

Section 4



Improving Genetics in the Suckler Herd

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Introduction

Carefully identifying better animals and breeding them with other superior animals will gradually improve the genetics of a herd. Enhanced genetics will lead to greater profitability. Genetic improvement is permanent and cumulative and if you use animals with high genetic merit the herd performance will benefit into the future. However the reverse is also true. If you introduce an animal with poor genetic merit then those genes can be dragging down performance and profitability for a long period.

- ① How can beef breeding indexes help improve my profitability?
- ② How should I use the indexes?
- ③ What breeding terminology do I need to know?
- ④ How important is reliability?
- ⑤ Do breeding values work?
- ⑥ What can we expect in the future for beef breeding?
- ⑦ What breeds should I use?
- ⑧ Why consider cross-breeding?
- ⑨ What should I consider when choosing a stock bull?

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1 How can beef breeding indexes help improve my profitability?

Identifying appropriate superior animals to breed from, be they cows or heifers within the herd, AI sires, bought-in animals, etc., is key. Breeding indexes will help by predicting the impact which a sire or dam will have on the profitability of the next generation of animals.

Beef breeding indexes, which are published by the Irish Cattle Breeding Federation (ICBF) are composed of three new Euro-star indexes and are a measure of the effect a sire or dam will have on the profitability of their calf.

An animal with an index of €150 means that the progeny of that animal will, on average, generate €150 more profit over their lifetime compared to the progeny of an animal with an index of €0 produced in a similar environment.

1. **Terminal Index** This index helps farmers identify sires which will breed high-profit animals for slaughter. This index will replace the current weanling export sub-index and beef carcass sub-index.
2. **Maternal Index** This is most suitable for the identification of animals (sires and/or suckler female replacements) suitable for breeding high profit replacement females. This index includes maternal cow traits but also terminal traits to account for calves that are destined for slaughter.
3. **Dairy Beef Index** This index will assist dairy farmers identify beef sires suitable for use on dairy cows.

2 How should I use the indexes?

Before using any index decide what type of animal you are aiming to produce.

- Farmers solely targeting the weanling or finishing markets should pay particular attention to the Terminal Index when choosing sires. These animals may not be suitable for the production of replacement females.
- In contrast, farmers breeding replacements should consider using the Maternal Index.

Irrespective of the type of calf that is needed, look closely at the star rating of the breeding animal and the reliability associated with the index and traits of interest.

3 What breeding terminology do I need to know?

Estimated breeding values (EBVs): EBVs are estimates of the genetic merit of a heifer, cow or bull. The aim is to predict breeding values from recorded observations on an individual and/or its relatives. EBVs are calculated from the animal's individual performance records as well as those of their known relatives and also information recorded on the animal's herd mates.

Euro-stars: Published alongside each EBV for an animal is a Euro-star rating for the index. Euro-star ratings scored on a scale of one to five stars (one star indicates that the animal falls into the bottom 20% for the trait; five stars indicates that the animal falls into the top 20% for the trait). Euro-star ratings are shown for all goal traits and indicate the relative ranking of an animal both within and across breeds.

4 How important is reliability?

This refers to the "confidence" in the published genetic merit of an animal being a true reflection of the genetic merit of an animal. The genetic evaluation process, using sophisticated statistical techniques, provides the "best estimate" of an animal's genetic merit based on the available data.

Key fact

Reliability values are expressed as a % and indicate the quantity and quality of records used to produce the index or the trait of interest. The higher the % the better the reliability.



The major factors influencing the reliability of an animal's merit are:

- The heritability of the trait – the degree to which the trait is 'passed-on' in the genes. Low heritability traits (e.g., fertility) will have lower reliability values than moderate-high heritability traits (e.g., growth).
- The number of progeny recorded per bull (or cow) – the more progeny that have been recorded the greater the reliability.
- The number of herds with progeny – the more herds with progeny of the bull the greater the confidence that we are taking account of extreme environmental effects or preferential treatment of progeny.
- The number of herd mates for comparison - the greater the number of contemporaries the more accurate the proof.

List of male animals entered for sale (in date of birth order).

Lot	Name of animal and seller	DOB, Sex & MC Sire	Maternal Index (across breed herd)	Terminal Index (across breed herd)	Dairy Beef Index (across breed herd)	SEMI REC Bull Breeder
1	Highfield Tommy Farmer A	01/01/2011 CF32	€194 *****	€125 *****	€67 *****	
2	Shinagh John Farmer B	05/01/2011 MNO CF32	€123 ***	€132 *****	€70 **	

The examples below highlight the potential movement in Maternal and Terminal Index value of bulls based on their reliability.

