated with feeding mature cows within the herd).

A bull with a Maternal Production Value of 10, for example, will be worth £5 more per cow mated than a bull with a value of 0, half of which will be realised in his progeny.

It should be emphasized that where there is little or no information available for maternal traits it is likely that terminal sire traits will dominate the index produced.

How to use Maternal Trait EBVs

Maternal trait EBVs are only useful where the daughters of a bull or cow are going to be used as breeding replacements. If all the progeny are going to be slaughtered then maternal trait EBVs can be ignored and animals selected on their growth and carcase EBVs.

Where the bull's daughters are going to be used as replacements, the best starting point is to screen a number of bulls based on their Maternal Production Value (Signet) or Self Replacing Index (BreedPlan). Both these indexes take into account the performance of a bull's male offspring as slaughter animals as well as his daughters as replacements. An alternative approach under the Signet scheme would be initially to select bulls based on their Maternal Value Index which evaluates bulls solely in terms of their daughter's performance as breeding females. Then having produced a list of possible purchases, individual bulls can be assessed on their Beef Value or other terminal sire EBVs.

Selection for Growth and Carcase EBVs

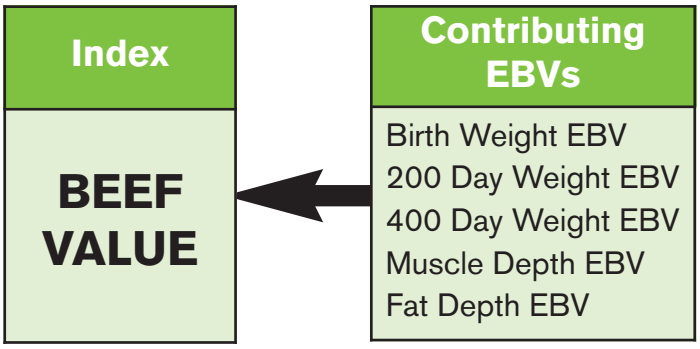
Careful examination of a bull's ability to sire progeny with superior growth and muscling characteristics is not only important for producing finished animals but can also be used to target improvements in any system of production from weaned calves to store cattle. Equally attention needs to be paid to such factors as ease of calving, birth weight and gestation length to ensure the birth of a live calf, enabling the realisation of the desired outcomes. The following EBVs are available to help you meet your selection objectives.

EBV	What does the EBV indicate?	Look for...
Birth weight (kg)	Genetic potential for calf weight at birth	**High negative EBVs** if you want optimum calf birth weights
Calving Ease (%) (Signet) **Calving Ease Direct (%)** (BreedPlan)	Ease with which a bull's progeny will be born	**High positive EBVs** if you want less assisted calvings
Gestation Length (days)	Genetic potential for gestation length	**High negative EBVs** if you want short gestation lengths
200 day Weight (kg)	Genetic potential for growth from birth to 200 days of age	**High positive EBVs** if you want high growth rates to weaning
400 day Weight (kg)	Genetic potential for growth from birth to 400 days of age	**High positive EBVs** if you want heavier yearlings
600 day Weight (kg) (BreedPlan)	Genetic potential for growth from birth to 600 days of age	**High positive EBVs** if you want high growth rates to finishing
Muscle Depth (mm) Signet **Eye Muscle Area (sq.cm)** BreedPlan	Genetic potential for muscularity and potential to increase lean meat yield	**High positive EBVs** if you want good calf conformation
Carcase Weight (kg) BreedPlan	Genetic potential for carcase weight at 650 days of age	**High positive EBVs** for heavier carcases
Retail Beef Yield (%) BreedPlan	Genetic potential for total (boned out) meat yield as % 300kg dressed carcase	**High positive EBVs** for increased meat yield
Fat Depth (mm) Signet **Rib fat (mm)** BreedPlan	Genetic potential for leaner carcases (subcutaneous fat)	**High negative EBVs** if you want to produce leaner carcases or take calves to heavier weights without penalty for fatness
IntraMuscular Fat (%) BreedPlan	Genetic potential for intra muscular fat	**High positive EBVs** if you want to increase marbling levels in the meat

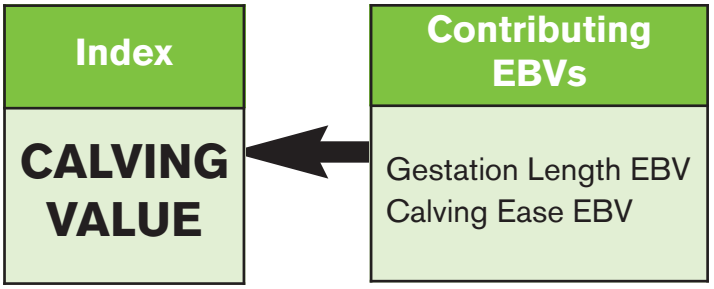
Terminal sire indexes

Both Signet and BreedPlan produce indexes combining the appropriate growth and muscle EBVs into a single figure based on their relative economic value in the market place. For Signet this index is the **Beef Value** which ranks animals on the expected merit of their offspring's carcases. It takes into account the financial improvements in carcase weight, fat and conformation and is presented as a cash value (£/head). As with EBVs, a bull's Beef Value must be halved to estimate the value of his calves.

