

# Bull Buyer's Guide



## About HCC

Hybu Cig Cymru/Meat Promotion Wales (HCC) is the strategic body for the promotion and development of red meat in Wales and the development of the Welsh red meat industry. Its mission is to develop profitable and sustainable markets for Welsh lamb, Welsh beef and pork for the benefit of all stakeholders in the supply chain.

HCC's five strategic goals are:

- Effective promotion of Welsh Lamb and Welsh Beef and red meat products in Wales
- Build strong differentiated products
- Improve quality and cost-effectiveness of primary production
- Strengthen the red meat supply chain
- Effective communication of HCC activities and industry issues

This booklet forms part of a series of publications produced by HCC's Industry Development team.

The Industry Development team deal with a range of issues that include:

- Technology Transfer
- Research and Development
- Market Intelligence
- Training
- Demonstration farms
- Benchmarking

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## Contents

<b>1. The Importance of Breeding Improvement</b>	<b>3</b>
1.1 Data Collection and Validation	3
1.2 Contemporary Groups and Across Herd Comparisons	4
1.3 Estimated Breeding Values	5
1.4 Beef Value, Calving Value, Maternal Value and Maintenance Value	9
1.5 Accuracy Values	11
<b>2. Interpreting Estimated Breeding Values (EBVs)</b>	<b>12</b>
2.1 Selecting Bulls for Different Production Systems	14
2.2 Cost Benefit from Investing in Superior Breeding Stock	14
<b>3. Selection for Fertility and Structural Soundness</b>	<b>16</b>
3.1 Bull Fertility	16
3.2 Structural Soundness	17
3.3 Financial Impact of Optimising Bull Performance	19
3.4 Buying Bulls at an Auction	20
3.5 Looking After a New Bull	23
<b>4. Breeding Strategy</b>	<b>24</b>
4.1 Hybrid Vigour	24
4.2 Crossbreeding Programmes	25
4.3 Planning a Crossbreeding Programme	26
<b>Technical Notes</b>	<b>27</b>
<b>Glossary of Terms</b>	<b>29</b>
<b>List of Contacts for Pedigree and Commercial Beef Producers</b>	<b>30</b>



## Introduction

The purchase of a stock bull represents an investment in genetic material that will have a major impact on the financial performance of the herd.

Calves sired by bulls with superior breeding are capable of improving herd gross margins by £40 to £60/calf and in self-replacing herds a bull's genes may continue to be expressed for over 20 years, so it is important to invest wisely.



It is imperative that beef producers know how to:

- Assess a bull's genetic potential
- Ensure the right genetics are purchased to meet the needs of the farm and the market
- Optimise the use of the bull over several seasons, by selecting for reproductive fitness and ensuring it is structurally sound
- Understand how to utilise these genetics within purebred and crossbred breeding programmes

By following these steps producers can identify bulls that:

- Produce more progeny
- Produce calves that are born easily
- Produce faster growing progeny
- Produce progeny with desirable carcass traits that meet market specifications
- Produce more productive female replacements

This manual shows commercial producers how to identify the right bull for their beef production system and increase the profitability of the enterprise.

## 1. The Importance of Breeding Improvement

The breeding (or genetic) improvement of beef cattle represents those gains in productivity that can be obtained through the selection of superior parents for mating. Whilst breeding only represents one aspect of herd management, it can lead to permanent and cumulative gains in productivity that are of major economic importance.

It simply isn't possible to assess a bull's breeding potential by looking at it, because it's appearance will have been influenced by its age, management and feeding regime – as well as its genetics.

Producers must use records of performance and Estimated Breeding Values (EBVs) to identify bulls that are truly genetically superior.

### 1.1 Data Collection and Validation

In the UK over 1000 pedigree herds are involved in performance recording and most producers have good access to recorded breeding stock. This section explains how raw data is collected, converted into EBVs and then used in bull selection.

Performance recording takes place in three stages:

- On-farm collection of pedigree and performance data
- Bureau based data entry and validation
- BLUP analysis of data to produce EBVs and Indexes

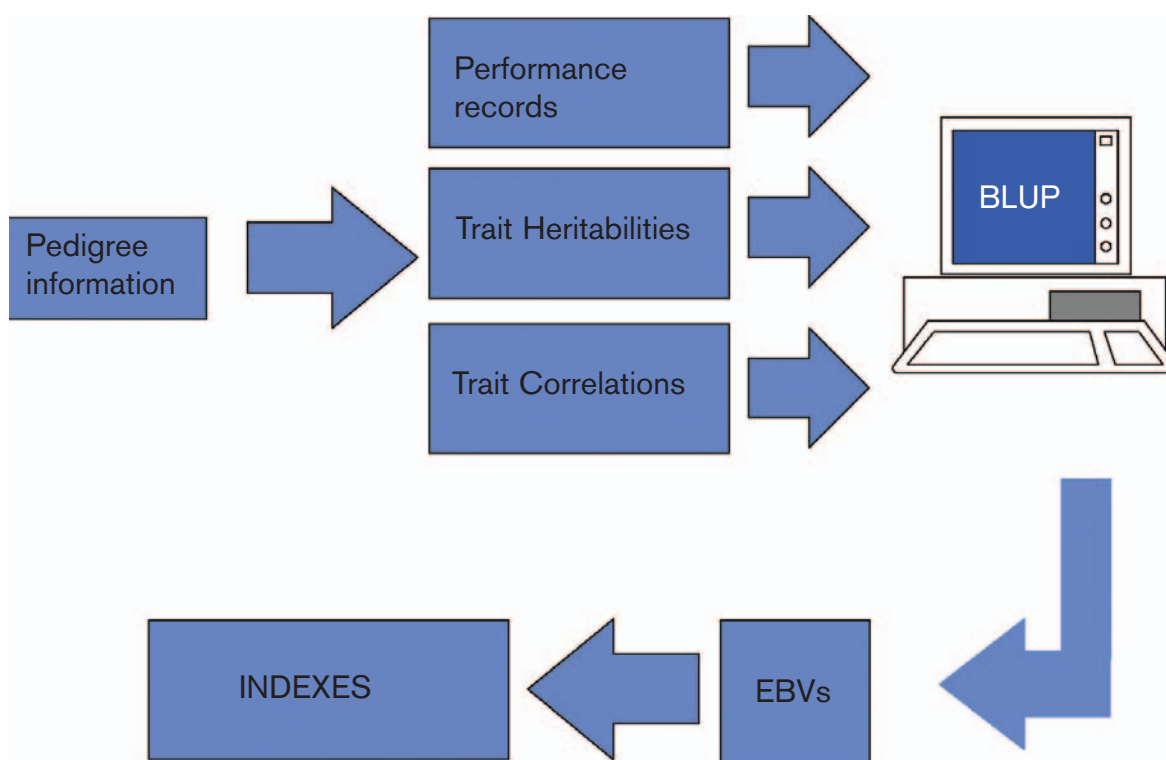


Figure 1. Performance Recording: Converting Raw Data into EBVs

The collection of performance data focuses on traits recorded at birth, weight records collected up to 600 days of age and measurements of carcass conformation taken using ultrasound. These traits are explained in Tables 1 and 2.

Breeding values are calculated using an analytical procedure known as BLUP (Best Linear Unbiased Predictor). BLUP separates those genetic factors that influence an animal's performance from the non-genetic factors such as dam age, sex and management, in order to produce Estimated Breeding Values (EBVs).

As data is entered into the database it is checked for errors. Breeders are contacted where anomalies arise and weights are validated prior to their inclusion within an analysis.

## 1.2 Contemporary Groups and Across Herd Comparisons

The way in which animals have been managed within their herd of origin and the differences in management between herds, need to be taken into account when performance data is analysed.

### 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 similarly – are referred to as “contemporaries”. Within the analysis, animals within an individual herd are assigned to distinct contemporary groups, so that they can be accurately compared.



*British Blonde cattle being wintered on silage*

The accuracy of recording programmes can be improved by:

- ensuring that animals in contemporary groups get as similar treatment as possible
- making sure that groups are large enough to identify true genetic differences.

Within the UK based analysis service, special programmes have been developed to address the challenge of the small contemporary group sizes that exist within UK pedigree herds.

### Across Herd Evaluations

Twenty years ago it was difficult to compare the breeding potential of bulls raised in different herds, so they were brought together at central bull testing stations.

Today, the use of powerful computing programmes which take into account the common ancestry that exists between animals in different herds can be used to produce across herd EBVs.

