

# Soil management for your farm business



**CAMPAIGN  
FOR THE FARMED  
ENVIRONMENT.**



# SOIL STRUCTURE

The most important tool to help understand the condition of the soil on your farm is a spade. Whilst your soil type and its key characteristics do not change, the soil structure will vary across the farm from year to year depending on things such as crop rotation, machinery use, livestock stocking density and the weather. The best thing you can do to understand the structure is dig holes across your farm and take a look. This approach will also give you a feel for the organic matter content and begin to identify any compaction.



A well-structured and free-draining soil has abundant air spaces enabling water to percolate through soil. Surface-water runoff is unlikely on these soils.



A surface cap can occur on some soils that seals the immediate soil surface causing runoff.



Compacted soil with few air spaces only allows water to percolate slowly down the profile and can cause surface-water runoff.



Some soils naturally absorb water slowly, surface saturation and runoff can occur on these soils

A good guide on what to look for and links to the Visual Soil Assessment can be found on the CFE web site.

To improve soil structure, consider managing soil organic matter and compaction.

All soil types can suffer from erosion. Light soils, particularly those on slopes, can be more at risk. To protect soils on slopes choose a suitable crop, plant and place tramlines across contours to minimise risk of channels forming.

## SOIL ORGANIC MATTER

Without organic matter soil would just be a mixture of sand, silt and clay with limited ability to hold nutrients. Soil organic matter is made up of plant and animal matter which release nutrients into the soil as they decompose. This improves the porosity, workability, fertility and biota of soils as well as helping to maintain good structure. Where there are good levels of soil organic matter, the risk of capping, slumping and erosion can be reduced.

Levels of soil organic matter can be maintained or improved by retaining crop residues, growing green manures or cover crops, applying organic materials (e.g. livestock manures, biosolids or composts), introducing grass leys into an arable rotation, or by extending the length of time grass is managed in an existing rotation. In an arable rotation, reduced cultivation techniques can be a good practice to help maintain soil organic matter, especially in the soil surface tilth. In grassland, sensitive management of permanent pasture is key.

## BIOTA

Biota describes all the animal and plant life in the soil. A diverse biota is required to maximise soil health and crop potential, reduce reliance on artificial inputs and achieve better disease resistance in crops.

A diverse biota is required to:

- maximise soil health and crop potential
- reduce reliance on artificial inputs
- achieve better disease resistance in crops
- improve food supplies for farmland wildlife

## EARTHWORMS – a farmer's friend

The burrowing, feeding and casting of earthworms plays a major role in decomposing and cycling organic matter and in releasing nutrients. They can also improve soil porosity and aeration, water infiltration and conductivity, aggregate size and stability, reduce surface crusting and increase root growth and subsequent yields.

# The Campaign for the Farmed Environment (CFE) is encouraging farmers and land managers across England to protect and enhance the environmental value of farmland, through environmental measures that sit alongside productive agriculture.

The CFE helps farmers and land managers choose the right environmental measures, put them in the right place and manage them in the right way – to protect soil and water, and benefit wildlife.

CFE is a partnership approach, supported by many organisations engaged in agriculture and the environment. All recognise the importance of managing the farmed environment. By working with CFE, a number of voluntary industry led initiatives (Greenhouse Gas Action Plan, Tried & Tested and The Voluntary Initiative) demonstrate how the industry collectively takes responsibility for addressing environmental issues alongside profitable farming.

Well managed and biologically active soils are fundamental to sustainable and profitable farming. Soils with a good structure, organic matter content and diverse soil biology will help to ensure good yields, reduce the risk of runoff and erosion, will help protect

the environment, provide resilience to climatic pressures such as floods and drought and can help to reduce inputs by ensuring nutrients and water are utilised correctly.

Good infield management of soils is vital to reducing sediment loss and ensuring that valuable nutrients and pesticides, which are crucial to increased yield, are kept in the field; this involves managing soil organic matter content and creating and delivering good soil structure.

This approach combined with the effective placement of physical barriers such as buffer strips, beetle banks, and infield grass strips will help protect water courses while at the same time keeping a focus on production.

The general principles given here should take account of local priorities for soil, water and wildlife conservation.

## KNOW YOUR SOIL

Soil can be classified in five broad groups: sand and light silt, medium, heavy, chalk and limestone, peaty. For more details see the CFE Soils page: [www.cfeonline.org.uk/campaign-themes/soils/](http://www.cfeonline.org.uk/campaign-themes/soils/)



# DRAINAGE

Maintaining your land drainage is an essential tool for maximising the workability of your soils and will help improve both crop development and soil quality by helping to improve aerobic conditions particularly in wet conditions. Where land is drained, extra care must be taken when applying fertilisers, manures and pesticides so that the field drain network does not act as a conduit for pollutants to water caused by these inputs. Check your field drains annually. Clear and repair any blocked or collapsed pipes when found so as to maximise their effectiveness.