A bull with a Beef Value of +30 will produce progeny whose carcases are worth on average £15 more than those sired by a bull with a Beef Value of 0.



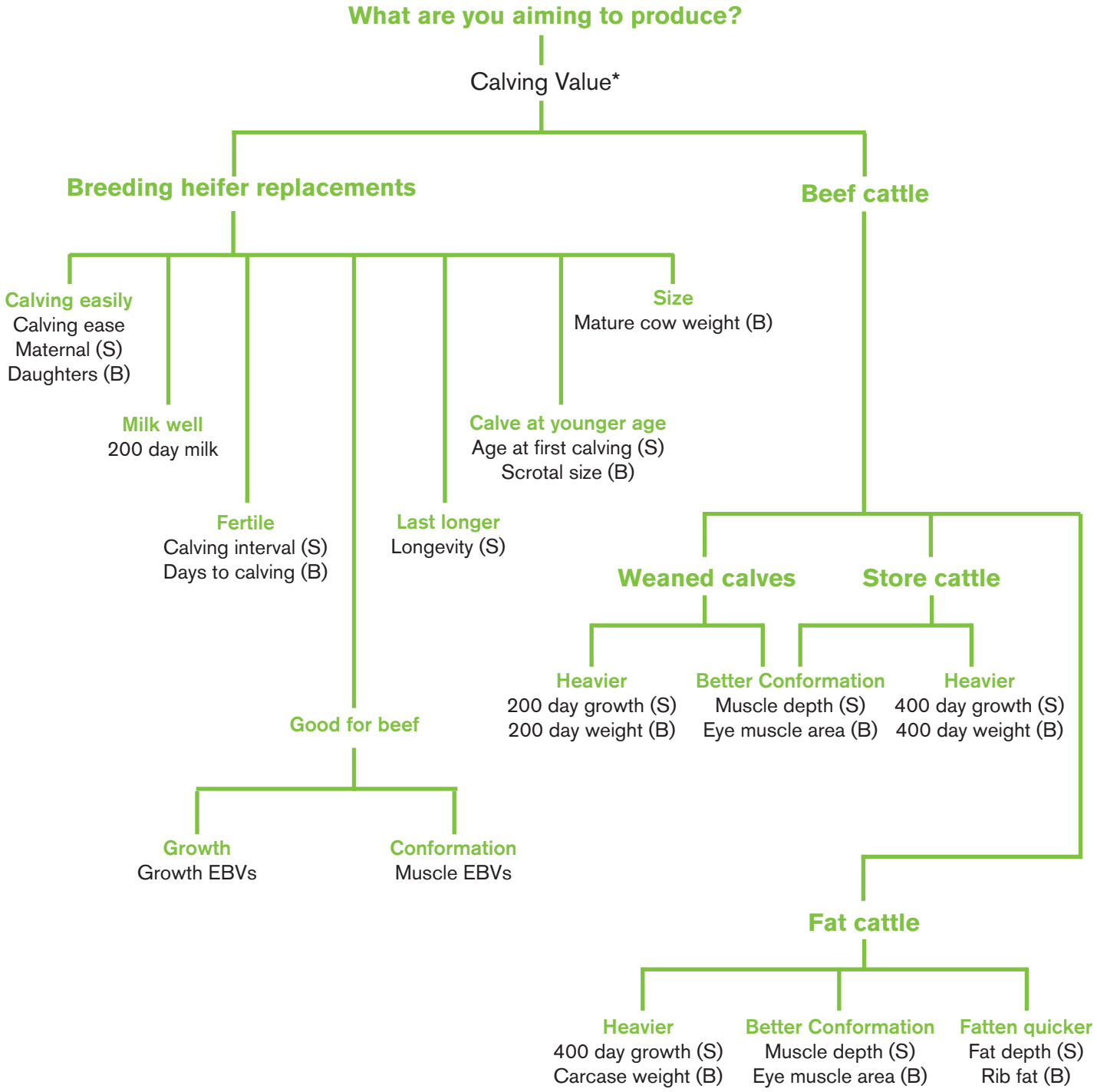
When selecting for Beef Value, it is important to keep an eye on the **Calving Value** which aims to improve the financial returns from beef production by reducing the costs associated with longer gestation lengths and difficult calvings.
Costs associated with extended gestation lengths include those associated with difficult calvings and the direct costs with having to feed and house a pregnant cow for longer and extended calving intervals. The costs associated with difficult calvings include the potential death of a cow or calf, veterinary costs, reductions in fertility and increased stockperson hours.



