**YEAR 11 - WEEK 1**

**STRAND11.3: AGRONOMY**

**SUBTRAND 11.3.1: SOILS**

**C.L.O: Demonstrate the assessment method used in determining the physical properties of soil**.

Introductory notes

Soil is a mixture of minerals, organic matter, gases, liquids, and organisms. It is a natural body known as **pedosphere** which plays four important roles:

* Medium for plant growth
* Stores water
* Modifier of the earth’s atmosphere
* Habitat for organisms

Fiji soils can be grouped into 8 major types:

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| **Group**  |  **Description**  |
| 1 | Young sandy soil formed around the coastal areas  |
| 2 | Fertile, deep agricultural alluvial soils mostly found in valley bottoms |
| 3 | Shallow and moderately deep dark nutrient rich soils on rolling and hilly land  |
| 4 | Sandy and silty moderately deep to deep soils formed from volcanic materials  |
| 5 | Deeply, highly weathered clay rich soil, usually acidic  |
| 6 | Deep, highly weathered oxide-rich clay soil with limited agriculture values |
| 7 | Deep sandy soil from acid parent materials  |
| 8 | Gleys and peats found on low lying areas in valleys and plateaus |

**Lesson 28**: Soil Colour

**Outcome**: Discuss **how** soil gets its **colour**

* Soil has various colours. Geologists had identified about 170 different colours of soil.
* The most common soil colours are brown, black, grey and red soil.

**What factors influence soil colour?**

* Mineral matter in rocks(parent material) : when rocks **weather(**break down) the minerals and compound are released into the soil so it will influence the soil colour.
* Organic matter : when organic matter in the soil decompose it changes its colour from brown to black. So it will influence the soil colour.
* Air and water content of soil : air and water reacts with certain minerals in soil. This will result in the different colour of soil. Eg. Red soil, yellow soil, grey soil, bluish soil. Soil colour reflect the amount and type of iron in it.
* Water content : soil colour darkens as water content changes from dry to wet.

**Lesson 29**: Importance of soil colour

**Outcome**: Discuss the **importance** of soil colour and how soil colour is **measured**

**Why do soil scientists study soil colour?**

* To assist with field identification of the types of soil
* To describe and classify soil
* To determine the origin and condition on which soil was deposited
* To determine the mineral composition of soil
* To determine the chemical processes which have made the soil
* To determine the age of soil
* To differentiate the types of horizons of the soil profile

When this is determined, soil scientists can decide on the use and management practices that are needed to improve the productivity of soil.

***Pedology***: study of soil in their natural environment

**How soil colour is measured?**

* Soil colour is measured using a standardized system known as the **Munsell Colour System**.
* This system was invented by Albert H Munsell in 1858 – 1918.
* The system is composed of 1000 colour samples
* The colour system is designated a **letter** and **number** which relates to the **hue**, **value** and **chroma** of a colour.
* So when a soil is studied, the colour is compared to the colour system.

Eg. A soil colour may be described as **R5/10**. This means that Hue **Red**, Value **5**, Chroma **10**.

**Soil colour activity**

List four factors that determine the colour of soil.

Farmers say that black soil is best for farming. Discuss this statement.

State four importance of soil colour to soil scientists.

Explain how the soil colour is determined.

**Lesson 30:** Soil Depth

**Outcome**: Discuss the factors that determine the depth of soil.

***Soil profile***: vertical section of soil which shows the different layers of soil in horizons.

**What factors influence the depth of soil?**

* **Age of soil**: soil formation takes millions of years. Undisturbed soil are usually deeper.
* **Erosion**: the rate at which soil is lost from a site determines how deep the remaining soil is.
* **Topography**: soil in steep slopes and removed by wind, water and gravity moves to the bottom of the slope.
* **Ground cover**: exposed soil erodes easily. Mulching and cover crops reduce erosion.
* **Formation of hard pans**: minerals dissolved in water forms hard pans which make the soil shallow.

**Lesson 31:** Importance of Soil depth

**Outcome:** Discuss the **categorie**s and **importance** of soil depth.

* Crops have adapted features which suit different depths of soil.

**Why do farmers need to know the depths of soil?**

* Farmers need to know the depth of soil so that the can determine the crops to grow.
* Also it will help them identify the water table.
* It will assist them in determining the type of tools and implement to use in cultivating the soil.

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| **Depth of soil** | **Very shallow** | **Shallow**  | **Moderately deep** | **Deep**  | **Very deep** |
| **Dist.from surface**  | Less than 0.25m  | 0.25 – 0.5m  | 0.5 – 1.00m  | 1.00 – 1.5m | More than 1.5m |
| **Nutrient availability** | Low | High | Higher | Higher | Highest |
| **Water availability**  | Low | High | Higher | Higher | Highest |
| **Mechanical support**  | Low | High | Higher | Higher | Highest |
| **Effect on plant roots**  | Restrict growth | Less restrictive | Less restrictive | Less restrictive | Least restrictive |
| **Suitable for**  | Very shallow rooted plants | Vegetables/spices | Maize, dalo, sugarcane | All crops and short tree crops | All crops and tree crops |

**Activity for soil depth**

Determine the different depths of soil required by the crops below:

Palm

Vegetables

Sugarcane

State the reasons why farmers need to know the depth of soil in their land.

List three factors that influence soil depth.

**Lesson 32**: Soil Temperature

**Outcome**: Discuss the **factors** that influence soil temperature

***Rhizosphere*:** narrow region of soil that is influenced by root secretions

***Thermal energy***: energy generated and measured by heat

***Thermal conductivity***: rate at which heat passes through a material

Temperature is an important factor which influences the growth, development and yield of crops and livestock.

**What influence soil temperature?**

* Solar radiation: major part of this radiation is absorbed by the atmosphere and only a small part reaches the soil.
* Microbial decomposition of organic matter: when organic matter decompose, it produces heat
* Respiration by soil organisms and plants: when living things respire, heat is also produced and transferred to the soil.
* Internal source: heat that is produced inside the earth.

**Lesson 33**: Importance of soil temperature

**Outcome**: Discuss the importance of soil temperature

***Cardinal temperature***: the maximum, optimum and minimum temperature at which organisms can survive.

**Scientists study soil temperature because of the following reasons**:

* Determine the type of crops that can survive in an area
* Affects plant growth
* Affects germination
* Affects survival of soil organisms
* Affects soil moisture content
* Affects availability of plant nutrients
* Affects soil aeration

**Activity for soil temperature**

**Differentiate** between thermal energy and thermal conductivity.

**Discus** two factors that influence soil temperature.

Explain the importance of the **cardinal temperature**.

List four reasons why scientists study the soil temperature.