# Choosing bulls

# Contents




The information in this booklet was compiled by AHDB and Dr Liz Genever, independent sheep and beef consultant.

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# Introduction

Breeding lies at the foundation of any beef production system. While herd breeding decisions are just one element of cattle management, selecting superior parents for breeding will lead to cumulative and permanent gains in herd productivity, profitability and efficiency.

There is no single definition of a good breeding plan. Instead, breeding plans need to be devised to meet the specific requirements of a herd and the target market.

Good genetics are the basic building blocks of animal production. No amount of feed or management can overcome poor genetics. In the pages that follow, we will take you through how to set breeding objectives for your herd, and how you can use estimated breeding values (EBVs) to help you achieve these objectives.

Along with good genetics, visual assessment remains an essential part of the bull selection process. This manual will also explain how to ensure that bulls are physically sound and fit to work.

We hope this manual will help you to unravel some of the issues to address when choosing a sire for your herd – whether you choose to purchase a stock bull or use AI sires.

# Setting breeding objectives for your herd

Suckler farms across the UK have a variety of end markets that they supply, both terminal and maternal. Each market will have its own requirements, meaning that one end product will not fit all markets. Surely then, this means that the product, or calf, that we start with needs to be different depending on what market we are supplying and what production system we are working with? The terminal and maternal traits of that calf will need to be different depending on what we want it to do and what will be the most profitable for our farming system.

Identifying the requirements of your market and, subsequently, what the calf needs to do to maximise profit at different stages of production is an essential first step to choosing a bull to breed your cows with.

**When making a breeding plan, try not to focus on too many areas at once. This is likely to make finding a suitable bull harder and could slow down genetic progress in the areas that are most important to your business.**

Once you've identified the requirements of your market, think about which areas you are fulfilling and which areas you need to improve on, using genetics as one of the tools to get you there.

**Not all suggested EBVs are available for every breed. Once you've chosen the breed of bull you want to use, focus on the relevant EBVs available for this breed. You can compare cross breed EBVs using AHDB's National Beef evaluations: ahdb.org.uk/knowledge-library/national-beef-evaluations**

## Getting in calf to weaning stage

Below are a series of questions for you to answer in relation to your business. After highlighting the areas that are important to you, look for a bull with the desired traits that link to those areas.

### Getting in calf

To be at their most profitable, cows should produce a calf once every 365 days. Calving more cows in the first three and six weeks of calving gives them more chance to get back in calf next time.

**What is your average scanning percentage?**
Industry target: >96%.

$$\frac{\text{Number of cows confirmed in-calf}}{\text{Number of cows put to the bull}} \times 100 = \quad \%$$

**What percentage of cows and heifers calve in the first three weeks?**
Industry target: >65%.

$$\frac{\text{Number of cows that calve in the first three weeks}}{\text{Number of cows in herd}} \times 100 = \quad \%$$

**What percentage of your cows have a calving interval of less than 370 days?**
Industry target: >90%.

$$\frac{\text{Number of cows that have calving interval <370 days}}{\text{Number of cows in herd}} \times 100 = \quad \%$$

To improve these figures, use these EBVs:

- Calving interval
- Gestation length
- Maternal value

### Calving ease

For profitable suckler systems, calves need to be born easily. Difficult calvings cause fertility problems in cows and poor performance in calves. There are two elements to calving ease: bull calving ease and cow calving ease.

**What percentage of your cows and heifers do you assist at calving?**
Industry target: <5% assisted calving's in mature cows.

$$\frac{\text{Number of cows assisted}}{\text{Cows in herd}} \times 100 = \quad \%$$

**What would you like this figure to be in five years?**

To improve these figures, use these EBVs:

- Calving ease direct (how easily a bull's calves will be born)
- Calving ease maternal/daughters (how easily a bull's daughters will calve)
- Birth weight
- Gestation length
- Calving value
- Maternal value

## Calf growth

Young calves are the most efficient animals on the farm. Capitalising on early growth rate potential can reduce the need for concentrate feeding. If selling weaned calves as stores, bigger, well-grown calves will increase sale price. Calf growth rates are a reflection of the calf's genetics, farm practices and the milking ability of the cow.

**What is your average daily liveweight gain (DLWG) from birth to weaning?**
Industry target: >1.1 kg/day.

$$\frac{\text{Weaning weight - birth weight}}{\text{Age of calfs (days) at weaning}} =$$

**This can be done using averages from the herd or individuals*

To improve, use these EBVs:

- 200-day growth rate
- Milk/200-day milk
- Weaning weight
- Weaning index

## Cow efficiency

Cows need to rear the maximum weight of weaned calf possible to be at their most efficient while still getting back in-calf. Smaller cows will eat less and may suit some systems better.

**What is the average weight of your cows at weaning?**

**What would you like it to be in five years' time?**

**What is your 200-day weaning weight/kg of cow or heifer bred?**
Industry target: >45%.

$$\frac{\text{Total adjusted 200-day kg of weaned calf}}{\text{Total kg of cows and heifers bred}} =$$

To improve, use these EBVs:

- Milk
- Mature cow weight
- Longevity
- Age at first calving
- Maintenance value

## Bulling heifers

Heifers need to be 60–65% of mature weight at bulling. Efficiency and profitability is improved by calving them at 2 years old.

**What is your average age at calving?**
Industry target: 2 years old.

**Where would you like this to be in five years' time?**

**What is your average heifer bulling weight?**

$$\frac{\text{Average heifer weight}}{\text{Average cow weight}} \times 100 = \quad \%$$

**What percentage of your mature cow weight is this?**
Industry target: 60–65% of mature cow weight.

To improve, use these EBVs:

- Calving ease maternal/daughters (how well she will calve)
- Age at first calving
- Scrotal circumference
- 400-day growth
- Milk
- Mature cow weight
- Age at first calving
- Yearling weight

## Weaning to finishing

### Growth rates

Having the genetic potential for high growth rates can reduce feed costs and days on farm, depending on the type of system.

**What is your average age at finishing/sale?**

**What would you like this to be in five years' time?**

**Taking your average weaning weight and your average finishing weight, what is your DLWG?**

$$\frac{\text{Average finishing weight - Average weaning weight}}{\text{Days between weaning and finishing}} =$$

**Where would you like this to be in five years time?**

To improve, use these EBVs:

- 400-day growth rate
- 600-day growth rate
- Days to slaughter
- Beef value
- Terminal production index
- Finisher index

## Feed intakes

Having finishing animals that have greater feed efficiency will mean that less feed will be needed to achieve target growth. It also has an effect on environmental impact.

To improve, use these EBVs:

- Feed-to-gain ratio
- DM feed intake

## Market specification

Meet market specification with finished animals to avoid penalties at slaughter and achieve the highest premium.

**What percentage of your finished animals hit target specification?**

**What areas are they being penalised for?**

**What is the maximum deadweight you can get paid for before penalties?**

**What is your average deadweight?**

**What is your average age at slaughter?**

**Is this high/low/just right?**

To improve, use these EBVs:

- Carcase conformation
- Carcase fat class
- Carcase weight
- 400-day weight
- 600-day weight
- Days to slaughter
- Retail beef yield
- IMF (Intramuscular fat)
- Eye muscle area
- Rib fat
- Fat depth

To record the performance of your herd, including growing and finished stock, use our **Herd notebook**.

# Choosing a breeder

Choosing a breeder to buy your stock bull from is just as important as choosing the bull. Working with a breeder that you trust and that has similar breeding goals to those that you have identified for your herd will ensure that progress is made more quickly and that you are buying a bull you can be sure of.

**A breeder's herd should always have a higher genetic merit than yours to ensure your herd makes progress.**

Where can you find a reliable bull breeder?

- Word of mouth
- Breed society websites
- Farming press
- Social media

If buying a bull from a sale at auction, do your research on the breeders as well as the bulls beforehand. If practical, it's a good idea to visit the breeder so you can see their system first-hand. A good breeder should always be open to potential buyers visiting them.

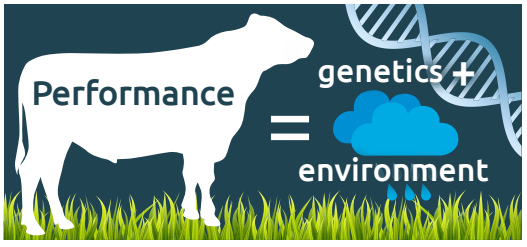
What questions should you be asking a breeder?

- What are the breeding objectives of their herd?
- Are they performance recording?
- What is the genetic merit of their herd compared with the breed average?
- Are they calving at 2 years old?
- What is their calving pattern?
- How long are their cows lasting in the herd?
- Are there any lameness or structural issues in their cow herd?
- What is the health status of their herd/ are they in a health scheme?