The corresponding index for BreedPlan is the **Terminal Index** and is a measure of a bull's ability to produce prime steers and heifers for the finished market.

Guidelines on making your choice of bull EBV's

Please refer to the flow chart below to help identify your breeding priorities for your own herd with regard to the choice of EBVs for your bull.

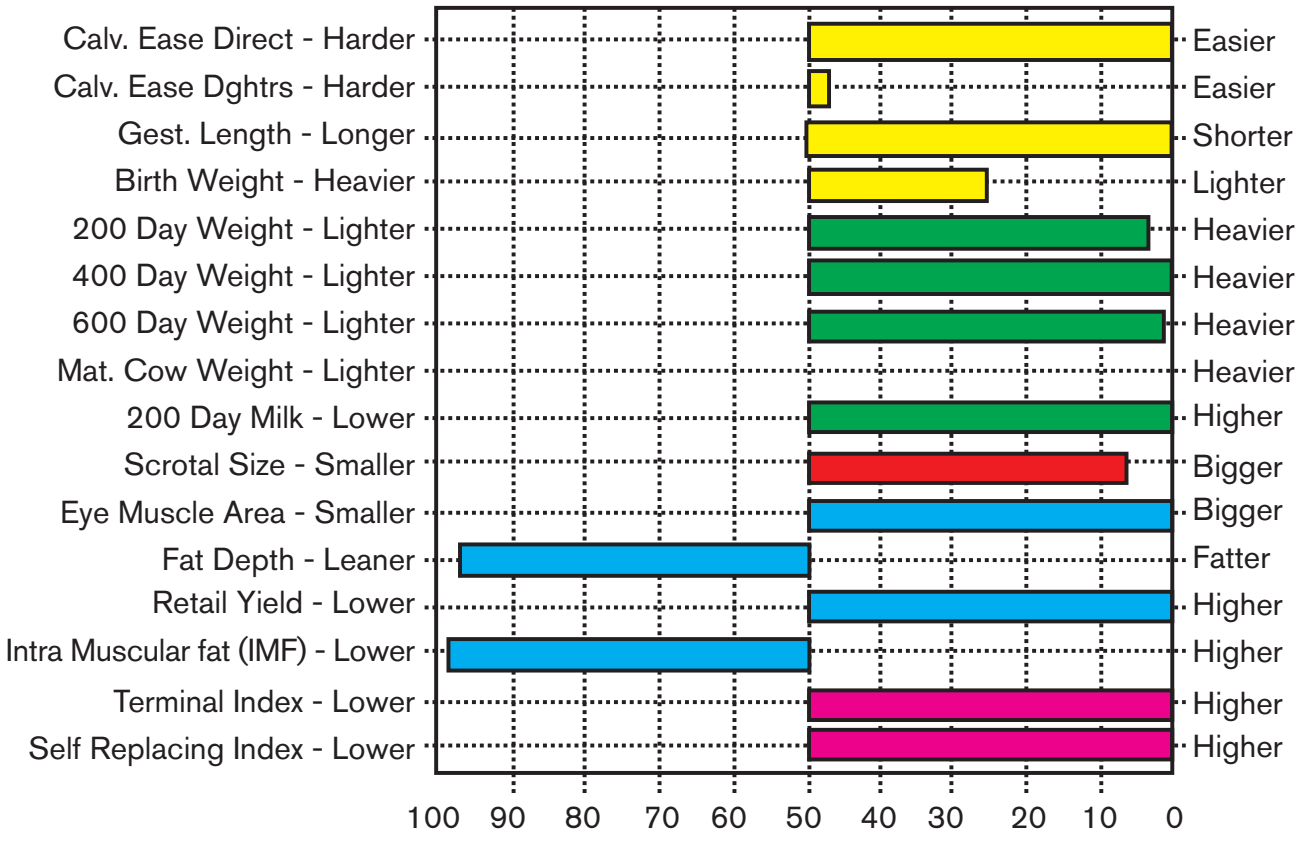


* This should be a priority EBV to ensure a live calf is born, and the cow recovers quickly after calving.

Understanding EBV percentile graphs

The coloured bar charts represent a quick and easy way to compare the animal against its contemporaries within the same breed. The vertical midpoint on the graph is the breed average for each recorded trait. Coloured bars that appear on the right of the mid point are advantageous whilst those on the left have to be treated with caution.

