

The Between Animal Variance in CH₄, CO₂ and CH₄/CO₂ Concentration Ratio Measured in Farm Conditions

Scott Zimmerman¹, Lisanne Koning², Leon Sebek²

¹C-Lock Inc, Rapid City, SD USA

²Wageningen Livestock Research, Wageningen University & Research, the Netherlands

The between-animal percentage coefficient of variation (%bCV) in enteric methane flux (CH₄) and Carbon Dioxide flux (CO₂) characterizes the differences in high and low emitting animals within a herd. It is an important statistic because %bCV determines the numbers of animals needed in experimental designs, the uncertainty of inventory estimates, and can be used to assess the effectiveness of breeding programs aiming to reduce CH₄. Further, a benchmark %bCV can be used when reviewing the viability of indirect proxy methods, such as the sniffer methods for estimating CH₄ which produce highly variable results. It was hypothesized that in production dairy farms with varied management strategies, the %bCV in CH₄, CO₂, and CH₄/CO₂ ratios are not highly variable. Five GreenFeeds (C-Lock Inc) were used to measure CH₄ and CO₂ from 1994 lactating dairy cattle on 18 dairy farms in varied locations and management strategies in the Netherlands. On each farm, the animals were first habituated to the GreenFeed, then CH₄ and CO₂ was measured for a period of 14 days. The CH₄ and CO₂ visit data was averaged by animal to determine the CH₄, CO₂, and CH₄/CO₂ concentration ratio and then the %bCV was determined. Across all farms, the averaged %bCV for CH₄, CO₂, and CH₄/CO₂ ratio was 17% (9%-27%), 12% (8%-20%), and 11% (5%-18%), respectively. When removing early and late lactation animals from the analysis and excluding grazing animals, the averaged %bCV in CH₄, CO₂ and CH₄/CO₂ ratio was 12% (6%-19%), 10% (5%-15%), and 7% (5%-15%), respectively. The %bCV in CH₄/CO₂ ratio was significantly lower than both CH₄ and CO₂. This study showed that %bCV is relatively consistent and predictable between animals in different farms and locations for mid lactation animals that have similar expected feed intake rates.