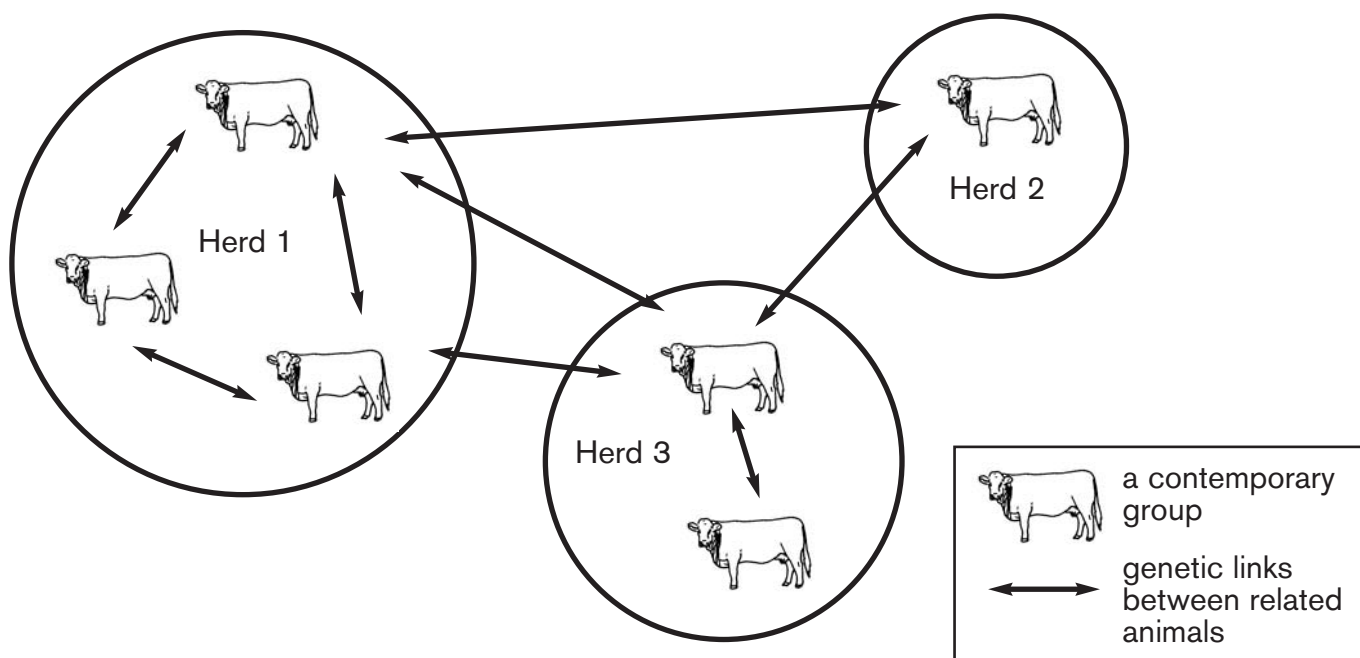


Figure 2. The within-and across-herd comparisons that take place within cattle breeding programmes

The genetic linkage created through the sale of bulls and use of Artificial Insemination enables differences in herd management to be taken into account when predicting the breeding merit of cattle reared in different herds.

EBVs for different animals can be compared within a breed, but they can't be compared between breeds.

### 1.3 Estimated Breeding Values

#### Estimated Breeding Values (EBVs)

An Estimated Breeding Value (EBV) is an indication of the breeding potential of an animal for a specific trait. They take into account the performance data collected on the animal and its known relatives, the relationships that exist between performance traits (correlations) and the degree to which a trait is passed on from one generation to another (heritability).

EBVs are expressed in the same units as the traits they represent (e.g. kg for liveweight) and are expressed relative to a common baseline. For cattle evaluated in the UK, this baseline is set so that the average breeding value of cattle born in 1980 is zero.

#### Estimated Breeding Values

Nine EBVs are currently available to beef producers from MLC's Signet Breeding Services and, with the exception of 200 day milk, these all indicate how an animal would perform as a terminal sire. Nine new Maternal EBVs are being introduced in April 2006. See Technical Note 1.

**Table 1. Estimated Breeding Values for Terminal Sire Traits (Signet)**

EBV	Interpretation	Trait	Notes
Birthweight (kg)	Negative Values = Lighter calves at birth	Size of calf at birth	High birth weights are more likely to be associated with difficult calvings
Gestation Length (days)	Negative Values = Shorter gestations	Length of pregnancy	Shorter 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.
Calving Ease (%)	Positive Values = More unassisted calvings	Calving ease of a bull's progeny	Estimates the percentage of unassisted calvings that can be derived from a particular sire.
200-Day Growth (kg)	Positive Values = Faster growth rates	Growth rate	Selection for faster growth will result in animals that have heavier carcasses at a constant fat class or leaner carcasses at a constant age.
400-Day Growth (kg)	Positive Values = Faster growth rates	Growth rate	Selection for high growth rates also tends to result in an overall increase in mature size (and therefore higher birthweights).
Muscling Score	Positive Values = More muscular carcasses	Muscling of the carcass	Selecting for these traits will increase the yield of lean meat in the carcass
Muscle Depth (mm)	Positive Values = Deeper loin muscles	Depth of loin	
Backfat Depth (mm)	Negative Values = Leaner carcasses	Leanness of the carcass	Indicates animals capable of producing lean carcasses or, if required, can be taken to heavier carcass weights without becoming overfat.

- In the Republic of Ireland the Irish Cattle Breeders Federation uses an on-farm BLUP system, supported by bull performance tests completed at Tully and commercial progeny testing. Several system specific indexes are available, such as the “Weaned Calf Index” and “Production Index”
- In France “Iboval” Indexation uses a BLUP system based on a range of growth, carcass, fertility and maternal traits. There are large schemes in France involving Charolais and Limousin Cattle.
- In Australia and the UK, Breedplan run by ABRI uses a BLUP analysis system that is very similar to Signet’s, Breedplan produces a range of EBVs for traits of commercial importance and a Beef Index – which is similar to Signet’s Beef Value. The traits analysed by this Australian service are provided in Table 2.



**Table 2. Estimated Breeding Values for Beef Cattle evaluated by ABRI (Agricultural Business Research Institution)**

EBV	Notes
Calving Ease Direct (%)	Indicates the influence of the sire on calving ease in purebred females calving at two years of age. Positive EBVs are favourable and indicate easier calving.
Calving Ease Daughters (%)	Indicates how easily a sire's daughters will calve at two years of age. Positive EBVs are favourable and indicate easier calving.
Gestation Length (days)	Estimate of the time from conception to the birth of the calf. Lower (negative) EBVs indicate shorter gestation length
Birth Weight (kg)	The lower the EBV the lighter the calf at birth and the lower the likelihood of a difficult birth. This trait is particularly important when selecting sires for use over heifers.
200 Day Weight (kg)	Calculated from the weight of progeny taken between 80 and 300 days of age. This EBV is the best single estimate of an animal's genetic merit for growth to early ages.
400 Day Weight (kg)	Calculated from the weight of progeny taken between 301 and 500 days of age, adjusted to 400 days. This EBV is the best single estimate of an animal's genetic merit for yearling weight.
600 Day Weight (kg)	Calculated from the weight of progeny taken between 501 and 900 days of age, adjusted to 600 days. This EBV is the best single estimate of an animal's genetic merit for growth beyond yearling age.
Mature Cow Weight (kg)	This EBV is an estimate of the genetic difference in cow weight at 5 years of age.
Milk (kg)	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)	Calculated from the circumference of the scrotum taken between 300 and 700 days of age. This EBV is an estimate of an animal's genetic merit for scrotal size and will influence the fertility of his daughters.
Eye Muscle Area (sq.cm)	Calculated from measurements from live animal ultrasound scans. Positive EBVs indicate better muscling on animals at a dressed carcass weight of 300 kgs.
Rib Fat (mm)	Calculated from measurements of subcutaneous fat depth at the rib from live animal ultrasound scans. Sires with a low, or negative, fat EBV are expected to produce leaner progeny at a dressed carcass weight of 300 kgs.
Retail Beef Yield (%)	Represents total (boned out) meat yield as a percentage of a 300kg dressed carcass. A more positive EBV indicates higher % yield for the 300kg carcass size.
Intramuscular fat (%)	An estimate of the genetic difference in the percentage of intramuscular fat in a 300kg dressed carcass.
Carcass Weight (kg)	Based on abattoir carcass records. This is an indicator of genetic differences in carcass weight at the standard age of 650 days.
Terminal Index	A combination of growth and carcass trait EBVs and is a measure of a bull's ability to produce prime steers and heifers for the finished market. The Index is reported as an EBV and expressed in £'s.

## Interpreting EBVs

A bull's EBVs must be halved in order to estimate how much of his genetic superiority (or inferiority) will be passed on to the next generation, because, on average, only half of his genes will be passed on to the next generation (the other half coming from the cow to which it is mated).

For example:

A bull with an EBV of +40 for 400-Day Growth is expected to produce, on average, calves 20kg heavier at 400-days than calves sired by a bull with an EBV of 0.

Maternal traits can be interpreted in the same way....

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

...and sometimes a negative figure is a positive attribute.

A bull with a Birthweight EBV of -1 is expected, on average, to produce calves 0.5kg lighter at birth than calves sired by a bull with an EBV of 0.



*A recorded Charolais bull purchased on the basis of its EBVs*

## The Breed Benchmark and EBV Indexing

The Breed Benchmark shows a percentile breakdown of the EBVs within the breed, enabling buyers to see where bulls rank within their breed for each trait. An example of a breed benchmark is shown in Table 3.

