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Plant biodiversity impacts on soil stability

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In recent times, growing threats to global biodiversity have raised awareness from the scientific community, with particular interest on how plant diversity impacts on ecosystem functioning. In the field of plant-soil interactions, much work has been done to research the implications of species loss, primarily focussing on biological processes such as plant productivity, microbial activity and carbon cycling. Consequently, virtually nothing is known about how plant diversity might impact on soil physical properties, and what mechanisms might be involved. This represents a serious gap in knowledge, given that maintaining soils with good structural integrity can reduce soil erosion and water pollution, and can lead to improved plant yield. Therefore, there is a need for a greater understanding of how plant communities and ecological interactions between plant roots and soils can play a role in regulating soil physical structure.

Soil aggregation is an important process in determining soil stability by regulating soil water infiltration and having consequences for erodibility. This is influenced by both soil physical constituents and biological activity; including soil organic carbon content, microbial growth, and increased plant rooting. As previously mentioned, plant diversity influences carbon dynamics, microbial activity and plant growth, therefore could have substantial consequences for soil aggregate stability. Here, we present results from a series of plant manipulation experiments, on a range of scales, to understand more about how plant diversity could impact on soil aggregate stability.

Soils from both a plant manipulation mesocosm experiment, and a long term biodiversity field study, were analysed using the Le Bissonnais method of aggregate stability breakdown. Increasing plant species richness was found to have a significant positive impact on soil aggregate stability at both scales. In addition to this, the influence of species identity, functional group identity, and root traits were also investigated. Studying at the interface of ecology and soil physics, this work aims to provide scope for a new direction in soil biodiversity studies.