Fundamental of
Soil Science

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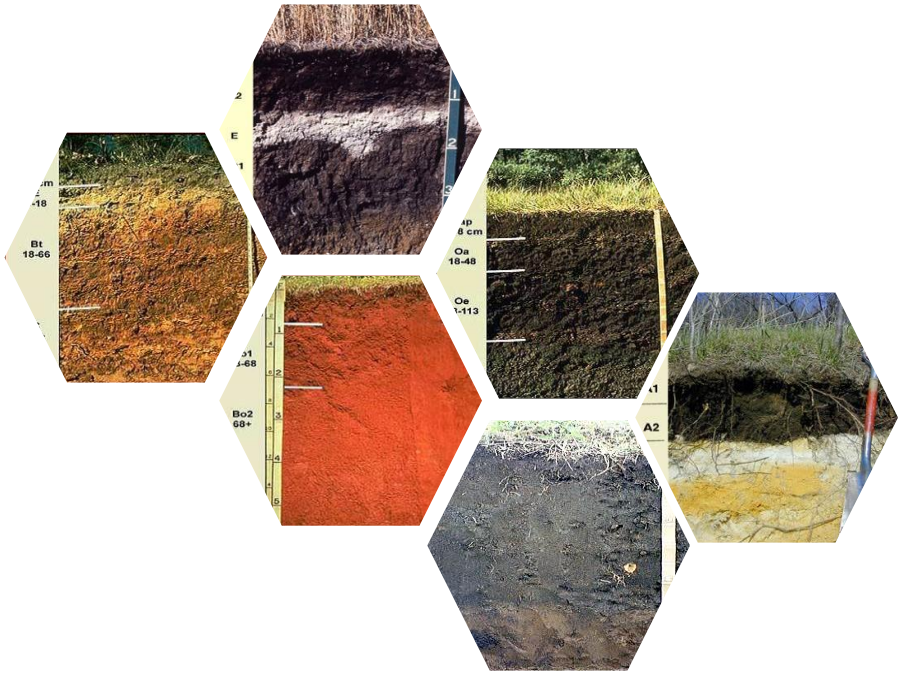


Description

- The concept of soil in agriculture
- Soil components
- Soil forming factors
- Physical, chemical and biological soil properties
- The role of minerals, organic matter and water in the soil
- Morphological characteristics of soils and soil classifications
- Soil management for sustainable agricultural productivity

Course Materials

01 Introduction

- Contract course, Introduction (Soil background information)
- Soil definition, and the approach of soil study

02 Soil Formation

- Soil-forming factors
- Soil formation process

03 Physical Soil Properties

- Texture, Bulk Density, Soil Porosity, Struktur, Aggregation, and Soil Color

04 Chemical Soil Properties

- The Availability of Nutrients in Soil
- Soil reaction (Soil and Plant Relation)

Course Materials

05 Chemical Soil Properties

- Cation axchange capacity and base saturation
- Soil colloid properties

06 Biological Soil Properties

- Soil microorganisms
- The function and identification of soil microorganisms

07 Biological Soil Properties Part II

- Soil flora and fauna
- Utilization of soil biology for environmental remediation

08 Midterm Exam

- Online exam

Course Materials

09 Soil Organic Matter

- The Sources and Processes of Formation of Soil Organic Matter
- The Role of Soil Organic Matter

10 Soil Water Management

- The Concept of Soil Water Management
- Plant and Water Relation

11 Soil Water Management II

- Loss and Control of Groundwater

12 Soil and Land Classification

- Soil Classification system
- Land Capability and Suitability Classification

Course Materials

13 Soil and Land Classification Part II

- Land Survey
- Agricultural Land Classification and Evaluation

14 Land Degradation and Remediation

- The Concept of Soil Health
- Land Degradation Control

15 Land Degradation and Remediation Part II

- Land Remediation

16 Final Exam

- Online Final Exam

COURSE LEARNING OUTCOMES (CLO)

1. Able to explain the definition and the approach of soil study
2. Able to explain the concept of land in agriculture
3. Able to explain the soil-forming factors and process
4. Able to explain physical, chemical and biological soil properties
5. Able to explain the role of minerals in the soil
6. Able to explain the role of organic matter in the soil
7. Being able to explain the concept of soil water management
8. Able to explain soil classification, survey and evaluation of land.
9. Able to explain soil management for sustainable agricultural productivity

LEARNING METHOD

This course takes place through the Student Center Learning (SCL) strategy with methods including lectures, contextual learning, small group discussions, book reviews, simple surveys, etc.

