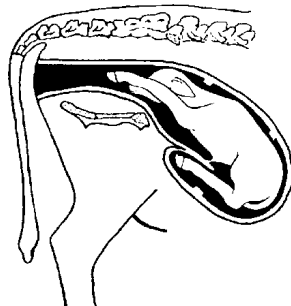


CALVING DIFFICULTY: NEW AND IMPROVED GENETIC EVALUATION



ICBF AND TEAGASC HAVE RELEASED A NEW AND IMPROVED GENETIC EVALUATION FOR CALVING DIFFICULTY. REASONS FOR THE CHANGE AND HOW IT WILL ALLOW DAIRY FARMERS AND THE WIDER INDUSTRY TO MAKE BETTER BREEDING DECISIONS ARE EXPLAINED HEREIN.

UNDERSTANDING THE GENETIC EVALUATION FOR CALVING DIFFICULTY

The genetic evaluation for calving difficulty was introduced by ICBF in 2004 to predict the extent of assistance that is expected to be required at calving due to the genetic make up of an animal. The genetic evaluation has two components: 1) the prediction of genetic merit, and 2) a measure of confidence surrounding the prediction of genetic merit (i.e., reliability).

- 1) The first component, the prediction, is expressed as the percentage of progeny that are expected to require considerable assistance at their birth, either with or without veterinary assistance. For example, if a bull has a predicted genetic merit of 5% for calving difficulty, on average, considerable assistance will be required at the birth of 1 out of every 20 of his progeny. The lower an animal's predicted genetic merit for calving difficulty, the fewer of the number of progeny that are expected to require considerable assistance at their birth. Therefore, the lower the predicted genetic merit for calving difficulty, the more desirable the animal is in terms of calving ease.
- 2) The second component of the genetic evaluation for calving difficulty is a measure of confidence surrounding the prediction of genetic merit, which is more commonly known as the reliability. Reliability is expressed as a percentage, typically ranging from 15% to 99%. A reliability of 15% indicates that the prediction of genetic merit is likely to change considerably as additional measures of calving difficulty become available, or when genotype data becomes available. A reliability of 99% indicates that the prediction of genetic merit is unlikely to change considerably when additional measures of calving difficulty become available. A reliability of 99% also indicates that the prediction of genetic merit is a very realistic reflection of the extent of calving assistance that is provided on-farm. Therefore, higher reliabilities are always more desirable.

HOW THE GENETIC EVALUATION FOR CALVING DIFFICULTY IS ESTIMATED

When farmers register the birth of each calf they also record pedigree information (i.e., sire and dam of the calf) and a measure of the extent of assistance provided at calving (i.e., 1 = no assistance, 2 = assistance provided with some calving difficulty, 3 = assistance provided with considerable calving difficulty but without veterinary intervention, 4 = assistance provided with considerable calving difficulty resulting in veterinary intervention). It is these records that farmers record which are used in the genetic evaluation process. Currently, there are ~20 million calving difficulty records on the ICBF database from >30 breeds which are used in the genetic evaluation. That said, only records that meet the strictest quality criteria are considered in the genetic evaluation for calving difficulty at ICBF.

As part of the genetic evaluation process, calving difficulty records are compared only among cattle in the same herd and management group. Where a bull’s progeny generally requires no assistance at their birth, across many herds, then that bull will have a lower predicted genetic merit for calving difficulty. The reliability of that bull will depend on the number of progeny with a calving difficulty score. As more calving difficulty scores are recorded by farmers, those scores will contribute to each animal’s predicted genetic merit and reliability. Where a bull has no progeny his predicted genetic merit for calving difficulty will be determined from ancestral data and genomic information.

THE IMPORTANCE OF RELIABILITY

On average, the lower a bull’s predicted genetic merit for calving difficulty, the fewer the number of progeny that will require considerable assistance at their birth. However, where a bull has a low reliability (i.e., <40%) there is a greater risk that bull’s genetic merit will fluctuate (up or down) when more calving difficulty records become available, compared to a bull with a high reliability (i.e., >90%).

