



Effects of soil faunal activity on soil structure as a prerequisite for soil functions

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Soils are increasingly recognized as a limited resource fundamental to the functions leading to important ecosystem services, such as biomass production, nutrient cycling, water regulation and filtering, carbon sequestration and the provision of habitat for organisms and their activities. However, soils are threatened worldwide by anthropogenic activities that are degrading soils at a rapid rate. As their functionality cannot simply be replaced once lost, a comprehensive functional understanding of soil systems is needed to maintain sustainable use of soils.

The research program "Soil as a Natural Resource for the Bio-Economy - BonaRes" aims to predict – and thus help reduce - the impact of external disturbances (e.g. agricultural management practices) on soil functions via a systemic modelling approach that incorporates physical, chemical and biological soil properties. As this approach requires a systemic understanding of soil behavior and its component interactions, a Knowledge Centre has been developed that collects, structures and visualizes knowledge on those soil processes relevant for soil functions. As part of this Knowledge Centre, we focus on the identification and quantification of biological drivers of soil processes.

Soil fauna and their interactions play a key role in a number of ecosystem processes and functions, e.g. through food-web interactions or the modification of soil structure. As structural soil properties provide the matrix in which soil functions take place, changes in soil structure will influence an array of soil functions. As a prerequisite for most soil functions, understanding how soil faunal activity affects soil-structural properties is thus of utmost importance. However, a quantitative understanding of the overall contribution of soil fauna to soil structuring is lacking. Therefore, to assess the role of soil-faunal activity on soil structure, we are conducting meta-analyses of literature data, including various soil faunal groups and those soil structural properties deemed most relevant for soil functions in agricultural systems. As soil faunal communities and their performance are affected by site-specific conditions such as climate, soil properties or management practices, these additional conditions are considered in our analyses. We present first results of the literature review for effects of soil fauna on bulk density and porosity and identify knowledge gaps. Due to the paucity of data specific to agricultural systems, we included studies from all terrestrial ecosystem types. Soil-faunal effects on soil structural properties are strongly dependent on, e.g., organism functional group and time.