**Table 3. Limousin Breed Benchmark (Example)**

TRAIT	BOTTOM			BREED AVERAGE	TOP		
	1%	10%	25%		25%	10%	1%
Calving Value	LM-4C	LM-1C	LM0C	<b>LM1C</b>	LM2C	LM3C	LM5C
200-Day Milk (kg)	-7	-3	-2	<b>0</b>	1	3	6
200-Day Growth (kg)	-8	0	5	<b>12</b>	18	24	37
400-Day Growth (kg)	-13	0	10	<b>21</b>	31	41	63
Muscling Score (pts)	-0.3	0	0.1	<b>0.3</b>	0.6	0.8	1.2
Muscle Depth (mm)	-1.4	-0.1	0.5	<b>1.3</b>	2.1	3	4.7
Fat Depth (mm)	0.4	0.1	0	<b>-0.1</b>	-0.2	-0.3	-0.5
Beef Value	LM0	LM6	LM11	<b>LM16</b>	LM20	LM25	LM34

EBVs on index are updated on a regular basis and individual animals figures will vary up and down

Some breeds in the UK have adopted a method of indexing EBVs. This system converts each EBV into a figure between 70 and 130, where 100 is maintained as the average value for the breed. This information is presented on sale cards and in sale catalogues, an example of which is shown in Tables 4 & 5.

#### 1.4 Beef Value, Calving Value, Maternal Value and Maintenance Value

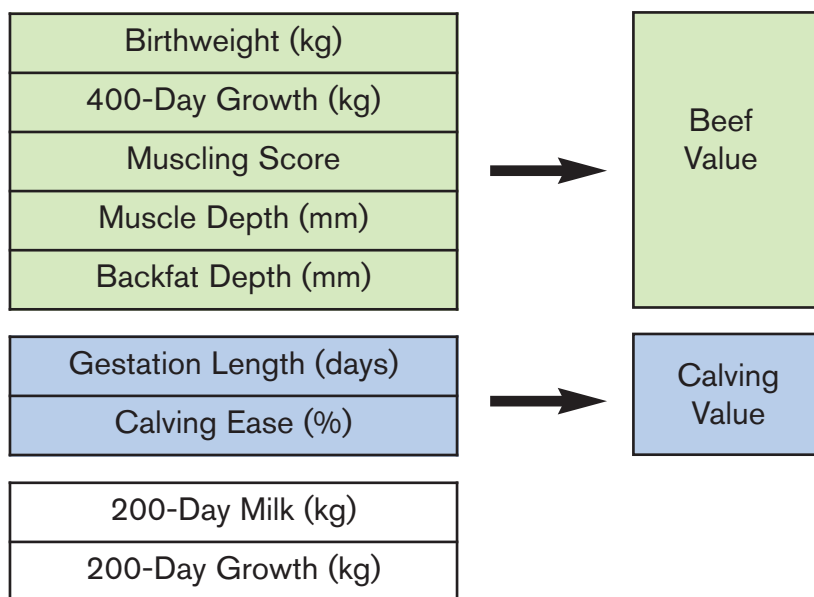
Whilst EBVs aid the selection of breeding stock according to specific traits they can also be combined into selection indexes to meet given breeding objectives.

Each trait is weighted according to its relative economic value to provide a single figure on which selection decisions can be based.

The UK based breeding evaluation service provides two selection indexes, Beef Value and Calving Value. The construction of these indexes from their component EBVs is shown in Figure 3. The introduction of maternal EBVs in 2006 will generate three new indexes, Maternal Value, Maintenance Value and Production Value.



Figure 3. Construction of Beef Value and Calving Value



### Beef Value

The Beef Value ranks animals on the expected financial merit of their offspring's carcasses. It takes into account the financial benefits from improvements in carcass weight, fat and conformation that arise in commercial cattle production and is presented as a cash value (£/head).

As with the EBVs, a bull's Beef Value must be halved to estimate the value of his calves.

Interpretation:

A bull with a Beef Value of +20 will produce progeny whose carcasses are worth on average £10 more than those sired by a bull with a Beef Value of 0

### Calving Value

The Calving Value aims to improve financial returns from beef production by reducing the costs associated with longer gestation lengths and difficult calvings.

Costs associated with extended gestation lengths include those associated with difficult calvings and the direct costs associated with having to feed and house a pregnant cow for longer and extended calving intervals. The costs associated with difficult calvings include the potential death of a cow or calf, veterinary costs, reductions in fertility and increased stockperson hours.

The Calving Value helps producers to select terminal sire bulls that will produce calves that do not have extended gestation lengths and which are born easily. It is presented as a cash value (£/head) and it must be halved in the same way as the Beef Value in order to aid interpretation.

## Interpretation

A bull with a Calving Value of +4 is expected to sire calves that save an average of £2 in calving and gestation length costs compared to calves sired by a bull with a Calving Value of 0.

The Beef Value and Calving Value of bulls of different breeds cannot be compared.

## 1.5 Accuracy Values

Accuracy values are presented along with the EBVs. They indicate how close the EBVs are to the true breeding value of the animal. They are expressed as percentage points ranging from 0 to 100. Bulls that have been recorded and have lots of recorded ancestors and progeny, such as AI sires, will have high accuracy values.

The accuracy of an EBV will be influenced by the:

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

Accuracies provide a guide to the likelihood of an EBV changing (up or down) as more information on the animal becomes available. However, BLUP EBVs are already scaled to account for the amount of performance information on which they are based. EBVs based on very little information get adjusted back towards the average. In this way BLUP has already accounted for the risk involved in making breeding decisions when data is limited.




*Accuracy Values are influenced by contemporary group size*

## 2. Interpreting EBVs


Bull buyers are able to assess a bull's strengths and weaknesses by looking at its EBVs. Only then can they decide whether it has the right breeding attributes for their herd. Compare and contrast the EBVs for these two Limousin bulls in Tables 4 & 5.


**Tables 4 & 5. Sale Cards for two Limousin Bulls**

<b>BULL A: ERYRI</b>								
Sire: TRYFAN								
Dam: WYDDFA								
Analysis Date:	Calving Value	200 Day Milk (kg)	200 Growth (kg)	400 Growth (kg)	Muscling Score (pts)	Muscle Depth (mm)	Fat Depth (mm)	Beef Value
07/11/2005								
<b>E B V</b>	<b>LM1C</b>	<b>+4</b>	<b>+28</b>	<b>+42</b>	<b>+1</b>	<b>+4.1</b>	<b>-0.1</b>	<b>LM27</b>
Accuracy %	57	42	72	69	63	69	62	63
Index	100	120	122	117	126	128	103	120


100 day wt.	200 day wt.	300 day wt.	400 day wt.	500 day wt.	Scanned
118	253	378	556	710	YES



<b>BULL B: BANNAU</b>								
Sire: FAN FAWR								
Dam: FAN LLIA								
Analysis Date:	Calving Value	200 Milk (kg)	200 Growth (kg)	400 Growth (kg)	Muscling Score (pts)	Muscle Depth (mm)	Fat Depth (mm)	Beef Value
07/11/2005								
<b>E B V</b>	<b>LM4C</b>	<b>-5</b>	<b>+30</b>	<b>+52</b>	<b>+0.5</b>	<b>+2.0</b>	<b>+0.3</b>	<b>LM25</b>
Accuracy %	59	43	73	68	60	66	60	64
Index	120	86	124	125	107	107	76	116

100 day wt.	200 day wt.	300 day wt.	400 day wt.	500 day wt.	Scanned
126	256	385	568	744	YES



By comparing each bull's EBVs against the EBV benchmark for the breed in Table 3 and reviewing the information displayed on the cards, the following points can be observed.

- Each bull has been fully weight recorded, scanned and possesses satisfactory accuracy figures (for a young animal).
- Both bulls have above average EBVs for growth and carcass traits and would make suitable bulls for use as terminal sires, but in several important ways their characteristics differ.
  - Bull A has high muscle depth and muscle score EBVs
  - Bull B has the highest EBVs for growth rate
  - 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 be ideal for a beef production system where cattle are sold on a deadweight basis and carcass quality takes a high priority. The high 200 day milk EBV would also make it a suitable sire for herds where female replacements are being retained for breeding.

Bull B would be suitable for mating to heifers, because of its high Calving Value. It could also be used in herds where the top priority is to improve growth rate.

Buyers need to take the time to consider their own breeding objectives and then select those bulls with the right combination of EBVs.

### Presentation of EBVs

Estimated Breeding Values are produced on sale cards and in sale catalogues. They can also be represented graphically, as shown in Figure 5.

