Evaluation Methods of Subjectively Scored Functional Traits in Finland

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Abstract

In Finland the recording for milking speed was changed in 1993 from objective milk amount/min to subjectively scored farmer provided information with five classes and collected by the AI-technicians after the first calving. The main reason for the change was the high cost of objective measurement and harmonizing the recording with other Nordic countries. The information of leaking animals is collected simultaneously. The information of temperament, also with scores from 1 to 5, is collected by AI-technicians who ask the farmer to compare the cow to its collateral herd mates. Some information is recorded also from older cows by the breeding advicers while type scoring the animals.

Data from above described subjectively scored traits of 143688 first lactation Finnish Ayrshire, Finncattle and Finnish Holstein-Friesian cows were analyzed simultaneously with single trait sire model BLUP for milkability, leakage and temperament. The model included breed, herd, year and technician as fixed effects. The heritability values used for milkability, leakage and temperament were 0.2, 0.07 and 0.09, respectively.

Milkability, leakage or temperament has not been included into Finnish total merit index of dairy bulls since 1993, but the information of these traits has been made available to individual breeders to be used in within herd breeding planning. As a result to this many breeders put much emphasis to temperament although its heritability is low.

Milkability has been regarded as an optimum trait, which means that neither slow nor very fast cows are wanted. Slow cows increase the time needed for milking and fast cows have higher risk of leaking due to strong genetic correlation between milking speed and leakage. Leaking is unhygienic and will also increase the risk of mastitis. Breeders tend to use the information about milkability in corrective mating according to phenotypic information of the cow. No analyzes about the success of such corrective mating has yet been carried out in Finland.

Introduction

Many functional traits, such as temperament, milking speed and leakage, have importance in every day management of dairy herd. Milking speed affects straight to working time and temperament plays an important roll with work easiness and accidents at dairy farm. Many farmes put a high value to such traits, although their total economic value is difficult to measure. Milking speed accounts for more than 50% of routine work at dairy herd (Blake and McDaniel, 1978) and milking speed has been found to be positively correlated to somatic cell count (e.g. Moore, et al., 1983; Trede and Kalm, 1989). According to Finnish milk recording statistics published by the Association of Rural Advicory Centre 1.4% of cullings of dairy cows in 1994 were due to poor temperament and according to farm accident statistics published by Farmers Social Insurance Institution 35% of accidents in animal management in Finland in 1993 were caused by the misbehaviour of animals.

Methods used for measuring milking speed in different countries vary considerably (INTERBULL, 1992). Objective methods measure the amount of milk in a time unit and subjective scores are based on interviews of farmers or on observations made by a classifier. In Finland the recording for milking speed was changed in 1993 from objective milk amount per minute to subjectively scored farmer provided information with five classes and collected by the AI-technicians after the first calving. The main reason for the change was the high cost of objective measurement and harmonizing the recording with other Nordic countries.

Recording for temperament can only be made subjectively either as farmer-supplied or collected by a classifier. In Finland the information is collected after first calving by AI-technicians who ask the farmer to compare the cow to its collateral herd mates. The comparison is done under classes from 1 to 5. Information from older cows is also recorded by the breeding advicers while type scoring the herd book animals.

Leakage is easily measured as a yes or no trait. It is of importance due to its effect on milking hygiene and possible effect on mastitis (Jones, 1986), but it is not frequently reported in sire catalogues. The observed frequency of leakage in different populations varies between 0-24% (Geer et al., 1988; Schukken et al., 1990; Slettbakk et al., 1990). It is routinely recorded at least in Norway (Steine, 1988) and in Finland.

Material and Methods

Genetic parameters

The genetic parameters used in prediction of transmitting abilities (PTA) of milkability, leakage and temperament were from the analysis carried out by Juga et al. (1996) and are given in Tables 2 and 3. Since parameters were estimated for FAY and FHF separately and in prediction of breeding values the breeds are analysed simultaneously the heritability estimates close to FAY population were selected. The parameters used for milkability, leakage and temperament are 0.20, 0.07 and 0.09, respectively.

Data

The data used in prediction of transmitting abilities of milking speed, leakage and temperament was sampled in April 1996 by Finnish Animal Breeding Association. After the edition the data consisted of 143688 Finnish Ayrshire (FAY), Finnish Holstein-Friesian (FHF) and Fincattle (FC) first lactation cows which had calved between 1980 - 1994. The average milkability and temperament score were 3.018 and 3.23, respectively (Table 1). Juga et al. (1996) noticed that fast milking cows had more problems with leakage, since 66.4% of FAY cows in milkability class 5 (fastest) showed leakage, the corresponding percentage in FHF beeing 54.6% when the total frequency of leakage for FAY was 7.7% and for FHF 8.2%.

The information in Finnish population was collected from 19283 herds by 770 AI-technicians or breeding advicers. Total number sires included in the analyses was 2463.

Methods

The PTAs were analysed using single trait BLUP sire model included in the DMU-package (Jensen and Madsen, 1993).

