Index figures

E-31
Degree of genetic relatedness

▪ Introduction

The degree of relatedness of an animal is the extent to which an animal shares common genes with a certain population in which the animal is used for breeding. Using the degree of relatedness it is easy to identify what a so-called 'outcross' bull is. However, calculating and publishing the degree of relatedness of bulls within the entire population will not reduce inbreeding. The degree of relatedness is only valid for a bull that is used within its own breed type. As soon as a bull is used in, for example a terminal cross, the degree of relatedness of the bull with that animal, which is of a different breed, will be zero if they are mated. This chapter describes how the degree of relatedness of the bulls is calculated and published.

▪ Calculating the degree of genetic relatedness

When calculating the degree of genetic relatedness for bulls, the group of bulls this applies for must be determined and also the group of animals that will be used as a reference group to determine the degree of relatedness. Calculating the degree of relatedness for bulls is of particular importance for AI bulls, which will possibly actively be used for breeding in the population. In addition, the degree of relatedness of a bull is calculated in relation to the use of the bull within the same breed. In the Netherlands and Flanders, for instance, we have population of black-and-white Holstein Friesian, red-and-white Holstein Friesian, and the breeds that originate in the Netherlands or Flanders: Dutch Friesian, MRIJ, Blisterhead (Blaarkop), Verbeterd Roodbont, Belgian Blue, the Deep Red (Brandrode) breeds, White-Blue Dual Purpose, Belgian White Red and the Lakenvelder cattle. No degree of relatedness is calculated for bulls of breeds of foreign origin as there is no, or only a very small, cow population present in the Netherlands and Flanders.

The following applies in the calculation of the degree of genetic relatedness:
- degree of relatedness is calculated for AI bulls born since 1995 and that have a minimum of 87.5 percent of genes of a single breed;
- for the reference population all the living, female animals are chosen, that are alive at the moment of calculation and have a minimum of 87.5 percent of genes of the same breed;
- the degree of relatedness of a bull is calculated based on its own breed and it kinship to cows of the same breed;
- the minimum year of birth of the AI bulls is moved up one year, each year.

