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CO_2-C emissions associated to soil tillage, liming and gypsum applications in sugarcane areas under green and burned harvest

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Debate regarding the potential of bioenergy crops to substitute fossil fuel in an efficient way is still opened. New management strategies from agricultural crops should be identified to increase their potential contributing to avoid the climate changes. This study quantified the impact of sugarcane harvest systems and other management practices on CO_2-C fluxes following crop replanting. Two agricultural systems were considered: burned and green harvest, in plots where residues were left or removed from soil surface, from no till and after conventional tillage, with or without dolomite and agricultural gypsum applications. Soil CO_2 emission, moisture and soil temperature were taken since 24 hours after tillage, totalizing 25 days after tillage with 18 measuring days. NT plots emissions were kept lower than others during the whole period studied, presenting in some cases fluctuations which were mostly related to changes in soil moisture associated to the occurrence of rain precipitations. Changes in CO_2-C emission, in each of the harvest systems can be clearly seen when tillage, dolomite or gypsum were applied. The removal of sugarcane residues from soil surface resulted in almost immediate reduction of soil moisture (6% in volume) following an increase in soil NT CO_2 emission of + 64%. The additional soil carbon emission due to the simple operation of removing the crop residues from soil surface was 252.4 kg CO_2-C ha-1, as higher as the soil CO_2 losses induced by tillage operation. Dolomite and agricultural gypsum applications did not always result in higher emissions, especially when applied at the presence of crop residues on soil surface. Reducing tillage frequency in green harvested sugarcane areas could reduce CO_2 emissions and probably increasing the soil carbon stock considering long-term period crop system, while maintaining the sugarcane crop residues on soil surface has shown to be also a GHG mitigation option.