

Maintenance of soil organic matter

Introduction – The Importance of Soil Organic Matter

Soil organic matter comprises all living soil organisms and the remains of previous living organisms in their various degrees of decomposition. Soil organic matter plays a major role in maintaining soil quality as it positively influences a wide range of soil properties such as the provision of nutrients, water retention and release, as well as reducing the risks of soil compaction, surface crusting and soil erosion. The practice of continuous tillage, (i.e. tillage for six years or more), tends to reduce the organic matter content of the soil unless appropriate management practices are implemented to reverse this trend. This decline is a gradual process. In like manner the process of replenishing soil organic matter is slow, but can be achieved through adapted agricultural management practices and the addition of organic materials to the soil.

Increasing soil organic matter will result in a 'win-win' situation with respect to positively influencing soil fertility and quality and maintaining the physical, chemical and biological conditions necessary in sustainable continuous tillage practices.

A number of factors influence the rate of decline of soil organic matter levels including soil type and physical properties, climate, topography, vegetation and land management practice. Soils with organic matter levels above 3.4% are not considered to be vulnerable. This equates to a soil organic carbon content of 2%. The conversion factor from soil organic carbon to soil organic matter is approximately 1.72 (i.e., Soil Organic Matter (SOM) = 1.72 multiplied by Soil Organic Carbon (SOC)).

Requirements under Good Agricultural and Environmental Condition

Applicants for the single payment scheme (SPS), the disadvantaged area scheme (DAS) and REPS 4 are obliged to comply with the provisions of Good Agricultural and Environmental Condition, one of which is the maintenance of organic matter levels in the soil¹. While the levels of organic matter in Irish soils are in general satisfactory, there is evidence that there are areas of the country where organic matter levels could be considered to be low, i.e. below 3.4% organic matter (2% organic carbon content). Ireland is obliged to put controls in place to monitor soil organic matter levels in the case of the SPS, DAS and REPS 4 applicants. Such controls will only apply on land under continuous tillage.

The Department of Agriculture, Fisheries and Food will identify land that is in continuous tillage for six years or more in vulnerable areas and notify the applicants that declare this land on their 2009 SPS application form. Applicants who are notified must determine the actual organic matter levels in these continuous tillage parcels in 2009 by arranging to have soil samples taken in accordance with the Statutory Instrument 101 of 2009. Should the organic matter percentage be below the threshold value of 3.4% it will be necessary to seek Cross Compliance – Farm Advisory System (CC-FAS) advice on any remedial action as may be considered necessary. Depending on the soil type or ongoing practices, either no further action will be

¹ Helpsheet/Terms & Conditions for the 2009 EU Single Payment Scheme and for the 2009 Disadvantaged Areas Scheme and other 2009 Area-Based Schemes

required or remedial action will have to be undertaken. The CC-FAS report must set out in detail any remedial actions as may be required.

Applicants in other areas who have not been written to but are also undertaking continuous tillage must also monitor soil organic matter levels from 2010 onwards. Where organic matter levels are found to be below the threshold values of 3.4%, the farmer must again seek the advice of a CC-FAS advisor and where appropriate follow the programme of remedial actions. Where necessary these remedial actions must commence in the year following the organic matter sampling.

Remedial action may have to be applied each year until a soil organic matter level of 3.4% or a level deemed appropriate by the CC-FAS advisor has been achieved.

Failure to have the samples taken and to provide the results of the analysis or where appropriate failure to contact a CC-FAS advisor and to follow the recommended remedial programme set out in the CC-FAS report may incur a sanction in accordance with the single payment cross compliance rules. Sampling must be repeated every 10 years. All sampling should be conducted in accordance with SI 101 of 2009 and using approved laboratories. One sample must normally be taken for every 4 Ha. However where soil type, cropping history and fertiliser treatment can be shown to be similar, the sample area may be increased to a maximum of 8 Ha per sample.

Inspections

Inspections for this requirement will be conducted as part of the normal GAEC Cross Compliance requirements. On inspection, applicants will be required to provide the soil analytical report showing the organic matter levels and where it is less than 3.4% they must also show the CC-FAS report setting out, where applicable, the programme of remedial actions. From 2010 onwards, the inspecting officer will check that the remedial actions listed in the CC-FAS report are being implemented. DAFF reserves the right to take soil samples and have them analysed where it deems it appropriate.

