What is an accuracy of an estimated breeding value, *and why do we publish it?*

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The accuracy of an estimated breeding value (EBV) is a measure of how effectively it represents the true breeding value of an animal for a specific trait. The accuracy is always expressed as a value between 0 and 1, usually published as a percentage ranging between 0% to 100%.

In statistical terms, the accuracy of a breeding value is determined by calculating the correlation between the true breeding value of a specific animal for a given trait and the predicted (estimated) breeding value based on the available information. A higher correlation indicates a greater accuracy of the breeding value and increases the reliability of the estimated breeding value. Moreover, a higher accuracy means that the prediction is less likely to change as more information becomes available.

Accuracy is influenced by various factors, including the heritability of the trait, the accuracy of parent recording, the completeness of available performance information, and the accuracy of measurements associated with the performance data. Additionally, the effective size of the contemporary group in which the animal and its relatives were recorded is another contributing factor.

Heritability of a trait is a measure of the extent to which differences in genes account for variations in the specific physical expression of that trait. Represented by the symbol h^2, heritability is a statistical concept that quantifies the proportion of trait variation attributed to genetic variation within a particular population.

Heritability estimates range from zero to one. A heritability close to zero suggests that the variability in a trait among animals is primarily influenced by environmental factors, with minimal contribution from genetic differences. On the other hand, a heritability close to one indicates that the variation in a trait is predominantly due to genetic differences, with minimal influence from environmental factors.

For traits with higher heritability, obtaining accurate predictions requires less performance data from relatives. Conversely, traits with lower heritability necessitate a larger amount of performance data from relatives to achieve higher accuracy values. Therefore, it is possible to achieve high accuracies for low heritable traits when sufficient performance data is recorded for all related animals of a specific individual. Obviously, the number of related animals increases significantly with more measured (recorded) progeny.

The accuracy of breeding values is inherently dependent on the accuracy and completeness of an animal's recorded pedigree. Animals with meticulously recorded and complete pedigree trees are associated with more precise breeding value predictions.

However, it is the performance measurements recorded within the pedigree that truly contribute to the accuracy of an individual's breeding value. In cases

where few or none of an animal's family members have undergone performance testing, the accuracy of their breeding values will be lower compared to animals whose family members have been tested.

Accurate recording of traits, particularly for various production and reproduction traits, further enhances the accuracy of predictions across the board. On the other hand, any inaccuracies in recording the pedigree, including the parents and offspring of an animal, can lead to a misrepresentation of breeding value accuracies. In such instances, the published accuracy figures create a false impression due to the misrepresentation of the true relationships among animals in the pedigree.

The accuracy of a breeding value must also be seen as the risk involved in using that specific breeding value. The lower the accuracy value, the higher is the risk that the estimated breeding value is not necessarily a true reflection of the animal's true breeding value for that specific trait. The higher the accuracy value, the closer is the estimated breeding value to the animal's true breeding value, and the lower the risk that the breeding value will change in future predictions.

Use the breeding value accuracies only as a risk management tool and use the estimated breeding value itself as the selection tool. Even where the accuracy of a breeding value is low, it still reflects the best measure of the true genetic merit of the animal. An estimated breeding value is always more accurate for selecting an animal for breeding than any phenotypic measurement independent of its accuracy value.

What should a breeder do to make sure that the prediction of the genetic merit of his or her animals are predicted accurately and therefore selected with confidence:

- Record pedigrees (parentage) accurately.
- Record all traits of economic importance accurately.
- Make sure all animals have an equal chance to be compared on the base of their (phenotypic) performance with their contemporaries.
- Compare the progeny of more than one sire in each contemporary group.
- Keep contemporary groups fair, but not too small to allow for adequate variation and ranking of performance. Preferably not less than five animals per group.
- Measure ALL animals and not selected groups or individuals.
- Use genetic values (with functional physical appearance) for own selection.
- Buy from herds that are serious about measurement and accurate recording. Similarly, try to sell to fellow breeders that are equally serious in recording accurately and diligently.

Therefore, always select animals based on breeding values and not accuracies. The accuracy value is a risk measurement parameter or indicator of the probability that a specific breeding value of an animal could change in the future. The higher the heritability of a specific trait, the more complied and accurate an animal's pedigree tree is recorded, and the more performance information is available of the specific trait for an animal and its relatives, the higher the accuracy will be and the lower the probability for the breeding value to change.

Due to this, the Nguni Breeders' Society has found it fit to introduce minimum accuracy levels in the publication of breeding values based on the heritability of each trait for the purpose of the official Nguni catalogue.

For traits with higher heritability and easily measured, breeding values will only be published in a catalogue in the future, when the accuracy is 40% and above (traits like birth and weaning weights).

For traits of moderate heritability and not so easy to be measured (post-wean growth traits), accuracies must be 30% and higher.

For low heritable traits like reproduction and selection values, the minimum accuracy must be 15% and higher.

Where a breeding value accuracy does not comply with these minimum accuracy requirements, the breeding values for that animal and trait will not be published in the official Nguni catalogue in the future.

These are just ways the Nguni Breeders' Society introduced to ensure a sustainable future for its breeders and commercial buyers.