Geophysical Research Abstracts
Vol. 21, EGU2019-18864-1, 2019
EGU General Assembly 2019

Effect of duration of market gardening operations on soil organic carbon fractions. A case study in Bobo-Dioulasso (Burkina Faso)

Rayangnéwendé Adèle Ouédraogo (1,2), Caroline Chartin (1), Fabèkourè Cédric Kambiré (2), Bas van Wesemael (1), Hélène Millogo (2), and Charles L. Bielders (1)

(1) Earth and Life Institute, Université Catholique de Louvain, Louvain-la-Neuve, Belgium (rayangnewende.ouedraogo@uclouvain.be), (2) Centre National de Recherche Scientifique et Technologique, Ouagadougou, Burkina Faso (delaoued@hotmail.fr)

Given the crucial role of SOC on soil quality and the environment, it is important to monitor its evolution and improve our understanding of its dynamics in response to human practices. In developing countries, market gardening practices are characterized by intensive use of organic amendments, but little is known regarding their impact on soil carbon. Furthermore, recent studies have demonstrated that a better understanding of carbon dynamics can be achieved by considering different carbon pools. Hence, a simple and refined method of SOC fractionation was used in this study to assess the impact of market gardening practices, especially their duration, on total SOC and on two sub-fractions (stable and labile). The study was conducted in the Kuinima market gardening zone in Bobo-Dioulasso (Burkina Faso). Composite soil samples (0-15 cm) were collected from 69 plots that had been in operation for 0 to 60 years. These samples were subjected to two methods of physical fractionation (agitation and sonication) to assess stable and labile carbon. The results of the analysis show an asymptotic increase in total carbon content as a function of operating time, increasing on average from 5 g C kg-1 for non cultivated plots to 35 g C kg-1 for plots cultivated for 60 years or more. This increase tends to stabilize after 40 years of operation. The same trend is observed with labile carbon content (fraction > 20 μm), whether samples were sonified or agitated. On the contrary, carbon content in the fraction < 20 μm increased linearly with time, and this increase was stronger in sonified samples compared to agitated samples. Comparison of the two fractionation methods revealed a strong contribution of micro-aggregates to the physical stabilization of SOC, favored by iron and aluminum oxyhydroxides. Market gardening appears to improve soil quality and could help mitigate the effect of climate change through long term carbon sequestration.