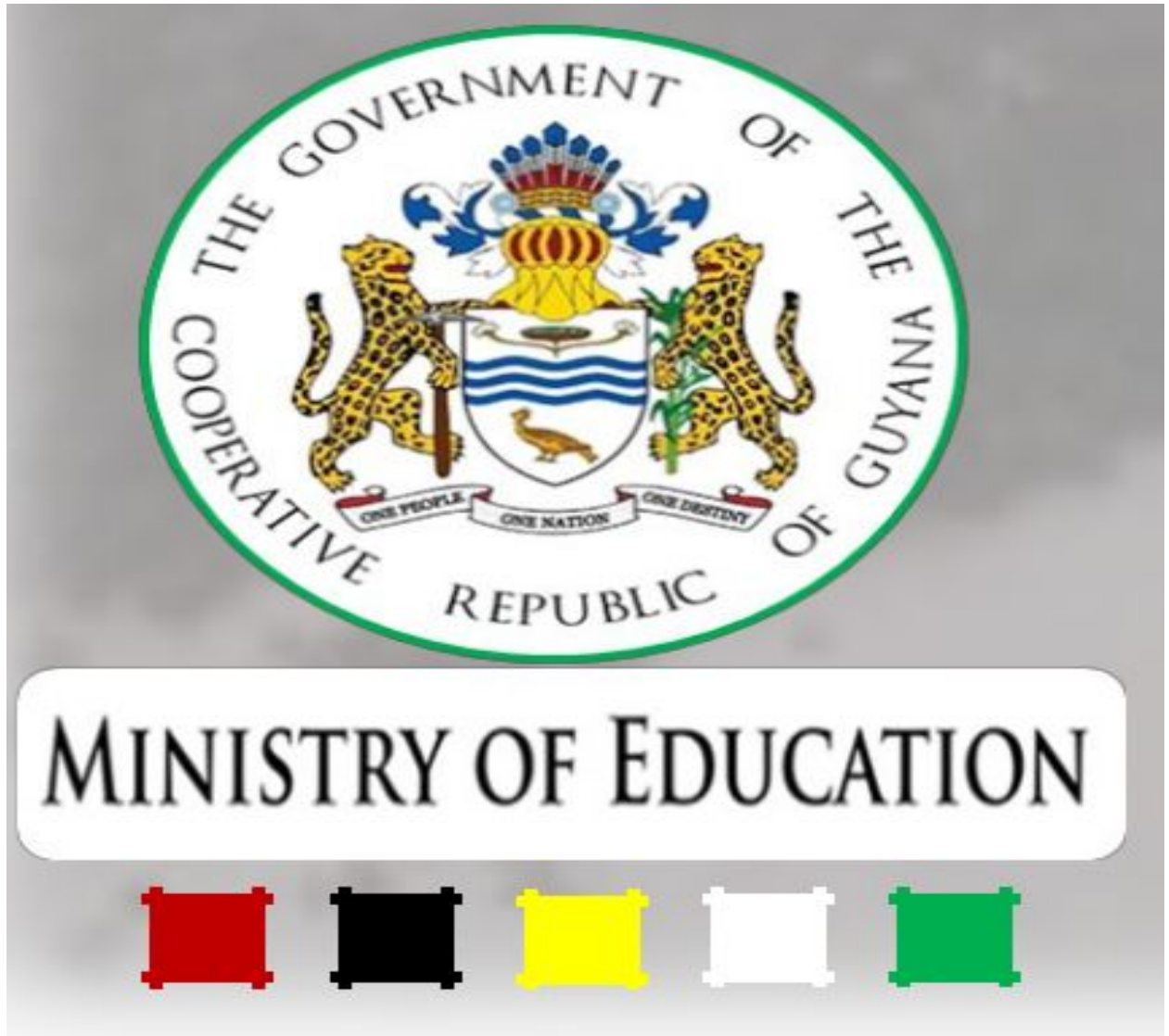
Secondary Engagement Programme

Christmas Term

Grade 10

Activity Sheets

Agricultural Science


THE GOVERNMENT OF THE COOPERATIVE REPUBLIC OF GUYANA
ONE PEOPLE
ONE NATION
ONE DESTINY
MINISTRY OF EDUCATION

MINISTRY OF EDUCATION
SECONDARY ENGAGEMENT PROGRAMME
OCTOBER 2020
WEEK 7

LESSON # 2

GRADE :10

SUBJECT : AGRICULTURAL SCIENCE
TOPIC : SOIL AND SOIL FERTILITY
SUB TOPIC : SOIL PROFILE AND PROPERTIES OF SOIL

Objectives

To describe the major components of the soil and the soil profile.

