# Soil GHG emissions in different livestock production systems in the Brazilian Cerrado

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**Introduction.** Greenhouse gas emissions are mainly associated with changes in land use in Brazil, especially the conversion of forests to pasture or agricultural systems. The objective of this study was to evaluate soil metane ($CH_4$), carbon dioxide ($CO_2$) and nitrous oxide ($N_2O$) in three production systems.

**Material and Methods.** The study was conducted in a Oxisol, on a long-term experiment at the National Center of Beef Cattle Research, Campo Grande, MS, Brazil. Treatments were: continuous *Brachiaria decumbens* cv Basilisk without maintenance fertilization (CPWF); integrated crop-livestock with forage *Brachiaria brizantha* cv BRS Piatã, with annual maintenance fertilization, plus eucalyptus trees rows of 22 x 2 m (ICLF) and integrated crop- livestock with forage *Brachiaria brizantha* cv BRS Piatã, with annual maintenance fertilization and no trees (ICL). Five replications inside two blocks were utilized for measurements. An adjacent area with natural vegetation of Cerrado (Savanah) was evaluated as reference (CER). Soil GHG emissions estimates were performed from February 2014 to April 2015, reaching 13 sampling times. Gases fluxes were measured by static chambers technic. The soil gas flux rates were calculated for each chamber from the linear increase in headspace gas concentration over the sampling time. Results were evaluated by ANOVA procedure and Tukey test ($P < 0,05$).

**Results and Conclusions.** The total cumulative annual $N_2O$ emission from grazing systems was higher in ICLF, followed by ICL, CER and CPWF. The lower emission in CPWF may be related to the non-supply of nitrogen fertilization in this system. For $CH_4$, ICL has the system with higher emission, which may be associated with higher soil moisture content, when compared to CPWF and ICLF systems, and CER. The $CO_2$ emissions were higher for ICL, followed by ICLF and CPWF, and smaller in CER, probably due to greater natural stabilization of the carbon in this system. Higher emissions of $CO_2$ in ICL may represent a higher flow in the dynamics of soil organic matter, and not necessarily loss of soil carbon.

Table 1. Cumulative annual average emissions of N2O, CH4 and CO2, and soil moisture in different crop and livestock production systems, and native vegetation of Cerrado (Savanah).

| Treatment | $N_2O$-N, mg $m^{-2}$ | $CH_4$-C, mg $m^{-2}$ | $CO_2$-C, g $m^{-2}$ | Soil moisture, % |
|---|---|---|---|---|
| CPWF | 6 **c** | 43 **b** | 1660 **b** | 16 **b** |
| ICL | 44 **ab** | 491 **a** | 2666 **a** | 26 **a** |
| ICLF | 68 **a** | -108 **b** | 1783 **b** | 18 **b** |
| CER | 42 **b** | -441 **c** | 1076 **c** | 24 **a** |

*Means followed by the same letter in the column do not differ by Tukey test ($P > 0.05$).

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