

# PROduction Traits European Joint Evaluation (PROTEJE)

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## Abstract

International evaluations are becoming more and more important for genetic improvement and exchange of semen across countries. The current tool used for international genetic evaluation is a multiple across country evaluation (MACE) that makes use of genetic proofs computed in each of the participating countries as different traits. This technical tool has several limitations, the main one being that it allows comparison only among bulls, not among cows. To allow for international evaluation of bulls and cows one method presently under investigation is a Global Animal Model, which will use lactation or test-day data from each of the countries participating to the evaluation in a general multiple trait evaluation. An alternative procedure may consider to use pre-corrected records from each country, allowing a more precise estimation of all fixed effects, and the use of a simple multiple trait model for the evaluation of bulls and cows. The aim of this project is to verify the feasibility of this alternative approach using data from four countries: France, Germany, Italy and The Netherlands; and the work of five research units. Among the issues to be addressed are: proper weightings of pre-corrected records, structure of (co)variance matrix, pedigree file checks to avoid miscoding of cows moving from one country to another, and use of test-day records. The three year project will, if successful, lead to an alternative tool for international genetic evaluation of cows and bulls.

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## Introduction

The last official international genetic evaluation has seen 25 participating countries sending and receiving data from Interbull. The increasing number of participating countries shows the growing interest in international genetic evaluation. It is an important tool for genetic improvement programs and for exchange of semen across countries.

The current method used for international comparison among bulls was developed by Schaeffer in 1993 and it is known as Multiple Across Country Evaluation (MACE). Proofs computed at national level are provided to Interbull every four months and are de-regressed and used as different traits in a multiple trait sire model. At the end of the process each country obtains a list on its own scale of all bulls evaluated in any of the national levels.

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 and, moreover, correctness of national proofs. Last update of the system defined use of proper weights of information used to compute national proofs instead of simple number of daughters. In order to verify data quality, methods to check genetic trend of bulls were developed and these trends were required to be within set parameters for the data to be accepted internationally. One of the main limitations remains the fact that this process evaluates only bulls.

## A global animal model

In order to overcome bias derived from partial use of the information, resulting by simply using sire proofs, several attempts to run a global animal model using raw data (i.e. information on all cows within each population

and their related sires) have been made (Weigel et al., 1999).

While this alternative may seem very appealing it has several limitations. Simply putting together raw data from many different countries raises questions about the need of estimate genetic parameters for each of them. Following the theory behind the concept of borderless genetic evaluations it was suggested that differences among countries in some cases will be defined only by national borders not by real differences at the genetic level. Clustering of similar countries has thus been defined as the tool to simplify the computation in order to get a feasible animal model evaluation across countries. Concerns are high with regards to which will be the most appropriate variables to take into account to define clusters and how precise the final system will be in estimating particular effects into particular areas of each of the countries analysed.

In addition to this technical problem, a political concern is that a global animal model will mean no need for national genetic evaluations. It will be also extremely difficult to keep all countries involved up to date and involved in all the decisions taken with respect to: phantom group definitions, data editing, fixed effects definition and all other details that will need to be considered in order to get an unbiased genetic evaluation of all bulls and cows across the world.

### An alternative procedure

Assuming that national models, developed and improved over time by gathering expertise from all over the world, better account for specificities from each country (i.e. population structure, trait mean and variability, breeding schemes, data recording etc..) is there any way we can run a genetic evaluation for bulls and cows preserving entirely this know how?

The alternative approach envisioned in the present project is to base the international evaluation on pre-corrected records obtained from national evaluation (i.e. lactations or, in the future, test-day records adjusted for all fixed effects estimated in national evaluations). Because production systems, management and data collection conditions vary across countries, it seems unrealistic to include the same long list of fixed

effects in an international evaluation, or to select a subset of those fixed effects.

A huge correlation matrix will still be a problem to be faced. Clustering is just one of the options. An alternative procedure may consider deriving a reduced ranked genetic correlation matrix. This approach would alleviate computational and statistical difficulties without the important draw backs of clustering.

