

# WHAT IS SOIL CARBON SEQUESTRATION AND ITS IMPLICATIONS?

## An Introduction

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Soil carbon sequestration is a process of storing organic matter in soils. Soil organic matter (SOM) which is 57 percent carbon by weight is the residue of decomposed biomass that imparts important biological, chemical and physical properties to soils. Soil biota adds to, modifies and depends on SOM. A healthy soil is rich in biota and SOM. SOM is electrically charged and adsorbs and retains positively charged nutrient cations essential for plant growth. In the sandy soils of West Africa, cation retention for sustained plant growth hinges on the presence of negatively charged SOM. A healthy soil is rich in negatively charged SOM.

SOM is also the glue that binds minute, dust-forming soil particles into large, stable aggregates that enable soils to resist the erosive power of wind and water. Pores between SOM-rich aggregates increase in size as aggregate size increases, thus enabling rainwater to infiltrate into the soil to recharge ground water rather than flowing over land surfaces with sediments to flowing streams and rivers. SOM also acts as a sponge that enable sandy West African soils to supply water to crops long after rains have ceased. A healthy soil is rich in gluey and spongy SOM.

SOM is also a source of nutrients for crops. But SOM must be mined by plowing the soil for its nutrients to be released, and in West Africa, decades of mining SOM

for nutrients have resulted in land degradation on a regional scale. The ecosystem services of maintaining balanced nutrient, carbon and hydrologic cycles in the West African ecosystem have been distorted at great expense to millions of people who depend on it for their livelihood.

Carbon sequestration is the reverse of SOM mining - the former converts  $\text{CO}_2$  into SOM, and the latter converts SOM into  $\text{CO}_2$ . Carbon sequestration has been referred to as a WIN-WIN situation because it not only restores ecosystem services that enables a productive and stable farming system to exist, but has the potential to make a significant dent in the rise in greenhouse gases that now threatens our climate. A third WIN can be added to this scenario based on trading carbon sequestered in West African soils with  $\text{CO}_2$  emitted by polluting industries elsewhere in the world to finance the cost of training a new generation of farmers in the art and science of implementing practices that lead to increases in SOM over time.

In a series of Information Bulletins that will be made available, you will find steps that users can follow to transform West Africa from the current SOM mining and net  $\text{CO}_2$  producing, to a ecosystem restoring net greenhouse gas-lowering, region of the world.



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