# Comparison of Enteric Methane Repeatability Estimates Using GreenFeed and Agscent Measurement Devices

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GreenFeed Emissions Monitoring units and Agscent Air sensors both quantify enteric methane emissions. GreenFeed uses an active gas-flux approach and reports methane as g/day, whereas Agscent passively samples air and reports methane concentration. While GreenFeed is being used to generate genomic reference data globally, the Agscent, when paired with an Optiweigh unit, is not yet widely used for that purpose. This study used available data to estimate repeatability to compare the systems.

GreenFeed data were limited to Angus, Charolais, Hereford, Shorthorn, and Wagyu cattle. Data were analysed separately for males (feedlot; n=2947) and heifers (paddock; n=1598), spanning multiple seasons and locations in NSW, Australia. Agscent data were collected in a single paddock system in the southeastern United States on mature cows (≥450 kg; n=49) and their nursing calves (<450 kg; n=32). Only animals with ≥5 samples were considered. Each visit, or spot-sample, to the measurement unit can be used as a record of methane emission. However, given the impact of diet and diurnal pattern on methane production, average production over 1-, 5-, 7-, or 10-day periods were also considered as phenotypes. A random-effects model with animal as the sole effect was used. Repeatability was calculated as variance explained by the animal effect relative to the total variance. For GreenFeed, repeatability increased as the averaging window increased from 0.21 (feedlot) and 0.28 (paddock) for spot-samples to 0.49 (feedlot) and 0.65 (paddock) when methane production was averaged over 10-days. Agscent repeatability showed the same pattern. The lowest repeatability estimates were 0.17 (calves) and 0.23 (cows) for spot-samples while the highest estimates were 0.27 (calves) and 0.45 (cows) for the 10-day average. We also analysed total-animal repeatability of the GreenFeed data with the fixed effects of breed, days of age at time of record, and contemporary group. For spot-samples and 10-day averages repeatability was reduced to 0.13 and 0.35 for feedlot animals and 0.10 to 0.31 for paddock animals, respectively. This implies some variance previously attributed to animal effect was captured by breed and group effects.

Overall, results support the further evaluation of Agscent in large scale genomic reference capture initiatives as a methane recording and ranking tool for grazing animals.