

Soil texture

Purpose:

To introduce the importance of understanding soil texture and structure, and how they impact soil health and the holding capacity or loss of nutrients on your farm.

Why:

To optimise crop growth and reduce the risk of pollution and environmental damage.

Who:

This Toolbox Talk is to highlight the importance of soil texture and structure to those with little or no knowledge of the subject, or those looking to refresh their knowledge.

TIAH Capability Framework area:

This aligns with the knowledge and skills in the Environment area.

<https://tiah.org/tiah-capability-framework>

Talk leader instructions:

- Prepare to do the talk in a suitable/quiet location with no distractions
- Consider using some of the resources as part of the talk, e.g. showing a video
- Engage with participants, ask questions and give everyday examples
- Conclude with a brief review
- Get everyone to sign the form. Make sure to write the name of the farm and the date. Keep a copy for your records (e.g., staff training, land/ environmental management)
- Ensure all participants have access to a copy of this document to refer to once the session has finished. This could be electronic and emailed or printed

Notes:

Background

Understanding soils

Understanding the texture and structure of soils on our farm is very important as it gives us information on factors such as how quickly water passes through the soil (its permeability) and its water-holding capacity. It impacts what type of crops we can grow, and which soils may be more prone to leaching or runoff resulting in loss of nutrients and damage to the environment.



By the end of this Toolbox Talk, you'll understand what soil is made up of, the impacts of poor soil structure.

Main learning points 3 minutes

Soil components

Soil consists of mineral particles (small particles of rock), organic matter and pore spaces that can be filled with air or water. The ideal percentage for each component is:

- Mineral particles – 45%
- Organic matter – 5%
- Air – 25%
- Water 25%

The above figures refer to volume rather than weight.

The amount of each of these components can change for example, due to heavy rainfall or increased water in soil.

Pore spaces

Water and air within the pore spaces are needed by the plant and its roots. Too much water will make the soil waterlogged and unable to supply oxygen to the roots and the organisms that release available nitrogen from organic matter.

It also promotes the growth of bacteria that need an oxygen-free environment, and that cause loss of available nitrogen by de-nitrification (conversion of nitrate to nitrogen gases). This is why crops on waterlogged soil look yellow and stunted.

Q: What percentage of pore spaces do you think should ideally be filled with water/air – is it:

- a) 10%
- b) 30%
- c) 50%

The answer is (a) Around 50% is ideal.

Organic matter

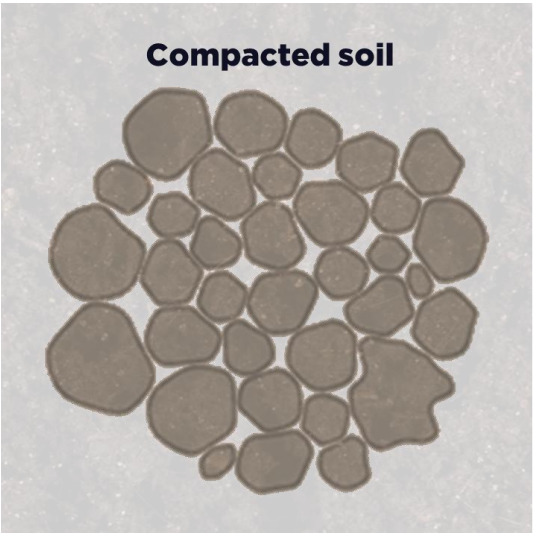
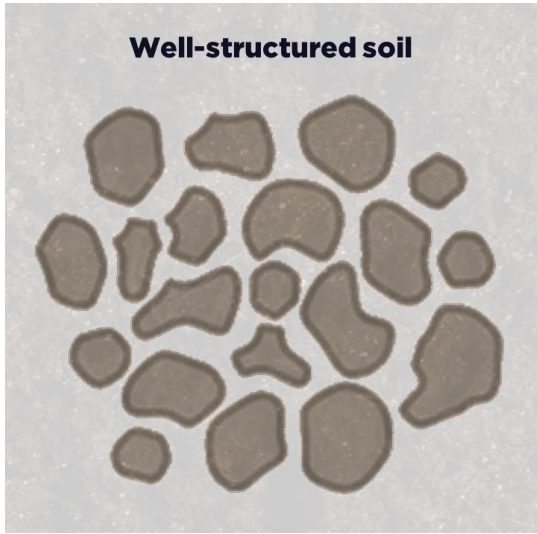
Organic matter includes living organisms, roots, plant debris and decomposed material, which was once living but was broken down and changed to humus by earthworms, small animals, fungi and bacteria.

