SOIL

BY NALITSO ELLY KENEDDY

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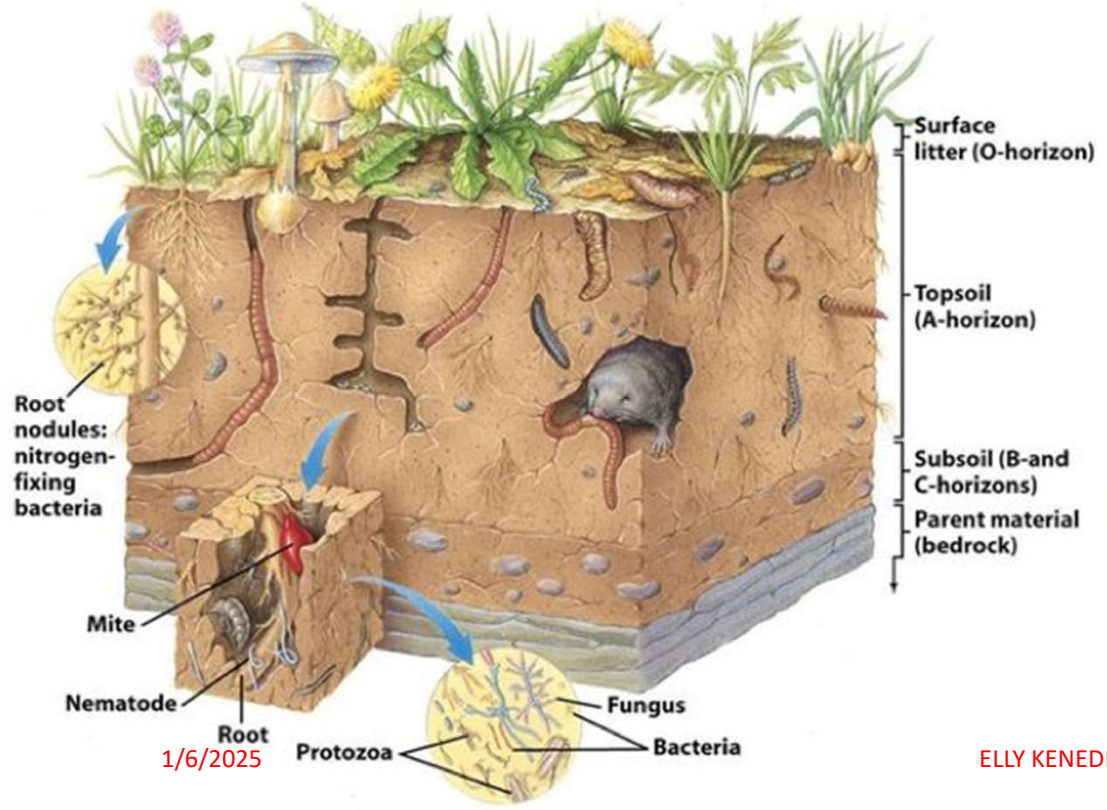
INTRODUCTION

- What does the word soil mean?
- Define the term soil

CONT……

- Soil is an important component of the earth which is essential for survival of man.
- This is because man uses soil for various purposes essential for his survival.
- **In your respective groups, discuss the different uses of soil.**

CONT……


Surface litter (O-horizon)
Topsoil (A-horizon)
Subsoil (B-and C-horizons)
Parent material (bedrock)
Root nodules: nitrogen-fixing bacteria
Mite
Nematode
Root
Protozoa
Fungus
Bacteria

- **Soil** is finely divided material covering the earth crust or surface. It consists of air, water, humus, living organisms, and weathered rocks.

Importance of soil

- Soil provides nutrients e.g. water and minerals to plants which are the chief producers of food in the environment.
- Soil is a habitat (home) for many organisms such as earth worms, termites, bacteria fungi and arthropods.
- Soil provides a medium through which man and all other animals dispose of their wastes.
- Soil is an important natural resource which provides construction materials, supports agriculture, craft and art materials.
- Soil is used in art and craft industry for making ceramics through pottery
- It is a natural water filter and hence important in purification of water

CONT……

- The function of soil is dependent on the nature and type of soil .

Activity

- Suggest the different types of soil we have.
- In your respective groups, research and discuss the characteristics of each type

ACTIVITY

- What are the different types of soil?
- Examine the different types of soil and note down their characteristics
- Pick a small portion of each sample and feel it between your fingers and note the texture.
- Observe the colour of each soil sample and note it.
- Obtain small samples of soil samples A,B,C and add a small amount of water.
- Feel each wet sample between your fingers and note the texture.

A

B

C

TYPES OF SOIL

Soil is grouped basing on size and nature of soil particles. On this basis, there are 3 main types of soil namely:

- Clay soil
- Loam soil
- Sand soil
- Silt soil

SANDY SOILS

Sandy soils contain large space between the particles and these spaces allow water to drain off very quickly.

They have a gritty feel when wet and felt between the thumb and figure.

They contain only very small quantities of water and they may be deficient in calcium and magnesium

They are described as light soils because they are relatively easy to work with.

CLAY SOIL

- They have small fine particles i.e. fine texture.
- The soil particles in clay are closely parked together leaving very small spaces between them. This causes clay soils to have poor water drainage and also become water logged.
- They are difficult to work with and therefore described as heavy soils.
- They have a sticky feel when wet.

LOAM SOIL

- This is a mixture of sand (about40%), silt (about40%), clay (15%), organic matter (1-4%).
- it has stable crumb structure and is the best for crop production.
- Its dark in colour due to presence of humus
- It has moderate water drainage and retention capacity.

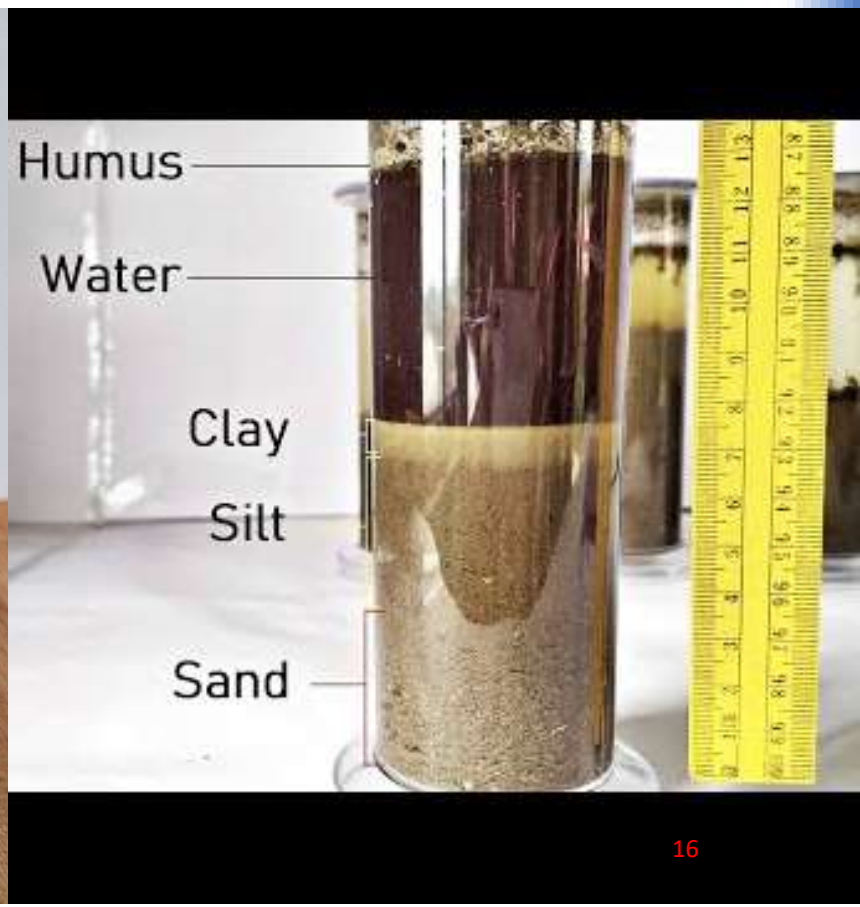
DIFFERENCES.

Clay soil	Sand soil
1. Very small air spaces between particles	Large air spaces between particles
2. Rich in dissolved salts	Poorly dissolved salts
3. Has high water retention capacity	Has only very low water retaining capacity
4. Poor drainage i.e. low permeability	Very easy drainage i.e. high permeability
5. Water can rise to high level by capillarity	Water cannot rise to high level by capillarity
More than 70% clay and less than 40% sand	More than 70% sand and less than 20% clay

ACTIVITY

- In groups half fill the measuring cylinder with soil sample A
- Add water until the measuring cylinder is two thirds full. Observe what happens.
- Cover with your palm the opening of the measuring cylinder
- Shake vigorously for about 2 minutes
- Place the measuring cylinder on a flat surface and allow the soil to settle.
- Draw the different layers formed and correctly illustrate.

CONSTITUENTS OF SOIL



RESULTS.

- When the soil particles settle down, the particles arrange themselves according to their particle size where the heaviest settle at the bottom and the small and lightest at the top as shown above.

Conclusion

- Soil is made up of different particles, which have varying sizes and densities.

INORGANIC PARTICLES

- These are produced during the process of weathering. Soil particle vary in size and their sizes are used to classify them. The different soil particles are clay, silt, fine sand, coarse sand and gravel.
- Table showing sizes of soil of particles

Soil particle	Diameter (mm)
Gravel	> 2.0
Coarse	0.2 – 2.0
Fine sand	0.02 – 0.2
Silt	0.002 – 0.02
Clay	< 0.002

