INTERBULL

International Bull Evaluation Service

Status and perspectives on international genetic evaluations with respect to Interbull activities and international co-operations

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Role

The International Bull Evaluation Service (Interbull) is a permanent sub-committee of the International Committee for Animal Recording (ICAR) and, as a non-profit organisation, responsible for promoting the development and execution of international genetic evaluations for cattle.

Interbull achieves its goals through co-ordinating international communication and research efforts, and providing a number of services to participating countries through the activities of the Interbull Centre in Uppsala, Sweden.

History

Interbull was developed in 1983 as a joint venture between ICAR, the European Association for Animal Production (EAAP) and the International Dairy Federation (IDF). At that time, increasing trade in semen and livestock had led naturally towards breeders wanting to make accurate comparisons between animals, primarily bulls, performing both within and across countries. However, these comparisons were made difficult by:

- differences in genetic evaluation methods;
- differences in breeding objectives;
- differences in genetic levels;
- differences in farming environment.

Since then, the international exchange of information provided by Interbull has helped member countries to develop more effective methods for genetic evaluation of cattle.

Interbull became a permanent sub-committee of ICAR in 1988, supported by its parent organisations EAAP and IDF, and also the FAO. Following a call for tender the Interbull Centre was established in 1991 under contract with the Swedish University of Agricultural Sciences in Uppsala, Sweden, and with financial support from the Swedish Farmers' union, the dairy industry and the Swedish Agricultural Board.

The first routine international genetic evaluation took place in August 1994 and included milk production data from the Nordic countries for the Holstein and Ayrshire breed groups. Half a year later the second Interbull evaluation was conducted including milk production data from nine countries.

In 1996 the European Union (EU) appointed the Interbull Centre as the community reference laboratory for bovine evaluations.

Benefits

Interbull currently provides four major benefits to its member countries:

1. **International Communication**

   A major benefit of Interbull membership is the exchange of information with other member countries. Interbull co-ordinates this international communication through

the use of meetings, workshops, surveys, presentations, publications and its web-site www.interbull.org. Interbull annually organizes an international seminar for exchange of research results and experiences among industry representatives and scientists in the area of genetic evaluation of dairy cattle. Proceedings of these meetings are published in the Interbull Bulletin series.

2. **International Research & Development**

   The Interbull Centre provides international leadership in researching and developing methods for generating international genetic evaluations. It achieves this through co-ordinating and reviewing research done in member countries, as well as running its own research program.

3. **International Genetic Evaluation Service**

   The international genetic evaluation service provided by the Interbull Centre calculates international genetic evaluations for most of the economically important traits in dairy cattle. Over 25 countries currently subscribe to this service.

4. **International Technical Support**

   Interbull provides member countries with advice and assistance on all matters relating to the genetic evaluation of cattle. This includes guidance for countries developing joint evaluation or recording schemes, and recommended codes of practice for national evaluation systems.

Through the benefits of combining research and information from around the world, Interbull contributes to the greater genetic progress for all its member countries.

Participating countries receive the benefits of Interbull through payment of annual membership fees. Additional service fees are charged by the Interbull Centre for countries subscribing to the international genetic evaluation service.

International Genetic Evaluation Service

International genetic evaluations are across-country measures of genetic merit of dairy bulls for individual traits. In 2007, the international genetic evaluation service provided by the Interbull Centre evaluated sires of 6 breed groups (Brown Swiss, Guernsey, Holstein, Jersey, Red Dairy Cattle and Simmental) and 6 trait groups (milk production, udder health, conformation, longevity, calving and female fertility traits) (see Table 1). Other traits will be included in the future. A considerable number of bulls is evaluated in this system (see Table 2).

Interbull uses a scientifically advanced method commonly known as Multiple Across Country Evaluation (MACE) to calculate international genetic evaluations. MACE has two major advantages over other methods:

1. **Use of all known relationships among animals**

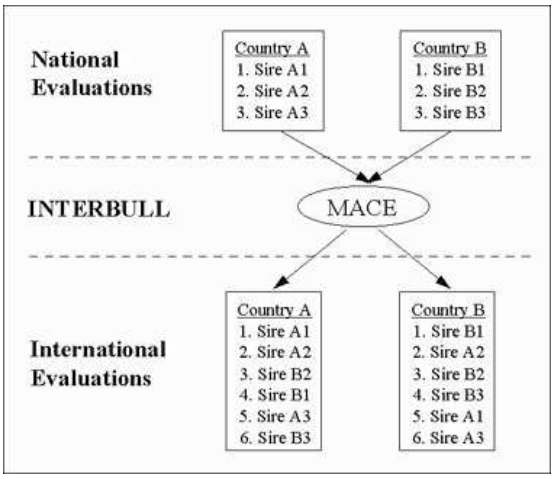
   MACE combines information from each country using all known relationships among animals, both within and across populations.

2. **Genotype by environment interactions**

   MACE accounts for the possibility of animals re-ranking between certain countries. This occurs when animals perform better in certain environments than they do in others or when genetic

evaluation methods differ between countries. For this reason, a separate set of results is calculated for every participating country. This process is demonstrated in the figure below.

Separate lists of international genetic evaluations for all traits and sires are provided to each member country.



The figure shows that the international genetic evaluations calculated for sires from countries A and B (and their subsequent ranking's) can be different from one country to the next.

