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Improved breeding values for Yield

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In 2022, the new Single Step method for calculating breeding values was introduced. So far, indices for nine traits are calculated with the new method. The turn has now come to yield traits, for which indices were calculated for the first time using the new method in May. Moving from old "two-step" method to the new single step changes the genetic trends and creates differences between previous and new breeding values.

Index for **Yield** describes genetic potential for milk, fat and protein production. The higher the breeding value the better the yield. The yield index includes breeding values for milk, fat and protein based in kilograms of milk as well as fat and protein (the latter are based on kg of milk and fat and protein percentages.) Information comes from the first three lactations from milk recording.

For all breeds and for all traits (milk kg, protein kg and fat kg, yield index), the genetic trends get more steep with the new model compared to the old one. This means that breeding values for older animals decrease compared to younger animals. However, the correlations between the old and the new indexes for daughter proven bulls are very high implying that ranking between bulls within birth years change minimally.

Applying single step method for genetic evaluation of yield traits causes genetic trends to become stronger as expected. Overall changes in GEBVs are moderate but there are individual animals for which changes in index values can be large.

More information about the single step method is provided in the article New method to calculate breeding values for Dairy breeds.

Yield and NTM

Yield has the highest weight in NTM for all breeds. The weight is different for genomic tested animals and non-tested animals. The weight of yield for bulls and genomic tested females is 1.02 for RDC, 0.90 for Holstein and 0.83 for Jersey. For non-tested females with own records the weight is slightly lower (RDC 0.93, 0.81 HOL, 0.75 JER). Since the weight of yield is so high for all breeds, changes in yield index affect the NTM and the change is almost the same size for yield and NTM.

Proven sires are very stable

Correlations between the old two step evaluation and the new single step evaluation are very high across breeds for proven bulls. This means that few indices change, and changes are very small. There is very little re-ranking for proven bulls within birth years.

More changes for young genomic bulls

For young genomic bulls the correlations between the old and the new yield evaluation are a bit lower but still high. For RDC and Holstein the correlations are about 0.93 and for Jersey a bit higher, about 0.97. This means that young genomic bulls have more changes in yield indices compared to

proven bulls. For young genomic Holstein bulls indices for milk and protein production increase, while fat production and overall yield index slightly decrease. The average change in yield index is about 1-2 index units. For young genomic RDC and Jersey bulls changes are positive for all traits. The average change in yield index is about two index units.

Minor changes for genomic females

For genomic tested females changes are very small for all breeds in yield index. For all breeds changes are positive and the change in yield index is about 1-2 index units. For the youngest females (born 2023-2024) changes are slightly larger and more re-ranking might be seen. However, the changes are on average still very small.

Significant method development

Production traits are the most important trait group in dairy cattle breeding and getting single step method in use for breeding value evaluation is a major improvement. When method is changed, index values tend to change to some extent. On average changes for yield traits have been small but even these small changes influence NTM. However, this development work is very important, and the outcome is very positive.