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Sugarcane field management practices: how to minimize carbon dioxide emission in the plantation renewal.

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The management of agricultural soils can play an important role in the greenhouse gases (GHG) balance, depending on the adopted practices. In the agricultural system, current GHG emissions generated by anthropogenic activities include land use, land use change and management practices, which have contributed to disrupt the C and N cycles in terrestrial ecosystems. The GHG (CO_2, N_2O and CH_4) emissions from agricultural soils depend on the biophysical processes, and the incorporation/decomposition of organic residues. The preparation of agricultural soils requires a combination of several implements, which can produce great soil disturbance as is the case of conventional tillage or minimum soil mobilization in the reduced tillage or no-tillage. Tillage breaks soil aggregates leading to enhanced organic matter decomposition and reduced C and N concentrations and no-tillage increases the stability of soil macroaggregates, reducing the emissions of CO2. In this study, we evaluated the CO2 emissions from different management practices widely used in the renewal of sugarcane fields previously planted with soybean, in an Acric Oxisol plantation in the southeast region of Brazil. The conventional tillage (CT) operation consisted of an offset disk harrowing using a tool with 36 disks x 26" and a subsoiling with an implement reaching nearly 50 cm depth. The reduced tillage (RT) was carried out with subsoiling operation in the row planting and in the no-tillage (NT), the soybean trash from the last harvest was left on the soil. The soil preparation and the establishment of four experimental plots (30 m x 30 m each) occurred within two days. During the studied period, two CO_2 emission peaks were observed, the first one on day 4 and the second on day 35 after the soil preparation. On day 4, the flux of 19.7 g m^{-2} day^{-1} for NT was different from the 26.8 and 27.0 g m^{-2} day^{-1} observed for RT and CT, respectively. On day 35, the fluxes for NT, RT and CT were 25.6, 32.4 and 41.7 g m^{-2} day^{-1}, respectively. The cumulative CO_2 emissions were measured during 40 days after soil preparation. We observed higher emissions in the conventional tillage (CT), and lower values in the reduced tillage (approximately 10%) and non-tillage (approximately 20%) areas. Considering the expansion of sugarcane area in 320,000 hectares during the next sugarcane season (2014/2015), the NT management practice compared to the CT could reduce the emissions of CO_2 in approximately 0.2 - 0.5 T g of CO_2.