▪ Presentation

The calculated degree of relatedness is expressed as a percentage as a whole figure. For example, the figure 6 or 8 appears with a certain bull, which means a 6 or 8 percent degree of relatedness.
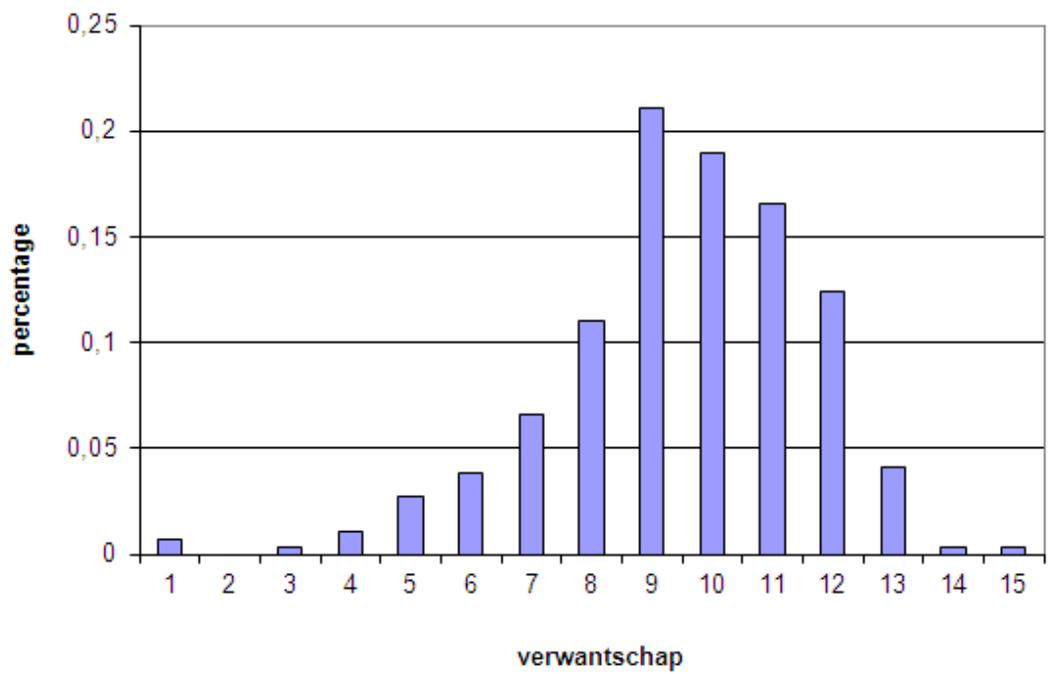
Figure1 shows a frequency distribution of degrees of relatedness of black-and-white Holstein bulls. A Holstein bull can be labelled an outcross bull, for example, if he has a degree of relatedness that is 5 percent or lower. Figure 2, 3, 4 and 5 show the frequency distribution of degrees of relatedness for red-and-white Holstein bulls, MRIJ bulls, Friesian Dutch bulls and Belgian Blue bulls.
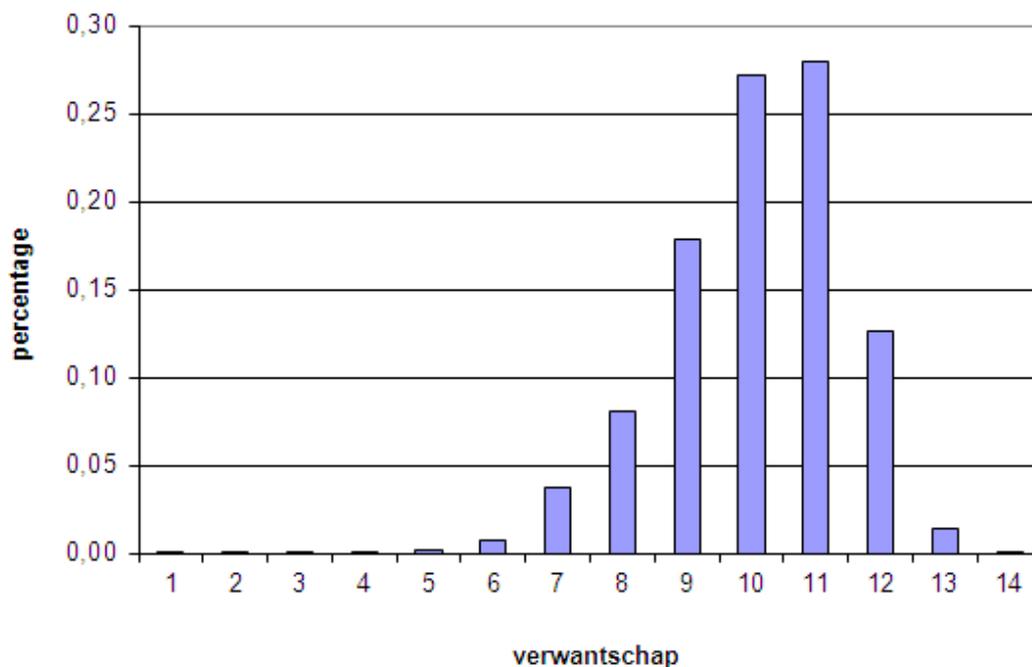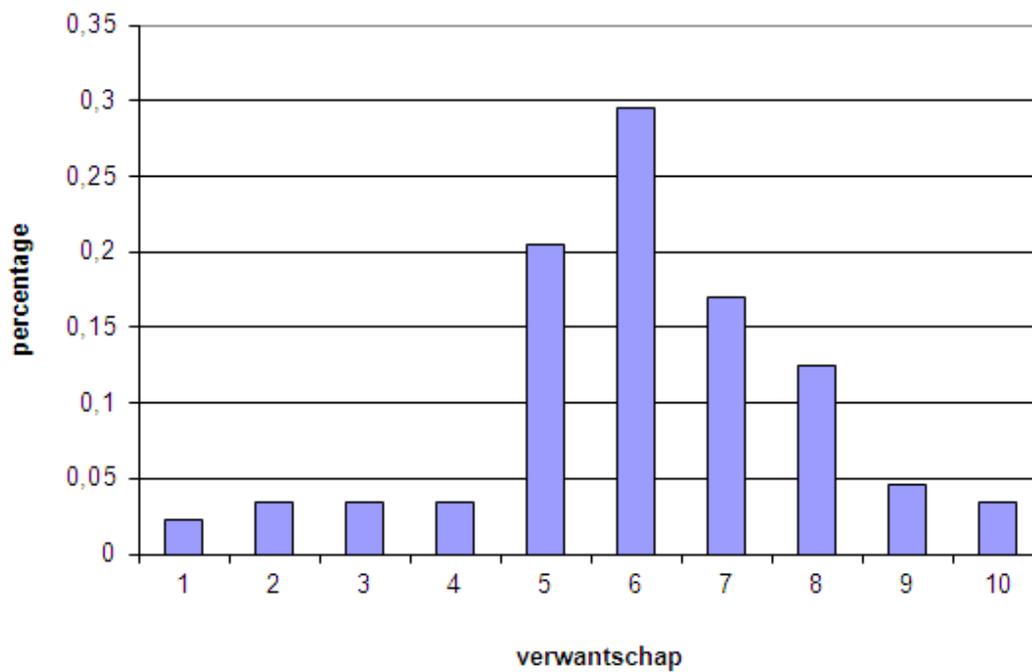

