International Genetic Evaluations
the French Perspective


(1) laurent.journaux@unceia.fr
UNCEIA, 149 rue de Bercy, 75595, Paris Cedex 12, France
(2) MIDATEST, Les Nauzes, 81580 Soual, France
(3) BGS, 149 rue de Bercy, 75595, Paris Cedex 12, France
(4) Gènes Diffusion, 3595 Route de Tournai - BP 70023, 59501 Douai Cedex, France
(5) UMO TEST, BP 2 - Les Soudanières, 01250 Ceyzeriat, France
(6) AMELIS, Saint Manvieu, BP 30281, 14653 Carpiquet, France
(7) DYNAMIS, 86 rue de la République, 76000 Rouen, France
(8) Simmental France, 23 route de Munster, 68140 Gunsbach, France
(9) Jura Bétail, 39570 Crancot, France
(10) CREAVIA, 69 rue de la Motte Brûlon - BP 80225, 35702 Rennes Cedex 7, France

Summary

French Breeding companies are very pleased with the work of breeding value comparisons carried out by Interbull. However they regret that the proof distribution phase in each country obeys rules that are so unlike each other that they are not comparable and often work to the disadvantage of foreign sires. On the beef side (Interbeef project) they hope for an international assessment service per breed. With the development of genomic selection, the Breeding companies reassert that Interbull must continue to produce unbiased breeding values from phenotypic data in order to maintain populations of international benchmark animals and must invest in evaluations combining genomic evaluations. Very recently Interbull provided validation procedures for genomic indexing of the different countries which had been impatiently awaited. Now we must see that they are implemented at grass roots level. The French Breeding companies think that support to some international breeds to construct their genomic selection tool or the implementation of a genotyping platform are the concern of special service provisions which must not slow down the implementation of priority actions.

Introduction

Since 1995, and the first international proof comparisons in the Holstein breed, Interbull has become an essential authority for the comparison of the breeding values of breeding bulls evaluated in different countries. France participates regularly in genetic evaluation in the Holstein and Simmental breeds (with the Simmental and Montbéliarde breeds) and the Brown Swiss breed. It actively participates in the Steering Committee, in the Scientific Advisory Committee and in the business meeting via its fundamental and applied research structures and its representatives in the artificial insemination sector.

In addition France has made enormous investments in genomic selection and marker-aided selection in dairy cattle. Moreover it has been a mainspring of Eurogenomics to reinforce the size of its benchmark population and that of its partners.

With the appearance of genomic selection and the growth of international trade, the French Breeding companies have given thought to the present and future positioning of Interbull. It is these thoughts which are
reported here, giving consideration to the international evaluations themselves and to the changes engendered by the appearance of genomic selection.

**Interbull contributions to international evaluations and points to be improved**

Interbull’s main contribution is as a neutral body making objective comparisons of the breeding values of sires by combining data from a maximum of countries. This comparison is made with a concern to provide maximum accuracy, in particular checking the validity upstream of the evaluations of each of the countries presenting data. The mobilization of a large number of countries (Mattalia and Minery, 2006a) has also vastly improved the validation of the Interbull evaluation results.

On the one hand, the number of available traits has increased, in particular by integrating the functional traits. Nevertheless, differences in the definition of traits such as fertility harm the comparability of the proofs between sires from different countries (Minery et al., 2008). What is more, even though the number of traits is very high in the Holstein breed, we regret that morphology traits are not the subject of an international evaluation in the Simmental breed in spite of regularly repeated demands for this.

On the other hand, the weakness of the present system lies in the publication rules at the level of each country. They are very different from one country to another and only very rarely provide good visibility of the range of foreign sires, as underlined three years ago by the Institut de l’Elevage team (Mattalia and Minery 2006b). Improvements have been proposed that give a better description of the procedures implemented in each country. But these measures do not yet seem sufficient. The latest studies carried out in France (Minery, personal communication, 2009) confirm that the publication rules of some countries still impose very strict limits on the appearance of foreign bulls in their prize-winners list as shown in table 1 for the best French sires.

