

Sire evaluation for fertility and calving ease in Germany

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1. Introduction

Reproductive traits like fertility and calving ease are of increasing importance in cattle breeding programs, especially in dual purpose cattle. Recording costs for these traits are negligible, if most of the information is already collected through routine data collection in the context of herdbook keeping or routine bookkeeping of an AI-operation. Therefore several approaches exist to use this information for selection purposes throughout the world (Philipsson *et al.* 1979, Philipsson 1981, Freeman 1984). In Germany there were several routine evaluations for fertility and calving ease, using a sire model (Lederer 1984, Distl *et al.* 1988), which under the aspect of new evaluation methods were suboptimal. The Federal Ministry of Agriculture and Forestry granted funds to develop a program package to evaluate direct and maternal effects in one system for the above mentioned traits. The program was developed by Georg Thaller with the skilled support of Maciej Gierdziewicz in 1993/94. This package is now in use in Germany and will in the future also be adopted to Austrian conditions. VIT Verden has just published their first results from this package.

2. Material and methods

Data on calving ease are collected in Germany since the 70'th in connection with birth recording through the milk recording organisations. The farmer answers in this connection the calving ease score in a system with five classes with respect to the help required during delivery. The following classes are used, giving also the frequencies for the Fleckvieh breed in Bavaria: no help 28,2%, help of one person 55,2%, two or more persons helping 14,0%, veterinary assistance 2,2% and Caesarian 0,4%. At the same time the utilisation of the calf is registered, including born dead or died within 48 hours p.p.. Both traits are used in the evaluation method, excluding twins, uncertain sires with gestation limits and unknown sires. In certain parts of Germany only three classes (easy, normal, heavy calvings) were used, but the recording system requires in the future the first mentioned scale. It should be mentioned, that the five classes are only useful, if the classes are properly used and there are differences between farms in this respect.

Fertility is recorded with insemination results on individual cows, collected through AI-technicians, veterinarians and to a very limited degree through farmers. As trait the non-return result 90 days after first service (NRR90) is used. This time span was used, since it includes at least three cycles and earlier investigations showed, that there were further return

peaks between 60 and 65 days and around day 85. Up to now there is no control of disposal during lactation, which means that cows eliminated for infertility reasons with no returns are counted as successful. Insemination results are delivered from the AI-centres to the milk recording organisation and are also used as paternity control for the farmers calving sheet. Independent of accounting rules all inseminations within a parity are used for sire evaluation, excluding only the so called "double matings" (wn. 2 days). Exclusion limits on age, on service period (< 25 days, >180 days), on return interval (>150 days) are employed. Results for most AI-studs are available from 1985 on.

Linear models are used for both traits and details have been discussed at last years EAAP-meeting by *GIERDZIEWICZ et. al (1994)* and *THALLER et. al. (1994)*. One reason for the linear model was the marginal difference between categorical and linear approaches and the computing time with data more than 8 mio. calvings.

In contrast to most performance traits, fertility and calving ease are combined traits genetically determined by more than one animal. The direct effect of the calf and the maternal effect of the dam were included in the calving ease model (fig.1). In the fertility evaluation the paternal effect of the bull and the maternal effect of the cow is used. Also a negative correlation (-0.1) between the direct and the maternal effect for calving ease was included. For both traits a permanent effect of the cow is included, since previous calvings could have an effect upon later parities. A reduced animal model was applied, following the approach from *QUAAS and POLLACK (1980)*. The animal model for these traits has also the effect, that quite common disassortative matings are taken into account.

Besides of the random effects for

- paternal resp. direct genetic effects
- maternal genetic effect
- permanent environment of the cow resp.dam

the following fixed effects are included:

herd-year of calving resp. insemination

month of calving resp. first insemination

parity of dam

age at calving or insemination (classes wn. first or second parity)

service period within parity for fertility

sex of calf for calving ease.

The herds in Germany are in general rather small, having only 4,9 observations within herd-year-season subclasses, which lead to the decision for the above model. For larger herds in the future a HYS effect may be used. The inseminator was omitted from the model, since in most cases these are confounded with herds and the use of herd-years is taken care of such effects.

3. Results

Some of the results for the fixed effects are shown in fig. 2-3. It might be, that the season effect for fertility in the future should be stratified as a herd-year-region effect rather than a season effect across years and regions. Most of the fixed effects showed comparable results with previous investigations. One point of interest may be the effect of service period on the insemination success, which is free of most other effects : The negative influence is lasting

until 70 days p.p. and NRR90 is still increasing until 190 days; this effect is more pronounced in later lactations compared with the known problems after the first calf.

Some results for the genetic trend are given in fig. 4-6 for the major breeds in Bavaria. For fertility there is no pronounced trend in the Fleckvieh breed (fig. 4), but a negative trend in the Braunvieh breed (fig. 5), especially for the maternal component. At present it is not clear, if this is connected with an increasing amount of inbreeding through the use of American Brown Swiss sires. This question has to be further investigated. The genetic trend for calving ease in the Simmental breed is given in fig. 6. While the direct effect seems to be negative, there is a positive trend on the maternal side, which was also found in the American Simmental population. At least this is in a favourable genetic direction and it is open, if natural selection is supporting this tendency.

