



## Soil

### Curriculum Links:

- **Science** Living things  
Environmental awareness and care
- **Geography** Human environments  
Natural environments
- **SPHE** Myself and the wider world

### Lesson objectives:

To identify the different layers of soil and their function. To recognise the various steps that the farmer takes to further improve the quality of their soil.

### Teacher guidelines

It is suggested that teachers ensure that students are familiar with the vocabulary and concepts introduced in the previous modules before starting this lesson.

### Keywords and concepts introduced in previous modules:

plough aerate bristles moist burrow

Of all insects that live in the soil, the earthworm is the most useful to the farmer. This is because they help to plough the soil, turning it so that air and water are evenly distributed. The structure of the earthworm's body helps them to make these tunnels in the soil.

### Keywords for this lesson:

topsoil humus bacteria sub-soil iron copper magnesium bedrock acid

Soils are the medium that farmers work with every day in the production of meat, milk, grain and fibre. We tend to look above ground at either growing crops or animals grazing. However, it is very important to take a spade out and examine the soil, because without soils, we would have no farms/food.

### Layers of soil

When we look at the soil in the field, we usually just see one large brown layer. However, there are actually three different layers in the soil and each layer helps keep the soil healthy.

#### Topsoil

The layer that we usually see is called the **topsoil**, which is dark and loose. A fertile topsoil is full of life, with many creatures such as earthworms, millipedes, centipedes, woodlice and beetles living within. These creatures are decomposers. They feed on dead plants and animals, turning them into **humus**. Humus makes soil dark, moist and crumbly. **Bacteria** breaks the humus down to release the nutrients, which keeps the soil healthy. This layer is very important for the overall productivity of the soil. Plants have their roots in the topsoil and larger animals of the hedgerow such as rabbits, hedgehogs, badgers and foxes build their homes there.

#### Sub-soil

Just underneath the top soil is the **sub-soil**, which is made up of both big and small rock particles. Many minerals such as **iron**, **copper** and **magnesium** are present in this layer. When rainwater falls, it drains through the top soil into the sub soil and dissolves these minerals. The minerals are then absorbed by the water and sucked up by the roots of the plants. These minerals from the sub-soil are important for our own healthy diet.

#### Bedrock

Beneath the sub-soil is the **bedrock**, which is made up of large rocks. Over time, the bedrock slowly breaks down into finer particles that make up soil.



## What does the farmer do to keep the soil healthy?

The health of our soil is a key component for the efficient production of food in an environmental and sustainable manner. However, Irish soils can vary a great deal from one part of the country to the next. Some soils are well drained whereas others can be waterlogged. Some are shallow while others are deep, and others can be much more fertile than others.

As such, the farmer always works hard to maintain and improve the soil. During the winter, animals are housed so they do not overgraze the land. To help maintain soil quality, the farmer can also (1) plant trees, (2) spread farmyard manure and animal slurry and (3) regularly test the pH of the soil.

### (1) Plant trees

Farmers grow plants and trees because they are good for the soil and help against soil erosion, land degradation and aid in river management. Without the roots of trees, the soil becomes dry and loose. The top layer can then be wiped away by strong winds or floods, making it useless. On the other hand, if a farmer's soil is too wet, the trees and plants can soak up the excess water, which helps prevent flooding. Silvopastoral systems and Agroforestry are two ways in which farmers can plant trees as a viable land use option. Silvopastoral is the process whereby protected trees are grown in grazed pastures, while agroforestry combines forestry and productive grassland on the same tract of land for renewable energy.

### (2) Add manure/slurry

To improve the quality of the soil, the farmer adds manure and some fertilisers, which are full of nutrients. The farmer can buy artificial fertilisers, but even better, they can use manure, which is a natural animal waste. These fertilisers are usually spread on the fields during good weather to improve the quality of the soil. The farmer must be very careful to keep it well away from any water ways as this can affect the natural aquatic wildlife. Animal manure helps to grow healthy crops and grass. See Module 4 Water for more information.



### (3) Test the pH

Soil shouldn't be either too basic or acidic. The farmer often measures the amount of **acid** in the soil by testing its pH. The ideal pH is between pH6 and pH7 (neutral). If the soil is too acidic, the farmer adds lime because it helps to keep the soil fertile. Acid soil can make it difficult for plants to grow.

### Suggested activities

- Complete the activity sheet on page 56
- In a transparent container, get the class to build their own soil profile. The bedrock at the bottom should have large rocks and stones, the sub-soil should have smaller particles, whilst the top soil should contain very loose soil. Discuss the different sections in class
- Plant two plants in class. One should be in top soil and the other in sub-soil. Over the following weeks, compare the progress of both
- Take a trip to your school garden or nearby field and get the class to analyse the soil. Is it too wet or dry? Is the soil nearer the trees in better condition than the soil in the middle of the field?
- Take a sample of the soil and measure its pH value in class using litmus paper. If the soil tested is too acidic, divide it into two pots with plants. Add lime to one pot and use the other as a control. Over the following weeks, compare the progress of both. Why are some soils more acidic than others? How do different plants affect the acidity of the soil? How do people and livestock change the pH of the soil?
- Students should write a drama on what life would be like without soil. Remind them that the animals would have no grass to eat, we would have no vegetables and all the insects would have nowhere to live etc.
- Discuss farming in warm climates. Students should note that without water, the soil gets very dry and dusty. This makes it hard for the farmer to grow crops. How do farmers in different climates adapt?

### Learning outcomes:

At the end of this lesson, students should know the different layers of the soil and how to test the pH of soil.

### Additional resources:

- [www.agriaware.ie](http://www.agriaware.ie)



## Soil

Name: \_\_\_\_\_

Date: \_\_\_\_\_

### 1 Fill in the blanks using these words

Sub-soil, magnesium, quality, manure, grow, top soil, copper

The layer of soil we see on the ground is called \_\_\_\_\_.

Minerals like \_\_\_\_\_ and \_\_\_\_\_ are present in the \_\_\_\_\_.

To improve the \_\_\_\_\_ of soil the farmer adds \_\_\_\_\_.

Acid in the soil can make it difficult for plants to \_\_\_\_\_.



### 2 Unscramble the words

meil \_\_\_\_\_

Darsbboe \_\_\_\_\_

ylera \_\_\_\_\_

eetlsb \_\_\_\_\_

lois \_\_\_\_\_

Hp \_\_\_\_\_

osole \_\_\_\_\_

\* To be used with teacher guidelines, page 32