



Relative Contribution of aggregated soil Carbon to soil organic carbon pool in an Ultisol, SouthEastern Nigeria

Akudo Ogechukwu Onunwa, Ifeyinwa Monica Uzoh, Chukwuebuka Christopher Okolo, Charles Arinze Igwe, and John Nwite
Nnamdi Azikiwe University, Awka, Faculty of Agriculture, Soil Science and Land Resources Management, Nigeria
(ao.onunwa@unizik.edu.ng)

ABSTRACT

Maintenance of Soil Organic Matter (SOM) has been recognized as a strategy that could reduce soil degradation, improve soil organic carbon (SOC) pool thereby reducing atmospheric concentration of carbon iv oxide (CO₂) so as to ameliorate the effect of carbon and other greenhouse gases on the environment. Soil fertility depletion in the humid tropics is a serious problem emanating from erosion and leaching due to intense rainfall. Decrease in soil fertility and productivity is believed to be due to depletion in SOM. This study aims at determining the relative contributions (RC) of the various aggregated soil carbon (C_{WSA}) (which is a function of available organic matter in the soil) to Soil organic carbon pool. Soil samples were collected from an area of land (0.1125ha) planted to sole cowpea, sole maize and maize-cowpea intercrop in No till (NT) and conventionally tilled (CT) plots amended with poultry droppings (PD), pig waste (PW), cassava peels (CP) at 20t/ha each and a control in a split-split plot in Randomized Complete Block Design with three replicates. Cropping system was assigned to the main plots, tillage system was assigned to split plot while organic amendments and control was assigned to the split-split plot measuring 7.5m². The same treatment was maintained for two planting seasons (2012 and 2013), with the residual taken in 2013. Soil samples were collected at 0-30cm at the end of each planting season and SOC of the whole soil and the aggregated soil carbon (2mm, 2-1mm, 1-0.5mm, 0.5-0.25mm and < 0.25mm) were determined using Walkley and Black method as described by Nelson and Sommers (1982). Data collected were subjected to Analysis of Variance (ANOVA) using Genstat release 7.22D. The result revealed that there is a trend of aggregate size fractions 1-0.25mm contributing more carbon to the SOC than aggregate size fractions >2-1mm irrespective of the cropping system, tillage method or organic amendments applied. The highest relative contribution of aggregated soil carbon to the SOC pool shifted from the micro-aggregates (<0.25mm) to the macro-aggregates (1.0-0.25mm) for as long as the organic amendments lasted but gradually returned to the micro-aggregates when the amendments were withdrawn. It is therefore recommended that organic amendments be use to improve the soil aggregation which goes a long way in improving soil carbon pool thereby ameliorating the effect of carbon and other green house gases on the

environment.

Key Words: Soil Organic carbon pool, Soil Aggregated carbon, Relative Contribution, Macro and Micro Aggregates