PERFORMANCE RECORDING
YOUR PEDIGREE HERD
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PERFORMANCE RECORDING YOUR PEDIGREE HERD

Introduction

Signet’s performance recording services have been developed over 40 years to give British beef producers an accurate way to assess the genetic merit of their cattle.

Recording schemes originated as a way to disentangle the combined influences on a bull’s appearance of the environment (feeding, management etc) and genetics.

Over time a range of Estimated Breeding Values for traits relating to carcase quality, calving and maternal performance have been developed. These indicators of breeding potential are now seen as an important part of pedigree bull production, increasing returns in all types of beef enterprise.

This booklet aims to show how pedigree breeders can get involved in performance recording and get the very best out of the service.

Samuel Boon and Alison Glasgow, December 2009

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1. Why Should I Record My Herd?

Performance recording gives breeders and bull buyers an objective way of assessing the genetic merit of breeding animals.

Whether you are a pedigree or commercial producer, it is the most accurate way of assessing breeding potential.

Recording helps breeders to
1. Make better breeding decisions
2. Market pedigree stock more effectively
3. Make more money from pedigree beef production

Performance Recording Adds Value…

To Commercial Herds
Commercial finished and suckled calf producers are enhancing herd productivity by up to £45/calf through:

✓ High Weight EBVs – Increased slaughter/sale weights and reduced days to slaughter/sale

✓ Superior Carcase EBVs – Improved carcase conformation

✓ Superior Maternal EBVs – Breeding productive cows that produce more calves during their working lifetime

✓ Easy Calving EBVs – Reducing costs associated with difficult calvings including the additional management time, cow/calf deaths, failure to get cows back in calf etc

To Pedigree Herds
Due to increased returns from high genetic merit animals, buyers seek them out:

✓ Clearance rates for recorded bulls are higher than bulls that are unrecorded

✓ Premiums are paid for recorded bulls with superior EBVs

Table 1. Limousin Sale, Carlisle Feb 2009

<table>
<thead>
<tr>
<th>Beef Value</th>
<th>No. Sold</th>
<th>Average Price (gns)</th>
<th>Premium per bull vs. price for bulls with average BV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top 1%</td>
<td>14</td>
<td>8921</td>
<td>+4296</td>
</tr>
<tr>
<td>Top 10%</td>
<td>43</td>
<td>5817</td>
<td>+1192</td>
</tr>
<tr>
<td>Top 25%</td>
<td>19</td>
<td>5284</td>
<td>+659</td>
</tr>
<tr>
<td>Average</td>
<td>20</td>
<td>4625</td>
<td>0</td>
</tr>
<tr>
<td>Non Recorded</td>
<td>29</td>
<td>3828</td>
<td>-797</td>
</tr>
</tbody>
</table>

Commercial bull buyers are actively seeking bulls with EBVs. This means it pays to record.
2. How Do I Record My Herd?

Signet’s Beefbreeder recording service has been designed to make data collection simple and easy to fit around routine management activities.

Recording Costs

The annual recording fee is based on the number of cows in the herd. The investment spent on performance recording is estimated to represent just over 1% of gross income from most pedigree herds with 10 cows or more. Scanning is optional and prices are available from your local operator (see page 23).

Start recording today

1. Send in a contract
2. Let Signet have details of the breeding cows and youngstock within your herd
3. Your first weighsheets will be dispatched within the week
3. Tips on Making Recording Easy

Most of the records required for herd recording are already collected for registration and/or management purposes. It really is just a case of making the information available to us. However, some steps can be taken to simplify the process:

1. Collect records around other tasks. There is no need to make a special job of weighings if they can be made to coincide with a time when cattle are being handled for another purpose. Many herds weigh at weaning, housing and spring turnout, which can cover three of the ideal four weighings in the year.

2. Recording birth weights is not essential. Although having the data is important, where systems are extensive or there are potential difficulties with aggressive cows, the evaluation will work without it. (Without an actual measurement, a Birth Weight EBV would still be predicted using its known correlations with the other traits that are measured e.g. growth rate, calving ease, gestation length etc. Where this occurs, the accuracy of the EBV will be lower than if the trait had been measured).

3. Only collect additional data when there is sufficient need. In particular, it is recommended that scanning should only be carried out when there are at least five animals in the management group (or 'contemporary group', see paragraph 4.2, p10). Too few animals in a group means an insufficient number is available for comparison purposes which limits the value of the data in the evaluation.

4. Consider the use of labour saving devices, particularly in larger herds, such as electronic tags and weigh scales.

5. Involve your staff. Breeding decisions and the associated work is often carried out partly or wholly by farm staff. Whoever is involved in collecting the records needs to be aware of the importance of accuracy and timeliness and ideally be made party to the results of their efforts.
4. Estimated Breeding Values

The pedigree and performance data collected on-farm is analysed using a procedure called BLUP (Best Linear Unbiased Predictor).

This calculates how much of each animal's performance is due to genetics and how much is due to its environment.