The model for trait i (i=1,2) was

$$\mathbf{y}_i = \mathbf{X}\mathbf{b}_i + \mathbf{Z}\mathbf{s}_i + \mathbf{e}_i \qquad (1)$$

where

$\mathbf{y}_i$ is the vector of N_i observations of milkability, leakage or temperament of the daughters
$\mathbf{b}_i$ is the vector of fixed effects including breed effect, herd effect, the effect of the calving year of the daughter and the effect of the technician who collected the information
$\mathbf{s}_i$ is the vector of random sire effects with $V(s) = \mathbf{A}\delta_s^2$ and $\mathbf{A}$ is the numerator relationship matrix between sires
$\mathbf{e}_i$ is the vector of random residual effect with $V(\mathbf{e}_i) = \mathbf{I}\delta_{ei}^2$ and
$\mathbf{X}$ and $\mathbf{Z}$ are the incidence matrices that link effects to $\mathbf{y}_i$

The analysis was run in an Axill 311 workstation with four 100 MHz risk processors and 384 Mb of memory.

The PTAs are published as within breed standardized indexes with mean 100 and standard deviation of 10. The standardization base is the breed average of three bull year batches starting with bulls born nine years from evaluation date. The genetic trends in milkability and temperament for FAY and FHF are given in Figs. 1 and 2.

Discussion

Although milkability is scored as a farmers' impressions of cow's milking speed from the first calving to first insemination and it hence easily reflects the farmers' image of a cow the reasonably high heritability of milkability (Juga et al., 1996) suggests that the trait can be selected even within herd if necessary.

The low heritability of temperament (Juga et al., 1996) reflects the problems of defining the trait on farm. Different farmers have different views of the temperament and it is easily mixed to something that is a general goodness of the cow.

The genetic correlation between milking speed and leakage is very high (Juga et al., 1996), which means that selecting for bulls and cows with faster milking speed will increase the frequency of leaking cows. According to Lawnstuen at al. (1988) the genetic correlation between fat corrected milk yield and milking speed is positive and hence selection for yield traits will also result in faster milking cows and possibly to increase in leaking cows.

The moderate genetic correlation between milkability and temperament (Juga et al., 1996) migh reflect the prohibitive effect of adrenaline to oxytocin action by reducing blood circulation to the alveoli (Ensminger, 1969) if cow is stressed during the stimulation of the cow for milk let down.

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Milkability has been regarded as an optimum trait, which means that neither slow or very fast cows are wanted. Slow cows increase the time needed for milking and fast cows have higher risk of leaking due to strong genetic correlation between milking speed and leakage. Leaking is unhygienic and will also increase the risk of mastitis infections (Jones, 1986; Geer et al., 1988). Breeders tend to use the information about milkability in corrective mating according to phenotypic information of the cow. No analyzes about the success of such corrective mating has yet been carried out in Finland.

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Table 1. The frequencies of the observations in milkability and temperament in Finnish first calving dairy cattle population

	Milkability[1]	Temperament[2]
1	7350	1676
2	21986	19697
3	79476	64719
4	30492	51064
5	4384	5874
Total	143688	143030

[1]1: very slow; 2: slow; 3: normal; 4: fast; 5: very fast.
[2]1: very poor; 2: poor; 3: normal; 4: good; 5: very good.

Table 2. Estimates of heritabilities and genetic and phenotypic correlations in milkability, leakage and temperament in FAY. (Standard errors of the estimates are in the paranthesis). (Juga et al., 1996)

	Milkability	Leakage	Temperament
Milkability	.20 (.009)	.66 (.026)	.28 (.035)
Leakage	.26	.06 (.004)	.25 (.042)
Temperament	.14	.03	.09 (.005)

h^2 on the diagonal, genetic correlations above the diagonal and phenotypic correlations below the diagonal.

Table 3. Estimates of heritabilities and genetic and phenotypic correlations in milkability, leakage and temperament in FHF. (Standard errors of the estimates are in the paranthesis). (Juga et al., 1996)

	Milkability	Leakage	Temperament
Milkability	.20 (.017)	.84 (.032)	.20 (.076)
Leakage	.27	.09 (.009)	.13 (.087)
Temperament	.13	.02	.06 (.008)

h^2 on the diagonal, genetic correlations above the diagonal and phenotypic correlations below the diagonal.

