Emissions of Greenhouse Gases in Soil Management Systems During Soybean Season Production in Savanna

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Background

The vulnerability of agriculture to the effects of climate change indicates that strategies need to be investigated to reduce emissions of greenhouse gases (GHG) and increase the accumulation of carbon in the soil. Management systems with conservation tillage and high net primary production may contribute to the sequestration of carbon in soil and mitigate GHG (CO_2, CH_4, N_2O). The objective of this study was to evaluate the potential of soil management systems to mitigate GHG emissions in the environmental conditions at Dourados, MS, during soybean crop season.

Methods

The study was conducted in a long-term experiment (15 years), on an Oxisol with loamy texture. The treatments evaluated were integrated crop-livestock (ICL), during the crop season (rotation B. decumbens/oats/soybean); no-tillage (NT) with wheat/soybeans and conventional tillage (CT) with succession black oat/soybean crops. Air samples for GHG analysis were collected every two weeks by the method of static closed chamber. The concentration of greenhouse gases in the air samples was determined by gas chromatography.

Main Results

The management system with the lowest accumulated emission of N_2O was the ILP (481.3 g N ha^{-1}), followed by the NT (504.8 g N ha^{-1}). In the conventional tillage system, the emission of N_2O was 23% higher than in ILP. The flow of CH_4 in the period ranged from +10 to -30 g C m^{-2} h^{-1} with no difference between the management systems. An increase in CO_2 emissions occurred between 20 and 100 days of the trial period. Considering the amounts of greenhouse gases in CO_2 equivalent, there was a reduction of 14 and 17% of GHG emissions by NT (249.8 kg CO_2 ha^{-1}) and ICL (241.9 kg CO_2 ha^{-1}), respectively, replacing the CT (293.2 kg CO_2 ha^{-1}). Despite the large area in NT in Brazil, the Cerrado region still adopted the use of disking to prepare the soil. The adoption of ICL and NT systems could not only increase the profitability of the activity, but allow for a lower environmental impact of agriculture, mainly by reducing the emission of greenhouse gases.