Effect of Including within Herd-Year Heterogeneity of Variances on French Genetic Evaluation of Foreign Holstein Bulls

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Introduction

French evaluations of foreign Holstein bulls, *ie* bulls with only 2nd crop daughters in France, have been shown to be overestimated for a long time (Bonaïti and Boulanger, 1987 ; Banos et al, 1993 ; Mattalia, 1996). Indeed, the average French proofs of these foreign bulls have always been higher than expected from their evaluations in their country of progeny test, when using converted or Interbull proofs. This is why French proofs of foreign Holstein bulls have never been included in the routine international evaluations.

As only 4-5 % of the semen are imported in Holstein breed, some speculation is expected on the daughters of the foreign bulls. Therefore, the bias observed on French proofs could be explained by preferential treatments on French daughters, due to the semen price and the reputation of these bulls. On the other hand, this semen was not widely spread but was preferentially used in specific herds, with a high genetic level, high performances and thus, with a high variability of performances.

In March 1999, a new model has been implemented in France, accounting for within herd-year variance heterogeneity (Robert-Granié et al, 1999). This new model is denoted 'Heterogeneous Model' in this paper, whereas the previous model was called 'Homogeneous Model'. As the Heterogeneous Model reduced the overestimation of high proofs of females in herds with a high variability, it could also have affected the proofs of foreign bulls.

The aims of this study were :

1. To assess the recent evolution of the bias over time within the same homogeneous model
2. To analyze the impact of the change in French model on the national proofs of foreign bulls.

1. Evolution of the bias with the Homogeneous model and characterization of this bias

Foreign bulls, born since 1982, with at least 75 French daughters in 50 herds in January 1997 and with an Interbull evaluation at that time, were selected in order to analyse the evolution of the bias with the French Homogeneous model. Out of the 117 bulls who met the requirements, 57 were first evaluated before February 1995 and 60 between February 1995 and 1997. The bias on French proofs was estimated by the difference between the French evaluation of January 1997, 1998, and 1999 and the corresponding Interbull evaluation, assuming Interbull proofs to be unbiased.. French evaluations were based on French data only and without any foreign information.

Table 1. Evolution of the bias on French proofs of foreign bulls over the last 3 years of the Homogeneous model (Bias in French EBV kg, standard deviations in parentheses)

		Evaluation date		
		1997	1998	1999
117 bulls evaluated in 1997	Milk Yield	155 (288)	129 (240)	113 (224)
	Fat Yield	3.2 (10.1)	2.6 (9.0)	0.7 (8.1)
	Protein Yield	5.2 (8.9)	4.1 (7.6)	3.3 (7.0)
57 bulls, eval before Feb.1995	Protein Yield	3.0 (7.5)	2.3 (6.5)	2.6 (6.3)
60 bulls, eval betw Feb.95 and Jan. 97	Protein Yield	7.2 (9.6)	5.8 (8.2)	4.0 (7.7)

A positive bias on French proof of foreign bulls was observed (Table 1), particularly for milk and protein. In 1997, this bias reached 0.22, 0.11, and 0.27 genetic standard deviation for milk, fat, and protein, respectively. However, from 1997 to 1999, the bias of these 117 bulls decreased by 27, 78, and 37% for milk, fat, and protein, respectively. The youngest bulls, first evaluated in 1995-97 had the most biased proofs in 1997 and also the largest decrease in bias from 1997 to 1999. In contrast, the oldest bulls, first evaluated before February 1995, had a limited but stable bias from 1997 to 1999. This hows that the first (up to 500) daughters of the most recent popular bulls (who are embro donors in majority), received more preferential treatment than the next ones. AI sons of these popular bulls also contributed to decrease the impact of the initial bias.

A sample of 59 more recent foreign bulls had at least 75 daughters in 50 herds in the January 1999 French evaluation. The bias on their French proofs (table 2) was lower than the bias observed on the older bulls in 1999 and even in 1997. This shows that the problems observed at the early use in France of the older bulls seems to decrease over time.

Table 2. Bias on French proofs of new foreign bulls, having their first French daughters after January 1997