In certain locations, wetter fields can provide biodiversity and flood risk benefits therefore it is important to consider these impacts when considering draining your fields. You must not drain wet grassland that is used or designated as an important site for breeding and overwintering birds such as waders; unless advised by Natural England. You must avoid draining those fields that are designed as flood storage areas unless advised by the Environment Agency.



## SOIL COMPACTION

Compaction describes when soil has been compressed by, for example, machinery or livestock into a solid impermeable layer, either at the surface or within the topsoil. This band of compressed soil restricts the movement of air, water and nutrients down through the soil profile.

Root development can be restricted, which affects yield and plant health, and reduces drought resilience and crop nutrient response. The risk of runoff and nutrient loss will increase by up to 50%.

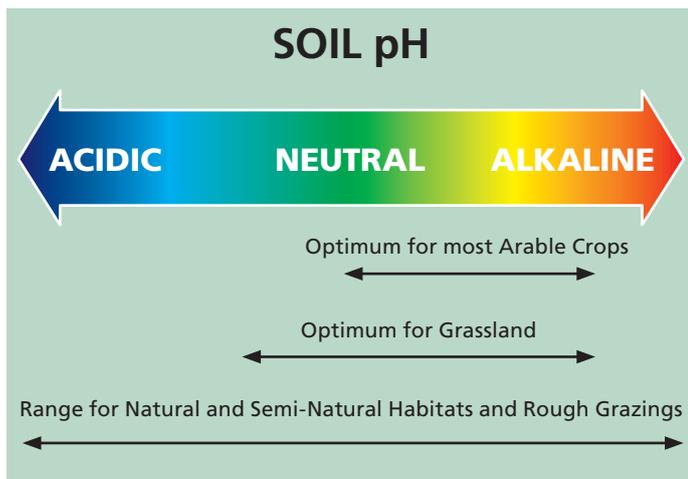
A compacted soil has a higher risk of erosion as it is less porous, meaning it is less able to absorb water and resist surface runoff. Erosion removes soil, nutrients and pesticides from the field.

**On an arable farm, the shape of wheel imprints in tramlines channel rain water. If tramlines become compacted, this can create pathways for water runoff. Runoff carries soil, nutrients and pollutants to the edge of the field and, potentially, to rivers. Research has shown that 80% of runoff in arable fields on sloping land comes from these compacted tramlines. Follow the checklist on the right to avoid compacted tramlines.**

## Compaction Checklist

- Find out where there is compaction and its likely cause:
  - Dig a hole to at least a spade's depth when the soil is not excessively wet or dry.
  - Look how far roots and moisture extend down the profile.
  - Look for any obvious change in soil structure.
  - Where the spade meets resistance is where the compaction (or a different soil type) starts.
- Remove stock in wet conditions to avoid poaching.
- Consider moving troughs and feeders periodically.
- Restrict travel across fields, especially in wetter conditions.
- Plan vehicle routes and consider using GPS systems.
- Spread the weight of machinery by using low ground pressure tyres or tracked vehicles.
- In areas where soil structure is good, and where cropping is appropriate, consider integrating minimum tillage operations into the rotation to help maintain it.
- Fields damaged by compaction will recover through time but care must be taken to identify the extent of the problem and manage it. Refer to [www.cfeonline.org.uk/campaign-themes/soils/](http://www.cfeonline.org.uk/campaign-themes/soils/) for more details.

# SOIL pH AND NUTRIENTS



Soil testing will help you decide how many additional nutrients are required, allowing a more targeted approach to nutrient use, saving time and money, and optimising plant growth. Test for pH and nutrients across the farm every three to five years, or more often if there is a known problem, such as a low nutrient index.

The pH determines the acidity or alkalinity of a soil, and is important to assess in order to check that it is not limiting to nutrient availability and crop growth. pH is measured on a scale of 1 to 14 (but less than 4 and more than 9 is uncommon), with 7 being neutral, below 7 being acidic and above 7 being alkaline.

It is important to manage inputs with great care in areas important for wildlife, and if unsure you should consult an environmental adviser. If appropriate, correcting the pH status of your soil by applying lime to reduce acidity is a simple and effective way to increase crop productivity.

Using the chart above you can build up a picture of your best fields and identify problem areas through 'scoring' your soil health.

Understanding your existing soil nutrient levels helps you to apply only the additional nutrients you need to, saving you time and expense. It also minimises the risk of excess nitrate and phosphate not used by crops being lost to watercourses, which can reduce water quality for wildlife, drinking water and groundwater.