There are a number of factors that will influence the growth of a calf, but the only factor that will be passed on to the next generation is the Inherited Genetic Potential.

* Collectively known as 'the environment'

The inherited genetic potential is the only part of performance that an animal can pass on to its progeny and it is this that is expressed as an Estimated Breeding Value or EBV for each trait we measure.

The list of EBVs that are produced in the UK are set out in Table 2 on p8.
## 4. Estimated Breeding Values

**Table 2: Estimated Breeding Values (EBVs) produced by Signet**

**TERMINAL SIRE EBVs** (i.e. EBVs relating to an animal’s performance as a terminal sire. When applied to a cow/heifer, they indicate how her bull calves are likely to perform as sires.)

<table>
<thead>
<tr>
<th>EBV</th>
<th>Interpretation</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Birthweight (kg)</td>
<td>Negative Values = Lighter calves at birth</td>
<td>High birth weights are more likely to be associated with difficult calvings.</td>
</tr>
<tr>
<td>Calving Ease (Direct) (%)</td>
<td>Positive Values = More unassisted calvings</td>
<td>Estimates the percentage of unassisted calvings that can be derived from a particular sire.</td>
</tr>
<tr>
<td>Gestation Length (days)</td>
<td>Negative Values = Shorter gestations</td>
<td>Short gestation lengths result in easier calvings, because birthweights 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.</td>
</tr>
<tr>
<td>200-Day Weight (kg)</td>
<td>Positive Values = Faster growth rates</td>
<td>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 birthweights).</td>
</tr>
<tr>
<td>400-Day Weight (kg)</td>
<td>Positive Values = Deeper Loin Muscles</td>
<td>Selecting for these traits will increase the yield of lean meat in the carcase.</td>
</tr>
<tr>
<td>Muscle Depth (mm)</td>
<td>Positive Values = Deeper Loin Muscles</td>
<td>Identifies females that will calve more easily. Should not be confused with Calving Ease Direct (see above), which is an EBV predicting how easily born a bull’s progeny will be.</td>
</tr>
<tr>
<td>Fat Depth (mm)</td>
<td>Negative Values = Leaner carcases</td>
<td>Indicates animals capable of producing lean carcases or, if required, can be taken to heavier carcase weights without becoming overfat.</td>
</tr>
</tbody>
</table>

**MATERNAL EBVs** (i.e. EBVs relating to an animal’s maternal performance. When applied to a bull, they indicate how his daughters will perform as mothers.)

<table>
<thead>
<tr>
<th>EBV</th>
<th>Interpretation</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Calving Ease (%)</td>
<td>Positive Values = More unassisted calvings</td>
<td>Identifies females that will calve more easily. Should not be confused with Calving Ease Direct (see above), which is an EBV predicting how easily born a bull’s progeny will be.</td>
</tr>
<tr>
<td>200-Day Milk (kg)</td>
<td>Positive Values = More productive female replacements</td>
<td>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 (see paragraph 4.5, p13).</td>
</tr>
<tr>
<td>Age at 1st Calving (days)</td>
<td>Negative Values = Puberty reached at an early age</td>
<td>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.</td>
</tr>
<tr>
<td>Longevity (days)</td>
<td>Positive Values = Longer breeding life</td>
<td>Predicts the length of an animal’s breeding life in the herd.</td>
</tr>
<tr>
<td>Calving Interval (days)</td>
<td>Negative Values = Cows that get back in calf more quickly</td>
<td>This EBV can be used to breed cows with short calving intervals that get in calf again quickly.</td>
</tr>
</tbody>
</table>
4. How Are EBVs Calculated?

EBVs are calculated using information from several sources:

- Measurements from the animal itself
- Measurements from the animal’s herd mates (known as ‘contemporaries’, see p10)
- Measurements from the animal’s relatives and their contemporaries
- The degree to which one trait influences another (known as a ‘correlation’, see p10))
- The degree to which each trait is passed on to the next generation (known as ‘heritability’, see p10)

When using EBVs it is important to remember that although they can be compared between herds, they cannot be compared between breeds.

Each EBV calculation involves solving a set of simultaneous equations where the unknowns are the genetic value of the animal and the environmental effects on its performance. When carried out many times, the equations are able to quantify the unknown genetic component.

Over time, as more pedigree and performance data is added, the solution to the equations becomes more accurate as the true breeding value of the animal is approached.
4.1 Heritabilities and Correlations

**Heritability**

This is a term used to describe the strength with which traits are inherited and it varies depending on the trait in question. Generally:

- Traits associated with reproduction and survival have low heritabilities
- Milk production and early body size have medium heritabilities
- Later growth and carcase traits (i.e. fat and muscle) have relatively high heritabilities

When something is known of the performance of one or both parents, then the trait’s heritability can be used to help predict how the offspring will perform and BLUP uses this ‘knowledge’ to enhance the accuracy of its EBV calculations.

