Problems Including Interbull Breeding Values in National Evaluations

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Abstract

Publishing Interbull breeding values for bulls together with national breeding values for cows and young bulls can lead to conflicts, if the national and the international breeding values show big differences. In this study the differences between national and Interbull breeding values for Simmental and Brown Swiss bulls were analysed to determine the need for a correction of breeding values. It was shown, that altogether 46 Simmental and 26 Brown Swiss bulls have a 6 milkvalue points higher Interbull breeding value than their national. 807 cows are relatives of these bulls and this difference will have influence on their breeding value, too. A method to take Interbull breeding values into consideration is useful. Methods used in different countries are not useful for German conditions and a new method based on Interbull breeding values as a modified single-trait animal model needs to be developed.

1. Introduction

In most countries Interbull breeding values are published as 'official' breeding values. This can lead to conflicts, if the national breeding values are much different from the international breeding value and therefore from the breeding values of close relatives as daughters, dams or sons without international breeding value.

Example:

A foreign bull has an international breeding value of +800 kg milk . Then he is used in Germany the first time. For the national estimation of breeding values for his daughters no information of the performances of his daughters outside Germany will be used. So for the first daughter in Germany no half-sib information will be considered. Assuming a HYS-deviation of +200 kg milk for the first daughter and +500 kg milk for the dam (no further information available) and a heritability of .25, following breeding values will be estimated.

bull: $\hat{u}_s$ = +17.46; dam: $\hat{u}_d$ = +138.09;
daughter $\hat{u}_o$ = +95.24

The estimated breeding value (EBV) of the daughter $\hat{u}_o$ = +95.24 contains no information of the father, whose breeding value is estimated only from the performance of this only daughter.

Publishing these national breeding values of the daughter and the dam ($\hat{u}_d$ = +138.09) together with the international breeding value of the bull($\hat{u}_s$ = +800), the breeding value of the daughter is much different from the mean of the EBVs of their parents ($\hat{u}_s$+ $\hat{u}_d$)/2 = +469.05. This is a contradiction to the published breeding values.

2. Comparison of national breeding values and Interbull breeding values for Simmental and Brown Swiss bulls in southern Germany

As seen before, theoratically big differences between national and international breeding values may occur. But the described case was extrem and theoretical. To analyse the real

differences between national and international EBVs, the data sets sent to Interbull and the recieved data sets were compared.

9077 Simmental bulls and 1967 Brown Swiss bulls were found identically in the data sets for national and international evaluation. For the comparison EBVs for milk kg were taken. Additionally the 'milkvalue', a combination of the $EBV_{fat\text{-}kg}$ and the $EBV_{protein\text{-}kg}$, was calculated. Table 1 shows the means and standard deviations of the national and international EBVs for milk-kg and milkvalue and the mean difference Δ for Simmental bulls. Table 2 shows the equivalent values for Brown Swiss bulls.

Table 1. Means and standard deviations of national and international EBVs for the traits milk-kg and milkvalue and their mean difference Δ for Simmental bulls

	milk (kg)		milkvalue	
	National	international	national	international
mean	-44.03	-43.37	-1.05	-1.07
s	383.8	348.21	13.357	13.351
Δ	5.6		0.19	

Table 2. Means and standard deviations of national and international EBVs for the traits milk-kg and milkvalue and their mean difference Δ for Brown Swiss bulls

	milk (kg)		Milkvalue	
	national	international	national	International
mean	32.14	33.9	.012	.068
s	412.8	413.0	14.19	14.19
Δ	5.6		0.52	

Obviously there is no big difference between the average national and international breeding values. Also the difference between them is not very high. As seen in the example, differences between the estimates can be expected, when a bull has a lot of daughters outside Germany and only some daughters in the country. In the next step only bulls were analysed, that have more daughters in foreign countries than in Germany. That were 174 Simmental and 115 Brown Swiss bulls. Table 3 and 4 show means and standard deviations of national and international EBVs and their mean difference.