SOFT SKILL ATTRIBUTE

Soft skill attributes that will be developed for students through lectures are initiative, objective, analytical and logical

QUALITY CONTROL

The quality control of lectures is carried out through independent and structured assessment, discussion activities, case research reports, presentation and soft skill displays.

ASSESSMENT

Assessment of students is determined by students learning outcomes using the Norms Reference Assessment System.

EVALUATION

- The evaluation was done by combining the value of student achievement in quality control of all items by using the following formula:
  - Participation (PS) = 10 %
  - Homework (PR) = 50 %
  - Mid-term Exam = 15 %
  - Final Exam = 25 %
- Based on the quality control items the final grades of students are obtained

EVALUATION

Note :

- Students who can take the Midterm and Final Exams are students who have taken **75%** of the courses. For students whose attendance is insufficient 75%, the faculty may not allow them to take the Midterm and Final Exams.
- Lecturers must fill in the points on each component and the value is not ou tside the specified range and the total is 100%
- Faculties through meetings can determine the percentage of assessments within the range that we have set.

RANGE OF VALUE

A = ≥ 85

B+ = 77.5 - 84.9

B = 70- 77.9

C+ = 62.5- 69.9

C = 55 - 62.9

D = 45 - 54.9

E = ≤ 44.9

- Not pass value which formerly K, can be given if the student does not take the classes or attendance less than 75% or not attend Final Exam.
- Not pass = 0 (zero) credit and the student cannot take the Short Semester for the course..

ACADEMIC NORMA / COURSE OF CONDUCT

- Students must attend on time. Students who are late are more than 15 minutes are not allowed to take lectures
- Students who are absent for reasons justified according to regulations, submit a letter of permission to the lecturer at the latest on the day next lecture
- If the lecturer cannot be present on the schedule that has been set for some reason, then lecturers are required to provide information to students no later than 1 day before lecture schedule.
- If the lecturer is absent after 15 minutes of the lecture schedule, the student has the right to contact the lecturer by asking the clerk / lecturer picket about lectures carried out or not. If the lecturer does not come within 2 x 15 minutes of the lecture schedule, the student has the right not to participate lectures at that time and lectures are considered not carried out.
- Students must submit group or individual assignments lecturer time will be determined later
- Students must dress neatly and politely when attending lectures
- Students cannot do other activities when lectures take.

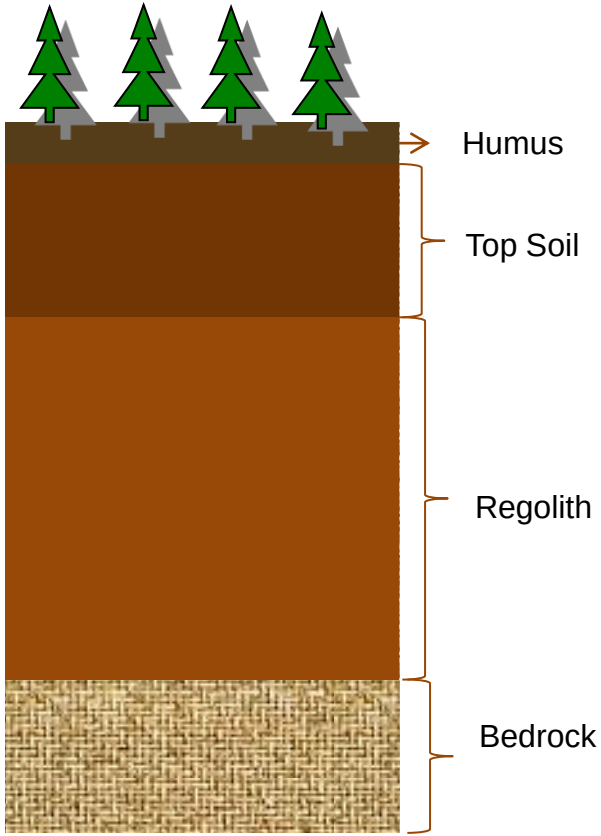
Introduction of Soil Science

Definition of Soil

- Have a different definition depending on each interest
- Soil science is the branch of agriculture
- Soil considered as a natural body and as an important medium for plant growth
- Five soil forming factors :

