

Interbull new services: Current and Future

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Abstract

Interbull Centre has been closely working with several working groups on different topics spacing from the improvement of the MACE model to a revision of validation methods due to genomic pre-selection to expansion of the MACE and Interbeef portfolio to new traits. The activity of such working groups has progressed so nicely that the outcome of their research has been either recently implemented or it is aimed for an implementation in the near future (within one year's time). The present article aimed at providing the reader with an overall view of such activities and the related new services they have, or are going to, generate.

Key words: International Evaluations, Interbull, Interbeef, Validation, Genomic pre-selection, New traits

Introduction

Interbull Centre is the operational unit of Interbull, a permanent sub-committee of ICAR, located in Uppsala (Sweden) and represented by a team of 10 people between geneticists and IT. In reality, though, and thanks to the world wide network available through the Interbull community, the Interbull Centre team can count on a much larger resource availability represented by the different technical working groups whose members are part of either the steering or technical committees. Interbull Centre staff works closely with such working groups providing assistance on matters like data and infrastructure availability, feedback and guidance, when needed, so to assure a

smoother and timely transition of the different research areas into productions.

The activity, deliverables and/or implementations' plans for several Interbull activities as described in Fig. 1 has been reviewed in the present article.

Evaluation – Plans for a “GPS-MACE”

One of the main role for Interbull has been to provide international genetic (via MACE) and later on genomic (via GMACE, InterGenomics) evaluations to the different member countries so to facilitate the comparison of bulls' performances across countries and, in doing so, providing farmers with an independent tool to use for identifying the bulls that best would perform in their own specific environmental conditions. Over the years, however, and especially with the onset

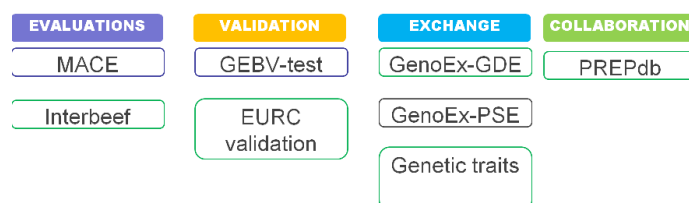


Figure 1. Graphic representation of the main activities delivered by Interbull Centre and the areas therein where new developments have been introduced.

of genomic selection, MACE international evaluations have changed their usability moving from a “comparison” tool to a way for countries to include foreign bulls’ information in their national genomic evaluation. The onset of genomic selection, and its related methodologies refinements, especially single step type of evaluations, posed two main needs: 1) to assure that national input to MACE evaluations would have been kept free of genomic data, so to avoid problems with double counting of information and increased bias, 2) start investigating ways to enhance the current MACE model making it able to better account with the accumulation of genomic pre-selection bias in the data.

Before genomic selection it was reasonably correct to consider the within- family pre-selection random in EBVs models. With the onset of genomic selection, though, this assumption could no longer be considered valid, as genomics made it possible to identify above average bulls, within a family, without any need for progeny testing. The accumulation of genomic pre-selection (GPS) directly associated with this behavior altered the distributions of breeding values for AI bulls (Sullivan et al. 2023).

An Interbull working group was established back in 2018 with the double aim of understanding better the nature and source of genomic pre-selection and work towards the implementation of a “Future” MACE (GPS-MACE) model. Several reports have been produced by the working group (Sullivan et al, 2019; Sullivan et al., 2022) with the latest being the presentation, during the Interbull technical workshop, which was held in Rome on February 2023, of a new MACE model and its possible impacts on the countries data (Strandén and Mäntysaari, 2023; Jibrila et al., 2023; Sullivan et al. 2023). Further refining of the new MACE model is planned during 2024 with the aim of carrying out the first GPS-MACE pilot run in the late fall of 2024.

Evaluations – Expanding Interbull Portfolio

The need for a clear procedure to follow for identifying new possible traits suitable to the MACE or other international evaluations, has been identified as an important strategic goal during the 2020-2023 Interbull Strategic meeting which was held in Uppsala in January 2020-

In 2021 a working group was appointed with the aim of defining a clear set of steps that could assure not only the identification of all the key decision’s factors for implementing of any new traits, but also could take into account the need for the required (new) infrastructure and methodology as well as the need for possible new business models, business plans and appropriate fee structure (Fig. 2).

