



MANYAM FRANCHISE
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KCSE AGRICULTURE NOTES

TOPIC 6: SOIL FERTILITY I (ORGANIC MANURES)



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MANYAM FRANCHISE
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SPECIFIC OBJECTIVES

Specific Objectives

By the end of the topic, the learner should be able to:

- define soil fertility
- explain how soil fertility can be maintained
- describe how soil loses fertility
- define and distinguish organic matter, manure and humus
- explain the importance of organic matter in the soil
- describe the different organic manures
- prepare compost manure;
- Demonstrate a caring attitude towards soil.

“China's use of 'night soil,' as the Chinese rightly call a manure that is collected after dark, is probably the reason that its soils are still healthy after four millennia of intensive agriculture, while other great civilizations - the Maya, for one - floundered when their soils turned to dust.”

~Rose George

COURSE OUTLINE

SOIL FERTILITY I (ORGANIC MANURES)

Soil fertility

- Definition
- How soil loses fertility
- Maintenance of soil fertility

Organic Manure

- Organic matter and humus
- Importance of organic matter in the soil
- Types of organic manures
 - Green manure
 - Farm-yard manure
 - Compost manure

Note: For each type, describe its preparation, advantages and disadvantages and use

Compost manure:

- Meaning
- Materials used and materials to avoid
- Preparation methods and procedure
 - Heap
 - Pit



SOIL FERTILITY I (ORGANIC MANURES)

Introduction

Soil fertility is the ability of the soil to provide crops with the required nutrients in their proper proportions.

Characteristics of a Fertile Soil

- ✓ Good depth - Good soils give roots greater volume to obtain plant nutrients and provide strong anchorage.
- ✓ Good aeration - for the respiration of plant roots and use by soil organisms.
- ✓ Good water holding capacity - ensures provision of adequate water for plant growth.
- ✓ Proper drainage - ensures provision of adequate air for plant growth.
- ✓ Correct soil pH - different crops have different soil pH requirements.
- ✓ Adequate nutrients supply - it should supply the required nutrients in the correct amounts and in a form available to plants.
- ✓ Free from excessive infestation of soil borne pests and diseases.

How soil loses fertility

- a) **Leaching** - vertical movement of dissolved minerals from the top to the lower horizons of the soil profile.
- b) **Soil erosion** - The removal and carrying away of the top fertile soil from one place to another.
- c) **Monocropping** - This is the practice of growing one type of crop on a piece' of a land over a long time.
- d) **Continuous cropping** - crops take away a lot of nutrients from the soil which are never returned.
- e) Growing crops continuously without giving the soil time to rest makes the soil infertile.
- f) **Change in soil pH** - changes in soil pH affect the activity of soil microorganisms as well as the availability of soil nutrients.



Maintenance of Soil Fertility

- ✓ Soil fertility is maintained through the following methods:
- ✓ Control of Soil Erosion ;
- ✓ Terracing,
- ✓ Contour cultivation,
- ✓ Strip cropping,
- ✓ Cut off drains
- ✓ Planting cover crops.
- ✓ Crop Rotation ;
- ✓ Practice of growing different crops on the same field in different seasons in an orderly sequence.
- ✓ Control of Soil pH :
- ✓ Application of liming materials such as limestone, quicklime, magnesium
- ✓ Burning of vegetation - burning of vegetation cover destroys organic matter. It also exposes the soil to the agents of soil erosion.
- ✓ Accumulation of salts - soils with a lot of salts are said to be saline. State of having too much salt in the soil is referred to as soil salinity.
- ✓ Salts accumulation cause water deficiency in plants. It may also lead to change in soil pH

Carbonate and slaked lime if the soil is acidic.

- ✓ Application of acidic fertilizers if the soil is alkaline.
- ✓ Application of manures.
- ✓ Proper drainage;



Done through:

- ✓ Breaking hard pan.
- ✓ Construction of water channels.
- ✓ Growing crops on cambered bed
- ✓ Pumping out water from the soil.
- ✓ Weed control:
- ✓ Use of herbicides.
- ✓ Slashing
- ✓ Uprooting.
- ✓ Mulching
- ✓ Use of proper farming practices such as early planting, correct spacing and covercrops.
- ✓ Intercropping –
- ✓ Farming practice where different crops species are grown together in the field.
- ✓ Minimum Tillage;
- ✓ Use of herbicides.
- ✓ Uprooting of weeds.
- ✓ Slashing weeds
- ✓ Mulching
- ✓ Strip cultivation.
- ✓ Use of Inorganic Fertilizer;
- ✓ Chemical compounds manufactured to apply specific plant nutrients for example



Calcium ammonium nitrate (CAN).

- ✓ Use of Manure;
- ✓ Well decomposed manures release nutrients into the soil and increase its water holding capacity.

Organic Manures

- ✓ Manures are derived from plants and animal remains.
- ✓ They supply organic matter to the soil which after decomposition releases plant nutrients.
- ✓ The end product of this decomposition is known as humus.
- ✓ It influences soil chemical properties and soil temperature.
- ✓ Manures supply a wide range of essential plant nutrients.

