B. Mechanical methods

1. **Wind breaks**: these are lines of trees planted perpendicular to the direction of prevailing wind to shield the soil from blowing effect
2. **Contour ploughing**; this is the ploughing of the land across the slope. i.e. along the contours and the furrows between the contours used to trap water and the soil
3. **Gabions**: these are wires or net baskets filled with stones built along the slope and gullies
4. **Terracing**: these are series of steps cut across a sloping piece of land purposely to reduce the speed of running water
5. **Use of stones**: this involves heaping of stones along the slope to trap any soil being washed down
6. **Dams and weirs**; these are constructed to store and conserve excess water that would cause soil erosion
7. **Absorption banks**: these are constructed in the field to encourage retention of soil and water. it can also be used to store water on the farm for farm use.
8. **Barriages**: these are the barriers built of stones or concrete across the gully to reduce the speed of running water and encourage sedimentation of soils
9. **Diversion channels**: these are channels constructed on the upper parts of the field to trap the running water and carry it along the sites of the field
10. **Bands**: these are heaps of soils built across the slope to reduce water run off.
11. **Ridges**: these are formed by pilling up the top soil along the contour to increase the depth of soil and water infiltration.

Advantages of ridges

- Increase water infiltration into the soil
- Encourages proper growth of crops like Irish potatoes and sweet potatoes.
- Retains the soil in one place
- Reduces surface run off on the land

12. **Trash lines**: these are lines of vegetative material(trash) lied on a sloping land. It can be banana leaves, grass, e.t.c.
13. **Grass water way** : these are strips of land planted with grass along the contour or the grazing land to reduce run off.

Qualities of a good cover crop

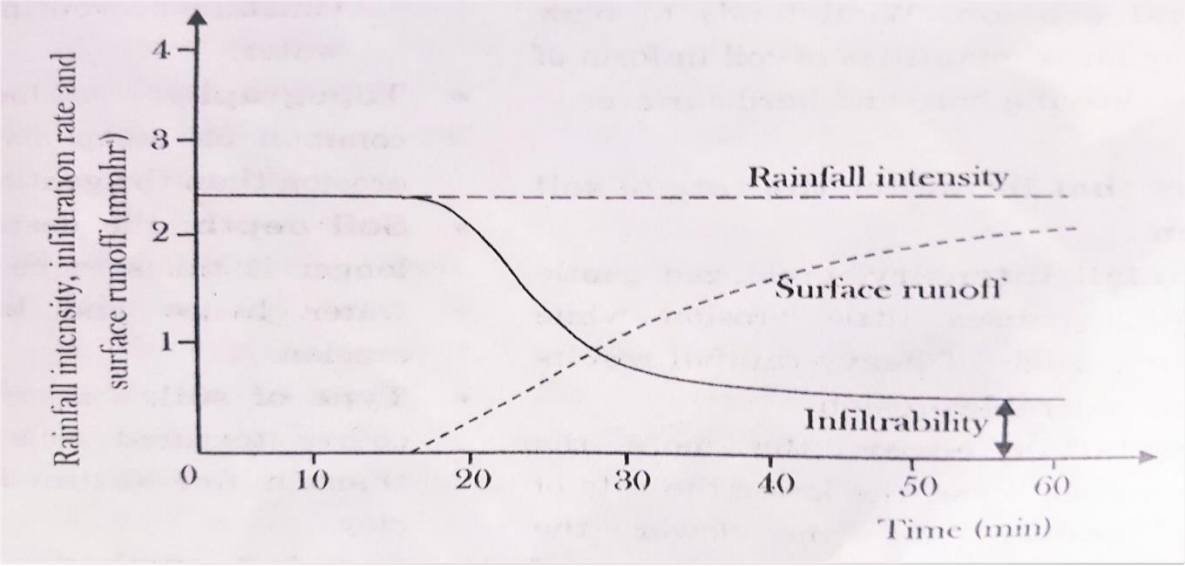
- It should require less labour to facilitate
- It should be resistant to drought conditions
- It should be resistant to pests and diseases
- It should be easy to remove from the soil when not required
- It should be resistant to slashing and pruning
- It should be able to grow in a wider variety of ecological conditions.

