



Soil sustainability indicated and measured by soil resilience

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Soils are the nexus of water, food and energy which illustrates the need for a holistic approach in sustainable soil management. The search for relevant bioindicators of soil sustainability has led to a huge output of studies recently, but yet a proper parameter or a set of parameters has not been identified. Resilience is often promoted to be a boundary concept to integrate social and natural dimensions of sustainability. Therefore, resilience is a promising parameter when it comes to measuring sustainability of soil management practices, since it reflects both its highly interlinked ecological and management components. To include both of these two interlinked components, the whole concept of soil ecosystem functioning needs to be reconsidered. We will present a modified concept of soil functioning cycles within the three dimensions of potential, connectedness and resilience. Additionally, we present a first methodological approach of how to measure resilience by the maximum ecological performance (MEP), using the multi-omics approach. The multi-omics techniques can be used to identify agro-ecosystem thresholds, tipping points and resulting regime shifts. We will present resilience as a key element of an adaptive management scheme, to also meet the challenge of deriving information about the link between soil biodiversity and soil multifunctionality.