

Genomic Breeding Values

In the pig and poultry industry, the large scale breeding programmes and recording of millions of animals in controlled environments over successive generations has facilitated rapid genetic progress through DNA testing. This is now routinely used in these species and in dairy cattle. In the sheep and beef world, the majority of gene markers that have been available have been identified and developed in Australia, New Zealand and America, where much larger flocks and herds are recorded. Several thousands of animals need to be recorded to validate a DNA test which has restricted the commercial development and validation in UK beef and sheep breeds.

What are GEBVs?

Genomic Breeding Values (GEBVs) are breeding values derived from information in an animal's DNA. They are calculated differently to our conventional Estimated Breeding Values (EBVs). Whilst EBVs are based on measured performance (e.g. growth rate) on farm and within a contemporary group, GEBVs are calculated by compiling information both from the animal's performance and its DNA to produce a performance indicator also referred to as a 'SNP key' (pronounced 'Snip'). Further animals' DNA can then be compared and evaluated against this library of DNA and performance records from thousands of animals to accurately predict breeding merit.

GEBVs are likely to be most useful for:

- traits that are difficult or expensive to record as with carcass and meat quality traits
- traits that can only be measured in one sex, like milk yield or prolificacy
- traits that can only be measured accurately later in life, like longevity

In the first of their kind for the UK beef industry, GEBVs for a range of new carcass traits are now available for all Limousin bred cattle. They represent estimates of genetic merit using new and independent sources of information; visual image analysis (VIA) records on individual carcass cuts from selected abattoirs and information from a vast pool of Limousin DNA. This information is combined to produce breeding values that indicate an individual animal's strengths and weaknesses for each trait.

Dean Holroyd, Group Technical and Sustainability Director with ABP Food Group reports "Some work carried out at the research stages looked at the progeny of 259 Limousin sires. Significant ranges in genetic potential for the different carcass cuts were clearly identified between the best sires and the poorest sires against the average. Identifying the sires that can pass on their superior genetics to their progeny has obvious benefits along the whole of the supply chain".

When the additional value of all the cuts is multiplied up, it equates to an estimated difference of around £100/calf between high genetic merit sires and low genetic merit sires. Half of the calves' genes come from its sire and assuming all things are equal, this means the sire with superior carcass genes has the ability to produce calves worth £50-£75/head more than calves by sires with the poorer carcass genes.

On a wider level, further advantages of GEBVs include:

- **Data from independent sources:** Use of independent abattoir records and animal DNA represents a significant step forward in the data used for genetic evaluation. On farm recording will remain important however, as GEBVs are not effective in isolation since they require ongoing recalibration.
- **Speed:** GEBVs can be obtained shortly after a calf is born, thereby enhancing the opportunities for selection much quicker than by performance recording alone.
- **Improved accuracy:** for many traits that have low heritability or are difficult or expensive to measure, GEBVs will offer higher levels of accuracy than conventional EBVs.
- **Lower cost:** Because accuracies are enhanced much more quickly using GEBVs than by collecting records on farm (depending on the trait) there can be less cost involved in getting breeding value estimates to similar levels of accuracy.
- **All owners of Limousin bred cattle can gain GEBVs:** A significant difference between an EBV and GEBV is that the former relies on the collection of performance records across groups of animals all managed in the same way. To gain the latter- a GEBV- all that is required is the DNA sample and the identity of the animal.

It offers commercial producers significant opportunity in assessing current and future sires and replacement heifers.

Professor Mike Coffey from SRUC says “This is a game changer for the beef industry. Genomic selection will bring large and rapid benefits to beef breeders and processors in the same way as it has for the dairy industry. It will enable the UK beef sector to remain internationally competitive and will provide a platform for the future that will include other economically important traits such as feed intake and meat quality”.

In order to aid understanding of how this new technology may provide advantage to the beef industry in Wales, Farming Connect are offering owners of Limousin stock bulls, whether used for pedigree breeding or in a commercial beef or dairy herd, the opportunity to have funding to DNA test their bull for his Carcass Traits GEBVs. If you wish to take part, please register your interest with Delana Davies on delana.davies@menterabusnes.co.uk or 07811 261628.