A Guide to Bull Selection and Management

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Quality Meat Scotland (QMS)
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Foreword

This handy sized guide on bull selection and management, comes at a time when commercial pressures to improve efficiency in the industry are driving farmers to review their production systems. Getting more out of a bull, whether this means more calves per lifetime or more value from these calves, can help. The guide covers:

Areas to look at when purchasing a bull:
• Structure of the bull in terms of legs, feet, locomotion and conformation
• Using Estimated Breeding Values (EBVs)
• Health status of the herd where the bull has come from

When the bull is purchased:
• Correct nutrition from sale through to mating
• Examination for breeding soundness prior to mating
• Getting the bull into condition for mating

After the Bulling Period:
• Getting the bull back into condition

EBVs are just another tool to be used when purchasing a bull, together with an experienced eye and searching questions on herd health.

There are differences in the terminology breed societies use to present EBVs. This booklet aims to cut through the jargon and help the buyer identify the important traits depending on whether the bull is being bought to produce store cattle, finished cattle to meet customer specification or for breeding heifer replacements.

As the industry moves forward in eradicating diseases, knowing the health status of prospective purchases is vital. If information is unclear or missing, ask the seller: it is in their interest to ensure that they have as many potential purchasers for their bulls as possible.

**USING A COMBINATION OF EBVS AND 'THE EYE' WILL
GIVE THE BEST CHANCE OF SUCCESS.**

Introduction

Satisfying customer and consumer requirements is vital to ensuring a continued demand for Scotch Beef and protecting the price premium it commands. Meeting target carcase specification is crucial to this objective. Production systems need to incorporate breeding and feeding strategies which provide the optimum mix of genetics and nutrition to meet specification and maximise returns. Bull selection and management is a pivotal part of this process.

In relation to weight, processors are generally seeking carcases under 400kg. Continued selection for high growth rates and leanness has led to cattle capable of achieving high weights with limited fat deposition. This in turn can present a challenge in terms of achieving optimum conformation and fat cover before the animal becomes 'overweight'.

Breeding strategies require matching cow type to bull type. A lean, continental type cow matched to a lean, continental type bull will result in large framed animals which will tend towards heavier weights at finishing. At the other end of the spectrum, significant numbers of heifers are slaughtered at very light weights or are penalised for being over-fat, through a miss-match of genetics and feed regime.

Matching feed strategy to cattle type is critical. A range of feeding strategies can be adopted. For instance, leaner continental type steers can be moved on to high powered, high starch diets much sooner in order to drive fat deposition at a lighter weight and allow specification to be met. At the opposite end of the scale, smaller native type heifers can be grown on a low starch, forage based diet to allow them to maximise their frame growth prior to moving on to a short, sharp finishing phase.

Getting the right diet, at the right time, in relation to the type of animal being reared can be challenging especially where cattle are traded as stores during the rearing process. This adds a further dimension in terms of the timing of sales/purchases in relation to the animal's genetic potential and age.

Bull selection and management is also a vital part of matching cow type to production systems through the breeding of replacements. Maintaining the right cows in the herd is crucial to keeping feed and labour costs down whilst meeting abattoir specifications. Cows must both suit their environment, for example, by exhibiting traits such as slightly higher levels of fat to cope with hill or upland conditions and have strong maternal characteristics such as good fertility and milk. Maternal bulls are essential in the future supply of cattle to meet industry needs.

> When selecting the correct bull for the job, it's not all about which breed is best. Often the biggest differences lie within the breed rather than between breeds.

Pre/Post Purchasing of a Young Breeding Bull

It is important to plan well ahead, as a new bull will need two to three months after being purchased to settle in to his new home and reach the ideal condition for mating. Before the sale, check out prospective bulls in the catalogue or on their breed society's website and take every opportunity to see the bull before you decide to buy. An extra day at the sales can often be justified. Arriving at the sale early will allow you to go to where the bulls are being washed to view them. Spend plenty of time studying how well the bulls move to and from their pens and compare them to their contemporaries in the show ring.

After purchasing, ask the seller if it is possible to give you a bag of the feed that the bulls are currently being fed. This should be encouraged as it not only makes the breeder consider the energy density of the feed he is using but also allows the bull a gradual changeover once he is home to a more suitable diet for mating.

When the bull arrives at his new home it is recommended to wash him down to take out the soap etc. used at the sales. Not doing this can cause skin irritation and has at times led to hair loss.

Observe the bull for behavioural changes as he adjusts over the next few days to his new environment. If he is very restless and showing temperament issues, act quickly to help him to settle in.

Prior to sale, bulls have often been group housed from weaning and are not used to isolation, so do not isolate your purchase on arrival in a dark pen away from other stock. However, there is a need for him to be quarantined, so ensure that he is not in contact with other stock. Visual contact with other stock is good and human contact is also important. Spend time with your investment.

At this stage, do not suddenly feed him a restricted diet as it is not good to have sudden changes in quantity and type of feed. Purchase proprietary pellets or make up a good energy concentrate feed with at least 30% beet pulp or low starch distillery by product such as dark grains. If he is over-fat he will need to be gradually slimmed. Meet his appetite initially to settle him and then slowly start to reduce the level of concentrates down to a maximum of 40% of daily dry matter intake. This is easily adequate for a growing bull. The rumen needs six to eight weeks to adjust to a forage based diet. If using home grown feeds add vitamins and minerals.

Allow him to have some exercise, as he would have been used to exercise whilst being reared. As soon as he is out of quarantine, close contact with other livestock is advised.

Check the insurance certificate so you know exactly what you are covered for. It is recommended that prior to the bull being used he is given a veterinary pre-breeding examination to check everything is physically normal and his semen is of good quality.

To avoid injury to the bull when he starts work, he should be allowed exercise in a small paddock with some company to improve his walking ability and get muscles working in preparation for serving the cows. Keep water and feed apart to encourage him to exercise.

Some producers will allow the bull to serve a couple of cows before he is to be used within the herd to see if he settles them. This gives confidence prior to the main bulling period. A young bull should serve his first female under supervision on a non slip surface. Observe him closely at the start of mating to check for normal service behaviour and absence of any penile injury/lesions - e.g. warts.

Ten to 20 females are enough for a young bull to serve. The cows should then be monitored to see if any return to service. If more than 50% return seek veterinary advice. Young bulls should only be used for a short period (no more than two cycles). When replacing an old but sound bull do not sell or cull him until the young bull has proved himself, an on farm back-up could be very valuable.

Do not assume bulls are immune to gastrointestinal worms as they may have had little pasture exposure – worm/fluke dose after their first grazing period, perhaps when housing for winter.

Feeding

After the young bull has been removed from the cows, he needs to be fed a growing ration as he is still growing. Failure to do so can impact on longevity and serving capability.

