

UNDERSTANDING “BREEDPLAN”

EBV's, Selection Indexes and Accuracy

EBVs

An animal's breeding value is its genetic merit, half of which will be passed on to its progeny. While we will never know the exact breeding value, for performance traits it is possible to make good estimates. These estimates are called Estimated Breeding Values (EBVs).

In the calculation of EBVs, the performance of individual animals within a contemporary group is directly compared to the average of other animals in that group. A contemporary group consists of animals of the same sex and age class within a herd, run under the same management conditions and treated equally. Indirect comparisons are made between animals reared in different contemporary groups, through the use of pedigree links between the groups.

EBVs are expressed in the units of measurement for each particular trait. They are shown as positive or negative differences between an individual animal's genetics difference and the genetic base to which the animal is compared. For example, a bull with an EBV of +30 kg for 400-Day Weight is estimated to have genetic merit 30 kg above the breed base of 0 kg. Since the breed base is set to an historical benchmark, the average EBVs of animals in each year drop has changed over time as a result of genetic progress within the breed.

The absolute value of any EBV is not critical, but rather the differences in EBVs between animals. Particular animals should be viewed as being "above or below breed average" for a particular trait. The breed averages for the current two year old animals are reported with the selected animals' EBVs.

Whilst EBVs provide the best basis for the comparison of the genetic merit of animals reared in different environments and management conditions, they can only be used to compare animals analysed within the same analysis. Consequently, British Blue BREEDPLAN EBVs cannot be validly compared with EBVs for any other breed.

EBVs are published for a range of traits covering fertility, calving ease, milking ability, growth and carcass merit. When using EBVs to assist in selection decisions it is important to achieve a balance between the different groups of traits and to place emphasis on those traits that are important to the particular herd, markets and environment. One of the advantages of having a comprehensive range of EBVs is that it is possible to avoid extremes in particular traits and select for animals with balanced overall performance.

Calving Ease EBVs (%) are based on calving difficulty scores, birth weights and gestation length information. More positive EBVs are favourable and indicate easier calving.

- **CE % Dir** = Direct Calving Ease - The EBV for direct calving ease indicates the influence of the sire on calving ease in purebred females calving at two years of age.

- **CE % Daughters** = Daughters' Calving Ease - The EBV for daughters' calving ease indicates how easily that sire's daughters will calve at two years of age.

Gestation Length EBV (days) is an estimate of the time from conception to the birth of the calf and is based on AI and hand mating records. Lower (negative) GL EBVs indicate shorter gestation length and therefore a tendency for easier calving and increased growth after birth.

Birth Weight EBV (kg) is based on the measured birth weight of progeny, adjusted for dam age. The lower the value the lighter the calf at birth and the lower the likelihood of a difficult birth. This is particularly important when selecting sires for use over heifers.

200-Day Growth EBV (kg) is calculated from the weight of progeny taken between 80 and 300 days of age. Values are adjusted to 200 days and for age of dam. This EBV is the best single estimate of an animal's genetic merit for growth to early ages.

400-Day Weight EBV (kg) is calculated from the weight of progeny taken between 301 and 500 days of age, adjusted to 400 days and for age of dam. This EBV is the best single estimate of an animal's genetic merit for yearling weight.

600-Day Weight EBV (kg) is calculated from the weight of progeny taken between 501 and 900 days of age, adjusted to 600 days and for age of dam. This EBV is the best single estimate of an animal's genetic merit for growth beyond yearling age.

Mature Cow Weight EBV (kg) is based on the cow weight when the calf is weighed for 200 days, adjusted to 5 years of age. This EBV is an estimate of the genetic difference in cow weight at 5 years of age and is an indicator of growth at later ages and potential feed maintenance requirements of the females in the breeding herd. Steer breeders wishing to grow animals out to a larger weight may also use the Mature Cow Weight EBV.

Milk EBV (kg) is an estimate of an animal's milking ability. For sires, this EBV indicates the effect of the daughter's milking ability, inherited from the sire, on the 200-day weights of her calves. For dams, it indicates her own milking ability.

Scrotal Size EBV (cm) is calculated from the circumference of the scrotum taken between 300 and 700 days of age and adjusted to 400 days of age. This EBV is an

estimate of an animal's genetic merit for scrotal size. There is also a small negative correlation with age of puberty in female progeny and therefore selection for increased scrotal size will result in reduced age at calving of female progeny.

Carcase Weight EBV (kg) is based on abattoir carcass records and is an indicator of the genetic differences in carcass weight at the standard age of 650 days.

