

Preliminary Report of the Survey on Genetic Evaluation Procedures for Dairy Production Traits in the Interbull / ICAR Member Countries

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Abstract

The latest survey on the national genetic evaluation procedures for dairy production traits practiced in the INTERBULL member countries, published in 1992, has been widely used. However, evaluation procedures are constantly changing and the demand for an update has been enormous. This prompted Interbull to undertake the task of conducting a new survey. This paper reports the preliminary results of the survey which started in April 1999 and is supposed to be finished by late fall 1999.

Introduction

Since 1988 the International Bull Evaluation Service (Interbull) has published several surveys on genetic evaluation procedures practiced in its member countries. These were published as:

- 1) Interbull Bulletin No. 3, 1988, for dairy production traits;
- 2) Interbull Bulletin No. 5, 1992, for dairy production traits;
- 3) Interbull Bulletin No. 6, 1992, for non-production, growth & beef production traits; and;
- 4) Interbull Bulletin No. 13, 1996, for non-dairy-production and growth & beef production traits.

Because of the enormous amount of changes that have taken place in the genetic evaluation programs in various countries in recent years much of the information contents of the previous surveys have become obsolete and a new survey seems to be both necessary and of immediate interest. Therefore, the Interbull Centre has decided to conduct a new survey on “Genetic evaluation procedures for dairy production traits practiced in various countries”. The final results are expected to be published as an Interbull Bulletin, 1999. Similar surveys on other traits

are also planned for near future. Obviously, such an undertaking would have not been successful without the kind co-operation of the responsible organizations in the Interbull member countries. This paper reports the preliminary results obtained from this survey.

Data collection

In late April 1999, a questionnaire in the form of a blank table, which will be used in the final presentation of the results, and a rather detailed list of guidelines on how to respond to the questionnaire were sent to ICAR / INTERBULL member countries. Table 1 summarizes the initial response.

Table 1. Initial response to the survey

Number of member countries	41
Number of organizations	51
Number of countries not responding*	12
Number of responses	34
Countries with multiple responses	3
Traits	Milk yield
	Fat yield
	Protein yield
	Fat %
	Protein %

*More responses are expected soon.

There are three countries (DEU, ITA, and CHE), each of which have two or three organizations responsible for different breeds.

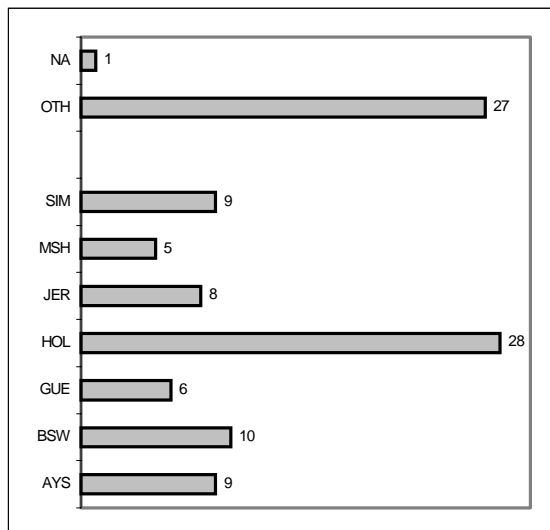
5 countries require only 45 days in milk or even less for inclusion of a record.

Results

The preliminary results of the survey are presented here in form of a series of histograms or tables. Some times the required information was not provided by the responding organization / country. These are counted as NEI (=Not Enough Information). And some times the question was not relevant to some organizations / countries. These are counted as NA (=Not Applicable).

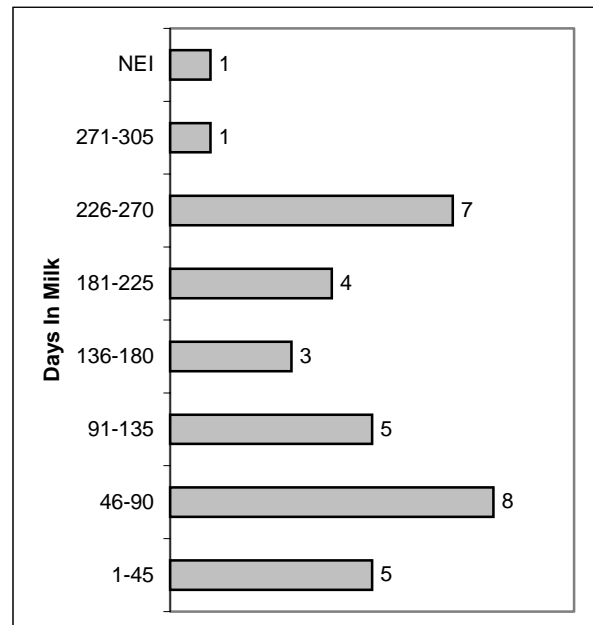
Breeds / Populations

Many countries reported that they have several breeds included in their evaluation, though, in majority of countries evaluations are conducted within breeds. The breeds represented as OTH are local breeds, or variants (e.g. crosses, etc.) of other breeds. Holstein type breed is the dominating breed in the world.