Importance of Organic Matter in the Soil

- ✓ Increases the soil water holding capacity of the soil.
- ✓ Improves soil fertility by releasing a wide range of nutrients into the soil.
- ✓ Provides food and shelter for soil micro-organisms.
- ✓ Improves the soil structure.
- ✓ Buffers soil pH/moderates soil pH
- ✓ Reduces the toxicity of plant poisons in the soil.
- ✓ Moderates soil temperature by its dark colour.

Limitations in the Use of Manure

- ✓ They are bulky - low nutritive value per unit volume.
- ✓ Laborious in application and transport.
- ✓ They spread diseases, pests and weeds.
- ✓ Loss of nutrients if poorly stored.
- ✓ If not fully decomposed crops may not benefit from them.



Types of Organic Manures

- ✓ Green manure.
- ✓ Farm yard manure.
- ✓ Compost manure

Green Manure

Made from green plants which are grown for the purpose of incorporating into the soil.

Characteristics of plants used for preparation for green manure:

- ✓ Have fast growth rates.
- ✓ Have high nitrogen content.
- ✓ Capable of rotting quickly.
- ✓ Capable of growing in poor conditions.

Preparation of Green Manure

- ✓ Plant the green manure crop in the field.
- ✓ Allow the crop to grow up to flowering stage.
- ✓ Incorporate it into the soil through ploughing.
- ✓ Allow the crop to decompose for two weeks.
- ✓ Prepare the field for planting the major crop.

Reasons why green manure is not commonly used/limitations:

- ✓ Most of the plants used as green manure are food crops.
- ✓ Green manure crops may use most of the soil moisture.
- ✓ Most of the nutrients are used up by soil micro-organisms in the process of decomposing the green manure.
- ✓ Planting of the major crop is delayed.

Farm Yard Manure (FYM)

This is a mixture of animal waste and crop residues used as beddings in animal houses.



Factors that Determine the Quality of FYM

- ✓ The types of the animals used.
- ✓ Types of food eaten
- ✓ Types of litter used.
- ✓ Method of storage.
- ✓ Age of farmyard manure.
- ✓ Age of the animals used.

Preparation of FYM

- ✓ Provide beddings in the houses of farm animals.
- ✓ Animals deposit their droppings and urine on the beddings.
- ✓ Animals mix them through trampling.
- ✓ The beddings together with dung are removed and heaped under shed to decompose.
- ✓ After sometime, the materials decompose and FYM is formed.
- ✓ It can then be used in the farm

Factors to consider in selecting site for making compost manure:

- ✓ A well-drained place.
- ✓ Direction of the prevailing wind.
- ✓ Size of the farm.
- ✓ Accessibility.

Preparation of Compost Manure

Two methods:

- ✓ Four heaps method
- ✓ Indore Method (Pit Method)



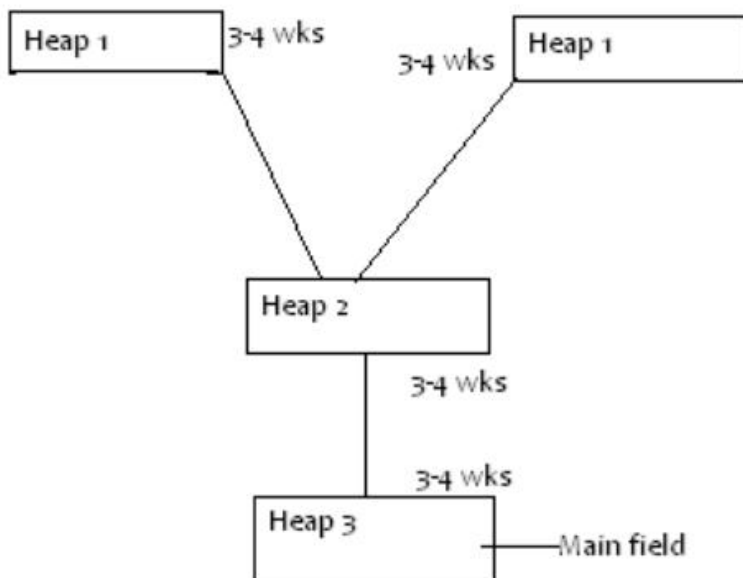
Indore Method (Pit Method)

Procedure;

- ✓ Select a sheltered place with a shade and near the field.
- ✓ Dig a pit with the dimension 1.2m x 1.2m x 1.2m.
- ✓ Place the materials in the following order:
 - ✓ Hedge cuttings or maize stalks to a depth of 30cm as a foundation
 - ✓ A layer of grass, green weeds or leaves and kitchen wastes to 30cm.
 - ✓ A well rotten manure/poultry droppings.
 - ✓ Wood ash and phosphatic fertilizers.
 - ✓ A layer of topsoil to introduce microorganism for the decomposition of organic remains.

Note: Some water should be sprinkled to the materials to initiate the decomposition process and regulate temperatures.