Eye Muscle Area EBV (sq cm) is calculated from measurements from live animal ultrasound scans and from abattoir carcass data, adjusted to a standard 300 kg carcass. This EBV estimates genetic differences in eye muscle area at the 12/13th rib site of a 300 kg dressed carcass. More positive EBVs indicate better muscling on animals. Sires with relatively higher EMA EBVs are expected to produce better muscled and higher percentage yielding progeny at the same carcass weight than will sires with lower EMA EBVs.

Fat EBV (mm) are calculated from measurements of subcutaneous fat depth at the rib (from live animal ultrasound scans and from abattoir carcasses) and are adjusted to a standard 300 kg carcass. This EBV indicates the genetic difference in fat distribution on a standard 300 kg carcass. Sires with a low, or negative, fat EBV are expected to produce leaner progeny at any particular carcass weight than will sires with higher EBVs.

Retail Beef Yield EBV (%) indicates genetic differences between animals for retail yield percentage in a standard 300 kg carcass. Sires with larger EBVs are expected to produce progeny with higher yielding carcasses.

Intramuscular Fat EBV (%) is an estimate of the genetic difference in the percentage of intramuscular fat at the 12/13th rib site in a 300 kg carcass. Depending on market targets, larger more positive values are generally more favourable.

Selection Index

The British Blue Cattle Society has developed the BBB Carcass Yield Terminal Index. Based on the BREEDPLAN performance recording technology, the index is calculated for commercial cattle producers wishing to produce slaughter progeny from larger framed, mature cows. The Index is reported as an EBV, in units of relative earning capacity (£'s) per cow mated for the given market and reflects the short-term profit generated by a sire through the sale of his progeny.

BBB Carcass Yield Index (£'s) - Estimates the genetic differences between animals in net profitability per cow mated for an example commercial herd targeting the EU market with no marbling requirement. All progeny are assumed to be marketed at around 550-580 kg live weight (280-320 kg carcass weight) at approximately 19 months of age.

As the name suggests, this index ranks bulls by their genetic potential for the production of prime steers and heifers for beef production. Consequently, growth and carcass

EBV's are the main drivers used in compiling this Index. Some emphasis is also placed on calving ease direct, which is an estimate of genetic difference between animals ability to calve without assistance.

Typical production parameters, prices and costs underlie this selection Index. Benefits and costs evaluated include both those for the sale animal from birth to slaughter and average running costs for a typical cow herd. Feed is assumed a limited resource for a large part of the year and any increase in feed requirement is a cost.

Bulls with a higher BBB Carcase Yield Index will have a greater genetic potential to sire heavier finished progeny. As there are no maternal traits included in the calculation of the BB Carcase Yield Index, bulls with a high Index will not necessarily be suitable for breeding heifer replacements.

BB Pedigree Breeding Index This index (£ per cow mated), targets herds that breed their own replacement cows and bulls and slaughter progeny from large framed cows, to produce progeny for slaughter at around 16 months and 360kg steer carcass weight. The main EBV emphases are on weight, carcass yield and calving ease. This index is only reported for animals with at least moderate accuracy for key traits, who are in the top 50th percentile for Calving Ease Direct, 400 Day Weight and RBY % EBV's.

The Pedigree Breeding Index, is an index suited to herds that breeds its own female replacements, is seeking comparatively easier calving, whilst maintaining carcass characteristics. It can be used as a selection tool, by identifying useful genetics, within the back-pedigree's of both potential sires and dams. One should however, bear in mind, that calving ease is also heavily influenced by the genetics of the dam and her nutrition in the latter stages of pregnancy. Of what you see in an animal, 30% is influenced by its genes and 70% by your management.

The Indexes are derived using BreedObject technology. More information is available from the [BreedObject](#) web site.

Accuracy

Accuracy (%) is based on the amount of performance information available on the animal and its close relatives - particularly the number of progeny analysed. Accuracy is also based on the heritability of the trait and the genetic relationships (correlations) with other recorded traits. Hence accuracy indicates the "confidence level" of the EBV. The higher the accuracy value the lower the likelihood of change in the animal's EBV as more information is analysed for that animal or its relatives. Even though an EBV with a low accuracy may change in the future, it is still the best estimate of an animal's genetic merit for that trait. As more information becomes available, there is an equal likelihood that an EBV will increase in value, as it is to decrease.

Accuracy values range from 0-99%. The following guide is given for interpreting accuracy:

Accuracy range	Interpretation
less than 50%	Low accuracy. EBVs are preliminary and could change substantially as more performance information becomes available.
50-74%	Medium accuracy, usually based on the animal's own records and pedigree.
75-90%	Medium-high accuracy. Some progeny information included. EBVs may change with addition of more progeny data.
more than 90%	High accuracy estimate of the animal's true breeding value.