Pivotal point of the new procedure is the usage of the latest database developed at Interbull Centre: the **Performance Recording**

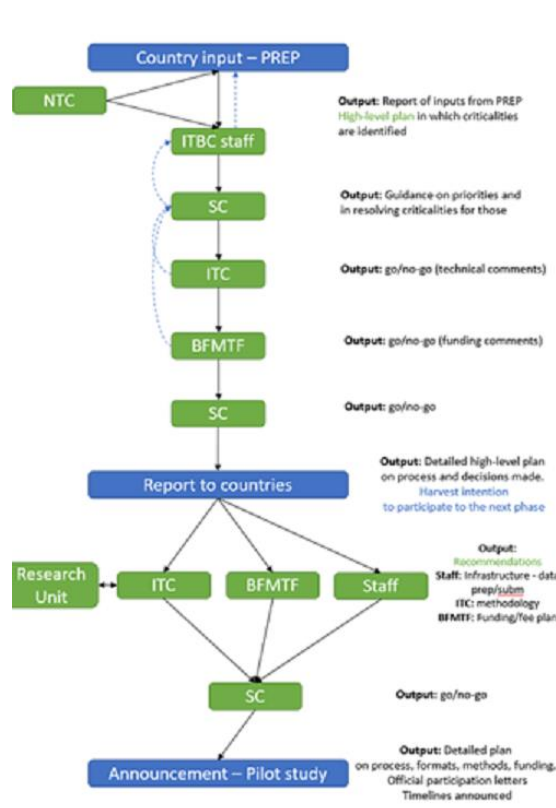


Figure 2. Interbull procedure for identification and inclusion of new traits

Evaluations and Publication (PREP) database. PREP is equipped with ad hoc electronic forms that users can fill in to provide Interbull Centre with the information on which traits available at national level they would like to see included in an international evaluation.

By reviewing the information since then collected (Fig. 3), the working group identified three initial traits which showed some potential: Retained placenta, Hypercalcaemia/milk fever and Gestation length.

The traits were further discussed at the Interbull technical workshop held in Rome on February 2023 where it came out how, while for the two fertility traits an international evaluation would have been considered useful the same was not entirely true for the trait gestation length which was by the majority of participants considered mostly a management tool rather than a selection trait (Haugaard et al, 2023). Figure 3 showed the amount of information collected in PREP for any new traits for which at least two countries had expressed a medium-to-high interest for an international evaluation. Two more trait groups stands out: feed efficiency and claw-health related traits.

The working group will further review all the information collected and will provide a recommendation on how to proceed to the steering committee in line with the new trait procedure as described in figure 2.

Evaluation - Expanding of Interbeef portfolio

The Interbeef portfolio, currently made of adjusted weaning weight and calving traits (including calving ease, both direct and maternal, and birth weight) has been recently expanded with the inclusion of carcass traits (carcass conformation, fat and weight). The new trait group will be estimated for all the Interbeef breeds, currently Aberdeen-Angus, Limousin, Charolais, Simmental and Hereford.

After few research and pilot runs, the results have been found satisfactory by both technical group and participating countries. The first official test run for carcass traits was performed in April 2023 and the first official routine evaluation has been performed in October 2023. (Macedo, 2023, Interbull 2023a)

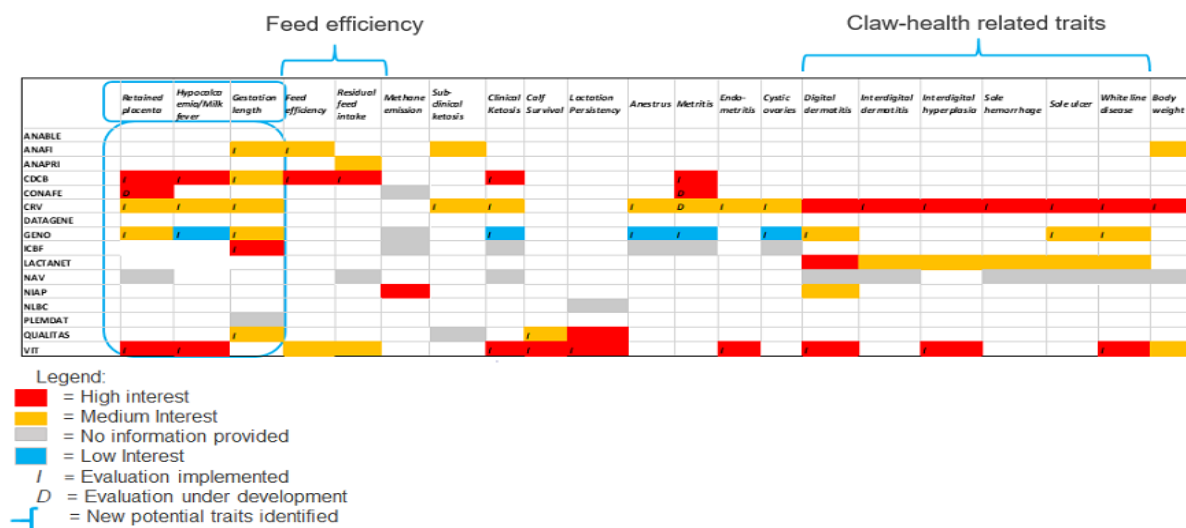


Figure 3. Overview of information on possible new traits to be considered for an international evaluation. Source: August 2023, Interbull PREP database (<https://prep.interbull.org/>)