Results are published as relative breeding values (RBV) with a mean of 100 and a standard deviation of 12, to be reached with 100 % reliability (50 % in case of paternal fertility). The base is the same as for the RBV for milk, which means AI-bulls from the birth years 1985-1987 have in the moment on average a mean of 100. Calving difficulties have converted signs, meaning a bull with difficult calvings has a RBV below 100 and vice versa. Reliabilities are calculated by an indirect method using selection index procedure *Thaller and Jaitner (1994)*.

For bulls with only sampling results the means and standard deviations for both trait groups are given in table 1. Despite of the low heritabilities assumed (0,05 for calving ease and 0,05 for NRR90) assumed, it can be seen, that there is enough genetic variation. With a normal AI-testing program and well organised data collection reliability's are reached, which could give farmers the advice, they are asking for in practical use of bulls. One problem we are facing with both traits: the call for a calving ease bull or a bull with good paternal fertility. Breeders still have to be convinced to make use of the maternal component rather than the direct or paternal component.

Table 1: Means and standard deviations of RBV's for reproductive traits

Fleckvieh-bulls birth year 1988

Trait	No. of bulls	No. of records	RBV		Reliability	
			mean	SD	mean	SD
<i>NRR90</i>						
paternal	386	613	100.2	8.3	37	2
maternal	386	149	100.1	10.5	68	6
<i>Calving difficulties</i>						
direct	394	568	100.9	9.3	82	7
maternal	394	187	100.5	9.3	57	6
<i>Dead borne calves</i>						
direct	394	568	100.8	7.2	82	7
maternal	394	187	99.4	10.9	57	6

Some practical aspects still have to be solved: one problem is the ranking of bulls for calving ease on heifers vs. older cows. *PASMAN et. al. (1995)* has investigated this problem for the Braunvieh breed, finding a genetic correlation of >0.7 . Their conclusion is, that this means a comparable ranking instead of a second stage testing after selection for milk. Nevertheless AI-managers and farmers want separate results for heifers and older cows. Another problem is connected with routine information and the frequency of evaluations. At present our plans are to run the analysis two times a year, but for urgent use more frequent evaluations are wanted by our customers, the AI-studs. The solution probably should be to offer less complicated models at shorter intervals and with other trait definitions, e.g. NRR30 to get a quick result for those unfavourable bulls below two SD's. Of course for the paternal fertility we are not dealing with a normal distributed trait and further routine investigations should probably be conducted with those outliers (e.g. chromosome analysis for translocations).

Fertility and calving ease are components of reproduction and should be complemented by the productive life of the daughters. Here we will apply the methods developed by *SÖLKNER and DUCROCQ (1995)* and all these traits will be combined in an index for reproduction, which is part of the requirements of information for tested bulls by our animal breeding regulations. The economic weights for the five reproduction components and the relative weight in a total merit index (TMI) is still under discussion and will vary between breeds. Some views have been presented by *AUMANN (1995)* at this EAAP-meeting. We feel the need for more joint discussions of questions connected with a TMI.

4. Conclusions

There is an increasing demand for information on functional traits in dairy production. Reproduction is a complex with big economic impacts and increasing demands from the farmers side. In most recording systems informations on these traits are available, if they are properly organised and organisations are cooperating. Fertility from inseminations and calving ease scores can be collected in routine systems without extra collection costs. Modern statistical analysis have to be applied to get selection guides for the practical farmer. The results should at the present stage of the population not be used for direct selection, but to avoid problem matings. The inclusion of these traits in a total merit index could avoid some antagonistic selection effects, but requires proper training of all people working with such results.

The acceptance of additional information by farmers is very good in most cases. Nevertheless we have to watch the developments and trends carefully. In this context we also would like to emphasise the need for variation in TMI-weightings: if all countries and all breeds are doing the same, we will lose genetic variability, where all of us are looking for and make use of. Therefore we should ask for more variation in breeding goals.

