PRACTICAL APPLICATION OF FOREIGN PROOFS FOR CALCULATION OF COMBINATED PROOFS - DEMONSTRATED BY THE BREEDING VALUES OF JOINT TESTED FLECKVIEH-BULLS IN BAVARIA AND LOWER-AUSTRIA

Bull-testing in two countries is a precondition for the calculation of unbiased and reliable conversion factors.

A joint estimate from sufficiently overlapped records on cows would result in the best reliability. At the moment there is no view in realization due to many factors (technical problems, different animal identification in the countries involved, place of the estimation, different data quality, interests and so on).

In order to avoid an increase in the amount of the data, only the information of the daughters of LINK-bulls (= bulls tested in both countries) is used instead of working with the whole foreign cow records. This would only result in a small increase of data. There is no answer about the increase in reliability because the absolute foreign performance is compared only inside the LINK-bulls.

For optimal use of all data it is necessary to work with a cross-table which contains all frontier-crossing numbers of animals.

An alternative is the way described by **GODDARD (1985)**, who proposed to combine two national breeding values (BV) of bulls with daughters in both countries to a combined one.

This combination is independent of the national model and the national base because it takes care of the national reliability and the deviation inside of the LINK-bull group.

The advantages of this combination on the level of BV in comparison to the level of cow are as follows :

- An increase in the reliability without the effort of unmistakable identification for bulls and cows (crosstable only for the bulls with daughters in both countries).
- The data (BV of a bull in country A and B) exist, therefore there is no effort in collecting data. It is possible to compute the values with a small PC.
- The increase in the reliability can be from 40 % to 70 %, expressed as a daughter-equivalent.
- Decrease of the number of daughters per bull in every country in the case of a joint testing program.

The calculation can be briefly explained and illustrated with the results of joint testing of Fleckvieh-bulls in Bavaria and Austria.

GODDARD (1985) proved that the relation between the estimated BV in the foreign country ($\hat{BV}_A$) and the true BV in the home country (BV_B) is the same as the relation between BV_A and the deregressed BV ($_d\hat{BV}_B$) in the home country.

The deregression (recalculation of the phenotypic deviation) is in effect a standardization of the reliability and is computed as follows.

$$_d\hat{BV}_B = \frac{\hat{BV}_B - \overline{\hat{BV}}_B}{r^2} + \overline{\hat{BV}}_B \qquad (1)$$

The following parameters are the result of a weighted least-squares analysis ($\hat{BV}_A$, $_d\hat{BV}_B$) for 63 jointly tested Fleckvieh bulls :

	a	b
Milk kg	331.0	0.937
Fat kg	19.9	0.733
Protein kg	10.2	0.834

$$\hat{BV}_B^* = a + b \cdot \hat{BV}_A \qquad (2)$$

At the time of computing these values, Austria used a sire model (base 1975) and Bavaria an animal model (base 1985). Starting in June 1992, Austria will also use an animal model.

These conversion factors (a and b) can be used to combine $\hat{BV}_A$ and $\hat{BV}_B$ into a more reliable $\hat{BV}$ for both Bavaria and Lower-Austria. This combination would be most worthwhile for a bull which has a proof of low reliability in country B (import) and a proof of high reliability in country A (export), a joint occurence shortly after importation.

The variance of the true proofs and the genetic correlation between the true proofs between country A and B are necessary as 'a priori' information - there exist credible values in the literature.

$$\hat{\hat{BV}}_B = d\overline{\hat{BV}}_B + b_1 \cdot (\hat{BV}_B^* - d\overline{\hat{BV}}_B) + b_2 \cdot (\hat{BV}_B - d\overline{\hat{BV}}_B) \quad (3)$$

$$b_1 = \frac{1 - r^2{}_B}{1 - r^2{}_B \cdot r^{*2}{}_B} \qquad b_2 = \frac{1 - r^{*2}{}_B}{1 - r^2{}_B \cdot r^{*2}{}_B} \quad (4)$$

$$r^{*2}{}_B = \frac{\sigma^2\ (\hat{BV}_B{}^*)}{\sigma^2\ (BV_B)} \quad (5)$$

$$\sigma^2\ (\hat{BV}_B{}^*) = \sigma^2\ (\hat{BV}_B{}^* \mid \hat{BV}_A) + \sigma^2\ (BV_B \mid \hat{BV}_B^*) \quad (6)$$

$$\sigma^2\ (\hat{BV}_B{}^* \mid \hat{BV}_A) = \left[1\ (\hat{BV}_A - \overline{\hat{BV}}_A) \right] \underline{\hat{V}} \begin{bmatrix} 1 \\ (\hat{BV}_A - \overline{\hat{BV}}_A) \end{bmatrix} \quad (7)$$

$$\underline{\hat{V}} = \sigma^2(\epsilon)\ (X'X)^{-1} \quad (8)$$

$$\sigma^2\ (BV_B \mid \hat{BV}_B^*) = \sigma^2(BV_B) \cdot (1 - r^2{}_{(A)} \cdot r^2{}_{(A.B)}) \quad (9)$$

APPENDIX A : Graphic presentation of the estimated Breeding values in Lower-Austria and Bavaria plus regression.

APPENDIX B : Graphic presentation of the computation of a combinated proof.

