

Agroforestry Practices on Soil Microbial Biomass Carbon and Organic Carbon in Southern Ethiopia

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Abstract : The rapid conversion of an old aged agroforestry (AF) based agricultural system to monocropping farming system in southern Ethiopia is increasing. The consequence of this, combined with climate change, has been impaired biodiversity, soil microbial biomass carbon (MBC), and soil organic carbon (SOC). The AF system could curb such problems due it is an ecologically and economically sustainable strategies. This study was aimed to investigate different agroforestry practices (AFPs) on MBC and SOC in southern Ethiopia. Soil samples were collected from homegarden based agroforestry practice (HAFP), crop land based agroforestry practice (CIAFP), woodlot based agroforestry practice (WIAFP), and trees on soil and water conservation based agroforestry practice (TSWAFP) using two depth layer (0-30 & 30-60 cm) by systematic sampling. Moreover, woody species inventory was also collected. The chloroform fumigation extraction method was employed to determine MBC from different AFP types. In this study, the value of MBC and SOC decreased significantly with soil depth ($p < 0.05$). Besides, AFP type, soil depth, woody species diversity, and key soil properties also strongly influenced MBC and SOC ($p < 0.05$). In this study, the MBC was the highest (786 mg kg^{-1} soil) in HAFP, followed by WIAFP (592 mg kg^{-1} soil), TSWAFP (421 mg kg^{-1} soil), and CIAFP (357 mg kg^{-1} soil). The highest mean value of SOC ($43.5 \text{ Mg C ha}^{-1}$) was recorded in HAFP, followed by WIAFP ($35.1 \text{ Mg C ha}^{-1}$), TSWAFP ($22.3 \text{ Mg C ha}^{-1}$), while the lowest ($21.8 \text{ Mg C ha}^{-1}$) was recorded in CIAFP. The HAFP had high woody species diversity, and the lowest was recorded in CIAFP. The finding indicated that SOC and MBC were significantly affected by land management practices, and HAFP has the potential to improve MBC and SOC through good management practices of AFP.

Keywords : agroforestry practices, microbial biomass carbon, soil carbon, rapid conversion

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