For example, where an Aberdeen Angus bull has a genetic merit of 8% for calving difficulty on dairy heifers with a reliability of 15%, his genetic merit may fluctuate ±6.3 percentage units (i.e., 1.8 % versus 14.4%) as additional calving difficulty records become available (Table 1; Figure 1). For comparison purposes, if that same Aberdeen Angus bull had a reliability of 95%, his genetic merit would only fluctuate ±1.5 percentage units (i.e., 6.5% versus 9.6%) as additional calving difficulty records become available (Table 1; Figure 1). Therefore, to reduce the risk of unprecedented calving difficulty, select bulls for mating with a high reliability (≥90%) as their genetic merit (which is calculated from on-farm records) is less likely to increase (or decrease) than low reliability bulls.

Table 1. Potential increase and decrease in the genetic merit for calving difficulty of an Aberdeen Angus bull with a genetic merit of 8% when that bull is selected for mating with a reliability ranging from 15% to 99%

Reliability	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	80%	90%	95%	99%
Change (±)	6.3	6.1	5.9	5.7	5.5	5.3	5.1	4.8	4.6	4.3	4.0	3.7	3.1	2.2	1.5	0.7

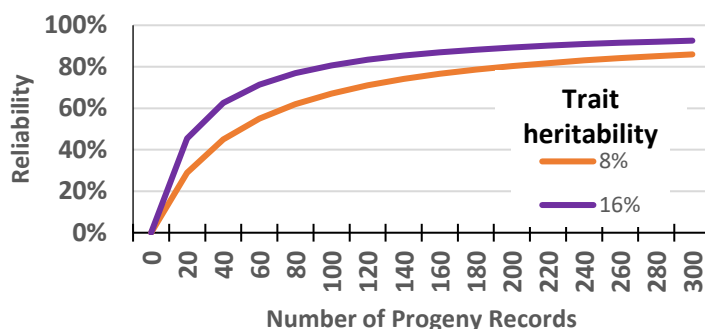


Figure 1. The number of progeny records required to achieve varying levels of reliability where only progeny information inform the prediction of genetic merit

MOTIVATION TO REVAMP THE GENETIC EVALUATION FOR CALVING DIFFICULTY

Traditionally, the genetic evaluation for calving difficulty used only farmer scored records of calving difficulty from dairy and beef cattle. The resulting single-figure prediction of genetic merit for calving difficulty was deemed applicable to dairy heifers, dairy cows, beef heifers, and beef cows. Such an assumption was not fully accurate. For example, if a beef bull was only used on beef cows then his genetic merit for calving difficulty only accurately reflected the on-farm calving difficulty of progeny born to beef cows but not beef heifers, dairy heifers, or dairy cows. Therefore, there was a need to re-estimate the genetic merit for calving difficulty separately for dairy heifers, dairy cows, beef heifers, and beef cows. This also provided an opportunity to incorporate new indicators of calving difficulty (i.e., calf birth size and calf birth weight) as well as to consider the suitability of the existing economic value for calving difficulty.

IMPROVEMENTS TO THE GENETIC EVALUATION FOR CALVING DIFFICULTY

The new genetic evaluation for calving difficulty, which is presented in the Dairy Beef Index, has four major improvements compared to the old genetic evaluation for calving difficulty (which will continue to be presented in the Euro-star indexes and the EBI for Spring 2019). These are:

- 1) It provides a better indication of how suitable a beef bull is for use on dairy heifers and separately on dairy cows, by separating the heifer trait from the cow trait
- 2) More sources of data are being used (i.e., calf birth size and calf birth weight) with the farmer scored calving difficulty records which have always been used
- 3) Additional strict editing criteria are applied to the data to remove herds that have low levels of data recording
- 4) It takes into consideration that the economic value for calving difficulty is linear up to a point (i.e., a genetic merit of 2.5% for calving difficulty), after which the cost of calving difficulty increases in a non-linear fashion. This updated non-linear economic value reflects the view of dairy farmers which will only choose to use more difficult calving beef bulls where a higher price is paid for the resulting calf compared to easier calving beef bulls.