**Correlations**

This term describes the direction and strength of the association between two traits. For example, some traits are highly positively correlated, such as 200-Day Weight and 400-Day Weight, whilst others are negatively correlated, such as 400-Day Weight and Calving Ease. When something is known of one trait but perhaps not another, a prediction can be made based on what is known about the correlation between them. This again enhances the accuracy of the EBV in question and helps deal with situations where records for a trait are limited or unavailable.

4.2 Contemporary Groups

Animals that have been treated in a similar way – e.g. born over a relatively short period of time on the same farm, and fed and managed similarly – are known as ‘contemporaries’.

Within the analysis animals that have been reared in a similar manner are assigned to ‘Contemporary Groups’ to enable accurate comparisons to be made.
These are created in a flexible manner:

- Contemporary groups are created within each herd rather than across herds.
- Animals are assigned to separate contemporary groups for each trait, as some animals will only have been recorded together for a limited range of traits.
- Contemporary groups are formed flexibly, so clusters of calves that are born within 92 days of one another end up in the same group.
- The differences between the last date of each group and the start date of the following one are calculated.
- Contemporary groups may be merged, where there are too few animals in them.
  a) Pairs of groups are considered in order of the smallest difference first:
  - where both groups contain at least 5 records nothing is done;
  - where one or both groups contain fewer than 5 records the groups are combined as long as all the dates of birth are within a further specified range of 183 days, otherwise nothing is done.
  b) For 400-day weight, muscle depth and fat depth contemporary groups are then split by management code, as long as each part of the split group contains at least 5 records, otherwise nothing is done.

As new information is collected between evaluations some cattle may move into a different contemporary group. This can sometimes have a big impact on their EBVs.

### 4.3 High and Low Variation in a Contemporary Group or Herd

Occasionally, animals in a contemporary group, or even in a herd, have either very low variation or very high variation in their records. For example, they all have very similar 400-Day Weights, or have 400-Day weights that are spread across a wide range.

If nothing were done, animals from the most variable herds would tend to get the highest EBVs. On the other hand, if the records were adjusted so that all herds have the same range of performance (albeit different averages) there is a risk of downgrading some animals that really are genetically superior. To address these situations, the Signet analysis reaches a compromise:

- The variation in each herd is scaled towards an overall average range.
- The amount of scaling that goes on depends on the size of the contemporary groups which animals belong to.

Small groups with extremely high or low variation get scaled down or up more than big groups because there is a much higher risk that extreme variation in a small group is due to chance or the result of accidental differences in management.
4.4 Genetic Linkage

To enable accurate comparisons to be made between cattle reared in different herds, it is important that there is genetic linkage between the contemporary groups in different recorded herds.

A common example where linkage is created is where an AI sire has produced calves in a number of different herds. The performance of his progeny provides a benchmark against which the progeny of other bulls can be compared.

There are occasions when breeders should consider structuring their breeding strategy to improve their linkage to other recorded herds.

These include:
1. Where a new, imported sire is being used in a herd
2. When a new breeder starts recording and little is known about the genetic merit of their cows
3. The recording of breeds that are not widely recorded

The EBLEX Promising Young Bull Scheme aims to increase the degree of genetic linkage within recorded herds by making the semen of high EBV Society-nominated young bulls widely available.

For more information contact Signet
Tel: 0247 647 8829
Email: signet@eblex.org.uk

Diagram 1: The use of an AI sire to create genetic linkage between herds
4.5 The 200 Day Milk EBV

Many commercial and pedigree producers are breeding their own female replacements and need to identify bulls with superior maternal attributes.

An important maternal EBV is the 200-Day Milk EBV, indicating the degree to which a calf’s 200 day weight is influenced by the maternal performance of its dam – e.g. milkiness and general mothering ability.

This is calculated by considering the performance of the grand-offspring of a bull. The weights of all of his grandprogeny are influenced by his growth genes, but only those produced by his daughters are affected by his genes for milk.

If the grandprogeny produced by his daughters are consistently heavier than those produced by his sons, then this is likely to be due to the superior genes for milk production & maternal behaviour passed on to his daughters and will be reflected by the EBV (see Diagram 2 below).

**Interpretation**

A bull with an EBV of +4 for 200-Day Milk is expected to produce heifer calves which will have maternal characteristics leading to their calves being 2kg heavier at 200-days than calves from heifers sired by a bull with an EBV of 0.

The other maternal traits currently produced by Signet include Longevity, Age at 1st Calving, Calving Interval and Maternal Calving Ease (refer to Table 2 on p8).

Maternal traits are passed on to calves by both bulls and cows, but only cows can express them. EBVs are vitally important when considering a bull’s maternal attributes, since these cannot be assessed by eye.
5. Breeding Indexes

What is a Breeding Index?

Whilst EBVs aid the selection of breeding stock according to specific traits they can also be combined into selection indexes to meet wider breeding objectives.

