

Greenhouse Gas Emission as Affected by Management Straw of Sugarcane in Cerrado Region

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Background

The increasing demand for bioenergy has instigated the possibility of using sugarcane straw for generation of energy. This practice, by removing the ground cover and limiting the carbon addition to soil may interfere in the dynamics of soil organic matter with direct impacts on greenhouse gases emission and on carbon sequestration in soil. This study evaluated the effect of partial and total removal of sugarcane residues after harvest on GHG emissions and carbon sequestration in soil.

Methods

The experiment was installed in area (Oxisol) under sugarcane (after first harvesting) in Dourados - MS. Carbon sequestration was assessed after the second harvesting, with manual soil sampling to 40 cm deep. The sequestration rate was calculated in comparison to treatment without straw. The GHG emission was monitored from the 2nd until the next harvesting, totalizing 292 days, starting in October 2010. For monitoring of GHG emissions, we used the method of static chamber. The global warming potential of the treatments was obtained after considering the sequestration rate and net emission of greenhouse gases (N₂O and CH₄).

Main Results

Regarding the carbon sequestration in 0-40 cm, results showed that treatments with straw (50 and 100%) have similar rates of carbon sequestration with values greater than 3 Mg C ha⁻¹ yr⁻¹ compared to non straw. However, cumulative N₂O emissions were higher in the treatments with straw, probably because of emission peaks after the addition of crop residues. The CH₄ fluxes were quite small, with negative flows which amounted, on the average of the treatments, 0.25 kg C ha⁻¹ yr⁻¹. The global warming potential of the treatments was driven mainly by soil carbon sequestration, with net inflow in treatments 50 and 100% of straw (2.8 Mg C ha⁻¹ yr⁻¹) and net emission in the treatment 0% (0.10 Mg C ha⁻¹ yr⁻¹). These results show that in addition to the benefits to soil quality, the maintenance of straw in sugarcane fields can enhance the environmental benefits of generation of bioenergy by sugarcane.