



Soil carbon stocks in response to management changes due to vinasse application in sugarcane production in southeast of Brazil

Caio Fernandes Zani, Arlete Simoes Barneze, and Carlos Clemente Cerri
Centre of Nuclear Energy on Agriculture, University of Sao Paulo, Piracicaba-SP, Brazil

Brazilian commodities, such as ethanol, are looking for sustainable production to suit the international market demands. Thus, studies about variations in soil carbon (C) stocks on the ethanol production are essential. Researches in relation of land use change are already been developed; however information about management changes on the sugarcane production is needed. According to Six et al. (2004) changing the management to conservationist practices can provide an organic matter accumulation to the soil and in a long-term, can increase the soil C stocks. The vinasse is a waste product of the sugarcane industry fuel which contains potassium and considerable quantities of other mineral nutrients. It is estimated that for each litre of ethanol produced is generated approximately 13 L of vinasse. Nowadays, almost all vinasse is applied to the soil as fertigation (Soares et al., 2009). The aim of this study was to evaluate the changes in soil C stocks after the management change with or without vinasse application into sugarcane production in southeast Brazil. The soil sampling was carried out in a fuel industry located in São Paulo state, on July 2013. This area was always used a conventional management at least 34 years with application of mineral fertilizer. However, in the mid of 1990, one part of this area started to use vinasse as source of potassium in sugarcane production. In view of this, we conducted the experiment in these two areas of conventional management: i) without vinasse and ii) with vinasse application. Soil samples were collected in the nine trenches in each site: three trenches at 1 m soil depth and six mini-trenches up to 0.3 m. Samples were used to calculate the bulk density using the undisturbed method with a steel cylinder. Total C was measured by dry combustion on Carbon Analyzer - LECO® CN 2000®. The results showed that C content was a decrease with an increase soil depth. Soil C stocks for areas without vinasse application and vinasse application at 1 m depth were 117.23 Mg ha⁻¹ and 126.92 Mg ha⁻¹, and at 0.3 m depth we found 50.34 Mg ha⁻¹ and 55.54 Mg ha⁻¹, respectively. It represented an increase 8.3% and 10.3% in soil C stocks in areas with vinasse application at 1 m and 0.3 m soil depth. This information may be used as a basis for public policies decision which dealing of the land use and global warming. The scientific information obtained in this research will be included in carbon footprint calculation of ethanol production and its use as biofuel.

References

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