Incorporation of the Foreign breeding values into the Irish Beef evaluation.

Introduction

ICBF publish EBVs for beef performance traits based on a multi-trait, multi-breed evaluation. This is necessary given the structure of the Irish Suckler herd where a small pedigree sector provide breeding bulls to service a predominantly cross bred commercial cow herd. Within the pedigree herd there is a large influence of foreign sire usage (30-40%). In addition cows and stock bulls are imported from abroad into pedigree herds. About 14% of the commercial herd is also sired by foreign AI bulls.

Prior to 2008 the genetic merit in the country of origin for imported bulls (and their descendants) was not utilized in Irish evaluations. There was a strong demand for ICBF to address this issue. ICBF made a changeover to MIX99 software for breeding value estimation in 2008 thus allowing an option to include foreign breeding values in the evaluation as correlated traits. In April 2008 ICBF introduced a method to include French EBV in the national evaluation of Ireland. The initial method was based on using deregressed proofs. This was changed to approximated daughter yield deviations (DYD) in 2009 to allow better correction for the parental average. The current method is described by Bonaiti and Boichard (1995).

METHOD

To date breeding values and accuracies have been made available from the respective countries for French Limousine, Charolais, Blonde d'Aquitaine, Partenaise, Saler, and Aubrac (INRA, France), UK Limousine (SAC) and UK Charolais, Simmental, Angus, Hereford and Belgian Blue (Breedplan). EBVs have been supplied for traits such as calving difficulty, birthweight, direct and maternal weaning weight, Muscle and Skeletal. ICBF provide a list of animals to the participating organization of animals they would like information on. This list usually contains the animals of foreign descent which are ancestors of Irish born animals or animals imported into Ireland. ICBF also request an additional list of animals to ensure that selection bias is taken account of by having a spread in EBVs which is similar to the country of origin. This usually could be a list of AI sires of varying genetic merit in the country of origin. A 5 generation pedigree for all animals requested is normally provided as sometimes there are gaps in the pedigree in the ICBF database for these animals.

Finally the heritability of the traits along with the mean and standard deviations is also requested from the participating countries. This information is then used in creation of the DYDs for the foreign trait and they are then incorporated as correlated traits in the evaluation. A comparison of EBVs across country for each trait is used to establish a genetic correlation to be used.

The daughter yield deviations are calculated as follows:
The daughter yield deviations were calculated as (Bonaiti and Boichard, 1995):

$$y_i = 0.5\left[u_p + \left(1 + \frac{d_i}{n_i}\lambda\right)\left(u_i - u_p\right)\right] \tag{1}$$

where y_i is the DYD of animal i, u_p is the average EBV of the parents (if only one parent was known and had an estimated breeding value u_p is half the EBV of that parent; if both parents are unknown u_p is replaced by the population average EBV), u_i is the EBV of the animal itself, d_i is 2, 1.33 or 1 when both parents, one parent or no parents are known, $\lambda = (4 - h^2)/h^2$ and n_i is the number of daughters of a bull back-calculated from the reliability correcting for the reliability of the parents average EBV:

$$n_i = \lambda \left(\frac{r_i^2}{1-r_i^2} - \frac{r_{ip}^2}{1-r_{ip}^2} \right) \tag{2}$$

where r_i^2 is the reliability of the animal and r_{ip}^2 is the reliability of parent average EBV $r_{ip}^2 = (r_s^2 + r_d^2)/4$, where r_s^2 and r_d^2 are the reliabilities of the sire and dam (if only one parent is known $r_{ip}^2 = r_s^2/4$ when the sire is known or $r_{ip}^2 = r_d^2/4$ when the dam is known; when both parents are unknown $r_{ip}^2 = 0$).

Each DYD is weighted in the evaluation depending on the accuracy/reliability in the country of origin. The weights are simply the n_i, which is the number of daughters of a bull back-calculated from the reliability correcting for the reliability of the parents average EBV (see equation 2). The weights goes into MiX99 and basically the MACE-procedure (Schaeffer, 1994) is used to account for differences in residual variance of DYD due to differences in accuracy/reliability.

Currently there are in the region of 45,000 foreign ebvs included in the Irish evaluation.
The end result is a better ranking of foreign animals on the Irish system both in terms of how they rank in the country of origin and how they rank relative to the Irish population for the breed in question which helps both the Irish breeders to source the best genetics from abroad but also the foreign organizations in the marketing of their genetics. A test run with the foreign data included is normally done and results provided to the participating organization to examine. At that stage if consent is given the foreign ebvs are included in the Irish official evaluation and published. So to summarise if a foreign organization is willing to participate and provide EBVs then ICBF would like:

- A description of your evaluation system and traits evaluated
- An excel list of ebvs on all your AI bulls to allow initial comparisons with Irish ebvs
- Heritability of traits supplied
- Mean and sd of the whole population evaluated

REFERENCES
Bonaiti, B. and D. Boichard. 1995. Accounting for foreign information in genetic evaluation. Interbull Bull. 11.
Schaeffer, L. R. 1994. Multiple-country comparison of dairy sires. J. Dairy Sci. 77:2671-2678.