**Table 1. Appearance in foreign prize-winner lists of the 20 best French Holstein bulls on the French total merit index “ISU” (Interbull, August 2009).**

<table>
<thead>
<tr>
<th>taureau</th>
<th>père</th>
<th>raison et eitr (ou génomique)</th>
<th>USA TPJ 1000 (bayerbul.com)</th>
<th>TA PFT 100 (bayerbul.com)</th>
<th>RDL NIV (110 taureaux)</th>
<th>DEU RZG (110 taureaux)</th>
<th>ORHS Index (110 taureaux)</th>
<th>CAN UPI 500 (110 taureaux)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VIA FILHO</td>
<td>O-MANJUT 2004</td>
<td>90 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VAMO</td>
<td>O-MANJUT 2004</td>
<td>77 (ed 80)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>USONIE FIN</td>
<td>FINLEY 2009</td>
<td>90 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VAUCLOSE</td>
<td>O-MANJUT 2004</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>REVIVEN</td>
<td>JOGGO BSN 2000</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>TUPPAC</td>
<td>FORD 2002</td>
<td>91 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>ROUMARE</td>
<td>JOGGO BSN 2000</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>SAVER</td>
<td>JOGGO BSN 2001</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VUCAIR</td>
<td>O-MANJUT 2004</td>
<td>75 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VOSAC MAN</td>
<td>O-MANJUT 2004</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VOLEN MAN</td>
<td>O-MANJUT 2004</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>TEUFUR</td>
<td>DUCKY BOY 2002</td>
<td>88 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VOLCAIN OK</td>
<td>OISEN 2004</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>STOL JOC</td>
<td>JOGGO BSN 2001</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VISIEUR</td>
<td>O-MANJUT 2004</td>
<td>76 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VELD MAN</td>
<td>O-MANJUT 2004</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>URBIELL</td>
<td>GARTER 2002</td>
<td>90 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>SOUR</td>
<td>JOGGO BSN 2001</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VOULIER</td>
<td>O-MANJUT 2004</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>SIBER</td>
<td>DONOR 2001</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>TROTSKY GP</td>
<td>TRENT 2002</td>
<td>90 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>VOLANI MAN</td>
<td>O-MANJUT 2004</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>THORBY</td>
<td>JESTER 2002</td>
<td>80 (ed 70)</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

85
The French industry is militating for greater transparency. The post treatment rules of Interbull proofs must be clearly described and known by all. The publication rules for the proofs of foreign bulls must as far as possible be harmonised between countries. They should be based more on the clauses of minimum level of accuracy necessary for importing the semen of these bulls than on national publication rules. All sires with official proofs in a given country should be accessible from the website of the organisation in charge of publishing the proofs.

If it proves impossible to implement such provisions for the publication of each country’s proofs, it would seem right and proper to study a centralised system of proof publication in the databases of each country. This evolution in the Interbull positioning is fully justified if it is wished to implement publications using the CMACE approach proposed by Liu. This makes it possible to classify sires on the scale of a country which does not participate in Interbull by as far as possible combining sire proofs on the different national scales of participating countries.

Finally, during the past 5 years France has widely contributed, financially and by the methodological contribution of the INRA, to the development of international genetic evaluations in beef from untreated performances (Venot et al., 2009). It is interesting to note that the investment in these new evaluations has been the opportunity for dairy cattle to benefit from improvement in the management databases of pedigrees and from the information exchange system (Interbull, 2009a). The standardisation of these pedigree data has made an important contribution to easing their exchange between countries.

The French Breeding companies hope that this work will culminate in an international breed indexing which integrates the information provided by cross-bred products. It is also hoped that this evaluation will soon be centred on the largest possible number of traits.

Requests from French breeding companies to Interbull in the context of genomic selection

In the context of genomic selection, Interbull plays an essential role: to calculate purely polygenic proofs to make it possible to maintain multi-country benchmark populations. In this context it is indispensable for Interbull to make investments to develop the present calculation of the MACE and integrate the short-listing of males on genomic information, which is a source of serious biases (Patry and Ducrocq, 2009), relying on methodologies which are beginning to be proposed (Ducrocq and Liu, 2009) or to be specifically developed.

