

Statistical Indicators

E-26

Publication Rules Sire Indexes

▪ **Introduction**

The breeding value estimation for sires is subjected to rules of the authorities. The Cooperation CRV is the organization, which is responsible for the publication of breeding values for sires. Breeding values of sires are estimated based on their parents information, observations on the animal itself and their offspring. Breeding values can also be converted from international figures. Interbull carries out this conversion.

The introduction of genomics makes it possible to predict the genetic value of an individual animal based on DNA tests. Breeding values based on genomic information are called genomic breeding values, and are based on ancestor information and DNA information. Breeding values based on the usual information sources (pedigree, performance and offspring) will be referred to as conventional breeding values.

Genomic breeding values and conventional breeding values are estimated in two separate genetic evaluation systems. Breeding values from both systems are combined in a post-processing step after these two genetic evaluations, generating a combined breeding value. Starting December 2014, genomic information will be added to the breeding value estimation directly. The genomic information (DGV: Direct Genomic Value) will be treated as a pseudorecord/observation in the breeding value estimation. The new breeding value estimation provides a direct breeding value for bulls who have been genotyped or whose offspring have been genotyped. For bulls who have no offspring with a performance, the genomic breeding value is based on ancestry, using only male ancestors and genomic information.

To publish a breeding value, this breeding value needs to comply with some publication criteria. Publication criteria are defined for conventional and for combined breeding values. Only one breeding value is published for a certain trait of a bull. When genomic information is available for a bull, only the combined breeding value is published.

This chapter describes the publication rules for all traits of all sires, whose breeding values are published at the moment.

▪ **Publication rules for conventional breeding values**

The publication of conventional breeding values for sires depends on four things:

- reliability of the breeding value;
- the breeding value has to make use of information on offspring;
- whether the animal has genomic information (DGV)
- the category to which the sire belongs.

Reliability

The breeding value estimation also calculates the reliability. This value, between 1% and 99%, is a measure of the amount of information on which the breeding value is based. It is also a measure of the possible change of the breeding value when new information is added. To be published, breeding values have to meet a minimum value for reliability.

The EU-regulation 2016-1012 describe the minimum values for reliability as follows (appendix 3, part 3, article 7):

“For purebred breeding bulls of which the semen is meant to be used for artificial insemination, the minimum reliability should be at least:

- a. for bulls belonging to the milkbreeds (including dual purpose breeds) 0,5 for the most important traits of milk production ...*
- b. for bulls belonging to the meatbreeds (including dual purpose breeds) 0,3 for the most important traits of meat production ...”*

Genomic information

The genomic information will be made available by the bull owner (for his own bulls) in the form of Direct Genomic Values (DGVs). The DGVs will be added to the breeding value estimation as an estimation method of the DGVs when it is validated by Interbull.

Information on progeny

To receive a breeding value for a trait, a sire is in most cases dependent on information of performances by his offspring. Besides the requirement regarding reliability, another requirement for publishing breeding values of sires is that every published breeding value has to contain information on the offspring of the sire. This means that the breeding value of a sire is published if at least one descendant has an observation for the concerning trait or for a correlated trait (predictor). The breeding value is also published if a sire has at least one descendant who contributes to the breeding value of the sire in the breeding value estimation. For example, a sire with one or more sons who has/have daughters in the breeding value estimation.

Category of the sires

The category of a sire depends on

- whether a sire has been used as an AI sire;
- whether a sire has been tested nationally and/or internationally;
- the moment at which offspring of the sire has been born. This is determined by the available pedigree information in the Cooperation CRV breeding value estimation.

The categorization of sires is redone before every breeding value estimation. Therefore, the category of a sire is fixed during one and the same publication run and will not differ per trait. However, a sire can change categories over the course of time. Table 1 shows the requirements per category.

Table 1. Overview of requirements for categorization of sires

Category	Name and requirements
A	Nationally tested AI sire <ul style="list-style-type: none"> - The sire has an AI code in the Netherlands and/or semen number in Flanders - The number of days between the birth date of the sire and the 15th daughter in the pedigree file ⁽¹⁾ of the breeding value estimation is 1800 days at the most - For privately-owned AI sires (AI code series 43000-44999 and 80000-83999) the number of days between the birth date of the sire and the 50th daughter in the pedigree file ⁽¹⁾ of the breeding value estimation is 1800 days at the most
B	Internationally tested AI sire <ul style="list-style-type: none"> - The sire has been AI tested abroad and is present in the Interbull breeding value estimation for milk production with foreign daughters - The sire is not a category A sire: sire has less than 15 daughters in the pedigree file of the breeding value estimation or the number of days between the birth date of the sire and the 15th daughter in the pedigree file of the breeding value estimation is more than 1800 days
C	Not AI tested sires <ul style="list-style-type: none"> - The sire does not meet the requirements for a national or international AI sire
D	International genomic AI sire

	- The sire is used as an AI sire abroad and is present in the Interbull genomic conversion.
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⁽¹⁾ The pedigree file is the complete pedigree file compiled from the pedigree files delivered by the studbook organizations

Publication rules

For all bull categories (see below) the reliability of the milk production breeding values need to be at least 50% to be published. For the meat breeding values, the reliability needs to be at least 30% to be published. For all other traits, the minimum reliability of a breeding value is 25% to be published.

