

The Genomic Future



We are in a new era of animal breeding. A lot more genetic progress is expected as genomics offers a lot more than the conventional technologies.

Animal breeding has a large impact on the improvement of livestock production, but we are entering a new era of animal breeding. Genomic selection caused a revolution in the animal breeding world, it all started in dairy cattle but also finding its way to the other livestock species. A lot more genetic progress can be expected due the implementation of genomic selection for traits that are measured late in life or are difficult to measure. Especially for the last group of traits, genomics can offer a lot more than the conventional animal breeding technologies.

Accelerated Genetic Progress

The rate of genetic progress is determined by 4 factors:

- 1) accuracy of the breeding values
- 2) selection intensity - how big is the group of potential selection candidates and how many do I select
- 3) genetic variability of the trait
- 4) the generation interval - how long does it take before I can use the selected animals as parents.

Genomic selection enables animal breeders to select animals with a lot more precision at a younger age, i.e. it increases accuracy and decreases generation interval, key components in the rate of genetic gain that can be achieved.

Genetic Markers

The next revolution in animal breeding is based on the sequencing of the genomes of the various species, the subsequent description of DNA (genetic) markers and the technology to map these markers. Genomic breeding values can be estimated from the information generated by a large number of genetic markers. With a large number of genetic markers spread across the entire genome there will always be a genetic marker close to the gene(s) of interest

SNP's

With genome sequencing - the laboratory process that determines the complete DNA sequence of an organism's genome - the whole library of base pairs of an animal is mapped. Animals have billions of base pairs. A small part of these (still millions) can be classified as Single Nucleotide Polymorphisms (SNP's); a situation where the nucleic bases in a certain location of the genome are of different types in some of the individuals within a species.

Genomic Breeding Values

Nowadays we have the full genome sequence of many species, more than 20 bird and mammalian species, including the human and hundreds of thousands of SNPs (Single Nucleotide Polymorphisms) are now available. These SNPs can be used as easily identifiable markers for locations on the genome of the pig. There are several millions of SNP's discovered in the genome of animals. These SNP's are the basis of Genomic Selection. Through this technology a large number of SNP's are selected across the genome to serve as an information source for breeding value estimation