Top breeders should be able to answer all of the above questions easily and openly. Negative comments regarding performance recording and genetic merit should be a red flag to potential buyers.

# Finding and using EBVs

Visual assessment remains an integral part of bull selection and is covered in detail from page 22 in this manual. However, it is impossible to fully assess the breeding potential of a bull through visual assessment alone, because its outward appearance is affected by its age, feeding and management regime, as well as by its genetics. Assessing a bull's EBVs is therefore an essential part of the bull selection process.




## What is an EBV?

EBV stands for estimated breeding value. An animal's breeding value shows the genetic merit of an individual and its potential as a parent for a specific trait. Although we cannot verify the true breeding value of an animal for a particular trait, we are able to estimate it. To do this, we use information on an animal's own performance and that of its herd mates (contemporaries) and relatives, along with information about the trait heritability and trait correlations.

**Heritability is a measure of how much variation in a trait is due to the animal's genetics, and trait correlations are a measure of the relationship between different traits.**

EBVs are expressed in the same units in which performance measurements are taken (e.g. kg for liveweight) and are expressed as the difference between an individual animal's genetics and the genetics of a base population of animals.

For example, a bull with an EBV of +20 kg for 400-day weight means that this bull is genetically superior to the breed's base population by 20 kg at 400 days. A bull contributes 50% of his genetics to his progeny, so, on average, we would expect this bull's calves to be 10 kg heavier at 400 days compared with the base population.

## How can we compare animals from different environments?

To estimate breeding values, we use an analytical procedure known as BLUP (best linear unbiased prediction). Given information on performance, along with information about the animal's pedigree, age and environment (e.g. herd/farm), BLUP is able to separate out genetic and environmental reasons for how an animal looks and performs.

It does this by comparing how well animals perform against their contemporaries – animals of a similar age raised in the same environment (i.e. within the same herd), who have therefore had equal opportunity to perform.

When one sire is used over many environments, we can easily compare many groups of cattle and identify how much of the performance is down to genetics as opposed to management differences. Making use of artificial insemination (AI) technologies has heavily increased the opportunities to compare cattle performance across many environments.

## Can we compare EBVs from different breeds?

As a rule, EBVs are calculated in comparison with a base population of a single breed, and so you cannot compare animals across different breeds. An exception to this is EBVs from the AHDB National Beef Evaluations, which are explained in more detail on page 18.

## How do I find EBV information?

All breed societies who performance record have easy access to EBV information through their society websites, and EBV information can also be accessed through individual animal pages on the websites of AI companies. Information on EBVs is presented both in graphs and using numerical figures.

A full list of breeds serviced by each of the providers can be found in Appendix 2 of this manual, along with the traits that are analysed by each service provider.

## Interpreting EBV information

As 50% of the genetics come from the sire, the EBV value must be halved to show how much of his genetic superiority (or inferiority) will be passed to the next generation.

### Example

A bull with an EBV of +20 kg for 400-day growth is expected to produce, on average, calves 10 kg heavier at 400 days than calves sired by a bull with an EBV of 0.

For some traits, a negative value relates to a positive quality.

### Example

A bull with a birth weight EBV of -2 is expected, on average, to produce calves 1 kg lighter at birth than calves sired by a bull with an EBV of 0.

## EBV charts

EBVs can be displayed as specific figures and in a bar chart format.

All breed societies generate these charts.

**Above-average EBVs are shown on the right-hand side of the graph and below-average EBVs on the left-hand side of the graph.**

The midpoint of the graph relates to the breed average EBV. An example of the graph produced by three different breeds can be seen in the bull selection examples on pages 12–14.

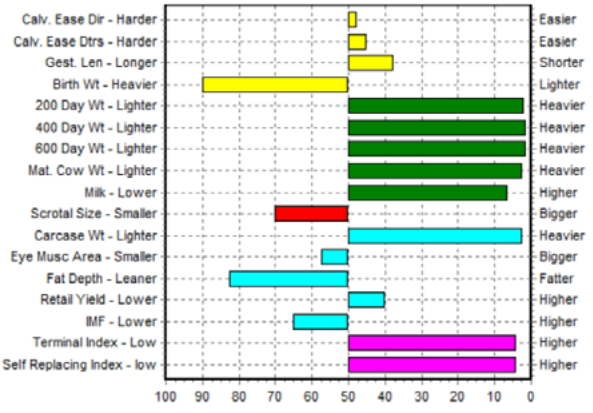
The following assumptions should be made when reading the examples:

- All bulls are assumed to be structurally sound and fertile
- Each example compares two bulls of the same breed
- We are only interested in EBVs for the traits mentioned in each of the examples

As a bull buyer, comparing bulls' EBVs for the traits that you have identified as part of your breeding plan allows you to choose the breeding bull that will have the best impact on your herd.

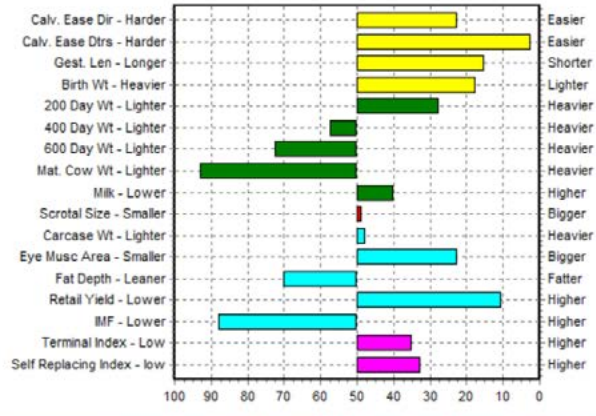
## Example 1

John runs a 50-cow suckler herd on an upland farm in the Yorkshire Dales. John has had some difficult calvings this year and worries that his cows are getting too big. He also wants to breed his own replacements. John has a choice between two Angus bulls, Fred and George, whose EBV charts are provided for you. Which bull should he choose for his system?




| | Calving Ease DIR (%) | Calving Ease DTRS (%) | Gestation Length (days) | Birth Wt. (kg) | 200 Day Wt (kg) | 400 Day Wt (kg) | 600 Day Wt (kg) | Mat Cow Wt (kg) | Milk (kg) | Scrotal Size (cm) | Carcase Wt (kg) | Eye Muscle Area (sq cm) | Fat Depth (mm) | Retail Beef Yield (%) | IMF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EBV | -1.2 | +0.5 | +0.4 | +5.1 | +63 | +103 | +126 | +118 | +18 | +0.6 | +80 | +3.2 | -2.2 | +1.1 | 0.0 |
| Acc | 50% | 44% | 51% | 78% | 72% | 72% | 67% | 59% | 51% | 74% | 61% | 54% | 61% | 54% | 50% |

Figure 1. Fred




| | Calving Ease DIR (%) | Calving Ease DTRS (%) | Gestation Length (days) | Birth Wt. (kg) | 200 Day Wt (kg) | 400 Day Wt (kg) | 600 Day Wt (kg) | Mat Cow Wt (kg) | Milk (kg) | Scrotal Size (cm) | Carcase Wt (kg) | Eye Muscle Area (sq cm) | Fat Depth (mm) | Retail Beef Yield (%) | IMF (%) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EBV | +1.1 | 3.9 | -0.4 | +1.9 | +43 | +65 | +73 | +52 | +12 | +0.9 | +54 | +4.7 | -1.7 | +1.8 | -0.2 |
| Acc | 85% | 79% | 92% | 97% | 93% | 93% | 90% | 83% | 81% | 88% | 83% | 72% | 81% | 73% | 71% |

Figure 2. George

Go to Appendix 1 'Example 1' to see which bull is most suitable for John's system.

