

Improving Quality of Results at the International Level : Critical Areas and Possible Solutions

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Abstract

International evaluations are becoming more and more important for genetic improvement and exchange of semen across countries. The assessment of their quality is therefore strategic for the entire international community.

Last February Interbull evaluation has enlightened some limitations in the actual system with respect to the evaluation of correctness of national and of international evaluation data. February release was considered irregular after one day of endless discussions between member countries on unexpected changes in national lists.

The international genetic evaluation reliability is under discussion and there is a big concern on how robust is the system. Methods to validate national evaluation were developed for production traits and they have never been updated to new traits, new models and new technical tools. The process of improvement of MACE itself, as the tool for international evaluation, is ongoing. At the same time there is a need for transparency especially with respect to the actual national and international routine evaluation. In addition to that, little work has been done in order to provide tools for final checks of international results before their official release and to describe details of changes in the results over time.

Introduction

The last official international genetic evaluation has seen for the first time the official release suspended after one day of comments and checks from many different participating countries. After hours of checks a problem was discovered in one of the national data files that passed unnoticed by all the standard controls run by Interbull.

This raised a lot of concern about quality of international evaluation and reliability of the entire system: standard procedures have shown several limitations that do need to be addressed by Interbull and all member countries.

Several improvements have been made since the beginning of the International evaluation service.

Programs to check sire variance were made available by Interbull. This year guidelines for national evaluation were published. New standard

checks and national proofs data files are in progress.

Methods actually in place to validate national proofs were developed for production traits back in 1994 (Bonaiti *et al.*, 1994). Although an audit group has been working in past years to develop a system of general validation for any national genetic evaluation system no further tools, nor methods were accepted for official validation of national data before their submission to Interbull.

Some of the methods actually used are not proper for traits other than production nor suitable with some of the new models, i.e. test-day, for the same production traits.

Questions are raised from time to time on the transparency of the entire computational process. Official documents illustrating the actual steps of the routine procedures, including details on setting of phantom groups for the different countries were never circulated among member organisations.

Several technical improvements were applied to Mace in order to enhance the accuracy of the results. Last update of the system defined proper weights of information used to compute national proofs instead of simple number of daughters (Fikse *et al.*, 1999).

Different research groups are now working on new approaches, beyond Mace, for the computation of International evaluations (Weigel *et al.*, 1999; Canavesi *et al.*, 2001).to define which organisation is responsible of the validation of the final Mace results before its official release. Would it be better to check at Interbull level or each national organisation should run its own checks before releasing official international proofs on its scale? The debate is still open.

The objective of this paper is to identify the critical areas concerning data quality in the actual routine system at national and international levels and propose possible improvement for each of them.

Quality of International Evaluations

The issue of quality in the process of International genetic evaluation involves different levels. Three items can be clearly identified although on many more of them a big debate can be open.

In this presentation we will cover the three areas of:

- a) quality of national data provided to Interbull;
- b) quality of the technical methodology used for international proof computation;
- c) quality of the results provided to the international community.

Quality of national data

The responsibility of providing correct data to Interbull is of each Member country providing data. At present each member is asked to run at least two out of three validation tests on genetic trend estimates. The three methods were developed for production traits evaluation systems in France in 1994 (Bonaiti *et al.*, 1994). Since then many different tools have been used to evaluate the goodness of fit of a genetic evaluation but non of them have been adopted

officially by Interbull. The three methods have been shown to be very weak for small populations (Biffani *et al.*, 2001) and not suitable for all traits and all models used in genetic evaluation at national level. Countries are required to redo the tests at each major change in genetic evaluation and also to test variation in sire variance estimates. Guidelines for national genetic evaluation have been published recently to help national evaluation system to improve constantly the methodology used for breeding values estimation.

Table 1 reports a summary of the application of the three methods up to date.

Table 1. Actual application of validation methods.

	Method			N. of populations
	I	II	III	
Production	21	17	15	26
Type	1	6	17	19
Udder	10	10	9	18

An audit group, whose objective was to develop a tool to check quality of national genetic evaluation systems is at work. At the moment no such tool is available. A new, promising tool for checks is Mendelian sampling, relatively easy to calculate in many situation to assess the quality of genetic evaluation (Gengler *et al.*, 2000; Miglior & Van Doormaal, 2000). It can be applied to all models and all traits. In the animal model situation mendelian sampling can be calculated as:

$$w_i = EBV_i - PA_i$$

where

w_i is mendelian sampling term of the i^{th} animal
 EBV_i is the estimated breeding value of the i^{th} animal
 PA_i is the parent average of the i^{th} animal.

Trend in mendelian sampling variance is expected to be close to zero.

Quality of the technical methodology

MACE (Multiple Across Country Evaluation) is the procedure used at the international level to compute international breeding values of bulls and

it was developed by Schaeffer in 1993 (Schaeffer & Zhang, 1993). Proofs computed at national level are provided to Interbull every four months and they are de-regressed and the model consider them as different traits in a multiple trait sire model. At the end of the process each country receives a list of all bulls evaluated on its own scale.

Over time the method has been improved but has been found highly sensitive to:

- changes in sire variance within country and over time;
- changes in genetic correlations;
- correctness of national proofs.

Last update of the system defined proper weights of information used to compute national proofs instead of considering simple number of daughters.

Anyway little transparency exists among all country members concerning details of the procedure used (i.e. phantom group setting, documentation of all the programs and parameters used). A clear procedure for adoption of technical improvements in MACE is not very well defined: in the past some changes were adopted very quickly, some others took years to be approved. It will be preferable to have a defined process for all technical improvement such as:

- 1) identification of the problem
- 2) simulation studies
- 3) development of feasible solutions
- 4) test run
- 5) adoption

An additional improvement would be to publish a complete documentation of all the programs run at Interbull with the complete details used for each country (i.e. phantom groups definitions).

Quality of the results provided

The increase in number of participating countries and in number of traits analysed has augmented the complexity of checks and the difficulty in explaining changes at national level. Interbull is the only level having complete information and

data and therefore the ability to explain variations in results and test quality of international evaluation.

Little documentation exists to explain in details what single countries have changed and what it is the effect of those changes in the evaluation. Moreover few details are given in describing movements in rank of single bulls or groups of bulls from one particular country into other countries lists.

In this area the following steps need to be defined:

- who is the institution responsible of the checks to assess the validity of international proof;
- the type and the amount of information that the international community needs to be able to explain the results to the public.

Our suggestion is that Interbull or the institutions actually running the international evaluation for specific traits should be responsible of checks because only those institutions have the necessary complete information. An alternative solution may be to set up a commission of experts for this strategic task. If wrong list are released as official, the reliability of the entire system is at stake and therefore the entire procedures of checks need to be clearly defined and documented.

Conclusions

February 2002 problem have shown limits of the actual system and this can have effect of the credibility of the international evaluation process. Steps were suggested in order to improve the total quality of the system such as:

- Mendelian sampling test;
- publications of official documentation of the MACE procedure;
- a more clear definition of responsibilities over final checks before data release.

All steps that would be required to improve all aspects linked to the total quality of the process cannot be postponed, and need official decisions soon.

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