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Conversion of amazon rainforest to pasture: Effects on carbon stocks and soil physical properties

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Introduction

The conversion of native forest to pasture is associated to changes in soil C dynamics. The maintenance, reduction or increase in soil carbon content in pastures compared to the natural ecosystems are dependent on several factors, including climate, soil type, tillage methods and residue and nutrient management.

Objectives

The objective of this experiment was to evaluate the effect of conversion of Amazon rainforest to pasture including well-managed pasture on carbon stocks and physical properties in a Haplic Ferralsol in the southern of Brazilian Amazon.

Materials & Methods

The study sites were located on three farms in the Amazon humid tropical forest, Alta Floresta-MT municipality – Brazil. Treatments corresponded to poorly managed pasture (PM1, PM2, PM3) and well-managed pasture (WM1, WM2, WM3) with 3 replications. A natural forest closed to the studied areas with the same soil characteristics was used as reference. WMP sites were all established in 2012, on previously poorly managed pasture areas, which was cultivated over the past 20 years after forest deforestation. WMP treatments comprehend the use of nutrient management strategies as well as adequate animal stock rate. On PMP treatments, there were no fertilizers or lime applications and animal grazing was continuous without stocking rate control. Soil samples were obtained in 2014 for five layers 0-5, 5-10, 10-30, 30-60 and 60-100 cm at each site.

Results

WMP2 obtained C stock similar to the native Forest in the 0-30 cm layer. However, C stocks on well-managed pasture (WM2 and WM3) were, on average, 27% higher than native forest. In the other treatments, even poorly managed pasture (PMP1 and PMP3) presented C stocks slight higher than native forest. The density of the soil in all assessed areas, were higher than those presented in the native forest, especially in the surface layers of 0-5, 5-10 and 10-30 cm, with values close to were close to the critical limit for root growth.

Conclusion

Conversion of Amazon rainforest to pasture can contribute to maintain soil C stocks; however C stocks may increase when well-managed pasture is used as a strategy for pasture management.