SR DP | **Farm Advisory Service**

Utilising Maternal Trait EBVs of Beef Bulls

Summary

- **Important maternal traits such as fertility are a key driver of profitability in the suckler herd.**

- **The aim of Maternal trait EBVs is to identify bulls whose daughters calve successfully at 2 years of age, have shorter calving intervals, increased longevity and wean heavier calves.**

- **Maternal Indices: allow animals to be selected based on their maternal characteristics. These indices combine the EBVs for several traits weighted by their relative economic importance into a single value.**

Introduction

Beef bulls have a major impact on the quality of the UK suckler herd as all suckler cows are sired by a beef bull. To improve the efficiency of the national herd, it is essential that the bulls used to breed heifer replacements, carry the most desirable genetics to improve the maternal characteristics of their daughters. Bull selection is a vital part of matching cow type to production systems through the breeding of replacements. Ensuring the right cows are in the herd is crucial to keeping feed and labour costs down, whilst meeting abattoir specifications. Cows must have strong maternal characteristics such as fertility, ease of calving and milk.

Since the 1980's Estimated Breeding Values (EBVs) have been available for an increasing proportion of the bulls bred in the UK. Initially, these EBVs have only included the traditional growth and carcase traits which are expressed in both males and females. These EBVs include Birth Weight, 200 and 400 Day Weight/Growth, Eye Muscle Area, Carcass Fat Depth, etc. There was only one maternal EBV – the 200 Day Milk EBV being a measure of how well a bull's daughters would rear their calves to weaning, the main aspect being their milking ability. However a range of other maternal trait EBVs, have subsequently become available to UK beef breeders. They are calculated using exactly the same methodology – BLUP (Best Linear Unbiased Prediction) – which is used to calculate all EBVs.

What are Maternal Trait EBVs?

Maternal traits are characteristics only expressed by females, for example milk production or traits relating to female fertility such as age at first calving and calving interval.

Traits such as weaning weight and calving ease are influenced by the calves genetics (direct EBVs) and the genetics of the cow (maternal EBVs). For the direct EBVs each parent has an equal effect on the progenies performance. However for the traits with both a direct and maternal EBV, the dam has a greater effect on the performance of the progeny through her additional maternal effect.

100% Maternal effect from the cow

50% Direct effect from the cow

50% Direct effect from the bull

An example of this is calving ease. The cow (dam) provides 50% of the genetic influence (through her direct Calving Ease EBV) on the calf size and shape she produces. The other 50% comes from the bull (sire). However the cow also has an influence on how easily her calf is born through the size and shape of her pelvis – i.e. her maternal characteristics. It is these characteristics which are measured through her maternal calving ease EBV and calving ease daughters EBV.
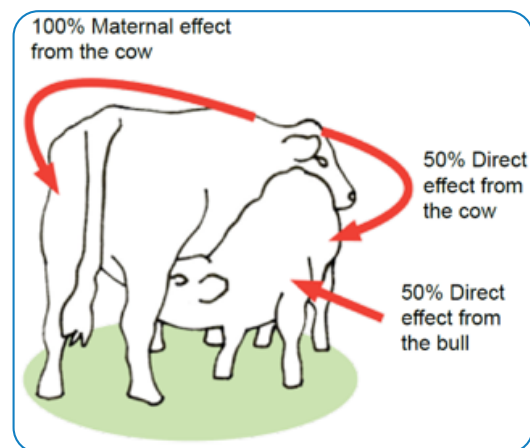
Maternal Trait EBVs in Practice

In the UK at present (December 2021) there are three different organisations producing EBVs for UK beef bulls – ABRI Breedplan, Signet Beefbreeder, and Taurus. All of these providers use the same methodologies and underlying BLUP technology to produce the EBVs with slightly different trait definitions. Beef breed societies and providers have strived to produce EBVs in a simple, straight forward way. Easy to understand EBVs are now presented as either a table or a bar chart, with those animals above average (better) stretching out to the right and with animals below average (worse) to the left side. The average for the breed sits in the middle (mid-point). An example of a bull's EBV (Signet & Taurus) chart can be seen below.