Many bulls, both young and mature, will require to regain condition/body reserves over the winter in order to be fit for the start of mating again the following spring. Examples of rations to achieve this are shown in the following table, assuming average quality hay and silage. In all cases an appropriate mineral/vitamin supplement should be incorporated.

Samples Rations (kg/day)

Liveweight (kg)	1,200	1,500
Hay	17	20
Barley	2.5	3.0
Rapeseed Meal	0.75	1.25
Silage (10 ME, 25% DM)	60	75
Barley	2.0	2.25

Simply feeding bulls with a group of dry cows or store cattle etc will not meet his requirements.

For bulls that have lost more than the 0.75 condition score points, (a lot of condition), start feeding earlier to allow them more time to regain weight at a moderate daily liveweight gain and concentrate input. For large bulls that have lost a lot of weight then a standard 12 ME beef nut will not do. They require a higher energy nut (12.5 to 13 ME) and if large quantities are required then it must be spread over two meals per day.

Housing

Make sure that pen divisions are high and strong (Figure 1) – many accidents happen when bulls try to jump out of pens shortly after arrival.

Bull pens should be in an area where bulls have contact with farm staff, can see other stock and ideally be naturally lit so stock can be easily observed.

Pens that allow bulls access to an outside exercise area are best.

Do not keep bulls on a slippery surface. Look after their feet by having areas that are hard and dry to walk on.

Figure 1: Examples of well designed bull pens

These pens have the facility to lock bulls in the locking yokes and pen back with the side gates. This allows for easy access, not only for cleaning out and bedding pens but also for handling by vets etc.

These pens are in a busy part of the farm to prevent isolation and again have locking yokes.

These pens are for housing several bulls together. Again, they have locking yokes. Also, note the escape gap beside the water trough to give handlers an escape route if required.

The Use of EBVs

The majority of bull buyers expect their purchases to have the qualities required. They assume their visual examination of conformation, legs, locomotion and general character will ensure the bull is sound and will work. Whilst this will go some way to satisfying their expectations, if more information is available then it is best to use it.

Estimated Breeding Values (EBVs) are **another tool** to use when purchasing but should be used to complement the visual examination. Many buyers arrive at the sales, look at the selection of bulls to check they have the correct characteristics and those selected are then marked in the catalogue as prospective purchases. Only then do they look at the EBVs to narrow the selection, giving a list of bulls that tick the box both visually and genetically. We don't just look at the car when we go to buy it; we always look under the bonnet and give it a run. We also get the brochure and check the specifications. So why is selecting a bull any different?

Others will get the catalogue in advance of the sale and mark the bulls whose genetics meet their specifications. However, once at the sale, they still ensure that the bull has the shape, conformation, legs and feet required. **EBVs are not responsible for these crucial parts nor how the bull was reared nor if he was over fed.** EBVs help the decision process. They do not dictate it.

One of the main areas of debate is the Calving Ease Direct / Calving Ease EBV, describing how easily a bull's calves should be born. Some bulls will be poorly rated for calving ease. The information is there, and what a bull with poor calving figures is saying to you is "Warning! I have the power to cause you severe problems if you do not manage your cows correctly". At calving time, how easily a cow will calve is due approximately 75% to management and 25% to genetics. We often hear of the bull that was rated poorly for calving and yet he never gave any problems. The EBV for calving ease may be correct but it could be because he was given the right cows, managed correctly. That is why we also hear of farmers sharing a bull where one comments on no calving difficulties and another has major problems. Do not let these findings give you the belief that Calving Ease EBVs are not accurate or relevant to you.

Some producers will buy bulls that are rated poorly for calving ease but will know the cows he will be serving and will manage them accordingly. Many will make sure bulls with low calving ease scores are not used on autumn calving cows. Autumn herds are very difficult to manage through the late summer. They are regularly in very good condition and these farmers know the combination of overfat cows with bulls that have poor calving ease figures will result in difficult calving.

Conversely buyers may take home a bull that is reasonably well rated for calving ease but have problems because they have not been used with the right females or the cows are not in the right condition for calving.

Increasingly, commercial bull buyers dictate where the breed is going genetically. As customers they make sure that valuable information such as calving ease is available to them. They do not have an abundance of staff prepared to calve cows and so use the technology available such as EBVs to make life easier.

Arguably there are too many bulls with the genetics to cause calving problems on farms and create welfare issues. If we do not open up to this problem now, then breeders will not have the time needed to change and in future face a limited market for difficult calving bulls as buyers move away from them. Some already have.

Calving Ease Daughters (also known as Maternal Calving Ease) EBVs are estimates of genetic differences in the ability of sire's daughters to calve at two years of age without assistance.

EBVs in Practice

There are two providers of EBVs in the UK – Signet Beefbreeder & Breedplan (ABRI), and the data for a particular breed will be provided by one of these two providers. All the breed societies who record have easy access on their websites to in depth information on EBVs. Information is presented with the use of graphs and also actual figures.

It is often said that the bull is half the herd. This is correct. With a calf, half the genetics come from the sire and half from the dam. Take this example:

Q. *Bull A has a 400 Day Weight EBV of +60kg. What is the expected advantage of his calves (Bull A) at 400 days compared with calves sired by a bull (Bull B) with a 400 Day Weight EBV of +20kg when used on the same cows?*

A. *Take half of 400 Day Weight EBV of Bull A (30kg) minus half of 400 Day Weight EBV of Bull B (10 kg)*

Convert this into an actual situation

	Bull A	Bull B
400 Day EBV	+60kg	+20kg
Transfer to Calf (50%)	+30kg	+10kg
Advantage to calf	+20kg	
Based on 38 calves/year	760kg	
Based on five year life of bull	3,800kg	
Financial Value	£8,360	

(Twice this amount if calving in two seasons)

The principle of EBVs is the same irrespective of the provider. Breeds and providers have strived to produce EBVs in a straightforward, simple to understand format which meets the needs of most purchasers (Figure 2 and Figure 3). Easy to understand EBVs are now also presented as bar charts, with those above average (better) stretching to the right and those below average (worse) to the left. The average for the breed in both systems is the middle (mid point).