An index is an overall score of genetic merit combining the relative economic values of several EBV traits. Signet currently offers five selection indexes:

**Beef Value:** The economic value of an animal in terms of the financial merit of its offsprings’ carcases

**Calving Value:** The economic value of an animal in terms of gestation length and difficult calvings

**Maternal Value:** The economic value of an animal’s genetic ability to produce breeding females

**Maintenance Value:** The economic cost associated with mature size

**Maternal Production Value:** The economic value of an animal’s ability to produce breeding females and beef carcase characteristics, calculated from the four values listed above

The EBVs accounted for in the calculation of these indexes is shown below:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Birthweight</td>
<td></td>
</tr>
<tr>
<td>400-Day Growth</td>
<td></td>
</tr>
<tr>
<td>Muscle Depth</td>
<td></td>
</tr>
<tr>
<td>Backfat Depth</td>
<td></td>
</tr>
<tr>
<td><strong>CALVING VALUE</strong></td>
<td></td>
</tr>
<tr>
<td>Calving Ease</td>
<td></td>
</tr>
<tr>
<td>Gestation Length</td>
<td></td>
</tr>
<tr>
<td><strong>BEEF VALUE</strong></td>
<td></td>
</tr>
<tr>
<td>Maternal Calving Ease</td>
<td></td>
</tr>
<tr>
<td>200-Day Milk</td>
<td></td>
</tr>
<tr>
<td>Age at First Calving</td>
<td></td>
</tr>
<tr>
<td>Longevity</td>
<td></td>
</tr>
<tr>
<td>Calving Interval</td>
<td></td>
</tr>
<tr>
<td><strong>MATERNAL VALUE</strong></td>
<td></td>
</tr>
<tr>
<td>Cow Weight</td>
<td></td>
</tr>
<tr>
<td><strong>MAINTENANCE VALUE</strong></td>
<td></td>
</tr>
</tbody>
</table>

Indexes cannot be compared between breeds. To avoid confusion, Index values are prefixed with two letters which indicate which breeds they refer to e.g. LM for Limousin, BA for British Blonde, ST for Stabiliser etc.

When using an Index it is important that your breeding objective is broadly similar to that of the Index in question, otherwise you may unwittingly change aspects of your herd that you did not want to.
At some breed sales, the EBVs are also presented in an Index form where the breed average value is presented as 100 with an approximate range of 70 (bottom 1%) to 130 (top 1%). The example in Table 3 below illustrates this:

Table 3: Limousin EBVs showing a bull with above and below average EBVs

<table>
<thead>
<tr>
<th></th>
<th>Calving Value</th>
<th>200 Day Milk (kg)</th>
<th>200 Day Growth (kg)</th>
<th>400 Day Growth (kg)</th>
<th>Muscle Depth (mm)</th>
<th>Fat Depth (mm)</th>
<th>Beef Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBV</td>
<td>LM –4C</td>
<td>-1</td>
<td>+25</td>
<td>+34</td>
<td>+3.40</td>
<td>-0.20</td>
<td>LM +23</td>
</tr>
<tr>
<td>Accuracy %</td>
<td>85</td>
<td>54</td>
<td>75</td>
<td>73</td>
<td>68</td>
<td>66</td>
<td>73</td>
</tr>
<tr>
<td>Index</td>
<td>77</td>
<td>98</td>
<td>112</td>
<td>106</td>
<td>111</td>
<td>111</td>
<td>108</td>
</tr>
</tbody>
</table>

These “EBV Indexes”, along with EBVs in their measurement units, are published in Sale Catalogues and on Pen Cards where requested by the Breed Society.
7. Accuracy Values

An Accuracy Value is published next to every EBV and Index. Accuracy Values are expressed as a % and indicate the quantity and quality of records used to produce the EBV or Breeding Index.

Several things affect the accuracy of an EBV or Index, namely:

• 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
• The amount of information from the animal and its relatives on traits correlated with the trait of interest and the strength of the correlations between different traits.
• The number of recorded herd mates in the same management group (‘contemporaries’).

Diagram 3 below illustrates the effect of increasing accuracy on an example EBV.

Scaling for Low Accuracy

An important feature of BLUP EBVs is that they are scaled to account for the amount of performance information on which they are based. EBVs based on very little information get adjusted towards the average EBV.

This prevents animals gaining very high or very low EBVs as a result of a few extreme (very good or very poor) records and is designed to protect the user from risk. The more information available on an animal and its relatives, the less the EBVs are adjusted.

Diagram 3: Illustration of effect of Increasing Accuracy on an EBV

Accuracy Values indicate how similar an animals’ EBVs are to its true breeding value. They predict the likelihood that an animals EBVs will change over time.
8. New Trait EBVs from Signet

Breeders have the opportunity to submit data to Signet for a range of new traits. In time EBVs will be produced for this range of new traits, which include Cow Mature Weight, Scrotal Circumference, Docility, Udder Score and Teat Score.

**Mature Cow Size**

Breeders wishing to record the mature size of their cows can now record these weights on an annual basis at weaning.

When weights are submitted breeders are also asked to record body condition score (1 to 5) and a management code (either commercial management or standard pedigree management).

This trait may be of particular importance for maternal breeds, where it may be desirable to limit increases in cow mature size, whilst continuing to improve calf growth rates.