APPENDIX C : Results for eight bulls for both countries

LITERATURE

GODDARD, M., 1985 A method of comparing sires evaluated in different countries. Livestock Production Science, 13, 321 - 331

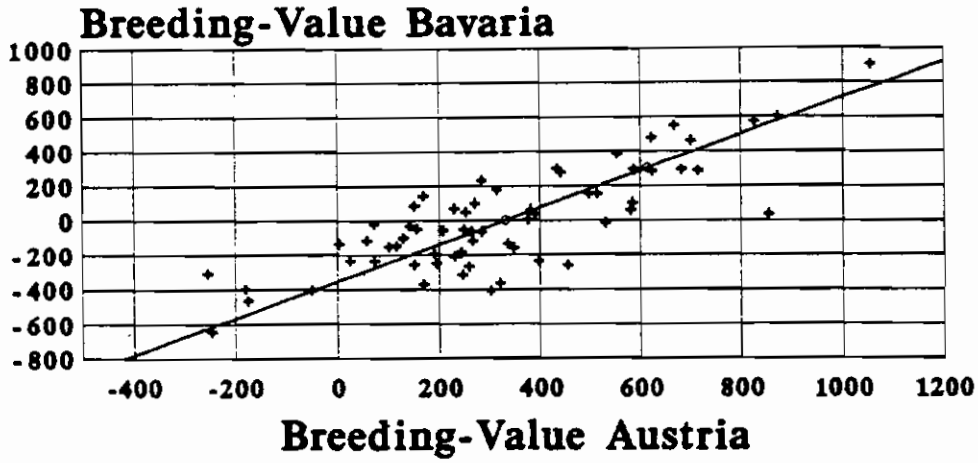
QIN ZHANG, 1990 Schätzung von Faktoren zur Umrechnung von Zuchtwerten zwischen Populationen. Diss. Hohenheim

RYSAVY, P., 1990 Verzerrungen bei der Umrechnung ausländischer Zuchtwerte, dargestellt anhand eines Simulationsmodells. Diss. Kiel

Common tested Fleckvieh-bulls

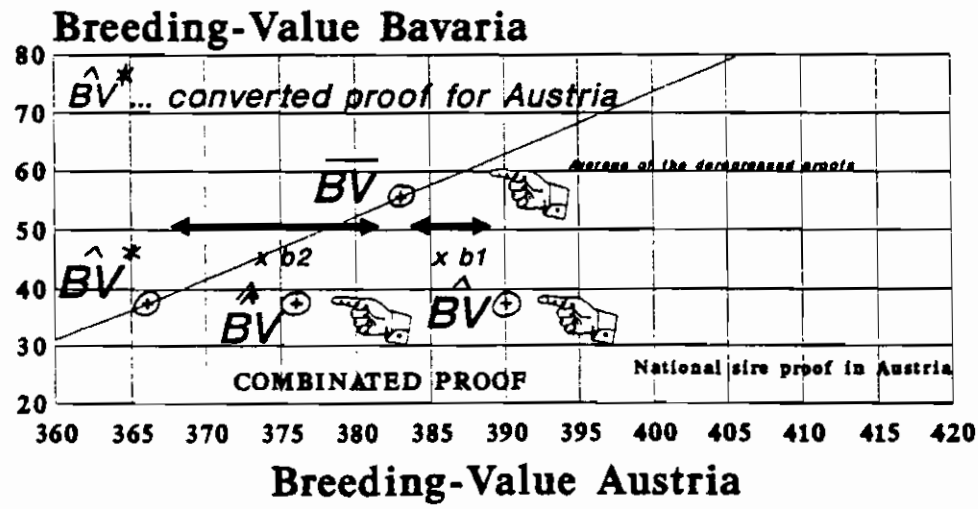
Austria - Bavaria

Sire-Proofs for Milk



APPENDIX : A

Graphic presentation of the calculation of a combinated proof



APPENDIX : B

RESULTS OF COMBINATION OF NATIONAL SIRE PROOFS

LOWER AUSTRIA AND BAVARIA

Nr.	AUSTRIA (Sire Model 75)					BAVARIA (Animal Model 85)				
	National sire proof					National sire proof				
	COMBINATED SIRE PROOF					COMBINATED SIRE PROOF				
	Milk	Fat	Protein	n n'	r^2 r'^2	Milk	Fat	Protein	n n'	r^2 r'^2
1	390.	21.0	11.0	35	.70	37.	4.3	1.6	68	.82
	376.	22.0	11.2	78	.84	44.	3.7	1.5	94	.86
2	265.	11.0	4.0	50	.77	-119.	-4.5	-8.3	140	.90
	223.	13.1	2.7	114	.88	-116.	-5.7	-8.3	174	.92
3	680.	31.0	20.0	600	.98	289.	5.2	8.1	1013	.99
	673.	30.0	19.7	726	.98	295.	5.7	8.3	1125	.99
4	169.	9.0	6.0	38	.72	138.	7.5	4.6	89	.86
	324.	17.4	10.3	90	.86	58.	3.1	2.5	116	.89
5	142.	6.0	-1.0	67	.82	-32.	-6.7	-6.6	103	.87
	196.	8.7	.4	122	.89	-90.	-9.2	-8.3	144	.91
6	258.	14.0	10.0	61	.80	-268.	-7.2	-3.7	136	.90
	144.	13.5	8.2	122	.89	-235.	-7.2	-3.0	175	.92
7	207.	22.0	7.0	1555	.99	-60.	7.0	-1.3	1660	.99
	211.	22.3	7.1	1681	.99	-65.	6.7	-1.4	1783	.99
8	579.	29.0	24.0	49	.77	59.	7.3	12.0	152	.91
	480.	27.4	23.0	119	.89	104.	8.1	12.9	186	.93