NAV Purebred beef evaluation for other breeds

Elisenda Rius-Vilarrasa, Växa.

In November 2023, NAV publish, for the first time, breeding values for calving, growth and carcass traits for other purebred beef animals currently having a National evaluation in Denmark, Finland and Sweden. Table 1, show the list of additional breeds included in NAV PbB evaluation. As for the main five breeds, breeding values for breeds in Table 1 will be estimated 4 times per year (March, April, June, and November) and replace, fully or partly, the nationally calculated ones, depending on the country.

Table 1. List of breeds included in the Purebred beef evaluation from November 2023

Full name	Abbreviation	Group	Countries sending data to the evaluation
Blonde Aquitaine	BAQ	Continental	DNK, FIN and SWE
Danish Blue Cattle	BBL	Continental	DNK
Dexter	DXT	British	DNK
Galloway	GLW	British	DNK
Grauvieh	TGR	British	DNK
Highland Cattle	HLA	British	DNK, FIN and SWE
Piemontes	PIE	Continental	DNK
Salers	SAL	British	DNK
Shorthorn (beef)	BSH	British	DNK

The NAV single breeding values starting from the November 2023 evaluation can be found at the NAV Beef search page for breeds included in Table 2, for all animals that are sent to the NAV evaluation with at least one record from the two trait groups (calving, growth and carcass).

Table 2. Number of animals sent to the NAV purebred beef evaluation with at least one weight record.

Country	BAQ	HLA
Denmark	18 342	16 953
Finland	2 178	10 036
Sweden	7 777	10 973

Data and genetic model

The data used, data curation, model and the presentation of breeding values follows the same principles and rules as for the other five larger breeds. More information about NAV beef evaluation is found on NAV homepage.

In short, calving, weight, and carcass registrations recorded by farmers, technicians, test stations (SWE) and slaughterhouses currently used in the national evaluations from Denmark, Finland and Sweden are the bases for the joint NAV Purebred Beef evaluation. Before calculating breeding values, the registrations are pre-adjusted for to account for (systematic) differences in the phenotypic variation between birth years, countries, breeds, and genders.

The genetic model is a breed-wise multi-trait BLUP animal model, and the breeding values are calculated separately for two trait groups: 1) calving, and 2) growth and carcass traits. Some of the major improvements of the joint NAV Purebred Beef evaluation compared to the national genetic evaluations include harmonization of fixed effects across the three Nordic countries, new genetic parameters and (improved) genetic groups. All these improvements are also part of the new genetic evaluation for the other breeds.

The NAV Purebred Beef model has an improved definition of systematic effects adjusting for phenotypic variation that is not due to genetics and therefore providing fairer comparisons of animals. A table with the fixed effects included in each trait group genetic evaluation is shown in Table 3.

Table 3. Fixed effects included in the calving and/or the carcass NAV Purebred Beef evaluation.

	Trait group	
Fixed effects	**Calving**	**Carcass**
Country-sex	X	X
Country-twin		X
Country-birth year-month	X	X
Country-dam age-time	X	X
CG: Herd-birth year	X	X
Adjustment for age at weighing		X

Another significant change in the NAV Purebred beef model compared to the current national models is the inclusion of genetic groups. The NAV Purebred Beef model with genetic groups affects estimated breeding values mainly for those animals with missing parent information. A larger proportion of animals with missing parent information are found in old birth year classes (animals born before year 2000) and for imported animals. For those groups of animals, substantial changes in breeding values can be observed affecting the ranking due to inclusion of genetic groups. The inclusion of genetic groups better estimates the genetic level of animals with missing pedigree information.

Breeding values for calving traits

The NAV calving evaluation for purebred Beef includes calf survival, calving ease and birth weight and all three traits are subdivided into two categories: primiparous calvings versus multiparous calvings. This division considers the differences in the degree of difficulties between first calving compared to later calvings. Of the twelve estimated breeding values, only eight will be published since birth weight is only used as indicator trait in this evaluation. The resulting breeding values from the NAV Purebred Beef evaluation calving traits are in Table 4.

Table 4. Calving traits in the model and resulting breeding values.

