#### **Vision Empower & XRCVC**

**Teacher Instruction KIT** 

# Soil

Syllabus: NCERT Subject: Science Grade: 7 Textbook Name: NCERT- Science Textbook for class VII Chapter Number & Name: 9. Soil

# **1. OVERVIEW**

#### **1.1 OBJECTIVES AND PREREQUISITES**

#### Objective

- To understand soil profile and layers in correct order.
- To distinguish and describe various types of soil like sandy soil, clay and loam soil.
- To understand the properties of soil.

#### **Prerequisite Concept**

- Soil, Grade 5, chapter 5: Natural Resources
- How nutrients are replenished in the soil, Grade 7, chapter: Nutrition in Plants

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Kindly Note: Activities marked with \* are mandatory

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# 2. LEARN

#### 2.1 KEY POINTS

Soil is composed of distinct layers. **Layers of soil**: (from top to bottom) humus- waterclay-sand-gravel.

The rotting dead matter in the soil is called humus.

The soil is formed by the breaking down of rocks by the action of wind, water and climate. This process is called weathering. The nature of any soil depends upon the rocks from which it has been formed and the type of vegetation that grows in it. A vertical section through different layers of the soil is called the soil profile. Each layer differs in feel (texture), colour, depth and chemical composition. These layers are referred to as **horizons**.

The uppermost horizon is called the topsoil or the A-horizon, generally dark in colour as it is rich in humus and minerals. It makes the soil fertile and provides nutrients to growing plants. It is generally soft, porous and can retain more water. This provides shelter for many living organisms such as worms, rodents, moles and beetles. The roots of small plants are embedded entirely in the topsoil.

The next layer is the B-horizon or middle layer, with a lesser amount of humus but more of minerals.

The third layer (from the top) is C-horizon, which is made up of small lumps of rocks with cracks and crevices. Below this layer is the bedrock, which is hard and difficult to dig with a spade.

The soil is classified on the basis of the proportion of particles of various sizes. If soil contains a greater proportion of big particles it is called **sandy soil**. If the proportion of fine particles is relatively higher, then it is called **clayey soil**. If the amount of large and fine particles is about the same, then the soil is called **loamy**. Thus, the soil can be classified as sandy, clayey and loamy.

The size of the particles in a soil has an influence on its properties. Sand particles are quite large. They cannot fit close together, so there are large spaces between them. These spaces are filled with air. We say that the sand is well aerated. Water can drain quickly through the spaces between the sand particles. So, sandy soils tend to be light, well aerated and rather dry. Clay particles, being much smaller, pack tightly together, leaving little space for air. Unlike sandy soil, water can be held in the tiny gaps between the particles of clay, so clayey soils have less air. But they are heavy as they hold more water than the sandy soils.

The best topsoil for growing plants is loam. **Loamy soil** is a mixture of sand, clay and another type of soil particle known as silt. Silt occurs as a deposit in riverbeds. The size of the silt particles is between those of sand and clay. The loamy soil also has humus in it. It has the right water holding capacity for the growth of plants.

Soil is affected by wind, rainfall, temperature, light and humidity. These are some important climatic factors which affect the soil profile and bring changes in the soil structure.

**Clayey and loamy soils** are both suitable for growing cereals like wheat, and gram. Such soils are good at retaining water. For paddy, soils rich in clay and organic matter and having a good capacity to retain water are ideal. For lentils (masoor) and other pulses, loamy soils, which drain water easily, are required. For cotton, sandy loam or loam, which drain water easily and can hold plenty of air, are more suitable. Crops such as wheat are grown in the fine clayey soils, because they are rich in humus and are very fertile.

2.2 LEARN MORE None

# **3. ENGAGE**

3.1 INTEREST GENERATION ACTIVITY

Different types of soil Activity1: Different types of soil *Materials Required*: Different sample of types of soil (soil from garden, soil from the roadside, soil from a construction site) *Prerequisites:* None

#### Activity Flow

• Give the student a different sample of the types of soil, one at a time, and ask her/ him to describe the sample in terms of texture, smell, consistency, etc.

