

Choosing bulls to breed for Better Returns



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Breeding lies at the foundation of any beef production system. However, there is no simple single answer to a good breeding programme. Instead, breeding programmes need to be devised to meet specific requirements of a herd, a market or a combination of both.

This booklet, produced as part of the Better Returns Programme, aims to unravel some of the issues to address when choosing a sire for the herd – either for AI purposes or buying a bull.

It is clear that selecting a bull is not something that can be left to the stockman's eye alone – no matter how experienced that eye may be. Producers must identify the traits that will have the greatest economic impact in their herd and select bulls with appropriate Estimated Breeding Values (EBVs).

Good genetics are the basic building blocks of animal production. No amount of good feed or management can overcome poor genetics. In the pages that follow the various EBVs are explained, according to their effects on ease of calving, carcase quality, herd fertility and so on.

These EBVs are invaluable tools to aid decision making. When buying a stock bull or making an AI decision, time spent studying these pages and assessing the breeding objectives will pay dividends. It will also help achieve better returns from the herd.



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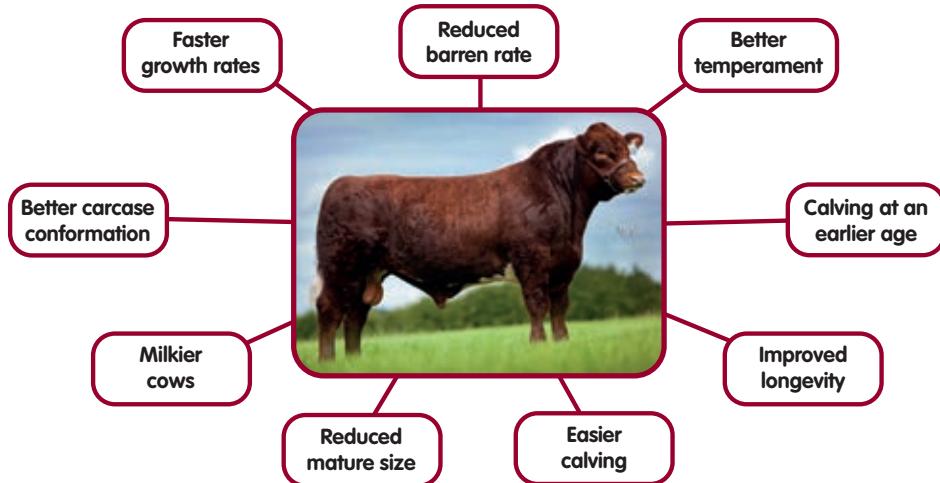
Drivers for herd profitability

The productivity and profitability of the suckler herd is influenced by many factors, including health, available nutrition and the genetic potential of the herd.

An animal's genetics set an upper limit on performance. Selective breeding can result in a permanent increase in output.

Many traits influencing suckler herd productivity are under genetic control.

Traits influencing productivity



The easiest way to change the genetic potential of the suckler herd is via bull selection. However, before buying a new bull, consider the factors influencing the profitability of your herd, then set appropriate breeding goals.

To identify areas for improvement:

- Compare the herd's physical performance to national figures, eg length of calving season, calves sold/100 cows mated, growth rate and conformation of calves sold for slaughter
- Calculate the cost of production
- Compare herd financial output against Beef Enterprise Costings produced by AHDB Beef & Lamb

Selective breeding can enhance the profitability of your herd

Breeding programmes should focus on the traits that influence herd profitability the most.

When prioritising traits, take account of farm resources, eg feed, housing and labour, as well as considering the target end market, eg finishing cattle, store cattle or breeding female replacements.

Breeding for profitable production

It is difficult to identify bulls with superior breeding potential for growth and carcase traits by eye alone and it is impossible to try and assess maternal traits. However, there are real genetic differences between bulls.

Case study: Harper Adams University, Aberdeen Angus Bull Trial

Two Aberdeen Angus bulls, one with Estimated Breeding Values (EBVs) in the top 10% of the breed and one with EBVs below breed average, were mated to dairy cows. Their progeny were reared on a cereal beef diet.

The calves by the high genetic merit bull consistently outperformed those by the lower genetic merit bull, generating an extra £42/calf.



