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ES1406 COST Action: Soil fauna: Key to Soil Organic Matter Dynamics and Fertility. How far have we got?

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Soil organic matter (SOM) is key to soil fertility, climate change mitigation, combatting land degradation, and the conservation of above- and below-ground biodiversity and associated ecosystem services like decomposition, nutrient cycling, carbon sequestration, detoxification and maintenance of soil physico-chemical properties. SOM dynamics represent the balance between the input of plant material (residues, root-derived materials) and the output through decomposition (OM mineralization) by organisms, erosion and leaching. Approximately 20% of global CO_2 emissions, one third of global CH4 emissions and two thirds of N2O emissions originate from soils. In many soils, most of the macro-aggregate structure is formed by the activities of soil invertebrates and roots, with important consequences for soil organic matter dynamics, carbon sequestration and water infiltration at several spatial and temporal scales. Current models of SOM dynamics are defined in terms of plant residues input and microbial decomposition, overlooking the important contribution of soil fauna. The composition and activity of soil fauna greatly vary with respect to climate and land use. SOM modelling has thus far largely ignored soil fauna due to various reasons: i) hardly existing communication between [C flow centered] biogeochemistry and [organism-centered] soil ecology, ii) lack of [awareness of] data on soil animals (both in the field and from laboratory experiments) and, iii) two different visions by soil ecologists: foodweb vs. self-organization. An international interdisciplinary approach (COST Action ES1406) is the proper platform for both experimentalists and modellers to discuss and provide solutions. This Action has fostered networking and collaboration for improved SOM models by implementing the role of the soil fauna as a basis for sustainable soil management. Key challenges in SOM management, soil fauna and modelling will be addressed and how far have we got thus far to meet the objectives of this Action.