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• Take the student to a farm, field or garden. With the permission of the relevant authorities, dig up a small patch in the garden along with the students. While doing so, bring to the student's attention all the plants, roots, insects, and worms that you encounter along the way. Additionally, ask the student to describe the texture and after the activity, ask the student if she/ he felt a variety of textures of soil or just one.

# **3.2 CONCEPT INTRODUCTION ACTIVITIES**

#### **Soil Profile**

#### Activity 2: Layers of soil

Materials required: soil, broad glass, water, tactile diagram showing layers of soil Prerequisites: None

#### Activity Flow

- Take some soil and break the clumps with your hand to powder it.
- Take a glass and fill it three quarters with water and a handful of soil to it.
- Stir it well to dissolve the sand and leave it undisturbed for some time.
- Observe the glass after some time by asking the students to dip their finger and feel the surface of the water and then slowly move their finger downwards.
- The student will feel sediments of rotting leaves and other matter on top and as they slowly move downwards, they feel sand and particles of rocks at the bottom. These layers depict the vertical section of a soil profile. Each layer differs in texture, colour, depth and chemical composition. These layers are referred to as horizons.
- Use the tactile diagram showing layers of soil and explain it to the students.
- The student should be introduced to the concept of weathering for soil formation after performing this activity

# Activity 3: Soil horizons

*Materials required:* 4 small rectangular plastic or cardboard box, samples of soil (top soil (dark fertile soil), middle soil (rough soil), third layer soil (with lumps and rocks), small pieces of rock

#### Prerequisites: None

# Activity Flow

- For soil profile, describe each layer to the student, in order and make sure that the student has the correct corresponding sample.
- To explain the ordering of the layers, give the student a small rectangular plastic or cardboard box, and make the student put a layer of one type of soil in one box and label the box. Once the students has filled in all the boxes, make them line up the samples in order (by placing the "lowest layer" close to the student and the next above it and in that order, till the student reaches the "top layer" and that is furthest away from them) and then move on to the theory of the soil profile (horizons).
- Use the tactile diagrams to show the soil horizons.

# Soil Types

#### Activity 4: Soil types

*Materials required:* sample of clayey soil, sandy soil and loamy soil *Prerequisites:* None

# Activity Flow

- Take a fistful of soil from each of the samples and remove any impurities from them.
- Add water to the samples drop by drop and ensure that you add just enough water to knead the soil.
- Students can do this on the floor or they can use a rectangular box for different samples.
- Ask the student to make balls of the soil samples.
- Ask them to roll these balls into cylinders and ask the student to make different shapes using the samples.
- Inference: The extent to which a soil can be shaped indicates its type. Different types of soils are used for different purposes and have different properties.
- Explain to them the different properties of each type of soil.

# **Properties of Soil**

# Activity 5: Percolation rate of water in soil

Materials required: rectangular box or tray, water Prerequisites: None

#### Activity Flow

- Demonstrate the property of percolation of water, by taking a rectangular box or tray and spreading a thick layer of soil on it.
- Pour a lot of water at just one end of the box (say, for example the left end), so that the water doesn't all get absorbed at once. Let the student feel the water on top of the soil, and then guide the student's hand over the other drier part of the soil and make them observe different parts every few seconds to observe the process.
- If you pour the water on the left end, make the student feel the layer of water on the left, make her/ him wipe their hands dry and proceed to feeling the soil from right to left, go all the way to the left, wipe hands, and repeat the process till the soil is uniformly wet.
- You can also try this on cemented ground and on sand, where students would observe that water on the cemented floor does not get absorbed easily whereas the water in the sand gets absorbed easily.
- Explain to the students, how the rate of percolation is calculated by using the formula.

Percolation rate (mL/min) = amount of water (mL)/ percolation time (min)

# Moisture in soil

# Activity 6: Moisture in soil

*Materials required:* boiling tube/container, candle/burner, soil sample *Prerequisites:* None

Activity Flow

- Ask the student to take some soil and place it in a container.
- Now heat the container and wait for some water droplets to arise and let the container cool down.
- Ask the student to place his hand on the edges of the container and observe.
- Inference: We observe the presence of water droplets in the container on heating the soil signifying the presence of moisture.