**Scrotal Circumference**

It is well known that bulls with above average scrotal circumference will produce female offspring that reach puberty sooner and have the potential for greater lifetime reproductive performance.

Beefbreeder members can now include scrotal circumference measurements within their recording program and once a sufficient number of records have been submitted, EBVs will be produced for this trait.

Breeders wishing to submit scrotal circumference measurements should wait until bulls are 400 days of age and then record a scrotal circumference measurement on their weighsheets. Measurements should be in centimeters and taken across the widest point of the scrotum (see Diagram 4).

The collection of this data is entirely at the discretion of individual breeders. If measurements are being collected breeders are advised to use a crush and take care to avoid the risk of injury.
Docility

Beef recording schemes around the world have indicated that several of the attributes that influence cattle behaviour have a moderate to high heritability. This means these traits could be successfully incorporated into a cattle breeding programme.

The following scoring protocol has been developed by Signet and the British Limousin Cattle Society to assess the temperament of young cattle when they are held within a crush. The collection of this data will enable Signet to produce a docility EBV in the future, which enables breeders to identify breeding lines whose youngstock are calmer when handled.

Table 4. Docility Scores

<table>
<thead>
<tr>
<th>DOCILITY SCORES (Record animals once between the ages of 300 and 500 days only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
</tbody>
</table>

Udder Score and Teat Score

Breeders wishing to record udder and teat conformation can score their cows on an annual basis at calving time using a 3-point scale (see Diagram 5 below). EBVs for these traits will be produced breed-by-breed once sufficient amounts of data have been collected.

Diagram 5: Udder and Teat Scoring

Udder Score 1 = A tight udder, with the base above the hock
Udder Score 2 = Normal udder, with the base level with the hock
Udder Score 3 = Udder hanging below the hocks of the cow

Teat Score 1 = Small, thin teats < 2cm
Teat Score 2 = Normal teats 2 – 4 cm
Teat Score 3 = Large teats > 4cm
9. Interpreting Breeding Reports

Breeding reports showing the results for all animals in a herd are distributed to their respective breeders at set times during the year. Each report updates and supersedes the last. Some breed societies also make individual animal information available on their web site as well as publishing summary reports highlighting leading stock. Examples of these would be annual Sire and Dam Summaries and Promising Young Bull lists.

Table 5: Breeding Report showing EBVs for Red Poll Bulls

<table>
<thead>
<tr>
<th>BREEDING REPORT FOR SIRES</th>
<th>BREEDER: I N Thomson</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAVENHAM SIR LANCELOT - UK 22/579/500000</td>
<td>EURIMBA GLASSTONE - AUUC300</td>
</tr>
<tr>
<td>EBV 1.2 0.1 -0.5 0.3 2 17 40 2.9 -0.2 29 3</td>
<td>BEASTHOPE HARRIOTT - UK 161423/100000</td>
</tr>
<tr>
<td>Acc 67 59 31 47 18 74 74 46 66 74 47 17</td>
<td>35 31 18 0</td>
</tr>
<tr>
<td>UGGESHALL ULTRA - UK 22/027/500132</td>
<td>UGGESHALL REDCOAT - UK 22/027/500007</td>
</tr>
<tr>
<td>EBV 0.7 0.1 0.0 -0.2 2 20 40 2.3 0.0 27 1</td>
<td>UGGESHALL NONSENSE - SLD1970/100</td>
</tr>
<tr>
<td>Acc 67 59 27 46 18 73 69 66 46 73 39 40</td>
<td>32 26 20 0</td>
</tr>
<tr>
<td>ONENFIAW PRINCE - TXGU1</td>
<td>UNDERHILLS LIKELY LAD - PGPF21</td>
</tr>
<tr>
<td>EBV -0.1 0.4 -0.4 -1.0 4 10 36 0.4 0.6 24 3</td>
<td>UNDERHILLS PHILUX - PGPF17</td>
</tr>
<tr>
<td>Acc 88 81 44 67 80 90 91 88 71 92 66 40</td>
<td>42 40 23 0</td>
</tr>
</tbody>
</table>

When You Get Your Herd Report

1. Check the information is correct and inform Signet of any amendments
2. Review your genetic progress over time. Are you meeting your breeding objectives? Ensure that the genetic merit of youngstock coming in to the breeding herd is increasing year on year and identify traits that need to be improved/changed. See Section 10 to assist with this task.
3. Identify potential breeding animals using the information at your disposal. EBVs for animals that are not in your herd are available from a number of sources...
   - From the breeder/owner
   - Sale Catalogues
   - Breed Society web site
   - AI Companies
   - Promising Young Bull Lists (from Signet, the Breed Society or the breeder/owner)
   - Sire and Dam Summaries (from Breed Society or the breeder/owner)
   - Young Bull Promotion Scheme (via Breed Society).
   - On the internet: http://www.egenes.co.uk/bascosearchbeef/
**EBVs and Breeding Indexes**

EBVs are expressed in the same unit as the recorded trait (e.g. kg for 400-Day Weight, mm for Muscle Depth) and are relative to a Breed Benchmark, which is updated and published annually.