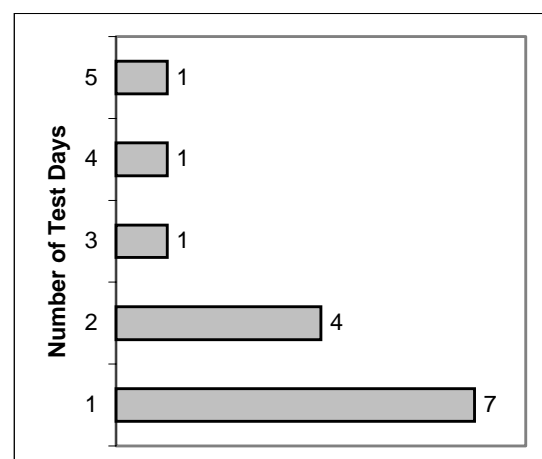


Inclusion of records

Minimum required days in milk for inclusion of a record in evaluation shows a lot of variation depending on the organization/country and/or lactation number. Later lactations often must fulfill more stringent criteria. Noteworthy is that



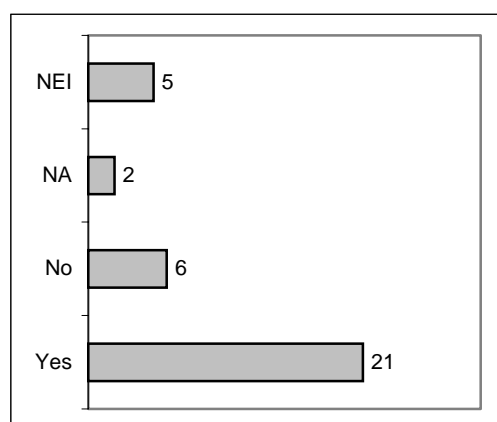
A number of countries use the number of test days as the criterion to include the record in the evaluations. Again here there seems to exist a tendency to accept 1 or 2 test days as enough information for inclusion of a record in the analyses.



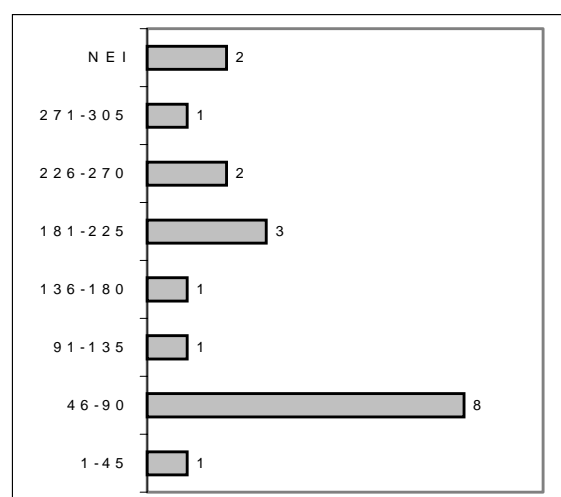
Extension of records

This is a very sensitive issue for a number of reasons and there is a lot of differences on how

part lactations are treated in different organizations /countries.



For 2 organizations/countries, conducting a test-day model analysis, this question is irrelevant and there is not enough information from 5 others. However, one must not think that the 21 countries answering YES are using the same extension method. Here again the minimum required days in milk for the record to be extended or not shows much variation.

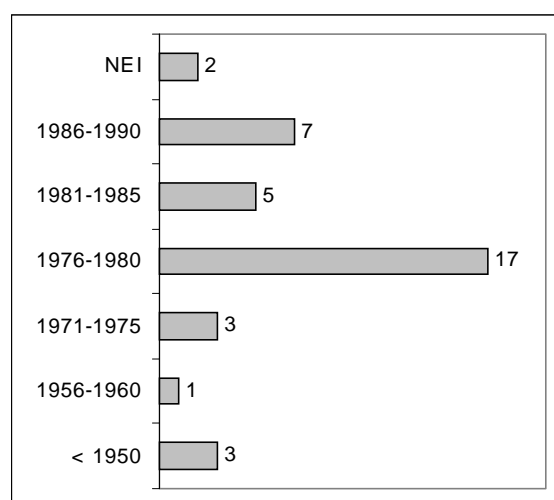


However, there is only one country extending a record that is 45 days or shorter.