Table 1: Comparison data between bulls in trial

Terminal Sire Index	Progeny by sire with EBVs in top 10% of breed	Progeny by sire with below average EBVs
Average Daily Live Weight Gain (DLWG) (kg)	1.30	1.24
Average carcase weight (kg)	293	278
Average carcase conformation (scores)	3.08	2.77
Average fat class (scores)	3.54	3.69
Average carcase value	£979	£918
Net benefit after accounting for difference in days to slaughter	£42	

In an average UK suckler herd, this £42/calf benefit would be worth an extra £5,000 over a bull's working lifetime.

Investing in cattle with superior genetics can be highly cost-effective.

Producing EBVs

Estimated Breeding Values are predictions of a bull's genetic merit and they enable producers to predict how a bull's progeny will perform.

Selecting a bull with the right combination of EBVs will help achieve herd goals – whether selling finished cattle or improving breeding herd performance.

Performance recording

Over 1,000 UK pedigree herds are involved in performance recording, so most producers have good access to recorded breeding stock.

Recorded herds supply information about their animals' pedigrees, performance, eg calving data or weights and the management groups they are reared in. Analysis of this data produces EBVs for a range of traits.



EBVs influencing ease of calving

- Birth Weight
- Calving Ease – Direct
- Calving Ease – Maternal/Daughters
- Gestation Length

EBVs influencing growth rate and carcase conformation



- 200 Day Growth Rate
- 400 Day Growth Rate
- 600 Day Growth Rate
- Muscle Depth/Area
- Fat Depth
- Intramuscular Fat Percentage



EBVs influencing maternal performance

- 200 Day Milk
- Age at First Calving
- Calving Interval
- Scrotal Circumference
- Cow Mature Weight
- Longevity

Estimated Breeding Values show an animal's breeding potential for a specific trait. They are expressed in units of the traits they represent, eg kg for liveweight and relate to a common baseline.

Estimated Breeding Values cannot be compared between breeds and not every breed receives every EBV shown.

Producing breeding indexes

Estimated Breeding Values enable stock to be selected for specific traits. However, they can be combined into indexes to meet specific 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 breeding indexes produced by Breedplan and Signet are slightly different. Individual breed societies can provide further information about precise index weightings.

Breedplan

Terminal Sire Index

Aim: Increase carcase values while minimising difficult calvings

Self Replacing Index

Aim: Increase herd productivity when females are retained for breeding and males sold for slaughter



Signet/Limousin Cattle Society

Calving Value

Aim: Reduce cost of difficult calvings



Beef Value

Aim: Increase carcase values

Maternal Value

Aim: Identify superior genetics to produce female replacements

Maintenance Value

Aim: Reduce suckler cow maintenance costs

Maternal Production Value

Aim: Identify superior genetics to produce quality female replacements with beef carcase characteristics

Indexes provide an overview when comparing bulls, while EBVs provide detail relating to specific breeding attributes.



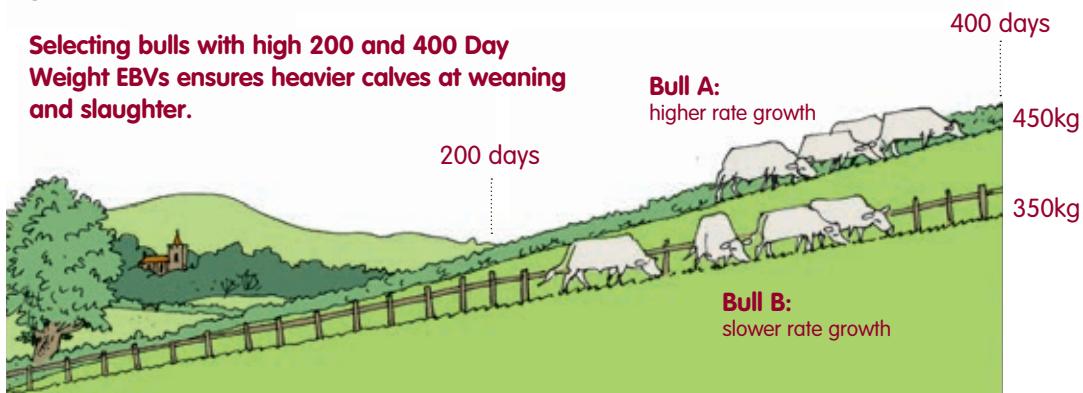
Growth rate

High growth rates can enhance the weight of cattle sold, production efficiency and timing of sales.

