

ABSTRACT BOOK PEDOMETRICS 2017

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Long-term diachronic series for soil carbon saturation evidence. A case study on volcanic soils of reunion island under sugarcane crops.

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The goal of the international ‘4 per mille’ initiative is to demonstrate that agricultural soils can play a crucial role for food security and climate change, and particularly in tropical areas where knowledge on soil carbon potential sequestration is still needed. The study is located at Reunion, a young tropical volcanic island in the Indian Ocean, 700km east of Madagascar, that presents a range of tropical soils comprising almost half of the 30 types recorded worldwide. Our work is focused on the drivers of soil organic carbon (SOC) content dynamics in the different types of volcanic soils under long-term sugarcane crops (more than 60% of the agricultural area). For doing so, a huge database on soil constituents has been mobilized. It was built over the last 20 years and represents more than 20 000 soil samples predominantly originated from sugarcane plots. Long-term diachronic series on SOC contents should be extracted from the database. Geolocated data combined with GIS tools allowed us to create a SOC map of Reunion and data mining tools, such as BRT, have been used to prioritize the drivers of SOC contents and evaluate the storage capacities of these young volcanic soils. In the conditions of the study, soil type was the main driver of SOC content, ahead of climate conditions and agricultural practices. Ferralsols, on the west and north coast, exhibit the lowest SOC content whereas Andisols, at higher altitudes, show the highest SOC contents for the 0-30cm layer. Long-term diachronic series showed almost constant SOC contents under sugarcane crops on the whole range of soils over time. Sugarcane cropping system produce high organic carbon inputs (residues and roots, $1.2 \text{ Mg C ha}^{-1}\text{y}^{-1}$) and agricultural practices in Reunion (mulching, one tillage every ten years on average) would maintain high SOC contents. All those considerations will suggest that soil carbon saturation is reached under sugarcane crops for all soil types. And hence, no more SOC storage is possible, but any land use change could decrease the soil organic carbon already stored in these soils. Soil carbon saturation rate, showed by long-term diachronic series, is therefore a better indicator than SOC content to develop soil carbon potential storage scenarios.

keywords: *Soil organic carbon, tropical volcanic soils, long-term diachronic series, sugarcane, soil analyses database, data mining*