Time period for data inclusion

There is a wide range of time periods for inclusion of data in the analyses depending on

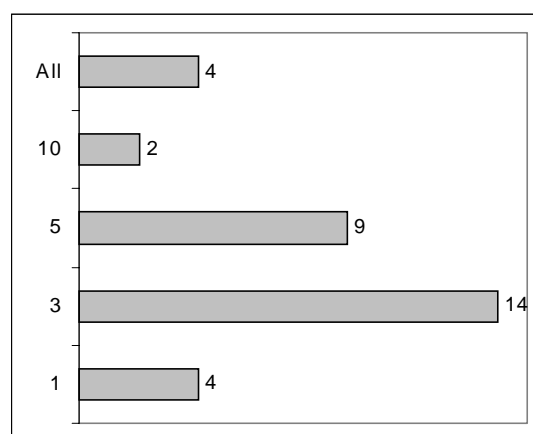
the purpose of data. For pedigree purposes time period is understandably longer.



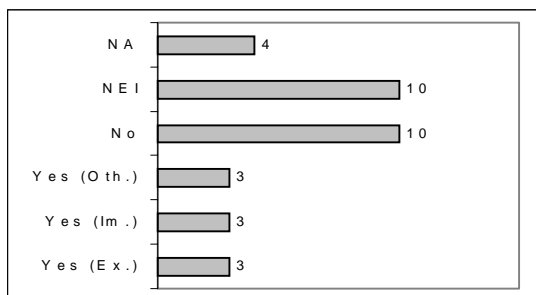
The lower range of values, less than 1950 to 1960, belong to a few countries with long history.

Number of lactations and their weightings

Number of lactations and how these are treated is yet another important source of difference between organizations/countries.



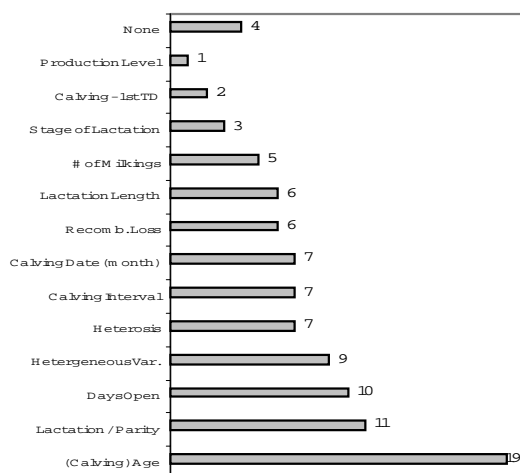
Despite the large difference between 1 and 10 or All lactations, it seems that many countries are settling somewhere between 3 and 5 lactations. Different lactations are treated differently in different countries, as can be seen in the next figure.



There are only three organization/ countries that explicitly have some kind of weighting factor for different lactations. However, three more organizations / countries implicitly give different weights to different lactations by dividing the first lactation into several periods or treating later lactations in one single group. Furthermore, in three other organizations / countries lactations are weighted based on other factors, such as number of milkings per day and so on. The information on weighting factors from 10 countries is missing.

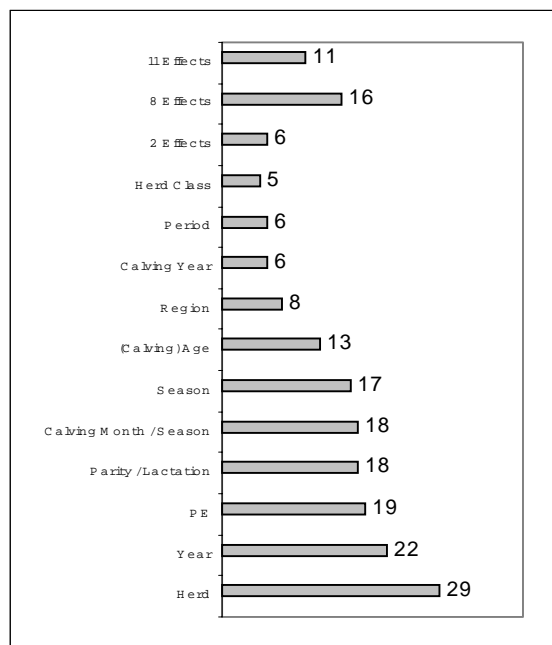
Environmental effects: Pre-adjustments and included in the evaluation models

Lactation records are adjusted for a very large number environmental effects before entering the analyses in different organizations / countries.