# Absorption of water by soil

# Activity 7: Absorption of water by soil

*Materials required:* funnel, filter paper, sample of soil (sandy soil, clayey soil, loamy soil), dropper, tactile measuring cylinder *Prerequisites: None* 

Activity Flow

- Take a filter paper, fold it and place it into the funnel.
- Weigh 50g of sandy soil and pour into the funnel.
- Measure some water and pour water drop by drop into the funnel on the soil.
- Do not let the water fall on one spot, pour water all over the soil till it starts dripping.
- Place the students hand under the funnel for him/her to feel the water dripping out of the funnel.
- Repeat the same activity with loamy and clayey soil.
- Observe the amount of water dripping for each of the soil samples and the amount of water left in the container after pouring.

NOTE: The facilitator should compare the difference in the amount of water present before and after pouring and explain that to the student.

Inference: You would observe that the volume of water reduces on pouring it from the soil as water is absorbed by the soil. Different soils have different percolation rates.

Percolation rates of different soils are as follows:

Sandy soil – highest

Loamy soil – moderate

Clayey soil – lowest

• Explain to them how to calculate the percentage of water absorbed.

Percentage of water absorbed =  $\frac{U-V}{Weight of soil} \times 100$ 

Where U = Initial volume of water in the measuring cylinder

And V = Final volume of water in the measuring cylinder

# Soil and crops

# Activity 8: Soil and crops

Materials Required: samples of soil and crops Prerequisites: None

# Activity Flow

• While discussing soil and crop, if possible have some examples of the types of soil as well as the crops. If you do not have these samples, then remind the student of the types of soil and the various crops before you start talking about the crops and soil.

# 3.3 LET'S DISCUSS: RELATE TO DAILY LIFE\*

- Take the students to a pottery studio to show them the pottery clay, and objects before they are baked to completion.
- Take the student to a beach to observe the sand.

- Take the student to a vermiculture pit and/ or a plant nursery.
- Watering farms, lawns, gardens and flower beds.

# 4. EXERCISES & REINFORCEMENT

#### 4.1 EXERCISE AND REINFORCEMENT

#### Reinforcement

Activity 9: Story – making pots Materials Required: None Prerequisites: None

Activity Flow:

• Ask the students to read aloud the story:

John, Rashida and Radha went to Leeladhar Dada and Sontosh Malviya of Sohagpur in Madhya Pradesh. Leeladhar Dada was preparing the soil to make items like surahi, matki, kalla (earthen frying pan) etc. The following is the conversation they all had with Leeladhar Dada:Where was the soil obtained from?

Dada–We brought the black soil from a piece of barren land.

- How is the soil prepared?

Dada–Dry soil will be placed in a large tank and would be cleaned of pebbles etc. After removing these things the soil will be soaked for around 8 hours. This soil would be kneaded after mixing horse dung. The kneaded soil would be placed on the wheel and given appropriate shape. The final shape is given with hands. The items are coloured after three days of drying. All the items are baked at high temperature after drying in the air. – Why is the horse dung mixed in soil?

Dada–Burnt horse dung helps open up the pores in the soil. So that water could percolate out of the matkas and surahis, evaporate and cools the water inside. You know Sohagpuri surahis and matkas are famous in far off places like Jabalpur, Nagpur, Prayagaraj (erstwhile Allahabad) etc.

# 4.2 IMPORTANT GUIDELINES\*

#### **Exercise Reading**

It is very important that the children practice their learnings as well as their reading. Hence have the children read out the newly learned concepts from their textbooks or other available resources.

#### Perform Textbook Activity

It is good practice to have the children perform the textbook activities. Your textbook activities might not be accessible hence go through this resource to learn how to make textbook content accessible

#### **Provide Homework**

To evaluate their understanding and to help the student revise and implement the new learnt concept ensure to provide them with homework. Students should perform one or two of the questions mentioned above or from the textbook exercises with the teacher in Class and the remaining may be given for homework. Also, ensure that the student knows their special skills linked to independently using their accessible books as it will be critical to doing homework independently

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