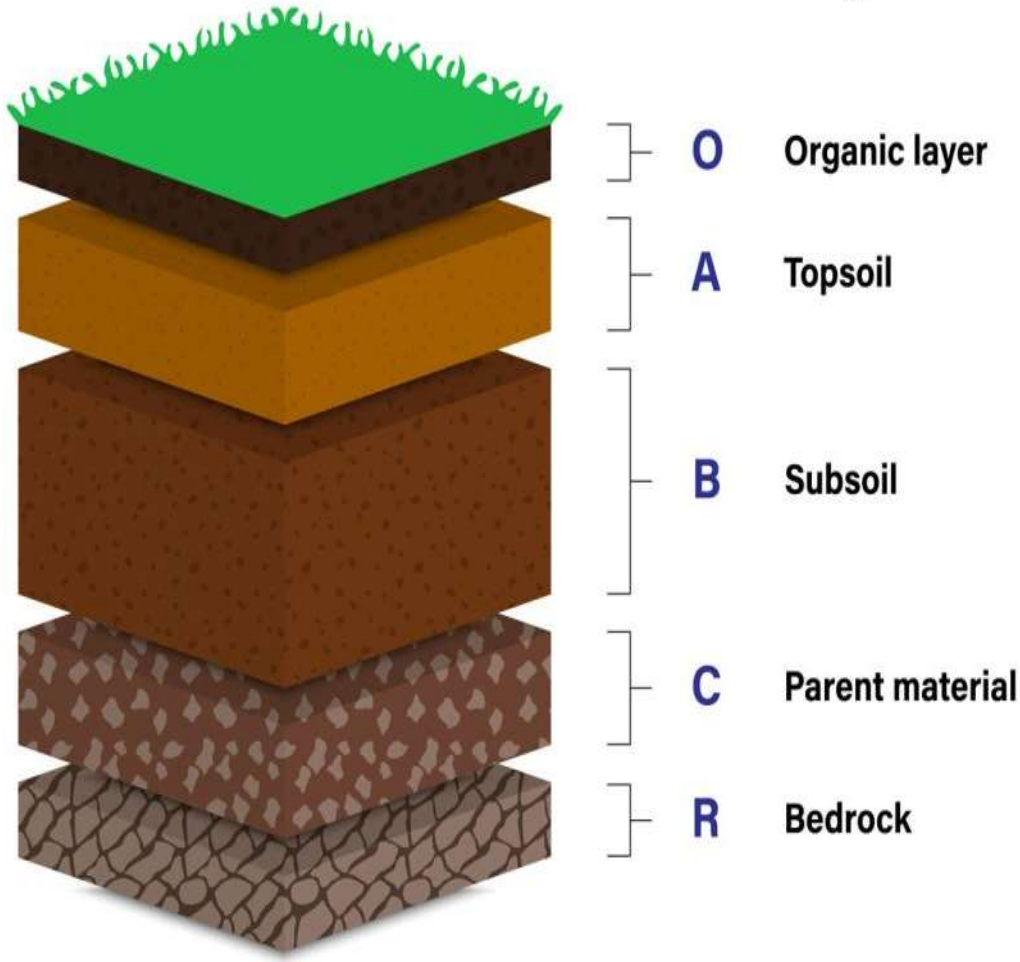
USES OF SOIL PARTICLES

- They provide a surface for anchoring plant roots hence providing support to the plants.
- Soil particles give a rigid frame work to the soil.
- They provide mineral elements to the soil which are the absorbed by plants using roots.

SOIL PROFILE

This is the vertical arrangement of the various soil layers called horizons. It represents the different layers at various stages of soil development. A soil with distinguished soil layers is known as mature and that without clear profile is immature or young. The profile consists of the following:

- Top soil
- Sub soil
- Parent or underlying rock



O (humus or organic
A (topsoil)

E (eluviated horizon)

B (subsoil)

C (parent material)

R (bedrock)

O HORIZON
Surface litter: Partially decomposed organic matter

A HORIZON
Topsoil: Humus, living creatures, inorganic minerals

E HORIZON
Zone of leaching, materials move downward

B HORIZON
Subsoil: iron, aluminium humic compounds are accumulated and clay leached down from A and E horizons

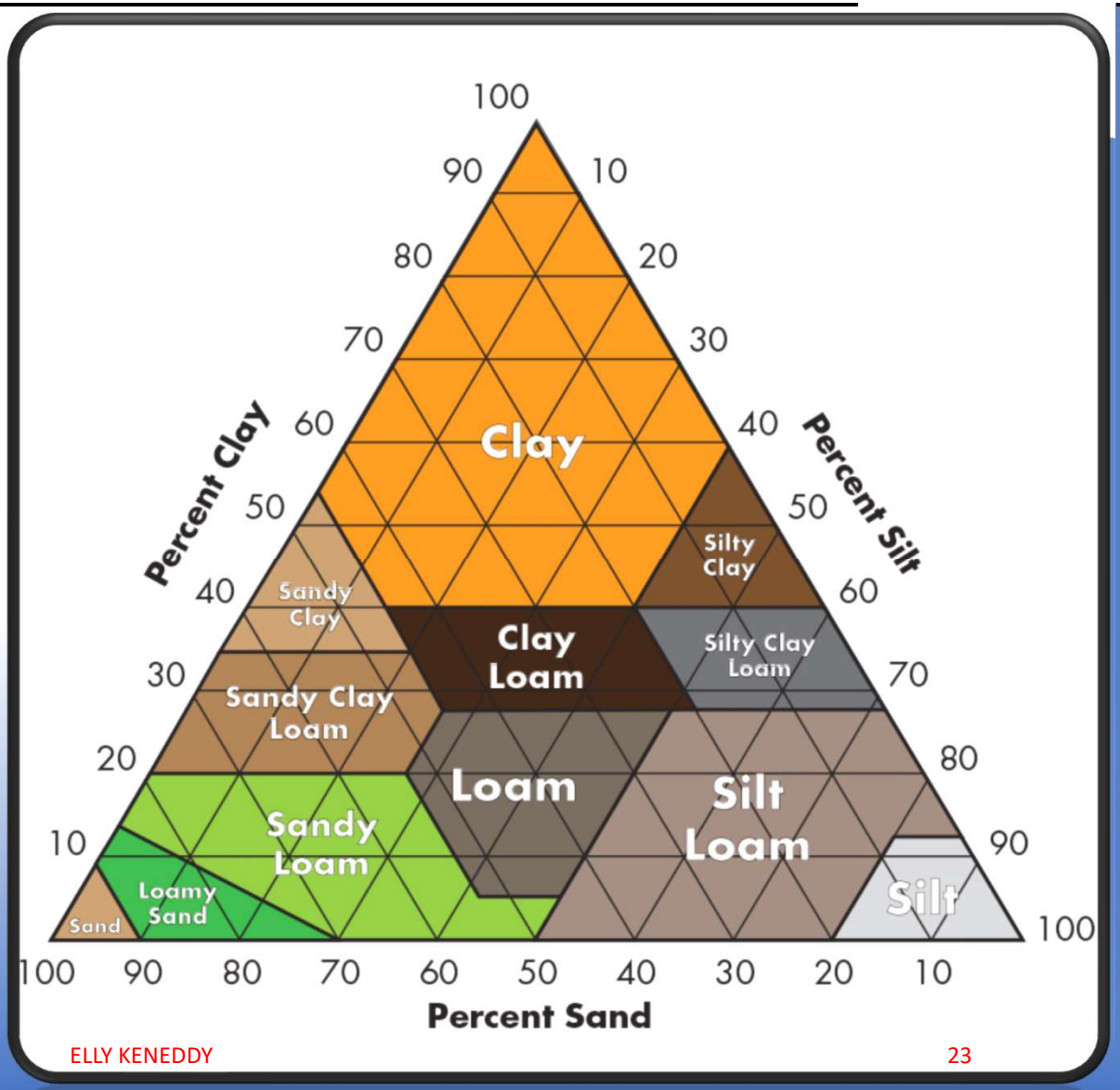
C HORIZON
Weathered parent material: Partial breakdown of inorganic minerals

R HORIZON
Bedrock

DETERMINATION OF SOIL TEXTURE

INTRODUCTION.

- Texture refers **to how rough or how smooth a particular soil sample is.**
- This is determined by relative portions of sand, silt, clay and particles present.
- Sandy soils are coarse textured and clay soils are fine textured.



AIM :EXPERIMENT TO SHOW THE SOIL TEXTURE OF TOPSOIL

Apparatus

- Measuring cylinder
- Top soil
- Stirrer
- Beaker
- Water

DETERMINATION OF SOIL TEXTURE

RESULTS

Soil type	When wet	When dry
Loam		
Sand		
Clay		

SOIL PROPERTIES

- **Drainage of water:**

•Soil drainage refers to the ability of soil to allow water to pass through it

•Soil has good water drainage if it allows water to pass through it very quickly. Soil has poor drainage of water if it doesn't allows water to pass through it very quickly and this makes it **water logged**.

- **Water retention capacity:**

•This **refers to the amount of water soil can hold**. Soil that holds little water so it has a poor water retention capacity.

•Some soils tend to become water logged i.e. it holds a lot of water so has a high water retention capacity.

SOIL DRAINAGE AND WATER RETENTION

Materials

- Funnels
- Measuring cylinders
- Filter papers or cotton wool
- Dry soil samples
- Water

PROCEDURE

- Measure an equal volume of each soil sample 40cc.
- Add cotton wool to the funnel to seal the entrance.
- Then place clay soil in the funnel containing cotton , sand in the other funnel and loam in the third funnel.
- Place the funnels with their contents over measuring cylinders.
- At the same time pour an equal volume of water on each of the soil samples as shown in the diagrams and immediately start the stop clock.
- Record the amount of water collected every after 2 minutes interval for soil samples

SET UP

TABLE OF RESULTS

Soil sample	Time in minutes						
	2	4	6	8	12	14	16
Sand							
Loam							
Clay							

Activity

- Use the results obtained to plot a graph to compare drainage of soil samples
- **Determine the amount of water retained in each soil sample**.

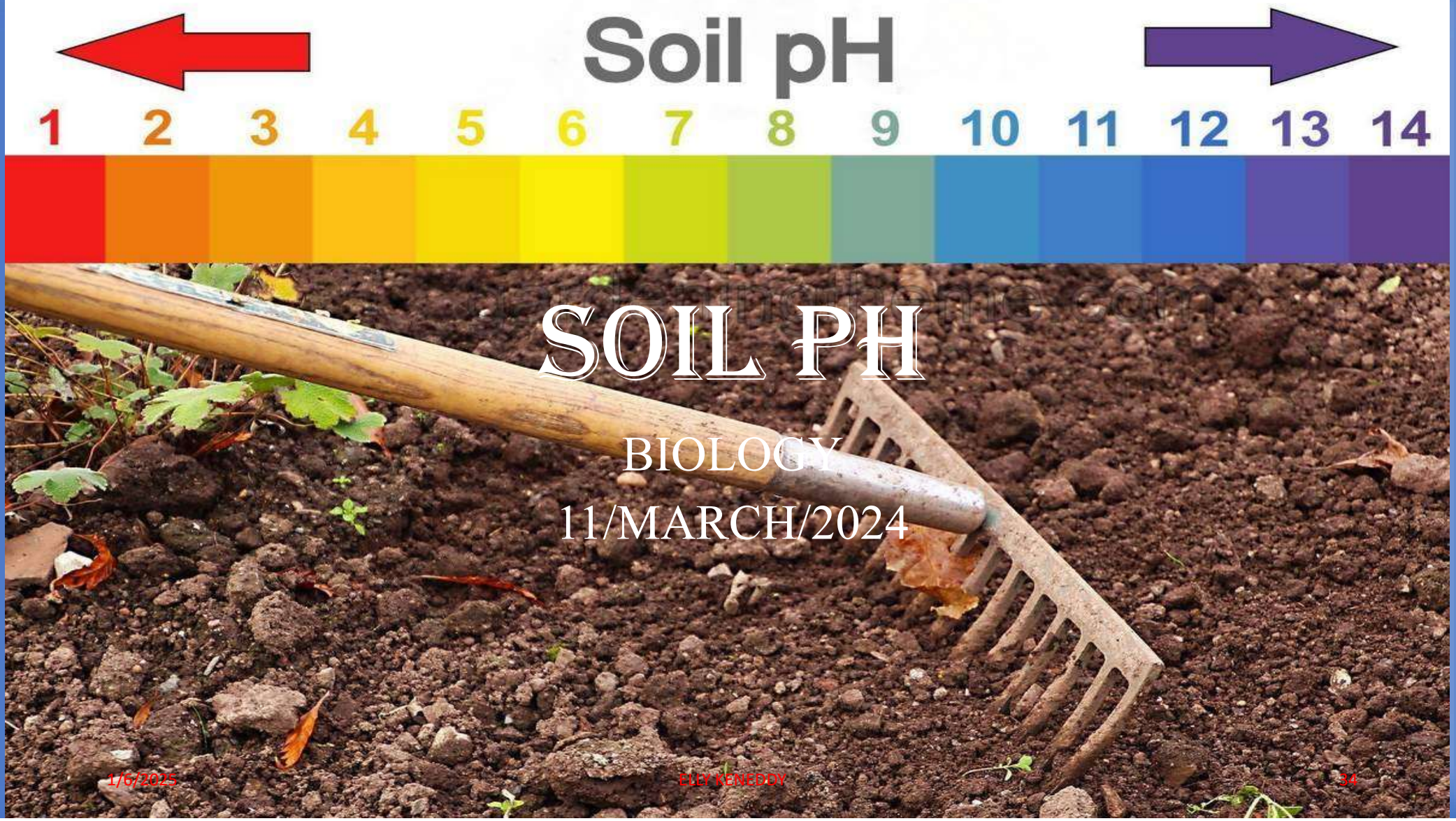
DISCUSSION OF RESULTS.