Cattle with high growth rates make more efficient use of feed. Therefore, feed costs per kilogram of liveweight gain are reduced, as is time to slaughter.

Cattle with high growth potential are easier to match and manage for periods of high market returns.

Figure 1: Difference between two bulls



Which EBVs are important?

200 Day Growth EBV (kg)	400 Day Growth EBV (kg)
An indication of breeding potential for growth to 200 days of age	An indication of breeding potential for growth to 400 days of age
Example Bull – with an EBV of +20kg is estimated to produce calves 10kg heavier at 200 days than a bull with an EBV of 0	Example Bull – with an EBV of +48kg is estimated to produce calves 24kg heavier at 400 days than a bull with an EBV of 0



Remember

The potential for high growth rates is only realised under good management, with adequate feed and high herd health status.

Beware

Selecting for high growth rate alone can increase birthweights, leading to calving problems (page 8) and increase cow mature size, which on some systems might reduce herd efficiency (page 12).

Do not select on growth rate EBVs alone.

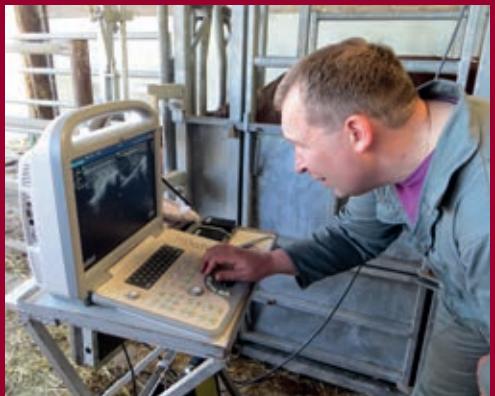
Carcase quality

Carcasses that meet market specifications optimise profit potential.



Measuring EBVs

- Muscle Depth/Area – assessed using ultrasound scanning
- Fat Depth – assessed using ultrasound scanning



Which EBVs are important?

Muscle Depth/Area EBV (mm/cm ²)	Fat Depth EBV (mm)
Assesses muscle depth/area across the loin	Assesses fat depth across the loin
Example A bull with an EBV of +6mm is estimated to produce calves with 3mm more muscle across the loin than those of a bull with a 0 EBV	Example A bull with an EBV of -2mm is estimated to produce calves with 1mm less fat across the loin than those of a bull with a 0 EBV

- Breeders recording with Breedplan measure muscle area rather than muscle depth. Both measurements are highly correlated to each other and the Muscle Area EBV can be used in a similar manner to the Muscle Depth EBV
- Choose sires with high Muscle Depth/Area EBVs to enhance carcase conformation
- Fat Depth EBV influences how quickly cattle can be finished for slaughter and the weight to which carcases can be taken without incurring a fatness penalty

AHDB Beef & Lamb, AHDB Dairy and Hybu Cig Cymru (HCC) have funded work at Scotland's Rural College (SRUC) to combine British Cattle Movement Service (BCMS) data and abattoir data to produce new EBVs for age at slaughter, carcase weight, carcase conformation and fat class. These EBVs will give producers new opportunities to select bulls on traits directly influencing herd profitability.

Ease of calving

A critical factor influencing calf survival is the ease with which they are born.

Difficult calvings reduce herd profitability. While slight assistance can cost around £20/case, this can rise to over £350/case where veterinary assistance is required. Added to this is the potential loss of cow or calf as well as reduced fertility, ie easier calvings will also mean a shorter calving interval.



Which EBVs are important?

Ease of calving is influenced by birth weight, calving ease (direct and maternal) and gestation length (page 10).

Birth Weight EBV (kg)	Calving Ease – Direct EBV	Calving Ease – Maternal/Daughters EBV
Enables sires to be selected for smaller calves at birth	Identifies bulls whose progeny will be born without assistance	Identifies bulls whose female progeny will calve without assistance
Example A bull with an EBV of -4kg is estimated to produce calves with birth weights 2kg lighter than a bull with a EBV of 0	Example A bull with an EBV of 6 is estimated to produce 3% more unassisted calvings compared to a bull with an EBV of 0	Example A bull with an EBV of 8 is estimated to produce daughters that will have 4% more unassisted calvings compared to a bull with an EBV of 0

- Do not confuse Calving Ease – Direct and Calving Ease – Maternal/Daughters
- Breed female calves that are easily born and will calve easily as heifers, when retaining female replacements
- Identify easy calving sires when mating heifers and when selecting continental breeds to mate with smaller native cow breeds

How have calving traits changed over time?