Notes:

Living organisms break down newly added organic materials to release nutrients that plants can take up. Organic matter is the main source of nitrogen for crops apart from applied fertilisers and manures. A little nitrogen is deposited from the air, and some is fixed from the air by legumes.

Soil structure

This describes the way in which mineral particles and organic matter are arranged into crumbs (aggregates), and how they come together. A well-structured soil has enough pore space to hold water and air. It allows good contact between soil and roots. Poor soil structure with little pore space can show issues in soil such as compaction, pans and slumping.



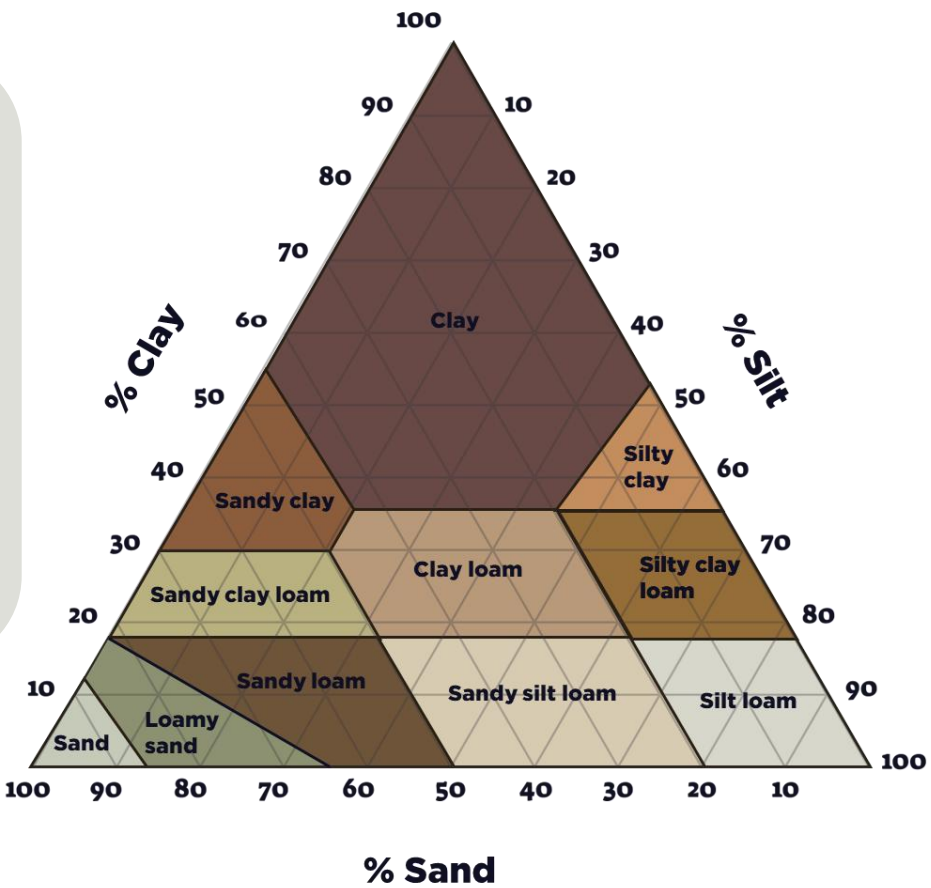
Optional: Watch the AHDB video on identifying good and bad soil structure: <https://www.youtube.com/watch?v=NFO0VivPIsk&t=1s>

Soil texture

Soil texture indicates the relative content of particles of various sizes, such as sand, silt and clay in the soil as shown in the **soil texture triangle** below.

Soils high in sand will be light and free-draining. This makes them susceptible to nutrient leaching.

Those high in clay will be heavy and can be difficult to work but they are less likely to lose nutrients by leaching.



The surfaces of clay particles and organic matter carry negative charges, so hold on to positively charge nutrients (potassium, magnesium, calcium and ammonium). Positively charged nutrients are cations and the capacity of a soil for holding them is measured as the '**cation exchange capacity**' (CEC) which can be shown on laboratory soil analysis reports.