After nearly a year of work, in February 2010 Interbull provided a method for validating the calculations of genomic proofs (Interbull, 2010). This tool is indispensable to allow international recognition of the different evaluation systems that exist. The validation results for the first countries are expected in the next few weeks. In spite of everything, additional developments are necessary to refine the validation criteria.

A genetic evaluation combining all available sources of information (genotyping and phenotypes) also seems indispensable, in particular for countries that are only users of Interbull proofs. Here too, the selected method will have to be chosen with care and France will be very attentive to the preliminary results of the tests of the GMACE approach (Sullivan and Van Raden, 2009).

Interbull gave a positive response to the request from the European Federation for the Brown Swiss Breed who wanted help in constructing a benchmark population of a sufficient size combining information from several countries whose size did not allow them individually to access a reliable genomic evaluation (Interbull, 2009a). Recently, the USA decided to adopt this project. This new service, called Intergenomics, consists in a first stage of calculating the genomic component of bulls from a common benchmark population of about 3,000 individuals. In a second stage, each country combines this genomic
component with polygenic information at their
disposal. This new Interbull approach
validated by its steering committee, while
beneficial to the Brown Swiss breed, poses
other questions: must Interbull, on its own
strengths, invest in genomic research? If so, to
what level? Are these new missions not carried
out to the detriment of the certification mission
of genomic evaluation methods and other
priority missions of Interbull?

Finally, Interbull’s proposal to offer the
 provision of a genotyping exchange platform
(Interbull, 2009b) are more the concern of a
specific service provision than of the core
mission of INTERBULL, even if it can greatly
contribute to easing and standardizing
exchanges of information.

Conclusion

Over the past fifteen years, Interbull has been a
wonderful tool for the development of
international exchanges of dairy semen on the
basis of objective comparisons of breeding
values. It is indispensable to maintain this tool,
whilst adapting it to the needs of genomic
selection. The French genetic improvement
sector will support Interbull’s activity in this
dimension of furthering objective competition
between countries.

References

Ducroc, V. & Liu, Z. 2009. Combining
genomic and classical information in
national BLUP evaluations. Interbull
Bulletin 40, 172-177.
Interbull, 2009a. Interbull centre activity report
Interbull, 2009b. Interbull provisional
strategic plan, 26th October 2009, 9 pages.
Interbull, 2010. Interbull validation test for
Genomic evaluations – GEBV test, 4
pages.
experience in routine validation of Interbull
evaluations. Proceedings of the 2006
INTERBULL Technical Workshop
Wageningen, The Netherlands March 2-3,
arising with official publication of Interbull
proofs, Kuopio, business meeting, June
2006, 4 pages.
Use of national and international EBVs of
fertility in total merit index. Proceedings of
the INTERBULL meeting, Niagara Falls,
USA, June 16-19, 2008. Interbull Bulletin
38, 113-118. ISSN 1011-6079.
Patry, C. & Ducrocq, V. 2009. Evidence of a
bias in genetic evaluation due to genomic
selection. Proceedings of the 2009,
INTERBULL meeting, Barcelona, Spain,
August 2 1-24, 2009. Interbull Bulletin 40,
167-171. ISSN 1011-6079.
Sullivan, P.G. & VanRaden, P.M. 2009.
Development of genomic GMACE.
Proceedings of the 2009, INTERBULL
meeting, Barcelona, Spain, August 2 1-24,
2009. Interbull Bulletin 40, 157-161. ISSN
1011-6079.
Venot, E., Fouilloux, M.N., Forabosco, F.,
Fogh, A., Pabiou, T., Moore, K., Eriksson,
Interbeef genetic evaluation of Charolais
and Limousine weaning weights.
Proceedings of the 2009, INTERBULL
meeting, Barcelona, Spain, August 21-24,
2009. Interbull Bulletin 40, 61-67. ISSN
1011-6079.