Breed Average
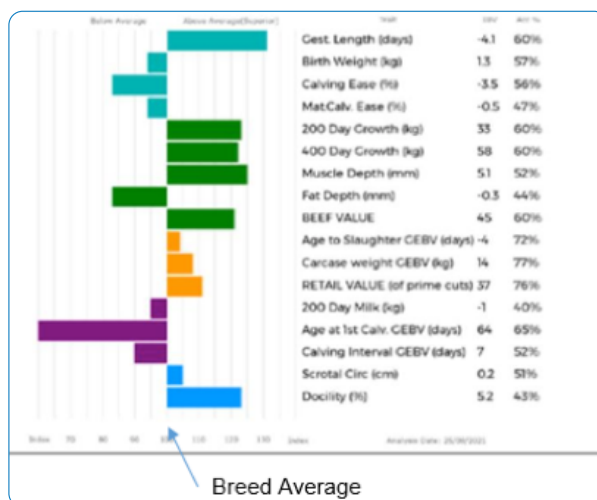
2021 SIMMENTAL BREEDPLAN							
	Calving Ease Dir (%)	Calving Ease Dtrs (%)	Gest. Len. (days)	Birth Wt. (kg)	200 Day Wt (kg)	400 Day Wt. (kg)	600 Day Wt. (kg)	Maternal Milk
EBVs	-8.7	+0.7	+1.3	+3.1	+34	+62	+75	+5
Accuracy	53%	48%	59%	74%	70%	69%	65%	43%
Av 19 Calves	-0.7	-0.2	+0.0	+2.5	+33	+61	+66	+6

	Scrotal Size (cm)	Carcase Weight (kg)	Eye Muscle Area (Sq.cm)	Fat (mm)	Retail Beef Yield	IMF %	Terminal Sire Index	Self Replacing Index
EBVs	+1.3	+47	+4.0	+0.4	+0.5	-0.3	+65	+78
Accuracy	63%	56%	36%	51%	45%	40%		
Av 19 Calves	+0.6	+44	+3.8	-0.1	+0.8	-0.1	+75	+83

The above is an example of Breedplan EBV's presentation.

REMEMBER that EBV's cannot be compared across breeds. All breeds have different values as their average. For example a Shorthorn will have more milk than an average Charolais.

Extensive research by SAC, DEFRA, SEERAD, MLC, QMS and supported by the British Limousin Cattle Society (BLCS) identified age at first calving, replacement rate and cow size as major maternal factors contributing to UK beef profitability. Along with these key maternal factors (so that breeders can effectively select animals with high genetic merit for traits that contribute to these), the following maternal EBVs are available;

- **Maternal Calving Ease (%)**

- **200 day milk (kg)**

- **Scrotal size (cms)**

- **Calving Interval (days)**

- **Mature Cow Weight (kg)**

- **Gestation Length (days)**

The table below shows what each EBV indicates and how to interpret it when buying bulls and replacement females:

Maternal Calving Ease (Signet & Taurus) or Calving Ease Daughters (Breedplan)	Identifies bulls whose daughters have characteristics that will help facilitate easier calvings (e.g. a larger pelvic area). Calving ease daughters takes into account both the maternal and calf influences on ease of calving and identifies how easily a bull's daughter will calve. (Should not be confused with Calving Ease Direct which determines how easily a calf will be born by a particular sire)
Interpretation	Higher, positive values mean more unassisted calvings.
Measurement	% (e.g. +4.0% is more favourable than –2.0%)
Example	A bull with an EBV of +4.0% would be expected to on average produce daughters that have 3% less calving problems when calving at 2 years of age than daughters of a bull with an EBV of -2.0%
200 Day Milk	Identifies how heifers will perform when they become mothers, e.g. the potential milk yield of the cow. 200 Day Milk EBV estimates the maternal effect on the 200 day weight of its calf
Interpretation	Positive values identify females that will rear heavier calves at weaning. Larger, more positive 200 Day Milk EBV's are generally more favourable
Measurement	Kg of calf weight at 200 days of age
Example	A bull with a 200 Day Milk EBV of +15kg would be expected to sire daughters with higher milk production than a bull with a 200 Day Milk EBV of +5kg
Scrotal Size	An indicator of male fertility with regard to semen quality and quantity. There is also a small favourable correlation with age of puberty in female progeny and shorter days to calving.
Interpretation	Positive values indicate higher increased fertility in males and earlier puberty in females.
Measurement	Cms
Example	A bull with a Scrotal Size EBV of +3cm would be expected to produce daughters that reach puberty earlier than the progeny of a bull with a Scrotal Size EBV of -3cms