Validation – Enhanced GEBV test software

Another Interbull core activity is represented by the validation of national statistical methods to assure that countries' estimates, which would then become inputs to the international evaluations, would be as unbiased as possible. Five validation methods have been developed by Interbull over the years: four dealing with conventional genetic models (trend tests I, II, III and Mendelian Sampling Variance test) and one specific for genomic models (GEBV-test). National genetic centres are requested to provide validation results a) when major changes have been introduced in their genetic/genomic models, b) when providing data for the first time for a given breed/trait evaluation, or c) when it has been more than two years since the last validation.

The fast development of genomic evaluations in many countries was the reason behind the creation of a validation working group whose aim is twofold: 1) revise the current version of the GEBV-test software as it was developed in the early stage of the genomic era when still very few countries had an evaluation for it and the amount of GPS bias was negligible, and 2) develop a new trend test III, looking at the random variation associated with new daughters' information, that could better cope with the even less number of proven bulls available.

The task of reviewing the current GEBV-test was assessed by the working group as a more urgent matter, therefore lots of activities and developments were carried out towards this aim. A presentation of an initial revised version of the program was given during the Interbull technical workshop in Rome were also feedback from countries, who had the possibility to test the software, were discussed (Sullivan, 2023; Liu et al, 2023; Mota et al., 2023; Jibrila and Eding, 2023). The version presented at the technical workshop was enhanced with several new features like: the possibility to make a base adjustment, so that the mean and variance of reduced-data

evaluations would match the base of expression of full-data evaluations; possibility to use different validation targets than the official one (represented by de-regressed EBV) like for example EBV from full-data evaluation or GEBV from full-data evaluation. The availability of different validation targets could be useful at national level to perform further testing.

In general, the enhanced software was well perceived by the people attending the workshop. Afterwards, the software was further enhanced providing information about the power of the test in case (like for small populations) the result would be inconclusive. The output of the software has also been improved by providing additional information that would be useful for the users should they wish to perform further testing on the data.

The software is currently under its final revision and testing, and it is expected to be rolled out in production as the official Interbull GEBV-test in 2024.

Validation – EU Reference Centre (EURC) Validation

Since 1996, Interbull Centre has taken up the role of EU Reference Laboratory. Starting from 1 November 2018, Interbull Centre has taken up its duties as the EU Reference Centre for Zootechnics, to ensure continuity in this field (EU Animal Breeding Regulation, 2016).

Under the umbrella of the EURC activities, Interbull Centre launched a new service in 2022: the EURC validation, aiming at providing validation of conventional genetic models to all European breeding organisations and/or national genetic centres, regardless of their involvement with Interbull's activities. The service covers all dairy breeds and will assist European countries in the process of harmonization of models applied while at the same time providing a “quality stamp” on conventional evaluation services as required by the current EU legislation for bulls advertised in the European market.

Exchange – Genetic Traits Data Exchange

Since 2019, Interbull Centre has been involved in the collection of several genetic traits, including recessive traits, identified as important for the Holstein breed by the World Holstein Friesian Federation (WHFF). The service aims at facilitating the exchange of such information in a timely manner as well as improving the resolution of any possible conflicting information that might arise. The exchange of genetic traits data is made possible via a dedicated module of the Interbull Data Exchange Area database (IDEA).

The information that can be shared is based on direct genetic test (direct genotyping) of a well-defined list of traits (Interbull, 2023b). The service provides several benefits to its users, such as:

- One common platform to share information with other organizations taking part in the service
- Sharing of important genetic information to make better breeding decisions, avoiding mating of carriers of recessive diseases or spreading of unwanted alleles in a population.
- As the service is an extension of IDEA pedigree, the consistency of the unique international animal ID is maintained across countries.
- Allowing access to a wider set of information and assuring a smoother and more timely exchange of genetic defects' information among participating organisations
- Drastically reduce the amount of conflicting information among countries
- Cost reduction by avoiding multiple genetic tests on the same animal for the same traits

The service, started for Holstein, has been recently expanded to share genetic traits data for the Brown Swiss breed as well.

Conclusions

Important improvements of the services offered by Interbull Centre have been either implemented or are planned to be implemented during the course of next year.

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