Utilizing International Gene Pool, a Nordic Experience

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Abstract

In the breeding programmes of the Nordic countries health traits have been included for several decades for both Holstein as well as the red breeds. For the Holstein, international sires of sons have also been used. A problem has been that several of the traits in the Nordic breeding profile, were not included in other countries set of EBVs and no international proofs were available for these traits. The effect of this was enlarged due to the unfavorable genetic correlation between production traits and some of the health traits. When national EBV for functional traits first was calculated in exporting countries, this information was considered in the selection of bulls to be used as sire of sons. Later international proofs from Interbull became available for production, conformation and also functional traits. This new information was valuable and utilized in the sourcing of candidates from the international gene pool.

Results are presented as genetic trend for total merit index (NTM), milk production, daughter fertility, mastitis resistance and udder conformation for age groups of Swedish Holstein test bulls for the years 1995 - 2005. The gain in NTM has been large for the period and is increasing over time. The composition of the progress has changed over time to be in better accordance to the breeding objective. During the first part of the period the genetic trend for milk production was large, but it has decreased slightly during the latter part. Initially the trend for female fertility was negative, but this has changed during the last years. The difference between the age groups' EBVs for mastitis resistance is smaller than for the other traits.

Keywords: Holstein, genetic trend, milk, fertility, udder health

Introduction

In the breeding programmes of the Nordic countries health traits have been included for several decades for both Holstein as well as the red breeds. A revision of the Total Merit Index was carried out in 1999. At this revision an increased economic weight was put on daughter fertility and udder conformation and decreased weight on milk production. International sires of sons have also been used in the breeding program. A problem has been that several of the traits in the Nordic breeding profile, were not included in other countries set of EBVs and no international proofs were therefore available for these traits. The effect of this was enlarged due to the unfavorable genetic correlation between production traits and some of the health traits. When national EBV for functional traits first was calculated in exporting countries, this information was considered in the selection of bulls to use as sire of sons. Later international proofs from Interbull became available for production, conformation and also functional traits. This new information was valuable and utilized in the sourcing of candidates from the international gene pool.

Table 1. Year and month when the first official international evaluation of breeding values was conducted.

Trait	First official evaluation
Milk production	August 1997
Conformation	August 1999
Udder health, cell count	May 2001
Longevity	November 2004
Calving traits	February 2005
Daughter fertility	February 2007
Workability	January 2009

Material

In this study genetic trends for test bulls of Swedish Holstein born between 1995 and 2004 have been used. The number of records per year was on average 79, with a maximum of 94 and a minimum of 65. Traits included in the investigation were milk production, daughter fertility, udder health (mastitis resistance), udder conformation and Nordic Total Merit Index (NTM)(http://www.nordicebv.info/).The proofs are calculated by Nordic Cattle Genetic Evaluation and proofs from May 2009 have been utilized (http://www.sweebv.info/).

Results and Discussion

Figure 1 shows the genetic trend for Milk Index. The trend is slightly larger during the first part of the period. This is also well corresponding to the higher relative economic weight on production at the beginning of the investigated period. National and international proofs for milk production traits have been available.

In figure 2 the genetic trend for daughter fertility is presented. Since 1999-2000 the trend has been positive. International proofs for daughter fertility were first published in 2007 and have had no influence during the investigated period. In 1999 a larger economic weight was put on daughter fertility and this made a change in the requirement of information on bulls before promotion to sire of sons. National proofs were used as well as domestic Swedish proofs for almost all MGS. Preliminary results, for a limited number of bulls born in 2005, show that the positive trend has continued.

Figure 3 shows the genetic trend for udder health as mastitis resistance. The variation across years has been considerable smaller than for the other two traits. Since 2001, when Interbull proofs first were published, the genetic trend has been positive.

In figure 4 the genetic trend for udder conformation is presented. Since 1999, when Interbull for the first time published international proofs, the trend has been clearly positive.

Figure 5 shows the genetic trend in NTM. The low result for 1999 is due to a strict deletion of CVM-carrier from the test bull group. No carriers were allowed to be sampled.

Table 2. The average annual genetic trend for the period for milk production, daughter fertility, udder health, udder conformation and NTM.

Trait	Annual genetic trend, index units	Present weight in NTM, index units	Relative gain in NTM units
Milk production	2,0	0,75	1,50
Daughter fertility	-0,1	0,31	-0,03
Udder health Mastitis resistance	0,3	0,35	0,10
Udder conformation	0,9	0,18	0,16
NTM / TMI	2,1		

The annual genetic gain in the studied traits is presented in table 2. The largest annual genetic gain was achieved in milk production; about 70 % of the total gain was expressed as increased milk production ability. The second largest gain was in udder conformation. Conformation belongs to the second group of traits that was included in Interbulls genetic evaluation. The genetic trend in udder health was larger after 1999, the year when udder health was included in Interbulls evaluations. The slight decrease in daughter fertility is an effect of a rapid decaling in the first part of the period and an equal regain during the later years. The gain in NTM has been high except during the years when the deletion of CVM-carriers from the breeding population was carried out. The last two year have been exceptional positive, mainly due to the fact that several of the most used sire of sons, such as O-Man, Ramos and Chassee, still have very strong proofs.

Conclusion

This study shows clearly that it is possible to utilize the international gene pool to achieve genetic progress in NTM as well as in the individual traits, such as milk production, conformation and functional traits.

Acknowledgment

The Swedish Dairy Association and Nordic Cattle Genetic Evaluation are acknowledging for the calculation of the used breeding values.

References

Definition of traits and estimation EBVs: http://www.nordicebv.info/.
Source of official estimated breeding values: http://www.sweebv.info/.