## Example 2

Emma is looking for a bull to use as a terminal cross over her cows. Her cattle are sold deadweight, and she is part of a premium beef supply chain which focuses on carcase and meat-eating quality. Emma has narrowed her choice down to two Limousin bulls, Derek and Roy. Based on their EBV charts, which bull should Emma choose?

| | EBV | Accuracy | GEBV |
|---|---|---|---|
| Birth weight | -0.50 | 71% | n/a |
| Calving Ease | 1.00 | 65% | n/a |
| Maternal Calving Ease | 1.10 | 62% | n/a |
| Gestation Length | -1.30 | 76% | n/a |
| Calving Value | 3.00 | 75% | n/a |
| 200 Day Growth | -2.00 | 64% | n/a |
| 400 Day Growth | 1.00 | 64% | n/a |
| Muscle Depth | 0.80 | 61% | n/a |
| Fat Depth | -0.10 | 58% | n/a |
| Beef Value | 22.00 | 66% | n/a |
| Scrotal Circumference | -0.20 | 60% | n/a |
| 200 Day Milk | 1.00 | 55% | n/a |
| Age at first calf | 24.02 | 57% | n/a |
| Longevity | -0.22 | 48% | n/a |
| Calving interval | 11.52 | 46% | n/a |
| Calf Survival | -0.03 | 52% | n/a |
| Docility | -2.90 | 56% | n/a |
| Age to slaughter | 3.64 | 51% | n/a |
| Carcase weight | 5.87 | 58% | n/a |

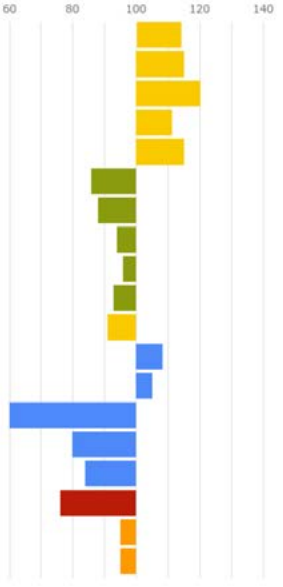



Figure 3. Derek

| | EBV | Accuracy | GEBV |
|---|---|---|---|
| Birth weight | 2.00 | 61% | n/a |
| Calving Ease | -1.20 | 63% | n/a |
| Maternal Calving Ease | 0.90 | 55% | n/a |
| Gestation Length | -1.70 | 75% | n/a |
| Calving Value | 2.00 | 74% | n/a |
| 200 Day Growth | 30.00 | 63% | n/a |
| 400 Day Growth | 59.00 | 63% | n/a |
| Muscle Depth | 5.20 | 60% | n/a |
| Fat Depth | 0.30 | 55% | n/a |
| Beef Value | 44.00 | 63% | n/a |
| Scrotal Circumference | 0.40 | 58% | n/a |
| 200 Day Milk | 2.00 | 53% | n/a |
| Age at first calf | 18.00 | 63% | n/a |
| Longevity | -0.07 | 52% | n/a |
| Calving interval | 6.00 | 52% | n/a |
| Calf Survival | -0.01 | 51% | n/a |
| Docility | 2.60 | 51% | n/a |
| Age to slaughter | -3.90 | 70% | n/a |
| Carcase weight | 9.90 | 75% | n/a |

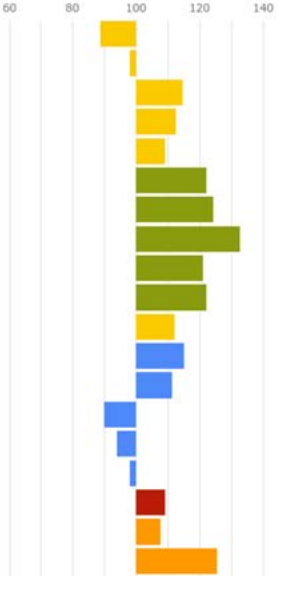



Figure 4. Roy

Go to Appendix 1 'Example 2' to see which bull is most suitable for Emma's system.

## Example 3

Patrick breeds and sells store cattle as yearlings. He wants to breed calves that will bring him the biggest return from the market. Patrick is looking at two Sussex bulls, Colin and Brian. Which is the best bull for Patrick's system based on their EBV charts?

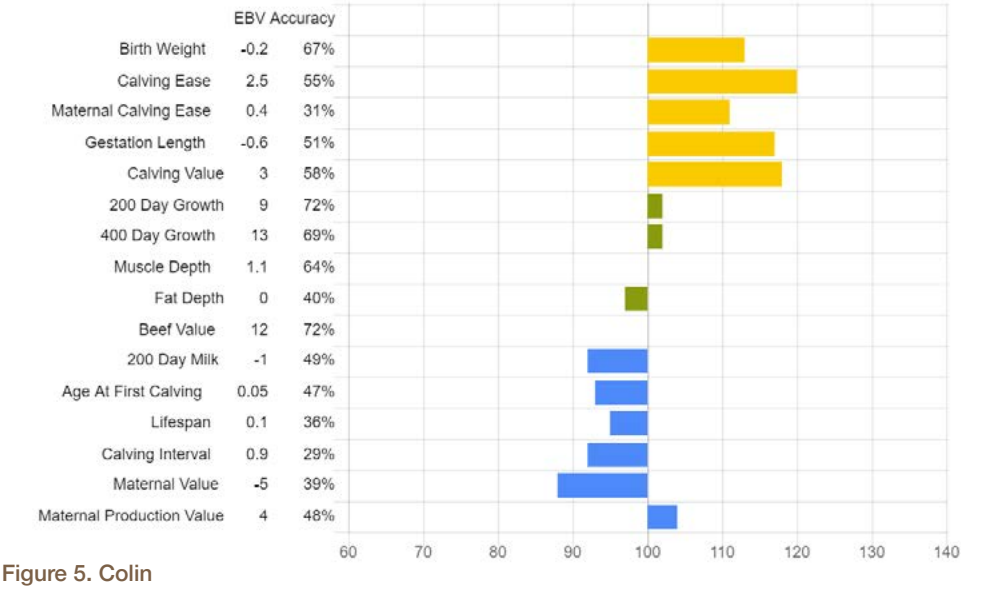



Figure 5. Colin

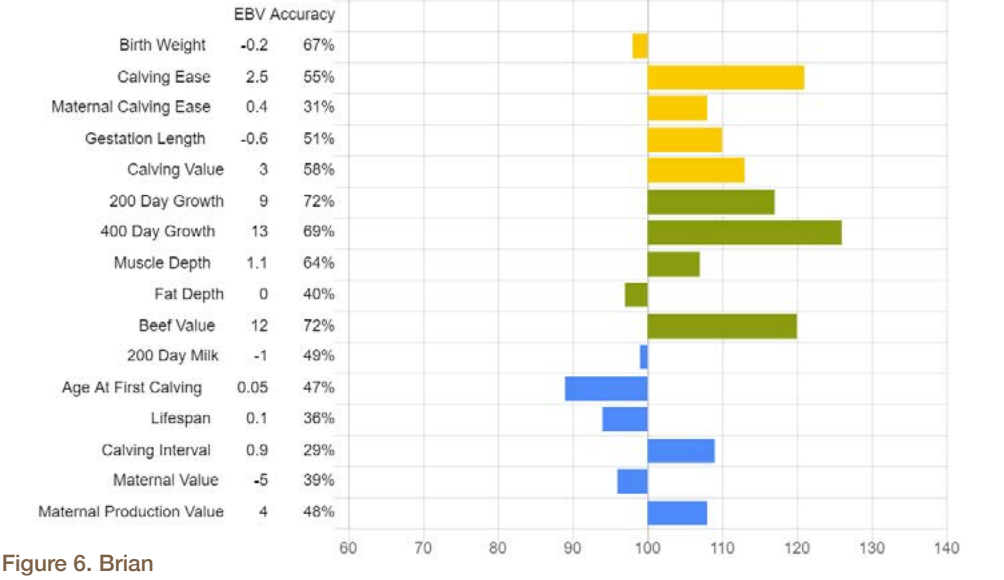



Figure 6. Brian

Go to Appendix 1 'Example 3' to see which bull is most suitable for Patrick's system.

## EBV accuracy

Alongside the EBV information, all providers show an accuracy value for each trait. The accuracy is a measure of how close the estimated breeding value is to the animal's true genetic merit and is shown in percentage points.

The higher the accuracy, the less likely it is that the current EBV value will change significantly over time as more data becomes available.

The accuracy of an EBV is influenced by:

- The amount of information on the trait from the animal itself
- The amount of information on the trait from relatives of the animal
- The heritability of the trait concerned
- The amount of information from the animal and its relatives on traits correlated with the trait of interest and the strength of the correlations
- The number of contemporaries recorded

The level of accuracy increases significantly once a bull has progeny of its own, and so when buying young bulls that haven't had any progeny, the accuracy of their EBVs is likely to be low.

However, the genetic gain that we see over time in the national herd means that you will make more genetic progress using younger sires than older ones.