S =f (Cl + O +R + P + T)

Cl = Climate
O = Organism
R = Relief
P = Parent Material
T = Time



Definition

- Dokuchaiev (Father of Soil Science) :
  - Viewed the soil as a natural body composed of mineral and organic constituents, having a definite genesis and distinct nature of its own

- Buckman and Bardy :
  - Soil is defined as a dynamic natural body on the surface of the earth in which plants grow, composed of mineral and organic materials and living forms.

- USDA :
  - The three dimensional natural body on the surface of earth, composed of mineral and organic materials and living forms, derived from the parent material due to influence of climate and organisms as conditioned by relief, over a period of time which is a medium for plant growth.

THE APPROACHES OF SOIL STUDY

Pedology

- The study of the soil as a natural body and does not focus primarily on the soil's immediate practical utilization
- Deals with soil formation, soil genesis, soil clasification and description of soil properties

Edaphology

- Study of the soil in relation to plant growth, nutrition and yield of crops and find means of conserving and improving productivity
- Consider the various properties of soils in relation to plant production

Functions of the soil:

1. Soils provide the physical support to the plants
2. Soils serve as medium for growth of all kinds of plants.
3. Soils provide nutrients for plant growth.
4. Soils act as a living filter to clean water before it moves into an aquifer.
5. It acts as a recycling system for nutrients and organic waste.
6. Soils modify the atmosphere by emitting and absorbing gases (carbon dioxide, methane, water vapor, etc)

S oul

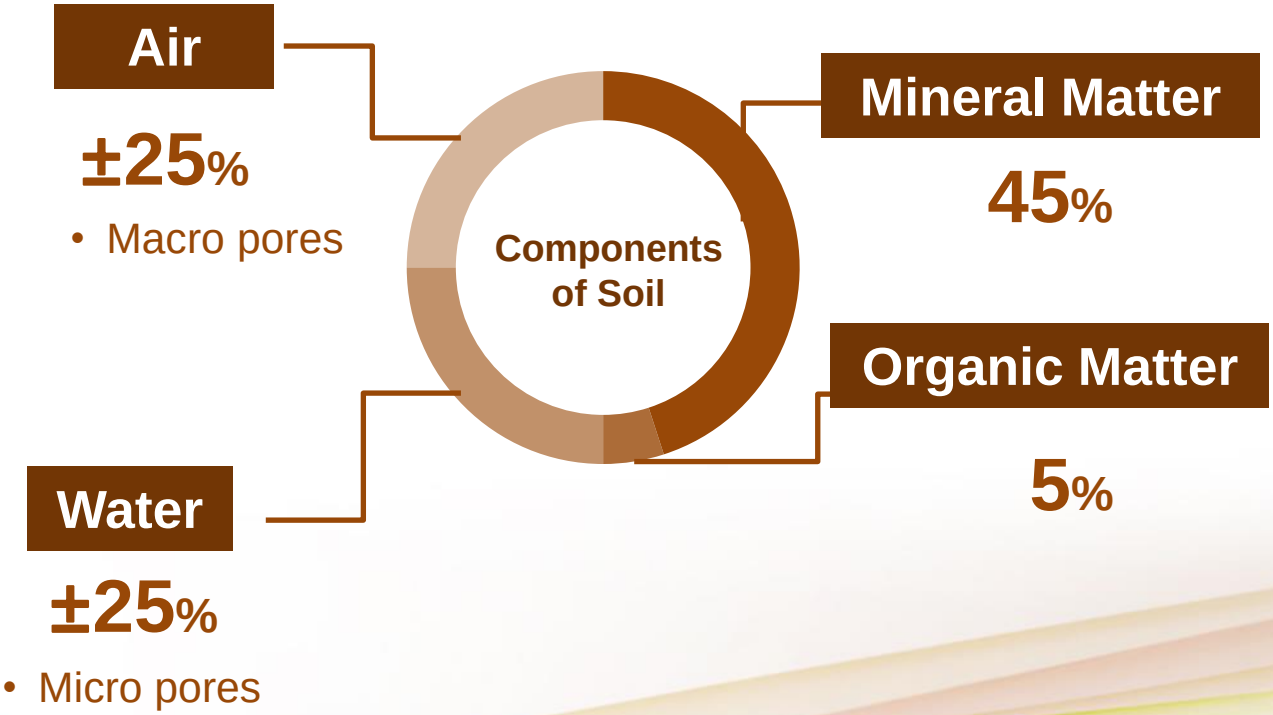
O f

I nfinite

L ife

Major Components of Soil

Soils consist of four major components (based on volume) :