•Water passed through sand soil faster than clay soil and loam. So much water was collected in the cylinder with sand soil and least water was collected in the cylinder containing clay soil.

•The soil particles in clay are closely parked together leaving very small spaces between them. These do not allow water to easily pass through it hence retaining much water.

•Sandy soils contain large spaces between the particles and these spaces allow water to drain off very quickly hence retaining less water.

•Loam drains water moderately.



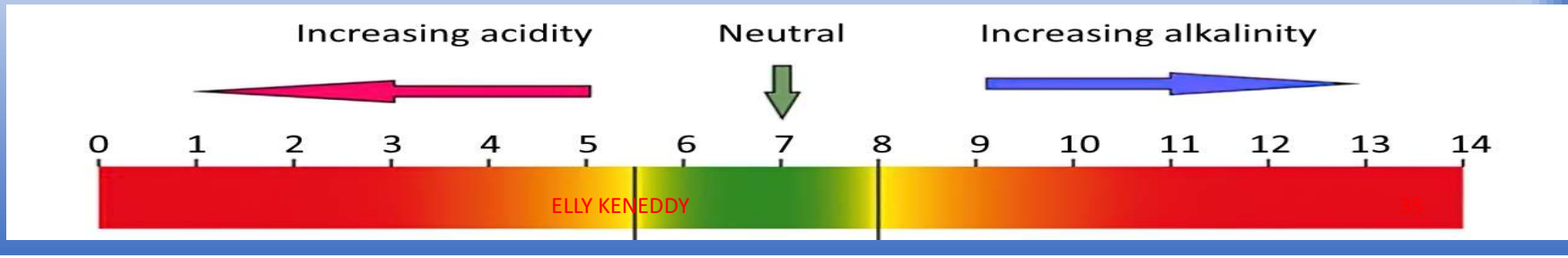
SOIL PH

BIOLOGY

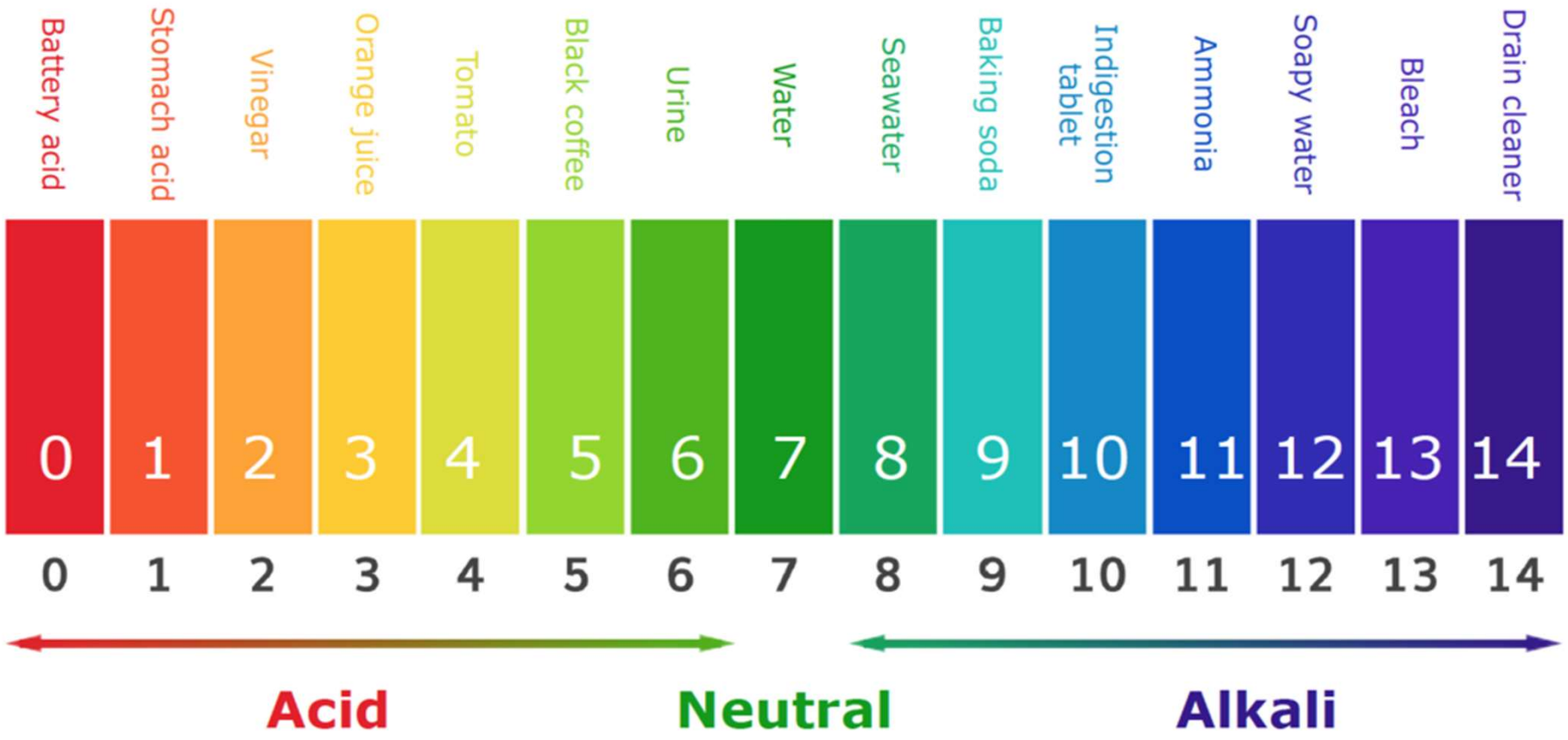
11/MARCH/2024

INTRODUCTION.

- This is the degree of acidity or alkalinity of the soil. Most soils in the tropics are acidic but some are alkaline.
- Soil pH affects the rate at which mineral salts e.g. nitrogen, phosphorous, iron are absorbed by plant roots and dissolve in soil.
- Most plants grow best in slightly acidic or neutral soil.



PH SCALE


Battery acid
Stomach acid
Vinegar
Orange juice
Tomato
Black coffee
Urine
Water
Seawater
Baking soda
Indigestion tablet
Ammonia
Soapy water
Bleach
Drain cleaner
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Acid
Neutral
Alkali

EXPERIMENT TO DETERMINE THE SOIL PH

Aim : To determine the PH of different soil samples.

Materials

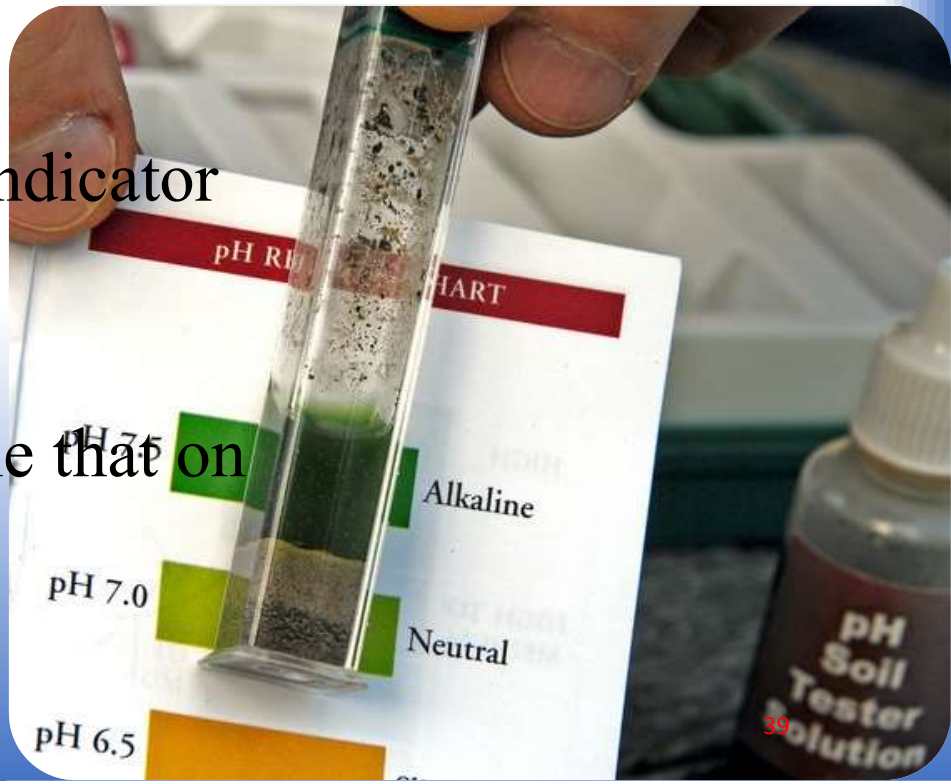
- Soil samples
- Petri dish
- Universal indicator
- Indicator chart
- White sheet of paper.