Number of effects, how they are adjusted for and the time the adjustment factor were computed show tremendous variation.

Number of environmental effects considered in the genetic evaluation models is even larger. On average a larger number of environmental effects are considered in the evaluation models than are pre-adjusted for.



I will not enter in a discussion on the historical reasons for adjustment and other related issues, such as much faster rate of change of production systems and populations' genetic constitution compared to 40 years ago. Neither am I willing to compare the computing power that we have at hand today with those of the past. However, I feel some thing should be done to summarize the huge number of environmental effects into some smaller number of categories in order to make some sense from it.

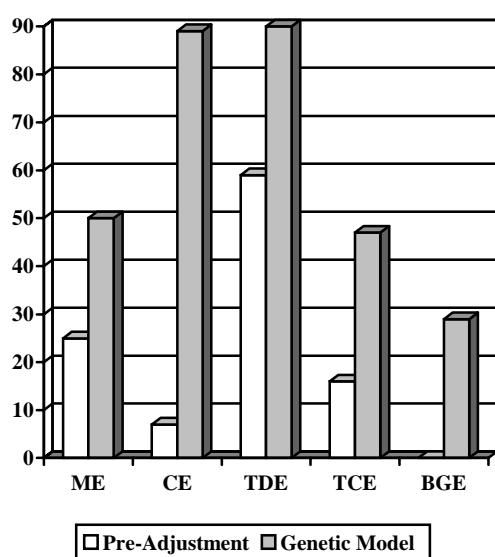
A very subjective, though intuitive classification of the environmental effects is as follows. Of course, this toddler's first steps need to endure a lot of practice.

The environmental effects were divided into 5 categories as follows:

- 1) Management effects, including herd, herd class, herd type, management group, test day, days in milk, lactation curve, days open, dry period, production level, status, number of milkings, heterogeneity of variance;

- 2) Climatic effects, including year, season, birth season, calving date, calving month, calving season, calving year, period, alpine & altitude;
- 3) Temporal density effects, including year, season, calving month, lactation number, calving year, calving season, calving period, test day, birth season, parity, period, calving date;
- 4) Temporal cumulative effects, including lactation number, age, calving, parity, days in milk, calving age, lactation curve, period, calving interval, days open, dry period, stage of lactation, lactation length; and
- 5) Biological (genetic) effects, including group of sires & dams, crossbred vs. purebred, phantom parent group, heterosis, breed, PE, stage of lactation, recombination (loss), non-additive genetic effect, herd*sire.

Obviously, there is much overlap between these categories and they are not mutually exclusive. Summarizing the environmental effects in this manner leads to the next histogram, which shows total number of effects in all countries.

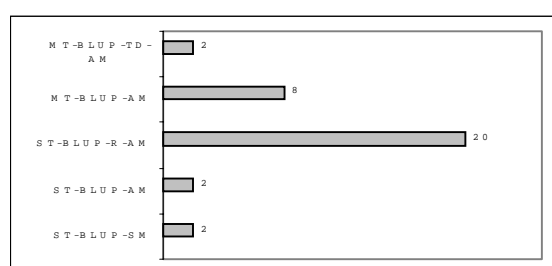


The resulting histogram does not yield to immediate interpretations, however, it can easily be seen that, given a more appropriate

classification, the large number of environmental effects can be grouped in smaller number of groups and treated similarly according to their common nature.

Genetic evaluation model

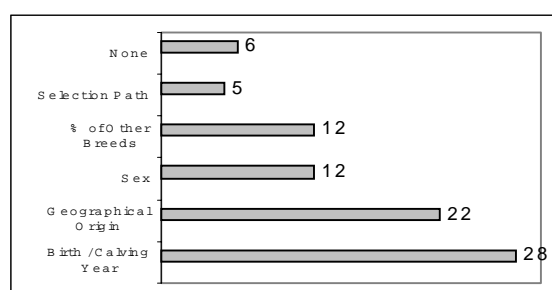
The lactation records finally enter a genetic evaluation model, which will be only one of the four classes of models illustrated in the next figure.



Looking at the future plans of different organizations / countries, it seems that the time gap between adoption of a new model / method in a country and adoption of the same model in other countries is decreasing.