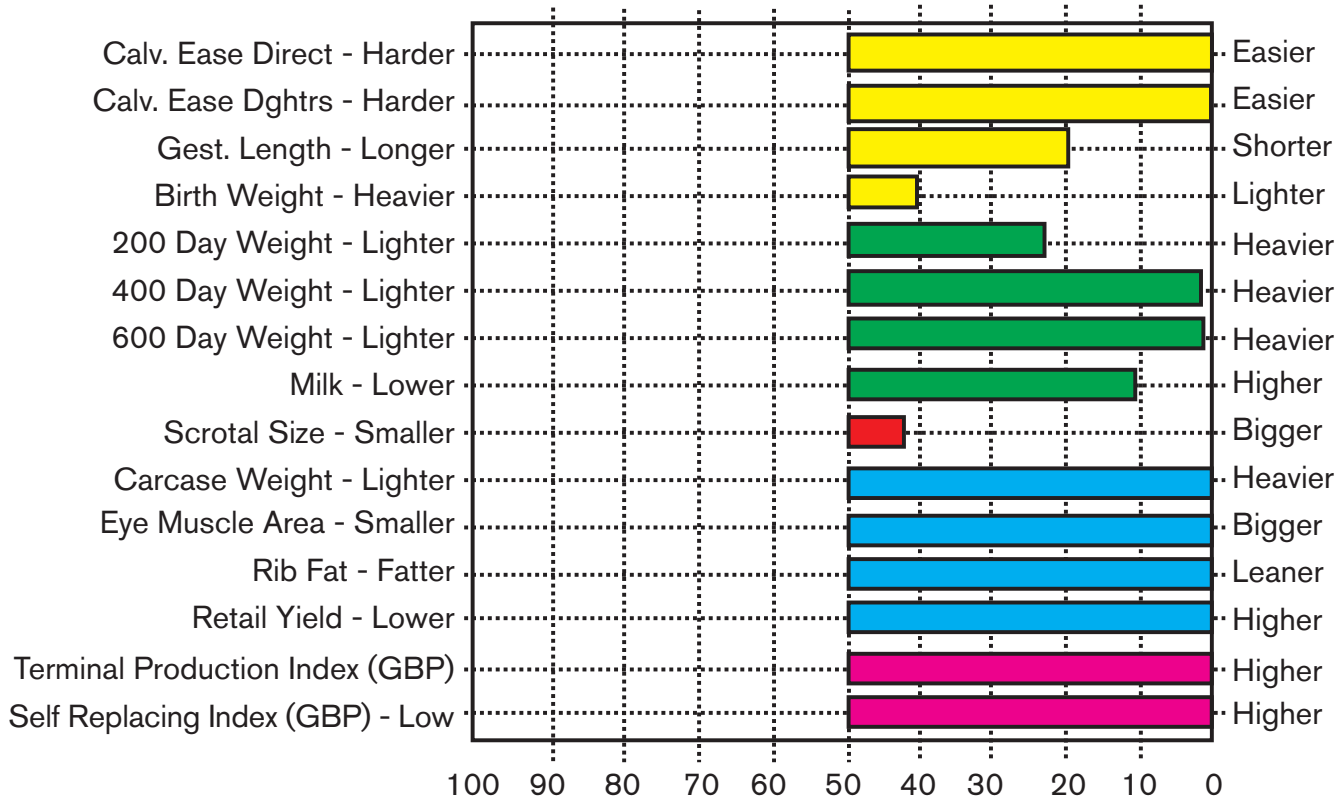
Example EBV percentiles for a bull with good terminal sire traits



50th Percentile is the Breed Average EBVs for 2009 Born Calves

This bull is very easy calving as shown by the yellow Calving Ease Direct bar to the right of breed average which shows he is in the top 5% of the breed for this trait. This is a reflection of the short gestation length shown for this bull plus his calves being lighter at birth. His progeny are fast growing with 200 day, 400 day and 600 day weights shown by the green bars all in the top 5% of the breed. Carcase characteristics are excellent with the bull promoting a Retail Meat Yield in the top 5% together with superior muscling. The only bars showing on the negative side of the graph are those for Fat Depth and Intramuscular Fat indicating that this bull will produce leaner carcases but progeny may take longer to lay down an acceptable level of fat cover for slaughter purposes.

Example EBV percentiles for a bull suitable for breeding heifer replacements



50th Percentile is the Breed Average EBVs for 2009 Born Calves

Indications are that this bull's progeny will be born easily and his daughters will themselves calve easily as shown by the first two yellow bars well extended into positive territory. Gestation length for the bull is shorter than breed average and his calves are born smaller, reinforcing the ease of calving. His genetics for milk passed on to his daughters show an EBV in the top 15% of the breed which together with the superior calving ease daughters EBV means that this bull would be suitable for breeding replacement heifers. Simultaneously, there is no compromise on growth and muscle traits with EBVs associated with the finished beef animal especially, such as Carcase Weight and Retail Meat Yield, in the top 1% of the breed. This bull would sire very lean carcases with good conformation.