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Assessment of soil carbon content in pastures with different managements

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Introduction

The Amazon region plays an important role in the global carbon cycle due to its land extension and amount of carbon stored both in the vegetation and in the soil (Aguiar et al., 2012). In the past 50 years, this region underwent an intense process of soil use change, thus studies investigating the carbon dynamics in agricultural and livestock production systems in the Amazon are of key importance.

It is observed that, in the current food production scenario, there are increasingly more public policies that foster agricultural and livestock activities than towards high-production systems that also promote environmental gains (Salton et al., 2011; Carvalho et al., 2014a).

This research aimed to investigate the dynamics of the soil carbon content in a native forest – poorly managed pasture – silvopastoral system chronosequence.

Material and Methods

The areas studied are located at Vitória Farm in Paragominas, state of

Pará, Brazil. The farm was established in the late 1960s, when part of the native forest was removed for the implementation of homogeneous pastures. By the 1990s, those pastures were suffering from agricultural degradation process (high infestation by weeds) and, in 2009, the area was overhauled, when the silvopastoral system was implemented in part of the land. The silvopastoral system is made up of the tree species *Schizolobium amazonicum* (Paricá) and by the forage grass *Brachiaria brizantha* cv piatã. Between 2009 and 2012, crop rotation with *Zea mays* x forage grass was performed in the system following guidelines of the no-tillage system.

The soil in the area is classified as high-clay dystrophic yellow latosol. The chronosequence investigated was as follows: remaining native forest (collection in 1992 by Camargo et al., 1997), pasture under agricultural degradation (collection in 1992 by Camargo et al., 1997), and pasture under silvopastoral system (collection in 2013).

Soil was collected from layers 0-10, 10-20, and 20-30 cm deep with three repetitions and the sites were selected away from the zone of interference of the trees' root system. The soil carbon content was assessed in a Carlo Erba elemental analyzer. Results were evaluated considering the different soil use systems and soil layers, through variance analysis (ANOVA) and mean comparison test Tukey at 5% probability, using the software SAS.

Results and Conclusions

When the degraded pasture (DP) area was compared to native forest (initial reference), significant carbon loss was found in the DP area due to poor management (Table 1). The carbon content in the 0-10 cm--deep-layer was statistically different between the silvopastoral system (SP) and the DP (Table 1). In the 10-30 cm-deep range, the results of the same systems were statistically similar, however, the SP system had higher absolute values than the DP.

Table 1. Mean C content (g kg^{-1}) in different soil management systems at Vitória Farm (Paragominas, PA, Brazil) between 1992 and 2013

	Soil use system		
Layer (cm)	NF	DP	SP
0-10	26.2 ± 0.13 A	22.4 ± 0.07 A	27.4 ± 0.18 A
10-20	17.3 ± 0.06 A	10.1 ± 0.03 B	12.8 ± 0.15 AB
20-30	9.0 ± 0 A	7.6 ± 0.07 A	10.5 ± 0.05 A

Means followed by the same letter in the line do not differ among themselves by the Tukey test ($\alpha = 0.05$); NF: Native forest; DP: Degraded Pasture evaluated in 1992; SP: Pasture under integrated Forest-livestock system with Paricá.

It is inferred that the pasture overhaul with soil fertility correction, adequation of the stocking rate, and incorporation of no-tillage planting for growing corn x forage grass (for three harvests) impacted the increase in soil carbon content in the area studied. It is important to point out that the integrated cultivation systems in no-tillage planting on straw leads to a greater increase in organic matter, which also benefits the soil's physical structure and favors the establishment of roots and water infiltration into the soil (Martorano et al., 2009).

Carvalho et al. (2014b), in a similar study, identified greater carbon stock in a crop- livestock area compared to a poorly managed homogenous pasture. Besides the benefits of the production system, agriculture and livestock integration systems also have the potential to control greenhouse gas emission from farming and ranching. According to Silva et al. (2014), the crop-livestock integration system can

potentially act as a CO_2 sinkhole as long as the grazing intensity is correct. In turn, Salton et al. (2014) identified that the crop-livestock integration system had better productivity and environmental efficiency. Those authors also report that the system is recommended for the different regions of Brazil.

Overall, it was found that pasture overhaul and responsible management led to an increase in carbon content in the area. Therefore, multiplying information on effective soil management systems, as is the case observed at Vitória Farm in Paragominas, PA, Brazil, becomes necessary.

References

AGUIAR, A. P. D.; OMETTO, J. P.; NOBRE, C.; LAPOLA, D. M.; ALMEIDA, C.; VIEIRA, I. C.; SOARES, J. V.; ALVALA, R.; SAATCHI, S.; VALERIANO, D.; CASTILLA - RUBIO, J. C. 2012. **Modeling the spatial and temporal heterogeneity of deforestation - driven carbon emissions: the INPE - EM framework applied to the Brazilian Amazon**. Global Change Biology, 18: 3346 - 3366.

CAMARGO, P.B.; TRUMBORE, S.E.; MARTINELLI, L.A.; DAVIDSON, E.A.; NEPSTAD, D.C.; VICTORIA, R.L. 1999. **Soil carbon dynamics in regrowing forest of eastern Amazonia**. Global ChangeBiology, 9: 693-702.

CARVALHO, J.L.N.; RAUCCI, G.S.; FRAZÃO, L.A.; CERRI, C.E.P.; BERNOUX, M.; CERRI, C.C. **Crop-pasture rotation: a strategy to reduce soil greenhouse gas emissions in the Brazilian Cerrado**. 2014a. Agriculture, Ecosystems and Environment, 183: 167–175.

CARVALHO, P. C. F.; MORAES, A.; PONTES, L. S.; ANGHINONI, I.; SULC, R. M.; BATELLO, C. **Definições e terminologias para Sistema Integrado de Produção Agropecuária**. 2014b. Revista Ciência Agronômica, 45: 1040-1046.

MARTORANO, L.G.; BERGAMASCHI, H.; DALMAGO, G.A.; FARIA, R.T.; MIELNICZUK, J.; COMIRAN, F. **Indicadores da condição hídrica do solo com soja em plantio direto e preparo convencional.** Revista Brasileira de Engenharia, Campina Grande, v. 13, n.4, p. 397-405, 2009.

SALTON, J. C.; MERCANTE, FABIO. M.; TOMAZI , M.; ZANATTA, J. A.; CONCENÇO, G.; SILVA, W. M.; RETORE, M. 2014. **Integrated crop-livestock system in tropical Brazil: Toward a sustainable production system**. Agriculture, Ecosystems & Environment, 190: 70-79.

SILVA, F. D.; AMADOB, T. J. C.; FERREIRA, A. O.; ASSMANNC, J. M.; ANGHINONID, I.; CARVALHO, P. C. F. 2014**. Soil carbon indices as affected by 10 years of integrated crop–livestock production with different pasture grazing intensities in Southern Brazil**. Agriculture, Ecosystems and Environment, 190: 60–69.