The impact of these improvements has resulted in an increase of the average genetic merit of all animals for calving difficulty. For example, of the bulls on the Active AI Bull List ranked on Dairy Beef Index (Spring 2019) their genetic merit for calving difficulty has increased on average by 7 percentage units on the dairy heifer scale, or by 1 percentage units on the dairy cow scale.

PRESENTATION OF THE NEW GENETIC EVALUATION FOR CALVING DIFFICULTY

Instead of having a single-figure of genetic merit for calving difficulty, each beef bull will have two separate figures of genetic merit for calving difficulty. The two separate figures of genetic merit for calving difficulty are:

- 1) The percentage of progeny expected to require considerable assistance at calving, either with or without veterinary assistance when born to dairy heifers
- 2) The percentage of progeny expected to require considerable assistance at calving, either with or without veterinary assistance when born to dairy cows

FINDING THE NEW GENETIC EVALUATION AND THE ANIMALS THAT HAVE IT

For Spring 2019, only beef AI bulls that have ≥30 progeny in dairy herds will have the new genetic evaluation for calving difficulty. These will initially be published on www.icbf.com as part of the Dairy Beef Index (DBI). The new calving evaluation will not be available under ‘Animal Search’ or incorporated into the existing EBI or €uro-star Indexes for Spring 2019. For beef AI bulls on the Dairy Beef Index Spring 2019 Active bull list, a breakdown of their predicted genetic merit for calving difficulty is in Table 2.

The new genetic evaluation for calving difficulty will eventually replace the calving difficulty figure for all animals that have an EBI or a €uro-star Index. When incorporated into the €uro-star Indexes, farmers will also be able to identify an animal’s genetic merit for calving difficulty when used on beef heifers and beef cows separately.

Table 2. Breakdown, by breed, of the predicted genetic merit for calving difficulty for beef AI bulls on the Dairy Beef Index Spring 2019 Active bull list

	All Breeds	Aberdeen Angus	Belgian Blue	Charolais	Hereford	Limousin
<i>Number of bulls</i>	75	28	14	2	16	9
DAIRY HEIFERS						
<i>Genetic merit of the easiest calving bull</i>	5%	5%	10%	14%	7%	10%
<i>Average genetic merit of bulls</i>	11%	9%	14%	14%	11%	14%
<i>Genetic merit of the hardest calving bull</i>	20%	20%	16%	15%	15%	18%
DAIRY COWS						
<i>Genetic merit of the easiest calving bull</i>	2%	2%	6%	7%	3%	4%
<i>Average genetic merit of bulls</i>	5%	3%	8%	8%	4%	7%
<i>Genetic merit of the hardest calving bull</i>	10%	6%	10%	9%	5%	9%

ADVICE FOR USING THE NEW GENETIC EVALUATIONS FOR CALVING DIFFICULTY

- Use a bull’s genetic merit for calving difficulty on dairy heifers when beef bulls are to be used on dairy heifers
- Use a bull’s genetic merit for calving difficulty on dairy cows when beef bulls are to be used on dairy cows
- Remember, the lower a bull’s genetic merit is for calving difficulty, the lower the risk of calving difficulty on-farm
- Preferably, use bulls with many progeny scored for calving difficulty, as the more progeny records a bull has, the less likely his genetic merit for calving difficulty is to fluctuate over-time
- Ideally, use a team of bulls to increase the reliability of the team
- The more calving difficulty you are willing to accept, the more dairy heifers/cows that will likely require assistance at calving; however, accepting more risk will increase the number of beef bulls that can be used in your herd.
- Confirm that the average genetic merit for calving difficulty of the team of bulls selected is below a reasonable limit of calving difficulty for your herd. For example, if the genetic merit for calving difficulty of the bull used is 8%, expect that, on average, 8% of dairy cows will require considerable assistance at calving. If this level of calving assistance is considered too high for your herd, select beef bulls that have a lower genetic merit for calving difficulty.