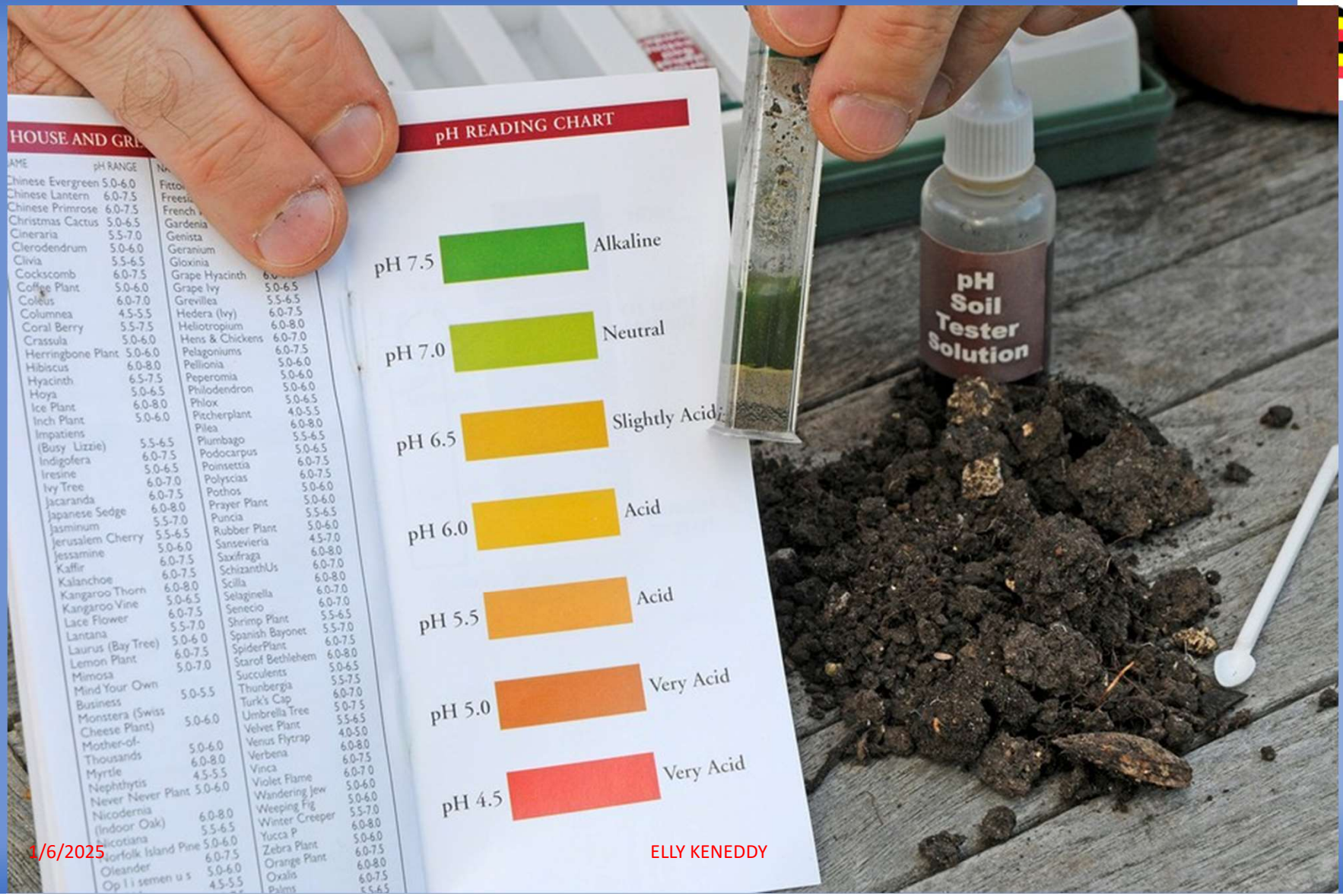
PROCEDURE

- Place about 2 spatula end full of soil on a Petri dish and soak it water. (Add little water)
- Add 4 to 5 drops of universal indicator.
- Leave for 2-3 minutes.

CONT.....

- Tilt the Petri dish so that the indicator drains out of the soil.
- Compare the indicator color with the indicator chart.
- Read the PH value corresponding to the that on the indicator chart.




pH READING CHART
pH 7.5
Alkaline
pH 7.0
Neutral
pH 6.5
Slightly Acidi
pH 6.0
Acid
pH 5.5
Acid
pH 5.0
Very Acid
pH 4.5
Very Acid
pH Soil Tester Solution

SIGNIFICANCE & APPLICATION

- Soil PH is important because it influences the availability of essential nutrients by regulating the chemical forms and chemical reactions that favour their availability in forms that can be readily absorbed by plant roots.
- PH is also important because it influences the type of crops to be grown **i.e**. some plants do best in acidic soils while others do best in alkaline soils.

75 Acid Loving Plants

AnnsEntitledLife.com

SOIL CAPILLARITY.

•Capillarity through soil means how well water can rise up in the soil.

•**Soil capillarity** is the ability of water to rise up the soil.

•Soil capillarity is the primary force that enables the soil to retain water as well as regulate its movement

•This depends on the size of air spaces between the soil particles.

TO DEMONSTRATE AND COMPARE WATER CAPILLARITY THROUGH SAND, CLAY AND LOAM SOIL

Aim: To Demonstrate and compare water Capillarity through sand, clay and loam soil

Materials

- ❑ 3 long glass tubes
- ❑ Glass troughs
- ❑ Muslin bags and threads/ cotton wool
- ❑ 3 retort stands and clamps
- ❑ 3 samples of dry sand, clay and loam soils.

SET UP

PROCEDURE.

- Tie a muslin sheath tightly at the end of the glass tubes.
- Fill one glass tube with dry sample of sand soil and pack it well ensuring that there are no spaces in the soil.
- Repeat this with clay and loam soils.
- The glass tubes are stood vertically with the ends tied with muslin sheath immersed in a glass trough containing enough water.
- The glass tubes are supported upright with retort stands and clamps as shown in the diagram above.
- Measure the maximum height attained by water after 1 day

Observation

- Water rises faster for a short distance in sand soil while in clay soil water rises slowly but to higher distances. In loam soil, water rises moderately to a moderate distance.

Conclusion

- Clay soil has the highest capillarity of water.
- Sand soil has the lowest capillarity while loam has moderate water capillarity.

Explanation

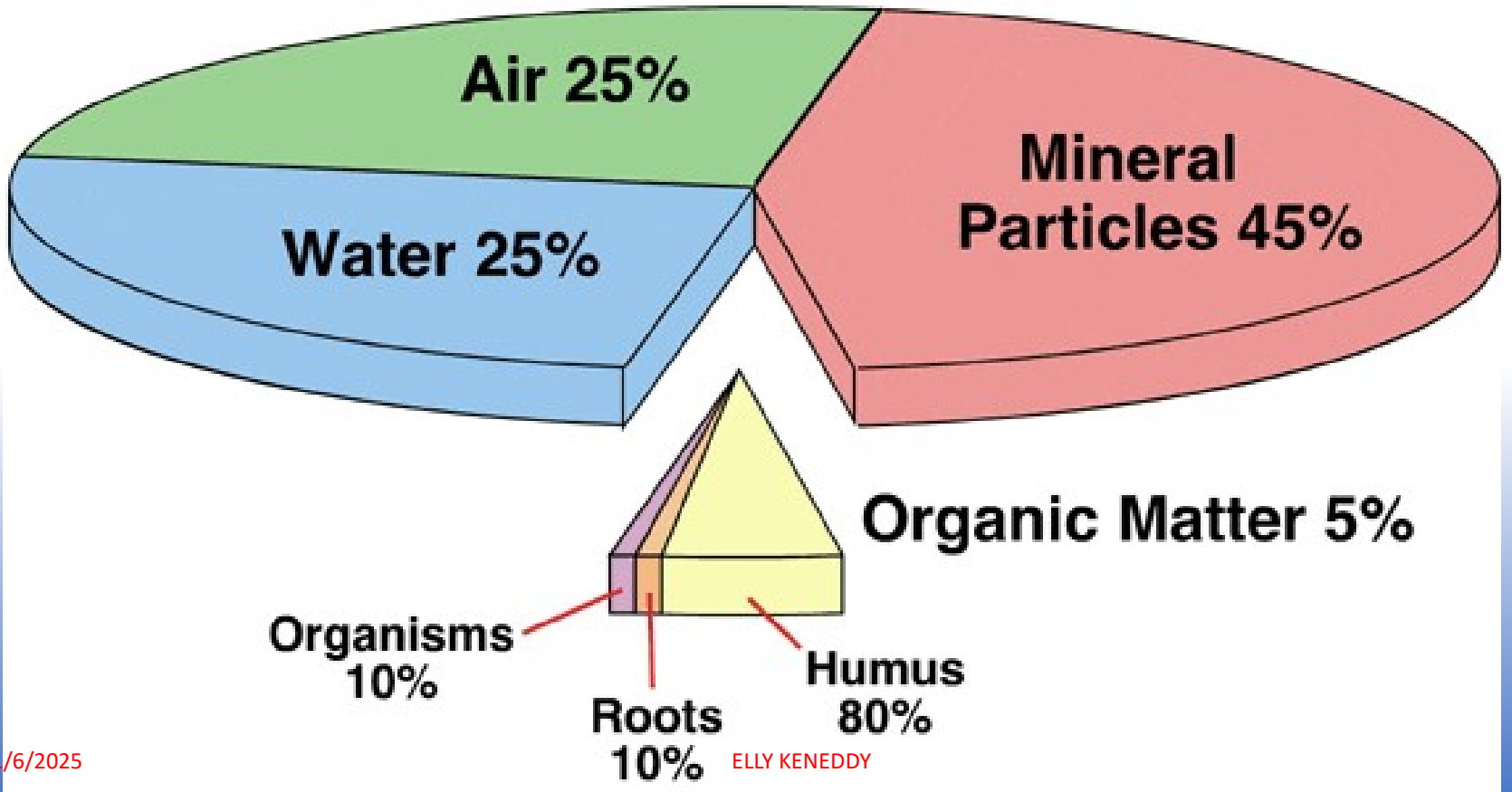
- Water rises to the greatest height at the nearest stages of the experiment in sand soil because sand has large spaces that enable water to rise more rapidly in the first hours.
- Clay soil shows the highest rise of water hence the highest water capillarity because it is composed of tiny soil particles which present the large surface area over which water molecules cling.
- Water rises at a slow rate in clay soil because clay has small air spaces between its particles.

