

Abstract

# DNA Testing and Genetic Evaluation for Poll Breeding in Tropically Adapted Beef Cattle †

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**Abstract:** In beef cattle, horn management is practiced to physically or surgically remove horns for the safety of animals and workers. However, invasive practices of dehorning and disbudding are a great threat to animal welfare, health, production and human safety, as well as labour intensive and costly. The most effective way to limit the impacts and costs of horns is to prevent their occurrences by breeding naturally polled (hornless) herds. Horn development is complex, although two mutually exclusive genetic variants (Celtic and Friesian) have been found prevalent on each copy of chromosome 1 in most polled cattle. Predicting genotypes in an animal is challenging. Available genetic testing assays were often limited in tropically adapted beef cattle. In this study we present a new optimized poll testing (OPT) assay, which has been bundled with SNP genotyping arrays being used for genomic evaluation in cattle. Breeding schemes can profile future parents for pure-polled stock based on the OPT results. We also evaluated the factors causing complexity in horn conditions. Thus, we coupled OPT predictions with head-status and sex distributions, by modelling genetic and non-genetic impacts, revealing that genetics, sex and sex hormones control horn ontology. Finally, concerns of polledness adversely affecting production and reproduction were investigated by using estimated breeding values of several beef traits. We found no detrimental effects of polledness on production or reproduction. Overall, this research concludes that genetically polled cattle will minimize issues about animal welfare and management costs without reducing production potentials in the tropically adapted beef cattle.

**Keywords:** poll gene testing; animal welfare; beef production; single nucleotide polymorphism; poll genetics; sexual heterogeneity; testosterone; reproductive efficiency; estimated breeding value; genetic merit

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**Author Contributions:** I.A.S.R.: conceived the study, collected the data, performed the analyses and wrote the paper; M.R.M.: collected the data and wrote the paper; L.R.P.-N. and B.J.H.: contributed in data analyses and interpretation of results; R.E.L.: supervised the study, collected the data and wrote the paper. All authors have read and agreed to the published version of the manuscript.

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**Conflicts of Interest:** The authors declare no conflict of interest.



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