

Temporal variability of soil CO₂ emission contrasting degraded and managed pasture in Brazil

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Abstract

Grazing areas represent the largest agricultural areas in Brazil, occupying more than 172 million hectares, about 20% of the agricultural land (IBGE, 2007). Despite the large areas of degraded pasture, little information exists about the temporal variation of soil properties including nutrients and soil carbon dynamic (Cerri et al., 2004). This study aimed to measure soil FCO₂ from degraded and managed pasture areas, describing their temporal variability correlated to the environmental variables. Our study was carried out at two pasture areas located in Mococa city, São Paulo State Brazil. On March 04, 2013, 2 grids of 100 × 100 m with 102 samples points were installed in DP (Degraded pasture) and managed pasture (MP). Measurements of soil CO₂ emissions (FCO₂), soil temperature (T_{soil}) and water content of soil (WC_{soil}) were initiated on March 12th, resulting 8 measuring days. Higher difference of emission between both areas occurred during the first days, probably due to a huge precipitation influence (accumulated 80 mm). In the first study day (12th), emission values were 8.73 ± 0.38 versus 4.47 ± 0.21 $\mu\text{mol m}^{-2} \text{s}^{-1}$, in DP and MP, respectively. In the last study day, March 19th, emissions in both areas were closer without remarkable rain influence (7.43 ± 0.54 and 5.98 ± 0.17 $\mu\text{mol m}^{-2} \text{s}^{-1}$). Total emission calculated by the area below the emission curves resulted 640.7 versus 440.0 kg CO₂-

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C ha⁻¹ in DP and MP, respectively, corresponding to an additional emission of 200.6 kg CO₂-C ha⁻¹ from DP or, 735.5 kg CO₂ released to the atmosphere, contributing to the Climate Change. The potential for soil C sequestration in pasture soils is strictly related to their management, and the rate and mechanism of soil C losses in pasture soils can affect this potential, with soils functioning as an atmospheric CO₂ sinking or emitter.

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