Four heaps method:





Procedure

1. Clear the site.
2. Level the site
3. Four posts 2m high are fixed 1.2m apart from four corners of the heap.
4. Fix wood planks on the sides.
5. Materials are placed in two heaps as in the pit method,
6. The two heaps make up heap 1.
7. After 3-4 weeks, the decomposed material from heap 1 is transferred to heap II.
8. After another 3 - 4 weeks the material is transferred to heap III.
9. After 3-4 weeks it is ready for use in the farm.

Indicators of well decomposed manure

- ✓ Absence of bad odour.
- ✓ Materials are lighter.
- ✓ Manure is brown in colour.

Advantages of Compost Manure

- ✓ One does not have to own livestock in order to prepare it.
- ✓ A lot of manure can be produced within a short time.
- ✓ A variety of materials can be used in its preparation.
- ✓ Uses locally available materials thus cheaper than the artificial fertilizers.
- ✓ Improves the soil structure.



Limitations of Compost Manure

- a) It releases nutrients slowly into the soil.
- b) Large quantities of compost manure are required to supply enough plant nutrients.
- c) Its preparation is labour intensive.
- d) It may induce soil-borne pests and diseases.



*“Spreading manure is a great way of bringing yourself
down to earth.”*

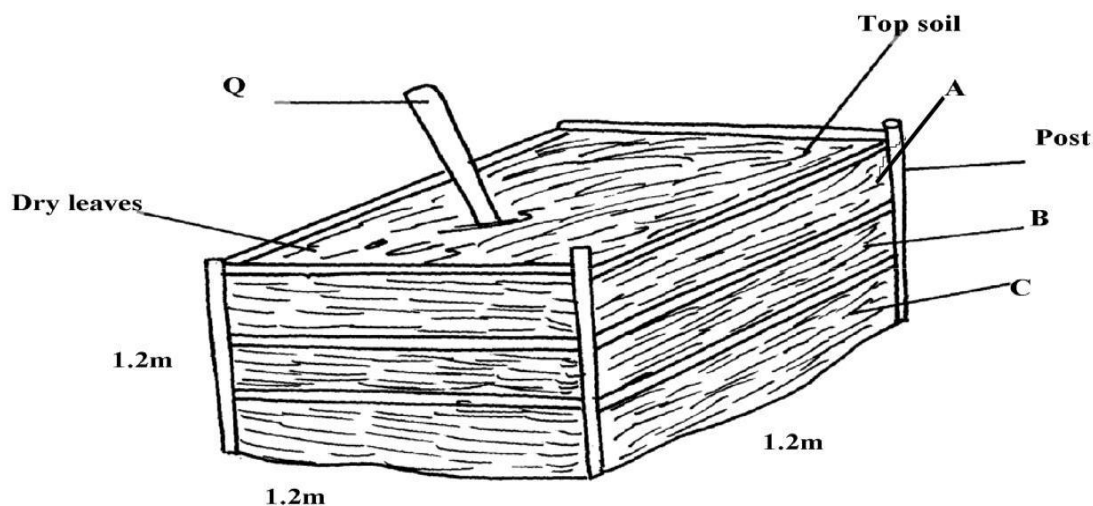
Steven Ford



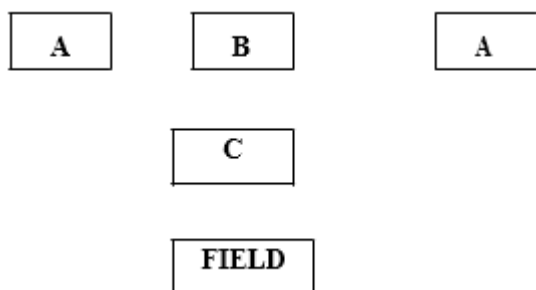


Soil Fertility Questions

1. State two roles of humus in the soil that are beneficial to crops
2. List four characteristic of fertile soil
3. The diagram below illustrates a compost heap. Study it and answer the questions that follow



4. Name the part labeled Q and state its function
5. What is the function of each of the following components in preparation of compost manure
 - a. Top soil
 - b. Wood ash
 - c. Rotten manure
6. The illustration below shows a four heap system of making compost manure. Study it and answer the questions that follow.





7. By use of arrows indicate on the diagram above how the following material should be transferred from one heap to another till the manure is applied in the field.
8. How long does the material take to be ready for application in the field as manure?
9. Give a reason for turning the material in the heap regularly
10. Give two reasons why it is necessary to sprinkle water on the heap
11. Name four indicators of well-decomposed manure
12. State two factors that should be considered when siting a compost manure heap
13. When preparing compost manure, explain the importance of each of the following:-
 - a. Addition of ash
 - b. Regular turning of the compost manure
14. What is leaching?
15. State four advantages of adding organic matter to a sandy soil
16. Describe the preparation of the following farm materials:-
 - a. Farm yard manure
 - b. Hay
17. Explain the factors considered in timely planting of annual crops
18. A ration containing 18% protein is to be made from maize and sunflower cake. Given that maize contains 7% protein, and sunflower seed cake 34% protein. Use Pearson square method to calculate the value of feedstuffs to be used to prepare 100kgs of the feed.
19. A part from Pearson square method, name two other methods that can be used to formulate feed ration