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Edaphic Carbon in A Chronosequence of Transformation from Cocoa to Pastureland in Southeast Mexico

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Abstract

The cocoa agroforestry system (SAFC) is one of the most important in Tabasco, Mexico. Currently faces phytosanitary problems, low yields and deforestation. The SAFC can accumulate an important tree mass, which allows them to store quantities of carbon (C), even higher than some natural forests. Under conditions of the humid tropics, the size of the MOS stores is small and rapidly degrades, so that soil fertility can be quickly depleted making the agroecosystem highly dependent on the supply of fertilisers. The objective of this research was to measure the concentration of SOC and other variables indicating soil fertility, in a chronosequence of pastures that were established on cocoa plantations. The research was carried out in Jalpa de Méndez Tabasco, Mexico. Sites that were previously SAFCs were selected and that currently record a change in land use. The age ranges of the pastures studied were: 1–5 years (PZ 1–5), 6–10 years (PZ 6–10) and 11–20 years (PZ 11–20). In each experimental unit, 10 sampling sites were located; At each sampling site samples were taken at three depths (0–10 cm, 10–20 cm and 20–30 cm). In the long term, the change of land use from SAFC to pasture reduces the COS warehouses. In the first years of the change the reduction of the COS content is reflected in the PZ 1–5. In the PZ 6–10 the COS increases, which causes an increase in the CIC and a reduction of the ρ_b . In PZ 11–20 the chemical and physical properties decline and the content of the COS decreases to levels below the SAFC 20–35. The highest concentration of COS was recorded in the PZ 6–10, this treatment recorded a higher C / N ratio that negatively affected the accumulation of COS. The PZ 6–10 and SAFC 20–35 presented the best accumulation of COS with 65 and 57 Mg C ha⁻¹ respectively, although the pastures tend to lose their storage capacity over time.

Keywords: Cocoa Agroforestry System, Grasslands of Tabasco, Land-use change, Soil Organic Carbon