Compare and contrast the EBVs and Breeding Indexes of the two young Limousin bulls below and compare their EBVs and Breeding Indexes to the Breed Benchmark shown in Table 6 below:

<table>
<thead>
<tr>
<th>Bull A</th>
<th>Bull B</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Bull A Image]</td>
<td>![Bull B Image]</td>
</tr>
</tbody>
</table>

**Table 6: Limousin Breed Benchmark 2009**

<table>
<thead>
<tr>
<th>Trait</th>
<th>1%</th>
<th>10%</th>
<th>25%</th>
<th>AVERAGE</th>
<th>25%</th>
<th>10%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestation Length (days)</td>
<td>3.8</td>
<td>2.6</td>
<td>1.1</td>
<td>0.2</td>
<td>-0.6</td>
<td>-1.4</td>
<td>-3</td>
</tr>
<tr>
<td>Calving Ease</td>
<td>-8.5</td>
<td>-5.4</td>
<td>-2.9</td>
<td>-1.4</td>
<td>-0.4</td>
<td>0.4</td>
<td>1.5</td>
</tr>
<tr>
<td>Birth Weight (kg)</td>
<td>3.2</td>
<td>2.2</td>
<td>1.7</td>
<td>1.1</td>
<td>0.7</td>
<td>0.3</td>
<td>-0.5</td>
</tr>
<tr>
<td>Calving Value</td>
<td>LM-5C</td>
<td>LM-3C</td>
<td>LM0C</td>
<td>LM1C</td>
<td>LM2C</td>
<td>LM3C</td>
<td>LM5C</td>
</tr>
<tr>
<td>200-Day Milk (kg)</td>
<td>-7</td>
<td>-4</td>
<td>-2</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>200-Day Growth (kg)</td>
<td>-6</td>
<td>4</td>
<td>8</td>
<td>14</td>
<td>21</td>
<td>28</td>
<td>42</td>
</tr>
<tr>
<td>400-Day Growth (kg)</td>
<td>-8</td>
<td>5</td>
<td>13</td>
<td>25</td>
<td>37</td>
<td>49</td>
<td>71</td>
</tr>
<tr>
<td>Muscle Depth (mm)</td>
<td>-3.1</td>
<td>-1</td>
<td>0.9</td>
<td>1.9</td>
<td>2.9</td>
<td>3.9</td>
<td>5.7</td>
</tr>
<tr>
<td>Fat Depth (mm)</td>
<td>0.5</td>
<td>0.2</td>
<td>0.1</td>
<td>0</td>
<td>-0.2</td>
<td>-0.3</td>
<td>-0.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Trait</th>
<th>1%</th>
<th>10%</th>
<th>25%</th>
<th>AVERAGE</th>
<th>25%</th>
<th>10%</th>
<th>1%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acc. %</td>
<td>57</td>
<td>42</td>
<td>72</td>
<td>69</td>
<td>69</td>
<td>62</td>
<td>63</td>
</tr>
<tr>
<td>Index</td>
<td>100</td>
<td>120</td>
<td>122</td>
<td>117</td>
<td>126</td>
<td>103</td>
<td>120</td>
</tr>
<tr>
<td>EBV LM1C</td>
<td>4</td>
<td>+28</td>
<td>+42</td>
<td>+4.1</td>
<td>-0.1</td>
<td>LM27</td>
<td></td>
</tr>
<tr>
<td>Acc. % 57</td>
<td>42</td>
<td>72</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>62</td>
<td>63</td>
</tr>
<tr>
<td>Index 100</td>
<td>122</td>
<td>117</td>
<td>126</td>
<td>103</td>
<td>103</td>
<td>120</td>
<td></td>
</tr>
<tr>
<td>100 Day Wt</td>
<td>118</td>
<td>253</td>
<td>378</td>
<td>556</td>
<td>710</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>200 Day Wt</td>
<td>253</td>
<td>378</td>
<td>556</td>
<td>710</td>
<td>YES</td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 Day Wt</td>
<td>126</td>
<td>256</td>
<td>385</td>
<td>568</td>
<td>744</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>400 Day Wt</td>
<td>126</td>
<td>256</td>
<td>385</td>
<td>568</td>
<td>744</td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>500 Day Wt</td>
<td>126</td>
<td>256</td>
<td>385</td>
<td>568</td>
<td>744</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>
The breeding information published for these two bulls indicates:

- Each bull has been fully weight recorded (i.e. they both have a complete set of 100-day adjusted weights), scanned (the box says ‘Yes’) and possesses satisfactory accuracy figures, given their age.

- Both bulls have EBVs for weight and carcase traits that are above the breed average, but in several ways their characteristics differ:
  > Bull A has the highest Muscle Depth EBV
  > Bull B has the highest EBVs for weight EBVs
  > Bull A has a 200-Day Milk EBV in the Top 10% of the breed
  > Bull B has a Calving Value in the Top 10% of the breed

Bull A would the most suitable out of the two for a unit where carcase quality takes a high priority. The high 200-Day Milk Weight EBV would also make it suitable for herds where female replacements are retained for breeding.