In recent decades most numerically large breeds have made high rates of genetic gain in growth and carcase traits, but this genetic change has tended to be detrimental to traits influencing ease of calving.

It is now even more important that commercial bull buyers actively source bulls with superior breeding potential for ease of calving.



Maternal performance – early fertility

It is common UK practice to calve heifers at two, two and a half and three years old. Calving at a younger age, under appropriate management, will increase the number of calves raised during a cow's lifetime, with consequent financial benefits.

Heifers must be reproductively active to calve at two years. The key factors influencing puberty are body condition score and liveweight, as well as age. To ensure high conception rates, heifers should reach two-thirds of adult weight before mating.

Breed can influence age of puberty, with native breeds tending to reach puberty earlier than continental ones. Within every breed there is variation that can be exploited using EBVs.



Which EBVs are important?

Producers can select bulls using the Age at First Calving EBV. There is also some relationship between a bull's scrotal circumference and the age at which his female progeny will reach puberty.

Age at First Calving EBV	Scrotal Circumference EBV (cm)
Identifies female breeding lines that are reproductively active and capable of conception at an early age	Increasing scrotal circumference in males enhances reproductive performance in male and female progeny
Example A bull with an EBV of -0.10 will produce 5% more females likely to have a first calf at an early age (if mated) than a bull with an EBV of 0	Example A bull with an EBV of +4cm will produce sons with scrotal circumferences 2cm greater than a bull with an EBV of 0cm and daughters are likely to reach puberty earlier

- Use careful management when calving heifers at two years
- Pay particular attention to:
 - Pre-mating and pre-calving nutrition
 - Selection of easy-calving bulls



Where to find more information?

Guidelines for herds considering mating heifers at two years of age can be obtained by reading **Managing replacement heifers for Better Returns** manual at beefandlamb.ahdb.org.uk or call 024 7647 8834 for a copy.



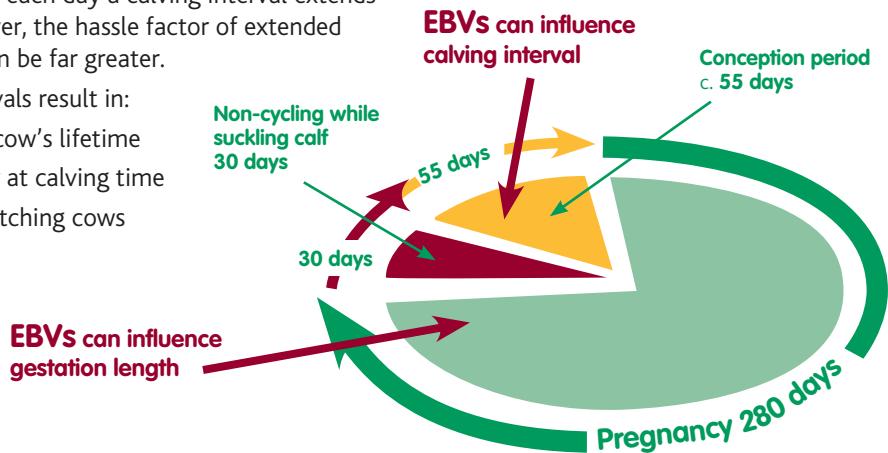
Maternal performance – calving period

Commercial suckler herds should aim for an average calving interval of 365 days, with 90% of the herd calving within ten weeks.

The direct costs of each day a calving interval extends is 63p/day. However, the hassle factor of extended calving seasons can be far greater.

Long calving intervals result in:

- Less calves in a cow's lifetime
- Increased labour at calving time
- Difficulties in batching cows and calves



Bulls can also be selected to shorten gestation length, either to tighten up calving intervals or to produce slightly smaller calves that are born more easily.

Which EBVs are important?

When breeding female replacements to calve within a 365 calving season, breeding stock should be selected with short Calving Interval and Gestation Length EBVs.