> It must be remembered that EBVs cannot be compared across breeds. All breeds have different values as their average. Example: An average Shorthorn will have more milk than an average Charolais.
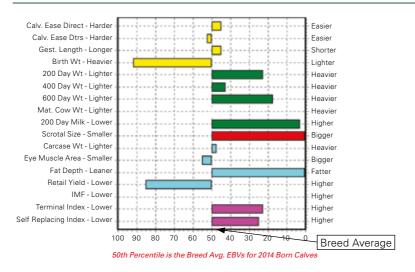
Calv. Ease Direct - Harder .... Easier
Calv. Ease Dtrs - Harder .... Easier
Gest. Length - Longer .... Shorter
Birth Wt - Heavier .... Lighter
200 Day Wt - Lighter .... Heavier
400 Day Wt - Lighter .... Heavier
600 Day Wt - Lighter .... Heavier
Mat. Cow Wt - Lighter .... Heavier
200 Day Milk - Lower .... Higher
Scrotal Size - Smaller .... Bigger
Carcase Wt - Lighter .... Heavier
Eye Muscle Area - Smaller .... Bigger
Fat Depth - Leaner .... Fatter
Retail Yield - Lower .... Higher
IMF - Lower .... Higher
Terminal Index - Lower .... Higher
Self Replacing Index - Lower .... Higher

100 90 80 70 60 50 40 30 20 10 0

Breed Average

50th Percentile is the Breed Avg. EBVs for 2014 Born Calves

Figure 2. Typical Breedplan EBV Display Card for breeds such as Charolais and Angus. The 50% line is the current breed average

Below Average   Above Average (Superior)

Breed Average

Analysis date: 14/03/2016	EBV	Acc %
Gest. Length (days)	1.2	47
Birth Weight (kg)	2.6	55
Calving Ease (%)	-1.1	48
Mat.Calv. Ease (%)	0.7	38
200 Day Milk (kg)	0	47
200 Day Growth (kg)	38	75
400 Day Growth (kg)	67	76
Muscle Depth (mm)	4.3	60
Fat Depth (mm)	0.1	48
Scrotal Circ (cm)	0.7	61
Docility (%)	5.8	48
Beef Value LIM	32	73
Calving Value LIM	0	47
Maternal Value LIM	7	49

Index 70   80   90   100   110   120   130 Index

Adjusted Weights (kg)	100	200	300	400	500	Scanned
	189	348	473	615	777	NO

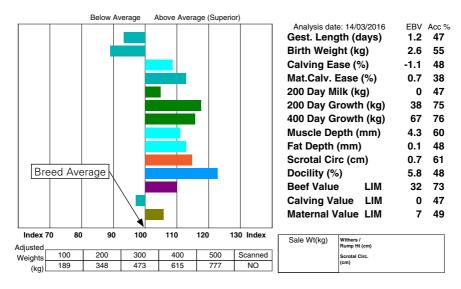Sale Wt(kg)   Withers / Rump Ht (cm)   Scrotal Circ. (cm)

Figure 3. Typical Signet Beefbreeder EBV Display Card (for breeds such as Limousin, Stabiliser, Red Poll, Lincoln Red and Blonde D 'Aquitaine). The Index 100 is the current breed average.

For both Figure 2 and Figure 3 interpretation of the data is easy – the further to the right the more superior the animal is for that trait. Anything to the left is below breed average.
Ideally most of the traits should be to the right of the mid-line.

Accuracy

EBVs are based on actual measurements of bull performance. Breeders record performance data and these measurements are what EBVs are based on. They are cross-referenced with other genetically related bulls. The more actual measurements of performance of progeny and genetically related animals that have been recorded, the higher the accuracy of the EBVs of a particular bull. Accuracy values are measured on a scale of 0 to 100 and are shown alongside each EBV in a sale catalogue. In order to select a bull with reliable EBVs, the minimum accuracy level should be 60%. EBVs with accuracy levels below 60% are more prone to change over time as more data becomes available.

Some traits have not been measured for as long as others, particularly maternal traits and this is where confusion can arise. Maternal figures have a lower accuracy level due to there being less information available for younger animals. They can often only be in the range of 40% to 50% at best. So when purchasing, make sure at least growth and carcase figures are over 60% giving you the best assurance you can get.

Some of the highest accuracy bulls are from lines where a lot of Artificial Insemination (AI) is used. This of course increases the number of offspring across more herds and hence the amount of information available.

<40% Accuracy Buyer Beware

>60% Accuracy Acceptable – traits such as growth, muscle and fat cover. Maternal traits such as milk have lower accuracies due to having been recorded for less time. Also true for Calving Ease.

What are the Main EBVs to Look at?

Calving

Large calves and long gestation periods lead to increased calving difficulty and often result in dead or injured calves/cows. Calves slower to their feet due to protracted calving will have decreased or delayed colostrum intake and are more likely to be affected by any disease challenge. Furthermore, difficult calvings affect the rebreeding ability of the cow meaning they take longer to start to cycle after calving. For those that have calved in the second half of the calving period, it is likely that they will not have cycled before the bull is withdrawn leading to an unexpected barren cow. This is unacceptable, especially with young cows who are already more likely to have calving difficulties.

Calving Ease Direct EBV

This indicates how easily this animal was born and influences how easily its progeny will be born. Using a bull in the top 1% for Calving Ease is predicted to result in approximately 15% fewer assisted calvings in two year old heifers compared to using a bull in the bottom 1%. This range is predicted to be smaller in cows. **Negative EBVs mean more difficult calving.**

This can be counteracted by considering other EBVs as well and not just those for calving. For example - selecting for 400 Day weight growth along with ease of calving can give you easily born calves who will grow fast and produce good size and weight whether selling for meat or breeding replacement heifers.

However, it should be remembered that cow condition and nutrition in late pregnancy also influence calving ease. Quite often a sire used on spring calvers creates no calving problems but when used on fatter autumn calvers there can be difficult calvings and even caesareans. Herd management pre-calving is critical.

Do not always blame the bull, BUT make sure his EBVs for calving traits are better than breed average.

Scrotal Size EBV
Higher positive EBVs indicate higher fertility in both males and females. Large testicles are an indicator of male fertility in regards to both semen quality and semen quantity. Daughters of bulls with a larger Scrotal Size EBV will come in to season at a younger age.

Milk EBV
Estimates the animal's milking ability. For sires, this EBV indicates his effect on his daughters milking ability. It is calculated from the 200 day weight of her calves. For dams, it indicates her milking ability. Bulls with a high Milk EBV have more milky daughters. It is, however, important to remember that an average rated Shorthorn will have more milk than an average rated Charolais.

Fat Depth EBV
Bar charts have been used to display EBVs at sales and events for some years now and are well received by industry. Traditionally the bar representing the Fat Depth EBV has shown the leaner an animal is, the better they were rated with the bar going to the right. Producers recognise that in practice they require livestock with an optimum level of fatness and this optimum varies according to farm and system. Replacements reared in many upland/hill situations did not have the fat cover required to thrive. Lean, late maturing heifers can also have adverse effects on fertility and age of puberty.

Charolais, Aberdeen Angus, Limousin, Blonde d'Aquitaine, Red Poll, Stabiliser and Lincoln Red Breeds (*and by February 2017, Simmental*) have reversed the direction of the Fat Depth bar on the charts. Genetically fatter animals EBVs will be presented as 'above average' (lying to the right of the central line) and genetically leaner animals will be presented as 'below average' (lying to the left).