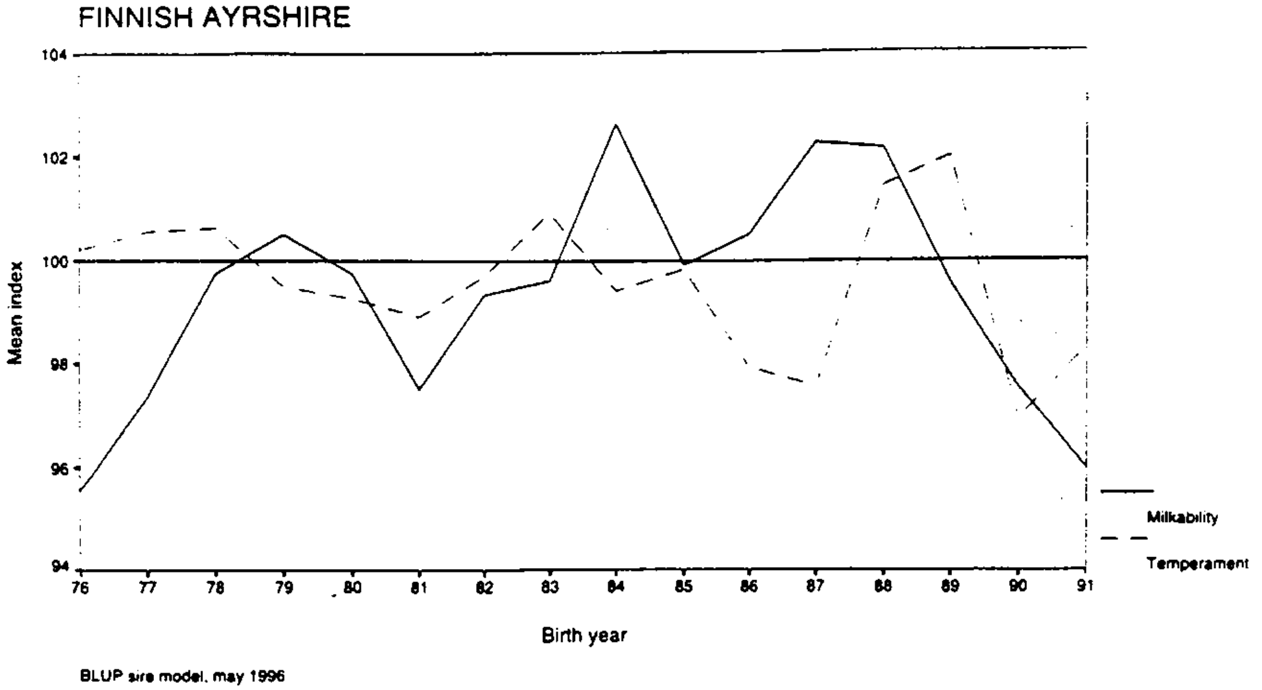
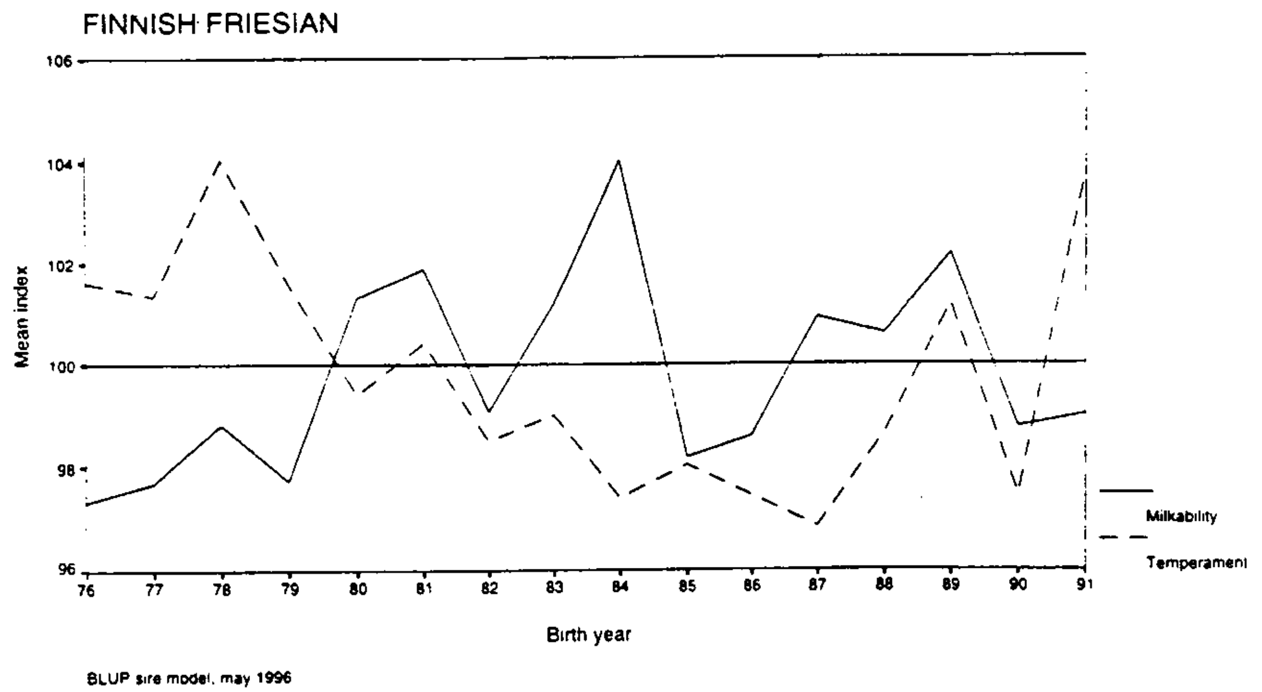


Figure 1. Genetic change in milkability and temperament.



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