The high Calving Value of Bull B indicates that it would be more suitable for mating to heifers. It could also be used in herds where a priority is to improve growth.

**Remember**

- When trying to establish just how much influence a bull will pass on to his progeny it is important to remember to halve the value of the EBV, since the other half of a calf’s genes comes from the cow.

  For example, a bull with a 400-Day Weight EBV of +62kg...

  - is estimated to have the genetic potential to be 62kg heavier at 400 days of age compared to a bull with an EBV of 0.
  - would be expected to leave calves 31kg heavier at that age when compared to calves by a bull with an EBV of 0.

✔ Select animals using EBVs relevant to your farm, cow type and market
✔ Consider the traits that will make you most money
✔ Don’t forget to check all important traits such as Calving Ease etc.
EBVs and Breeding Indexes are produced on sale cards and in catalogues either in tabular format similar to that shown in Table 6 on p20, or as a graph as shown in Diagram 6 below.

Bars that lie to the right of the central line indicate the EBV/Index is above breed average (and the further it is to the right, the higher above breed average it is).

Similarly, bars to the left of the central line indicate the EBV/Index is below breed average (and the further to the left it is, the further below average it is).

### Diagram 6: Graphical illustration of EBVs and Indexes

![Diagram 6: Graphical illustration of EBVs and Indexes](image)

Although sale cards are automatically produced for some of the larger bulls sales, they are also available from the Signet Bureau for any animal at any time (telephone 0247 647 8829). Please allow at least one week’s notice for delivery.
11. Ultrasound Scanning Service

Ultrasound scanning provides cattle breeders with the opportunity to assess the carcase quality of their cattle by measuring muscle and fat levels in the live animal. This information is then analysed to identify superior breeding lines.

Why use ultrasound to assess muscling?

Unlike growth rate, it isn’t easy to identify cattle with superior muscling across the loin. Ultrasound images enable breeders to select animals with superior loins and avoid those with a high level of carcase fat.

While this measurement simply reflects muscle depth across the loin, research indicates that selective breeding for muscle depth can greatly enhance total meat yield.

Raw Data or Estimated Breeding Values (EBVs)?

As with any raw performance data, muscle and fat depth measurements are affected by non-genetic factors such as age at scanning and herd nutrition. It is important that breeders select on the basis of muscle and fat depth EBVs, rather than on the raw data alone.

What is involved?

Cattle are scanned between 300 and 500 days of age. Liquid paraffin is applied to the hide to assist acoustic contact and the technician places the transducer across the last rib and latterly the third lumbar vertebrae to get two images.

As each image is taken the picture is frozen and linear measurements of muscle and fat depths taken on the screen. A single measure of muscle depth (at the 3rd lumbar) and eight measures of fat depth (4 at each site) are taken. These measurements are then submitted to Signet for inclusion in the forthcoming breeding evaluation.
Helping the Scanning Technician

To make the most efficient use of your technician we suggest:

1. **All** cattle (bulls, heifers and steers) are presented for scanning as the analysis involves comparisons with contemporaries. Only late born calves or animals in poor health should be excluded.

2. A crush is required so that the cattle can be restrained and weighed at scanning time.

3. The handling should take place undercover, and mains power is necessary at the scanning point. Please provide a table or bales to stand the scanning equipment on.

4. Notify the technician about any groups of cattle that have been managed differently, so this can be recorded.

5. Please have your Beefbreeder records to hand in case there are any queries relating to animal identities.

6. Please ensure adequate help is available.
# Appendix 1: How to Complete Signet Breeding Records

(where records are not already available via Society)

**Sex:**
- B = Bull
- H = Heifer
- S = Steer

**Type:**
- S = Single born
- M = Multiple born
- T = Embryo Transfer
- F = Foster Calf

Enter the weight and weigh dates of the calf. If not weighed enter one of the following codes.
- R = retained but not weighed
- D = died
- T = transferred into breeding herd
- B = sold for breeding
- S = sold for slaughter

For cows not listed, enter sire and dam ear number, name (optional) and date of birth.

Enter one of the following disposal codes if cows are no longer in the herd:
- D = died
- B = sold for breeding
- S = sold for slaughter

If the calf is fostered or is an embryo transfer, enter the ear no. and date of birth of the recipient or foster dam.

**Birth weight:** Only enter weight if weighed within 48 hours of birth. Do not estimate.

Enter code to describe your management of calves to weaning:
- 221 = suckling dam only
- 222 = suckling dam and creep feed
- 223 = suckling nurse cow and creep
- 224 = suckling nurse cow only
- 225 = bucket fed calves
- 226 = double suckling calves with creep

**Calving Score:**
- L = Live
- D = Dead within 48 hours
- L1 or D1 = No assistance
- L2 or D2 = Slight assistance
- L3 or D3 = Ropes/calving aids
- L4 or D4 = Non-surgical vet assistance
- L5 or D5 Caesarean section
- E = Elective caesarean

**Enter the weight and weigh dates of the calf. If not weighed enter one of the following codes.**

**Sex:**
- B = Bull
- H = Heifer
- S = Steer

**Type:**
- S = Single born
- M = Multiple born
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- D = died
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If the calf is fostered or is an embryo transfer, enter the ear no. and date of birth of the recipient or foster dam.