Calving Interval (Signet & Taurus) or Days to Calving (Breedplan)	A measure of the cow's ability to get back in calf again quickly post-calving. The Days to Calving EBV promotes cows that calve earlier in the season compared to those that calve later
Interpretation	Lower, or more negative values indicate heifers/cows that get back in calf more quickly (i.e. are more fertile).
Measurement	Days
Example	A bull with a Days to Calving EBV of -6 days would be expected to produce daughters that conceive earlier than daughters from a bull with an EBV of +6 days.
Mature Cow Weight (BreedPlan)	An estimate of the genetic difference in cow size/liveweight at five years of age
Interpretation	Positive values indicate cows that are heavier when their calves are weaned
Measurement	Kg of cow weight when the calf is weaned (200 days of age)
Example	A cow with a Mature Cow Weight EBV of +65kg would be expected to have a higher mature weight than a cow with a Mature Cow Weight EBV of +50kg
Gestation Length (Breedplan)	An estimate of the genetic difference between animals in the number of days from the conception date to the calf birth date.
Interpretation	Shorter gestation length is associated with lighter birth weight and improved calving ease.
Measurement	Days
Example	A bull with a Gestation Length EBV of -4days would be expected to produce calves are that born earlier and more easily than a bull with an EBV of +4days

Maternal Indexes

Selection indexes, also known as breeding indexes, combine data from individual trait EBVs to provide an overall score of genetic merit, which are weighted according to the relative economic value of each of its contributing trait EBVs. An example is the **Maternal Value** (Signet & Taurus).

Maternal Value

This index is a value predicting the overall economic value of an animal's genetic ability to produce breeding (replacement) females with emphasis on maternal traits such as calving ease.

The individual EBVs included in the calculation for this index are shown below;

Longevity
Age at 1st Calving
200 Day Milk Weight   **Maternal Value**
Maternal Calving Ease
Calving Internal

The aim of breeding indexes is to provide a way of selecting for a number of traits at the same time. Most breed societies involved with performance recording also publish selection indexes. These breed specific selection indexes e.g. the British Blue Societies' BBB Pedigree Breeding Index and the British Simmental Societies' Self Replacing Index, have been designed to provide for all the different markets and production systems within the UK that are most relevant to the given breed. These indexes can be used by both pedigree and commercial breeders.

The breed societies have slightly differing names for their maternal indexes, therefore it is best to contact the relevant breed society in the first instance if you require further information. As with EBVs, Breeding Indexes cannot be compared between breeds.

Using Maternal Trait EBVs

Maternal trait EBVs are only useful where the offspring (daughters) of a bull or cow are going to be used as breeding replacements. Where the bull's daughters are going to be used for breeding replacements it would be advisable to examine individual maternal trait EBVs such as calving, milk, growth and fertility. The priority of the EBVs will differ between farms. The following table is a general guide to the order of importance e.g. Ease of Caving is placed at the top as a dead calf is of no value however well it may grow or milk.

Calving Ease Direct Calving Ease Maternal	Always select for high positive values
Calving Interval (Signet &Taurus) Days to Calving (Breedplan)	Always select for high positive values
Milk	Select average or above average

When using EBVs to assist in selection decisions it is important to achieve a balance between the different groups of traits and to place priority on those traits that are important to the particular herd and breed. Breeding priorities will vary depending on the breeding goals for example selection for milk will be more important in less milky breeds.

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