Clearing the air between methane and commercial beef cattle in Ireland.

Background
Rumen methanogenesis is the single most significant source of anthropogenic methane (CH_4) emissions. This research aimed to analyse CH_4 data recorded by GreenFeed systems by assessing the repeatability of such phenotypic measures, estimating the heritability of CH_4, and generating CH_4 estimated breeding values (EBVs) for inclusion in the national breeding index.

Methods
CH_4 measurements were recorded on 979 cattle for 20 to 83 days using GreenFeed machines, resulting in 211,136 individual CH_4 observations. The phenotypic repeatability of CH_4 was estimated for six different averaging periods using a linear mixed model. Univariate repeatability animal models in DMU were used to estimate CH_4 and residual CH_4 (RCH_4) heritability parameters. EBVs for both CH_4 and RCH_4 were estimated using MiX99. EBV validation was completed using the most recent third of animals and linear regression was used to estimate the bias of the EBVs.

Results
Repeatability of CH_4 increased as the length of the averaging period increased, ranging from 0.16 within a day to 0.69 in a 15-day averaging period in steers. Heritability estimates of both CH_4 (0.08 – 0.31) and RCH_4 (0.09 – 0.39) increased as the duration of the averaging period increased. RCH_4 EBVs were more consistent in dispersion bias than CH_4 EBVs across the averaging periods, which suggests that RCH_4 may be better suited for inclusion within the national breeding index.

Conclusion
With respect to both repeatability and heritability of CH_4 and RCH_4, animals are required to spend a minimum of 10 days on test to produce EBVs from GreenFeed measurements.