

## Effect of Land Use on Soil Organic Carbon Stock and Aggregate Dynamics of Degraded Ultisol in Nsukka, Southeastern Nigeria

**Authors :** Chukwuebuka Vincent Azuka, Chidimma Peace Odoh

**Abstract :** Changes in agricultural practices and land use influence the storage and release of soil organic carbon and soil structural dynamics. To investigate this in Nsukka, southeastern Nigeria, soil samples were collected at 0-10 cm, 10-20 cm and 20-30 cm from three locations; Ovoko (OV), Obukpa (OB) and University of Nigeria, Nsukka (UNN) and three land use types; cultivated land (CL), forest land (FL) and grassland (GL)). Data were subjected to analysis of variance (ANOVA) using SPSS. Also, correlations between organic carbon stock, structural stability indices and other soil properties were established. The result showed that Ksat was significantly ( $p < 0.05$ ) influenced by location with mean values of  $68 \text{ cmhr}^{-1}$ ,  $121.63 \text{ cmhr}^{-1}$ ,  $8.42 \text{ cmhr}^{-1}$  in OV, OB and UNN respectively. The MWD and aggregate stability (AS) were significantly ( $p < 0.05$ ) influenced by land use and depth. The mean values of MWD are 0.85 (CL), 1.35 (FL) and 1.45 (GL), and 1.66 at 0-10 cm, 1.08 at 10-20 cm and 0.88 mm at 20-30 cm. The mean values of AS are; 27.66% (CL), 46.39% (FL) and 49.81% (GL), and 53.96% at 0-10cm, 40.22% at 10-20cm and 29.57% at 20-30cm. Clay flocculation (CFI) and dispersion indices (CDI) differed significantly ( $p < 0.05$ ) among the land use. Soil pH differed significantly ( $p < 0.05$ ) across the land use and locations with mean values ranging from 3.90-6.14. Soil organic carbon (SOC) significantly ( $p < 0.05$ ) differed across locations and depths. SOC decreases as depth increases depth with mean values of  $15.6 \text{ gkg}^{-1}$ ,  $10.1 \text{ gkg}^{-1}$ , and  $8.6 \text{ gkg}^{-1}$  at 0-10 cm, 10-20 cm, and 20-30 cm respectively. SOC in the three land use was  $8.8 \text{ g kg}^{-1}$ ,  $15.2 \text{ gkg}^{-1}$  and  $10.4 \text{ gkg}^{-1}$  at CL, FL, and GL respectively. The highest aggregate-associated carbon was recorded in 0.5 mm across the land use and depth except in cultivated land and at 20-30 cm which recorded their highest SOC at 1mm. SOC stock, total nitrogen (TN) and CEC were significantly ( $p < 0.05$ ) different across the locations with highest values of 23.43 t/ha, 0.07g/kg and 14.27 Cmol/kg respectively recorded in UNN. SOC stock was significantly ( $p < 0.05$ ) influenced by depth as follows; 0-10>10-20>20-30 cm. TN was low with mean values ranging from 0.03-0.07 across the locations, land use and depths. The mean values of CEC ranged from 9.96-14.27 Cmol  $\text{kg}^{-1}$  across the locations and land use. SOC stock showed correlation with silt, coarse sand, N and CEC ( $r = 0.40^*$ ,  $-0.39^*$ ,  $-0.65^{**}$  and  $0.64^{**}$  respectively. AS showed correlation with BD, Ksat, pH in water and KCl, and SOC ( $r = -0.42^*$ ,  $0.54^{**}$ ,  $-0.44^*$ ,  $-0.45^*$  and  $0.49^{**}$  respectively. Thus, land use and location play a significant role in sustainable management of soil resources.

**Keywords :** agricultural practices, structural dynamics, sequestration, soil resources, management

**Conference Title :** ICSS 2019 : International Conference on Sport and Society

**Conference Location :** Sydney, Australia

**Conference Dates :** December 02-03, 2019