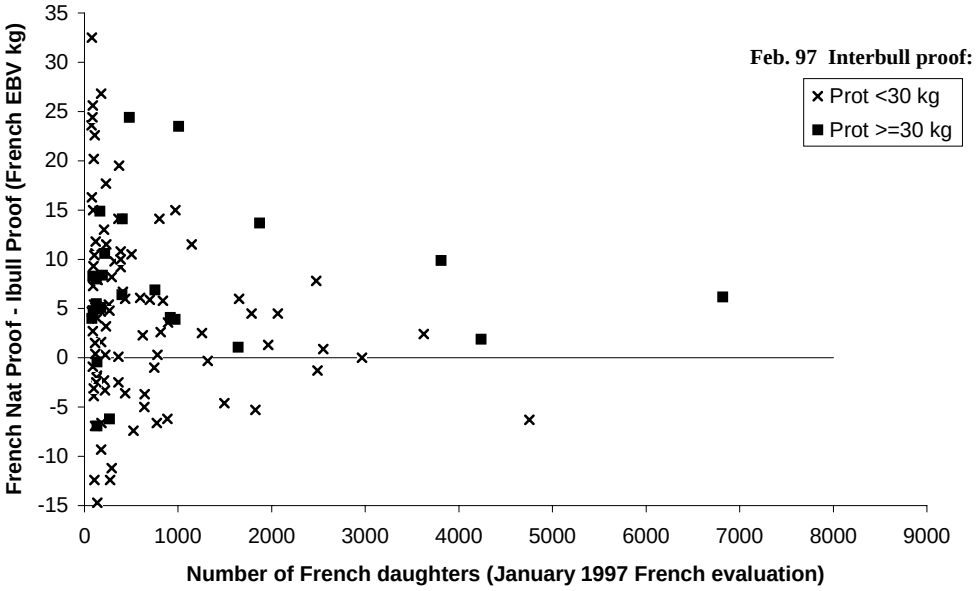
	60 bulls first evaluated in 95-97	59 bulls first evaluated in 97-99
	Bias on Jan. 1997 Proofs (kg)	Bias on Jan. 1999 Proofs (kg)
Milk Yield	216 (319)	95 (290)
Fat Yield	4.7 (11.1)	4.6 (9.2)
Protein Yield	7.2 (9.6)	4.5 (8.3)

Finally, the average bias on French proofs of the best bulls (selected on Interbull results) was higher than for the others, as shown in Table 3 and Figure 1. This result was consistent with the previous observations: the best bulls were also the youngest ones, and the most recently used ones.

Table 3. Bias on French proofs of foreign bulls (Homogeneous model) , according to their genetic level

	February 1997 Interbull Milk Proof (French EBV kg)	
Bias	<500 kg (92 bulls)	≥500 kg (84 bulls)
Milk Yield	75 (243)	142 (249)
Fat Yield	1.1 (8.9)	2.9 (8.4)
Protein Yield	2.4 (7.6)	4.9 (7.2)

Figure 1: Bias on French proofs depending on the number of French daughters in 1997 (Protein Yield, French units)



Remarks:

The bias estimated by the difference between converted proofs and French proofs (with conversions formulae proposed by Interbull) was much higher than the bias calculated with Interbull proofs (Table 4). This could be explained by two reasons:

- Until now, Interbull proofs were assumed to be unbiased. These proofs combine proofs in the country of progeny test with proofs computed in other countries. The proofs of imported bulls may also be overestimated in countries having imported semen, such as in France. In this case, Interbull proofs may be overestimated.
- Conversion formulae were computed from the Interbull proofs of the youngest bulls (bulls born since 1988), whereas most foreign bulls with French 2nd crop daughters were older. Inconsistencies between genetic trend estimated by the different national evaluation models may explain the difference between Interbull and converted proofs. In this case, converted proofs would underestimate the genetic level of the foreign bulls in French units.

Table 4. Bias on French proofs estimated from Interbull and converted proofs (Feb. 1999 Interbull results)

Country of origin	USA (116 bulls)		Canada (44 bulls)	
	Nat – Ibull proof	Nat. – Conv. Proof	Nat. – Ibull proof	Nat. – Conv. Proof
Milk Yield	134 (242)	262 (286)	58 (271)	100 (306)
Fat Yield	2.5 (8.4)	7.9 (9.7)	0.6 (8.9)	3.4 (10.8)
Protein Yield	4.1 (7.6)	7.9 (8.9)	2.8 (7.2)	4.4 (8.7)

2. Impact of the change of model in France

The 176 bulls presented in the first part of this study were also used to estimate the difference between the French National proofs of March 99 (Heterogeneous model) and the corresponding May 99 Interbull results. Between January and March 1999, the increase in number of French progeny of these foreign bulls was negligible.

The average bias decreased with the implementation of the new model (Table 5) and is now slightly significant only for Protein Yield. Moreover, the difference between new French National proofs and Interbull proofs does not depend neither on the genetic level of the bulls (Table 6 and Figure 2), nor on the number of French daughters (Figure 2).

Table 5. Impact of the change of model in France on the bias on French proofs of foreign bulls (176 bulls with at least 75 French daughters in 50 herds in January 99)

	Bias in French units (French Nat Proof – Interbull proof)	
Bias	Homogeneous model (Jan. 99)	Heterogeneous model (March 99)
Milk Yield	107 (247)	33 (219)
Fat Yield	2.0 (8.7)	-0.2 (8.0)
Protein Yield	3.6 (7.5)	1.5 (6.7)

Figure 2: Bias on French proofs depending on the number of French daughters in March 1999
(Protein Yield, French units)

