

Book of Abstracts

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Preferred session **C5. Soil organic matter and nutrient cycling in multi-strata AF systems**

Abstract Shaded perennial agroforestry systems contain relatively high quantities of soil carbon (C) because of continuous deposition of plant residues; however, the amount of C sequestered in the soil will vary depending on the turnover time and the extent of physical protection of different soil organic matter fractions. The objective of this study was to characterize soil organic C pools in relation to different soil aggregate-size classes in different soil layers up to 1 m depth in cacao (*Theobroma cacao*) agroforestry systems (AFS) in Bahia, Brazil. Soil samples were collected from 4 depth classes (0–10, 10–30, 30–60, and 60–100 cm) under 3 land-use systems in reddish-yellow Oxisol; the land-use systems were: 1) 30-year-old stands of cacao with *Erythrina spp.* (*Erythrina poeppigiana*) as shade trees; 2) cacao under natural forest (Cabruca); and 3) an adjacent natural forest. The soil sample from each layer was separated by wet sieving into 3 aggregate-size classes (>250 μm , 250–53 μm , and <53 μm). Cacao AFS have exceptionally high C sequestration potential. The organic C stock in the 0–100 cm soil layer did not vary among different systems (mean: 302 Mg ha⁻¹); however, in the 0–30 cm layer, the order was: Cabruca>cacao with *Erythrina spp.*>natural forest (154, 118, and 84 Mg ha⁻¹, respectively). The C concentration was higher in the silt-and-clay fraction, followed by the micro-size (53–253 μm) and macro-size fractions (250–2000 μm), but the relative proportion of the 3 size classes was such that the C which accumulated in the macro-sized, micro-sized and silt-and-clay-sized fractions were about 93, 24, and 9% of soil C, respectively. Sixty percent of the total soil C in cacao AFS are located inside the aggregates that represent physically protected C.

Assessing the level of organization in agroforestry systems

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Preferred session **A1. Multistrata agroforestry systems with perennial crops**

Abstract Agroforestry systems are generally characterized by several parameters, such as the number of plant species, the density of each species, or various biodiversity indexes. Many systems have a main crop, like coffee or cacao. In such systems, the ratio of the number of trees of the main crop to the total number of trees (the main crop plus the associated species) is also used to characterize the system. This parameter can vary from 1, in the case of a pure crop, to a value near 0 in more complex systems. This parameter assesses the relative density of the main species, but it does not provide an idea of the organization of a system. Indeed, for the same relative density, the system may be completely spatially regular or completely disordered with pockets of the pure main crop alternating with pockets without main crop trees. To estimate the level of organization in agroforestry systems with a main crop, we propose an index which varies from 0 to 1. For a given area, the plot is split into n sub-plots with the same area. In each sub-plot, the relative density is estimated, i.e. the number of trees of the main crop out of the total number of trees. The index E_n is expressed as the ratio of the relative minimum density obtained in one of the n sub-plots to the relative density estimated for the whole plot. In the case of a very regular system $E_n = 1$ whereas in very irregular systems $E_n \rightarrow 0$. A second index of the organization of the system is the speed of convergence of E_n to E_1 when n decreases ($n \rightarrow n/2 \dots \rightarrow 1$). Several examples are presented to illustrate the relevance of these parameters, which could help to more effectively compare agroforestry systems.

Rôle de l'Agroforesterie à base d'anacardier dans la dynamique de l'occupation du sol dans le Centre du Bénin

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