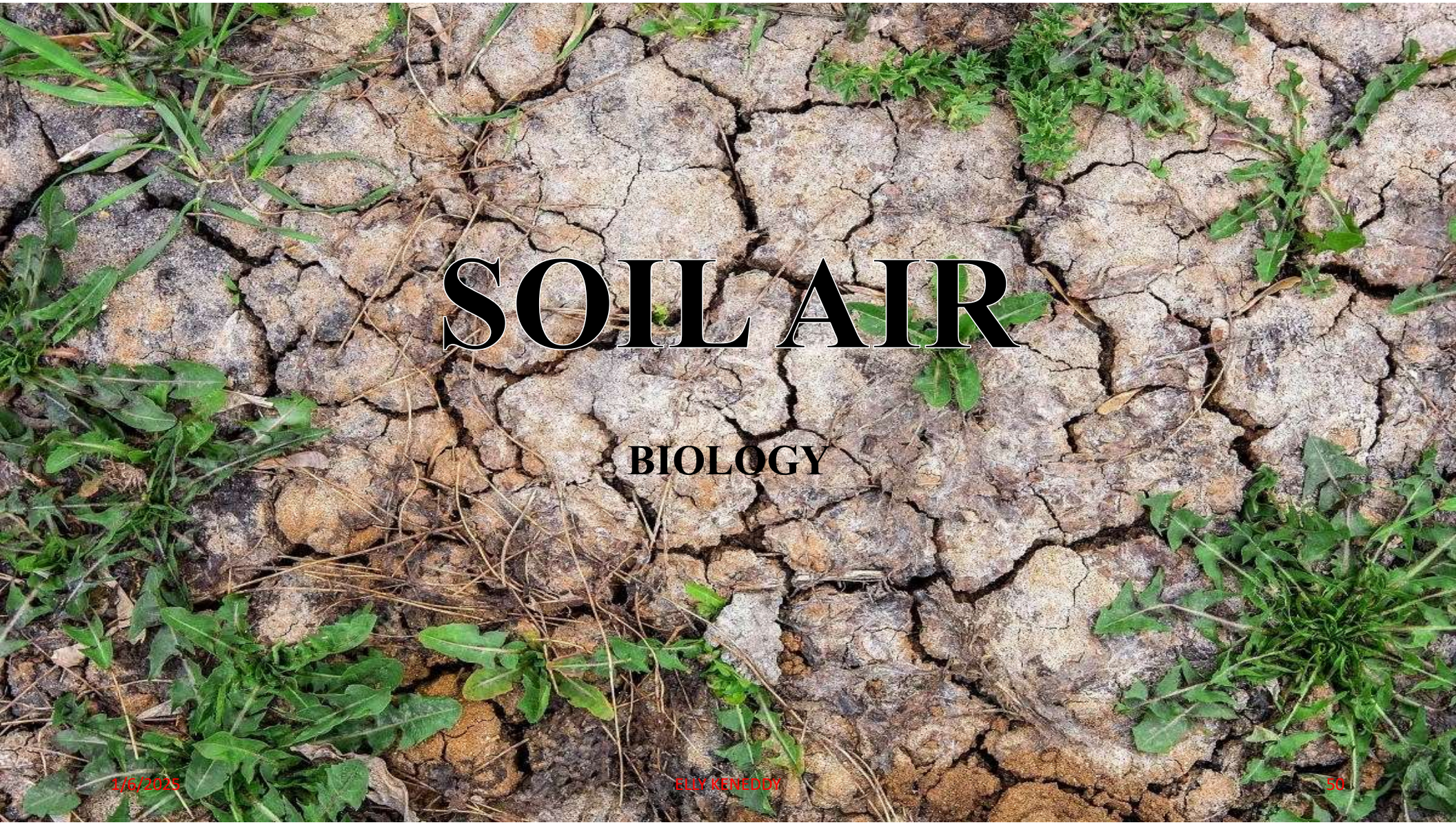
COMPONENTS OF SOIL

There are basically six components of soil. These are:

- **Inorganic particles,**
- **Humus**
- **Water**
- **Air**
- **Mineral salts**
- **Soil living organisms.**

COMPONENTS OF SOIL.





SOIL AIR

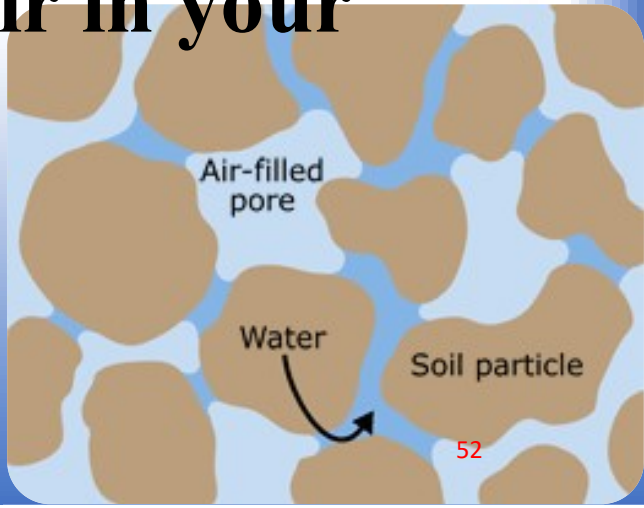
BIOLOGY

INTRODUCTION

- **Soil air** exists between the soil particles. Airspaces in the soil are important for growth of plant roots and health of soil organisms.
- It is mainly oxygen and nitrogen. (Carbon dioxide is usually in solution as carbonic acid).
- The depth to which the roots can grow depends on how deep the air can penetrate through the soil

INTRODUCTION.

- Recall the components of soil and mention them.
- Is soil air important?
- If yes, **discuss the importance of soil air in your groups.**



RESPONSES

- It provides oxygen for respiration of soil organisms and plant roots.
- Provided Oxygen needed for the decay of materials that produces humus.
- It also provides nitrogen for fixation by the nitrogen-fixing bacteria in the soil. The nitrogen absorbed is needed in the formation of nitrates and proteins.
- Carbon dioxide present in the air helps in increasing soil acidity which favors proper growth of some plants.
- Carbon dioxide present in the air dissolves in water to form carbonic acid for weathering.

DETERMINING PERCENTAGE COMPOSITION OF SOIL COMPONENTS.

SOIL AIR.

AIM : to determine the percentage of air in the soil

Apparatus

- Measuring cylinders
- Dry soil sample
- Water
- Glass rod

PROCEDURE

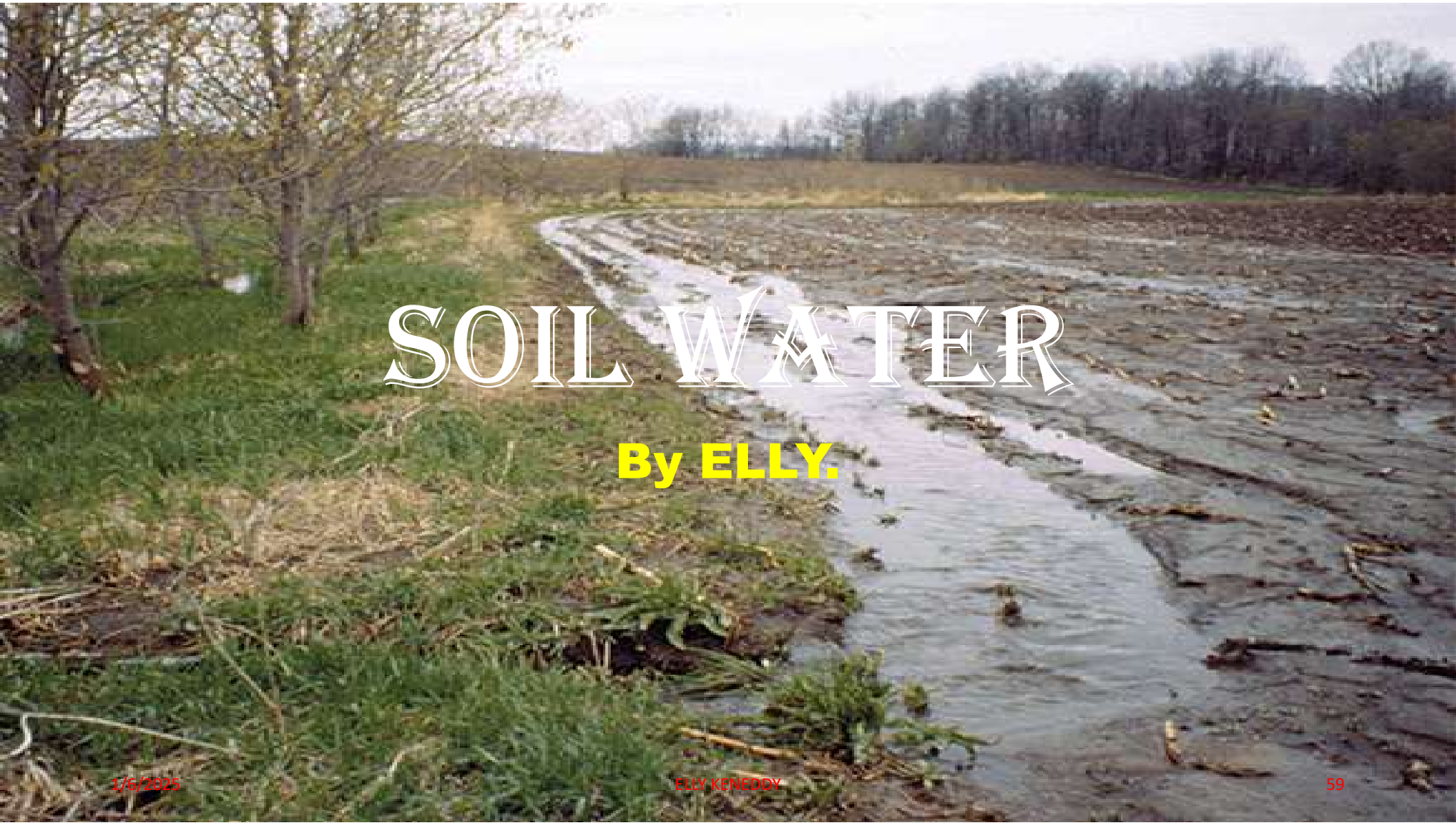
- Measure about 50cc of dry soil in a measuring cylinder and tap the container to level out the soil.
- Measure 50 cc of water in another measuring cylinder.
- Add the two together (observe carefully as you pour the water onto the soil)

PROCEDURE

- Allow the mixture to stand until no more bubbles appear. Read and record the final level of water plus soil in the measuring cylinder.
- Calculate the volume of air in the soil sample as below

CONT.....

- Volume of air= (**volume of soil + volume of water**)-**final volume of mixture**
- Percentage of air in soil sample = $\frac{\textbf{Volume of air in soil}}{\textbf{Volume of soil used}} \times 100\%$
- Which of the soil samples has the highest percentage.


SOIL WATER
By ELLY.

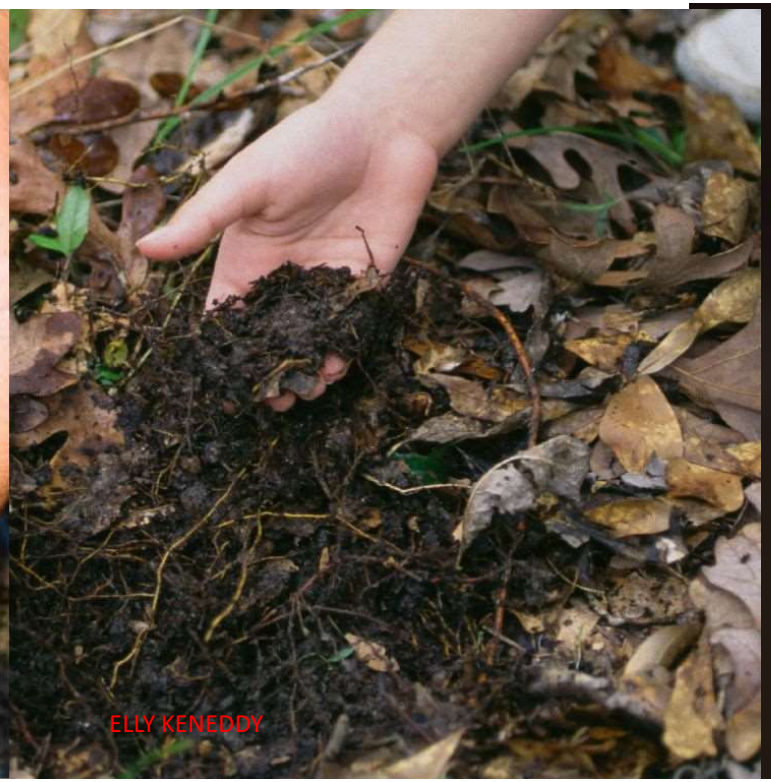
WATER

INTRODUCTION

- Soil water comes from rain.
- Also some rise up from the ground water by **capillary action** to replace water lost by **evaporation** from the surface.
- It is found as a thin film surrounding the soil particles.

TASK.

- Discuss the functions of water in soil towards survival of organisms.