Note: The way we manage soils cannot change the texture, but we can improve or damage the structure or alter the organic matter content and pH.

In part two, Toolbox Talks Challenge 26 – Assessing soil structure, you will discover how to correctly identify soil types by using the soil texture triangle in a practical exercise.

Notes:

Suggestions/ Ideas:

Discussion points 8 minutes

Choose two of the following questions to discuss with your team and complete the remaining two at another time.

Q: Which of the following processes do you think moves nitrogen from soil to water?

Choose only one answer

- a) Leaching
- b) Soil erosion
- c) With soil blown by wind
- d) As a gas

The correct answer is (a). Leaching. Leaching harms the environment by polluting water, causing harmful algal blooms, and wasting nutrients which increases the amount of fertiliser needed.

It's important to understand your soil texture as it has some major implications on soil management.

Q: What do you think soil texture has an influence on?

Responses might include:

- Water holding capacity
- Water infiltration
- Nutrient retention
- Risk of erosion

Q: What's the ideal percentage for each of the four soil components?

Responses might include:

- Mineral particles – 45%
- Organic matter – 5%
- Air – 25%
- Water 25%

Q: What do you think could be the consequences of poor soil structure?

Responses might include:

- Reduced soil aeration
- Restricted root development resulting in poor crop yield
- Waterlogged soil (poor drainage) during wetter periods
- Drought conditions during dry periods
- Less uniformity in crops
- Fewer days that land can be worked on by machinery
- Higher weed or disease pressure
- Higher risk from run-off or erosion resulting in soil loss, declining productivity and off-site impacts involving neighbours and local authorities



Want to develop your knowledge further?

The **FACTS training scheme** covers best practice in fertiliser use and plant nutrient management. Find out more here:

<https://basis-reg.co.uk/scheme-facts>

i

Did you know...

If you're a TIAH member, you have **FULL ACCESS** to the Learning Hub where you can also download further Toolbox Talks <https://tiah.org/toolbox-talks>, including others in this series with practical team tasks:

- **Nutrient management awareness**
- **Soil sampling and pH**
- **Taking a soil sample** (practical exercise)
- **Assessing soil texture** (practical exercise)

You can also complete the full learning path on nutrient management to **claim both CPD and BASIS points.**

Summary/Wrap-up

 1 minute

It’s important to know the texture and structure of soils on your farm so that you understand how to manage soils more effectively and know which crops can grow in specific soil types. Soil texture cannot be changed but soil structure can be improved through good soil management. Poorly structured soils reduce water infiltration and can lead to erosion, surface ponding and crusting. Compaction causes a reduction in air spaces between soil particles.

Next steps... Don’t forget you can also complete the second part of this series in a practical session – **Toolbox Talk 26b: Assessing soil texture**

Resources:

Catchment Sensitive Farming: Improving Soil Structure with Strip Tilling and Cover Crops (YouTube video): <https://www.youtube.com/watch?v=NAPluJvgysc>

Perdue Extension: Soil Basics: Structure: <https://www.youtube.com/watch?v=nkw07WdRXoc>

Perdue Extension: Soil Basics: Texture: <https://www.youtube.com/watch?v=8nU26sXVNS4>

Scotland’s Farm Advisory Service: A guide to the Visual Evaluation of Soil Structure: <https://www.youtube.com/watch?v=bWCDBT2sEVs>

FAS: Derelict to Productive: Soil Texture Structure: <https://www.youtube.com/watch?v=jkrvufCOiPg>

Dr. Elaine’s Soil Food Web School: Building Structure in Soil: <https://www.youtube.com/watch?v=BmZg9ybe62g>

Central West Local Land Services (AUS): How to test your soil texture (sand, silt, clay composition): <https://www.youtube.com/watch?v=fufeaLBLGlk>

CFE: Soil management for your farm business: <https://www.cfeonline.org.uk/environmental-management/soil-management-for-your-farm-business>

AHDB: How to identify good and bad soil structure: <https://www.youtube.com/watch?v=NFO0VivPISk&t=1s>

AHDB: How to assess soil structure: <https://ahdb.org.uk/knowledge-library/how-to-assess-soil-structure>

Toolbox Talks participants

Toolbox Talks: **Soil texture**

Name of farmDate

Talk leader name.....

Name	Signature	Date