Recommended indicators to assess soil health: proposal from EJP SOIL

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More than ever, the important role that soil plays in sustaining life is recognized. This is, amongst others, expressed in high level objectives at EU scale and in the UN Sustainable Development Goals (SDGs). Achieving these targets and goals is in large part reliant on sustainable land and soil management. As discussed by EEA (2023), soil quality is often described using soil indicators. These are observed and evaluated soil properties, which can indicate the degree to which soils fulfil expected functions as needed for the wellbeing of crops, livestock, and consequently, human society. To be able to use indicators for evaluation purposes, reference values, thresholds and target values are also needed. It is, however, not straightforward to set reference values, thresholds and target values, nor to select appropriate indicators, because such values, and even indicators, likely should vary depending on e.g. land use, soil type, climate, degradation type, soil management status.

Several past (e.g. EU soil research projects) and recent initiatives have proposed and published soil indicators and reference, thresholds or target values, including EEA (2023), the Soil Monitoring Law proposal (SML, EC 2023) and the EU soil dashboard (JRC 2023). Considering those documents and also existing literature, a large group of soil scientists from EJP SOIL reviewed information on indicators and threshold setting, dealing with a range of indicators that can, on the one hand inform on soil degradation, and on the other about soil fertility also. Adding their expertise and knowledge they provided recommendations for the selection of soil indicators to be used for accounting soil fertility and degradation changes. Topics like selection of indicators, determining the costs of soil monitoring by using field/laboratory methods as well as Remote Sensing (RS)/Proximal Sensing (PS)

methods, scale effects, and modelling were also included. Depending on the indicators to be measured best periods and methods to sample as well as sampling frequency were also discussed.

A reasonable agreement was found between the main recommendations and the indicators proposed by the Soil Monitoring Law, the EUSO soil dashboard and EEA (2023), except for certain indicators (e.g. biodiversity, soil sealing, Available Water Content) and for threshold values that should be discussed and adapted to local conditions.

Keywords: soil indicators; soil sampling; soil threats; soil fertility