

The Effects of Different Agroforestry Practices on Glomalin Related Soil Protein, Soil Aggregate Stability and Organic Carbon-Association with Soil Aggregates in Southern Ethiopia

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Abstract : The severities of land degradation in southern Ethiopia has been increasing due to high population density, replacement of an age-old agroforestry (AF) based agricultural system with monocropping. The consequences of these activities combined with climate change have been impaired soil biota, soil organic carbon (SOC), soil glomalin, soil aggregation and aggregate stability. The AF systems could curb these problems due it is an ecologically and economically sustainable. This study was aimed to determine the effect of agroforestry practices (AFPs) on soil glomalin, soil aggregate stability (SAS), and aggregate association with SOC. Soil samples (from two depth level: 0-30 & 30-60 cm) and woody species were collected from homegarden based agroforestry practice (HAFP), cropland based agroforestry practice (CIAFP), woodlot based agroforestry practice (WIAFP) and trees on soil and water conservation based agroforestry practice (TSWAFP) using systematic sampling. In this study, both easily extractable glomalin related soil protein (EEGRSP) and total glomalin related soil protein (TGRSP) were significantly ($p < 0.05$) higher in HAFP compared to others, with decreasing order HAFP>WIAFP>TSWAFP>CIAFP at upper surface but in subsurface in decreasing order: WIAFP>HAFP>TSWAFP>CIAFP. On the other hand, the macroaggregate fraction of AFPs ranged from 22.64-36.51% where the lowest was in CIAFP, while the highest was in HAFP, moreover, the order for subsurface was also the same but SAS decreased with the increasing of soil depths. The micro-aggregate fraction ranged from 15.9-24.56%, where the lowest was in HAFP, but the highest was in CIAFP. Besides, the association of OC with both macro-and micro-aggregates was greatest in HAFP and followed by WIAFP. The findings also showed that both glomalin and SAS were significantly high with woody species diversity and richness. Thus, AFP with good management practice can play role on maintenance of biodiversity, glomalin content and other soil quality parameters with future implications for a stable ecosystem.

Keywords : agroforestry, soil aggregate stability, glomalin, aggregate-associated carbon, HAFP, CIAFP, WIAFP, TSWAFP.

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