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Modelling the impact of the soil microbiome on carbon sequestration in the AGROECOseqC-project

Soil fauna and microbial communities drive key ecosystem functions such as carbon sequestration and nitrogen mineralisation. The soil microbiome itself is shaped by land-use and soil management, e.g. plant diversity. Detailed knowledge about the relationships involved would provide options for baseline accounting and/or soil management. However, current models for assessing carbon sequestration are poorly equipped to represent the soil biota composition, functional diversity and activity. We hypothesize that the effect of plant diversity on carbon sequestration, playing a key role on shaping soil microbiome, may be differentiated from its effect as a mere source of carbon. To test the hypothesis, a modelling exercise will be carried out using the RothC-model and data from EU long-term experiments (LTE). Data collection in the LTEs will include all relevant aspects of the soil microbiome, i.e. particularly regarding its composition and activity. The RothC-model includes a BIO pool that represents carbon stored in the microbial biomass. Not only have pool size and turnover rate of the BIO pool been poorly validated, but the concept falls short in taking soil biodiversity into account. Furthermore, the model may be extended to include C from plant roots. Based on the outcomes of a multivariate analysis focusing on carbon use efficiency (CUE), the inclusion of the effect of the soil biome may be improved. Several possible adaptations of the RothC model will be tested with data from selected LTEs and evaluation made relative to time series of measured SOC from selected LTEs reserved for validation. Then conclusions may be drawn for a policy-relevant indicator, e.g. regarding the impact of the soil microbiome on carbon sequestration. This approach for model development will be discussed.