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Abstract Title: How predictive methane emissions models, developed under experimental conditions, can help assess CH_4 emissions from ruminants in the Sahel region

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In the Sahel region of West Africa, pastoral ruminant grazing systems are characterised by very low levels of forage intake and low-quality forage of around 40% digestibility during much of the year, especially the dry season. Consequently, the results of the latest evaluations of enteric CH_4 emissions from Sahelian cattle herds considering the specificity of their diet (intake and digestibility parameters) have shown that CH_4 levels are around half of the predicted values of the initial IPCC Tier 1 proposals. The IPCC Tier 1 hypothesised that intake was at its full value. A database including 602 digestibility experiments of small ruminants and 87 experiments of cattle (*Bos Taurus* and *Bos indicus*), performed in Senegal from the early 60s to the end of the 90s, was used to predict potential CH_4 enteric emissions. These experiments accurately measured parameters which are indispensable for emissions estimations but quite difficult to assess in the field (intake, chemical composition of feed, feces) and which vary through seasons. The experiments aimed to consider the great diversity of livestock feed from natural Sahelian pastures, agricultural by-products (groundnuts haulms and husks, rice and mil straw) to available supplements (groundnuts or cotton cakes, local pellets, molasse). This diversity therefore also reflects the great range of proteins (16 to 283 g CPI/kg DMI), fibres (226 to 965 g NDFI/g DMI), fat (3 to 137 g EEI/kg DMI) or lignin (25 to 302 g ADLI/kg DMI) contents of local diets. In the literature, models which fit with these feeding conditions are scarce. In addition, they do not always consider as predicting indicators some chemical components (EE, CP, tannins, lignin) which could vary significantly between diets according to the seasons and landscapes in Senegal. Recently available models of CH_4 prediction established in experimental conditions considered to be closer to our digestibility trials were selected, discussed, and compared to the IPCC Tier 1 and 2 methods as a default reference. This work aimed to find models more suited to Sahelian livestock conditions. However, *in vivo* measurements are still lacking to assess and improve their accuracy. Some preliminary results of a new research project measuring *in vivo* enteric CH_4 emissions from Sahelian cattle provide tracks for a more relevant understanding of the whole process.

Keywords: Sahelian cattle; enteric CH_4 emissions; predictive models

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