HORIZON Europe Research and Innovation actions
and other actions to support the implementation of mission A Soil Deal for Europe (HORIZON-MISS-2023-SOIL-01).

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101157354

Long-list of soil health indicators relevant for the SOILCRATES living labs

Milestone MS5

Version n° 1

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Introduction

Within the SOILCRATES Living Labs we perform several distinct soil health assessment and monitoring activities.

1. Firstly, we contribute to the European Soil Observatory (EUSO) by performing a baseline monitoring of EU relevant soil health indicators in each of the four Living Labs.
2. Secondly, we monitor and assess the effects of soil health practices on soil health, which are implemented as part of the pilot projects funded via the FSTP (financial support to third parties) funding scheme. This is a more scientific assessment approach.
3. Thirdly, within SOILCRATES we develop a so-called farmers-toolbox to be used by the farmers in the pilot projects to perform their own monitor and assessment of the effect of the soil health practices.

For each of these assessment and monitoring activities, shared minimum indicator sets are developed to be used in each of the four sister Living Labs. As a starting point to develop the minimum indicator sets, in 2025 we first created a long list of soil health indicators. The longlist was established based both on the expert judgement and knowledge of the soil scientists within the SOILCRATES consortium and on a review on previous and other running projects from the Mission Soil of Horizon Europe. It should be noted that this long-list is not an exhaustive list of all possible soil health indicators and measurements. The indicators on the long-list were deemed specifically relevant for the SOILCRATES living labs and soil health in the context of sustainable agriculture in France, Ireland, Spain and the Netherlands. Table 1 shows the long-list of soil health indicators organised by category (organic matter, chemical, physical, biological) and associated ecosystem services.

Table 1. Long-list of soil health indicators relevant to the SOILCRATES living labs

Category	Indicator	Ecosystem services
Organic matter	Soil Organic Matter (SOM)	Soil Fertility (Food production); Carbon sequestration; climate regulation
	Particulate Organic Matter (POM) / Mineral Associated Organic Matter (MAOM)	Soil Fertility (Food production); Carbon sequestration; pollution control; nutrient cycling
	Total Carbon	Carbon sequestration ; climate regulation; pollution control;nutrient cycling
	POXC	
Chemical	Carbonates	Carbon sequestration ; climate regulation; pollution control; nutrient cycling
	Soil pH	Soil Fertility (Food production) ; pollution control; nutrientcycling
	Organic Carbon and Nitrogen Stocks	Soil Fertility; climate regulation; pollution control; nutrient cycling
	Available Phosphorus	Food production; nutrient cycling
	Total Nitrogen	Food production; nutrient cycling
	Mineral Nitrogen	Food production; nutrient cycling
	Potentially Mineralizable Nitrogen	Food production; nutrient cycling
	K, S, Ca	Soil fertility
	Cation Exchange Capacity (CEC)	Food production; nutrient cycling
	Electric conductivity	Soil Fertility (Food production)
	Pesticides	
	Heavy metals	
	Antibiotics	
	PFAS	
	PAHs	
Physical	Bulk Density	Root growth and aeration; water regulation
	Penetration Resistance / compaction	water regulation

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	Water infiltration Rate	water regulation
	Soil Moisture	water regulation
	Soil Water Holding Capacity	water regulation
	Aggregate Stability	water regulation
	Aggregate Distribution or microaggregates-within-macroaggregates	water regulation
	Soil Texture	Erosion control; water regulation; nutrient cycling
	Visual Evaluation of Soil Structure (VESS)	Climate regulation
	Soil porosity	Water and air circulation; water regulation
	Surface crusting	Water and air circulation; water regulation
	Soil compaction	Water and air circulation; water regulation
	Erosion	Water and air circulation; water regulation
Biological	Enzymatic activities	Nutrient cycling; Biodiversity
	Microbial activity; soil respiration	Nutrient cycling; Biodiversity
	Microbial abundance	Biodiversity; Pollution control
	Microbial community structure	Biodiversity; Pollution control
	Microbial biomass	Biodiversity; Pollution control
	Microbial Functional Diversity	Biodiversity; Pollution control
	Bacterial and archeal genetic diversity	Biodiversity; Pollution control
	Fungal/mycorrhiza genetic diversity	Biodiversity; Pollution control
	Protists genetic diversity	Biodiversity; Pollution control
	Coprophagous fauna activity	Nutrient cycling
	Soil biodiversity Index (IBS)	Biodiversity
	Meso- and macro-fauna abundance and diversity	Biodiversity
	Nematode community structure	Biodiversity/nutrient cycling/crop growth; Biodiversity
	Earthworm community structure	Biodiversity; Water regulation

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