Example 1. Bull of low reliability (30%)


	Maternal index	Terminal index
Index value	€250	€120
Potential movement in index value	±€248	±€74
Index value range	€2 - €498	€46 - €194

Example 2. Bull of high reliability (80%)

	Maternal index	Terminal index
Index value	€250	€120
Potential movement in index value	±€132	±€39
Index value range	€118 - €382	€81 - €159

Lot 4 Highfield Tommy

ID: IE123456712345 Breed: Charolais
Sex: Male DOB: 1st January 2012
Owner: Farmer A, Highfield House, Bandon, Co. Cork
Breeder: Farmer A, Highfield House, Bandon, Co. Cork



Sire: Uranium
Dam: Pupice

Star rating (Within Charolais breed)	Economic indexes	Euro value per progeny	Index reliability	Star rating (across all beef breeds)
★★★	Maternal	€350	18% (v low)	★★★
★★★★★	Terminal	€100	25% (Low)	★★★★★
★★★	Dairy beef	€78	23% (Low)	★

Star rating (Within Charolais breed)	Key profit traits	Index value	Trait reliability	Star rating (across all beef breeds)
Expected progeny performance				
★★★★★	Calving difficulty (% 3 & 4) Charolais average: 8.4%	+6.8%	22% (Low)	★★★
★★★★★	Docility (1-5 score) Charolais average: -0.03	-0.3	18% (v low)	★★★★
★★★★★	Carcass weight (kg) Charolais average: +27kg	+12.4kg	26% (Low)	★★★★★
★★★★★	Carcass conformation (1-15 score) Charolais average: +1.7	+1.1	22% (Low)	★★★★★
Expected daughter breeding performance				
★★★	Daughter calving diff (% 3 & 4) Charolais average: 5.8%	+8.6%	16% (v low)	★★★★★
★★★★★	Daughter milk (kg) Charolais average: 5.8kg	+3.4kg	23% (Low)	★★★
★★★★★	Daughter calving interval (days) Charolais average: +8.5	-1.3 days	7% (v low)	★★★★

Additional information:

Linear composite	Value	Reliability
Muscle	123	34%
Skeletal	112	35%
Functionality	97	26%

Herd data quality index: Excellent



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What is Beef Herdplus?

- Beef Herdplus® is a beef cattle breeding information service offered by the ICBF
- It contains all performance information related to your herd, from calving right through to slaughter
- Information is contained in easy to follow reports which allows you to evaluate animals performance relative to herd contemporaries and also to national averages
- Each report also provides an “Action List” which ranks animals based on their performance
- More information on Herdplus is available through www.icbf.com and on 1850 600 900.

5 Do breeding values work?

- Relationships between breeding values for ‘maternal milk yield’ and measured milk yield on 106 beef cows conducted on the Derrypatrick herd in Teagasc Grange show that ‘maternal milk yield’ is an excellent indicator of actual milk yield.
- Cows with the highest breeding values for maternal weaning weight (which is also a good indicator of milk yield of the cow) on average produced 8.2 kg more milk/day compared to the cows with the lowest breeding values for maternal weaning weight.

- Previous research at Grange has shown that bulls chosen on high breeding values for terminal traits produced progeny with 14kg heavier carcasses compared to bulls with low breeding values for terminal traits.

6 What can we expect in the future for beef breeding?

- Genomic selection is a new breeding technology that uses DNA samples (from blood or hair) to directly establish an animal’s genetic profile and generate breeding values. Genomic selection has been incorporated into the national dairy evaluations and will soon become the method of choice for beef genetic evaluations.
- Increases in the reliability of bulls via access to more on-farm performance data through the Suckler Welfare Scheme, the BTAP programme and also through the use of genomic selection.
- Economic values for the beef €uro-star indexes will be updated continually in line with current prices and costs of production.
- New traits relating to health, meat quality and the environment may soon be added to the genetic evaluations.

7 What breeds should I use?

SIRE BREEDS

Breed types can be categorised as dairy (e.g. Holstein-Friesian), early-maturing (e.g. Hereford, Angus) and late-maturing (e.g. Charolais, Belgian Blue, Limousin).

