



## **INFLUENCE OF LAND USE SYSTEMS ON CARBON STOCK AND STRUCTURAL STABILITY OF A TROPICAL ALFISOL**

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### **ABSTRACT**

The study was conducted to investigate the influence of four adjacent land use systems (Arable [A], Pasture [PL], Fallow [FL] and orchard [OL]) on carbon stock and structural stability of a tropical Alfisol in Sudan Savannan agro-ecological zone of Nigeria. The result reveals that carbon stock was statistically higher ( $P = 0.03$ ) in OL and FL than the other two land use systems. Carbon stock in the soil increased by  $5.67\text{t ha}^{-1}$  in OL relative to FL for over 10 years. But in contrary, a decline in carbon stock of  $6.4\text{ t ha}^{-1}$  and  $4.9\text{ t ha}^{-1}$  was observed relative to FL in AL and PL, respectively. This indicates soil carbon stock in the study area lost rapidly under continuous arable cropping than any other land use systems. Correlation analysis showed that soil carbon stock in the study area was significantly explained by clay ( $r = 0.71^{**}$ ), silt ( $r = 0.54^*$ ) and sand ( $r = -0.70^{**}$ ) contents. The structural stability index (SI) did not significantly vary ( $P = 0.195$ ) among the land use systems were all values fell below less than 5% that indicates structurally degraded condition of the soil due to generally small organic carbon content. The structural stability index was significantly related to pH in  $\text{KCl}_2$ , available phosphorus and carbon stock with correlation coefficients ( $r$ ) of  $0.45^*$ ,  $0.62^{**}$  and  $0.72^{**}$ , respectively. Therefore, there is a need to adopt proven management practices that enhance and maintain organic carbon content especially in the AL in order to improve productivity and structural stability of the soil vis-à-vis environmental resilience.

**Keywords:** Land use systems, carbon stock, structural stability and Alfisol.