

Genetic diversity and inbreeding in Dutch cattle breeds based on gene bank collections

A.E. Van Breukelen, H.P. Doekes and J.K. Oldenbroek

Wageningen University & Research, Animal Breeding and Genetics, Droevendaalsesteeg 1, 6708 PB Wageningen, the

Netherlands; anouk.vanbreukelen@wur.nl

To preserve genetic diversity within and between domestic breeds in the Netherlands, the Centre for Genetic Resources (CGN) collects ex situ genetic material and maintains gene bank collections. In this study, we investigated genetic diversity within and between bulls from Dutch cattle breeds and the Holstein Friesian breed based on material stored in the gene bank. Analyses were performed using 37k SNP data of in total 900 bulls. Based on genetic distances the most distinct breeds were the Dutch Friesian (DF; including Dutch Friesian Red and White (DFR)), the Dutch Belted (DB), the Groningen White Headed (GWH), the Dutch Red and White (MRY), the Improved Red and White (IRW) and the Holstein Friesian (HF). Overall, Dutch HF gene bank bulls are the least genetically similar to bulls of the other native Dutch breeds. Between breeds large differences in genomic inbreeding levels (F_{ROH}) were observed, GWH bulls were the most inbred and IRW bulls the least. When performing optimal contributions selection, with all bulls as selection candidates and maximizing diversity, the largest contribution is allocated to HF bulls. Additionally, when applying the method of Eding et al., HF bulls were allocated the highest unique diversity. Nonetheless, Dutch breeds contain diversity additional to diversity in HF bulls and are therefore important for conservation. These results provide insight into the genetic diversity currently stored in the Dutch gene bank and help to determine conservation strategies (e.g. to compose a core set and safe set).