Extensive research carried out at Teagasc Grange comparing sire breeds mated to Holstein-Friesian dairy cows showed that:

- Growth rate is similar for dairy and early-maturing breeds and higher for late-maturing breeds.
- All beef breeds have a higher kill-out proportion than dairy breeds, with late-maturing breeds having a higher kill-out proportion than early-maturing breeds.
- Compared to dairy animals, carcass weight at a constant age is 2-4% higher for early-maturing crosses, 5-8% higher for the smaller (e.g. Limousin, Piedmontese) late-maturing crosses and 9-12% higher for the larger (e.g. Belgian Blue, Charolais) late-maturing crosses.
- Muscle production is broadly similar for dairy and early-maturing crosses but is 10-20% greater for the late-maturing crosses.
- Early-maturing crosses have, on average, a higher carcass fat score and late-maturing crosses have a lower carcass fat score than dairy animals.

- Carcass conformation score is superior for all beef types than for dairy animals and is superior for late-maturing than early-maturing types.
- Dairy breeds have a 5-10% higher intake (for their weight) than beef breeds.
- The relative productivity of the breeds summarised above is midway between that of the parent breeds. The extent to which these differences are observed in practice also depends on the system of production.

Key Fact



Although there is an average breed ranking for different traits, there is huge variation within breed and consequently, large overlap between breeds, especially for individual bulls, in these traits.



Ranking of Holstein-Friesian (HF=100) and beef x HF steers for production traits

Sire breed	HF ¹	HE	LM	PM	RO	BA	SM	BB	CH
Slaughter weight /day (g)	803	101	98	95	101	102	106	104	107
Kill out (g/kg)	527	102	105	105	104	105	104	105	104
Carcass weight / day (g)	425	103	103	100	104	107	109	109	111
Carcass conformation (1-5) ²	2.19	133	136	139	139	132	136	138	143
Carcass fat class (1-5) ³	3.52	125	103	86	97	91	103	95	90
Feed Intake (g/kg LW)	18.2	98	96	94	92	96	98	97	97

Source: M.G. Keane, Teagasc, Grange

¹Actual values for HF, values for the beef crosses are expressed relative to HF=100.

^{2,3} Beef carcass classification scheme; ² 1 (P) = poorest to 5 (E) = best; ³ 1 = leanest to 5 = fattest.

HE = Hereford; LM = Limousin, PM = Piedmontese, RO = Romagnola, BA = Blonde d'Aquitaine; SM = Simmental; BB = Belgian Blue; CH = Charolais.

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Desirable sire traits

These include: relatively short gestation (pregnancy), easy-calving, high growth rate, good feed efficiency, good carcass characteristics, good temperament, etc.

SUCKLER BEEF COW BREEDING

It is not possible to advocate a single breeding policy for all suckler farmers. Breeding policy depends on factors such as whether replacement heifers are produced from within or outside the herd, the production system followed and market requirements.

Desirable cow traits include

- Moderate size
- Moderate feed intake
- Good reproductive performance
- First calving at 2 yrs of age (early puberty)
- 365 day calving interval
- Live calf per annum
- Good calving ability
- Satisfactory milk yield
- Longevity
- Docility
- Good cull value
.....etc.

Desirable progeny traits include

- High passive (and active) immunity (ability to fight-off disease)
- Heavy weaning weight
- High growth rate
- Good feed efficiency
- High carcass weight per day of age
- Good carcass characteristics (conformation & fat score)
- Good meat yield & quality characteristics
- Good temperament
-etc.

Suckler herd replacement strategies

The main replacement breeding strategies available to farmers are:

- Sourcing replacement heifers from the dairy herd or
- From the suckler herd – with heifers either bred from within the herd or purchased from another suckler herd.

Heifer replacements from the dairy herd

- Research at Teagasc Grange has shown benefits to beef suckler cow replacements from the dairy herd having late-maturing “continental” sires rather than early-maturing British beef breed genetics. For example, spring-calving Limousin x Friesian cows were compared with Hereford x Friesian cows within a calf-to-beef production system.

Cow feed intake, live-weight, calving difficulty, reproductive performance and calf pre-weaning growth were similar but the male progeny from the Limousin x Friesian had higher lifetime growth rates, and better killing-out rates, resulting in leaner, heavier, carcasses.

Heifer replacements from the suckler herd

- A series of studies at Teagasc Grange compared replacement heifers from the dairy herd (Limousin x Holstein-Friesian) with replacement heifer breed types from the suckler herd in a spring-calving, calf-to-beef production system.