**Birth weight:** Only enter weight if weighed within 48 hours of birth. Do not estimate.

Enter code to describe your management of calves to weaning:
- 221 = suckling dam only
- 222 = suckling dam and creep feed
- 223 = suckling nurse cow and creep
- 224 = suckling nurse cow only
- 225 = bucket fed calves
- 226 = double suckling calves with creep
Beefbreeder recording requires all heifers, steers and bulls to be weighed every 100 days from birth to 600 days of age.

To ensure animals conform to the weighing protocol they should be weighed as close to the "target weigh date" as possible. Target weigh date is printed at the top of the form. A breeding record must be completed for any animals that have been weighed that do not appear on the weigh sheet.

Management Codes

Enter a code to describe the current management of your calves/yearlings.

Up to weaning:
221 = suckling dam only
222 = suckling dam and creep feed
223 = suckling nurse cow and creep
224 = suckling nurse cow only
225 = bucket fed
226 = double suckling with creep

Bulls
441 = commercial management
442 = standard pedigree management
443 = show management

Steers
461 = commercial management
462 = standard pedigree management

Heifers
451 = commercial management
452 = standard pedigree management
453 = show management

Information is analysed on a "contemporary group basis", comparing animals reared under the same management to identify differences in genetic potential.

Where a contemporary group contains fewer than 5 records it may be merged with other groups within the herd, dependant on the spread of ages within these groups.

Enter the weight of the animals or one of the following codes
B = sold for breeding
D = died
S = sold for slaughter
T = transferred into your own breeding herd

Scrotal circumference measurements can be supplied for bulls over 300 days of age.

Care must be taken in the collection of this measurement. XXX indicates heifers, or bulls too young to be measured.

Please remember to weigh as close as possible to the target weigh date and enter the actual weigh date at the bottom of the form.

If animals are weighed on more than one date this must be made clear.

Appendix 2. How to Complete Signet Weight Sheets

Forms should be faxed to Signet at 0247 647 8902 or posted to AHDB, Signet Breeding Services, Stoneleigh Park, Kenilworth, CV8 2TL.
Further Information

Signet Breeding Services
AHDB
Signet Breeding Services
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL
Tel: 0247 647 8829
Fax: 0247 647 8902
Email: signet@eblex.org.uk
www.signetfbc.co.uk

EBLEX Better Returns
Agriculture and Horticulture Development Board
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL
Tel: 0870 241 8829
Fax: 0871 433 6205
Email: brp@eblex.org.uk
www.eblex.org.uk

Quality Meat Scotland
Rural Centre
West Mains
Ingliston
Newbridge
EH28 8N
Scotland
Tel: 0131 472 4040
Email: info@qmscotland.co.uk

Hybu Cig Cymru
PO Box 176
Aberystwyth
SY23 2YA
Tel: 01970 625 050
www.hybucigcymru.org

EBLEX Breeding Manual
Copies available from EBLEX for English Levy payers

HCC Breeding Manual
Copies available from HCC for Welsh Levy payers
EBVs Explained

WINTERHILL DAVE
UK 1234567890001

Sire: BRADWELL STEVE
Dam: WINTERHILL MARY

Below Average | Above Average (Superior)

Gestation Length (days) | -1.7 55
Birth Weight (kg) | 0.5 67
Calving Ease (%) | 0.5 61
Mat. Calv. Ease (%) | 1.0 34

200 Day Milk (kg) | -2 61
200 Day Growth (kg) | -34 77
400 Day Growth (kg) | 62 72
Muscle Depth (mm) | 3.9 74
Fat Depth (mm) | -0.3 68

Beef Value LIM 31 71
Calving Value LIM 4C 61
Maternal Value LIM 22 45

Beef Value: High positive values for calves that are fast growing with good conformation
Calving Value: High positive values for calves with short gestation lengths that will be easily born
Maternal Value: High positive values for production of quality breeding females

Gestation Length: High negative values for shorter gestation length
Birth Weight: Lower values for lighter calves
Calving Ease: High positive values for less assisted calvings
Maternal Calving Ease: High positive values for easier calving daughters
200 Day Milk: High positive values for daughters with good milking and maternal abilities
200 Day Growth: High positive values for fast growth to weaning
400 Day Growth: High positive values for fast growth to finishing
Muscle Depth: High positive values for improved carcase conformation
Fat Depth: Negative values for leaner carcase

AHDB
Signet Breeding Services
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2TL

Tel: 0247 647 8829
Tel: 0247 647 8902
Email: signet@eblex.org.uk