Evaluations are expressed in each country's own units and relative to that country's base group of animals.

This provides the advantage of individual countries being able to identify those animals from around the world that will perform best under their own unique farming conditions.

In 2006 it was decided to reduce the number of routine runs from four to three with release dates in January, April and August. The new evaluation schedule will be put in effect after the August 2007 routine evaluation.

Structure

Interbull is managed by an ICAR appointed **Steering Committee**, consisting of 9 members from different countries. The objectives for the Steering Committee are to set strategy, priorities, work plans and budget for Interbull.

Since 2003 the SC is supported by two expert groups: the **Scientific Advisory Committee** (SAC) and the **Interbull Technical Committee** (ITC). The objective of the SAC is to propose methodological developments that are needed to ensure the strategic direction, scientific soundness, and long-term progress of the Interbull services. The objectives of the ITC are to identify and review technical issues that may be essential for providing a high quality service to countries participating in the international genetic evaluations.

Interbull Business Meetings are held regularly (once per year) with the purpose to report on the activities of the Interbull Centre, present decisions of the Steering Committee including budget, and to provide member organizations with a forum for discussion of Interbull services, present and desired. Conclusions and recommendations of the Interbull Business Meeting are brought to the Steering Committee for decision.

Interbull Centre is the operational unit of Interbull. The Interbull Centre provides a number of user-paid services to member countries. In 2007, Interbull had 42 member countries and more countries are likely to join in the future.

Current Issues and Developments

As outlined Interbull has reached a high level of cooperation between parties involved in exchange of genetic material. The number of traits is large and provides possibilities to effectively select among the best animals from around the world. However, for many recently added traits the properties to compare across countries are not as good as for milk production traits or linear type traits, which are well harmonised. With low correlations between traits in different countries the value of MACE results is sometimes questioned, because on the foreign lists animals do not rank in top positions. Yet MACE is a better alternative for predicting international breeding values than conversion equations or the use home country rankings (Table 3). Harmonisation of trait definition, data collection and national evaluation procedures are the key elements to improve the genetic correlations and thus make more useful rankings across countries.

From industry side it is sometimes questioned, that separate lists for each country participating in MACE is the optimum. In this light projects like Proteje (Production Traits European Joint Evaluation) or a joint project between Germany and France (VIT – INRA) aims for better comparisons across countries. So far the research has shown, that just merging the raw data can have limitations, when specific situations from indvidual countries cannot be handled by a more general model that is needed when analysing this data jointly.

However, there is a tendency that - mainly for efficiency reasons – countries merge evaluation populations. Examples are the joint Nordic evaluation between Denmark, Finland and Sweden and also between Austria, Germany and Luxemburg for Holstein data. If the data collection is well harmonised, all environmental factors are properly accounted for this is a method to have a good comparisons within these populations, because all animals (cows and bulls) are directly compared on one scale. Another tendency is that evaluation software is shared with other countries, e.g. the Survival Kit for longevity evaluations. This eliminates another source for genetic correlations among countries less than unity, which is due to genotype by genetic evaluation procedure interactions.

Recent Interbull meetings highlighted the problem of different publication policies in the various countries. The observation that domestic top bulls are absent on foreign scales due to publication policies leads to distrust in Interbull evaluations. Especially differences in edits e.g. on reliability figures used for official publication of foreign and domestic bulls has to be harmonised by the Interbull community. As a first step Interbull conducted a survey among member organizations to increase transparency of publication policies; results of this survey will be presented at the next Interbull meeting and on the web-site of Interbull.

Industry Workshop in Madison

In 2006 it has been decided by the Interbull Steering Committee that the communication with the end users of Interbull evaluations should be intensified. For that reason Interbull organizes a workshop in conjunction with the World Dairy Expo in Madison. The target group are individuals employed by AI studs and breeding organisations, that work with Interbull figures in their selection schemes. People are invited to attend this workshop that will take place on October, 4 in Madison, Wisconsin.

For further Information on Interbull matters see:

http://www.interbull.org

Table 1. Number of populations participating in the routine Interbull evaluation of February 2007.

Breed group	Produc-tion	Confor-mation	Udder health	Longevity	Calving	Female fertility
Brown Swiss	9	7	8	6	4	-
Guernsey	6	4	5	5	-	-
Holstein	24	20	23	19	12	11
Jersey	10	9	8	7	-	-
Red Dairy Cattle	10	8	10	9	5	-
Simmental	10	-	8	2	-	-
Total	69	48	62	48	21	11

Table 2. Number of bulls in pedigree database and bulls with publishable breeding values for production by breed group (February 2007).

	Pedigree database	Publishable breeding value for production
Brown Swiss	59 131	7 249
Guernsey	2 315	892
Holstein	226 357	95 629
Jersey	19 448	7562
Red Dairy Cattle	29 703	10 945
Simmental	33 816	19 980

Table 3. Correlation between Interbull and home country breeding values with the Dutch national breeding value.

	No. bulls	Udder		Feet&Legs		Final Score	
		ITB	Home	ITB	Home	ITB	Home
Canada	28	0.82	0.71	0.75	0.49	0.93	0.80
France	30	0.78	0.75	0.77	0.45	0.74	0.65
Italy	21	0.74	0.67	0.75	0.71	0.82	0.85
US	74	0.84	0.76	0.74	0.63	0.82	0.66

Source: Van der Linde and Nooijen. 2004