

Determination of ecologically relevant pools for soil organic matter stability in terra firme oxisols

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The terra firme oxisols near Manaus are characterized by severe nutrient limitation. High leaching rates lead to high losses of nutrients from decomposing litter or of applied fertilizer. A closed nutrient cycling and the minimization of unproductive nutrient losses are the precondition of sustainable land-use management in this ecological region. To increase the soil organic matter (SOM) contents is an important factor of improving soil fertility, first as a source of slowly releasing nutrients and secondly as means of enhancing the soil cation exchange capacity in order to reduce nutrient leaching. Not only the amount of organic carbon in soil is ecologically important for SOM stability, but also its physical and chemical properties. Using particle size, aggregate and density fractionation methods together with the analysis of SOM compounds e.g. its lignin, carbohydrate or aminosugar content, profound statements can be made about SOM stability. The appropriate technique for the assessment of the ecologically relevant soil pools can vary between soils, and information about this is lacking for oxisols in the Amazon basin. This work should identify soil pools which are sensitive to land-use changes in terra firme oxisols and yield easy to handle techniques for the evaluation of SOM properties. For this purpose, we have studied the influence of 10 different trees and annual crops on SOM properties on an oxisol near Manaus.

First results show that the coarse sand fraction of particle size separates is an indicator of land-use changes. Much better than the particle size fractionation was a combination of aggregate and density fractionation. The particulate organic matter (POM, density less than 1.6 g cm^{-3}) varied by one order of magnitude between sites. The aggregate stability of the soils, obtained from the difference of dry and wet sieving, increased with higher SOM contents in large aggregate sizes and with higher POM contents.

Aggregate fractionation seems to be superior to particle size fractionation in terra firme oxisols, when evaluating ecologically relevant pools of SOM dynamics and stability. Thus, ecologically relevant soil pools can be obtained by dry sieving at 1mm or flotation in salt solutions with a density of 1.6 g cm^{-3} , giving rapid information about land-use changes.