Title: Potential of Small Holder Farmers Agricultural Practices in Enhancing Soil Organic Carbon Stock and Other Selected Soil Physico Properties at Akaki District, Ethiopia

Abstract: Land degradation and extensive use of agricultural lands have led to the decline in soil fertility. To reverse the nutrient deterioration of cultivated lands, farmers have started employing various conservation agriculture practices. This study was initiated to examine the potential of conservation agriculture (integrated practices such as inter cropping, crop rotation, residue retention and minimum tillage) by smallholder farmers to enhance soil organic carbon stock and other selected soil physicochemical properties in Akaki district Bilbilo micro watershed. A systematic sampling method was employed for data collection. Totally 96 composite soil samples (8 plots x 2 systems x 2 replication of site x 3 depth: 0-10cm, 10-20cm and 20-30cm) were collected for analysis. Results showed that soil bulk density (BD) was significantly (p<0.05) varied with practices and depth (p<0.001). It was lower in soil under conservation (0.78 g m⁻³) than under conventional practice (1.48 g m⁻³); and in the top layer 0-10 cm (1.21±0.05) than the rest depths. BD showed increasing trend with soil depth across the practices: lower on the top 0-10cm depth (0.78 ±0.03) compared with the rest. The pH was higher (7.28) in conservation than conventional (5.75). The CEC was higher (14.6Cmol (+)/kg) in conservation practice than in the conventional (10.3 cmol (+)/kg). Both pH and CEC had shown increase in the two practices and soil depth due to the leaching of base cation from upper to lower layers. The mean SOC stocks decrease with increasing soil depth about the significant variations with treatments and depth. The SOC stock was higher (110.6t c /ha) in conservation practice than in conventional practice (50.22 t/ha). Similarly, total N stocks was also higher (19.5 t c/ha) in conservation practice than in conventional practice (17.4 t c/ha). SOC and total N in both practices had decreased with soil depth due to lower accumulation of organic residue in the lower layer. Likewise, C: N ratios had increases with depth due to similar reason the decrease the amount of soil organic carbon and TN pool (e.g. root biomass) with depth. However, the C: N ratio has higher value in conservation practice (6.51) than in conventional practice (6.05). Most of the measured soil properties were improved in CA aided followed by soil depth compared with conventional agriculture and at soil depth layers ones. The interaction of farming practice types and soil depth also significantly affected all parameters. Keywords: Nutrient Management, Residue Retention, Crop Rotation, Crop Land Use, Step-wise Integration, Soil Bulk Density