SOIL WATER FUNCTIONS

- It **moistens soil** and keeps it humid/moist, **making it favorable for survival of micro-organisms.**
- It **dissolves mineral salts** making them **available for plants** to take.
- It dissolves carbon dioxide produced by living organisms **to form carbonic acid** which **causes chemical weathering** of rocks.
- It is a **raw material for photosynthesis**.
- Water absorbed from the soil **allows plant cells to be rigid (turgid)**, and this is very important for **support of the plant**, particularly herbaceous plants.

DETERMINING PERCENTAGE COMPOSITION OF SOIL WATER.

SOIL WATER.

Aim: Determining percentage composition of soil water.

APPARATUS:

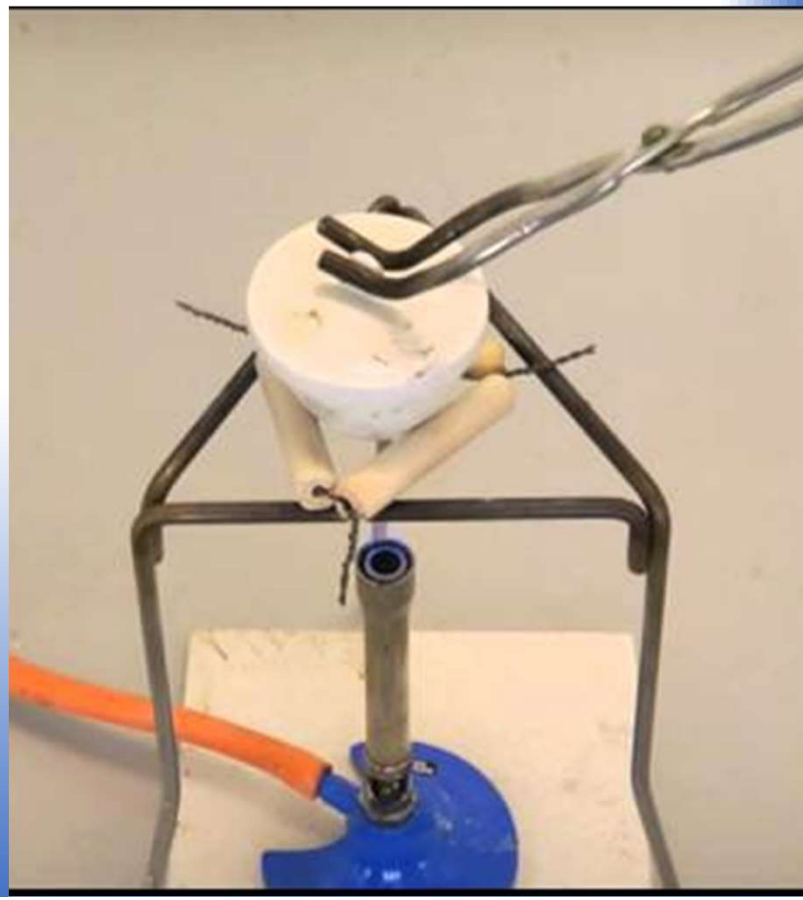
- Evaporating dish
- Fresh soil
- Weighing scale
- Bunsen burner. (Heat source)
- Tripod stand
- Wire gauze.

PROCEDURE

- Weigh a clean evaporating dish and record its weigh.
- Fill the evaporating dish with soil and record the weight of the soil plus the evaporating dish.
- Dry the soil by heating it gently over a Bunsen burner flame for about 30 min as shown below

CONT.....

- Heating and weighing is repeated until a constant mass is achieved. (Take care not to burn the soil (no smoke))
- Re-weigh the soil and the evaporating dish.
- Then calculate the water content in the soil sample as



RESULTS

- ✓Weight of the evaporating dish= X
- ✓Weight of soil + evaporating dish = Y
- ✓Weight of soil + evaporating dish after heating = Z
- ✓Weight of soil sample = Y-X
- ✓Weight of water in the soil sample = Y-Z

✓Percentage of water = $\frac{\textbf{Weight of water}}{\textbf{Weight of soil}} \times 100$

BY ELLY

THANKS FOR AUDIENCE

DETERMINING THE PERCENTAGE OF HUMUS

BY ELLY KENY

INTRODUCTION

- **Humus** is decaying plant and animal material- the dead bodies of animals, fallen leaves, dead plants and animal droppings.
- It is a dark brown, rather sticky material that gives soil its **dark color**.
- For the decay process that form humus to work properly plenty of oxygen is needed.

EXPERIMENT TO DETERMINE THE PERCENTAGE OF HUMUS IN THE SOIL

- **AIM** : To determine the percentage of humus in the soil

Apparatus:

- Crucible
- Soil sample
- Weighing scale
- Heat source
- Wire mesh
- Tripod stand

PROCEDURE:

- ✓Weigh a clean empty crucible and record its weight (W g).
- ✓Half fill the crucible with soil and record the exact weight of soil plus crucible on weighing scale (X g).
- ✓Dry the soil by heating it in an oven at 105C to constant weight (Y g) (the loss in weight of soil at this temperature is due to the water driven out by evaporation)
- ✓Reweigh the soil and crucible and record the weight
- ✓Heat the dried soil on a crucible to redness in an oven.
- ✓Weigh the soil after cooling and record its weight.
- ✓Repeat this till a constant weight is achieved (Z g).

RESULTS

- Weight of crucible = **W** g
- Weight of crucible + fresh soil = **X** g
- Constant weight of soil + crucible after heating at 105^0C = **Y** g
- Constant weight of soil + crucible after heating after heating to redness = **Z** g

Calculations.

- Weight of soil = X - W
- Weight of dry soil = Y-W
- Weight of dry soil after burning off humus = Z - P
- Weight of humus = Y - Z g

CALCULATION.

- Percentage of humus = $\frac{\textbf{weight of humus}}{\textbf{Weight of soil}} \times 100\%$

- Percentage of humus $= \frac{(Y-Z) \times 100}{X - W}\%$

IMPORTANCE OF HUMUS

- Soil rich in humus absorbs more heat, and this warmth is useful for the germination of seeds.
- It forms a sticky coat around soil particles and binds several together to form soil clumps. The clumps structure greatly improves the drainage of the soil.
- Humus retains moisture and minerals in the top soil and so, greatly reduces the effects of drying and leaching (washing of minerals).
- It is a source of nutrients used by plants after it is decomposed.
- It improves soil aeration.
- It improves soil structure by reducing the sticky properties of clay.
- It stabilizes soil ph.
- It leads to improvement of activities of soil organisms by providing them with food and shelter.

SOIL EROSION AND CONSERVATION.

LEARNING OUTCOMES.

- Know the features of fertile soil
- Understand the process and factors leading to soil erosion
- Understand the causes of soil infertility and describe methods of soil conservation
- Outline the processes involved in nitrogen cycle and importance of micro-organisms in the cycle.

SOIL FERTILITY

- Soil fertility is the ability of soil to sustain plant growth and give maximum yield.
- Fertile soils contain all the major nutrients for healthy plant growth.

FEATURES OF FERTILE SOIL

- Observe the 2 soil samples carefully.
- Which of the soil samples is fertile? Give a reason.
- In your groups discuss the features of fertile soil.

FERTILE SOIL

RESPONSES

- **High Cation Exchange and Water Holding Capacity**: Fertile soil has the ability to retain essential nutrients and water, allowing plants to access them efficiently.
- **Adequate Humus and Organic Matter Content**: contributes to soil fertility. It improves soil structure, nutrient availability, and water retention.
- **Good Soil Structure and Drainage**: Fertile soil has a well-balanced structure that allows for proper aeration, root penetration, and efficient drainage. This ensures that excess water doesn't accumulate around plant roots.
- **Optimal Soil pH (6.0 to 6.8)**: Soil pH affects nutrient availability. Fertile soil typically falls within the slightly acidic to neutral range, promoting nutrient uptake by plants.
- **Rich in Nutrients and Minerals**: Fertile soil contains essential nutrients like nitrogen, phosphorus, and potassium necessary for plant growth.
- **Absence of Toxic Substances**: Fertile soil is free from harmful substances (such as heavy metals or excessive salts) that could inhibit plant growth.

Which of the soils is fertile and infertile? Give reasons for each

A

B

SOIL EROSION.

One of the major causes of loss of soil fertility is soil erosion

Carefully listen and watch the video and basing on it: **Define of soil erosion**.

- Agents of soil erosion and the process
- Human activities that contribute to soil erosion.

SOIL EROSION

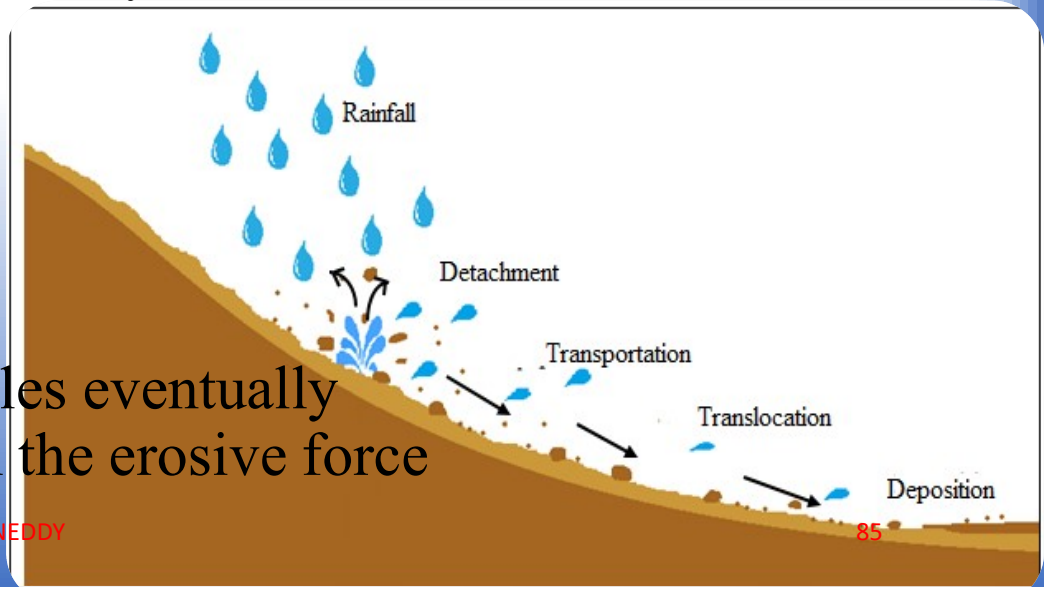
- This is the removal or washing a way of top soil by animals, wind or running water. The extent of soil erosion is dependent upon the intensity with which the rain falls and the nature of wind currents.

Agents of soil erosion.

- Wind
- Running water
- Animals
- Moving ice(glacier)

PROCESS OF SOIL EROSION

- **Detachment**: this refers to the loosening of the soil particles. soils particles susceptible to detachment are easily eroded.
- **Transport**: Soil particles that become detached need a medium to transport them. These are carried by either water or wind
- **Deposition**: Once transported, soil particles eventually settle or deposit. Deposition occurs when the erosive force (wind or water) loses energy



SHEET EROSION

- This is where thin uniform layers of soil are eroded over the whole slope.

RILL EROSION.

- This is where water cuts shallow channels called rills.
- The channels deepen as volume of water run off increases.

