# 3.1 Regional level (Oral)

## Carbon neutralization potential of beef cattle system in cerrado biome of maranhao, Brazil

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This paper evaluated the municipal performance of beef cattle production systems in 2006  and 2017, in relation to the enteric methane emissions in CO2 equivalent. The 109  municipalities evaluated belong to the Cerrado biome of the Maranhao state,Brazil. In this  period the cattle population increased 20% and reached 3.3 million head; the pasture area  remained at 2.6 million hectares. The total enteric methane emission, computed by the  Agriculture and Land Use National Greenhouse Gas Inventory Software (ALU), was 3,867  Gg of CO2eq in 2006 and 4,654 Gg of CO2eq in 2017. The municipalities with higher cattle numbers were classified as "Regions of net CO2 sink". The performance score was  calculated considering the pasture and forest area, herd size, enteric methane emissions  and the stock of biomass. These scores were computed as a data envelopment analysis  (DEA) measure for each year, under the variable return scale (VRS) hypothesis and output  orientation. There is a statistically significant difference between years, with higher  performance in 2017 (p-value 0.0193). We estimated the probability of a municipality being  sink of CO2 (p) considering the DEA-VRS score, the agricultural financing via ABC Program, the livestock financing and the agricultural GDP. The analysis, considering the  two periods showed that there is a positive and significant effect of time, with higher p in  2017. It also showed that only the livestock financing has a positive and significant effect in p. These results show that the introduction of biomass stock technologies was beneficial to  the performance of these municipalities.

Keywords: Carbon sink,  Carbon  Source, GEE, Grassland Management, Livestock, Pasture Degradation