Use of genetic groups

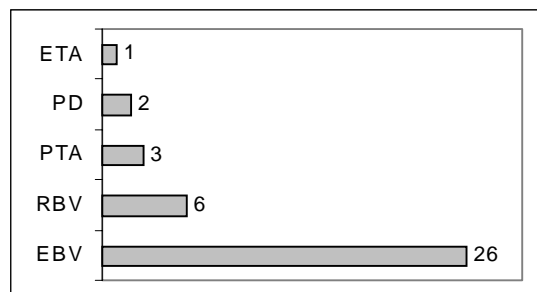
Except to 6 countries, genetic groupings are used in other evaluations. Year of birth or calving is the most common factor in building genetic groups.



Expression of genetic evaluations

This may not be of much practical consequence, however, harmonization of expression of genetic

evaluations and unit of expression pave the way for quicker comprehension of the evaluation results.



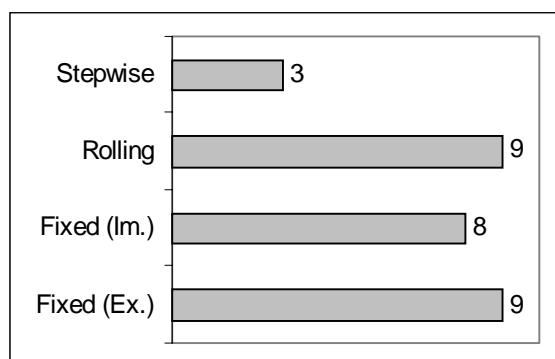
System validation

Responses to the question of system validation were, understandably, very vague. Because system validation entails very many things, with much variation between organizations / countries. Moreover, the documentations in this area seem to be less accurate.

More detailed specification of the adopted measures will undoubtedly be helpful to every one involved in the genetic evaluation.

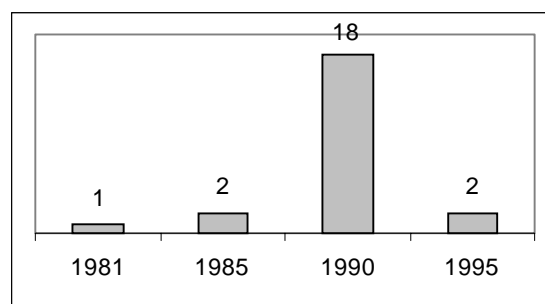
Genetic (reference) base

There seems to be some differences in nomenclature in this area. Here, I have followed what individual organizations / countries have stated in their responses.



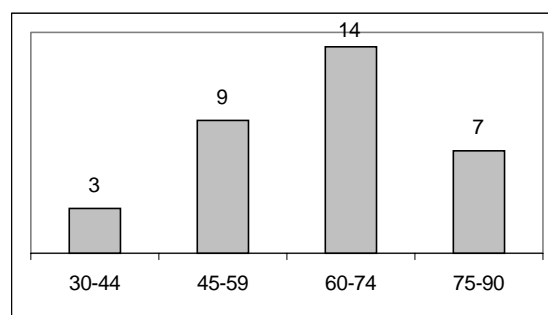
As regards to the time period used for the genetic reference base it seems that Interbull

recommendations have been accepted wholeheartedly by almost all.

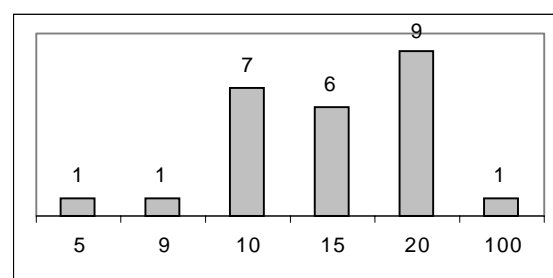


Criteria for official publication of results

Minimum reliability for an estimated breeding value or the number of daughters / herds is very different among organizations / countries and for cows vs bulls and domestic vs imported bull.



The above histogram shows the required minimum reliability in the various countries (lower range of values applies to cows).



The required minimum number of daughters for a bull shows much variation.

Conclusions

We are in the business of genetic evaluations and nothing is more nourishing to our work than variation. In the same way that genetic variation is beneficial for estimation of breeding values, success of breeding programs, advancement of genetic merit, etc., variation in trait definition, extension methods of lactations, evaluation models and so on is beneficial to our understanding of the processes that we are dealing with. Therefore, to demand a complete standardization of things related to genetic evaluation procedures practiced in different countries is utterly wrong. However, too much

variation destroys the coherence of any system and eventually leads to disintegration. In our case, too much difference would lead to un-comparability of the results and severed communications between populations which has been so beneficial to all of us. So, we should definitely say no to standardization, however, we would certainly appreciate more harmonization.

Acknowledgements

Many fruitful discussion with professor Jan Philipsson and financial support from USDA / NAAB are acknowledged.