GULLEY EROSION

- This results from rill erosion when the channels deepen and form galleys.
- Here a lot of soil is carried a way over greater distances. It is facilitated by careless ploughing (up& down the slope). It may follow tracks made by vehicles and from animals

SPLASH EROSION

- Splash erosion or raindrop erosion
- This occurs when intense raindrops displace soil.

WIND EROSION

- In dry conditions, herds of farm animals trample and compact the soil, causing a layer of dust on top. When wind comes, it can blow away the dust.

CAUSES OF SOIL EROSION

Research work.

- Discuss the causes of soil erosion in your society.

RESPONSES

Deforestation

Foliage of trees reduces intensity at which raindrops reach the ground. Extensive falling of trees in an area removes this cover thus facilitating erosion on slopes.

POOR FARMING METHODS:

Deep Ploughing: It lessens the soil and destroys its natural structure.

Failure to replace humus after successive crops reduces water holding properties, so soil dries easily and can easily be blown away.

Ploughing up and down a slope accelerates water erosion.

- **Over cropping**; over use of soil depletes fertility, thus causing loss of plant cover. This leaves the soil bare and so susceptible to erosion.

- **Over grazing**

This is caused by the keeping of many grazing animals on a small area. They finish the grass, i.e. remove the vegetation cover thus exposing the soil to the agents of soil erosion. This makes the soil to easily be carried away.

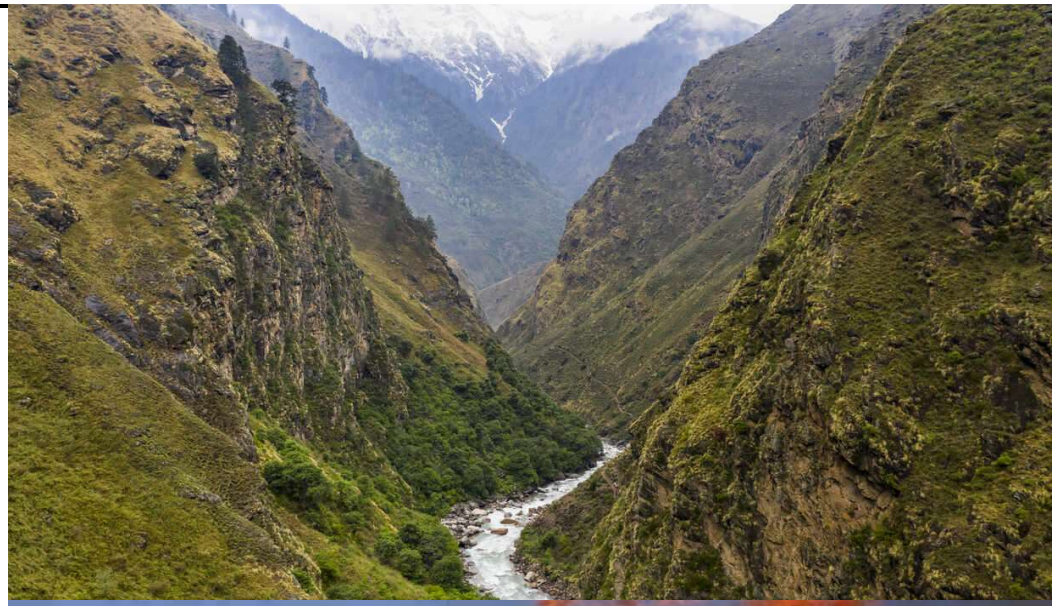
CONT……

- **Sloping nature of land**

The steeper the slope the greater the erosion and this is coupled with the intensity of rain.

- **Bush burning**

Uncontrolled burning of bushes in dry seasons removes the grass top cover, thus leaving the soil bars for erosion.



DISCUSS AND EXPLAIN HOW THESE LEAD TO SOIL INFERTILITY

- Charcoal burning
- Sand mining
- Excessive application of fertilizers
- Poor disposal of polythene bags
- Flooding

RESEARCH.

- In your respective groups, discuss the different methods of controlling soil erosion.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RESPONSES.

- **Contour ploughing**

Ploughing a long contours i.e. across a slope and not up and down. It allows furrows to trap water rather than to channel it a way.

- **Strip cropping**

This consists of alternate bands of cultivated and uncultivated soil, following contours. **Un tilled soil is covered with grass**. By alternating the grass and crops each year, the soil is allowed to rebuild its structure while under grass.

Terracing : This is cultivation a long contours in horizontal strips supported by stones or walls, so breaking up the step down water rush of the surface run-off. The steeper the slope, the closer the terraces must be.

Afforestation :This is the Planting large areas of land with trees. They act as wind brakes, hold the soil together, and prevent raindrops from hitting the soil directly They conserve water and control flooding.

Mulching

covering of top soil with plant material e.g. banana leaves, maize stems after harvest, cut grass etc. it protects the top soil and conserves the water in the soil.

Bush fallowing

It involves leaving land under bush that is not under use. The bush covers the soil hence protecting it from agents of erosion.

Planting cover crops

These crops are planted to protect the soil from the rain drop impact, direct wind and prevent water from running off the soil surface. Cover crops include paspalum. These hold the soil and prevent direct contact of water or wind with soil.

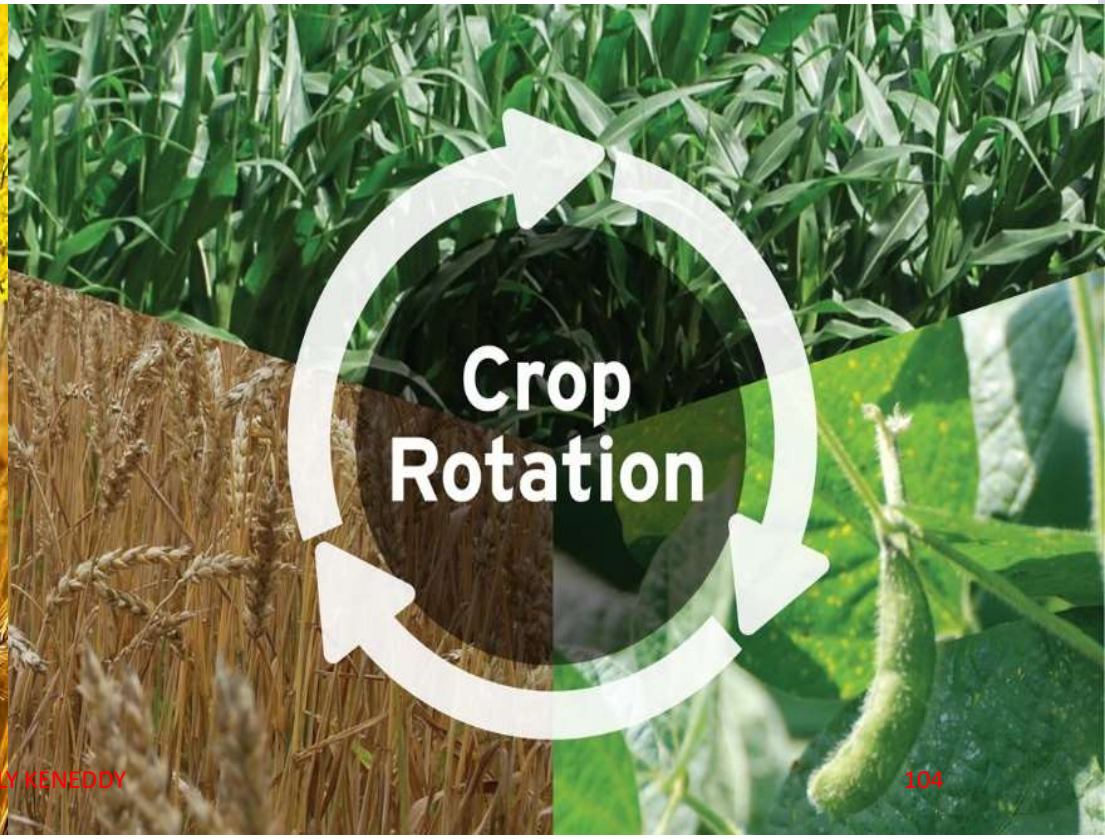
SOIL CONSERVATION

- This is the protection and careful management of soil to maintain its fertility. It includes methods of controlling erosion and others such as:

Intercropping

- Here, plants are alternately planted in a systematic or even random manner e.g. coffee, beans, and banana can be intercropped.
- **Fallowing** : Land is left to rest and grow back to bush.

- **Crop rotation** :The farmer carefully rotates his crops season after season, so that the plants make different demands on the soil.
- Deep rooted crops like cassava are rotated with shallow rooted ones e.g. g. nuts



APPLICATION OF MANURE (ORGANIC MANURE)

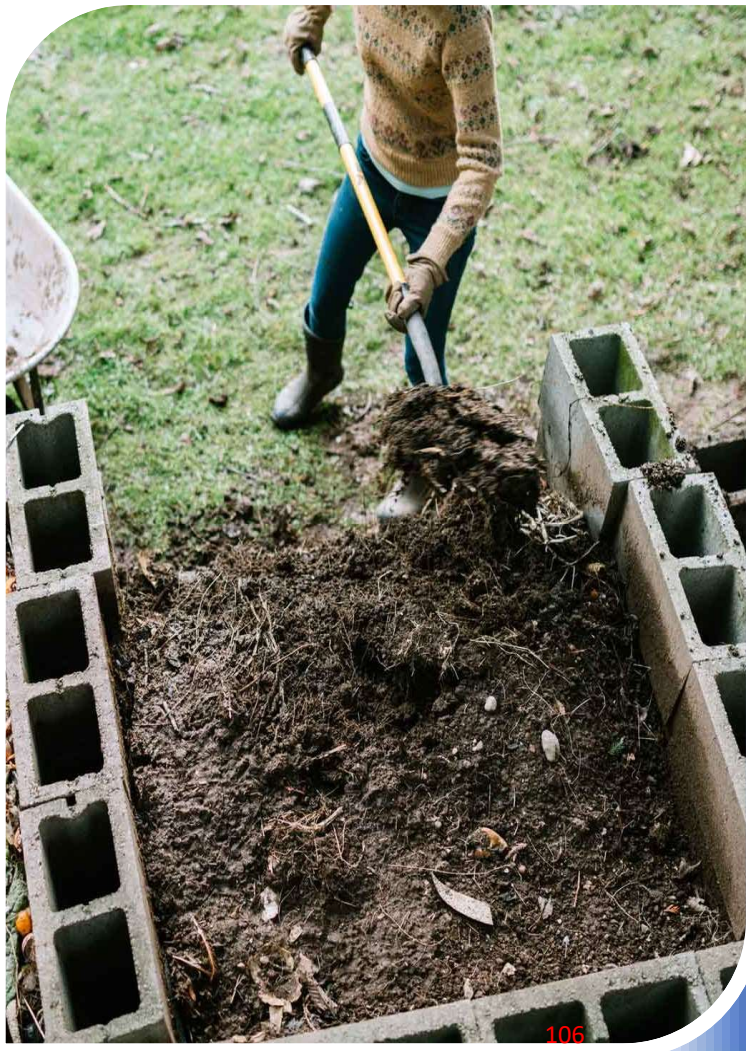
Green manure; These are green plants, mostly legumes which can be dug back into the soil. However, any available green plants can do.