Taking into account reliability, information on offspring, genomic information (DGV) of the bull himself and the above categories of sires, the following general publication rules apply:

A-category bulls:

- The national breeding value of AI sires that have been tested nationally (category A) will be published if the breeding value has a reliability of at least 50% for milk production traits, 30% for meat production traits and 25% for all other traits and if the information of at least one descendant or the bull's own genomic information was incorporated in the breeding value. For production, somatic cell and udder health an extra requirement is added, which demands the breeding value to be based on at least 15 daughters with observations, in at least 10 different herds.
- If the Interbull breeding value has a reliability of 10% or higher, the Interbull breeding value will be published. Once the national breeding value of a sire has been published, the national breeding value will be maintained.
When introducing a new Interbull trait, the 10% requirement is applied once again.

B-category bulls:

- The national breeding value of AI sires that have been tested internationally (category B) will be published if it has a reliability of at least 50% for milk production traits, 30% for meat production traits and 25% for all other traits and if the information of at least one descendant or the bull's own genomic information has been incorporated in the breeding value, as long as no Interbull breeding value is available. This may be the case when a country, breed or trait is not participating in the Interbull evaluation.
- As soon as an Interbull breeding value is available, this will be published provided that the reliability is higher than 50% for milk production traits, 30% for meat production traits and 25% for all other traits. The Interbull breeding value will be overruled again by the national breeding value as soon as the national breeding value has a reliability of 90% or higher.

C-category bulls:

- The national breeding values of sires that have not been AI tested (category C) will be published if the reliability is more than 50% for milk production traits, 30% for meat production traits and 25% for all other traits and the breeding value is based on at least 10 descendants. Sires that have not been AI tested will not appear in the international indexation and will therefore never receive an Interbull breeding value.

D-category bulls:

- AI bulls who receive a converted genomic breeding value through Interbull, will have their breeding values published provided the reliability is 50% for milk production traits, 30% for meat production traits and 25% for all other traits or higher and the reliability of the converted Interbull genomic breeding value is less than 10% higher.

These rules are applied per group of traits, considering the main trait as leading, e.g. percentage of reliability for final score is defining for all conformation traits. Table 2 indicates which trait is the main trait within a trait group. It is possible for one group of traits of a sire to

be published as national breeding values and another group of traits of the same animal to be published as Interbull breeding values.

Table 2. Overview of the main traits per trait group

Trait group	Main trait
Milk production	Overall INET
Conformation	Final Score
Longevity	Longevity
Fertility	Overall Fertility
Somatic Cell Count	Overall Somatic Cell Count
Udder Health	Udder Health
Claw Health	Claw Health
Calf Survival	Calf Survival
Birthing Traits (direct effect)	Calving Ease
Maternal Calving Process	Maternal Calving Process
Vitality	Vitality
Maternal Vitality	Maternal Vitality
NVI	NVI
Milking speed	Milking speed
Temperament	Temperament
Beef Merit Index traits	Beef Merit Index
Urea	Overall Urea

Parent averages may also meet the publication requirements, but they are never published in the publications/files.

NVI traits which do not have an official breeding value will not be used in the calculation of NVI.

Table 3 shows a summary of the individual publication requirements per trait, in case the breeding values contain daughters with performance.

▪ **Publication rules for combined breeding values**

If a bull has a genomic breeding value (DGV) for a trait, but he does not have offspring with performances for this trait, this breeding value is combined with the bull's pedigree-index. The pedigree index contains the breeding values of all known male ancestors of the bull. If a bull has a genomic breeding value (DGV) for a trait and he has offspring with performances for this trait, the breeding values from the breeding value estimation will be published. In this case, the genomic information will be added to the conventional breeding value as a pseudorecord.

A combined breeding value is published if a bull

- has an AI-code,
- is at least 10 months of age,
- the reliability of the combined breeding value of the main trait (table 2) has a reliability of at least 50% for milk production traits, 30% for meat production traits and 25% for all other traits.

