Chapter 8.1.2: Animal Model

However, if the heritability is low, then mass selection not necessarily results in selection of the genetically best animals. Also, if the phenotype for some reason is not available for all animals, such as for milk production of males, then mass selection is not sufficient because not all animals have a phenotype. In those cases we can use phenotypes of related animals to estimate the breeding value of the animal without a phenotype. This is possible because, as we have seen in the chapter about genetic relationships, related animals share alleles. And the closer the relationship, the more alleles are shared. This model for estimating breeding values while making use of information on related animals is called the Animal Model. Important prerequisite is that the pedigree recording of the animals is accurate, so that family relationships are known without errors. This method requires quite large numbers of animals to be able to estimate the breeding values accurately. The animals need to be related and/or kept in the same environment to be able to disentangle the genetic and environmental component of the phenotype.

Estimating breeding values with the animal model is very useful in case of missing phenotypes because the genetic relationships with animals that do have a phenotype allow for estimation of breeding values for animals without phenotypes. But even if the own phenotype is available it still has added value to mass selection because it can make use of the additional information on performance of related animals. This gives a more accurate estimated breeding value.

Definition

The Animal Model is a genetic statistical model that combines the information on phenotypes of related animals to achieve a better estimate of the breeding value of an animal.

Important advantages are:

1. you don’t necessarily need a phenotype on each animal to be able to estimate its breeding value.
2. even if you have a phenotype, the extra information on related animals increases the accuracy of the estimated breeding value.