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Understanding soil organic matter dynamics to ecologically increase crop yields

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There is an increasing societal interest to develop farming systems that produce high yields while maintaining or even improving ecosystem functioning. Organic farming is such an ecological-intensive system with generally lower yields but better ecosystem functioning than conventional farming systems. In this project we therefore study how we can accelerate the development of soils in organically managed farming systems to improve yield. We specifically aim to unravel how the quality and quantity of Soil Organic Matter (SOM) drives crop yields. We hypothesize that a higher quality and quantity of different SOM pools leads to enhanced ecosystem functioning (e.g. nutrient availability, water provisioning) through mutual links between soil biota with their physico-chemical environment. To test our hypothesis we will link spatio-temporal variation in crop quality (e.g. leaf-N content) and quantity to variation in biotic and abiotic soil properties in an on-going long-term experiment at the Vredepeel, the Netherlands. We will specifically focus on the possible mechanisms via which SOM dynamics can improve soil functions to achieve high crop yields. We will identify the different SOM pools (e.g. SOM in macro- and microaggregates) and SOM dynamics and link that to soil functioning (e.g. nutrient cycling) and crop yield. Understanding the underlying mechanisms via which SOM influences soil functioning and crop yield will provide tools to accelerate the transition towards a sustainable intensification of farming systems.