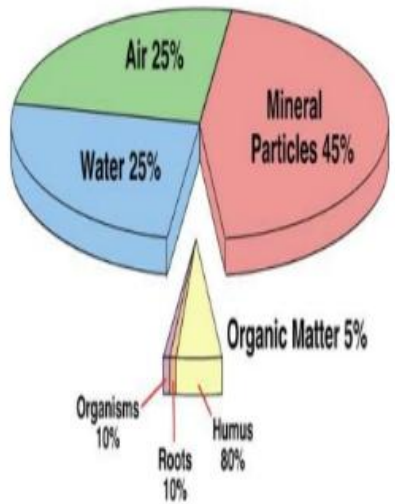
To describe the properties of the different types of soil

Major components of soil

- Soils have four major components:

(1) mineral matter,
(2) organic matter,
(3) air, and
(4) water.

- Mineral matter contains three fractions, sand, silt, and clay.
- Organic matter contains appreciable quantities of nitrogen, phosphorus and sulfur .
- Air and water occupy the pore spaces in soils.



1. Mineral

The largest component of soil is the mineral portion.

It makes up approximately 45% to 49% of the volume.

Soil minerals are derived from two principal mineral types –primary and secondary.

Primary minerals, such as those found in sand and silt, are those soil materials that are similar to the parent material from which they formed. They are often round or irregular in shape.

Secondary minerals, on the other hand, result from the weathering of the primary minerals, which release important ions and form more stable mineral structures such as silicate clay.

2. Water

Can make up approximately 2% to 50% of the soil volume.

Water is important for transporting nutrients to growing plants and soil organisms and for facilitating both biological and chemical composition.

The capacity of a soil to hold water is largely dependent on soil texture.

The more small particles in soils, the more water the soil can retain.

Thus, clay soils have the greatest water-holding capacity and sands the least.

Additionally, organic matter also influences the water-holding capacity of soils because of their high affinity for water.

The higher the percentage of organic material in soil, the higher is the water-holding capacity of the soil.

3.Organic matter

Organic matter is found in soils at levels of approximately 1% to 5%.

Organic matter is derived from dead plants and animals and as such has a high capacity to hold onto and/or provide the essential elements and water for plant growth.

Soils that are high in organic matter are the most productive for plant growth.

Organic matter also has a very high "plant available" water-holding capacity, which can enhance the growth potential of soils with poor water-holding capacity such as sand.

Over time, however, prolonged decomposition of organic materials can lead it to become unavailable for plant use, creating what are known as recalcitrant carbon stores in soils.

4. Gases

Air occupy the same spaces as water. It can make up approximately 2% to 50% of the soil volume.

Oxygen is essential for root and microbe respiration, which helps support plant growth.

Carbon dioxide and nitrogen also are important for below ground plant functions such as for hosting nitrogen-fixing bacteria.

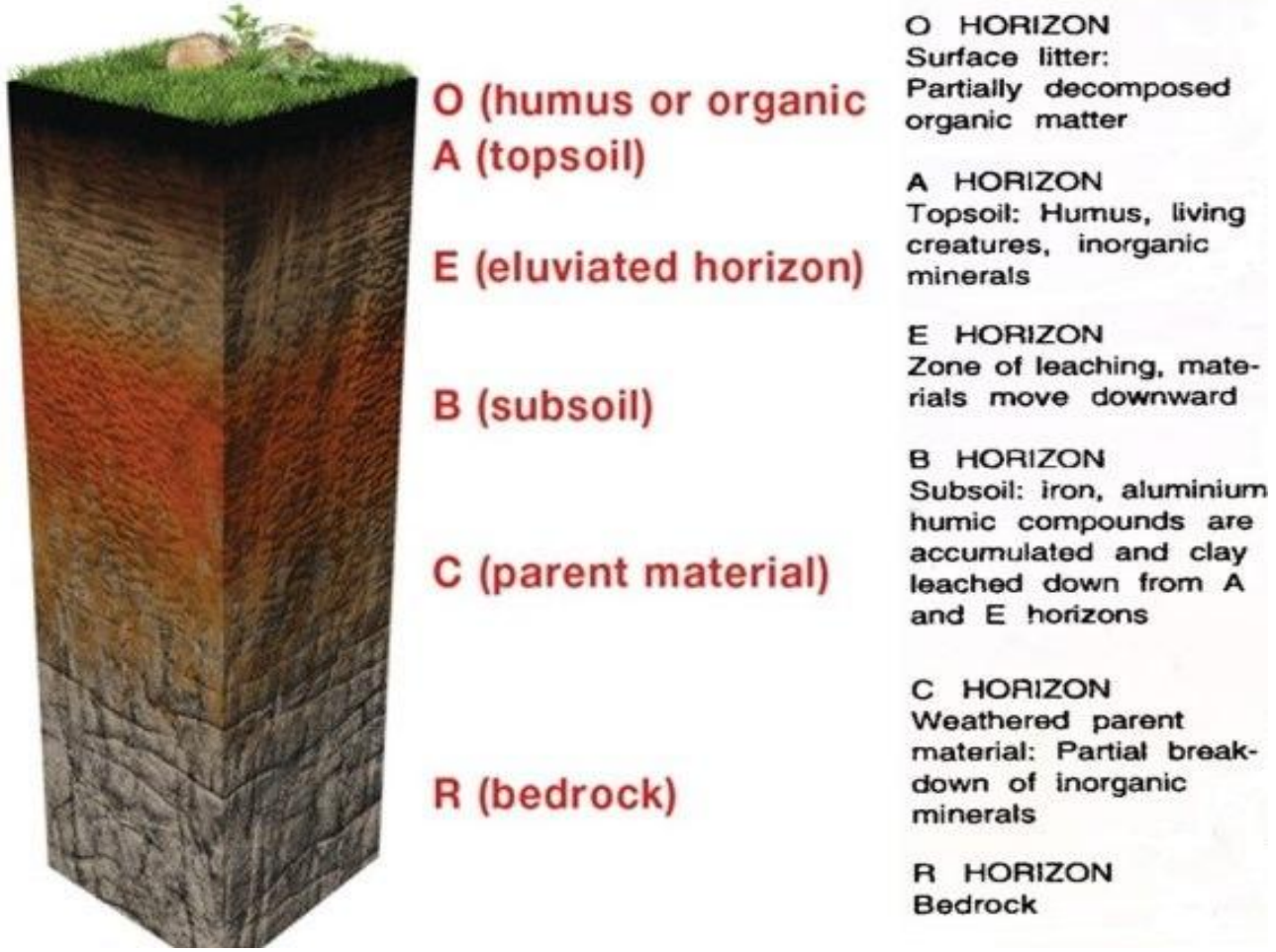
If soils remain waterlogged (where gas is displaced by excess water), it can prevent root gas exchange leading to plant death, which is a common concern after floods.

