

How do I maintain my soil organic matter?

What makes up soil organic matter?

Soil organic matter (OM) is made up of surface residue, root residue, animal residue, bacteria, fungi, and all decomposed products from these substances.

How do we lose soil organic matter?

The base product of OM is carbon. This is lost from the soil by natural processes such as decomposition and respiration in the form of CO₂. Mechanical processes such as tillage significantly increase the rate at which OM is lost through a process called oxidation. The broken down material is carbohydrate, the 'glues' that hold the particles together and provide soil strength. Again oxidation releases CO₂.

How do we maintain or increase soil organic matter?

The quickest way to increase OM in a cropping soil is to return it to long term pasture. The length of time that the site needs to be in pasture is dependant on the level of soil degradation. At the very extreme, it has been estimated that a heavily degraded soil that can no longer support a profitable crop could take up to 130 years to return to its natural state. However where cultivation has been reduced we have seen quite rapid improvements in soil quality even after only one season.

Pasture Rotations

Continuous cropping without over-wintering pasture rotation is a very quick way to deplete OM. This is particularly so when mono-cropping. Direct drilling short rotation grasses or a cover crop in autumn replenishes some of the OM lost over summer.

Another method of providing pasture rotations is to 'spell' the paddock for 3-4 years after 5-6 years of cropping by putting it into pasture. The length of 'spelling' and cropping is dependant on the amount of damage done during the cropping phase i.e. if the paddock was harvested in a very wet year it may be prudent to then spell that paddock immediately. These two strategies, winter grass or cover crop and/or spelling the paddock from cropping, will lengthen the time that you will be able to crop the paddock.

Reducing Tillage

Using a reduced tillage system such as strip tillage or no tillage can help maintain OM. Evidence shows that OM is still depleted using

these tillage regimes but at a far lower rate than under full cultivation.

How do I maintain and measure my Soil Organic Matter?

Residues either plant or animal, are the base materials that form OM so retaining residues helps. Plant residues come in two parts

- surface residue
- root residue
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LandWISE recommends that surface residues are **mulched** and **not incorporated**. This is to preserve the pores and drainage channels that the root residue has formed during the growing season. Surface residue incorporation may put **current the season's** carbon back into the soil but it oxidises **previous season's** carbon. The effect is a nett loss.

Many people are worried that they will lose the effect of the surface residue if it is not incorporated. However biological activity, such as earthworm feeding, can return a significant quantity of the surface residue to the soil without disturbing the root residue. This process will accelerate as the soil health increases.

How can I measure my Soil Organic Matter?

Most laboratories offer Organic Matter tests as part of their suite of soil analyses. This usually has to be asked for separately.

The organic matter laboratory test gives a good indication of the total amount of organic matter in the soil BUT it is not sensitive to changes in the different forms of OM within the soil. Laboratory analyses currently measures all the OM within the soil. The carbohydrate or 'glue' fraction (that which binds the soil together forming peds) is only a small part of the total OM.

Because of this it is hard to find significant changes in OM in just a couple of years using the current tests. In the future, Hot Water Carbon tests which measure that fraction of the carbon content of the soil that influences soil structure i.e. carbohydrates, may be developed and made available from standard laboratories. It would allow us to monitor levels of this critical form of organic matter and allow management changes before problems occur.

For further information see the following LandWISE Notes: Soil Organic Matter and Residue Management