Case Study 1

Graeme Mather Snr and his son, Graeme Jnr of Shandford Farm, near Brechin take time in selecting their bulls and do it with a mix of both visual appraisal and the use of EBVs.

The Mathers run 20 pure Charolais cows along with 320 commercial cows which are split with one third spring calving (March/April) and two thirds summer calving (May/June).

Replacements are bred on the farm from Simmental and Angus bulls but the bulk of the herd goes to Charolais bulls.

"With the Charolais it is vital we select the right bull for us and we are looking at the Calving Ease Direct EBV more now than ever. A number of years ago we experienced seven caesareans in one year while having no issues with the other breeds. A cow has to calve herself and we are achieving this now. In spring 2016, 50% of the cows calved within the first 21 days and only once was the calving jack required" say the Mathers.

"We look at calving ease along with birth weight but we still make sure that these calves, when born go on to give us high growth rates (400 day weight) and achieve target weight at a young age.

Our males are left entire and we are able to sell them at 13 months at approximately 380 kg deadweight grading E3, U-3 and U-4L.

45% of our bull beef calves grow at over 1kg deadweight gain per day (1.8kg liveweight per day from birth) and the remaining 55% at 0.9kg deadweight gain. Remember these are calves born from easy calving bulls with good 400 day weights. Ten years ago we were moving them at 1kg liveweight per day and now we see a 50% improvement at over 1.5kg liveweight per day for all of the bulls yet our calving is easier. On the management side we have a nutritionist working with us which has definitely made a difference in terms of keeping costs down whilst maximising performance".

Another EBV that is important to the Shandford bull selection criteria is Scrotal Size. The bull has to have good figures. As a result of selecting on scrotal circumference the latest bull, over the last two seasons, gave 41 calves from 40 cows and previous to that 40 calves from 40 cows. It is regarded as a vital and important trait.

The Mathers also regard bull locomotion as important. There is no EBV for this trait but it is a characteristic which alarms them, as a number of bulls are offered at sales that are not good walkers.

The Mathers maintain: "As many agree you have to have the right females but how we manage them is vital. The cows calve at around condition score 2 which is leaner than most, but it does make a difference. Most of our breeding has come from dairy types so they naturally will tend to score leaner. Calves from the different bull breeds are being born consistently at 38kg to 42kg birth weight which really makes our job so much easier at calving."

Shandford Herd Performance		Comment
Bulling Period for Cows	Nine weeks	Fed through bulling period and a few weeks after. 0.6kg/head plus minerals
Bulling Period for Heifers	Six weeks	
Overall Barren Rate	4%	
Overall Reared (based on number to bull)	92%	

With 240 cows calving in the summer it is vital to keep condition off them. They are fortunate to have hill ground with low quality swards. The cows are put out on the hill in April after weaning and grazing pressure kept tight. When grass (native pasture) supply reduces they are fed some silage and swedes. Fortunately, groups can be split up onto different hill areas as needed. However, as this can be time consuming, they may consider housing them at calving based on due date.

Steers are sold at 14 to 15 months old at 500 to 520kg liveweight (1.1kg liveweight gain per day). The steers at this weight can be purchased and quickly finished to hit the target weights specified by the processors. Heifers are put to grass and then finished in late autumn at 20 months averaging 327kg deadweight. Regular feedback from their buyers show how consistently the cattle meet weight and grade standards.

The Mathers maintain:"We aim to calve our heifers down at 30 to 36 months as in the past many of our replacements came from the dairy herd and needed time to develop. Whilst calving at 24 months seems to be gaining popularity in suckler herds, we need to make sure it is right for us as we move to using our homebred Angus and Simmental crosses with a target mature weight of around 650kg. A Shorthorn bull will be used on some heifers.

"As we move to beefier types, milk supply will be an important trait to concentrate on, as we will not be getting it from the dairy influence. With more beefy type females the hope is more fat cover can be brought in to the herd and so, when crossed to Charolais sires they will produce finishing cattle that can be taken to slaughter not only at the correct weight but also at the level of fat wanted in the market place. Up to now fat cover has not been an issue, but we will keep our eye on it to gain the cover we require at the new lighter finished weights.

"We need bulls to produce easy calving progeny and then in turn the female offspring to be easy calving themselves. We don't agree with the notion that to get good sized daughters for breeding, that the dam herself will have to have size and weight when born.

"To help select replacements that will be easily managed in future, any females that give us problems are culled. These include:

- Calving issues
- Performance
- Temperament
- Locomotion
- Udders/teat placement

Health is becoming more important and we are really reluctant to choose anything that is below Risk Level 1 for Johne's."

EBVs In Action: Which Traits are Important and Why?

The most important EBVs will depend on whether the bull is being selected as a terminal sire with all calves sold, a maternal sire where heifers will be kept for breeding, or a sire to use on first calving heifers. In all cases, the priority is a live calf.

Suitable bulls for each category are shown in *Figures 4, 5 and 6*.

Example 1. Selecting a Terminal Sire

When selecting a terminal sire the aim is for meat production so aim for growth and carcase traits. Care must always be taken in regards to Calving Ease Direct/Calving Ease.

Important EBVs

- Calving Ease Direct/Calving Ease
- 400 Day Weight/400 Day Growth
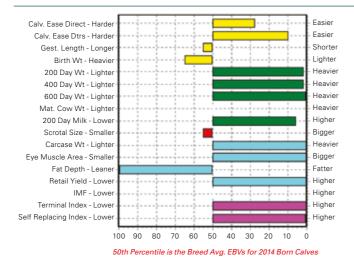- Fat Depth
- Retail Meat Yield/Beef Value

50th Percentile is the Breed Avg. EBVs for 2014 Born Calves

Figure 4. Example EBV figures for a bull suitable as a terminal sire

The bull in Figure 4 is an easier calving bull (yellow bars to the right) with a very high growth rate (green bars to the right) and low fat depth (blue bar at the extreme left). Whilst the high growth rate is good, careful consideration of market requirements are needed to ensure that progeny will finish at an acceptable weight and fat cover.

Other EBVs such as Muscle Depth/Ribeye Area are important but having first drawn up a short list using the above criteria any major differences between individual bulls in the other EBVs can then be taken into account.
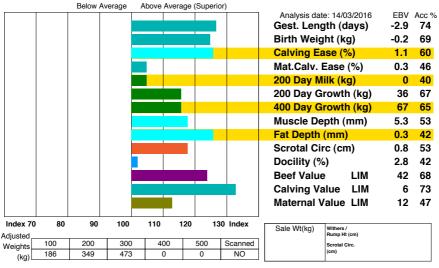
Example 2. Selecting a Replacement Sire

If breeding heifer replacements the critical EBVs are traits such as milk, growth and calving.