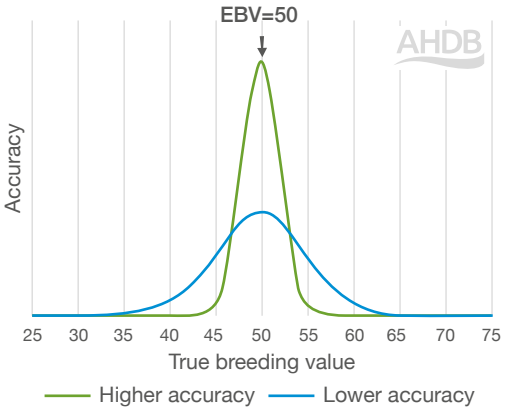



Figure 7. Accuracy distribution

## Making tough decisions

When trying to choose between two bulls, select the one with the highest accuracy if their EBVs are similar. If there are big differences in their EBVs for the trait you are looking at, select the one with higher EBVs.

## Selection indexes

Selection indexes, also known as breeding indexes, combine data from individual-trait EBVs to provide an overall score of genetic merit. When creating indexes, an economic weighting is assigned to each of the selected traits, and so index figures are published as £ figures. Most breed societies involved in performance recording also publish selection indexes. These can be found alongside the EBV's on the breed society database and in the national beef evaluations. Breed-specific selection indexes have been designed to cater for the different markets and production systems in the UK that are most relevant to the given breed. These indexes can be used by both pedigree and commercial breeders.

Each index is different. The traits included and the weightings assigned depend on the aim of the index and the importance each society places on the individual traits. Selection indexes should be used like an EBV, by comparing it with the breed average or breed percentiles to rank animals.

In general, there are two main types of index:

- Terminal/Beef value indexes are based on the genetic potential for prime beef production. Growth and carcase traits are usually given the heaviest weightings in this type of index.
- Self-replacing/Maternal indexes are based on the potential for producing heifer replacements. The emphasis in this type of index is on maternal traits such as calving ease, but growth and carcase traits are still included.

When using selection indexes, there is a risk that bulls with very different EBVs could have the same selection index value. If the wrong bull is chosen for breeding, this can have negative consequences (see Figures 8 and 9). It is essential that once bulls have been shortlisted based on their index values, the individual-trait EBVs are also checked.

When using selection indexes, we recommend that you complete the following steps, as well as carrying out a visual assessment:

1. Identify the selection index of most relevance to your breeding plan.
2. Rank bulls (within a breed) based on this selection index.
3. For each shortlisted bull, consider the individual EBVs that you have identified in your breeding plan.

### Put into practice

**Have a go at the questions in Example 4 on the next page.**

## Example 4

Based on Figures 8 and 9, answer the following questions:

**Question 1:** Both bulls have a terminal index value of +40, but which bull is more appropriate for heifer mating?

**Question 2:** Which bull's progeny will be of higher value to the finisher?

**Question 3:** What are the differences between bulls that mean they have the same terminal index value?

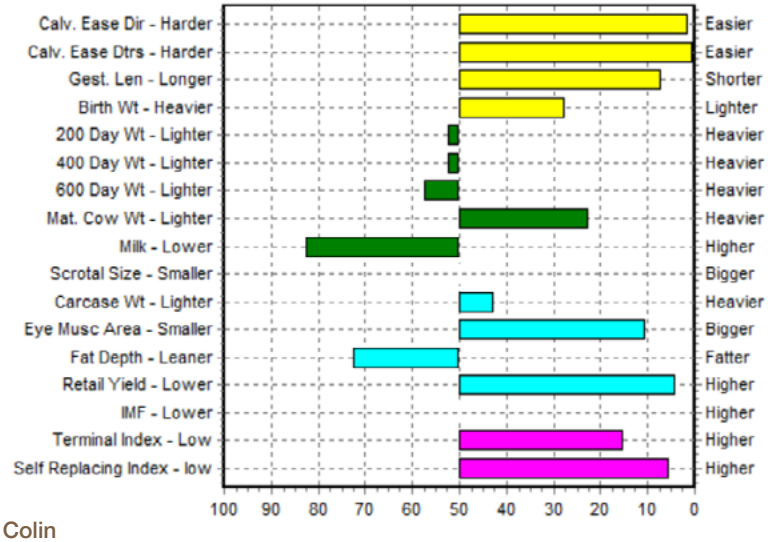



Figure 8. Colin

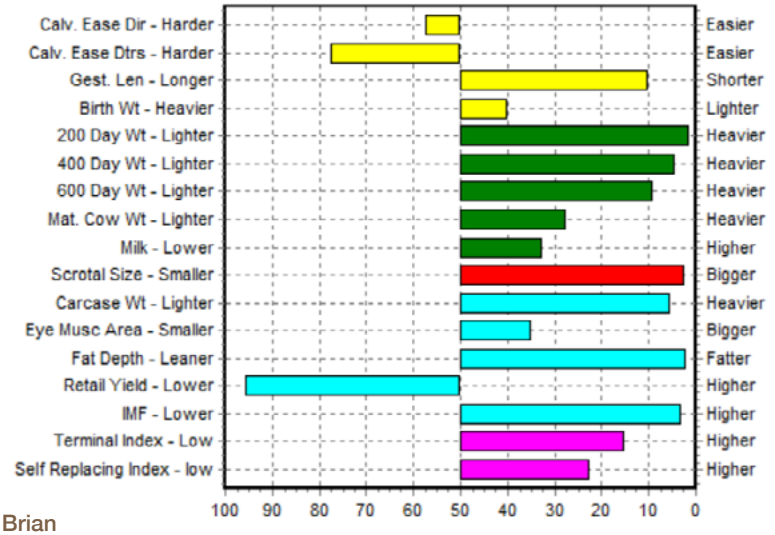



Figure 9. Brian

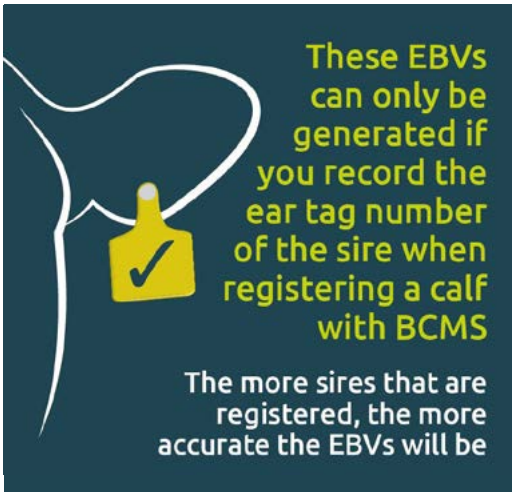
Go to Appendix 1 'Example 4' to see the answers.

## EBVs from commercial data – the AHDB National Beef Evaluations

The EBVs provided by breed societies are all based on performance data from registered pedigree herds, and in some cases, such as for carcase traits, it is not possible to record direct measurements from these animals.

However, data for many traits is collected via commercial sources. We have been able to use our long-term partnerships with abattoirs, the British Cattle Movement Service (BCMS) and Scotland's Rural College (SRUC) to provide evaluations based on commercial data. We currently provide EBVs for five finishing traits:

- Age to slaughter (days)
- Carcase weight (kg)
- Carcase conformation (EUROP classification)
- Carcase fat class (EUROP classification)
- Average daily carcase gain (kg/day)
- Age at first calving
- Productive lifespan
- Calf survival




The British Limousin Cattle Society also uses this data source to calculate their age to slaughter, carcase weight and average daily carcase gain EBVs.

Using data from the AHDB National Beef Evaluations in conjunction with EBVs from breed societies will allow faster genetic improvement in these carcase traits over time.

AHDB National Beef Evaluations are based on multi-breed base populations. EBVs can be compared across any breed within our database.

**This allows you to compare animals across breeds, for example comparing a Limousin with a Hereford.**

These EBVs are displayed using bar charts similar to those used by other EBV providers and can be accessed via the animal record in the society database or in Signet. Alternatively, you can search the database directly using the website **ahdbbeef.egenes.co.uk**

For more information on the project, see the FAQ section.

Over time, further EBVs will be added to the AHDB National Beef Evaluations. Currently in development are EBVs for bTB resistance and an index for environmental performance.

# EBVs in practice

## Case study 1

### Using EBVs in the pedigree beef sector – Ben Harman, Buckinghamshire

Ben Harman and his father have a mixed farm on top of the Chiltern Hills. Ben's pedigree Charolais herd is the oldest in the herdbook – the society was formed by his grandfather and others in the 1960s. He currently runs 50 breeding females, of which some are pedigree Charolais and the rest F1 Chagyu™ (Charolais x Wagyu). His Chagyu are sold direct into restaurants and to consumers and his pedigree bulls are sold either directly off farm or through society sales. Ben also sells semen throughout the UK and beyond.