- It should be leguminous hence able to fix nitrogen into the soil to increase fertility
- It should be able to grow rapidly/vigorously i.e. faster to cover the surfaces
- It should be leafy so that it can spread all over the surface

Roles of vegetation in soil and water conservation

- They help in rainfall formation hence improving the soil moisture content
- They cover the soil from direct sunshine hence preventing evaporation of water from the sun
- Increases water infiltration by breaking the speed of running water
- It acts as wind breaks hence controlling wind erosion
- It adds organic matter to the soil which binds the soil particles together e.g. leaf debris
- Tree canopies intercepts rain drops hence reducing their impacts on a bare grand
- The roots binds or holds soil particle together hence preventing erosional effects
- Soil particles may be heaped by the vegetation hence reducing their movement
- It provide a mulch for the surfaces of the soil when leaves fall and decompose on the land
- Legumes fix nitrogen into the soil hence improving on its nutrient value.

HOW WATER RUNOFF OCCURS IN DRY SOILS



The rain falling on the soil surface is drawn into the pores under the influence of both junction and gravitation.

If the rainfall intensity is less than initial infiltration rate (IR), all the water is absorbed into the soil

In the early stage of wetting a dry soil, suction gradient is common. However as the water content increases with depth, the suction gradient decreases as water penetrates deeper into the soil.

This effect together with structural changes in the surface, following the rain drop impact which reduces the available porosity, causes the infiltration rate to fall below the rainfall intensity with in the few minutes of raining

At this stage, ponding of water on the surface depression occurs leading to surface runoff when the whole soil profile has been rewetted

Water flows steadily downwards in response to gravitational head gradient and a constant and infiltrability is observed

WATER HARVESTING

This is the method of collecting and concentrating various forms of run off from different sources .

There are two classes of water harvesting namely ;

- Flood water harvesting
- Rain water harvesting.

N.B.Rain water harvesting system is made up of the following .

- Runoff producing area i.e the roof of iron sheets.
- Run off collecting area i.e the gutter.
- Run off storage structure i.e the dam

METHODS OF WATER HARVESTING

They are divided into two namely.

a. **Macro catchments**

These handle or store large volumes on the farm and include the following;

- Roof catchment ;The roof is used to trap and store water in a tank or reserviour for later use .
- Rock catchment ;These reservoirs are located on a bare rock surface with enough water catchment to capture rain water .
- Dams;These are depressions constructed across rivers to store water .
- Weirs ;These are barriers constructed across a river to collect and store water.

- Ponds;These are excavated holes on the ground that are sealed with concrete to harvest and store run off.
- Retention ditches ;These are small ditches made along the contour to collect and retain running water so that it can infiltrate into the soil.

b. Micro catchments.

These handle or store small volumes of water on the farm and they include;

- Ridges;These are basins with leveled bottoms constructed between raised heaps of soil to collect water .
- Tree catchments ;The tree trunks can be used to trap water for farm use e.g in forested areas .
- Semi- circular bunds;These are semi- circular holes constructed around a given crop or tree to trap water.
- Planting pits ;These are circular holes about 90cm in diameter surrounding a raised bed planted with crops .

SOIL SAMPLING

This the process of obtaining small quantities (samples) of soil from different parts of the field /garden to be taken to the labarotory for analysis /study.

Objectives / aims / reasons of sampling soil.

- To know the pH of the soil
- To know the organic matter content of the soil.
- To determine the moisture content of the soil.
- To determine the drainage rates and water holding capacity .
- To know the amount of air i.e aeration of the soil .
- To know the mineral content of /fertility level of the soil.
- To find out the presence of living organisms in the soil e.g soil fauna and flora ,macro and microorganisms.
- To know the capillarity of the soil .
- To know the structure and texture of the soil .
- To determine the lime requirements of the soil or area .
- To establish the most suitable programme of soil improvement (amendment).
- To fairly estimate how much increase in crop yields is expected after applying a certain fertilizer.
- To know the type to be grown in the soil e.g cotton and tea prefer acidic soils .
- To know the type of fertilizer to apply into the soil e.g nitrogenous fertilisers should not be applied in acidic soils.