Traits in the model	Resulting EBVs
Calf survival - Primiparous	2 official EBVs: DIR* + MAT**

Calf survival - Multiparous	2 official EBVs: DIR + MAT
Calving ease - Primiparous	2 official EBVs: DIR + MAT
Calving ease - Multiparous	2 official EBVs: DIR + MAT
Birth weight – Primiparous	DIR + MAT but only to be used as indicator trait
Birth weight - Multiparous	DIR + MAT but only to be used as indicator trait

*Direct, **Maternal

Breeding values for weight/growth and carcass traits

The NAV Purebred Beef evaluation for growth and carcass traits includes seven traits: birth weight, weaning weight gain, yearling weight (only Denmark), post-weaning weight gain (only Finland and Sweden), carcass daily gain, carcass conformation score and carcass fat score.

The calculation of post-weaning weight gain requires information on weights at weaning and at one-year age, and in occasions this data can be limited, such is the case of weaning weights records especially from Denmark. For this reason, it was agreed that Danish records on yearling weight will be used instead of post-weaning weight in the evaluation so that there is no information lost on weight records. The resulting breeding values from the NAV Purebred Beef evaluation for weight/growth and carcass traits are in Table 5.

Table 5. Growth and carcass traits in the model and resulting breeding values.

Traits in the model	Resulting EBVs
Birth weight	2 official EBVs: DIR* + MAT**
Weaning weight gain	2 official EBVs: DIR + MAT
Yearling weight	2 official EBVs: DIR + MAT
Post-weaning weight gain	1 official EBV: DIR
Slaughter daily gain	1 official EBV: DIR
Carcass score	1 official EBV: DIR
Fat score	1 official EBV: DIR

*Direct, **Maternal

NAV Purebred Beef Breeding values in practice

The new NAV Purebred Beef genetic evaluation has been developed to provide farmers and breeding advisers with modern and more accurate estimated breeding values for calving, growth, and carcass traits. NAV estimated breeding values consider all performance information and information from relatives from all three countries to give unbiased estimates of an animal's genetic merit for a given trait. Hence, sires used in more than one country will have their genetic merit estimated with more accuracy compared to their estimated breeding values from the national evaluations. Joint Nordic estimated breeding values also makes it possible to compare EBVs directly across Denmark, Finland and Sweden.

Presentation of EBVs

Breeding values for calving and growth and carcass traits are expressed as the difference between an individual estimated breeding value and the genetic base to which the animal is compared.

For the animals in the genetic base, estimated breeding values have a mean of 100 and standard deviation of 10. The selection of animals to form the genetic base includes males and females with birth years 5 to 9 years prior to the publication date having a reliability for one of the traits in that trait group

of at least 10% or having observations or having at least 5 offspring with observations for one trait in each trait group.

While the genetic base for the mean of relative EBVs is rolling, and therefore updated at every evaluation, the standard deviation of the relative EBVs is constant from one evaluation to the next.

The group of animals forming the base population in the NAV Purebred Beef model differs from all the three national evaluations by including a mix of animals from Denmark, Finland, and Sweden. Changes in how the base population is formed affects the genetic level and the spread of the breeding values, but not the ranking of animals. The NAV purebred Beef evaluation provides breed-specific estimated breeding values and therefore individual estimated breeding values cannot be compared across breeds.

Publication of EBVs

At first, single estimated breeding values for calving, growth, and carcass traits (Table 4 and Table 5) will be published at [NAV Beef search](). They will also be available for the National organizations (SEGES, Faba and Växa Sverige) that will be responsible for national publication and for calculating national sub-indices and TMI, if applicable.

In the coming March 2024 evaluation, it is plan that publication of subindex will be also available.

Validation of the NAV Purebred Beef genetic evaluation

Breeding values from the new NAV Purebred Beef evaluation have been carefully examined. Correlations and genetic trends have been compared between the NAV and the nationally estimated breeding values for all traits and breeds. The NAV Purebred Beef model for both calving and growth and carcass traits has shown stability of the breeding values when comparing two consecutive runs where in the later run more data is added to the evaluation.