Comparative analysis of the enteric methane correction factor (Ym) as influential in the prediction of mathematical modeling of emission in beef cattle production systems.

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This study aimed to calculate the Ym value (data review) more consistent with the reality of Brazilian livestock and compare it with the values estimated by the IPCC Guidelines for national greenhouse gas inventories (2006) and IPCC Guidelines for national greenhouse gas inventories (2019). For this study, 55 papers containing beef cattle Brazilian production data were reviewed, of which 25 were related to Ym values. The data selection included the analysis of variables such as treatments applied in each study, production phase and animal category, type of feeding (representing the production systems), method used to measure enteric methane, genetic group or breed studied, animal live weight (BW), dry matter intake (DMI), average daily gain or milk production (performance indices), gross energy intake (GE) amount of enteric methane produced (g/d) and finally, as the main target of this review, the variation of the methane correction factor for energy intake from gross energy (Ym %). The publications consulted in which the Ym values (%) were not presented in the results item, but had the values of gross energy and enteric methane (enteric CH_4) emission, had the value of calculated Ym (Blaxter and Clapperton,1965 corrected by Wilkerson et al., 1995). The Ym values generated by the literature review were compared with the standards described in the IPCC, 2006 and IPCC, 2019 Guidelines. All averages were analyzed using a descriptive method. For this context, the mathematical modeling for the emission calculations followed the same models. Production scenarios in intensive pasture (IP), extensive pasture (EP) and feedlot (FL) were stipulated, considering beef cattle, castrated males (CM), females (F) and intact males (IM) in growing and finishing phases (from 400 to 600 kg BW). The Ym values calculated were 6.8 (IP), 7.2 (EP) and 4.8 (FL), compared with values of 6.5 (IP), 6.5 (EP) and 3.0 (FL) and 6.3 (IP), 7.0 (EP) and 3.5 (FL), respectively for the IPCC, 2006 and IPCC, 2019. The estimated methane emission factors for the average of 500 kg in the finishing phase (g $CH_4.head^{-1}.d^{-1}$) using the Ym calculated for IP were 224.09 (CM), 234.89 (F) and 216.52 (IM), for EP 265.62 (CM), 277.05 (F) and 257.6 (IM) and for FL 141.28 (CM), 148.9 (F) and 135.93 (IM). Using the Ym IPCC 2006, they were calculated for EP 239.79 (CM), 250.11 (F) and 232.55 (IM), for IP 214.21 (MC), 224.53 (F) and 206.97 (IM) and for FL 88.30 (CM), 93.06 (F) and 84.96 (IM). Finally, using the IPCC 2019 Ym, they were calculated for EP 258.24 (CM), 269.35 (F), 250.44 (IM), for IP 207.62 (CM), 217.62 (F) and 200.60 (IM) and for FL 103.01 (CM), 108.57 (F) and 99.12 (FL). The value of Ym showed a direct influence on the emission values within each beef cattle production system evaluated.

Keywords: Enteric Fermentation, Feedlot, IPCC 2006, IPCC 2019, Pasture, Finishing.