Realized Effect of Selection for Mastitis Resistance

Torstein Steine
Norwegian Cattle, Box 5025, N-1432 Ås, Norway

In the Norwegian breeding program for dairy cattle it is focused very much on selection for fertility and health. Mastitis resistance was included in the selection in 1978, and since then the relative weight on that trait has increased gradually. Today the weight on mastitis resistance is equal to the weight on protein yield. Both of them account for 21 % of the total merit index for the bulls.

Because of the high relative weights on traits with low heritabilities it has been paid much attention to number of daughters per bull and also to number of bulls tested.

Table 1 shows the number of sampled bulls and number of progeny for different traits over the last years. The number of bulls is around 125 per year. It is very important to keep the number of bulls as high as possible. With the large progeny groups we have now, it is more important to keep the number of bulls constant than to keep the progeny group size constant. However if the number of progeny per bull for traits like health and fertility goes below 200, the discussion about the weigting of traits will be quite different. The accuracy of breeding values will vary much more between traits, and this will influence the realized effects on the different traits from selection for the total merit index.

Table 1. Number of bulls and progeny group sizes.

	Bull batches, year				
	1993	**1994**	**1995**	**1996**	**1997**
Number of bulls	123	125	130	123	121
Progeny groups:					
Protein yield, 1. run *	212	206	206	221	226
Protein yield; 2. run *	259	251	244	257	
Conformation and temperament	126	133	133	144	153
Milkability	191	187	188	201	200
Fertility of daughters	303	283	273	293	302
Calving ease and stillbirths, paternal	490	489	450	481	471
Calving ease and stillbirths, maternal	267	265	258	277	285
Health	304	300	295	313	291 **
Beef , carcass informations	154	160	163	190	244

* number of efficient daughters ; ** 1. run.

Table 2. Weighting of traits, in percentages.

Protein yield	21
Beef	12
Milkability	0
Leakage	0
Body	2
Legs	4
Udder and teats	11
Temperament	4
Fertility of daughters	14
Still births	4
Calving ease	4
Mastitis	21
Other diseases	3

It is important to be aware that the weighting is just telling something about the tool. The result is the genetic change obtained by selecting for this total merit index. The realized selection differentials in Figure 1 may be a good indicator of the result.

It tells us that even with this only about 20 percent of the weigt on protein yield more than 50% of the maximum genetic gain is obtained. For mastitis resistance the corresponding figure is 40% and for fertility of daughters 30%.

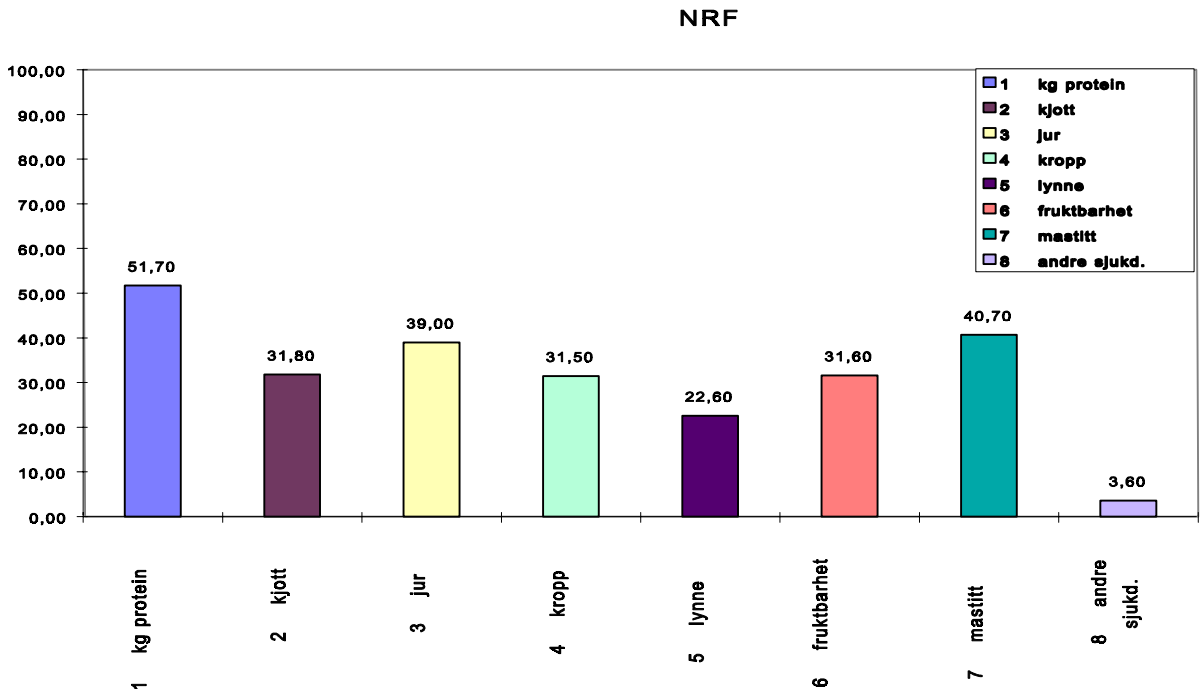

Figure 1. Realized selection differentials in the Norwegian breeding scheme. Expressed in percentage of selection differential if selecting for one trait at the time.

1: protein yield
2: beef
3: udder conformation
4: body and legs
5: temperament
6: fertility of daughters
7: mastitis resistance
8: other diseases

It may be questioned how much genetic change is possible for a trait like mastitis resistance. In order to find an answer to this question a special experiment was started in 1989. The dairy herds in seven agricultural schools and on one State farm are divided in two lines. In one line the very best proven bulls with regard to protein yield are used, 2-4 bulls per year. In the other line the 2-4 best bulls for mastitis resistance are used. This means that we carry out a single trait selection after the ordinary progeny testing.

The expected result in the line with selection against mastitis is that we will get an effect on mastitis frequency so that it goes down to about 8 or 9%. The milk yield in this line should be around the population average because the sampled bulls are selected according to the population breeding objective.

In each line there are about 250 cows. We have just started to look into these data, and the results so far seem to be very promising. In 1996 190 cows had their first lactation, equally distributed on the two lines. **The frequency of mastitis was 16% in the high milk line and 11% in the healthy line.**

The selection seems to be very symmetric in the two lines. In Table 3 the selection differences are shown for each line for protein yield and mastitis resistance, expressed in relative breeding values. This shows that there is almost no effect on the traits not selected for. This is not as normally expected because the correlation between milk yield and mastitis is unfavourable.

The reason may be that because of the selection for a combined breeding objective the parents of a new generation are always individuals with *special+ relations between the traits.

This is a question that must be analysed further, and with simulation of a population with selection for milk yield only, it may be possible to show the effects in population with different breeding objectives.

Table 3. Selection differences expressed in kg milk and mastitis frequency, expressed as breeding values.

Line	Milk yield, kg	Mastitis frequency (%)*
High milk yield	+828	+0.4
Low mastitis frequency	-18	-14

* average mastitis frequency=23 %

Another important question when selecting for a trait like mastis is what is really affected. Are the cows becoming different with regard to other traits which it is easier to select for than mastitis resistance directly.

As the lines are becoming even more different with regard to mastitis it will be more likely to find interesting differences in other traits. Just now we are discussing what to record in addition to the information already avilable in the cow recording system.