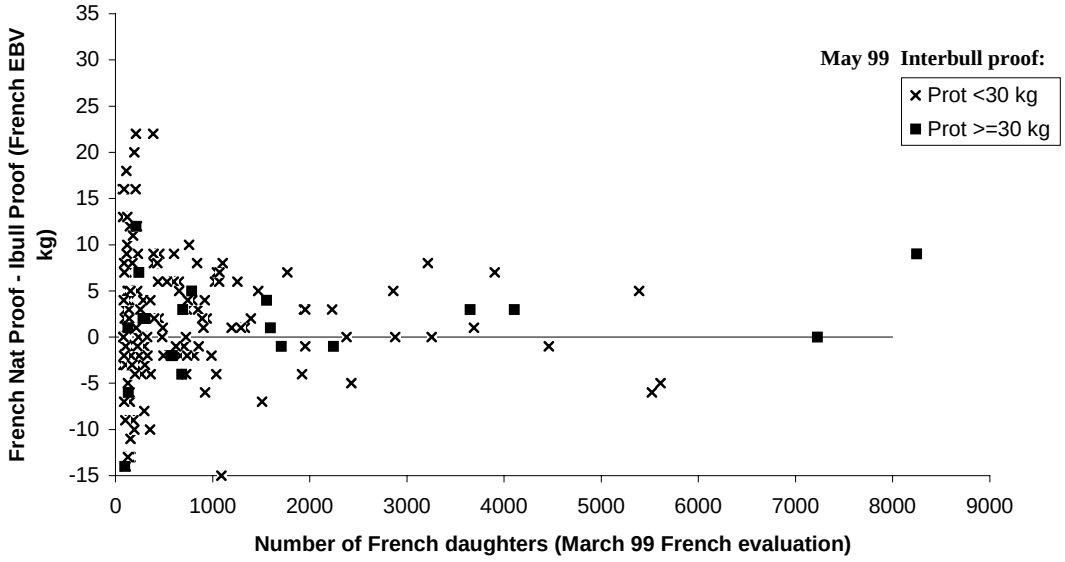


Table 6. Bias on French proofs of foreign bulls (Heterogeneous model), according to their genetic level

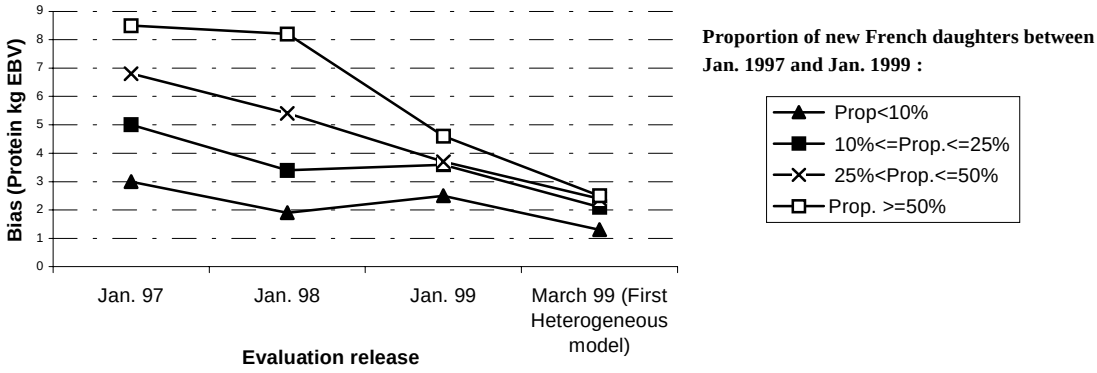
	February 1999 Interbull Milk Proof	
Bias	<1000 kg (145 bulls)	≥1000 kg (31 bulls)
Milk Yield	43 (220)	-16 (210)
Fat Yield	-0.3 (8.1)	0.2 (7.7)
Protein Yield	1.6 (6.9)	1.0 (6.0)

3. Discussion and conclusion

The implementation of the new French evaluation model, which accounts for within herd–year variance heterogeneity, led to a decrease of the average bias on French national proofs of foreign bulls of about 70 kg milk and 2 kg protein, as already mentioned previously (Robert-Granié et al, 1999). The remaining bias, when estimated as the difference between French and Interbull proofs, seems to be now not significantly different from zero. When estimated from conversion formulae, this bias is still positive (200 kg milk for US bulls for instance) and this point clearly needs further investigation. However, the heterogeneous model did not solve all problems related to preferential treatments, as some popular bulls still have highly overestimated proofs in France even with a large number of daughters (figure 2).

In the last 5 years, the bias continuously observed in the 80s and the beginning of the 90s, gradually decreased. In fact, this bias had already decreased before the implementation of the Heterogeneous model. Higher the increase in number of daughters between 1997 and 1999, higher the bias in 1997, and bigger the reduction in bias between 1997 and 1999 (figure 3). Thus, the decrease in bias is likely to be due to a change in the management of daughters of foreign bulls, less specific and speculative than before.

Figure 3: Evolution of the bias on French National proofs between 1997 and 1999, depending on the proportion of new French daughters (Protein Yield, French kg EBV)



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