▪ **Availability of breeding values**

A breeding value is publishable if a group of traits meet the requirements seen in Table 3. This table shows the requirements needed for animals belonging to the A, B or C category. For animals in the D category, no additional requirements exist.

The sires of categories A,B,C, and D are made available by Cooperation CRV. All publishable breeding values of the sires of categories A, B, C and D are available in the 031 file of the breeding value estimation.

Table 3. Publication requirements per trait group and category of the sire for the press publication and the sire files (ITB = Interbull, BV = breeding value)

Trait group	Category of the sire		
	A	B	C
	nationally tested AI sire	internationally tested AI sire	Not AI tested sires
NVI	- Production is official	- Production is official	- Production is official
Production	<ul style="list-style-type: none"> - National BV if INET has a reliability of 50% or higher and is based on at least 15 daughters in at least 10 herds. 15 daughters have to be at least 120 days in milk. For small local breeds⁽²⁾ bulls need to have at least 10 daughters with observations and no minimum for number of herds - ITB BV if ITB BV has at least a 10% higher reliability than the national BV and national BV has never been published before 	<ul style="list-style-type: none"> - As long as ITB BV is not available: National BV if INET has a reliability of 50% or higher and is based on at least 15 daughters in a minimum of 10 herds. 15 daughters have to be at least 120 days in milk - ITB BV with at least 50% reliability for INET - National BV if INET has a reliability of 90% or more 	<ul style="list-style-type: none"> - National BV with a reliability of 50% or higher for INET and is based on at least 10 daughters
Other traits Conformation Longevity¹ Birth Traits Maternal Calving Process Vitality Maternal Vitality Udder Health Temperament Milking Speed Urea Somatic cell count Claw health Calf survival Automatic milking traits	<ul style="list-style-type: none"> - National BV if BV for main trait has a reliability of 25% or more - ITB BV if ITB BV has at least a 10% higher reliability than the national BV and national BV has never been published before 	<ul style="list-style-type: none"> - As long as ITB BV is not available: National BV with a reliability of 25% or higher for the main trait - As soon as ITB BV is available: ITB BV with a reliability of 25% or higher for the main trait - National BV if main trait has a reliability of 90% or higher 	<ul style="list-style-type: none"> - National BV with a reliability of 25% or higher for the main trait and based on at least 10 daughters

Fertility	<ul style="list-style-type: none"> - National BV with a reliability of 25% or higher for fertility index - ITB BV if ITB BV for calving interval has at least a 10% higher reliability than the national BV for the main trait and national BV has never been published before 	<ul style="list-style-type: none"> - As long as ITB BV is not available: National BV with a reliability of 25% or higher for the main trait - As soon as ITB BV is available: ITB BV with a reliability of 25% or more for calving interval - National BV if main trait has a reliability of 90% or higher 	<ul style="list-style-type: none"> - National BV with a reliability of 25% or higher for fertility index and is based on at least 10 daughters
Calving index	<ul style="list-style-type: none"> - One of the four breeding values for the underlying traits is official and the index has a reliability of at least 25% 	<ul style="list-style-type: none"> - One of the four breeding values of the underlying traits is official and the index has a reliability of at least 25% 	<ul style="list-style-type: none"> - One of the four breeding values of the underlying traits is official and the index has a reliability of at least 25%
Body Weight	<ul style="list-style-type: none"> - Underlying conformation traits meet the conformation requirements and body weight has a reliability of 25% or higher. 	<ul style="list-style-type: none"> - Underlying conformation traits meet the conformation requirements and body weight has a reliability of 25% or higher. 	<ul style="list-style-type: none"> - Underlying conformation traits meet the conformation requirements and body weight has a reliability of 52% or higher.
Beef Merit Index	<ul style="list-style-type: none"> - National BV with a reliability of 30% or higher for beef merit index 	<ul style="list-style-type: none"> - National BV with a reliability of 30% or higher for beef merit index 	<ul style="list-style-type: none"> - National BV with a reliability of 30% or higher for beef merit index and is based on at least 10 daughters

- 1 For longevity there is an extra requirement besides the minimum percentage of reliability, regarding the percentage of animals for which the first calving date is allowed to be missing from the data set: at the most 70% of the daughters or granddaughters are allowed to have a first calving date that lies before January 1, 1988. January 1, 1988 marks the beginning of the data set used for the breeding value estimation. The reason for this requirement is to prevent that only a very select group of progeny will be analysed which may have had a different selection process than the majority of the progeny. This could lead to an inaccurate breeding value estimation.
- 2 Small local breeds are: Blaarkop, Fries Hollands, Fries Roodbont, Lakenvelder, Witrik, Brandrood, West-vlaams Rood, Oost Vlaams Wit-Rood, Belgisch Rood, Belgisch Blauw Mixte