Soil Profile

The soil is the topmost layer of the earth's crust and is mainly composed of organic minerals and rock particles that support life.

A soil profile is a vertical cross-section of the soil, made of layers running parallel to the surface.

These layers are known as soil horizons.



Types of Soil and their characteristics

Sandy Soil

It consists of small particles of weathered rock.

This type of soil is very good for the drainage system.

Sandy soils are one of the poorest types of soil for growing plants because it has very low nutrients and poor water holding capacity, which makes it hard for the plant's roots to absorb water.

Sandy soil is usually formed by the breakdown or fragmentation of rocks like granite, limestone and quartz.

Silt Soil

Silt has much smaller particles compared to sandy soil.

It is made up of rocks and other mineral particles, which are smaller than sand and larger than clay.

It is the smooth and fine quality of the soil that holds water better than sand.

Silt is easily transported by moving currents and it is mainly found near the river, lake and other water bodies. The silt soil is more fertile compared to the other three types of soil.

It is also used in agricultural practices to improve soil fertility.

Clay Soil

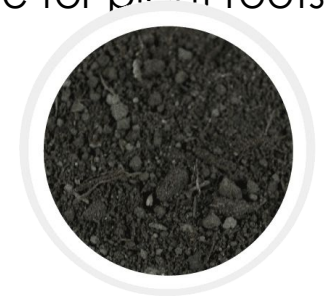
Clay is the smallest particle amongst the other two types of soil.

The particles are tightly packed together with very little or no airspace.

This soil has very good water storage qualities which make it hard for moisture and air to penetrate into it.

It is very sticky to the touch when wet, but smooth when dried.

Clay is the densest and heaviest type of soil which does not drain well or provide space for plant roots to flourish.



Loamy Soil

Loam is a combination of sand, silt and clay such that the beneficial properties from each is included.

For instance, it has the ability to retain moisture and nutrients; hence, it is more suitable for farming.

This soil is also referred to as an agricultural soil as it includes an equilibrium of all three types of soil materials being sandy, clay, and silt and it also happens to have humus.

It also has higher calcium and pH levels because of its inorganic origins.

Review questions

1. Draw a diagram to show the soil profile and label the horizons.
2. Explain the relationship between soil, air and soil water.
3. What is the difference between loam soil and sandy soil.
4. Describe how the soil texture can be determined by the farmer in the field.
5. Explain why leaching of nutrients is very prevalent in sandy soils.

References

S. Ragoonanan, agriculture for C.S.E.C revision course. Caribbean educational publishers.
R. Ramharacksingh, agricultural science for C.S.E.C examinations macmillan publishers.

Internet

Https://climate-woodlands.Extension.Org/basic-soil-components/
Https://byjus.Com/biology/types-of-soil/

video link

Https://www.Youtube.Com/watch?V=7v5quusgylw
Https://www.Youtube.Com/watch?V=ko-gjdbnxe8
Https://www.Youtube.Com/watch?V=r0mevltsvl8