With commercial farmers wanting pedigree bulls that are easy-calving but maintain excellent growth rates, Ben uses all the breeding tools that are available to him. Ben says, "I am acutely aware that chasing an easy-calving type of bull over generations can lead to a reduction in width of the progeny, which in time will lead to narrower females which may be harder to calve. Narrower progeny would also not be as successful in the store or finishing market for my customers. To counter this threat, it is imperative that pedigree breeders use all of the tools available to them when selecting a bull."

### Ben's bull selection toolkit

- Performance recording data (EBVs)
- Visual assessment
- Knowledge of pedigree
- Knowledge of myostatin status

Ben says, "The customers for Charolais bulls in recent years are increasingly using EBVs to inform their purchases. Whether selling bulls direct from farm or through society sales, the message from the commercial buyer is clear: an easy-calving bull is the standard requirement."

One of the main EBVs that Ben considers is gestation length. However, he ensures that the terminal qualities of the breed are kept by also focusing on 400-day weight. "By targeting 400-day weight and carcase weight EBVs, my customers can hit the target slaughter weight and grade at 13–14 months of age. In a time of increased pressure on beef farming to lower our emissions, seven months' less maintenance requirement of an animal before slaughter makes sense both for the pocket of the commercial producer and for the environmental impact of the meat produced."

When choosing Wagyu semen to produce commercial carcases, Ben says the choice is easy. "The choice of Wagyu semen to use on my Charolais becomes particularly easy with the use of EBVs. I don't have to consider calving ease or growth rates as the Charolais will provide these in spades. I buy Wagyu semen straight out of the catalogue, solely on the basis of eye muscle area (EMA) and marbling EBVs." By selecting the Wagyu sires on the basis of EMA and marbling, Ben can maximise the meat quality and value in his niche market.

## Progeny testing schemes – spotlight on New Zealand

Trials are occasionally carried out to validate estimated breeding values, to prove that what they are predicting is actually happening on commercial farms. This involves matching the expected performance on farm (the EBV) to the actual performance for a given trait.

An outcome of the Beef + Lamb New Zealand Genetics Beef Progeny Test has been proving that various BREEDPLAN EBVs do in fact produce what they predict. In this, it was investigated whether or not bull EBVs predict weaning weight of calves sired by Simmental, Charolais, Hereford, Stabiliser and Angus sires.

In the calf, half the genes come from the cow and half come from the bull. That means that we would expect half the benefit of a sire's EBV to be passed on to the calf. Table 1 shows that it is expected that sires with heavier 200-day weight EBVs will wean heavier calves, e.g. for every extra 1 kg of 200-day weight EBV, you get an extra 500 g of actual calf weaning weight on farm.

In Figure 10, each dot represents the average weaning weight of the various sires' calves. If the dots are close to the coloured line of their breed, then the sire's 200-day weight EBV accurately predicted the actual average weaning weight of his calves.

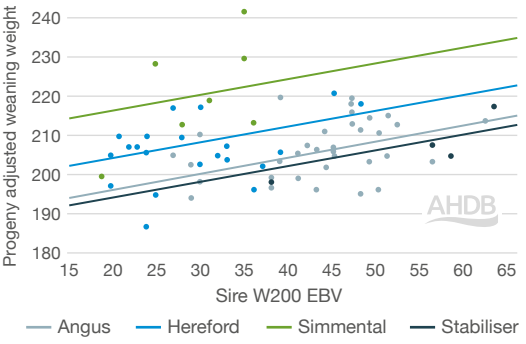



**Figure 10. Correlation between sire 200-day weight (weaning) EBV and on-farm weaning weight in their calves**

Source: Beef + Lamb New Zealand Genetics, Beef Progeny Test 2016.

It was found that for every 1 kg more in 200-day weight EBV, 470 g was gained in the average weaning weight on farm. Table 2 shows that 94% of the expected weaning weight advantage predicted by EBVs is being realised in New Zealand commercial farms. This was achieved across the country, with 2,200 cows, on five large-scale commercial farms, five breeds and with high- and low-accuracy sires.

**Table 1. Progeny difference and expected calf weaning weight**

| | 200-day weight EBV | Progeny difference (compared with Bull 2) | Calf average WWT (mob average = 230) |
|---|---|---|---|
| Bull 1 | +20 | -10 | 220 |
| Bull 2 | +40 | 0 | 230 |
| Bull 3 | +60 | +10 | 240 |

**Table 2. Expectation and reality of calf weaning weight**

| | Average calf weaning weight (kg) | % of predicted response achieved on farm |
|---|---|---|
| Expectation | 0.50 | 100 |
| Reality | 0.47 | 94 |

## Case study 2

### Using EBVs in the commercial beef sector – Guy Prudom, Yorkshire

Guy Prudom farms around 270 suckler cattle near Whitby, North Yorkshire. The majority of his breeding females are Stabilisers, with some Aberdeen Angus, Simmental and Shorthorn crosses as well. Cattle are finished on farm and sold deadweight, with steers finished at around 640 kg at 17 months and heifers at around 20 months. In both cases, he is aiming for an R or higher for conformation and a 4L for fat class.

Guy breeds his own replacement females and maternal traits are of great importance to his business. Selection starts at birth, with ease of calving, dam temperament and how quickly the calf gets up to suck all recorded on farm. Heifers are then selected throughout the year based on weight criteria, with the aim of 390 kg at 14 months for bulling, or 60% of the cow's mature weight. Weighing cattle regularly also allows Guy to check the temperament of potential replacements when handling them through the crush.

Guy said, "Once we've shortlisted heifers based on weight, we also make sure they've had no health issues, that they were born in the first six weeks of the calving block for improved fertility and that their mother calved on her own. If they don't meet these criteria, they're not picked as replacements."

When choosing stock bulls, Guy focuses on both EBVs and structural soundness. He said, "Stabilisers are bought on EBVs and then looks, as they are very well performance-recorded as a breed. Some of the other breeds have little data available, so I have bought bulls based on looks only in the past. Sometimes this works, others times it has not.

"The most important EBV for me is ease of calving, especially with the heifer replacements. From a heifer, I am looking for a calf of around 35 kg at birth that is up and capable of sucking within a few hours on its own. With the cows, a calf birth weight of around 45 kg seems to be ideal, making the birth weight EBV very important.

"Next would be milk and weaning weight EBVs, both fairly well linked. We do not creep the calves at grass, so I want a cow that has plenty of milk. Scrotal size EBV has also been shown to affect daughter fertility – another desirable trait when breeding for replacement heifers."

For the finishing side of the business, Guy focuses on 400-day weight EBV and DM feed intake, stating, "Cattle that eat less but finish quicker are always good."

Guy says, "EBVs give me a starting point rather than buying a bull just on looks alone. I have an awful lot of outside factors influencing my cattle and their performance, including weather, soils, environment and personal management. Choosing a bull that has plenty of recorded data using EBVs allows me to make a more informed decision."

# Fit to work and physical soundness

Selecting a fit bull and maintaining him so that he is able to work (physically and reproductively sound) is integral to good fertility and economic performance of beef suckler herds.

## Body condition and nutrition

Having bulls in appropriate body condition score (BCS) of 3–3.5 (scale 1–5) at the point of work means bulls are fit but not fat, enabling them to mobilise some body condition (≤1 BCS) due to physical exertion and still maintain BCS above 2.

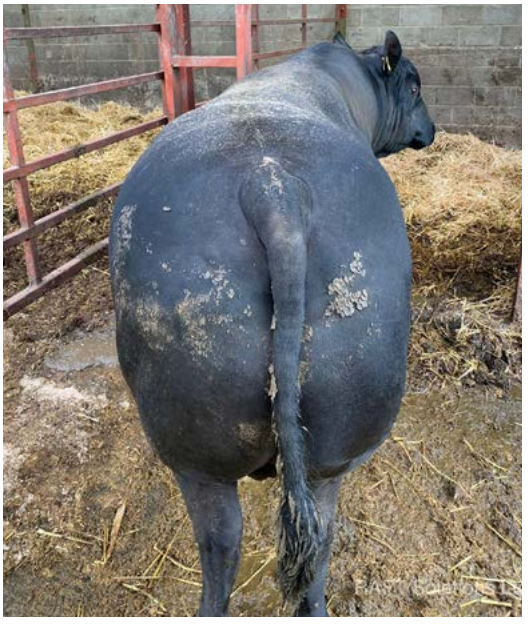
Bulls in body condition score 3 (above) have some fat covering of the transverse processes of the lumbar spine, ribs and tail head, but the bones can be felt when pressure is applied.

Being over-conditioned in the pre-service period (>3.5) may impact on a bull's reproductive performance.