### The goal of the project

In order to clarify the goal of the project Figures 1 to 3 show the current system (Figure 1), the proposed Global Animal Model (GAM) option (Figure 2) and the present proposal (PROTEJE) (Figure 3).

Figure 1. Current genetic evaluation procedures (national + MACE).

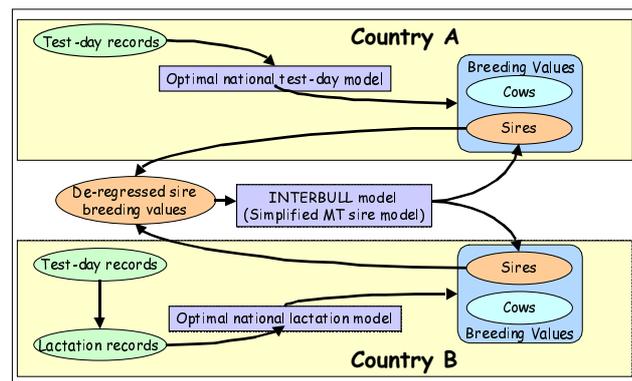


Figure 2. Proposed GAM procedure.

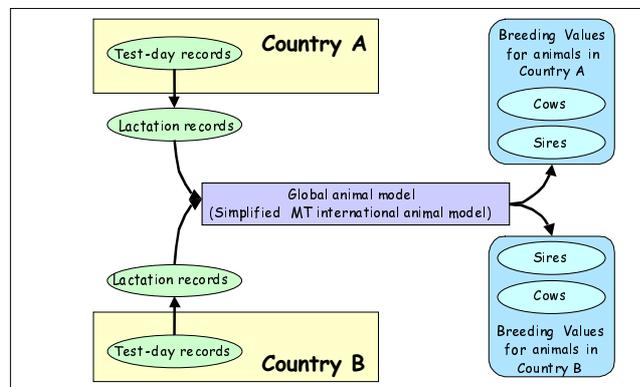
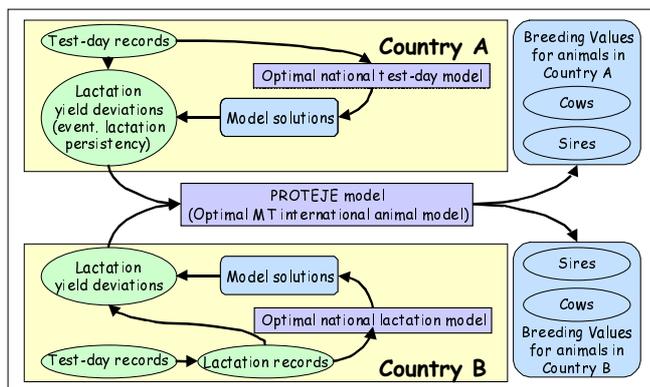


Figure 3. Proposed PROTEJE procedure.



Pre-corrected records or yield deviations sent to international level will contain only additive genetic and residual effects, i.e. only random effect will be re-estimated at the international level (Ducrocq et al., 2001). This approach will preserve entirely the knowledge and the data quality control at the national level. In practice this will imply:

1. the design and study of pre-correction steps for all fixed effects at the national level;
2. the design and study of the use of pre-corrected data into international genetic evaluations;
3. the estimation of a reduced rank matrix of genetic correlations based on pre-corrected records;
4. the comparison of this approach with national and international evaluation results.

## Project plan

Data from four countries have been collected to verify the feasibility of the alternative procedure. A joint technical group including project coordinators within each country and researchers discuss all technical details and results.

Questions to be addressed will be, among others:

- definition of phantom groups to incorporate at best information from daughters of imported bulls;
- computation of YD and its accuracy based on adjustments at the national level;
- estimation of genetic parameters and joint evaluation;
- expansion of the approach into incorporating test-day model applications.

## References

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