

**Modeling enteric Methane Emission from Beef Cattle in Brazil: a proposed Equation performed by principal Component Analysis and mixed Modeling multiple Regression**

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Brazil has the largest commercial beef cattle herd in the world but does not have its own model to predict methane (CH<sub>4</sub>) emission. The aim of this study was to create the first empirical enteric CH<sub>4</sub> emission equation from variables that describe the animal diet using a meta-analytical data from Brazilian scientific publications (n = 50, published from 2003 to 2012).

The frequency statistics (FREQ procedure, SAS) were used to evaluate the animal characteristics: 60% came from grazing systems (other 40% from feedlot), about 80% were classified as beef cattle and Nellore was the predominant genotype (76%). The Principal Component analysis was performed using the PRINCOMP procedure for CH<sub>4</sub> enteric emission using the hexafluoride technique (CH<sub>4</sub>, kg/d; 0.137 ± SD 0.0721 kg/d), dry matter intake (DMI, kg/d; 7.3 ± 3.11 kg/d), neutral detergent fiber (NDF, % in DM basis; 55.3 ± 13.89%), acid detergent fiber (ADF, %; 36.9 ± 18.02%), lignin (%; 4.6 ± 1.67%), and fat (%; 4.1 ± 3.42%).

Using Principal Component analysis, the cumulative variance explained by the first 3 principal components (CH<sub>4</sub>, DMI, and NDF) was about 96%. Consequently, DMI and NDF were used as independent variables in the multiple regression analysis using the MIXED procedure. In this regression model, the experiment was considered as a random effect as well as the intercept. Just 36 studies were used in the final model (once observations without DMI or NDF were removed). The final regression model was: CH<sub>4</sub>, kg/d = - 0.1011 (SE ± 0.02903) + 0.02062 (± 0.002834) × DMI + 0.001648 (± 0.000417) × NDF. The approximate Z-test for the DMI random effect and the intercept probabilities values were P < 0.001 and P = 0.0015, respectively. The residual based on covariance parameter estimates of the model was 0.000249.

As suggested by IPCC we encourage the use and improvement of the developed equation in order to increase the accuracy and precision of the Brazilian greenhouse gases estimates.