A methodology framework for weighting genetic traits that impact greenhouse gas emissions intensity into selection indexes

P. R. Amer, F. S. Hely, C. D. Quinton and A. R. Cromie

**Supplementary material S1**

The marginal change in greenhouse gas (GHG) emissions per unit of output expressed per breeding female that arises from a unit change in genetic trait *g* is obtained by taking the first partial derivative of the emissions intensity equation as follows:



The partial derivative of a ratio is obtained by using the quotient rule of calculus. Let

 and  such that then

.

The partial derivatives and  of functions andrespectively are obtained using the product rule of calculus so that:

, and



Combining the above and factoring out  (which at current levels of genetic merit we denote as) from all of the resulting terms, and further factoring out  (which at current levels of genetic merit we denote as ) from terms associated with the denominator of the emissions intensity equation results in Equation 2.