

Balanced breeding – the dairy-beef index

TEAGASC, ICBF and AbacusBio researchers have developed a dairy-beef index to identify and breed beef bulls for use on dairy females.

The expanding dairy herd, coupled with improving reproductive performance, will necessitate that a greater proportion of slaughtered cattle in Ireland originate from dairy herds. Hence, a tool that ranks beef bulls for use on dairy females is required, and must provide a balance between the desires of the dairy farmer and those of the beef farmer. Such a ranking system should rank bulls on estimated genetic potential to efficiently produce a high-value carcass, while having minimal repercussions on the milk, health and reproductive performance of the dairy female. The technical name for such a tool is a breeding index. The breeding index can be used by dairy farmers to select suitable beef bulls for use on their dairy females, but can also be used by beef bull breeders to breed the next generation of beef bulls demanded by dairy producers. A trait must fulfil three prerequisites to be considered for inclusion in a breeding index:

1. It must be important (either economically, socially or environmentally).
2. It must exhibit inter-animal genetic variability.
3. It should be measurable (ideally early in life and at a low cost) or correlated with a trait that is measurable.

Categories of sub-indices, a selection of possible traits within each of those categories, and the percentage of observed inter-animal variability that is due to transmissible genetic effects, are summarised in **Table 1**. While routine genetic evaluations are

already in place for many of these traits (e.g., calving difficulty, carcass weight), the animal geneticists at both Teagasc and the Irish Cattle Breeding Federation (ICBF) are actively developing genetic evaluations for other traits (e.g., calf vigour, environmental hoofprint). Moreover, with time, new traits will be added to the list. For example, the Irish national dairy cow breeding index, the Economic Breeding Index (EBI), today includes almost four times as many traits as it did when it was launched in 2001.

Finding the optimal balance of traits

Once genetic evaluations exist, the next step in the development of an optimised breeding objective is the derivation of how much relative emphasis to place on individual traits. Obviously minimal calving difficulty is crucial, but a breeding index with a high emphasis on calving difficulty will, on average, select bulls with poor carcass characteristics. Finding the optimal balance between traits is key, but is also the most contentious issue in animal breeding.

The weighting factors currently used in all Irish cattle and sheep breeding indices are economics based; the intensifying interest in social licences could challenge this dogma and necessitate alternative strategies to derive weight for public good traits. Notwithstanding this, the economic weighting factors placed on the current traits within the dairy-beef index are informed by costs and prices experienced on farm. For example, the economic value attributable to carcass weight is simply the value

Table 1: Potential traits for consideration in a dairy-beef index and the contribution of genetic differences to the observed inter-animal variability.

Sub-index	Trait	Genetic emphasis (%)
Calving	Calving difficulty	10
	Gestation length	35
	Calf mortality	2
	Calf vigour	3
Efficiency	Feed intake	33
	Environmental hoofprint	20
	Age at slaughter	13
Carcass	Carcass weight	35
	Carcass conformation	35
	Carcass fat	35
	Ability to meet carcass specifications	10
	Meat quality	16
Societal	Docility	20
	Polled	100

of an additional kg of carcass sold in the marketplace. The overall cost of a difficult calving includes costs associated with increased labour requirements, veterinary costs, and the likelihood of reduced subsequent cow performance such as reduced milk production, compromised reproductive performance, and even risk of death.

The relative emphasis placed on the eight traits within the dairy-beef index launched in January 2019 is summarised in **Figure 1**. Some 65% of the emphasis relates to calving performance (i.e., calving difficulty, gestation length and calf mortality); these traits reflect the desirable attributes from the perspective of the dairy farmer. The remaining emphasis is on carcass merit (26%), feed intake (8%) and docility (1%), which reflect animal characteristics sought after by the beef farmer and processors.

Where to from here?

Traits currently not explicitly included in the dairy-beef index include, among others, calf vigour and health, lifetime methane emissions, novel measures of meat quality and nutritive value, and saleable red meat yield. Research is currently underway to generate routine genetic evaluations for these traits. Given the high heritability of most of the traits within the dairy-beef index, individual animal genetic merit should be a good reflection of future performance. Research is well underway in the development of an index informative for the sale and purchase of cattle; such an index would not include the traits associated

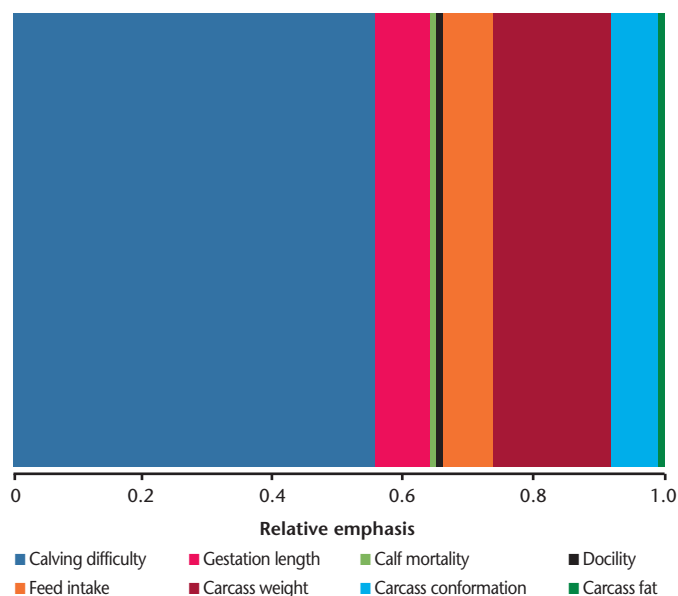


FIGURE 1: Relative emphasis on the component traits of the dairy-beef index.

with calving performance, since the animal has already expressed those traits (i.e., it is already born).

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Authors

Donagh Berry

Senior Principal Research Officer, Teagasc Animal & Grassland Research and Innovation Centre, Moorepark, Fermoy, Co. Cork, and Director of the VistaMilk SFI Research Centre
Correspondence: donagh.berry@teagasc.ie

Ross Evans

Irish Cattle Breeding Federation, Highfield House, Bandon, Co. Cork

Peter Amer

AbacusBio Ltd, Dunedin, New Zealand

Fiona Hely

AbacusBio Ltd, Dunedin, New Zealand