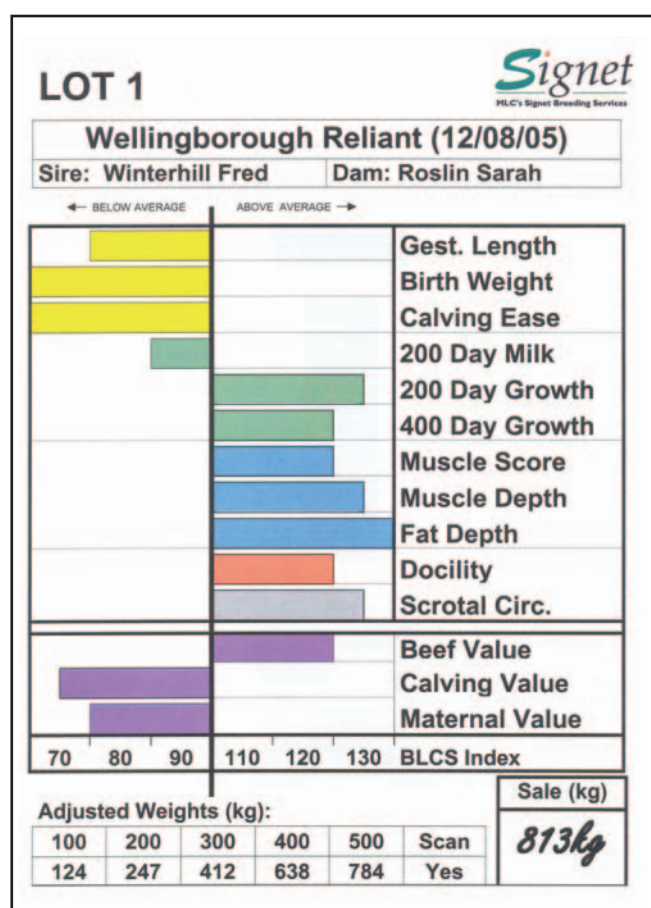


Figure 5. Graphical illustration of EBVs

## 2.1 Selecting Bulls for Different Production Systems

Bull buyers will have different selection criteria when it comes to choosing a sire, depending on their herds' breeding objectives.



*These crossbred heifers have been bred for use as herd replacements. They are sired by bulls with high 200 day milk and low birth weight EBVs.*

**Table 6. Traits of Interest for Beef Producers**

Breeding Role	Important EBVs
Terminal Sire - progeny finished for slaughter	Calving ease and birth weight 400 day growth, muscle depth, muscle score and fat depth
Terminal Sire - progeny sold at weaning	Calving ease and birth weight 200 day growth
Sire of dairy calves – progeny sold at 48 hours	Gestation length, calving ease and birth weight
Sire of dairy calves – progeny finished for slaughter	Gestation length, calving ease and birth weight. Muscle depth and muscle score
Maternal Sire – female progeny retained for breeding purposes	Birth weight, 200 day milk, Calving Interval, Maternal Calving Ease, Early Maturity and 200 day growth
Sire for mating to maiden heifers	Calving ease, birth weight and 200 day growth rate

## 2.2 Cost Benefit from Investing in Superior Breeding Stock

Producers throughout the UK are seeing significant financial benefits associated with the use of bulls with superior EBVs. Within the last five years two independent trials have conclusively shown the clear financial benefits that can be attributed to the use of bulls with high EBVs due to improvement in growth rates and carcass quality.



The financial benefits will significantly enhance the profitability of the herd on a per calf basis and over a bull's working lifetime this sum can easily run into thousands of pounds. Trials show conclusively that even if buyers have to spend a little more money on the purchase of a bull with high breeding potential, it is usually a highly cost effective investment for the herd.

**Table 7. Impact of Growth and Carcase EBVs**

	Sire Details		Performance of Progeny by High EBV Bull (Bull A)		Financial benefit	
	400 day growth EBVs	No. male progeny recorded	Growth rate	Carcase quality	Per calf	Per bull (over lifetime)*
Bull A Bull B	Top 25% Average	67 98	15kg heavier carcase weight & slaughtered 17 days earlier	11% more 'U' grade carcasses	Calves were worth £50 more	Bull A was worth £6000 more than Bull B

\* Assuming an average stock bull sires 120 calves during his working lifetime

### Impact of Birth Weight and Calving Ease EBVs

The financial impact of growth and carcase traits should not be considered in isolation, because one of the biggest influences on herd profitability is the number of calves successfully reared to weaning. One of the best ways that producers can enhance herd productivity is by ensuring high rates of calf survival.

Table 8 shows calf survey data that has been collated by a leading AI station. This shows the strong relationship that exists between the birth weight and calving ease EBVs for five Charolais bulls and the calving records of cows to which they were mated using AI.

Calf mortality figures for Bull A were just 1.5%, compared to an average calf mortality rate amongst the other bulls of 4.3%. This difference in calf mortality is worth £30/cow; for a 50 cow herd this would be worth £1500/annum.

**Table 8. Calf Survey Data for Five AI Sires**

	Birth Weight EBV	% Calves with "Above Average" birth weight	Calving Ease EBV	% of unassisted calvings
Bull A	0.6	12%	-1.3	67%
Bull B	3.1	24%	-7.9	61%
Bull C	3.4	27%	-14.8	59%
Bull D	4.8	32%	-13.6	57%
Bull E	4.1	29%	-26.9	51%

\* Each sire had over 200 progeny.

\* This type of survey tends to overstate levels of calving difficulty – but it does provide a good relative comparison between bulls.

### 3. Selection for Fertility and Structural Soundness

Whilst EBVs will assist bull buyers in the selection of breeding stock for a range of economically important traits, a subjective assessment is still required to assess a bull's fertility, temperament and structural soundness.

#### 3.1 Bull Fertility

One of the most important attributes of a bull is his fertility, because infertile bulls are a major source of economic loss. There are a number of steps that a bull buyer can take to minimise their chance of purchasing a bull with poor fertility. These include checking:

- Scrotal size and tone
- Structure of sheath and penis
- Semen quality
- Bull behaviour – such as libido and serving capacity
- Structural soundness

Testicle size is important as it will have a direct influence on daily sperm production and hence mating load. A positive genetic relationship also exists between the scrotal size of a stock sire and both the fertility and age at puberty of their female progeny.

Great care should be taken when measuring testicle size to avoid operator injury. To measure the scrotum, restrain the bull in a crush and stand behind it. With one hand draw the testicles to the bottom of the scrotum, with finger and thumb around the side of the scrotum, rather than between the testes. With the other hand, loop a tape around the widest point of the scrotum and take the measurement. Specialist equipment to measure scrotal circumference is available through certain stockists.

Scrotal circumference will be influenced by the age of the animal, its breed and body condition score. Table 9 shows the guidelines set by several of the UK Beef Breed Societies.

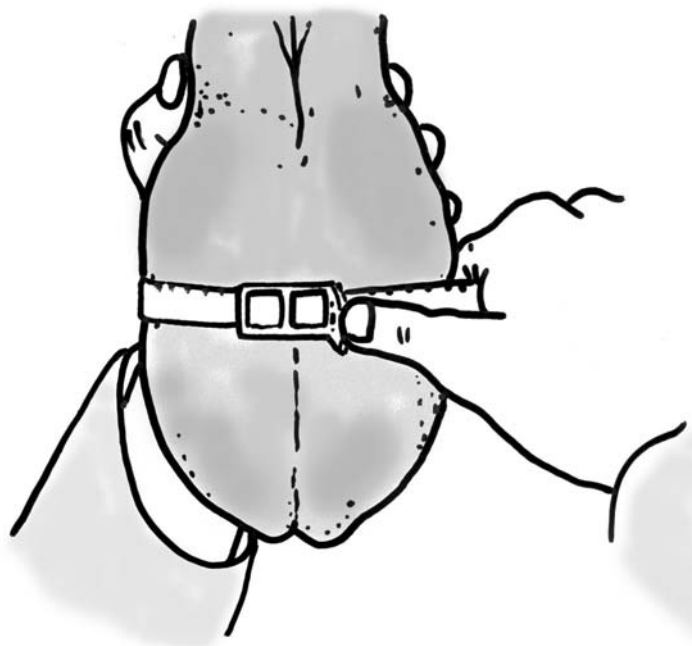


Figure 6. Measuring Scrotal Circumference

**Table 9. Minimum Scrotal Circumference Measurements**

Breed	Guide for Scrotal Circumference
Aberdeen Angus	Minimum 32cm at 12 months Minimum 34cm at 18 months Minimum 32cm at 24 months
Belgian Blue	Minimum 25cm at 18 months
Beef Shorthorn	Minimum 32cm at sale
British Blonde	Minimum 30cm at sale
Charolais	34-36 at 13 - 18 months 36-38 at 18 - 24 months >38cm at over 24 months
Limousin	Minimum 30cm at sale
Simmental	Minimum 34cm at 10-12 months Minimum 36cm at 13-18 months Minimum 38cm at 18 months and over

Testicle tone is also important. Testes should be firm and springy, not soft or hard. They should move freely within the scrotum and it is worth checking the top and bottom of each testicle to ensure the epidymus is neither hard nor swollen. The scrotum should be free of skin lesions.

A veterinarian can complete a more comprehensive check of a bull's sexual organs as well as completing an assessment of their semen quality. This approach is particularly useful for older bulls and those that have been in poor health.

When assessing a bull's fertility on farm it is sometimes possible to evaluate their serving capacity (number of mounts completed during a set period) and libido (willingness to mount a cow in oestrus). These techniques can be useful in identifying older bulls that are reluctant to serve through injury, but they are not always appropriate for shy, younger animals.

