



Root distribution and characteristics in a young alley-cropping system: potential impacts on soil CNP stocks and enzymatic activity

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In alley-cropping systems, the root distributions and characteristics of annual crops and perennial species are still unknown despite their direct impact on the entries of C in soils. This study aims to link the root distributions and characteristics to soil biotic and abiotic properties according to soil depth and to distance to the tree in a young alley-cropping system. The experimental set-up was synthesized in Fig.1. The reduction of root density in the wheat-1m, especially in topsoils, was not due to the soil properties (which were not modified) nor to any presence of perennial roots in the crop zone. The higher lignin content in the wheat-1m meant to increase of the absorption capacity in response to the low water content at this location, probably due to the massive water uptake by the UVS. The UVS roots brought a diversity of root traits such as higher root tissue density and ligno-cellulosic index than crop roots. Soil CNP and microbial biomass decreased with depth such as root density. In topsoils, despite a higher entry of organic matter (roots, aerial litter...), the eco-enzyme stoichiometry of the relative C to N vs. C to P acquisition showed higher C needs in topsoils than at depth. In this young alley-cropping system, the root biomass was not increased compared to a hypothetical similar conventional system thanks to the UVS root balancing the loss in wheat near the UVS. The important ligno-cellulosic index in UVS and wheat near UVS roots could lead to a recalcitrance to decomposition and thus increase the potential C storage in AF systems, especially at higher depth, where the CNP needs are more balanced than in topsoils and tends to a stable environment.