Moorepark focus

EBI and its components reflect superior performance

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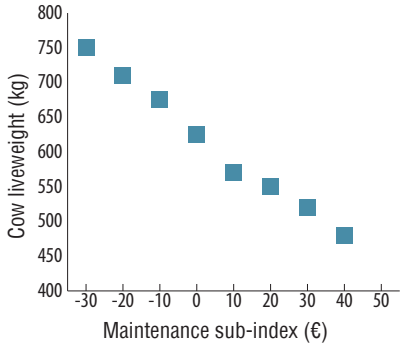
There are two strategies to validate breeding indexes and their component traits. One is to compare animals divergent for genetic merit within a controlled experiment, such as in the Next Generation Herd.

A second approach is to compare the performance of a large database of herds, or animals, differing in genetic merit.

The Next Generation Herd and the high-low cow fertility study have clearly documented the range of performance that can be achieved in animals divergent for EBI and fertility, respectively.

Evaluated here, using herd data, is the degree to which herd EBI and performance concur; also evaluated, using cow data, is the concordance between genetic merit for milk production and actual cow output. Finally, we look at the relationship between the maintenance sub-index and cow liveweight.

Figure 1
Mean cow liveweight across different maintenance sub-index values



Key messages

- Each unit change in herd EBI translates to €1.946 profit per lactation in Holstein Friesian dairy cows, which is as expected.
- Animals with a higher maintenance sub-index (i.e., genetically lighter) are indeed lighter animals.
- Progeny from sires of higher genetic merit for milk production and composition do indeed produce more milk of greater composition.

EBI and profit

Access to Teagasc eProfit Monitor data provides a unique opportunity to validate if herd EBI translates into more profit per cow. A €1 difference in herd EBI is expected to translate to an extra €2 profit per cow.

Using data from more than 1,000 eProfit Monitor herds between 2008 and 2011, a €1 difference in herd EBI was associated with a €1.94 extra net profit per cow in spring calving Holstein Friesian herds.

The analysis was recently re-run using data from 2012 to 2016 in spring calving herds where EBI data were available on more than 70% of cows; at least 90% of the genetics of the herd had to be Holstein Friesian to remove any confounding of heterosis which is not captured in the EBI.

Based on these most recent years, a €1 change in herd EBI was associated with €1.96 net profit per cow; account was taken of the year, herd mean stocking rate and the level of concentrates fed per cow as well as using a standard A+B-C milk pricing system across the whole country.

This new and more recent-based analysis further supports the results from the Next Generation Herd that higher EBI equates to more profit.

Milk production

Research studies from Teagasc Moorepark have clearly shown that animals genetically divergent for calving interval subsequently have dramatically different fertility performance. However, no study has attempted to validate if genetic merit for milk production translates into a difference in milk production.

Data from more than 200,000 lactations on over 3,000 Irish dairy herds were collated over the years 2012 to 2014 (i.e. pre-quota) and the lactation yields and composition of each cow was compared to the respective genetic merit of the sire.

We expect a one-unit difference in sire genetic merit to translate into a one unit difference in cow performance in an unrestricted environment. The results of the analysis are in Table 1.

Access to Teagasc eProfit Monitor data provides a unique opportunity to validate if herd EBI translates into more profit per cow.

Table 1 shows that a one-unit increase in sire genetic merit for milk yield translates to just a 0.59kg increase in daughter milk yield across all parities; the associated increase was less in first parity animals.

The change in daughter performance for milk composition per respective change in sire genetic merit for milk composition was greater. These results are not unexpected.

Firstly, milk quota restricted the yields that could be achieved and thus the benefit of genetic improvement in milk production was not being fully realised on the average Irish farm.

This implies that there was (and probably still is) ample genetic merit for milk production in Irish dairy cows. The lower response in first-parity cows compared with older cows is simply an artefact of their respective stage of maturity.

Genetic evaluations are based on the national herd which is dominated by older cows. Mature cows yield 22% more than first-parity cows and so genetic improvement is more fully realised in older cows signifying the importance of survival in realising genetic gain.

This is substantiated by a lesser parity difference in milk composition.

Table 1: Mean increase (standard error) in performance per cow per one unit respective increase in sire genetic merit

	Milk (kg)	Fat (kg)	Protein (kg)	Fat (%)	Protein (%)
Average	0.59(0.01)	0.61(0.01)	0.48(0.01)	0.79(0.01)	0.73(0.01)
Parity 1	0.48(0.01)	0.45(0.01)	0.39(0.01)	0.73(0.01)	0.66(0.01)
Parity 2	0.67(0.01)	0.73(0.01)	0.56(0.01)	0.84(0.01)	0.80(0.01)
Parity 3	0.87(0.02)	0.98(0.02)	0.73(0.02)	0.89(0.01)	0.88(0.01)

Maintenance

The maintenance sub-index within the EBI is calculated from the carcase weight of slaughtered cull cows multiplied by an economic value of -€1.65.

A question that is often asked is: how do differences in maintenance sub-index translate to differences in cow liveweight? To answer this, 22,705 liveweight records from cows sold singly in livestock marts in 2016 were used.

Adjustments were made for the herd the cow originated from, as well as the parity of the cow, days since last calving, and the calendar month of the year.

The mean liveweight of cows within €10 brackets of maintenance sub-index is presented in Figure 1. Each €10 increase in cow maintenance sub-index was associated with 41.6kg lighter cow liveweight.

Similarly, each unit increase in cull cow weight genetic merit was associated with a 3.4 kg increase in liveweight. Assuming a kill-out of 45%, one would expect the latter value to be 2.2 kg.