**Excess fat in the neck of the scrotum can reduce semen quality as it reduces the bull's ability to maintain a testicular temperature lower than core body temperature. Bulls in excessive body condition pre-mating are also likely to be affected by lower semen quality and temporary testicular degeneration when rapid weight loss occurs at the start of the breeding season.**

Bulls too lean at point-of-work (≤2) are also unsatisfactory. They are unlikely to be able to perform effectively as they have no capacity for weight loss due to the exertions of an intensive mating period.

Fat bull (below) – Bulls in body condition score 5 will struggle to regulate testicular temperature due to accumulation of fat deposits in the neck of the scrotum.



Assessment of BCS is subjective and therefore prone to inconsistencies. It may be more accurate to know the weight of your mature bull when he is in optimal

body condition for work, using this as his target weight for start of mating. This requires regular weighing and nutritional planning, allowing body condition to be changed or maintained by appropriate feeding.

**When purchasing bulls, particularly through the sale ring, it is important to remember the pre-sale diet often contains significant amounts of concentrate. Buying a bull at least two months before the breeding season allows time to adjust to their working diet and for any problems due to sudden diet change to pass before breeding commences.**

## Pre-mating nutrition

The feeding of bulls pre-mating should reflect the nutrition they will be receiving during the service period; any dramatic changes should be avoided. If a bull is being supplemented with concentrate pre-mating, then this should be continued through the service period, wherever possible. Likewise, if the bull's nutrition is going to be forage-based throughout mating, then his pre-mating diet should reflect this, otherwise the risk of excessive body condition loss due to increased energy demands and reduced energy intake may occur, resulting in a reduction in semen quality.

### Protein

Ensure adequate levels of good-quality protein (this can be met with good-quality forage) are being fed in the pre-mating period to optimise sperm production and this should be continued through the service period.

### Trace element supplementation

The bull should not be forgotten in relation to the trace element supplementation strategy of the farm. Antioxidant properties of selenium help maintain semen quality; the role of zinc in maintaining good reproductive performance in bulls is well documented; and copper deficiencies can affect fertility in a bull.

It is worth testing forage samples for trace element levels and blood sampling or liver sampling a representative sample of stock to ascertain whether supplementation on a herd basis is necessary.

Bulls at grass – rearing breeding bulls in groups at pasture will help keep them active and mobile

## Feet and legs

Poor mobility and lameness are the biggest cause of premature culling of breeding bulls in the UK. Significant attention should be paid to this when selecting a new bull and in the preparation of bulls for breeding. Before purchase, bulls should be strictly assessed for conformation and mobility and any limb abnormalities or swellings should be identified.

Young bulls intensively reared on concentrates to maximise growth performance can develop swollen joints (particularly the hocks) due to abnormal cartilage development. This could result in lameness at a later date and should be viewed with caution.

Common hindlimb conformational abnormalities that may predispose bulls to lameness include being post-legged, where stifles and hocks are particularly straight, putting excessive strain on these joints. Animals with overly flexed or sickle hocks can develop heels with a narrow angle and overgrown toes, thereby increasing the risk of foot lameness.

Assessment of forelimb confirmation should identify common abnormalities such as 'toe out' or valgus. These bulls will wear the claws unevenly, increasing risk of lameness.

Foot abnormalities, including interdigital growths or fibromas, should be viewed with caution; even if there is no current lameness, the risk of future lameness is high. Claws that 'corkscrew' or 'scissor' should also be noted as they increase the risk of lameness.

Infectious causes of lameness, most commonly digital dermatitis (DD) and foul in the foot, should be controlled through maintaining clean and dry environmental conditions and keeping the herd free from DD wherever possible.

Preparation for the breeding season should include assessment of mobility and, in particular, examination of the feet, assessing whether there is a need to trim the feet prior to breeding. Trimming should occur 8–10 weeks before breeding, at a similar time to the pre-breeding assessment. This will allow time for any issues identified to recover and heal prior to the service period and any temporary effect on semen production to have recovered before breeding occurs.

Water-logged gateways with old bricks and stone provide an ideal environment for bacteria and damage animals' feet, leading to foul of the foot

## Fertility soundness and semen quality

**An annual pre-breeding bull assessment is essential. This is best done as part of the annual bull breeding soundness evaluation (BBSE) performed by an experienced veterinary surgeon.**

This complete examination includes an overall physical examination from head to tail, including eyes, teeth, heart, lungs and all aspects of the reproductive tract.

Bull exam desk set-up

Equipment used for examination of bull semen on farm should be in a sheltered, well-lit area, e.g. farm office/ kitchen, or in a dedicated mobile laboratory.

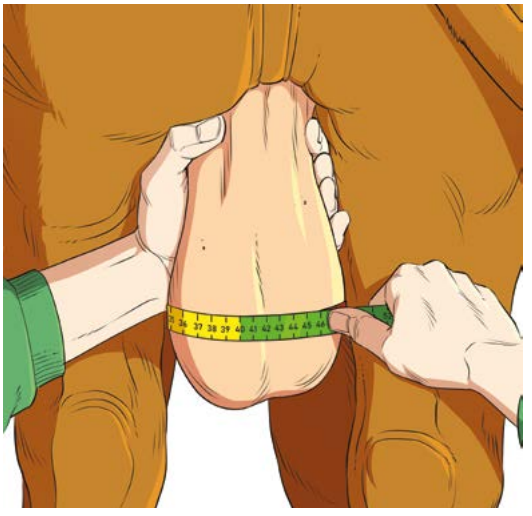
### Scrotum

The general appearance of the scrotum is observed, including symmetry, shape and size. Closer examination includes inspection of the skin of the scrotum, looking for abnormalities including warts or papillomas and inflammation such as that caused by mange. The scrotal contents are evaluated by palpating each testicle, assessing for tone and signs of abnormalities such as inflammation and scarring from traumatic or infectious processes.

The head, body and tail of the epididymis are palpated to detect any abnormalities, as these are relatively common sites of infection, particularly in young bulls.

The epididymis is a long, coiled tube located at the back of each testicle, where sperm mature and are stored before being transported to the vas deferens.

Where significant issues are found on one epididymis, it may mean that a bull is only producing normal semen from one testicle and therefore his overall fertility will be significantly reduced. If both are affected, this could render the bull infertile.



Scrotal measure

The testicles should be measured at their widest point once the neck of the scrotum has been squeezed to force testicles down.

Measurement of the scrotal circumference is a very important part of the examination as it is highly correlated to daily semen production. The greater the testicular circumference, the greater the serving capacity of the bull. As scrotal circumference is a moderately heritable trait, young bulls with greater scrotal circumference will achieve puberty earlier; this will be passed on to their male and female offspring, who may also reach puberty earlier and potentially be more fertile animals.

Using measuring tapes designed for this purpose, such as our bull testical tape, provides consistency in technique using a pressure mechanism.

There are minimum standards for differing ages of bulls, but this varies with breed. A guide would be:

- 12 months – 30 cm
- 18 months – 32 cm
- 24 months – 34 cm

### Sheath and prepuce

The sheath and prepuce should also be examined for abnormalities. Common abnormalities include:

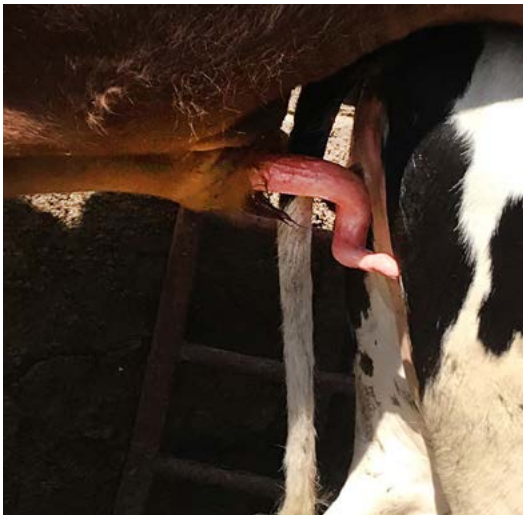
- Warts or papillomas affecting the skin at the tip of the sheath
- Sores on the tip of the sheath, predisposed by dirty and moist conditions
- Pendulous sheaths, which may include partial prolapse of the prepuce in certain breeds, could predispose to trauma
- Traumatic injuries can occur that lead to swelling of the sheath and prepuce, including penile rupture, which often occurs in the act of mating, and preputial laceration. Both of these conditions should be referred to the veterinary surgeon for examination and treatment

Normal sheath and penis (above) – bulls should achieve an erection and extrude their penis during semen collection so that it can be fully examined.

### Penis

Examination of the penis is important as abnormalities that prevent effective service will render the bull unfit for breeding. Examination can be performed either during electroejaculation as part of the BBSE, or through observation of mating with a bulling female.