These studies evaluated the effect of late-maturing “continental” breeding in the cow (i.e. ½ beef ½ Holstein-Friesian vs. ¾ beef ¼ Holstein-Friesian vs. purebred beef).

Progeny from purebred and crossbred late-maturing breed cows had superior carcass conformation and meat yield compared to those with a proportion of dairy breeding in their ancestry.

However these studies demonstrated that crossbred cows with good maternal (milk) traits produced calves with

- (i) High passive immunity (ability to fight-off disease) due to higher colostrum production of the dam
- (ii) Higher weaning weight due to higher milk production of the dam
- (iii) Higher carcass weight per day of age, mainly due to higher pre-weaning growth
- (iv) Good carcass (conformation and fat score) characteristics.

8 Why consider cross-breeding?

- Breeding policy should aim to exploit breed differences and hybrid vigour or heterosis (advantage to crossbreds over the average of the parent breeds).
- Hybrid vigour from cross-breeding can result in a combination of enhanced reproductive performance, lower calf mortality and higher calf growth.
- Research shows that calves born to cross-bred suckler cows are roughly 13% heavier at weaning than calves from purebred sucklers. In addition, using a sire from a third breed (of at least equivalent genetic merit) increases the weight of calf weaned per cow by approximately a further 8%.

This breeding policy is more readily achievable where replacement heifers are purchased rather than bred, and where it is practical to allocate a portion of the herd specifically for the production of replacement heifers, for example, through the use of artificial insemination, or in large herds through the use of separate sires.

In practice many suckler herds are small and can only justify one bull. Where a single sire is used to breed both replacement heifers and animals destined for slaughter, a bull having both good maternal and good terminal traits is required.

Key fact

Ideally suckler cows should be cross-bred and mated to a bull from a third breed.

9 What should I consider when choosing a Stock Bull?

BULL SELECTION GUIDELINES

Key target

Any bull selected must improve profitability whether chosen to breed replacements or animals for slaughter.

How to

select the best bull for my herd?

- Determine the most suitable animal for your production system (i.e. the herd's breeding objective). For example, if you are interested in finishing all progeny then you should pay particular attention to the Terminal Index of the bull. On the other hand, if you are looking to breed your own replacements then you should examine the Maternal Index carefully.
- Establish the genetic merit of your herd. This can be done by logging onto the ICBF website (www.icbf.com). Select bulls that have high genetic merit for the herd's breeding objective but also pay attention to the level of reliability associated with the traits of interest

Where replacement heifers are obtained from the dairy herd they should be from sires used in the dairy herd with relatively high breeding values for growth rate, conformation and leanness etc. As all the progeny produced in this suckler cow herd are destined for slaughter, cows should be bred to sires selected using the Terminal Index.

Where replacement heifers are bred from within the suckler herd a proportion of the herd (40-50%) should be bred to bulls that are specifically chosen as suitable for producing replacements (see Maternal Index) and ideally the remainder to a sire selected using the Terminal Index.

Where one sire is used to breed both replacement heifers and animals destined for slaughter, a bull having both good Maternal and good Terminal traits is required. To maintain hybrid vigour the next generation of replacements should be bred to sires from alternative breeds.

AI versus stock bulls

The advantages of using an AI bull over a stock bull include:

- An AI bull will almost certainly have superior genetic merit
- There is a greater selection of superior bulls to choose from
- Higher reliability – a stock bull will have an overall reliability of approximately 30%, whereas well proven AI bulls can be as high as 90%
- Reduced risk – a stock bull may perform poorly due to injury, poor semen quality, or poor libido

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- AI bulls have undergone rigorous selection criteria (calving difficulty survey and disease testing for example)
- Less physical danger as there is no bull on the farm

How to

Estimate the expected profit from the bull



Quick estimate

- A bull with an index of €150 means that the progeny of that animal will, on average, generate €150 more profit over their lifetime compared to the progeny of a bull with a sub-index of €0 produced in a similar environment.

Detailed estimate

- For this you need to know the breeding values for the bull and the cows or heifers he is mated to. Progeny receive half their genes from their sire and half from their dam so add the figures for each trait together and divide by two.

Example 1. Breeding replacements

	Maternal index
Average cows and/or heifers	€80
AI sire	€150
Estimate for calves	€115

Example 2. Breeding animals for slaughter

	Terminal index
Average cows and/or heifers	€46
AI sire	€100
Estimate for calves	€73