CC-FAS Advisor

A CC-FAS advisor is a Teagasc advisor or a private agricultural consultant that has been approved by DAFF to deliver cross compliance advice in accordance with Articles 13 to 16 of Council Regulation 1782/2003. The names of the approved FAS Bodies are listed on the DAFF website at www.agriculture.gov.ie.

The CC-FAS Report

The CC-FAS report is a report prepared and signed by a CC-FAS advisor. It is required when the soil analysis shows one or more samples have an organic matter level below 3.4%. Such sample areas must be dealt with separately in the CC-FAS report. The advisor must take into account the organic matter levels, soil type, soil condition, climate and the intended future cropping including crop rotation where deemed necessary. The advisor should consider if the land use is agriculturally and environmentally sustainable and whether there is a need or not for a change of practice. As the process of building up organic matter in the soil is very slow, the report must set out the remedial action to be taken for a 10-year period at the end of which the organic matter level will again have to be determined by soil sampling. An exception to this requirement is where a soil sample taken before the end of the 10-year cycle shows that the OM levels have recovered to greater than 3.4% or to a level deemed acceptable for that soil type by the CC-FAS advisor. The remedial action can be suspended in this case.

A template report sheet, 'GAEC OM', is available on the DAFF cross compliance web page and from the Cross Compliance Unit in Portlaoise. These reports must be available for inspection.

The applicant must confirm each year that the recommended remedial action was carried out by entering the year and a 'Y' in the box provided for each sample area.

How Can I Maintain or Improve Soil Organic Matter Levels?

Building up soil organic matter is a long-term process but is beneficial to the soil in many respects. Options available to improve organic matter content include the following:

- **Incorporate straw:** Chopping and reincorporation of straw improves organic matter levels.
- **Apply farmyard manures or mushroom compost:** Regular applications of FYM or mushroom compost will gradually improve organic matter levels as well as providing valuable nutrient for plants. However under the nitrates regulations, farmers have to adjust their fertiliser applications to take account of the nutrients in these organic fertilisers.
- **Apply organic fertilisers:** Poultry, pig and cattle manure all add organic matter to soil. Again the nutrients in these fertilisers have to be taken into account under the nitrates regulations.
- **Cover Crops:** Growing green cover in autumn combined with spring crops can help build or maintain soil organic matter particularly where they are ploughed in as green manure. However, best results can be achieved if growing of cover crops is combined with other remedial measures.
- **Crop rotation:** Crop rotation including grass in the cycle may restore organic matter levels depending on the particular circumstances.
- **Reduced Till options:** Min-till, and no-till systems on their own will not significantly increase organic matter levels in soil but will reduce the rate of decline. When combined with other actions such as straw incorporation, green manure, etc. they will help to maintain or increase the organic matter level.
- **Reduce or Eliminate Tillage in the cropping rotation:** Tillage increases the aeration of the soil and causes a flush of microbial action that speeds up the decomposition of organic matter. Tillage can often increase erosion which also removes organic matter.
- **Grass:** Grass based cropping normally increases the level of organic matter in soils. Where organic matter is very low the best way to build up levels again is to return the land to permanent pasture.

What Are the Benefits of Organic Matter?

Organic matter is a vital component of the soil because of its role in the chemical, physical and biological processes

Chemical Processes

- **Nutrient Supply:** Organic matter is a reservoir of nutrients including nitrogen and phosphorous that can be released to the soil through the mineralisation process. Each percent of organic matter in the soil represents about 1000kg of organic nitrogen in addition to other nutrients. The gradual mineralization of this nitrogen provides an important supply of crop nutrient requirement.
- **pH Buffering:** Organic matter is a useful aid in limiting pH fluctuations.

Physical Processes

- **Water Holding Capacity:** Organic matter behaves like a sponge, with the ability to absorb and hold a significant quantity of water. A great advantage of the water-holding capacity of organic matter is that it will release most of the water that it absorbs to growing plants. In contrast, clay can also hold large quantities of water, but much of it is not available to plants.
- **Soil Structure Aggregation:** Organic matter causes soil to clump and form soil aggregates, which improves soil structure. With better soil structure, permeability (infiltration of water through the soil) improves, in turn improving the soil's ability to take up and hold water.
- **Erosion Prevention:** Higher organic matter levels tend to reduce loss of soil by erosion because of better water infiltration through a more stable soil structure. A good soil structure reduces the risk of wind erosion.
- **Compaction:** Higher organic matter levels tend to reduce the risk of soil compaction.
- **Reduces surface crusting:** Higher organic matter levels tend to reduce the risk of soil capping particularly on fine textured soils through an improved soil structure.
- **Reduce Erosion:** Most soil organic matter is in the topsoil. When soil erodes through water movement, organic matter is removed with it. Appropriate tillage practices particularly on sloping soils can reduce erosion and organic matter losses such as contour ploughing.