Figure 1. Frequency distribution of degree of relatedness of black-and-white Holstein bulls with the reference population.
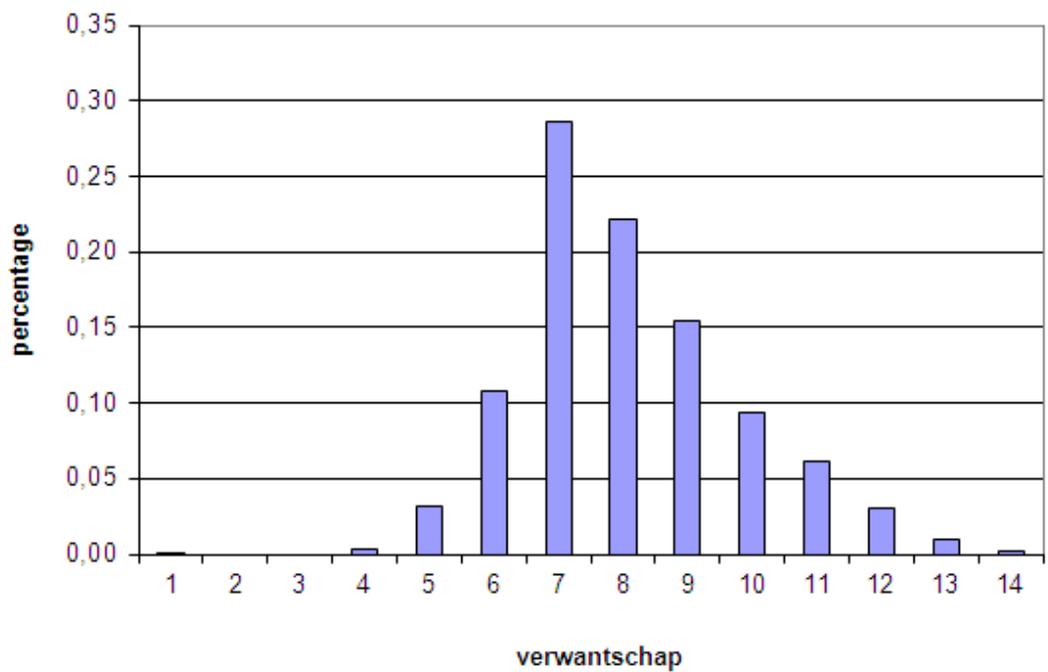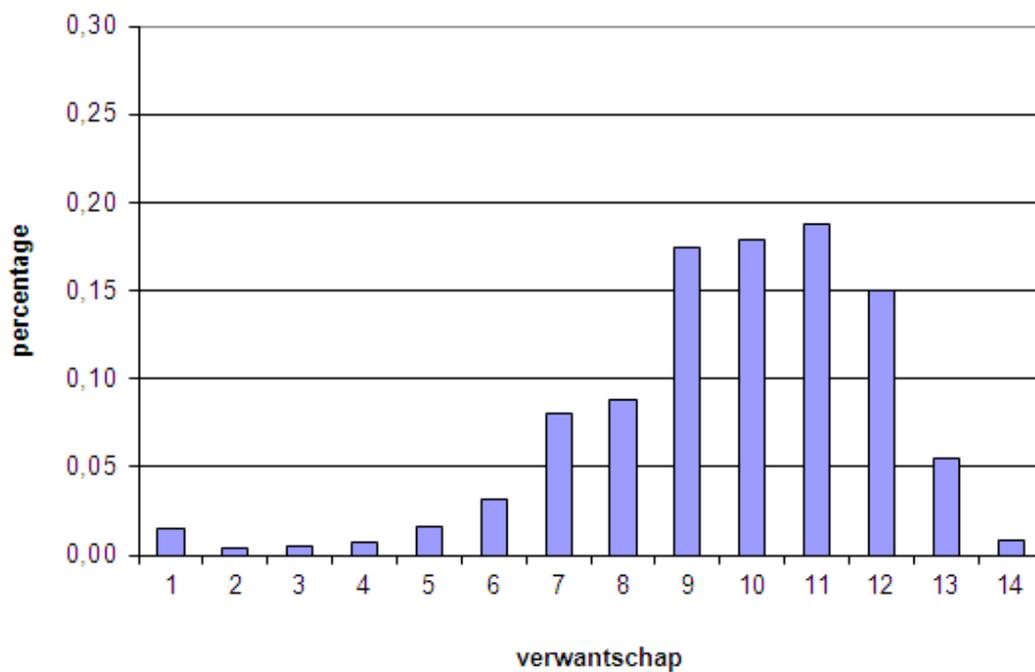
Figure 2. Frequency distribution of degree of relatedness of red-and-white Holstein bulls with the reference population.

Figure 3. Frequency distribution of degree of relatedness of MRIJ bulls with the reference population.

Figure 4. Frequency distribution of degree of relatedness of Friesian Dutch bulls with the reference population.

Figure 5. Frequency distribution of degree of relatedness of Belgian Blue bulls with the reference population.