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Decomposition rate and other indicators for ecosystem services evaluation in African agroecosystems

HELENA CRISTINA SERRANO, CRISTINA BRANQUINHO

Fac. of Sciences of the University of Lisbon, Center for Ecology, Evolution and Environmental Changes (cE3c) & Global Change and Sustainability Institute (CHANGE), Portugal

Abstract

In agroecosystems humans' actions interfere with the natural biogeochemical cycles, but the different management options will render different impacts on the ecosystem services delivery in general and on the ones of nutrient and carbon cycle/decomposition in particular.

Organic matter decomposition is essential for restoring soil fertility by the turnover between organic and mineral forms, that is achieved by physical, chemical, and biological action, at several biodiversity levels, that convert back the organic molecules into plant-assimilable nutrients. The plant decomposition rate depends on the quality and quantity of the litter, the local environment (soil and climate) and on the biodiversity and activity of the decomposition microorganisms present. While decomposition is a regulatory/maintenance service, other types of ecosystem services can be evaluated also in agroecosystems, using other indicators, to estimate their sustainability. In fact, although provision services are more used to evaluate ecosystem services in agriculture, for a complete picture on sustainability, regulatory/maintenance and cultural services should be evaluated, and their trade-offs considered.

We will give examples of the application of a standardised method for decomposition assessment (teabag method) and provide other indicators of ecosystem services in African agroecosystems.

Results show that in just a few months it is possible to differentiate the decomposition rate in soil of different cultures (e.g., cereals, maize, agroecological pollinator strips, agroforestry) based on biodiversity and microclimate. In more natural systems, at local scale, biodiversity drives decomposition, but in agroecosystems the human inputs modify those processes, either increasing their rate or decreasing it, and should be interpreted with care and appropriate controls.

Keywords: Agroecosystems, biodiversity, decomposition, ecosystem services, sustainability