Important EBVs

- Calving Ease Direct/Calving Ease
- Calving Ease Daughters/Maternal Calving Ease
- 200 Day Milk
- 400 Day Weight/400 Day Growth
- Scrotal Size/Scrotal Circumference

Because of the link between fertility and Testicle Size Scrotal Size EBV should be considered.

	Below Average	Above Average (Superior)		Analysis date: 14/03/2016	EBV	Acc %
				Gest. Length (days)	-2.9	74
				Birth Weight (kg)	-0.2	69
				Calving Ease (%)	1.1	60
				Mat.Calv. Ease (%)	0.3	46
				200 Day Milk (kg)	0	40
				200 Day Growth (kg)	36	67
				400 Day Growth (kg)	67	65
				Muscle Depth (mm)	5.3	53
				Fat Depth (mm)	0.3	42
				Scrotal Circ (cm)	0.8	53
				Docility (%)	2.8	42
				Beef Value LIM	42	68
				Calving Value LIM	6	73
				Maternal Value LIM	12	47

Index	70	80	90	100	110	120	130 Index

Adjusted Weights (kg)	100	200	300	400	500	Scanned
	186	349	473	0	0	NO

Sale Wt(kg)	Withers / Rump Ht (cm)
	Scrotal Circ. (cm)

Figure 5. Example of EBV figures for a bull suitable as a replacement sire
(Please note this is a Limousin graph and the traits are listed in a different order)

The Limousin bull in Figure 5 above is an excellent example of a breeding bull. He has an above average Calving Ease EBV (highlighted) and above average for the 200 Day Milk EBV (highlighted). It is important to select for milk but you must consider how milky your current females are.

He also shows high 400 Day Growth EBV (highlighted), demonstrating that heifers born from him will achieve optimum weight and structure to allow calving at 2 years old. With this, there is also a higher Fat Depth EBV (highlighted) so his daughters will carry more flesh. This is important in for those out-wintering and in upland / hill areas, where fat cover provides insulation against cold wet conditions.
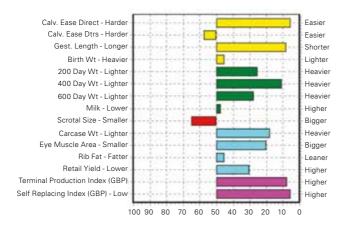
The final EBV of interest here is Docility. Various surveys carried out amongst commercial calf producers unanimously identify docility (temperament) as a main selection driver when purchasing decisions are being made. Docility in beef cattle is associated with overall performance, higher daily gains, health and carcase quality, and as such is a trait of economic importance.

Example 3. Selecting a Sire for First Calving Heifers

When selecting a sire for first time calving heifers the aim is to concentrate on ease of calving especially when calving at two years.

Important EBVs
- Calving Ease Direct/Calving Ease
- Gestation Length
- Scrotal Size/Scrotal Circumference

Figure 6. Example EBVs for a bull suitable to sire first calving heifers (this is the EBV graph style used by the Shorthorn, South Devons, Herefords , British Blue and Salers breeds. Note that the fat trait is reversed to those seen in Figure 2)

The most important criteria for a first calving heifer is to have a live calf with no complications. With this in mind, two EBVs come to the fore, Calving Ease Direct/ Calving Ease and Gestation Length. As can be seen in the graph above, this bull has a very high Calving Ease EBV (first yellow bar) with a short Gestation Length EBV (third yellow bar) so is well suited to first calving heifers.

Simmentals

Understanding the New EBV Graph

The British Simmental Cattle Society (BSCS) is moving to a new graph for pen cards for all animals at Society sales (See figure 7). The new graph has been available for some time as part of the Breedplan package used for performance recording and includes more detailed information on individual EBV values compared to the old graph. The new graph allows the buyer to see clearly where the animal's individual traits fall in relation to breed average and also include the accuracy value of that trait.

Of course, as the EBV takes into account all the pedigree and performance information that is available at this point in time, the EBV is also the most reliable indication available of the animals breeding value for each trait at this point in time.

			Breed Avg.				Acc
Calv. Ease Dir	Harder	-13.7	-0.5 **-5.3**		+12.7	Easier	94%
Calv. Ease Dtrs	Harder	-12.3	-0.4 **+0**		+11.5	Easier	90%
Gest. Len	Longer	+9.5	+0.2 **-1**		-9.1	Shorter	93%
Birth Wt	Heavier	+13.4	+2.2 **+4.5**		-9.0	Lighter	97%
200 Day Wt	Lighter	-18	+30 **+39**		+78	Heavier	94%
400 Day Wt	Lighter	-20	+54 **+77**		+128	Heavier	94%
600 Day Wt	Lighter	-27	+59 **+80**		+145	Heavier	91%
Mat. Cow Wt	Lighter	-80	+59		+198	Heavier	
Milk	Lower	-31	+5 **+8**		+41	Higher	78%
Scrotal Size	Smaller	-4.6	+0.4 **+2.6**		+5.4	Bigger	90%
Carcase Wt	Lighter	-26	+38 **+50**		+102	Heavier	84%
Eye Musc Area	Smaller	-6.8	+3.0 **+5**		+12.8	Bigger	71%
Fat Depth	Fatter	+5.8	+0.0 **-0.2**		-5.8	Leaner	81%
Retail Yield	Lower	-5.6	+0.5 **+1.5**		+6.6	Higher	78%
IMF	Lower	-4.0	-0.1 **-0.2**		+3.8	Higher	73%

Figure 7. New Simmental graph

As you can see, the EBV Accuracy for each trait is shown at the right side of the graph. The Breed Average values are listed in the centre of the graph and reflect the average EBV's of current animals within the breed (ie. all two year old animals). The minimum and maximum EBV values are displayed at the left and right of the graph for each trait represented.

The horizontal bar (shaded/coloured area) displays where the animal is placed in relation to the current animals within the breed for each trait.

As an illustration of the interpretation of the EBV graph, in the example above the animals 400 Day Wt EBV is of higher accuracy than the Eye Muscle Area EBV (because it's horizontal bar is much narrower) and so there is less possible change in the 400 Day Wt EBV as additional information becomes available. Conversely, the Eye Muscle Area EBV may change when additional information becomes available.

Overall Indexes

In order to simplify the communication of EBVs, breed societies have created indexes that pull together a number of different EBV traits to give overall indexes. Each index is different, depending on the job they are for and the importance each society places on the traits within the indexes.

There are two main types of index.

Terminal Index or Beef Value
This index ranks bulls by their genetic potential for the production of prime steers and heifers for beef production. Growth and carcase traits are the main drivers used in compiling this index.