Unfortunately, there is no single strategy that will guarantee the fertility of a stock bull, but by following these simple steps bull buyers can avoid problem animals. If producers are concerned about a bull's fertility they should always consult a veterinarian who can conduct a more thorough examination on their behalf.

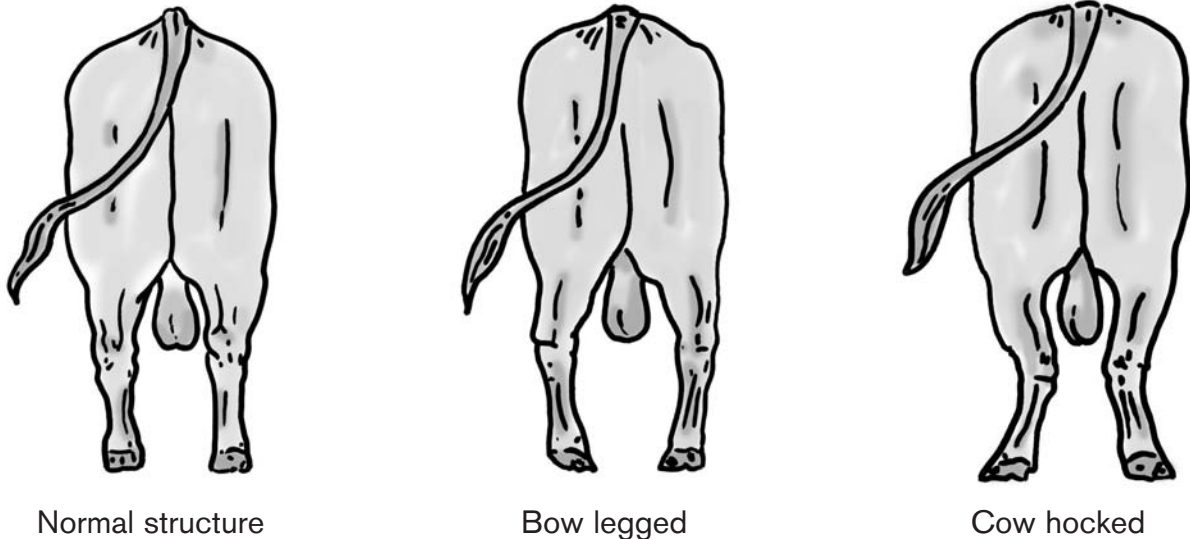
### **3.2 Structural Soundness**

For a bull to actively seek out cows for mating and mount them, it needs to be physically fit and possess good locomotion. Bulls with suboptimal locomotion tend to be sub-fertile and require culling at a younger age.

The conformation of the hind limbs in a working bull is of paramount importance, as they have to support the bull's weight during mating. More bulls are culled for problems with their hind limbs than for any other structural condition. If the bull feels leg pain during mating it will influence his libido.

Common faults in cattle include limbs that are sickle hocked, post legged, bowed legged and cow hocked. Some of these faults are shown in Figure 7.

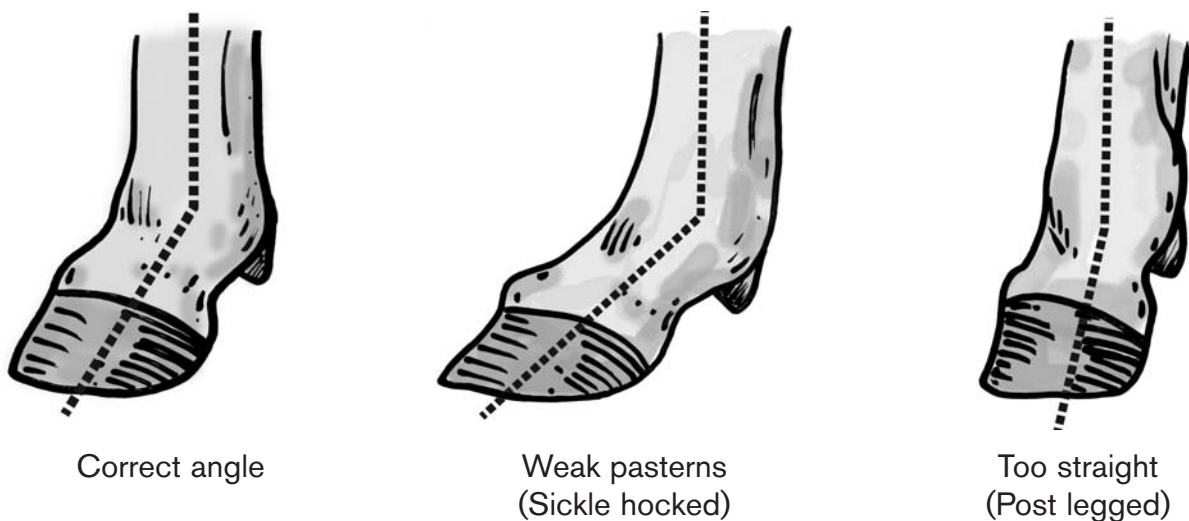
Figure 7. Hind Limb Structure



Faults in young bulls tend to get worse with age, leading to arthritis and premature culling - so vigilance when buying a bull is vital.

Foot structure should be observed. Avoiding bulls with short hooves, which tend to be post legged and those with long hooves, which tend to have weak pasterns. Overgrown claws can indicate that animals have been on soft soils or overfed, but they can also indicate poor limb structure or the early onset of arthritis. Be aware that hoof trimming can temporarily hide potential feet problems. Hooves should also be checked for signs of lesions and hairline cracks – which can lead to lameness

Figure 8. Hoof Structure



Finally buyers should check the bull's locomotion. A bull should have a freely moving gait, with the hind foot stepping into the imprint of the front foot. Avoid bulls that either under or overstep and any that show signs of discomfort when they walk.

### 3.3 Financial Impact of Optimising Bull Performance

By increasing the working life of a bull and optimising his fertility to maximise the number of calves that he produces during his working lifetime it is possible to halve the costs associated with the maintenance of a stock bull (Farms A to C).

**Table 10. Impact of Lifetime Performance Upon Bull Costs per Calf**

	Farm A	Farm B	Farm C	Farm D
Purchase price (£)	£3,500	£3,500	£3,500	£4,500
Working lifetime (years)	3	4	5	5
Cost of upkeep (£150/year)	£450	£600	£750	£750
Sale value (£)	£750	£750	£750	£750
Net bull cost (£)	£3,200	£3,350	£3,500	£4,500
No. cows mated per annum	30	35	40	40
Calving percentage	85%	87%	90%	90%
No. calves during working life	77	122	180	180
Cost per calf	£41.83	£27.50	£19.44	£25.00

Where high levels of bull utilisation are taking place, the extra investment in a high performing bull works out at a relatively small amount per calf. In this scenario (Farm D) such a sum can be recouped through improvements in calf performance attributable to better breeding.



*A Stabiliser bull in good working condition*

### 3.4 Buying Bulls at an Auction

Many of the bulls sold in the UK are sold at auction. For potential purchasers this brings the advantage of choice. However, it can reduce the opportunity to examine each animal closely, there are more decisions to be made.



*A Limousin bull being sold at Perth Bull Sales*

#### Key Points

- Decide on the type of bull required
- Contact the auctioneer for a catalogue several days in advance of the sale and examine the EBVs of the bulls entered. Create a shortlist of suitable animals
- Read the sale terms and conditions in the front of the catalogue and take any necessary action
- Determine what you would be prepared to pay for each bull. Do these sums in advance and be realistic in your estimates
- Arrive in plenty of time to view all the bulls, but prioritise your time looking at those on your shortlist
- Go through the Bull Buyer's Checklist shown in Table 11
  - Write notes in the catalogue next to each entry, listing strengths, weaknesses and faults
  - Eliminate bulls from your shortlist which have major faults or fail to meet your minimum standard for a particular trait
- Identify “back up” bulls, which you would be prepared to buy if you do not secure your first choices
- Find a seat where you have a good view of the ring and the auctioneer.

When the sale is in full swing, stick to your decisions. If the bulls you have selected go for too much, don't be tempted to buy something else that you haven't examined closely – there will be other sales or breeders to visit.

If you do buy a bull then it is yours from the fall of the hammer – so it might be worth insuring it before you arrange to transport it home.

**Table 11. Bull Buyers Checklist**

<p>Structural Soundness</p> <ul style="list-style-type: none"> <li>▪ Legs</li> <li>▪ Feet</li> <li>▪ Locomotion</li> <li>▪ Temperament</li> <li>▪ Scrotal Size</li> <li>▪ Scrotal Firmness</li> </ul> <p>Genetic Potential (depending on your priorities)</p> <ul style="list-style-type: none"> <li>▪ Calving ease / birth weight</li> <li>▪ Milking ability</li> <li>▪ Growth rate</li> <li>▪ Carcase attributes</li> </ul> <p>Other</p> <ul style="list-style-type: none"> <li>▪ Health status of the herd and individual bull</li> <li>▪ Body condition score and pre-sale management</li> <li>▪ Genetic relationship to your cows (to avoid inbreeding)</li> </ul>
-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

**Health Status**

As well as checking the herd’s health status prior to purchase, it is advisable to enquire about the bull’s health status and find out when his next set of vaccinations are due.

