

1. BACKGROUND

The technical advances in the field of reproduction in cattle, i.e. the use of deep-frozen semen and embryo transfers, have broadened the prospects of any breeding programme far beyond its original domestic borders. The increased trade and exchange of genetic materials call for methods to evaluate sires across populations and countries. However, a first step in order to convert sire-proofs from one country to another is to have a minimum standard of information on the proofs and such depth in the description of the sire evaluation procedures practised in each country of interest that the proofs of various bulls in different countries can be correctly interpreted.

In order to initiate the work on standardization and utilization of appropriate methods for sire evaluations across countries, an international committee, INTERBULL, was set up by the European Association for Animal Production (EAAP), the International Dairy Federation (IDF) and the International Committee for Recording the Productivity of Milk Animals (ICRPMA). Later the Food and Agriculture Organization of the United Nations (FAO) also joined this group of patronizing organizations. This joint venture was preceded by committee activities within both EAAP and IDF. In 1988 INTERBULL was reorganized as a permanent sub-committee of ICRPMA with the other parental organizations as well as the various country organizations as its members.

1.1. Problems in across country evaluations

The problems to overcome in evaluations of bulls for international use can be summarized as follows:

- a) Hardly any two countries utilize the same procedure for evaluation of their bulls. Some countries use herdmate comparisons, while most use BLUP-procedures today, but the statistical models vary. Different populations and time periods are used for definition of the genetic bases with which the bull proofs are compared. Fixed bases may be wide apart in time, and rolling bases may include a varying number of years.
- b) Different environmental factors may be adjusted for when estimating the genetic merit, as well as a different number of lactations included. Furthermore, sire proofs are often expressed in different ways, e.g. transmitting ability or breeding value in absolute or relative values and different units may be used, e.g. lbs, kg or BCA.
- c) The systems and levels of production differ considerably between various parts of the world and this might question the applicability of results from one country to another, e.g. between temperate and tropical or sub-tropical climates, or between intensive concentrate feeding systems and grazing systems.
- d) Carefully designed experiments could give good estimates of the genetic differences between populations at a given time under the actual conditions of the experiment. However, such point estimates may only be valid for a short period of time if the populations undergo different rates of genetic improvement.
- e) Since a continuous sire evaluation across countries is needed, continuous measures of the differences between populations are also needed. Such a continuity is only possible to establish if the same bulls, or sons of these, are being adequately sampled and evaluated in the two countries being compared. The problem in such comparisons is to ensure a random use of the bulls and that the daughters on average are equally treated in both countries.

1.2. Documentation of sire evaluation procedures for production traits

A primary task of INTERBULL has been to document the sire evaluation procedures practised in most major dairying countries. Such a standardized documentation of production traits, giving information on general methodology used, definition of traits, adjustments of records, expression of proofs and definition of bases was published in 1986 and 1988 (INTERBULL, Bulletins no. 2 and 3). An updated version for 1990 will be published. These also include vital statistics of the breeding programme of each country. The documentation provides the minimum standard information that is needed to describe the evaluation procedure practised in a given population or country.

1.3. Conversion of sire proofs

Since a large number of bulls today have progeny in more than one country, sire proofs have been calculated and published for the same bulls in both the exporting and importing countries. This situation is common today and, provided the bulls have been accurately evaluated in each country, the basis has been established to continuously assess the factors needed to convert breeding values from one country to another.

In a simulation study (INTERBULL, Bulletin no. 1, 1986) it was shown that the procedure earlier recommended by IDF (A-Doc 64, 1981), with modifications suggested by Goddard (1985) and Wilmink et al. (1986), would accurately estimate the a - and b -values needed in the following formula to convert sire proofs:

Converted proof = $a + b \cdot (\text{proof in exporting country})$
(importing country)

where a is a measure of the genetic difference between the bases used for sire proofs published in the two countries, and b is a scaling factor.

These procedures have by now been widely used in many countries and generally seem to serve the purpose. However, it must be emphasized that the procedure for estimation of a - and b -values assumes random use of the bulls in both countries, or that the statistical model practised can account for any deviations of importance in this respect. Otherwise the estimated factors might be biased in such a way that the converted sire proofs will be either over- or underestimated.