

Section 5: Soils

Soil is one of the farmer's most important raw materials. On an arable farm it is essential for producing crops. On livestock farms it supports grass for grazing.

What is soil?

Once you step out onto a piece of ground, you step out onto something that is alive. Soil is not just a piece of dirt. Soil is made up of living and nonliving material spread as a very thin layer over the entire Earth's surface.

Soil provides nutrients, water, and air and helps to anchor the plant. It is a combination of materials. One part of soil is rock that has been broken down over time by wind, water, and chemical processes. Another material is called organic matter. It is made up of decaying plant and animal matter. Water and air are the other ingredients in soil. In a good soil, about 45 percent will be rock particles, 5 percent organic matter like leaves, 25 percent water, and 25 percent air.

Soil is...

45% rock particles

25% water

25% air

5% leaves



Unfortunately, soil can be badly damaged if not looked after properly. For example, each year about 75 million tonnes of fertile soil are washed away or damaged around the world. This is called erosion.

Erosion by wind and rain can cause:

- Loss of topsoil
- Loss of seed or fertiliser
- Abrasion damage
- Blocked roads
- Ditches to become filled
- Streams and rivers to become polluted.

Farmers actively reduce the problems of erosion by:

- Using shelter belts – reducing wind speed at the soil surface by using plantings of trees and hedgerows
- Leaving cultivations rougher or more cloddy
- Using cultivation techniques – Furrow pressing (leaving steep ridges to stop soil being lost) or Clod forming (early ploughing and rolling to form a protective crust that forms clods when subsequently broken)
- Using minimal cultivations – direct drilling new seed into stubble without ploughing the field at all
- Planting nurse crops – rows of barley planted to protect the row crops
- Employing other techniques like planting straw, adding clay (marl) and using mulches (e.g. manure or sugar beet factory lime)
- Leaving permanent strips of grass/vegetation
- Adopting contour farming – working across slopes
- Avoiding overgrazing in winter which can compact soil making water 'run off' more likely.

Soil types

The type of soil on a farm determines what can be grown or kept there. The type of soil varies depending on the size of the (bits) particles in the soil. If the particles are very small the soil is clay, if particles are big, the soil is sandy. A half and half mix of clay and sand is called loamy soil.

People describe soil types in all kinds of ways such as heavy, light, sandy, clay, loam, and poor or good. Soil scientists describe soil types by how much sand, silt and clay are present.

Sand is the largest particle in the soil. When you rub it, it feels rough. This is because it has sharp edges. Sand doesn't hold many nutrients.

Silt is a soil particle whose size is between sand and clay. Silt feels smooth and powdery. When wet it feels smooth but not sticky.

Clay is the smallest of particles. Clay is smooth when dry and sticky when wet. Soils high in clay content are called heavy soils. Clay also can hold a lot of nutrients, but doesn't let air and water through it well.

Particle size has a lot to do with how well a soil holds water and nutrients. To better understand how big these three soil particles are, think of them like this. If a particle of sand were the size of a football, then silt would be the size of a tennis ball, and clay would be the size of a golf ball.



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Soil activities

1. Describe soils using some technical vocabulary and complete a simple table. This activity will get children to look at the soils as more than just uniform dirt. Children will discover that different soils have different characteristics and can go on to relate this to how easy or hard it is for the farmer to use. (Sheet 10)
2. Another multisensory activity. Children mould the soil, attempting to work it into various shapes which help them determine what sort of soil they have. This can then be related to the size of the particles making up the soil. (Sheet 11)
3. Use a soil settling test to identify the particles that make up soil. Decide if the soil has much organic matter in it (humus). Can you spot the sand, silt and clay particles and see how some are finer than others? (Sheet 12)
4. Use this unusual graph to show another way of presenting information using visual forms. This will also help children to understand a practical use of percentages and give them practice understanding information in a graphical form. (Sheet 13)
5. Children can investigate and categorise the elements that make up soil. How good are the children at observing closely and organising data into suitable categories? (Sheet 14)
6. This activity gets children to create a soil map or profile of soil and introduces and develops quadrant work. Their observation skills will be developed and their ability to work methodically. A digital photo of the map displayed alongside their drawn map makes a useful comparison. (Sheet 15)
7. This activity gives opportunity to carry out a fair test and record findings. This experiment could be written up back at school and/or developed by instigating children's own similar investigations, e.g. how does compaction affect plant growth? (Sheet 16)