**The Cost of Infectious Diseases**

Infectious diseases is a major cause of economic concern to the beef industry. Table 1 highlights the impact that four major infectious diseases are having within the UK cattle industry (beef and dairy). The industry loses a significant amount of money every year through lost production and costs associated with the treatment, control and monitoring of infectious disease at a national level.

Producers will see loses due to reductions in liveweight gain, poorer fertility, higher levels of cow and calf mortality and a reduction in milk. These factors have a massive impact on the financial productivity of the beef herd, they also prevent the marketing of animals in peak condition, disrupt farm efficiency, reduce animal welfare and create an addition, unwanted management challenge for producers.

	BVD-MD Complex	IBR	Leptospirosis	Johnes Disease
Animals affected ('000 head)	325	102	209	1
Costs associated with production losses, treatment, control and monitoring (m£)	39.6	6	11	0.8
Cost per animal	£122	£59	£53	£800

- Based on "Best Estimates" taken from a paper written by Bennett and Jeplaar (2005), Journal of Agricultural Economics (Vol:56, 1, Pages 135-144).
- These figures do not take into account the human health costs associated with zoonotic disease or the welfare implications of ill health for both humans and animals.

## **Maintaining High Biosecurity**

Prevention is clearly better than cure and because the movement of germs between animals spreads each of these diseases, tight herd biosecurity is a must.

Every herd should develop a Herd Health Plan with their veterinary surgeon. When purchasing cattle, stock should come from herds of known disease status. Buyers should know what questions to ask a prospective vendor and vendors should be able to provide evidence as to the disease status of their herds and their current vaccination policy. A rigorous selection and isolation protocol should be applied to all purchased cattle.

Some additional testing for disease may be worth considering before the bull is allowed to join the main herd e.g. Tuberculosis, BVD, Johnes.

## **Practical tips in avoiding disease**

Avoid cattle coming into contact with animals of an unknown health status

- Practically, this means double fencing 3m apart, solid partitions 3m high or 2m wide hedges/ditches
- isolate bought in cattle
- Avoid hiring bulls and consider breeding homebred female replacements

Avoid contamination in the feed or water

- Keep feed fresh, dry, clear of faeces and inaccessible to wildlife
- Feed in troughs where possible, rather than on the ground
- Provide mains water where possible and clean out water troughs regularly
- Fence off watercourses to which other stock may have access

Ensure workers and visitors follow a high standard of hygiene on the farm.

- Regularly clean and disinfect vehicles, shared equipment and any buildings used to isolate cattle
- Clean and disinfect after a disease outbreak
- Clean and disinfect vehicles after transporting animals
- Insist visitors use a foot dip, which is changed regularly
- Park vehicles away from livestock

Provide isolation facilities for bought in animals and any that fall sick within the herd.

Store slurry with care, because infectious disease can survive in slurry for a long time.

- Store slurry for at least 4 months before use
- Spread slurry on arable land rather than grass for conservation
- Use an inverted spreading plate to avoid spraying the slurry
- If possible, avoid the use of hired/shared slurry spreaders

Prevent wildlife from gaining access to buildings, taking particular care to keep them away from stored feed and waste.





*It is important to identify bulls with good temperaments. One way to do this is to observe them being handled prior to a show or sale, such as this Blonde bull at a show.*

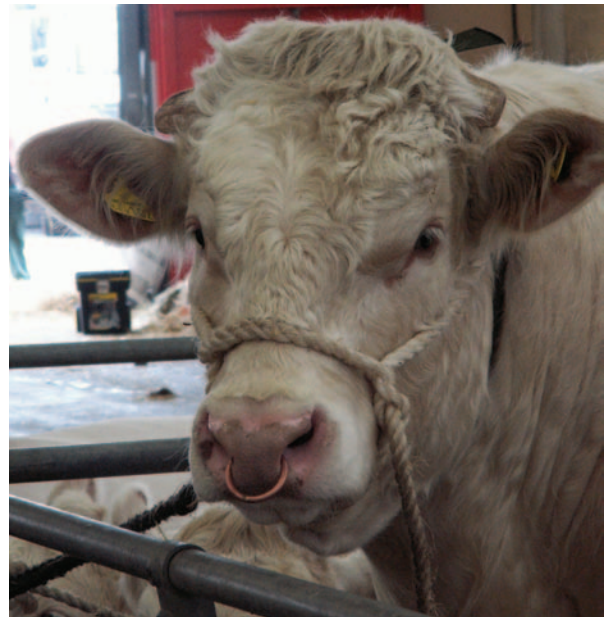
### **3.5 Looking After a New Bull**

Having purchased a new bull it is important to get him settled in his new environment as quickly as possible.

#### **Delivery**

If you are using a professional haulier then instruct them how you wish the bull to be handled, to ensure that it is handled quietly. The floor of the cattle float should be non-slip and ideally it should be covered with sawdust in case the bull goes down in transit.

If transporting the bull yourself, ensure that you know how to tie him up correctly. Many accidents and deaths are caused in transit when bulls become tangled in their halters and ropes.



#### **Arrival and Starting Work**

Avoid unloading a new bull straight into the herd. Rest him in a quiet part of the yard, where he can be isolated and monitored for signs of ill health prior to his introduction into the herd. Some producers take this opportunity to test for contagious diseases, such as Bovine Viral Diarrhoea (BVD).

The bull should be able to see his new surroundings and other stock. Avoid keeping him in a confined space and ensure that the surface on which he is walking and may be expected to work in the future is not uneven, slippery or very soft.

Find out what your new bull has been fed prior to sale and use this knowledge to gently adjust him onto his new diet, starting with something simple like hay.

New bulls need time to settle into their new surroundings and should not be overworked. Young bulls should only be put with 15 – 20 cows to start with. Monitor bulls closely when they are working and ensure they don't lose too much condition. In larger herds it may be possible to rotate sires to reduce the risk of running an infertile bull and always have a back up plan ready in case a bull stops working.

The money spent on your new bull is a major investment in the herd. It is time well spent getting him settled in and ensuring he is fit and healthy

## 4. Breeding Strategy

When breeding cattle the first decision a producer must make is whether to keep the herd pure or whether to crossbreed.

Pure breeding is in many ways, the most straightforward breeding strategy. It only involves one breed and the herd doesn't need to be split to produce replacements and slaughter animals.

However, crossbreeding provides a much faster way for commercial beef producers to change the genetic composition of their herds and generate calves suited to a specific environment or market. A planned crossbreeding program also enables breeders to exploit the use of hybrid vigour, which is an excellent way to increase the reproductive efficiency of the cow.

### 4.1 Hybrid Vigour

Hybrid vigour is the degree to which the crossbred progeny of a particular mating are better than their two parent breeds. Figure 9 shows the extra performance that can be attributed to hybrid vigour for a given trait.

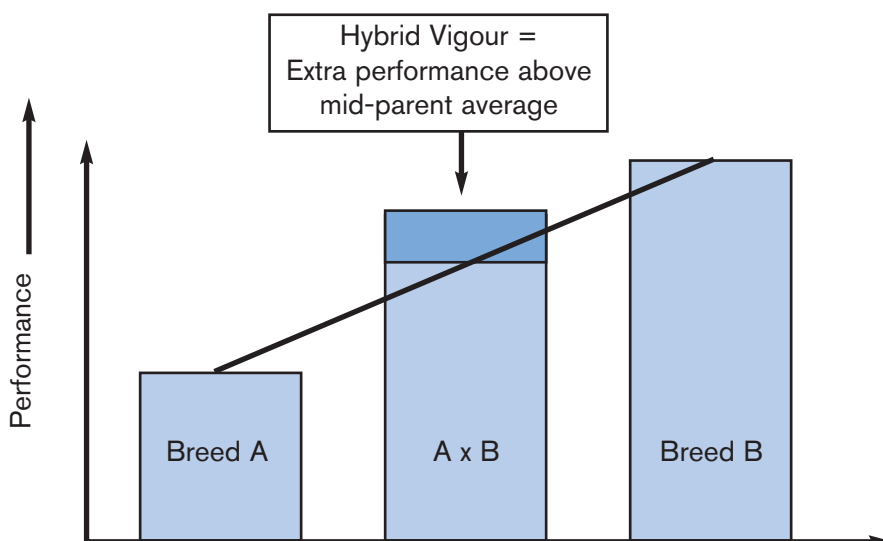


Figure 9. Impact of Hybrid Vigour

While hybrid vigour can be used to enhance traits such as growth rate it actually has a far greater impact on traits of low heritability, such as fertility, milk yield and longevity. These traits, which are difficult to enhance through pure breeding, are greatly enhanced through crossbreeding – leading to improvements in calf survival, reproductive efficiency and calf growth rates.