Table 3. Means and standard deviations of national and international milkvalues (MV) and their mean difference (Δ) for Simmental bulls with more daughters in foreign countries than in Germany

	National	International
mean	5.86	10.05
s	14.88	16.58
Δ	6.03	

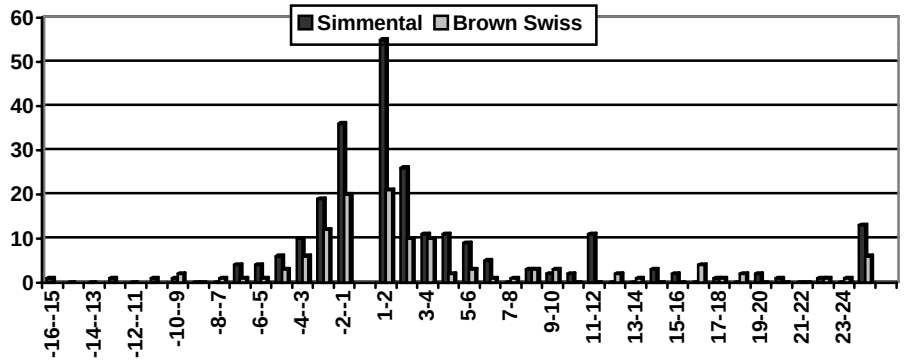
Table 4. Means and standard deviations of national and international milkvalues (MV) and their mean difference (Δ) for Brown Swiss bulls with more daughters in foreign countries than in Germany

	National	International
mean	2.94	6.25

s	12.99	14.82
Δ	5.17	

Observing only bulls with more daughters in foreign countries than in Germany, bigger differences between national and international milkvalues appear. It can be seen, that for these bulls the international estimates are higher than the national. Also the mean difference between national and international milkvalue with 6.03 for Simmentals and 5.17 for Brown Swiss bulls increases. So, high differences between national and international EBVs can be expected for single cases. To analyse the height of these differences, they were calculated for every bulls and allocated in different classes. The distribution of the different classes is shown in figure 1.

Fig. 1. Distribution of the differences milkvalue-Interbull - milkvalue-Germany



The medium bar of the class -1 to 1 was left out not to bias the figure, because of its height. The number of Simmental bulls in this class is 8873, the number of Brown Swiss bulls 1605. The classes with negative differences (-1 to -16) contain bulls, whose national milkvalue is higher than their international. The classes with positive differences contain bulls with a higher international milkvalue than the national. It can be seen, that more bulls have a positive difference than a negative one. So more bulls have a higher international milkvalue. It is remarkable, though the total number of Brown Swiss bulls is lower, in the area of high differences it is nearly equal to the number of Simmental bulls.

Of special interest are those bulls with a high difference. For that reason table 5 shows the number of bulls with an absolute difference between international and national milkvalue more than 6, 12 and 18 milkvalue-points and the number of their daughters in Germany.

Table 5. Number of bulls with a higher difference between national and Interbull-breeding value of more than 6, 12 or 18 milkvalue-points and their number of daughters in Germany

	Simmental		**Brown Swiss**	
class of difference	number of bulls	number of daughters	number of bulls	number of daughters
$\geq$ 6 MV	46	579	26	228
$\geq$ 12 MV	23	55	18	68
$\geq$18 MV	17	50	10	17

≤ 6 MV	8	212	4	53
≤ 12 MV	2	20	-	-

Altogether 46 Simmental bulls and 26 Brown Swiss bulls have an Interbull breeding-value, which is 6 milkvalue-points higher than their national. These 72 bulls have 807 daughters in Germany. For these daughters one can expect, that their national breeding value is underestimated at least 3 milkvalue points (half of the difference of the father) if no international information is considered. For more than 100 daughters the breeding value is underestimated at least 6 milkvalue points. These sires are very interesting for breeders, which means that the systematical underestimation of the daughters will be a problem.

3. Conclusions

It was shown, that in single cases the Interbull breeding-values are much different from national breeding values. So Interbull breeding-values should be included in the national evaluation. Several countries have developed different methods to include Interbull breeding-values. The most common procedure is to fix the solutions for bulls to the Interbull-value and keep on iterating the system to obtain new breeding values for cows. This method can not lead to convergence. It is also not useful for German conditions, because in Germany a multi-interval model is used and interbull breeding values are only single-trait estimates. For a special procedure several conditions have to be mentioned.

1. Interbull breeding values are calculated for the traits milk-, fat- and protein-kg. For each trait one breeding value is given. Currently national evaluations use multiple trait models and test-day models in the future.

2. For international used bulls, Interbull gives the number of daughters, herds and the reliability of the breeding value. There is no difference between real and effective daughters and it is not known, how many performances the daughters had.

It is suggested to include Interbull breeding-values in the national evaluation based on a modified single-trait animal model. The development of a useful model under these conditions is required.

References are available from the author