Improved NAV breeding values for conformation

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Improved NAV breeding values (EBVs) for conformation traits were published 3rd of November. The main change is that EBVs for both bulls and cows are now based on classification records also from cows in later lactations from all three countries. We now get single EBVs for conformation in later lactations. The main improvement is however an increase in accuracy of EBVs, especially for cows. Now it is easier for farmers to distinguish between cows when it comes to genetic merit for conformation traits.

New breeding values

All NAV EBVs for conformation traits are based on classification records on cows made by official classifiers in Denmark, Finland and Sweden. Previously only records from first lactation cows were included from Sweden, whereas later lactation records were included from Finland and Denmark to estimate EBVs for cows and/or bulls. The model is now extended to include second and third lactation records from all three countries for both bulls and cows, see Table 1

Table 1. From which lactations classifications records are used to estimate bull and cow breeding values for conformation in genetic evaluation before (old model) and after (new model) November 2014.

	Bulls		Cows	
	Old	New	Old	New
Denmark	1	1-3	1-3	1-3
Finland*	1-10	1-3	1-10	1-3
Sweden	1	1-3	1	1-3

* For Finnish cows that have classifications later than lactation three, the latest record is included instead of the third lactation record in the new model.

One reason for including more records from later lactations was that some conformation traits, such as udder depth, deteriorate with increasing lactation. This could partly be explained by genetics and if so, records from later lactations could contribute with some important information. The results showed however that selection on first lactation results improves conformation in later lactations efficiently. Another reason was to increase the accuracy of EBVs, especially for cows.

 How much of the information included in the genetic evaluation that is from classifications in later lactation varies a lot both with country and breed. The proportion of records from later lactations is highest (38 %) in RDC (Red Dairy Cattle) from Finland and lowest in RDC (5 %) from Sweden.

From the new model there are now more single EBVs published, while the combined indexes (Udder, Feet & legs and Frame) are the same as before. For an overview of all the EBVs for conformation traits and how these are combined into indices, see text and figure in Fact box.

More accurate than previously

The inclusion of data from later lactations and other model improvements implies that the EBVs get more accurate now. The change is largest for Swedish cows where later lactations have not been

included earlier. Higher accuracy means that the selection will be more effective. It is easier to identify the best and the worst animals.

Figure 1 shows some examples of the increase in accuracy for Finnish Ayrshire when a cow is classified one or two times compared to having only a pedigree index for conformation. The classification in first lactation increases accuracy with around 25% and next classification gives an additional increase of around 10%.

First lactation records are still most important for the quality of the conformation EBVs. Conformation in later lactations will be improved already by selection on first lactation results since the genetic correlations between lactations are very high (>0.90 for most traits). This means that it is more or less the same genes that affect for example udder depth in first and later lactations.

Increase in accuracy of EBVs based on one or two records compared to pedigree index: Finnish Ayrshire
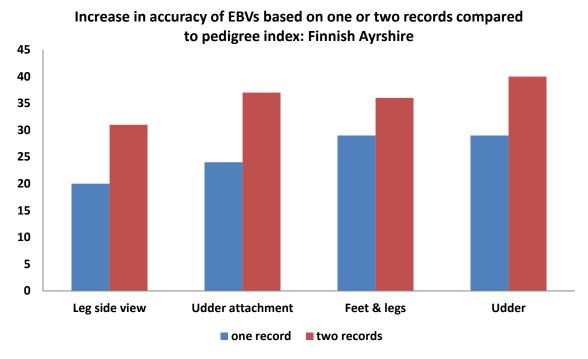
Figure 1. The increase (%) in accuracy for some conformation EBVs in Finnish Ayrshire cows when using information from one or two classifications compared to only having a pedigree index. These examples of increase in accuracy are for the single EBVs leg side view and udder attachment as well as the combined indices Feet & legs and Udder.

To conclude, the implemented changes in the genetic evaluation for conformation make EBVs more accurate, especially for cows. Therefore the EBVs published 3rd of November changes somewhat more than usual. The correlations between new and previous EBVs for Frame, Feet and legs and Udder are around 0.97-0.98 for bulls and 0.94-0.98 for cows. The biggest changes are for Feet and legs in RDC, where the correlation was 0.94. The lower the correlation the more re-ranking can be expected.

Here you find them

All indices for conformation as well as the underlying single EBVs for different lactations are published on NAV Bull Search (http://www3.mloy.fi/NAV/) and the national web pages for publishing EBVs.

Fact box:

Breeding values for conformation traits and how these are combined into sub-indices, some of which are included into NTM. The new thing from November 2014 is the single EBVs for second and third lactation and how lactation 1-3 are weighted together into one index per trait (50, 30 and 20% weight on 1st, 2nd and 3rd lactation, respectively).

	Body traits	Feet and leg traits	Udder traits
1. Single EBVs: one per trait and lactation 1-3 (*No. of EBVs*)	• Stature • Body depth • Chest width • Dairy form • Top line • Rump width • Rump angle **7*3**	• Rear legs, side view • Rear legs, back rear view • Hook quality • Bone quality • Foot angle **5*3**	• Fore udder attachment • Rear udder height • Rear udder width • Udder support • Udder depth • Teat length • Teat thickness • Teat placement front • Teat placement back • Udder balance **10*3**
2. Index across lactation: one per trait (*No. of indices*)	0,5*lact 1 + 0,3*lact 2 + 0,2*lact 3 **7**	0,5*lact 1 + 0,3*lact 2 + 0,2*lact 3 **5**	0,5*lact 1 + 0,3*lact 2 + 0,2*lact 3 **10**
3. One sub-index per trait group	**Frame**	**Feet and legs**	**Udder**

How the sub-indices are composed (included traits and economic weights) differs between the breeds

NTM

Two of the sub-indices are included in NTM
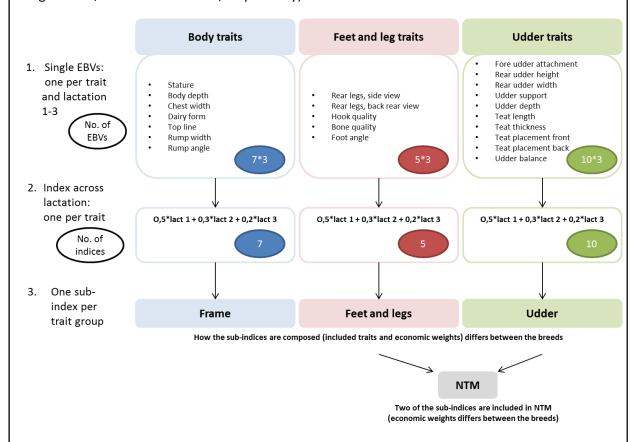(economic weights differs between the breeds)

Illustration of which single estimated breeding values (EBVs) are published for conformation traits in lactation 1-3 and how these are combined into indices across lactations as well as across traits within trait group.