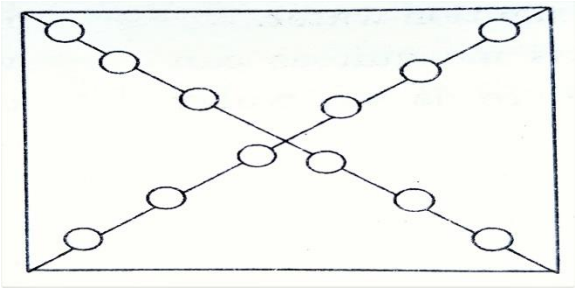
NOTE; After analysis, appropriate recommendations are made as to how the farmer can improve his soil by either applied fertilizers or other good farming practices .

Methods of soil sampling.

There are two (2) methods of soil sampling and these include;

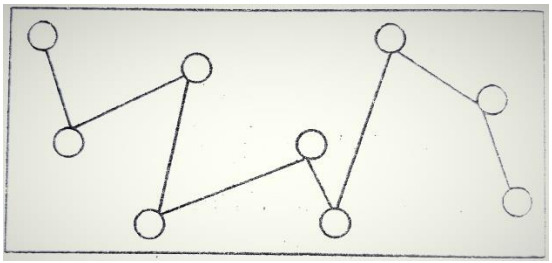
1. **Transverse/Grid method** .

In this method ,the samples are taken to from the sites that are selected to run diagonally from one corner to another as shown below.



2. **Random /Zig-Zag method.**

In this method ,the samples are taken from sites that are randomly chosen in a zig-zag format or pattern as shown below.



SITES /UNUSUAL AREAS TO AVOID WHEN GETTING SOIL SAMPLES.

- Under the trees due to too much organic matter content.
- Near manure heaps.
- Kraal
- Sty
- Near fences i.e along the fence line.
- Foot path /road embarkments with compacted soil structure.
- Ditches/channels/furrows.
- Areas with decayed vegetation.
- Areas where vegetation has been burnt.
- Ant hills.

- On house sites due to compaction of soil structure .
- Extremely wet areas /water logged or marshy /swampy area due to too much leaching.

TOOLS USED IN SOIL SAMPLING.

- Panga /cutlass /knife –For clearing land .
- Hand trowel-for cutting slices of soil.
- Wheel barrow-for carrying soil samples from the field.
- Hand hoe-for cutting verticle slices of soil.
- Shovel and spade-for cutting slices of soil ,scooping soil into the wheel barrow.
- Soil auger-usedto determine the depth of soil samples.

NB: Samples from unusual sites or areas give misleading result therefore the areas should be avoided.

PROCEDURE FOR OBTAINING A SOIL SAMPLE.

- Determine the size of the land area where sampling is to be carried out.
- Obtain the materials and equipments needed for sampling e.g polythene,soil auger,and shovel.
- Clean the equipment to be used.
- Determine the method to be used in sampling.
- Determine the area /spots from which samples are to be taken .
- Clear the vegetation around the area from which you are going to get the soil sample.
- Make a vertical cut into the soil to a depth of 15-25cm for crop land and 5cm for pasture land.
- Take a slice from the vertical cut made or use a soil auger to scoop out the soil.
- Collect the soil from many points or sites usually 15-20 on average .
- Mix the soil thoroughly to get a representative or composite sample .
- Dry the representative sample under controlled temperature.
- Put the representative sample in a container e.g soil tube or bag .
- Label the container using a tag from both inside and outside with the following information .
    1. Name and address of the sender.
    2. Plot or field number.
    3. Place of location.
    4. Date of sampling.
- Carry the sample to the laboratory for testing.

Soil testing.

This is the analysis of soil in the laboratory to determine its physical and chemical properties.

REVISION QUESTIONS.

1. a) Explain five factors that influence the rate of soil erosion.(10marks).

   b) Describe the mechanical methods of controlling soil erosion in your area .(10marks).

2. a) Describe the qualities of a good cover crop. (06 marks)

   b) Give four advantages of ridges(04 marks)

   c) Explain the roles of vegetation in soil and water conservation. (10 marks)

3. a) Outline the objectives of soil sampling.(10 marks)

   b) Describe the procedures used when obtaining soil samples in your area(10 marks)

"Stay home, stay safe"