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Mitigation of greenhouse gases with integrated crop-livestock system in Cerrado biome

Michely TOMAZI[1*]; Júlio C. SALTON[1], Marciana RETORE[1], Cimélio BAYER[2], Daiane C. dos SANTOS[3]
[1]Embrapa Western Agriculture, Rod. BR 163, km 253,6, 79804-970, Dourados, MS, Brazil; [2]Professor, Federal University of Rio Grande do Sul (UFRGS); [3]Pós-doutoranda, UFRGS. E-mail address of presenting author*:michely.tomazi@embrapa.br

Introduction

The crop-livestock systems (CLS) have been used successfully in several regions of Brazil, standing out for higher productivity and lower environmental impact. It is expected that these systems also contribute to mitigation of greenhouse gas emissions (GHG).

Material and Methods

The soil management experiment was implemented in 1995 in Dourados, MS, Brazil (22°16'56.08"S and 54°48'17.17"W) with the following systems: NTS – no-tillage with sucession soybean (*Glycine max* (L.) Merr.)/oats (*Avena strigosa* Schreb. or *Avena sativa* L.); ICLS – integrated crop-livestock with soybean/oat and pasture under no-till, rotating every two years, and PP – permanent pasture constituted by *B. decumbens*. Soil carbon was sampled every two or three years, and soil GHG monitored for two years (mar/2012 to mar/2014) with static chambers, being estimated the global warming potential (GWP).

Results and Conclusions

The rate of soil carbon accumulation increased with permanence of grass forages, and decreased with soil disturbance (NTS<ICLS<PP). Nitrous oxide (N_2O) and methane (CH_4) accounted for the smallest portion for GWP, while enteric CH_4 represent the greatest portion of it (Table 1). Grain and meat production in integrated systems reduced in 20% the GWP compared to equivalent production in simple systems. In addition, the ICLS has a higher meat production per area (Salton et al., 2014), which leads to a lower emission rate per product.

Table 1. Soil C accumulation rate in 0-30 cm, soil N_2O and CH_4 emission, enteric CH_4, production costs in C equivalent, and GWP, estimated per hectare with crop or meat.

	Soil C accumulation rate	N_2O	CH_4	Enteric CH_4	C equivalent costs	GWP[1]
	kg $C_{equivalente}$ ha^{-1} $year^{-1}$					
ICLS (1 ha crop + 1 ha livestock)	511.2	20.1	2.3	626.1	68.4	205.8
NTS + PP	426.2	13.8	19.3	575.0	68.2	250.1
NTS (1 ha crop)	36.4	10.9	-13.1		65.2	26.6
PP (1 ha livestock)	389.9	2.9	32.4	575.0	3.0	223.4

[1] GWP= Soil C accumulation rate – N_2O – CH_4 – CH_4 enteric – C equivalent costs.

References cited

Salton et al. (2014), Agric. Ecosyst. Environ. 190: 70-79.

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