Technical input: Dr Richard Smith, Environment Agency

THE DEVELOPMENT OF A SOIL STRUCTURE TARGET (March 2021)

Annex II - Example of Proposed Metrics

Proposed Metrics:

- Visual soil assessment
- Organic matter (%SOM) and mineral associated Organic matter (%MAOM)
- Earthworms

1. **Soil Groups**

Metrics will be stratified according to 6 broad soil groups based on Soil Associations and as already included in Cross-Compliance and the Environment Bill targets:

- Sandy and light silty soils
- Medium soils
- Clay-rich heavy soils
- Chalk and limestone shallow soils
- Peaty soils with a sub-groups for podzols and deep peats (>40cm)
- Urban soils

2. **Land use/ habitat**

Metrics will also be stratified according to key land use/ habitat (linked to UKHab):

- Broadleaved, Mixed Woodland, Coniferous, Woodland
- Arable and Horticulture including Rotational Ley Grassland
- Improved Grasslands
- Unimproved Grasslands
- Mountain, Moor and Heath
- Urban (targeted only perhaps e.g. parkland; infrastructure verges (roads, rail, canals etc.); community gardens; construction sites)

3. **Climate/ Rainfall classes**

- Low (< 650- 700mm)
- High (>650 - 700mm)

This to be based on evidence-derived data where rainfall/climate does have a role.

4. **Sampling protocol**

Within a 1ha area or location of interest:

- VSA

    - Surface VSA – assess location for signs of > 1ha of soil loss features (e.g. erosion channels, runoff, etc.).
    - Topsoil VSA – minimum of 3 inspections in the RB209 'W' to cover the 'typical' and 'extremes'.
    - Subsoil VSA – as for topsoil VSA (from below topsoil/cultivated layer to 40cm depth).
- SOM/SOC (MAOM)
    - Topsoil– RB209 'W' sampling in a representative and relatively homogenous area of field/land on a single broad soil group and single land use. Follow sampling approach as for RB209 using a spade or corer – i.e. not after fertilising, slurry and keep topsoil and surface organic layer etc. to 15cm depth (2/3 spade).
    - Subsoil – take a slice from the side of the 3 subsoil VSA pits for SOM analysis.
- Earthworms
    - Topsoil - RB209 'W' sampling as above using methods as described for '30 minute worms'.

Example metrics and targets: Sandy and light silty soils for arable and horticulture.

Visual soil Assessment[1]	**Serious**	**Poor**	**Good**
Soil surface	Presence of erosion > 1ha (e.g. erosion channels, wheel ruts, compacted surface causing runoff and soil loss over 1ha).	Presence of erosion < 1ha (e.g. gateways, headlands localised wheel ruts causing minor runoff and soil loss less than 1ha).	Porous well-structured soil surface.
Topsoil		Benchmark graphics to illustrate compaction and poor topsoil structure.	Benchmark graphics to illustrate good topsoil structure (e.g. granular soil structure).
Subsoil		Benchmark graphics to illustrate compaction, dense subsoil with no pores and fissures.	Benchmark graphics to illustrate natural subsoil structure (and artificially improved soil structure).

Organic matter (% SOM) [2]	Low rainfall <1.1% High rainfall < 1.4%	Low rainfall 1.1 – 3.3% High rainfall 1.4 – 6.2%	Low rainfall > 3.3% High rainfall > 6.2%
Mineral-associated Organic Matter (%MAOM)[3]	Low rainfall TBC High rainfall TBC	Low rainfall TBC High rainfall TBC	Low rainfall TBC High rainfall TBC

EARTHWORMS[4] **(20cmx20cm spadeful)**	No earthworms	Arable <4	Arable >4

[1] Following the approach of Think Soils by the EA/Defra and the Farming Rules for Water for England.

[2] SOM targets to be established using agreed protocols. This could be based on: a) a population approach of current data, or b) expert judgement based on current data, modelling and other sources of information to prevent ongoing upwards drift of standards as soils improve. Ranges indicated here are from Verheijen et al. (2005) as cited in Griffiths et al. (2017) but approach needs to be agreed and these values revisited for all soil types.

[3] Data to be enhanced over time however some national data is already available for analysis from both LUCAS, Countryside Survey and others.

[4] Proposed targets as cited in Griffiths et al. (2017) but approach needs to be agreed and these values revisited for all soil types.