Bulls that fail to achieve a normal erection or penetration may have deviations of the penis, sometimes caused by persistence of the tissue that connects the tip of the penis to the prepuce. The most common of these is spiral deviation of the penis, usually occurring in bulls between two and six years of age. Ventral (downward) deviation is less frequently observed but will also mean the bull will fail to serve females.



Spiral deviation (above) – it is always important to watch bulls closely when serving cows to ensure they can achieve penetration.

### Internal sex glands

Manual palpation of internal sex glands (prostate, seminal vesicles) via the rectum, is performed to assess for any abnormalities, most common of which is infection of the seminal vesicles.

## Semen quality

The final part of the BBSE involves collection of a semen sample, either by electroejaculation or with an artificial vagina, followed by evaluation of its quality.

Initial assessments are of density and gross motility, performed on an undiluted semen sample under a microscope at low power. A second, more detailed evaluation of motility looks at a diluted sample under higher power to establish the percentage of spermatozoa that are swimming in a progressively motile manner. Both assessments are graded on a scale of 1–5. This is performed bull-side and is a highly subjective assessment, dependent on the quality of the equipment and experience of the operator. The pass threshold for this characteristic is 60% progressively motile sperm.

Note: For a more detailed assessment and for problem breeders or 'borderline' cases, it is possible to send semen samples to a specialist laboratory which utilises computer-assisted sperm analysis (CASA) to assess motility in an objective manner.

The third assessment is the evaluation of the morphology (shape) of the spermatozoa in the sample to identify defects that are present due to issues with the sperm development process within the testicles. This requires a high-power, high-quality microscope. A bull should have at least 70% normal spermatozoa and no significant number of foreign cells, e.g. white blood cells, within the sample to pass a BBSE.

Normal semen

Semen collection

# Disease and parasite control

When sourcing a new bull, the health status of the herd of origin is a key factor to be aware of. There are accreditation schemes overseen by Cattle Health Certification Standards (CHeCS) that allow herds to gain a status for a number of diseases, namely Johne's disease, bovine viral diarrhoea (BVD), infectious bovine rhinotracheitis (IBR), leptospirosis and Neospora caninum. Breed society sales will require disease status to be given when animals are entered and this will be presented in the sale catalogue.

## Johne's

Look at the herd's status for Johne's – this is the most important disease. Given that it is not possible to accurately test individual (particularly young) animals for the presence of disease before purchase, knowing the status of the herd is essential. Herds are categorised from risk level 1 (R1 – lowest risk) to risk level 5 (R5 – highest risk). Buying from R1 herds will reduce the risk of buying in a Johne's-infected animal, because the herd of origin has had at least three clear herd tests at annual intervals and therefore no current evidence of any infected animals is present on the farm.

## BVD

There are a growing number of herds accredited free from BVD, but if not, it is possible to individually test animals for freedom of virus in their blood, ear tissue and semen.

## IBR

Herds can achieve accredited free status from IBR, but animals can also be individually tested for antibodies to IBR virus. Depending whether they have been vaccinated or not, the test used will differentiate whether the antibodies that have been produced are due to vaccination with a marker vaccine or due to exposure to wild-type virus.

## Leptospirosis

Buying bulls from leptospirosis-accredited herds or blood-tested antibody-negative is advisable. If an animal has been vaccinated, it is not possible to distinguish between antibodies due to vaccination or natural exposure. This means a vaccinated animal could be a carrier and, therefore, pose a risk to the purchaser's herd.

## TB

Bovine tuberculosis is a key disease to consider when purchasing stock, and the specific advice should be taken with the knowledge of the TB status of the herd of origin and potential destination.

## Venereally transmitted diseases

It is also important to purchase 'virgin' bulls, as this means that they should be free from venereally transmitted diseases such as campylobacter. Campylobacter can cause significant fertility issues in a herd using natural service, so ensuring the herd is kept free is critically important. If a bull has been used previously, it is possible to test him for campylobacter. However, it is possible to get false negative results and thus it is still best practice to purchase virgin bulls.

## Quarantine

If bulls have been bought through an auction, the possibility of disease exposure is increased and quarantine is essential. Irrespective of where new bulls are purchased from practice strict isolation and prevent contact between animals after arrival on farm to reduce the risk of spread of infectious agents.

- Quarantine all new arrivals for at least 30 days
- Cattle must not share community pastures/common grazings
- Cattle must not share fence lines with your cattle or any neighbour's cattle

## Parasite control

Ask the seller about parasite control and the history of treatment for that animal. Speak to your vet about an effective strategy going forward.

Anthelmintics play a key role in controlling cattle parasites, but proper use is essential for their effectiveness. Select products based on the specific parasite, its life cycle, the season, and treatment history. Store products correctly, use them before expiry, and calibrate dosing equipment beforehand.

Dose cattle according to their individual liveweight. Underdosing promotes drug-resistant parasites, while overdosing may lead to toxic effects or altered withdrawal periods. Always follow dairy and beef withdrawal periods after treatment.

If treatments seem ineffective, consult a vet or animal health adviser for a post-treatment efficacy check.

### Other infectious diseases

Bulls should also be foot-bathed in 5% formalin to minimise the risk of the introduction of digital dermatitis. Before leaving quarantine, the bull should have tested negative for the diseases relevant to the herd's current status and the rules of the CHeCS scheme.

### Vaccination

Whatever the vaccination and parasite protocols present on the farm, it is essential that the bulls are not forgotten about. Completion of these protocols well before the start of the breeding season will minimise the impact of a possible increase in a bull's body temperature (due to vaccination) on semen quality.

For more information on cattle diseases, see the **Parasite control guide**.

# Appendix 1 – Answers to the examples

**Example 1**
John should choose George. He has very good EBVs for direct and maternal calving ease and will produce cows with a lighter mature weight.

**Example 2**
Emma should choose Roy, who has superior EBVs for eye muscle area, fat depth and carcase weight.

**Example 3**
Patrick should choose Brian. He has better growth EBVs, particularly for 200- and 400-day weight. He also has a good EBV for body condition score.

**Example 4**
**Question 1:** Sean. His calving ease direct, calving ease daughters and gestation length EBVs are all in the top 10% (or better) of his breed.

**Question 2:** James. His 200-day weight, 400-day weight, 600-day weight, and carcase weight EBVs are all in the top 10% (or better) of his breed.

**Question 3:** Sean has moderate growth but excellent calving ease. James has excellent growth but poor calving ease.

# Appendix 2 – EBV service providers

## Societies that performance record with ABRI BREEDPLAN

- Aberdeen-Angus Cattle Society
- Beef Shorthorn Cattle Society
- British Blue Cattle Society
- British Charolais Cattle Society
- British Simmental Cattle Society
- Hereford Cattle Society
- Murray Grey Beef Cattle Society
- Red Ruby Devon Cattle Society
- Salers Cattle Society
- South Devon Herd Book Society
- Stabiliser Cattle Company
- Welsh Black Cattle Society

Table 3. ABRI BREEDPLAN EBVs

| EBV | Interpretation | Notes |
|---|---|---|
| Calving ease direct (%) | Positive values = more unassisted calvings | Indicates the influence of the sire on calving ease in purebred females calving at two years of age. |
| Calving ease daughters (%) | | Indicates how easily that sire's daughters will calve at two years of age. |
| Gestation length (days) | Negative values = shorter gestations | An estimate of the time from conception to the birth of the calf and is based on AI and hand mating records.<br>Shorter gestation length is generally associated with lighter birth weight and improved calving ease. |
| Birth weight (kg) | Negative values = lighter calves at birth | Estimate of genetic differences between animals in calf birth weight. At a genetic level, calf birth weight has a big influence on cow calving difficulty. |
| 200-day weight (kg) | Positive values = faster growth rates | Estimates an animal's genetic merit for early growth and weaning weight. |
| 400-day weight (kg) | | Estimates an animal's genetic merit for growth and yearling weight. |
| 600-day weight (kg) | | Estimates an animal's genetic merit for growth beyond yearling age. |

Table 3. ABRI BREEDPLAN EBVs (continued)

| EBV | Interpretation | Notes |
|---|---|---|
| Mature cow weight (kg) | Negative values = lower mature cow size | Estimate of the genetic difference in cow weight at five years of age. This is an indicator of growth at later ages and potential feed maintenance requirements of the females in the breeding herd. |
| 200-day milk (kg) | Positive values = more productive female replacements | 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 (cm) | Positive values = higher scrotal size | 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 (kg) | Positive values = higher carcase weight | Estimate of the genetic differences between animals in hot standard carcase weight at 650 days of age. This EBV is based on liveweight data. |
| Eye muscle area ($cm^2$) | Positive values = larger eye muscle area | Estimate of the genetic differences between animals in eye muscle area at 12/13th rib site of a 300 kg dressed carcase. This EBV is based on ultrasound scanning data. |
| Fat depth (mm) | Negative values = leaner carcases | Estimate of the genetic differences between animals in fat depth at the rib of a 300 kg dressed carcase. This EBV is based on ultrasound scanning data. |
| Retail beef yield (%) | Positive values = higher-yielding carcases | Indicates genetic differences between animals for retail yield percentage in a standard 300 kg carcase. |
| Intra-muscular fat (IMF) (%) | Positive values = higher marbling | Estimate of the genetic difference in the percentage of intramuscular fat at the 12/13th rib site in a 300 kg carcase. |

## ABRI BREEDPLAN indexes

Each breed recording with ABRI has its own set of indexes, and weightings of each trait will be set by the breed society in conjunction with ABRI. In general, breeds will have a terminal index, which focuses on terminal traits, and a self-replacing index, which focuses more on maternal performance.