5. References

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Figure 1: GENETIC MODELS

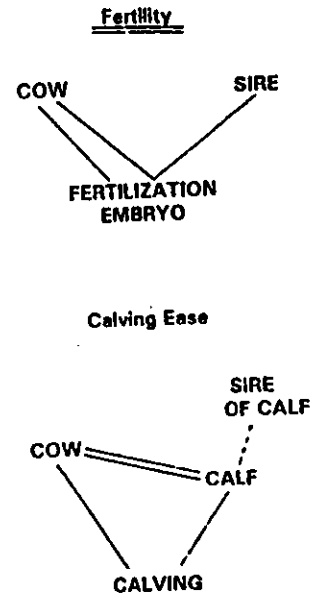


Figure 2: Breeding value estimation NRR90 Lactation

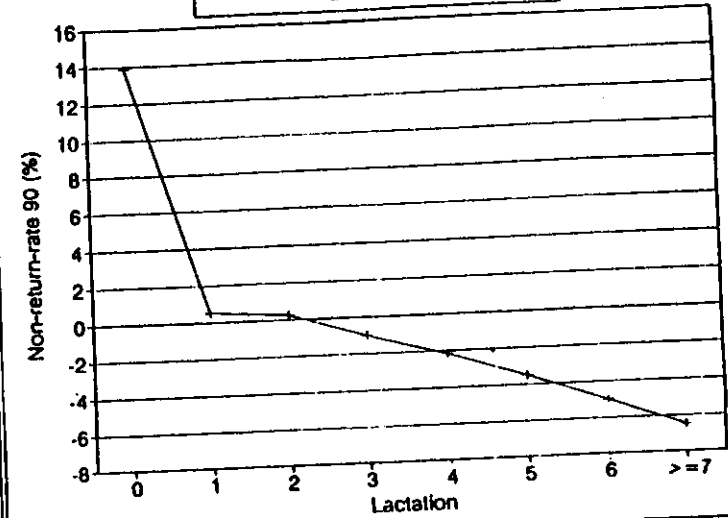


Figure 3: Breeding value estimation NRR90 Service period

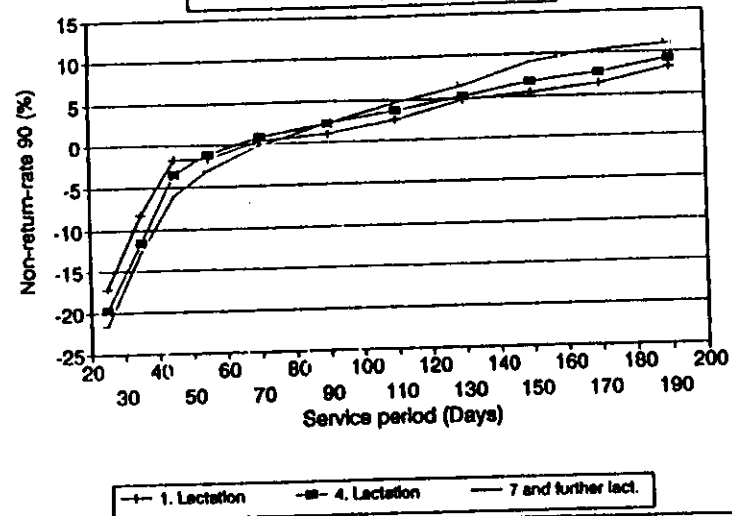


Figure 4: NR90 Estimated genetic trend Cow population Fleckvieh

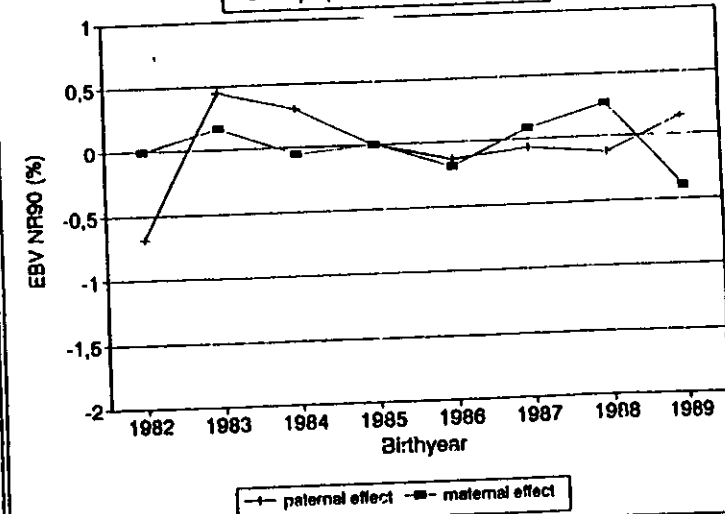


Figure 5: NR90 Estimated genetic trend
Cow population Braunvieh

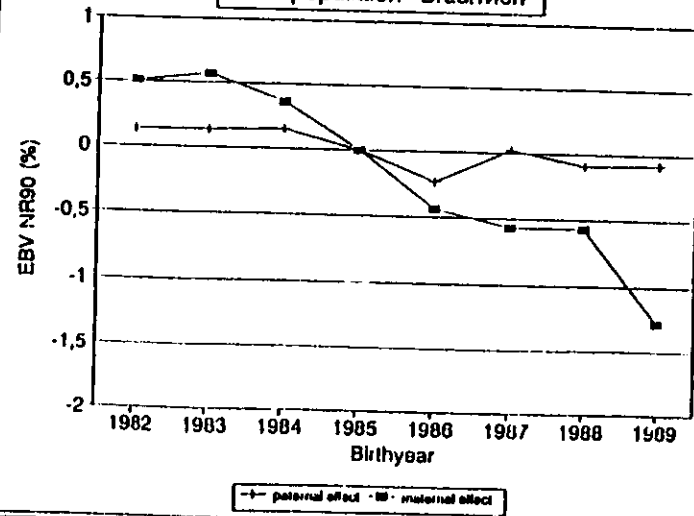


Fig. 6: Genetic trend for calving ease
Sires Fleckvieh

