



Beef Validation Guidelines on Applying Interbull Method II to Beef Evaluations

Introduction

The Interbull Centre, in collaboration with organisations participating in Interbeef evaluations, has investigated strategies for the validation of models in beef genetic evaluations, considering the structural differences between beef and dairy breeding systems (EURC Beef Validation Report, 2024).

Following recommendations from scientific advisors, the working group focused on adapting Interbull Method II to the beef cattle context. As reported in 2024, several criteria for selecting animals to be included in the validation test had been evaluated; however, a final decision on the criteria to be adopted had not yet been reached.

Update

Decision process for applying the Interbull Method II in beef

The alternative strategies were reviewed by the Interbeef Technical Committee at its meeting held on June 12, 2025. The Committee agreed on the following criteria to define the group of animals included in the validation test:

Animals must have progeny recorded in at least three consecutive years;

Animals must have at least three progeny per year;

Progeny must be represented in at least three herds per year.

The Interbeef Technical Committee recommended that the ICAR Beef Working Group (formerly the ICAR Interbeef Working Group) adopt this strategy. The recommendation was accepted at the ICAR Beef Working Group meeting held on November 11, 2025.

Guidelines

In parallel with the decision-making process, guidelines were prepared for publication. These guidelines (see Annex I) were also approved by the ICAR Beef Working Group at





its meeting held on November 11 2025, and have subsequently been submitted to the ICAR Board for final approval.

Next steps

While the adaptation of the Interbull Method II is complete, future refinements may be required if wider use reveals challenges with its applicability. Given the method's inherent limitations, the Interbull Centre is exploring alternative approaches, including the Linear Regression method (Legarra and Reverter, 2018) for beef cattle genetic evaluations, which will guide the next steps in this work.

References

Legarra A, Reverter A. Semi-parametric estimates of population accuracy and bias of predictions of breeding values and future phenotypes using the LR method. *Genet Sel Evol.* 2018 Nov 6;50(1):53. doi: 10.1186/s12711-018-0426-6. Erratum in: *Genet Sel Evol.* 2019 Nov 22;51(1):69. doi: 10.1186/s12711-019-0511-5. PMID: 30400768; PMCID: PMC6219059.

Annex I. Guidelines. Applying Interbull Method II to Beef Evaluations

Background

Genetic evaluations estimate the breeding value of the animals based on data from the individual, its relatives, or both. The accuracy of the estimates depends on the quality of the records and the models used for the evaluation. A major concern is the bias of the estimate, or, in other words, the difference between the animals' expected and actual breeding values. Biased breeding values can lead to incorrect selection decisions and inaccurate estimates of genetic trends, so detecting and removing bias are therefore crucial.

The methods used to detect and measure the bias in the genetic models are known as validation methods. Validation is a key point in international evaluations, where different data and models are received from several countries. Countries using models or data producing biased results can, over time, compromise the accuracy of international evaluations.

Since the 1990s, Interbull has developed and updated validation methods for dairy evaluations. No specific validation methods were yet available for the beef international evaluations due, among other things, to the relatively young age of the service, as the first official evaluations was launched in 2015. Recognising the need for validation and



the differences between the dairy and beef industries, adapting or developing specific validation methods for beef evaluations is a crucial step. To this end, the Interbeef Working Group and Interbull Centre have worked together to identify suitable methods for implementing a model validation for beef genetic evaluations. Their work led to adapting the Interbull validation Method II to beef evaluations.

The Interbull Method II should be applied at the national level before submitting data to the international evaluation. The results will be used to provide feedback to the National Genetics Evaluation Centres on the robustness of their genetic models and decide whether the data is suitable for inclusion in an international evaluation.

Interbull Method II

The Interbull Method II was initially developed for dairy cattle evaluation, focusing on the variation in daughter yield deviation (DYD) within individual bulls. The method can also examine the progeny yield deviation (PD) variation in beef cattle.

Objectives: To implement a standardised validation method (Interbull Method II) at the national level for beef genetic evaluations, ensuring that submitted data is unbiased and suitable for inclusion in international evaluations.

Validate data from countries participating in the Interbeef evaluation to determine their eligibility for inclusion. This process aims to improve the accuracy of the international evaluations.

Establish standardised validation methods for models at the country level, allowing countries to demonstrate that their evaluations are unbiased and meet international standards.

Responsibility: Countries calculating PD must use this method prior to submitting data to the Interbeef genetic evaluation.

Motivation: This approach assumes that PD is independent from environmental influences (Boichard et al., 1995), which allows for assessing whether yearly effects impact PD. The method investigates the non-genetic trend over the years, with deviations from zero indicating biases in the genetic trend estimation.

Data: The PD is calculated based on the most recent national genetic evaluation incorporated into international evaluations within a year. PD is determined for each observation by considering the breeding value of the dam and other influencing factors but excluding the progeny's breeding value, as follows:



$$PD = y - X\hat{b} - Z\hat{p} - \frac{1}{2}\hat{a}_{\text{dam}}$$

where:

y = observation of the progeny

$\hat{b}$ = the estimates of fixed effects

$\hat{p}$ = the estimates of non-genetic permanent effects

$\hat{a}_{\text{dam}}$ = the genetic value of the dam

The target bulls to include in the analysis should be A. I. bulls that following these criteria:

Have offspring in at least **three consecutive years**

Have at least **three progeny per year**

The progeny is present in at least **three herds per year**.

Action: The following model is used to analyse progeny individual deviations:

$$PD_{ij} = S_i + b \cdot j + e_{ij}$$

where:

PD_{ij} represents the progeny yield deviation for sire S_i in year j .

S_i is the sire i

b_j is the regression coefficient on year.

e_{ij} is the residual term.

The reference year ($j = 0$) corresponds to when the bull's first progenies are born.

Criterion: The value of b indicates the yearly trend for bulls. If b differs from zero, it suggests the presence of an environmental trend not accounted for in the model. To establish a straightforward pass/fail criterion, the absolute value of b ($|b|$) should not exceed 1% of the trait's genetic standard deviation.



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Remarks: If the b value is positive ($b > 0$), this may indicate that the genetic trend is being overestimated. Conversely, a negative b value ($b < 0$) suggests that the trend is underestimated.

Outcome: The validation process will follow specific criteria, such as population size and genetic diversity, ultimately resulting in a "yes/no" outcome.

Limitations: The estimation of PDs must be based on models that do not consider maternal effects. The test must be applied to at least 150 bulls that meet the requirements.

References

Boichard, D., B. Bonaiti, A. Barbat, and S. Mattalia. 1995. Three Methods to Validate the Estimation of Genetic Trend for Dairy Cattle. *Journal of Dairy Science* 78:431–437. doi:10.3168/jds.S0022-0302(95)76652-8