Mineral Matter

- Materials derived from rock weathering and has a mineral composition that varies according to the mineral composition of the rock being weathered
- Mineral matter includes :
  - Primarily minerals (eg. Feldspar, Puroxenes, etc)
  - Secondary minerals (eg. Biotite, Kaolinite, etc)
- Mineral matter provides mechanical support and nutrients for plants

Source : https://ilmugeografi.com/

Organic Matter

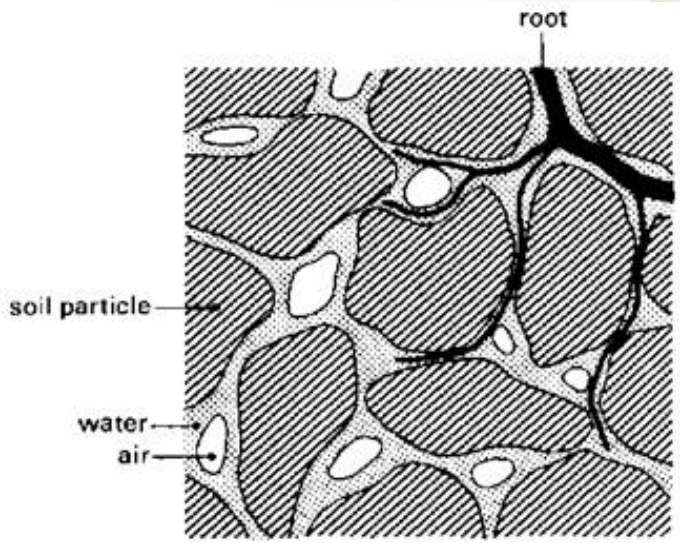
- Generally found in the surface of soil
- Has a small amount, but has a big role in soil properties
- Mainly plant and animal residues such as plant parts, urine, green manures, etc
- The function of organic matter for soil and plant :
  - Organic matter is a storehouse of plant nutrients (nutrients source)
  - It improves physical, chemical, and biological properties of soil
  - A source of energy for microorganisms

Water

- Water is absorbed by the soil because of the different factors (It is held in soil pores with varying degree of forces depending on the around of water present)
- Groundwater table, rainfall, irrigation are the source of the soil water
- Soil water keeps nutrients in solution and acts as reservoir for supplying water to plants.

Air

- Air and water filled the pores of the soil
- The number of pores in the soil is ± 50% of the volume of the soil.
- The amount of water and air in the soil is in equilibrium
- Soil air consist of O_2, CO_2, N_2, etc.
- CO_2 content in soil (0.5%) in higher than atmospheric air (<0.03%)
- Composition of soil air is quit dynamic and various greatly from place to place
- Soil air contains higher moisture than atmosphere



Source : http://www.fao.org/

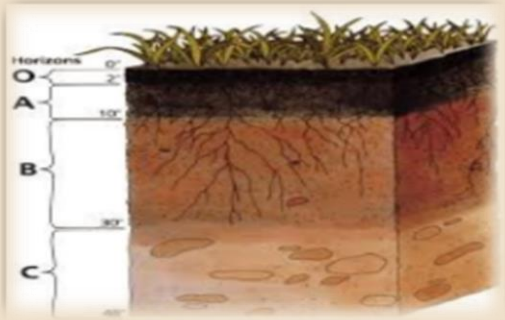
Soil

- Soil is the three dimensional natural body on the earth's surface
- It is the part of land in which plants grow
- Soil is a thin layer of material on the Earth's surface

VS

Land

- Land is the two dimensional natural body at the earth's surface
- Land includes all elements of the physical land and biological environment



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Thank You

Stay Safe and Healthy everyone..!!