Self Replacing Index/Maternal Value
This index ranks bulls by their genetic potential for the production of replacement heifers with emphasis on maternal traits such as calving ease for use in both commercial and pedigree herds. However, some growth and carcase traits are still used in this index to reflect the fact that around half of the calves will be males not for breeding.

If breeding replacements, use the Self Replacing Index or Maternal Value. However, ensure that you are happy with the individual EBVs – do not select on the index alone.

Selection Index Values		
Market Target	**Index Value**	**Breed Average**
Terminal Index	+36	+22
Self Replacing Index	+45	+26

It is not necessary to select the highest overall index. Many producers now do not use these overall indexes at all and prefer instead to concentrate on the individual traits. This allows them to be more specific in their requirements.

Some breeds have recently introduced a Maternal Index in place of the Self Replacing Index. It is specifically aimed at selecting replacement females and puts greater emphasis on cow traits.

Case Study 2

Ross King of Wolfstar Farm near Pencaitland, East Lothian runs 30 pure Simmentals along with a 150 commercial cow herd on a mixed farming unit.

EBVs are important to Ross as he sees them as a secondary tool after his visual assessment to work with when selecting bulls for his herd.

"EBVs can often help you decide what bull to avoid as well as what to go for", says Ross.

Wolfstar sell their finished commercial steers at 13 months of age at 330kg to 340kg deadweight achieving U and R conformation score with fat cover of 3 to 4L. Ross believes in efficiency and selling early which is the most efficient and profitable stage and says:

"We chose bulls that will give us the growth rate needed. Currently we are achieving 0.8kg deadweight per day (1.5kg liveweight from birth) and yes, we could put more weight on them. But what at what cost? And then maybe it would move them into a wrong fat class, it is not justifiable."

Which Traits and Why?

The Calving Ease Daughters EBV is important to Ross as it has such long term implications. We can make changes quickly as a result of bulls Calving Ease Direct, but with Calving Ease Daughters it will be three to four years down the line before results are seen and if not correct this has major impact on future labour needs.

Ross says: "Along with the right choice of EBVs we also have to make visual decisions and concentrate on choosing female lines with good udders, bloodlines, temperament, feet, legs, scale and fertility.

Scrotal Size EBV is also looked at as it is vital to maintain fertility and without this there would be no point in anything else. With the heifers only going to the bull for six weeks we are now bringing through only the best lines with fertility. Over the last few years all our heifers have held to the bull and calved at two years.

With many commercial herds producing their own replacements it is vital that the genetics chosen will bring in milk which is a priority in many herds.

We are now more conscious about Fat Depth. While the Simmentals still merit bulls for leanness, they now reward for greater fat depth. This is a good move as there is an increasing issue with leanness in many commercial herds where replacement heifers have not got enough cover and finished males are seen as being too lean.

Our aim is to always source bloodlines with more fat cover so that our steers have what the market wants when finished quickly and the females have natural fat reserves.

We have to produce finishing cattle that not only finish at the correct weights but have the right fat cover over them. The days have gone when it was OK to allow these cattle to get to very heavy weight with limited fat cover."

Wolfstar Fearless, sold for 14,000 guineas at Stirling in February 2016

Herd Health Declaration

The use of herd health declarations (pen cards) at breed sales is now commonplace in Scotland. Most of the major cattle breed societies endorse herd or individual animal screening with the information depicted on pen cards and in the index at the front of the sale catalogue. Breed society rules introduced over the last few years require all animals at society sales to be free from BVD virus and vaccinated against BVD virus.

> **When you buy outwith the society sales you should request to see the BVD herd certificate or the test result for the animal you wish to purchase.**
> **The best position is to buy from BVD Accredited Free herds**. Information on Johne's disease and IBR should also be requested.

The purchase of in-calf animals creates a risk of introducing BVD to your herd as there is no way of testing the calf until it is born. The best option is not to buy in-calf animals, but where this cannot be avoided, the resultant calf should be tested for BVD virus and kept isolated from birth until you have the result.

Johne's disease is often introduced to a herd by purchasing infected animals. The Johne's status of a herd is categorised on a Risk Level basis and purchasers should buy from herds with the lowest (ie best) best Risk Level.

Risk Level 1   the herd has had at least three clear annual herd tests.
Risk Level 2   the herd has had one or two clear annual herd tests
Risk Level 3   the herd has had less than 3% of animals testing positive for Johne's
Risk Level 4   the herd has more than 3% of animals test positive
All the above categories have a CHeCS Johne's disease health plan in place that is updated annually.
Risk Level 5   may be testing and are not adhering to the CHeCS Johne's disease control protocol.

Sellers should display pen cards and buyers should study the displayed information. Figure 8 gives an example of a pen card.
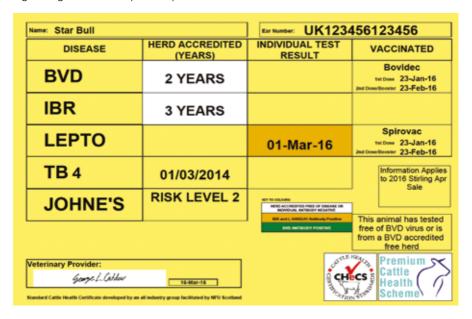

Figure 8. An example of a pen card

What does the above card tell me about the bull?

BVD – he comes from a herd that has been BVD accredited for two years and he has been vaccinated. Many breed societies ask that animals are vaccinated prior to breed sales.

IBR – the herd has been IBR accredited for three years. However the bull has not been vaccinated and is not protected. If he meets IBR in the sale venue, on transport or on the purchasers farm he may become positive. It is advised that the animal is quarantined after purchase, tested after one month and vaccinated with IBR marker vaccine.

LEPTO – although the herd is not accredited the bull has been individually tested as antibody positive. He was also vaccinated prior to the blood test so it is uncertain as to whether he carries leptospirosis or the blood test is indicative of a vaccine status. This bull may not be suitable for purchase for a herd which is accredited for Lepto.

TB4 – this tells you that the animal is from a herd on a four-year testing area and indicates the date of the last herd test for Tuberculosis.

JOHNE'S – no individual test results are given for Johne's disease – only a herd level status. This animal is from a Risk Level 2 herd which means that the herd has had at least one clear herd test.

Carrying out a Bull Pre-breeding Examination

Introduction

Although the term breeding soundness evaluation is commonly used worldwide to describe the process of examination of breeding bulls, the terminology used in this guide will be that used in the British Cattle Veterinary Association (BCVA) certificate – namely Pre-Breeding Examination (PBE). The aim of a PBE is to try and identify bulls that are potentially unfit for use as breeding bulls to avoid herd fertility losses. Various large studies worldwide have found up to 20% or more of bulls examined during routine screening failed PBE. These failures are for a variety of reasons including physical problems and poor semen quality. Very few bulls are infertile (incapable of impregnating) however many are subfertile. This raises the question of what we define as "normal fertility".