When planning a crossbreeding programme it is important to consider whether you wish to maximise the amount of hybrid vigour in the calf, cow (maternal hybrid vigour) or both. Maternal hybrid vigour tends to lead to far greater financial benefits over time, due to the increase in overall productivity seen in crossbred cows compared to purebreds.

## 4.2 Crossbreeding Programmes

There are many recognised crossing programmes. The four most widespread strategies are:

- First cross (between two different breeds of cattle)
- Terminal sire over first cross cows
- Rotational crossing
- Composite breeding



*A commercial herd engaged in a crossbreeding programme*

A first cross involves the mating of two animals of different breeds. This generates maximum levels of hybrid vigour in the calf crop and can result in a 5-10% lift in the weight of weaned calves produced in the herd.

The use of a Terminal sire breed over cows that are the product of a first cross between two different breeds makes optimal use of hybrid vigour in both the cow and the calf. Increases of 20-30% in the weight of weaned calves produced in the herd can be expected from this approach. The downside of this strategy is that it requires female replacements to be bought in or a separate herd established to breed replacements.

Rotational crossing enables producers to capitalise on the positive influence of hybrid vigour, with 10-20% increases in the weight of weaned calves produced, whilst retaining the herd's ability to be self replacing. In this system two breeds of sire are used over alternate generations of female replacements.

A Composite is a stabilised mix of two or more breeds. Composite breeding programmes can be open to the introduction of new genetics or closed. This decision will influence the amount of hybrid vigour retained within the population. The average level of hybrid vigour locked into a Composite breeding programme tends to be lower than when using purebreds for crossbreeding, but it will still have a strong beneficial impact on herd performance.

### 4.3 Planning a Crossbreeding Programme

Formulating a breeding plan will help producers to make the right decisions and realise their breeding goals. Cattle breeding programmes can take 10 – 15 years to implement, so it is well worth taking time to plan and consider how changes in breeding policy will influence enterprise profitability.



*A crossbred bull produced as part of a planned crossbreeding programme*

To determine the ideal crossbreeding programme for a herd it is important to assess:

- The requirements of the market for slaughter animals (or breeding stock)
- The constraints in which the enterprise has to operate - points to consider:
  - How many different bulls / mating groups can be run on the farm?
  - Are female replacements bought in or homebred?
  - What are the climatic and environmental factors that influence herd management and feed availability?

Taking these factors into account, a plan can be developed which considers:

- Which traits should be enhanced within the herd
  - Which EBVs can be used to aid bull selection
- Which traits are required in the male or female breeding line
  - Whether any traits are antagonistic to the overall breeding objective
  - Variation between breeds can be exploited
- Which breeds should be used to create the ideal cross
  - This should take into account breed strengths and weaknesses
- How to optimise hybrid vigour within the programme – particularly within the female breeding line

When planning a crossbreeding programme, producers need to take care in their selection of breeding stock, because hybrid vigour can only achieve so much. The performance of a calf is still greatly influenced by the overall genetic merit of its parents. Producers can't expect to breed outstanding calves based on the influence of hybrid vigour, if the initial breeding potential of their cows is limited.

By the end of the plan a producer will need to know:

- How many animals of each breed or cross will be on hand within a given year
- How many female replacements will need to be bought in / retained
- When and what type of bulls are required
- Which breed of bull will be mated to which group of cows.

## 6. Technical Notes

### 1. Estimated Breeding Values for Maternal Traits

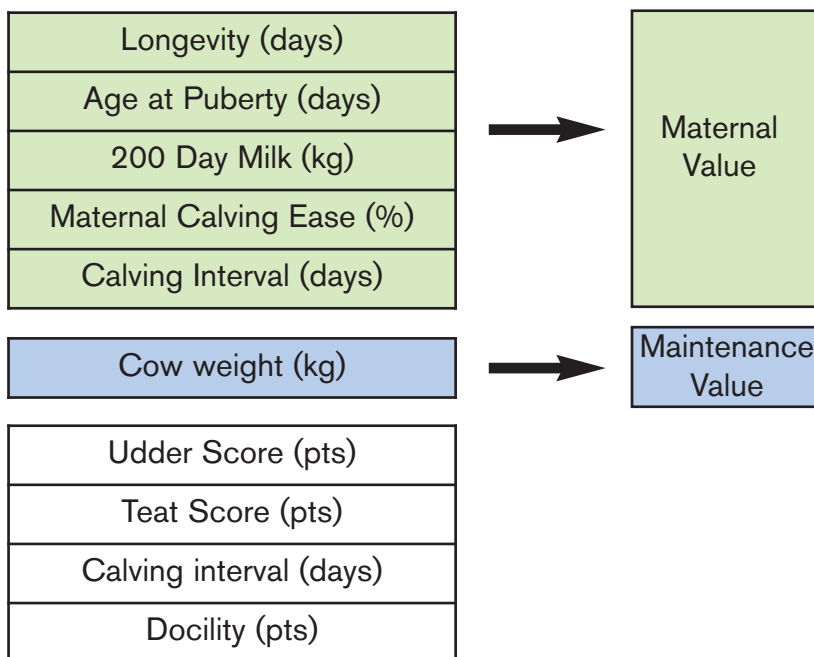
EBV	Interpretation	Trait	Notes
Longevity (days)	Positive Values = Longer breeding life	Longevity	Predicts the length of an animal's breeding life within the herd
Udder Score (pts)	Positive Values = Optimal udder shape	Udder shape	Selecting on this trait will result in average-shaped udders i.e. not too small, not too large.
Teat Score (pts)	Positive Values = Optimal teat size	Teat size	Selecting on this trait will result in medium sized teats
Early Maturity (days)	Negative Values = Puberty reached at an early age	Precocity	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.
Scrotal Circumference (cm)	Positive Values = Superior fertility in the bull and also in his female offspring	Fertility in both sexes	Scrotal size will influence a bull's daily sperm production and mating load. Selection for positive values will also influence the fertility and age at puberty of his female offspring.
Calving Interval (days)	Negative Values = Cows that get back in calf more quickly	Reproductive efficiency	This trait can be used to breed cows with short calving intervals that get in calf again quickly and hence are more efficient producers of beef.
200-Day Milk (kg)	Positive Values = More productive female replacements	Maternal component of 200 day weight	This EBV is already available. It indicates how well a bull's heifer calves will perform when they become mothers. This trait is greatly influenced by milking ability.
Maternal Calving Ease (%)	Positive Values = More unassisted calvings	Calving ease of the female line	Identifies females that will calve easily. This trait has a direct bearing on calf survival and the costs associated with difficult calvings. It should not be confused with Calving Ease Direct, which is an EBV predicting how easily born a bull's progeny will be.
Cow Weight (kg)	Negative Values = Smaller mature size	Maintenance requirements of the cow	Cow weight has a large impact on the efficiency of the cow with regard to feed conversion. The optimum cow size will vary from herd to herd, depending on resources and objectives.
Docility (pts)	Positive Values = More docile temperament	Temperament	Temperament has a direct bearing on labour and health and safety requirements. Animals that are easily stressed grow more slowly and tend to have poorer meat quality than those that are not.

## 2. Maternal Value

This index identifies the overall economic value of an animal's genetic ability to produce breeding females.

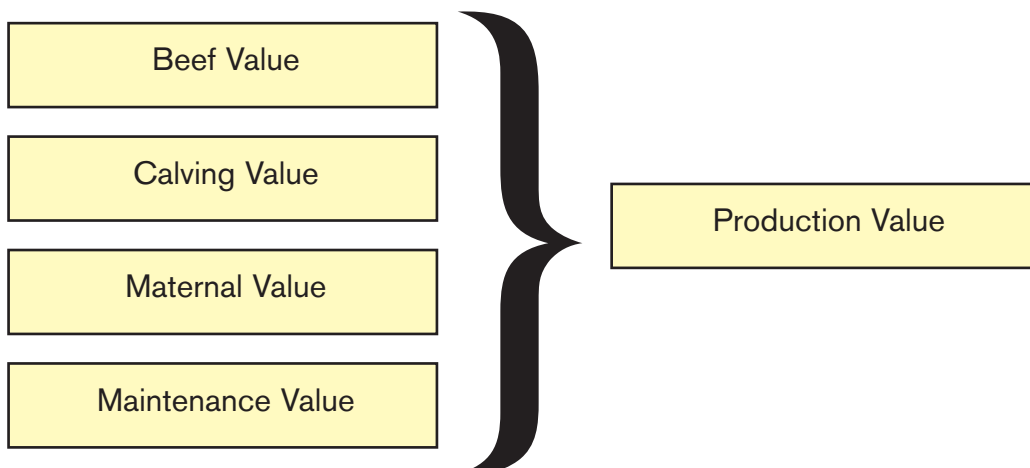
## 3. Maintenance Value

This index identifies the economic cost associated with feeding a cow, which will relate closely to its mature size.



## 4. Production Value

This index draws together the other four indexes to determine the economic value of an animal in terms of its ability to produce females for breeding and males for finishing, as shown in figure 4.