As a rule, animals should be compared on EBVs regardless of accuracy. However, where two animals have similar EBVs the one with higher accuracy could be the safer choice, assuming other factors are equal.

Percentile Bands for 2006 born calves

Percentile Band	Calv. Ease Direct (%)	Calv. Ease Dtrs (%)	Gest. Len. (days)	Birth Wt. (kg)	200 Day Wt. (kg)	400 Day Wt. (kg)	600 Day Wt. (kg)	Milk (kg)	Carcase Wt. (kg)	Eye Muscle Area (sq.cm)	Rib Fat (mm)	Retail Beef Yield (%)	IMF %	BBB Carcase Yield Index (GBP)	BBB Pedigree Breeding Index GBP
Top Value	+1.9	+1.2	-2.4	-2.2	+26	+46	+64	+7	+37	+3.8	-0.9	+1.5	+0.5	+27	+24
Top 1%	+1.4	+0.8	-1.1	-1.0	+20	+34	+48	+6	+27	+3.2	-0.4	+1.1	+0.2	+21	+16
Top 5%	+0.9	+0.6	-0.4	-0.1	+15	+25	+37	+5	+21	+2.8	-0.2	+0.9	+0.1	+16	+13
Top 10%	+0.6	+0.4	-0.1	+0.4	+14	+22	+32	+4	+18	+2.4	-0.1	+0.7	+0.1	+15	+12
Top 15%	+0.5	+0.3	0.0	+0.7	+13	+20	+30	+4	+16	+2.0	0.0	+0.6	+0.1	+14	+11
Top 20%	+0.4	+0.2	+0.1	+0.9	+12	+18	+28	+3	+15	+1.9	0.0	+0.5	+0.1	+12	+10
Top 25%	+0.3	+0.2	+0.2	+1.0	+11	+17	+26	+3	+14	+1.7	0.0	+0.4	+0.1	+12	+9
Top 30%	+0.2	+0.1	+0.3	+1.2	+10	+16	+25	+3	+13	+1.6	+0.1	+0.4	+0.1	+11	+8
Top 35%	+0.1	+0.1	+0.4	+1.3	+10	+15	+23	+3	+12	+1.5	+0.1	+0.3	+0.1	+11	+7
Top 40%	+0.1	0.0	+0.5	+1.4	+9	+14	+22	+3	+12	+1.5	+0.1	+0.3	0.0	+10	+7
Top 45%	0.0	0.0	+0.5	+1.5	+8	+13	+21	+2	+11	+1.4	+0.1	+0.2	0.0	+10	+6
Top 50%	0.0	0.0	+0.6	+1.7	+8	+12	+20	+2	+10	+1.3	+0.2	+0.2	0.0	+9	+6
Top 55%	-0.1	0.0	+0.7	+1.8	+7	+11	+19	+2	+10	+1.2	+0.2	+0.2	0.0	+9	+5
Top 60%	-0.1	-0.1	+0.7	+1.9	+7	+10	+18	+2	+9	+1.1	+0.2	+0.1	0.0	+9	+5
Top 65%	-0.2	-0.1	+0.8	+2.1	+6	+9	+16	+2	+9	+1.0	+0.2	+0.1	0.0	+8	+4
Top 70%	-0.2	-0.2	+0.9	+2.2	+6	+8	+15	+2	+8	+1.0	+0.3	+0.1	0.0	+8	+3
Top 75%	-0.3	-0.2	+1.0	+2.4	+5	+7	+14	+2	+7	+0.9	+0.3	0.0	-0.1	+7	+3
Top 80%	-0.4	-0.2	+1.1	+2.6	+4	+6	+12	+1	+6	+0.9	+0.3	0.0	-0.1	+6	+2
Top 85%	-0.4	-0.3	+1.2	+2.8	+3	+4	+10	+1	+5	+0.8	+0.4	0.0	-0.1	+6	+1
Top 90%	-0.5	-0.3	+1.4	+3.1	+3	+2	+9	+1	+4	+0.7	+0.5	-0.1	-0.1	+5	0
Top 95%	-0.6	-0.4	+1.6	+3.6	+1	0	+5	+1	+2	+0.6	+0.5	-0.2	-0.2	+3	-2
Top 99%	-0.9	-0.6	+2.2	+4.6	-2	-4	-3	0	-1	+0.3	+0.7	-0.3	-0.3	0	-5
Low Value	-1.1	-0.8	+2.9	+6.5	-9	-16	-30	-2	-10	-0.4	+1.1	-0.9	-0.6	-11	-13