Calving Interval EBV (days) (Signet)	Gestation Length EBV (days)
Enhances reproductive success within the herd	Enables producers to shorten gestation length
Example A bull with an EBV of -10 days will produce females with calving intervals 5 days shorter than the standard 365 day interval	Example A bull with an EBV of -6 will produce calves with gestation lengths 3 days shorter than a bull with an EBV of 0

- Maintain a tight calving pattern to enhance herd profitability
- Select bulls for dairy herds with shorter Gestation Length EBVs to increase productive days in milk

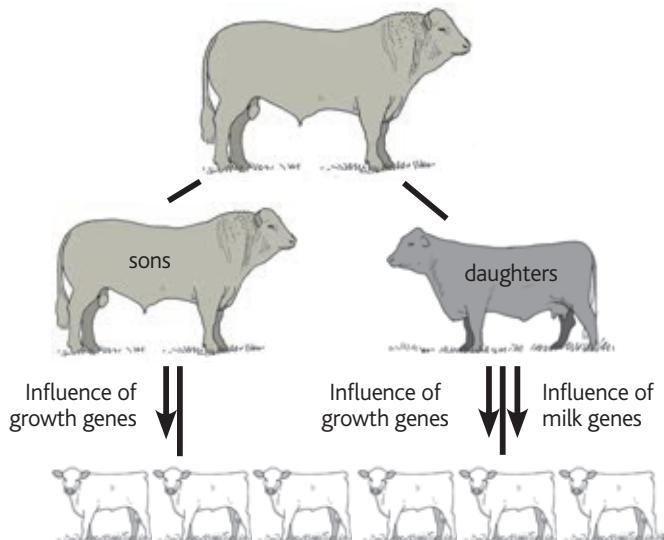
Maternal performance – milk production

Optimising a cow's milk production gives newborn calves a good start and provides adequate nutrition up to weaning.



In many systems, producers should consider optimising milk production, rather than maximising the trait.

- Inadequate levels of milk will have a negative impact on calf performance
- Excessive milk production will lead to greater cow maintenance costs and potentially lead to a loss of body condition during calf rearing. In harsh environments this can lead to a reduction in fertility
- Do not select on this trait when breeding replacements out of dairy cows



Which EBVs are important?

Producers can enhance the milking ability of cows retained within the herd by selecting bulls with superior 200 Day Milk EBVs.

200 Day Milk EBV (kg)

Identifies female breeding lines that will produce more milk and so wean heavier calves

Example

A bull with an EBV of +8kg will produce female progeny whose calves are 4kg heavier at 200 days than a bull with an EBV of 0.

Producers breeding replacements can select beef sires to improve the herd's milking ability using the 200 Day Milk EBV.



Maternal performance – cow efficiency

Selecting to improve growth rate will lead to increased mature cow size in most herds. Where feed is plentiful and feed costs low, this may not be a bad thing. However, where feed supply is limited, using a smaller cow requiring lower feed requirements can be advantageous. Smaller-framed animals are more likely to retain a higher body condition score under harsh conditions. This greatly enhances overall fertility.



Breeding smaller cows

Advantages

- ✓ Lower feed costs
- ✓ Higher stocking rates
- ✓ More fertile under harsh conditions
- ✓ Easier to outwinter/cheaper to house
- ✓ Potential to reach puberty earlier

Disadvantages

- ✗ Lower cull cow value
- ✗ Lighter weight calves
- ✗ Potential for more calving problems

Producers can select breeding stock with superior EBVs for early (200 day) growth rate, but low mature size. The growth curve of these animals is unconventional and they are referred to as 'curve benders'.

Producers can also enhance herd efficiency by extending cow longevity. This can be achieved through within-breed selection, using EBVs or crossbreeding to exploit hybrid vigour.

Which EBVs are important?

A Mature Size EBV will enable producers to modify mature cow size. Longevity EBVs are available to extend a cows' reproductive life within the herd.

