Monitoring the decline of soil biodiversity in European soils

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The soil biota have important fundamental roles in soil processes and contribute both directly and indirectly to many important ecosystem functions such as nutrient cycling, soil structure, decomposition of organic matter. It is essential to understand the importance of species diversity in soil and their impact upon soil quality and function. The EU project ENVASSO (Environmental Assessment of Soil for Monitoring) addressed the 8 threats to soil identified by the Commission (CEC, 2002). The aim of the project was to design and test a single, integrated and operational set of EU-wide criteria and indicators that will provide a basis for a harmonised comprehensive soil and land information system for monitoring in Europe. To identify suitable indicators for monitoring the decline in soil biodiversity, indicators were selected both from a literature review and an inventory of national monitoring EU programmes. Within this project decline in soil biodiversity was defined as the reduction of forms of life living in soils (both in terms of quantity and variety) and of related functions, causing a deterioration or loss of one or more soil functions. Whereas the literature review allows the identification of about 100 possible indicators the inventory of existing monitoring networks shows that few indicators are really measured. For monitoring application it was considered that only 3 key indicators per soil stress were practical, however this was considered a difficult task for indicating biodiversity decline due to the complexity of soil biota and multi-functionality in soils. Therefore stringent criteria were applied to the selection process to evaluate: 1) methodology standardisation, 2) complementarity to other indicators, and 3) interpretation at both scientific and policy levels. The key indicators selected were chosen as representative of 3 functional levels in soil: a) abundance, biomass and species diversity of Earthworms – macrofauna, b) abundance and species diversity of Collembola – mesofauna and c) microbial respiration. Procedures and protocols were written based upon current ISO standards and adapted for assessment at a European scale. Pilot sites were then established in 4 countries (France, Ireland, Portugal and Hungary) to test the ease of measurement of the selected indicators and their efficiency to indicate the decline in soil biodiversity. The effectiveness of each indicator and their sensitivity to detect change across a range of land-use categories at a European scale will be discussed using data from these sites.