

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

*Alexandre R. de ARAÚJO¹, Michely TOMAZI², Manuel Claudio M. MACEDO¹, Roberto G. de ALMEIDA¹, André D. FERREIRA¹, Liange de Oliveira DIEHL³, Thais S. MELO⁵.

¹ Researcher, Embrapa Gado de Corte, Campo Grande/MS, ² Researcher, Embrapa Agropecuária Oeste, Dourados/MS, ³ Technician, Embrapa Gado de Corte, Campo Grande/MS, ⁵ Agronomy student, Anhanguera University, Dourados/MS.

*alexandre.araujo@embrapa.br

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 methane (CH₄), carbon dioxide (CO₂) and nitrous oxide (N₂O) 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 (Savannah) 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 N₂O 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 CH₄, 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 CO₂ 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 CO₂ in ICL may represent a higher flow in the dynamics of soil organic matter, and not necessarily loss of soil carbon.

Treatment	N ₂ O-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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