A mature bull of "normal fertility" should be able to be run with a breeding group of 30 - 40 healthy, cycling cows and achieve a pregnancy rate of at least 94% in a nine week mating period. This assumes a conception rate of 60% to each service. A "subfertile" bull will fail to deliver this level of performance leading to reduced pregnancy rate in a restricted mating period and a disrupted calving pattern.

Carrying out a bull pre-breeding examination

Studies have shown that bulls of most breeds will have reached puberty and normal sperm production by 16 months of age. If bulls are being examined at under 16 months of age then the failure rate of PBE will be higher due to immaturity affecting semen quality. A brief history should be taken to ensure there has been no recent illness, lameness or veterinary treatment that could influence semen quality. See Figure 9.

BCVA Bull Pre-Breeding Examination Certificate

Date of Examination: _____

Owner:		BULL	Name:
Address:			Ear number :
			Breed :
			Date of Birth/Age:

Reason for examination:

Pre-sale Check ☐   Pre-breeding Check ☐   Examination for Insurance Purpose ☐

1.PHYSICAL EXAMINATION		
Body Condition Score (1-5)		
	*NAD	***Abnormal**
Heart/Lungs	☐	☐
Eyes	☐	☐
Incisor/dental pad alignment	☐	☐
Musculoskeletal system	☐	☐
External genitalia	☐	☐
Internal accessory glands	☐	☐
Scrotal circumference		**cm**
Overall result: SATISFACTORY*/UNSATISFACTORY*		

2.SEMEN EXAMINATION			
Collection method	EEJ ☐	AV ☐	MASSAGE ☐
Appearance/density	Creamy ☐	Milky ☐	Watery ☐
Gross motility	/5		
Progressive motility	%		
Morphologically normal sperm	%		
Overall result: SATISFACTORY*/UNSATISFACTORY*			

3.ASSESSMENT OF MATING ABILITY
This Bull has/has not* been observed exhibiting normal service behaviour and mating ability

*Place X in box to indicate findings.   NAD = No Abnormality detected   *Delete as Required

4. CLASSIFICATION
In my opinion, in terms of the standards detailed on the reverse of this certificate, the examination findings would indicate that on this date the bull identified above is:
SUITABLE for BREEDING*(based on meeting the requirements of sections 1 and 2 only) – mating ability has NOT been assessed
SUITABLE for BREEDING*(based on meeting the requirements of sections 1, 2 and 3)
UNSUITABLE FOR BREEDING*
NB: This certificate does not include any testing for infectious/contagious diseases, the results of which should be reported separately.

COMMENTS:

Name of Veterinary Surgeon:.. MRCVS   Date: ....

Signed: ....

Figure 9. Example of Bull Breeding Examination certificate

Bulls should be "fit not fat" prior to breeding, with a target Body Condition Score of around 3.

Physical Examination of the Musculoskeletal System
Many bulls are culled prematurely due to problems with the musculoskeletal system so it is critical that problems with the feet or legs are identified at all times to prevent these bulls being selected as sires. Bulls should be observed walking on a smooth level surface to check for evidence of lameness and the limbs carefully inspected for any conformational defects. **Look for a free moving gait, with the hind feet stepping into the footprints of the front feet. Overstepping or understepping are indications of structural problems or lameness, as are uneven footprints from the claws.**

Although some conformational defects may not be causing lameness on the day of examination, many have a hereditary component or will lead to lameness at a later date and thus will render bulls unsuitable for purchase. Some examples of common musculoskeletal problems that can be identified during bull PBE are discussed below.
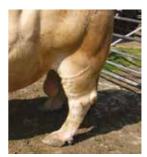
Post Leggedness
Post legged conformation is associated with an increased risk of lameness due to hock, stifle or hip joint pathology and young bulls showing this conformation should be avoided. Bulls with extreme post legged conformation will often break down with leg lameness within their first year of working.

Sickle Hock
The opposite extreme – sickle hock, will lead to collapsed heels and overgrown claws with a tendency for foot lameness and thus bulls with extreme sickle hock should also be avoided.

Valgus Deformity of Forelimbs
Young bulls with obvious valgus deformity (turned out from knee) will have a tendency to develop abnormal claw overgrowth of the fore-feet and have ongoing problems.

Swollen Hocks
Swollen hocks due to excessive synovial fluid are not uncommon in intensively reared young bulls less than two years old. Any bull with swollen hocks should be checked carefully for evidence of hind leg lameness.

Corkscrew Claw and Interdigital Fibroma (corns)

Both of these foot conditions can cause lameness and ongoing problems during a bull's lifetime and can pass on to offspring if they are retained as breeding stock.

Physical Examination of External Genitalia

Before handling the scrotum and testicles a visual appraisal of the scrotal shape should be carried out. In a cold environment this may be difficult as the muscle of the scrotal wall and the cremaster muscles will pull the testicles closer to the body wall.
The three common descriptors for scrotal shape are:

Straight (slab) sided scrotum

May be associated with small testicles and excessive fat in neck of scrotum

Normal scrotum

A pendulous scrotum with a well defined neck is ideal for thermoregulation of testicles

Wedge-shaped scrotum

This is associated with smaller testicles and excess fat in the neck which will be detrimental to thermoregulation and semen quality.

Examination of Scrotum and Contents

The scrotal skin should be smooth and elastic and the testicles should move freely within it. Each testicle should be palpated in turn and any abnormalities noted. Abnormalities in testicular tone that are significant (ie. due to degeneration) will normally be confirmed when semen is examined.

Testicles should be even size and shape unlike the bull on the right.

Measurement of Scrotal Circumference (SC)

Scrotal circumference is a critical component of PBE (Pre-Breeding Examination) as the SC measurement is highly correlated to paired testes weight, daily sperm production and semen quality. The SC measurement at one or two years of age in bulls is moderately to highly heritable. Bulls with above average SC reach puberty earlier and this trait can be passed to female offspring. Selection of young bulls with above average SC will improve the potential fertility of their female offspring

which is clearly beneficial in sires used to breed replacement heifers. Bulls with below target SC as yearlings will still have small testicles by two years old so culling decisions can be made when measuring SC in young bulls.

Nutrition can also have an effect on SC in young bulls. Overfeeding young bulls will not improve testicular size but may falsely increase SC due to obesity and fat in scrotum. Subsequent reduction in SC may be due to a combination of fat loss and/or degeneration leading to poor semen quality.

Various studies have shown bulls fed high energy rations between weaning and 12-15 months of age will tend to have greater SC than bulls fed less intensively. In these studies the greater SC was attributable to scrotal fat rather than greater testicular volume. Also bulls fed excessive energy levels at this age also tend to have poorer sperm quality than bulls fed moderate/forage based diets.