Farm yard manure; This is from wastes of farm animals like urine and feaces when left become manure. This improves the process of nitrification (addition of nitrates to the soil) e.g. poultry dropping, goats, pigs, cows etc.

- **Compost manure**; This is made by collecting all available organic materials like **chicken waste, weeds, fresh leaves** into a pit with alternating layers of soil, and leaving them to rot.

✓Water is added periodically to keep it moist for bacteria and fungi in the soil speed up the process.

✓When well decayed, the compost is spread over the garden. Organic manure **adds humus** to the soil and maintains the crumb structure



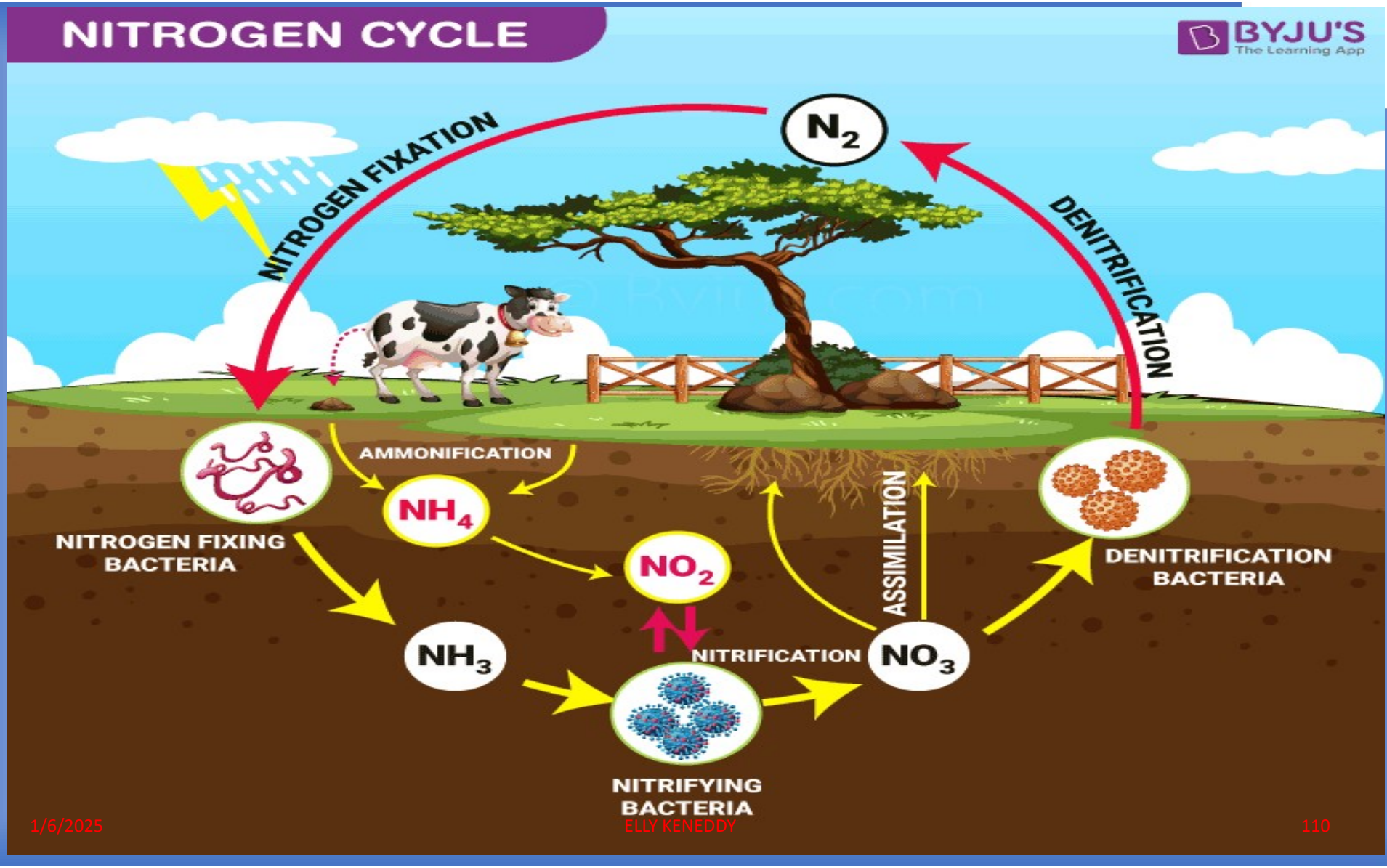
- **Artificial fertilizers;** These are added directly.
- The most common element lacking in highly cultivated soils are **nitrogen, phosphorus** and **potassium**.
- They are supplied in form of $K2SO_4$, $(NH4)_2SO_4$ and calcium phosphate which lead to high yield.

RESEARCH

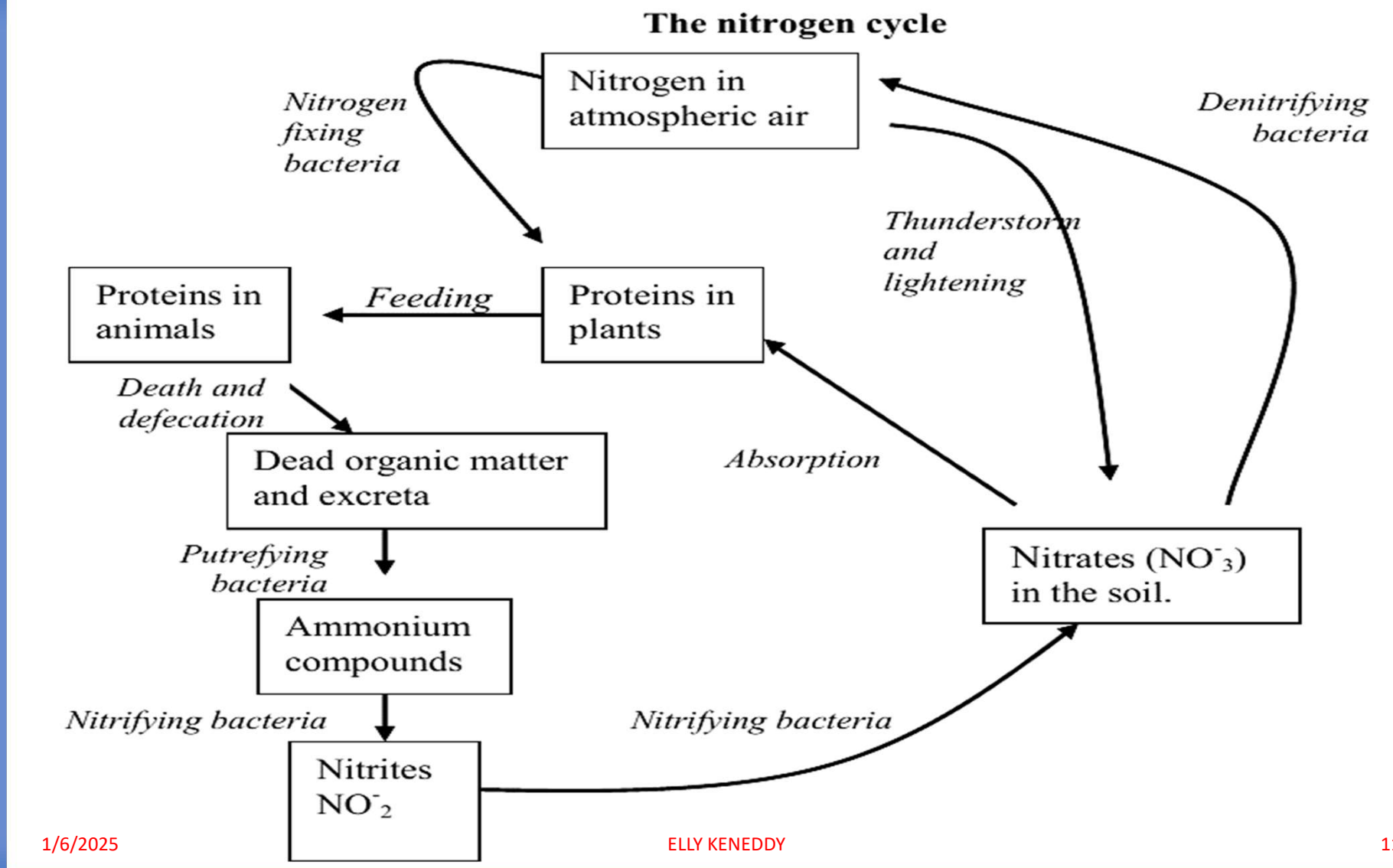
- ✓Why is it necessary to conserve soil?
- ✓Name the nutrients that may be lost if soil is not conserved?
- ✓How relevant are these nutrients to the plant?

THE NITROGEN CYCLE

- Nitrogen is one of the elements that make up proteins. Nitrogen makes up to 78% of air but it **is un reactive** so **cannot be used by plants and animals in its elemental form**.
- It becomes part of the bodies of organisms in a process called the **nitrogen cycle**.
- Nitrogen is in constant circulation between autotrophs, heterotrophs, and the soil in atmosphere.
- The changing of nitrogen into more reactive forms is called **nitrogen fixation**.


NITROGEN CYCLE
BYJU'S
The Learning App
N_2
NITROGEN FIXATION
DENITRIFICATION
AMMONIFICATION
NH_4
NITROGEN FIXING BACTERIA
NO_2
ASSIMILATION
DENITRIFICATION BACTERIA
NH_3
NITRIFICATION
NO_3
NITRIFYING BACTERIA

- Nitrogen fixation takes place during **lightening**, in the **manufacture of artificial fertilizers** and in the **metabolism of the nitrifying** and **nitrogen fixing bacteria.**
- Plants absorb nitrogen inform of **nitrates** and **ammonium salts**, for manufacture /build up of **proteins** they require.
- Animals obtain nitrogen they need by **eating plants**
- **At death** or by **leaf fall, egestion, excretion (urine**), the nitrogen of plants and animals is returned to the soil.
- Denitrification : process by which nitrates are converted back to nitrogen by denitrifying bacteria


The nitrogen cycle
Nitrogen in atmospheric air
Nitrogen fixing bacteria
Denitrifying bacteria
Thunderstorm and lightening
Proteins in animals
Feeding
Proteins in plants
Death and defecation
Dead organic matter and excreta
Absorption
Putrefying bacteria
Nitrates (NO^-_3) in the soil.
Ammonium compounds
Nitrifying bacteria
Nitrifying bacteria
Nitrites NO^-_2

SUMMARY

- The nitrogen cycle involves 4 major processes i.e. :
- **Nitrogen fixation**: atmospheric nitrogen is converted to nitrogen compounds utilized by plants
- **Nitrification**: ammonia compounds are converted into nitrites and nitrates. It is done by bacteria such as **nitrococcus** and **nitrosomonas** and these are known as **nitrifying bacteria**(**nitrobacter**)
- **Ammonification** : conversion of plant and animal remains into ammonia compounds
- **Denitrification** : process by which nitrates are converted back to nitrogen by **denitrifying bacteria**
- Lightening releases energy that provides energy to combine nitrogen with oxygen to form NO_2 which dissolves in water to form nitric acids.

THANKS FOR AUDIENCE

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