Refer to the CFE Nutrient Management guide for more information.

# SOILS AND PESTICIDES

Well managed soils can help reduce the risk of pesticides reaching water from soil erosion, surface runoff and drain flow.

The ideal conditions for herbicide application are a dry soil profile with a moist soil surface.

CFE works in partnership with The Voluntary Initiative ([www.voluntaryinitiative.org.uk](http://www.voluntaryinitiative.org.uk)). The Voluntary Initiative gives advice on pesticide applications for different types of soils:

## DRY CRACKED SOILS

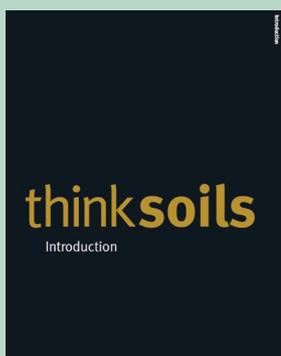
Avoid applications of pesticides to soils that are dry and cracked as water carrying pesticides can move into the drains. Cultivations will help to break up the large cracks and reduce the direct passage of water carrying pesticides into drains. If soils are cracked wait until they have re-hydrated and cracks have sealed before applying pesticides.

## DRY SOILS

Risk of pesticide movement through soils that are dry but not cracked is lower. If soils are very light and heavy rain is expected delay application until the rain has passed.

## SATURATED SOILS

Saturated soils are more likely to have runoff problems, especially along tramlines, resulting in the movement of pesticides off the field. Wait until drains have stopped flowing before applying pesticides. If heavy rains are forecast, application should be delayed.



- Remember well-structured soil with good levels of soil organic matter, free from compaction will usually be free draining and support good crop growth.
- Good soil health is fundamental to profitable farming and a cleaner environment.
- Good soil management will help to increase resistance to pests and diseases and will help improve the utilisation of fertilisers.
- Resilience at times of either drought or flood will be enhanced due to a greater rooting capacity where you have good soil structure.

## Working in partnership

Encouraging farmers and land managers to protect and enhance the environmental value of farmland alongside productive agriculture. Protecting wildlife, protecting natural resources, enhancing biodiversity

Campaign for the Farmed Environment partners – Agriculture & Horticulture Development Board, Agricultural Industries Confederation, Association of Independent Crop Consultants, Central Association of Agricultural Valuers, Country Land and Business Association, Environment Agency, Game and Wildlife Conservation Trust, Linking Environment And Farming, Natural England, National Farmers Union, RSPB, The Wildlife Trusts, Water UK – working in partnership with Defra.

Web: [www.cfeonline.org.uk](http://www.cfeonline.org.uk)

Twitter: @cfeonline



Promoting responsible pesticide use

The Voluntary Initiative (VI) promotes responsible pesticide use by encouraging operator training through NRoSO, sprayer testing via NSTS and careful management of pesticides using an integrated approach supported by BASIS registered advice.

[www.voluntaryinitiative.org.uk](http://www.voluntaryinitiative.org.uk)



Tried & Tested, (created by the industry for the industry), provides tools and resources designed to assist farmers and their advisers in improving farm nutrient management in an environmentally friendly, cost effective and practical way.

[www.nutrientmanagement.org](http://www.nutrientmanagement.org)



The industry-wide Greenhouse Gas Action Plan (GHGAP) for agriculture focuses on improving resource use efficiency in order to enhance business performance whilst reducing GHG emissions from farming.

[www.cfeonline.org.uk/home/about-us/greenhouse-gas-action-plan/](http://www.cfeonline.org.uk/home/about-us/greenhouse-gas-action-plan/)

## CAMPAIGN FOR THE FARMED ENVIRONMENT®



SOIL MANAGEMENT IS SUBJECT TO STANDARDS OF GOOD AGRICULTURAL AND ENVIRONMENTAL CONDITION (GAECs), AND OTHER REGULATIONS. SEARCH FOR CROSS COMPLIANCE ON [WWW.GOV.UK](http://WWW.GOV.UK) FOR FURTHER DETAILS

### **This guide outlines the best practice that should be used for managing soils.**

Many of the measures in this guide will provide significant benefits for farm wildlife, as well as protecting soil and water. Further advice is available in other CFE guides. These are available on the CFE website or from your local CFE coordinator and include:

- Conservation management advice for your arable business
- Conservation management advice for your livestock business
- Nutrient management for your farm business
- Pollinator management for your farm business

For sources of more detailed advice on soil management, please refer to [www.cfeonline.org.uk/campaign-themes/soils/](http://www.cfeonline.org.uk/campaign-themes/soils/)

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