Soil Organic Matter

Practical Guide

The Soil Organic Content (SOC) is the central characteristic of topsoil that provides the structure and bio-chemical conditions needed for sustainable and profitable farming.

We are also becoming aware of the importance that healthy topsoil has in the functioning and the protection of our climate, environmental quality and as a reservoir of biodiversity.

Most Scottish topsoils have an adequate and secure organic content and therefore we rarely advise having it tested. However, increased concern about soil health due to climate change pressures along with the growing amount of advisory information linked to organic content is changing this. This note provides some background to understanding the soil organic fraction and promotes the testing of your soils for your benchmarking purposes.

What is soil organic matter (SOM)?

SOM is the organic component of our topsoils that cannot be seen; it influences the colour of our topsoils but is so closely bound to the individual soil particles that it is indistinguishable. Roots and crop residues are part of the soil organic fraction that can become SOM but are not, in the short term, providing the benefits we are looking to promote, protect and test for.

SOM takes hundreds of years to develop as it is takes this long for the soil particles (sand, silt and clay) to become fully coated in SOM and it is only when this process is complete that a soil becomes topsoil. Once developed the SOM fraction is highly protected from decomposition making it secure in the long term.

What soil test should you have done?

SOM can be measured in a number of ways but the one that is recommended here is called Loss on Ignition (LOI). The reasons for choosing LOI is its relatively low cost and wide availability making it a practical tool for benchmarking.

Other tests can be more detailed but are expensive and the results can vary between labs. LOI testing is available from most labs that offer standard soil testing. Unlike nutrient management, a regular test for LOI is not usually recommended, however it should be considered as a onetime test to help you benchmark your topsoil in terms of their SOM levels.

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The European Agricultural Fund for Rural Development
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What is the ideal SOM content?

There are no fixed SOM targets as your soil texture (sand, silt and clay) and climate play an important role in how much SOM is required to provide the maximum benefits. Knowing your soil texture is therefore important for interpreting SOM results. Resources such as the "Valuing your Soils Guide" can help you understand your soil and are available from the FAS website (https://www.fas.scot).

Course textured soils (loamy sands and sandy loams) require a minimum LOI result of 3% to display all the benefits that good SOM levels provide. For fine textured soils (clay content of 20% or more) such as clay loams require a higher SOM content of at least 5% before they begin to display topsoil characteristics.

Figure 1: Loamy Sand with LOI of 2% which is below target and will be difficult to manage in terms of fertility and water holding capacity.

What are the risks to SOM?

The largest risk to SOM is erosion by wind and water as this removes the soil that it coats. Erosion is a natural process so not only do we need to make sure we do not increase the risk through poor land management but we also need to ensure that topsoil development is ongoing by allowing topsoil to function normally by:

- Retaining crop residues and applying manure, slurries and other organic material to allow the natural cycles of decomposition which is the how the soil particles become coated in SOM.
- A mixed rotation will ensure that organic material is deposited threw-out the soil profile.
- Minimum or no-till systems will help retain soil organic material for longer term decomposition that will increase the SOM production.

Importantly all these practices promote worm populations which are a major contributor and indicator of healthy topsoil.

Figure 2: Sandy Loam with LOI of 5% and will have good rooting potential and nutrient management characteristics

Figure 3: Clay loam with an LOI of 4% leaving it was a poor structure and drainage issue

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