## Glossary of Terms

Term	Explanation
Accuracy values	Indicate how close an EBV is to the true breeding value of the animal (0 to 100%). Accuracies provide a guide to how likely an EBV is to change (up or down) as more information on the animal and its relatives becomes available.
Best Linear Unbiased Predictor (BLUP)	A statistical procedure for determining how much of an animal's performance is due to its genes and how much is because of non-genetic (environmental) effects.
Breeding index	An overall score of genetic merit which combines information on several measured traits. The emphasis on each trait in the index usually depends on the strength of its association with traits in the breeding goal and their relative economic value.
Contemporaries	Animals of a similar age and sex that have been treated in a similar way, forming contemporary groups.
Correlation	A value between $-1$ and $+1$ which measures the direction and strength of the association between two traits. Positive values indicate that as one trait increases, the other generally increases too (e.g. liveweight and fat). Negative values indicate that as one trait increases, the other generally decreases (e.g. birthweight and calving ease).
Economic weightings	Weighting relevant to current market conditions used to ensure each trait in a multi-trait selection index is given the appropriate amount of economic emphasis.
Environmental effects	Anything non-genetic which affects performance, e.g. feeding, management etc.
Estimated Breeding Value (EBV)	An estimate of the genetic worth of an animal, half of which will be passed on to its progeny.
Genetic links	Links between contemporary groups provided by related animals. These links are needed in order for BLUP to estimate environmental effects and predict breeding values simultaneously. They enable the comparison of EBVs across contemporary groups, herds and years.
Heritability	The degree to which a trait is passed on to an animal's offspring. Some traits are more heritable than others.
Recorded traits	The set of traits in a multi-trait selection index which are directly measured. These may be the same as the breeding objective traits if the objective traits can be measured in both sexes and on the live animal.
Terminal sire	Sire or breed selected for specialised meat production characteristics.
Trait	Characteristic or attribute of an animal.

## List of Useful Contacts for Pedigree and Commercial Beef Producers

This selective listing highlights organisations with breeding information that can benefit both the pedigree and commercial beef producer.

### Hybu Cig Cymru

[www.hybucigcymru.org](http://www.hybucigcymru.org)

Tel: 01970 625 050

e-mail: [enquiries@hccmpw.org.uk](mailto:enquiries@hccmpw.org.uk)

### Breeding Evaluation Services

MLC's Signet Breeding Services

[www.signetfbc.co.uk](http://www.signetfbc.co.uk)

Tel: 01908 844 210

e-mail: [signet@mlc.org.uk](mailto:signet@mlc.org.uk)

Consultant contacts:

Alison Glasgow

Tel: 0131 535 3237

e-mail: [alison\\_glasgow@mlc.org.uk](mailto:alison_glasgow@mlc.org.uk)

Ian Pritchard

Tel: 01952 597 697

e-mail: [ian\\_pritchard@mlc.org.uk](mailto:ian_pritchard@mlc.org.uk)

### ABRI Breedplan

Pedigree Cattle Services Ltd

Tel: 01738 622478

e-mail: [barbara@breedplan.co.uk](mailto:barbara@breedplan.co.uk)

### Breed Societies

Aberdeen Angus Cattle Society

[www.aberdeen-angus.co.uk](http://www.aberdeen-angus.co.uk)

Tel: 01738 622 477

e-mail: [info@aberdeen-angus.co.uk](mailto:info@aberdeen-angus.co.uk)

British Blonde Society

[www.britishblondesociety.co.uk](http://www.britishblondesociety.co.uk)

Tel: 024 76419058

e-mail: [secretary@britishblondesociety.co.uk](mailto:secretary@britishblondesociety.co.uk)

British Belgian Blue Cattle Society

[www.belgianblue.co.uk](http://www.belgianblue.co.uk)

Tel: 01768 88775

e-mail: [info@belgianblue.co.uk](mailto:info@belgianblue.co.uk)

British Charolais Cattle Society

[www.charolais.co.uk](http://www.charolais.co.uk)

Tel: 02476 697222

e-mail: [charolais@charolais.co.uk](mailto:charolais@charolais.co.uk)

Hereford Cattle Society

[www.herefordcattle.org](http://www.herefordcattle.org)

Tel: 01432 272057

e-mail: [postroom@herefordcattle.org](mailto:postroom@herefordcattle.org)

British Limousin Cattle Society

[www.limousin.co.uk](http://www.limousin.co.uk)

Tel: 02476 696500

e-mail: [info@limousin.co.uk](mailto:info@limousin.co.uk)

British Simmental Cattle Society

[www.britishsimmental.co.uk](http://www.britishsimmental.co.uk)

Tel: 02476 696513

e-mail: [information@britishsimmental.co.uk](mailto:information@britishsimmental.co.uk)

South Devon Herd Book Society

[www.sdhbs.org.uk](http://www.sdhbs.org.uk)

Tel: 01392 447 494

e-mail: [info@sdhbs.org.uk](mailto:info@sdhbs.org.uk)

Welsh Black Cattle Society

[www.welshblackcattlesociety.org](http://www.welshblackcattlesociety.org)

Tel: 01286 672391

e-mail: [welshblack@btclick.com](mailto:welshblack@btclick.com)



Signet records a number of numerically smaller beef breeds, including

Devon Cattle Breeders Society	Tel: 01837 810845
Galloway Cattle Society	Tel: 01556 502753
Lincoln Red Cattle Society	Tel: 01522 511395
Red Poll Cattle Society	Tel: 01728 747230
Salers Cattle Society	Tel: 01948 667223
Beef Improvement Group – Stabiliser	Tel: 01759 368213
Sussex Cattle Society	Tel: 01580 880105

### **Auctioneers of Pedigree Breeding Stock**

Many auctioneers encourage vendors to supply EBVs for publication in their sale catalogues. Breed Societies can give you further details of the auctioneers that regularly sell stock within a specific breed.

Harrison and Hetherington <a href="http://www.livestock-sales.co.uk">www.livestock-sales.co.uk</a>	Tel: 01228 590490 e-mail: <a href="mailto:heather.pritchard@borderway.com">heather.pritchard@borderway.com</a>
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McCartneys - Brecon Livestock Market	Tel: 01874 622 386
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United Auctions <a href="http://www.uagroup.co.uk">www.uagroup.co.uk</a>	Tel: 01738 626 183 e-mail: <a href="mailto:perth_market@uagroup.co.uk">perth_market@uagroup.co.uk</a>
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Welshpool Livestock Sales	Tel: 01938 554818
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Williams and Watkins - Ross Auction Centre <a href="http://www.williamsandwatkins.co.uk">www.williamsandwatkins.co.uk</a>	Tel: 01989 762 225
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### **Semen Availability and Artificial Insemination Services**

AI Services (Northern Ireland) Ltd <a href="http://www.ai-services.co.uk">www.ai-services.co.uk</a>	Tel: 02890 833 123 e-mail: <a href="mailto:info@ai-services.co.uk">info@ai-services.co.uk</a>
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Cogent Breeding Ltd <a href="http://www.cogentuk.com">www.cogentuk.com</a>	Tel: 01244 622 000 e-mail: <a href="mailto:info@cogentuk.com">info@cogentuk.com</a>
-------------------------------------------------------------------------------	----------------------------------------------------------------------------------------

Genus <a href="http://www.genusbreeding.co.uk">www.genusbreeding.co.uk</a>	Tel: 01270 536536 e-mail: <a href="mailto:cs@genus-plc.co.uk">cs@genus-plc.co.uk</a>
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Lindsay's AI	Tel: 01228 674923 e-mail: <a href="mailto:hlindsay@genie.co.uk">hlindsay@genie.co.uk</a>
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UK Sire Services Ltd <a href="http://www.uksireservices.com">www.uksireservices.com</a>	Tel: 01364 661506 e-mail: <a href="mailto:rob.wills@uksireservices.com">rob.wills@uksireservices.com</a>
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## Summary

Welsh Beef Producers can improve the profitability of their herds through the use of bulls with superior breeding potential for traits of economic importance. The best way to assess breeding potential is through the use of Estimated Breeding Values (EBVs).

There are large differences between bulls in their breeding potential. These differences influence the physical and financial performance of their progeny. Trials show the use of bulls with superior EBVs can increase the profitability of a herd by £40-£60/calf. This can be worth thousands of pounds over a bull's working lifetime.

Different types of bull will be required for different production systems. EBVs will identify the most profitable bull for a given breeding objective.

Producers should assess the physical soundness of a bull prior to purchase, paying particular attention to its testicles, legs and feet, as these will influence its fertility and ability to serve cows. Ensuring a bull has a long working life will reduce production costs.

Many beef producers can enhance the productivity of their herds by utilising the beneficial effects of hybrid vigour within their breeding programme, particularly for traits such as longevity and cow fertility. Breeding programmes should be planned carefully to produce cattle that perform well within a specific environment and meet market requirements.

## Recommendations

Producers should:

- Use EBVs to select those bulls possessing the right traits for their herd objectives
- Check the physical soundness of a bull to optimise its performance
- Manage new bulls carefully to maximise their working life
- Plan a breeding programme that will enhance the productivity of their herd over time.