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Impact of reduced tillage and organic inputs on aggregate stability and earthworm community in a Breton context in France

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Soil aggregate stability, which refers to the ability of soil aggregates to resist breakdown when disruptive forces are applied (water, wind), is a good indicator of the sensitivity of soil to crusting and erosion and is a relevant indicator for soil stability. Within soil parameters which affect soil stability, organic matter is one of the main important by functioning as bonding agent between mineral soil particles, but soil organisms such as microorganisms and earthworms are also recognized as efficient agents. However the relationship between earthworms, fungal hyphae and aggregation is still unclear. In order to assess the influence of these biological agents on aggregate dynamics, we have combined a field study and a laboratory experiment. On a long term experiment trial in Brittany, SOERE PRO-EFELE, we have studied the effect of reduced tillage (vs. conventional tillage) combined to organic inputs (vs. mineral inputs) on earthworm community and soil stability. Aggregate stability was measured at different perturbations intensities: fast wetting (FW), slow wetting (SW) and mechanical breakdown (MB).

This study showed that after 4 years of experiments, reduced tillage and organic inputs enhanced aggregate stability. Earthworms modulated aggregation process: endogeics reduced FW stability (mechanical binding by hyphae) and anecics increased SW stability (aggregate interparticular cohesion and hydrophobicity). Some precisions were provided by the laboratory experiment, using microcosms, which compared casts of the endogeic Aporectodea c. caliginosa (NCCT) and the anecic Lumbricus terrestris (LT). The presumed hyphae fragmentation by endogeics could not be highlight in NCCT casts. Nevertheless, hyphae were more abundant and C content and aggregate stability were higher in LT casts corroborating the positive contribution of anecics to aggregate stability.