Biological Processes

- **Biodiversity:** Soil organic matter plays a fundamental role in sustaining soil biodiversity by providing, for example a source of energy and nutrients for soil microorganisms.

Frequently Asked Questions

Q1. The Department has written to me notifying me that I have land in continuous tillage. I have let this land out to grass so do I need to take soil samples to determine the organic matter level?

A1. If you intend to leave this land in grass for five years or more there is no need to take samples.

Q2. I am in continuous tillage but I chop the straw and incorporate it back in and I also use min-till so do I need to take samples?

A2. Yes as you have no way of knowing what the organic matter levels are at present.

Q3. Where do I get the name of a cross compliance FAS advisor?

A3. The Department of Agriculture, Fisheries and Food website has a list of approved CC-FAS advisory bodies at www.agriculture.gov.ie. Teagasc and the private Agricultural Consultants have specialised advisors trained on all the cross compliance requirements.

Q4. I have rented land in 2009 and now the Department has written to me telling me that this land is in continuous tillage for 6 years or more. I will not rent this land next year so do I have to pay to have soil samples taken?

A4. Yes you must take soil samples.

Q5. I have land in continuous tillage but I now intend starting a crop rotation including oilseed rape and I will incorporate all the straw, do I need to take samples?

A5. Yes for the reasons given at question 2 above.

Q6. What is the best crop rotation to adopt to build up organic matter levels?

A6. You should contact your CC-FAS advisor as it depends on the current organic matter level, the soil type and management practices.

Q7. Why was a level of 3.4% soil organic matter chosen as the threshold value?

A7. Soils with organic matter levels above 3.4% are considered not to be vulnerable or depleted.

Q8. Will the normal soil sample that my advisor takes for lime, P and K do for organic matter?

A8. Yes but your advisor must specify that you also need an analysis for organic matter.

Q9. Will I be sanctioned for low organic matter levels?

A9. Low levels of organic matter in soils will **not** incur a cross compliance sanction. Under cross compliance, applicants are required to:

- Have the necessary soil organic matter tests carried out and provide the results of the analysis at any subsequent cross compliance inspection;
- Obtain a written report from a CC-FAS advisor on the appropriate remedial actions if any where the OM analysis report shows levels are below 3.4% and provide a copy of this report at any subsequent cross compliance inspection;
- Implement the remedial action recommendations where deemed necessary;
- Record the remedial actions taken, parcel by parcel on an annual basis.

Q10. Is there a standard record for organic matter?

A10. A template report form is available on the DAFF cross compliance web page and from the Cross Compliance Unit in Portlaoise.

Q11. How long will I need to apply the remedial action for?

A11. Remedial action must be continued in accordance with the CC-FAS report until there is a soil analysis report showing the organic matter levels have exceeded 3.4% or other value deemed appropriate by the CC-FAS advisor. It may not be necessary for a particular remedial action to be applied each year as soil type, cropping practice and the remedial option chosen will determine this.

Q12. Will it be necessary to undertake remedial action for all land with soil organic matter levels less than 3.4%?

A 12. Advice on any action to be taken should be sought from a CC-FAS advisor.

Q13. How will I know if my land currently in continuous tillage is in an area identified as being potentially low in OM?

A13. Applicants applying on such land in continuous tillage in 2009 will be written to.

Q14. What is the level of sanction applicable for failure to comply with the soil organic matter Cross Compliance requirements?

A14. Where the non-compliance is deemed to be of a 'negligent' nature, the single payment legislation requires in the first instance a sanction of 3% to be applied to the single payment, and the disadvantaged areas and REPS 4 payments. If the breach is deemed to be of an 'intent' nature then this sanction increases to 20% of the payments. Further reviews may decrease or increase these initial sanctions depending on the circumstances, which include the extent, severity and permanence of the breach.

Q15 What records have I to keep?

A15. The soil analysis reports showing the organic matter levels must be retained for inspection. In addition the CC-FAS report must also be retained. All of these records will have to be retained so that the organic matter levels and the effectiveness of the remedial actions can be monitored over time.