The effects on sperm quality are probably due to the impairment of thermoregulation by excessive fat in the neck of the scrotum. Other studies have suggested that high energy diets fed up to 12 months of age will not be detrimental to sperm quality provided that the diet after 12 months of age is moderated to prevent fattening.

In addition to the effects on semen quality, the feeding of intensive cereal based diets will also increase the risk of laminitis and musculoskeletal problems in young bulls.

Once sexual maturity is reached some variation in SC will occur related to seasonality and plane of nutrition, but these changes should not normally exceed 1-2 cm. Losses in SC of 2-4 cm between point of sale and start of mating are likely to indicate testicular degeneration rather than simply bodyweight loss.

Minimum Standards for Scrotal Circumference (SC)
The standards used for assessing whether bulls have adequate SC vary around the world, however the Society for Theriogenology (SFT) standards (*see below*) have been used in the USA as the basis for breeding soundness standards for many years.

Age in months	12-15	>15≤ 18	>18≤21	>21≤24	>24
Minimum SC	30cm	31cm	32cm	33cm	34 cm

In the BCVA Bull PBE certificate bulls can pass SC standards for certification if they achieve the relevant <u>breed</u> standards for age. For most breeds this will be similar or indeed greater than the SFT standards.

All bulls now have EBVs for Scrotal Size which is presented in terms of Scrotal Circumference Size. Ideally bulls with positive values should be selected for purchase.

Artificial Insemination (AI) In the Beef Herd

Uptake of AI in the beef suckler herd until now has been poor with probably less than 10% of breeding beef cows bred by AI.

What are the potential advantages of using AI in commercial beef suckler herds?
• Access to superior EBV bulls to produce a calf crop to suit the market/management system on farm and increase output (see later).
• Identifying superior dams/heifers in the herd and using maternal trait AI sires (or female sexed semen) to breed quality replacement heifers.
• Potential to improve the calving pattern by serving large groups of cows/heifers on day one of the breeding period by using oestrus synchronisation.
• Reduction in calving problems by selecting bulls with high Calving Ease EBVs.
• Selecting bulls that have high Accuracies for Calving Ease Direct.
• Opportunity to reduce the bull stud especially if an "easy calving" bull is kept solely to breed small numbers of heifers.

How much does a natural service calf cost to produce?
Many farmers assume AI must be more expensive then natural service however the potential extra output can outweigh the system costs. The facts are that the average stock bull lifespan is four working seasons and many produce only 30-40 calves per year or less. Based on four year lifespan and a purchase price of £4,000, a rough calculation based on depreciation, variable and fixed costs, puts the cost of a reasonable quality stock bull at around **£1,600/year on farm**. If this bull only generates 30 calves per year then each calf has cost **£53** to get on the ground.

What is the cost of an AI generated calf?
The cost of synchronisation and AI will vary depending on protocol used, conception rates achieved, and semen/technician costs but is likely to be similar to natural service costs at around £50 per pregnancy. Economic advantage can be gained however with synchronised AI by producing calves of superior genetic merit that calve easily at the start of the calving period, and grow rapidly to give increased weaning weights.

Methods of Artificial Insemination

Successful AI requires cows to be served at the optimum time. There are a number of different methods of ensuring this. Using heat detection aids such as tail paint or activity collars/pedometers can allow heat detection and AI of individual cows to be done in some situations on beef farms. For this system to be considered there must be a reliable AI technician service or a DIY AI trained inseminator available as cows must be served within 12 hours of being seen in standing heat for best results.

Fixed time AI/Oestrus Synchronisation

Synchronisation for AI can seem complicated, however, the basic principle is to use drugs such as prostaglandin (PG) injection and progesterone implants to control the oestrus cycle and facilitate AI. Discussion with your vet will allow choice of the best programme for your herd.
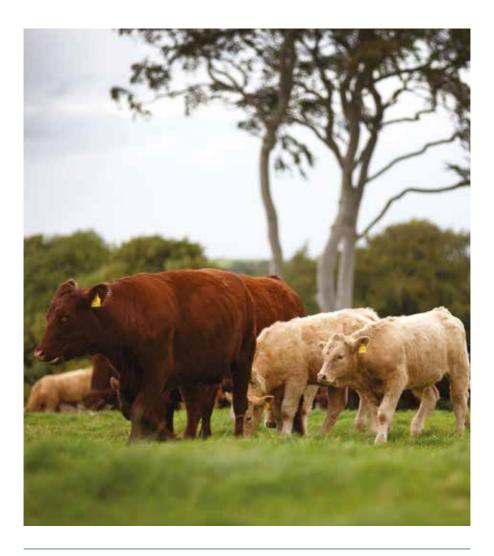

With advances in oestrus synchronisation programmes using combinations of intra-vaginal progesterone implants (CIDR™/Prid™) and prostaglandin/GnRH injections it is now possible to get excellent conception rates to fixed-time AI in beef cows and heifers. At the SRUC Easter Howgate herd the crossbred spring calving cows have consistently achieved first serve conception rates of 65% or more to AI over many years.

A compact batch of AI bred calves

Body Condition Score/Nutrition/Trace Elements

Forward planning is essential to ensure cows are calved at target condition scores to ensure most are cycling prior to synchronisation. The basic rule is to try and keep a steady or rising plane of nutrition and avoid sudden changes. Trace element supplementation (eg. copper and selenium), if required, should be administered well before any programme. Copper/selenium deficiency has to be severe and prolonged before they are likely to adversely affect fertility. Simple energy/protein deficiency leading to poor body condition score and prolonged anoestrus is by far the most common cause of poor fertility in many herds.

Check List for the Buyer

Buy a bull well in advance of the breeding season ☐

Get catalogue from auctioneer in advance of the sale ☐

Decide which traits matter for your herd ☐

Produce a short list of bulls that meet your criteria ☐

Decide how much you are going to spend ☐

Consider appropriate insurance cover ☐

At the sale, refine your short list after visually assessing the bulls ☐

Study the Health declaration ☐

Ensure BVD accreditation ☐

Ensure BVD vaccinated ☐

Ensure you are buying from a Johne's accredited herd ☐

Ask what he has been fed and if the buyer will give you some to aid transition ☐

BUY A PERFORMER - USE THE CHECK LIST

REMEMBER

- The eye alone cannot assess breeding potential
- EBVs are another tool to use when selecting bulls
- Examine the individual EBVs rather than just indexes (overall values)
- Remember what breed you are selecting from - will the breed average be high for that trait anyway, such as milk?
- Ensure your purchase has a good health status
- Careful post-purchase management will ensure a longer working life

Notes

Notes

QMS