Mature Size EBV (kg)	Longevity EBV (years) (Signet)
Estimates size at maturity	Estimates how long cows will be reproductively active in the herd
Example A bull with Mature Size EBV of -50kg will produce female replacements 25kg lighter at maturity than a bull with an EBV of 0	Example A bull with a Longevity EBV of +1.0 year will produce female replacements that live 0.5 years longer in the herd than females sired by a bull with an EBV of 0

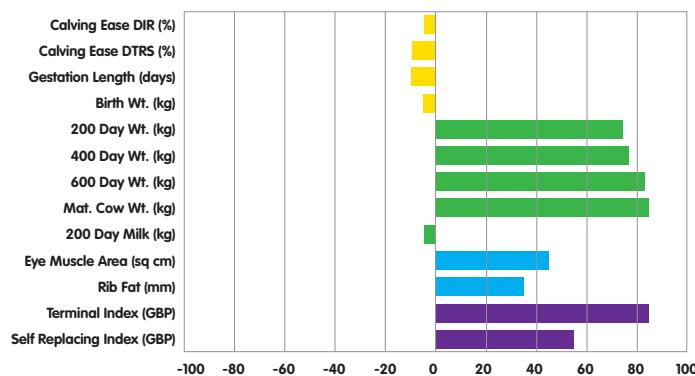
- In herds that breed female replacements, increased calf growth rate leads to increased cow mature size. This can be controlled by avoiding bulls with high Mature Size EBVs
- Optimum cow size for the herd depends on available resources, particularly feed

Research is looking at ways to measure and analyse genetic differences in feed intake and the efficiency with which feed is used for production. Selecting cattle for 'Net Feed Efficiency' will enable producers to reduce production costs.

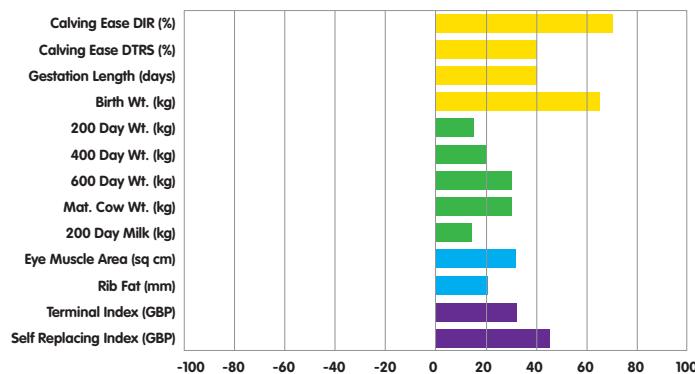
Interpreting EBVs when buying a recorded bull

Buyers can use EBVs to assess a bull's strengths and weaknesses and determine if he has the right breeding attributes for their herd.

Estimated Breeding Values are often shown graphically, with the centre of the graph representing the average performance of the population of bulls of each particular breed. Bars to the right tend to indicate superiority for any given trait – although bigger is not always best when selecting a maternal bull.



This bull has high EBVs for growth and carcase traits, but his EBVs for ease of calving are below average for the breed.



This bull has superior EBVs for calving traits and would be suitable for mating to heifers. The genetic merit of this bull for growth and carcase traits is slightly lower than the bull above.

More breeding information

- Accuracy Values are usually published alongside each EBV and Breeding Index. Accuracy Values range from 0 (nothing known) to 99 (well-recorded) and indicate the confidence that can be placed in the Breeding Value
- A Breed Benchmark indicates the distribution of EBVs across the breed. The benchmark can be used to identify an animal's ranking within the breed for a specific trait
- The first place to look for EBVs is on the Internet. Nearly all performance-recorded cattle have EBVs that can be quickly accessed online, either through the Signet website www.signetfbc.co.uk or via a breed society website. Smartphones will also show this data, so EBVs can now be assessed in the middle of a field

Checking physical soundness

While EBVs help bull buyers select for a range of traits, a subjective assessment is still required to assess fertility, temperament and structural soundness.

Check scrotal tone and size, as testicle size influences daily sperm production and how many cows a bull can serve. More bulls are culled for problems with their hind limbs than for any other structural condition, so check their feet, legs and locomotion carefully.



Looking after a new bull

The money spent on a 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 before he starts work.

Health status

- Check the seller's herd health status prior to purchase and find out when the bull's next vaccinations are due

Delivery

- Ensure the bull is loaded quietly, placed on a non-slip surface and tied correctly while in transit
- 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

Starting work

- Find out what the bull has been fed prior to sale and gently adjust him to his new diet
- Let him see his new surroundings and other livestock
- Avoid keeping him in a confined space
- Ensure the surface he will be working on is not uneven, slippery or very soft

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