For full information on the breeding indexes offered by the society of the breed you are interested in, please contact the society directly or visit their website.

## Societies that performance record with Signet Breeding Services

- British Blonde Society
- Highland Cattle Society
- Lincoln Red Cattle Society
- Luing Cattle Society
- Red Poll Cattle Society
- Sussex Cattle Society

Table 4. Signet EBVs

| EBV | Interpretation | Notes |
|---|---|---|
| Birth weight (kg) | Negative values = lighter calves at birth | High birth weights are more likely to be associated with difficult calvings. |
| Calving ease (%) | Positive values = more unassisted calvings | Estimates the percentage of unassisted calvings that can be derived from a particular sire. |
| Maternal calving ease (%) | | Identifies females that will calve more easily. Should not be confused with calving ease direct (see above), which is an EBV predicting how easily a bull's progeny will be born. |
| Gestation length (days) | Negative values = shorter gestations | Short gestation lengths result in easier calvings, because birth weights tend to be lower. A short gestation also increases the interval between calving and the start of mating, giving the cow more time to recover body condition. |
| 200-day growth (kg) | Positive values = faster growth rates | Selection for faster growth will result in animals that have heavier carcases at a constant fat class or leaner carcases at a constant age. Selection for high growth rates also tends to result in an overall increase in mature size (and therefore higher birth weights). |
| 400-day growth (kg) | | |
| Muscle depth (mm) | Positive values = deeper loin muscles | Selecting for these traits will increase the yield of lean meat in the carcase. |
| Fat depth (mm) | Negative values = leaner carcases | Indicates animals capable of producing lean carcases or, if required, that can be taken to heavier carcase weights without becoming overfat. |

Table 4. Signet EBVs (continued)

| EBV | Interpretation | Notes |
|---|---|---|
| 200-day milk (kg) | Positive values = more productive female replacements | This EBV is the maternal component of 200-day weight. It indicates how well a bull's heifer calves will perform when they become mothers and is greatly influenced by milking ability. |
| Age at first calving (days) | Negative values = puberty reached at an early age | Herds looking to calve heifers at two years of age should identify bulls with superior (negative) EBVs for this trait. This will increase conception rates at first mating. |
| Lifespan (days) | Positive values = longer breeding life | Predicts the length of an animal's breeding life in the herd. |
| Calving interval (days) | Negative values = cows that get back in calf more quickly | This EBV can be used to breed cows with short calving intervals that get in calf again quickly. |
| Mature cow weight (kg) | Negative values = lower mature cow size | Indicates the body size of the mature cow and is related to maintenance requirements. |
| Body condition score | Positive values = increased body condition in the mature cow | This EBV shows the genetic potential for body condition score in the mature cow. |

Table 5. Signet Indexes

| Index | Explanation |
|---|---|
| Calving value index | The economic value of an animal in terms of gestation length and difficult calvings. |
| Beef value index | The economic value of an animal in terms of the financial merit of its offspring's carcases. |
| Maternal value index | The economic value of an animal's genetic ability to produce breeding females. |
| Maintenance value index | The economic cost associated with mature size. |
| Maternal production value index | The economic value of an animal's ability to produce breeding females and beef carcase characteristics, calculated from the four values listed above. |

## Societies recording with Taurus Data

British Limousin Cattle Society are currently the only group recording with Taurus Data.

Table 6. Taurus EBVs

| EBV | Interpretation | Notes |
|---|---|---|
| Birth weight (kg) | Negative values = lighter calves at birth | High birth weights are more likely to be associated with difficult calvings. |
| Calving ease (direct) (%) | Positive values = more unassisted calvings | Estimates the percentage of unassisted calvings that can be derived from a particular sire. |
| Maternal calving ease (%) | | Identifies females that will calve more easily. Should not be confused with calving ease direct (see above), which is an EBV predicting how easily a bull's progeny will be born. |
| Gestation length (days) | Negative values = shorter gestations | Short gestation lengths result in easier calvings, because birth weights tend to be lower. A short gestation also increases the interval between calving and the start of mating, giving the cow more time to recover body condition. |
| 200-day growth (kg) | Positive values = faster growth rates | Selection for faster growth will result in animals that have heavier carcases at a constant fat class or leaner carcases at a constant age. |
| 400-day growth (kg) | | Selection for high growth rates also tends to result in an overall increase in mature size (and therefore higher birth weights). |
| Muscle depth (mm) | Positive values = deeper loin muscles | Selecting for these traits will increase the yield of lean meat in the carcase. |
| Backfat depth (mm) | Negative values = leaner carcases | Indicates animals capable of producing lean carcases or, if required, that can be taken to heavier carcase weights without becoming overfat. |
| Scrotal circumference (cm) | Positive values = higher scrotal circumference | Larger scrotal size is associated with male fertility and early puberty of daughters. |
| 200-day milk (kg) | Positive values = more productive female replacements | This EBV is the maternal component of 200-day weight. It indicates how well a bull's heifer calves will perform when they become mothers and is greatly influenced by milking ability. |

Table 6. Taurus EBVs (continued)

| EBV | Interpretation | Notes |
|---|---|---|
| Docility (%) | Positive values = more docile cattle | |
| Calf survival | Positive values = higher probability of survival | |
| Age at first calving (days) | Negative values = puberty reached at an early age | Herds looking to calve heifers at two years of age should identify bulls with superior (negative) EBVs for this trait. This will increase conception rates at first mating. |
| Longevity | Positive values = longer breeding life | Predicts the length of an animal's breeding life in the herd. |
| Calving interval (days) | Negative values = cows that get back in calf more quickly | This EBV can be used to breed cows with short calving intervals that get in calf again quickly. |
| Age to slaughter (days) | Negative values = animals that will reach 350 kg deadweight more quickly | Age at slaughter, assuming a standard carcase weight of 350 kg. |
| Carcase weight (kg) | Positive values = higher carcase weights at 600 days of age | Carcase weight at a standard slaughter age of 600 days. |
| Fillet (kg) | Positive values = higher fillet weight | Weight of fillet at a standard slaughter age of 600 days and carcase weight of 350 kg. |
| Striploin (kg) | Positive values = higher striploin weight | Weight of striploin at a standard slaughter age of 600 days and carcase weight of 350 kg. |
| Rump (kg) | Positive values = increased rump muscle | Weight of rump at a standard slaughter age of 600 days and carcase weight of 350 kg. |
| Topside (kg) | Positive values = increased topside muscle | Weight of topside at a standard slaughter age of 600 days and carcase weight of 350 kg. |
| Silverside (kg) | Positive values = increased silverside muscle | Weight of silverside at a standard slaughter age of 600 days and carcase weight of 350 kg. |
| Knuckle (kg) | Positive values = higher knuckle weight | Weight of knuckle at a standard slaughter age of 600 days and carcase weight of 350 kg. |

Table 7. Taurus indexes

| Index | Explanation |
|---|---|
| Beef value index | The economic value of an animal in terms of the financial merit of its offspring's carcases. |
| Calving value index | The economic value of an animal in terms of gestation length and difficult calvings. |
| Maternal value index | The economic value of an animal's genetic ability to produce breeding females. |
| Retail value index | An economically weighted index comprising all carcase trait values. High positive values for animals that will achieve slaughter weight quickly and with high proportions of the high-quality carcase cuts. |

# Notes

# Further information

## Other publications from AHDB

- Marketing prime beef
- Herd notebook
- Bull testicle tapes
- Optimising suckler herd fertility
- Managing beef replacement heifers

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