

NUCLEUS

ENGLISH FOR SCIENCE AND TECHNOLOGY

AGRICULTURE

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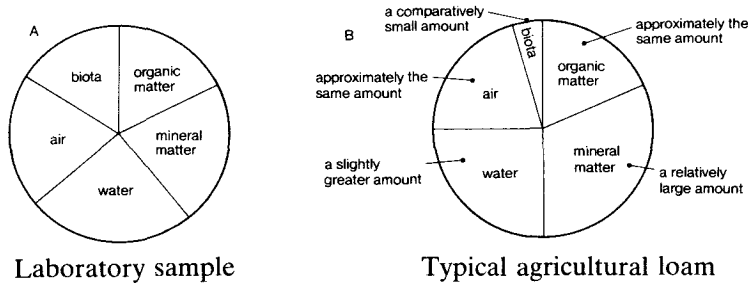
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Unit 7 Measurement 2 Quantity

Section 1 Presentation

1. Look at these pie charts and read:

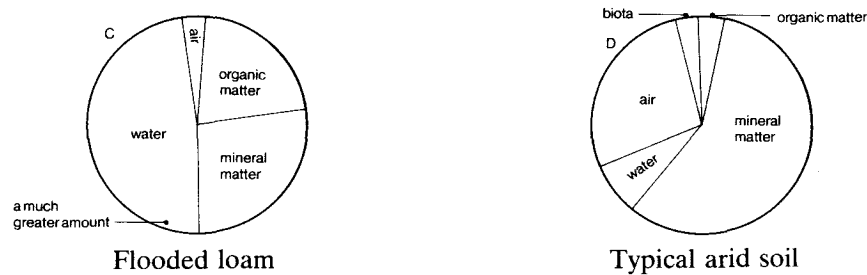
Soil samples



Look at soil sample A first. Compare sample B with sample A.

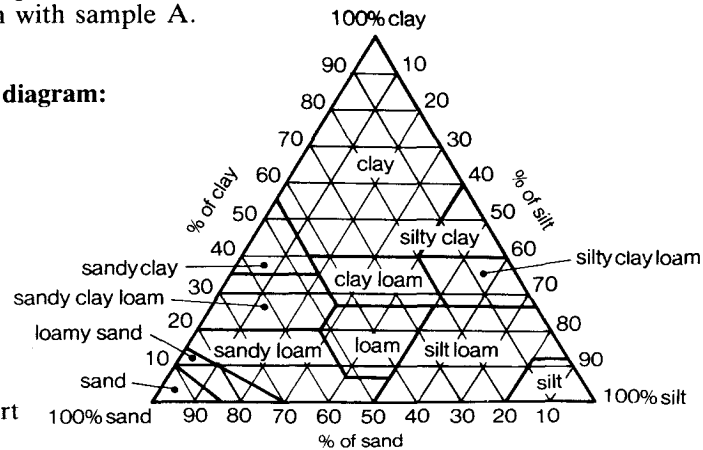
Soil sample B contains *approximately the same amounts of organic matter and air as sample A, a relatively large amount of water and a comparatively small quantity of biota.*

Now look at these pie charts:



Now write descriptions of samples C and D in the same way by comparing them with sample A.

2. Look at this diagram:



Soil texture chart (U.S.D.A.)

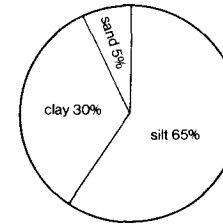
Now read this definition of a silt loam:

A silt loam is a soil which contains a large amount of silt, a fairly large amount of sand and a relatively small amount of clay.

Use the soil texture chart to write definitions according to particle size of the following soils:

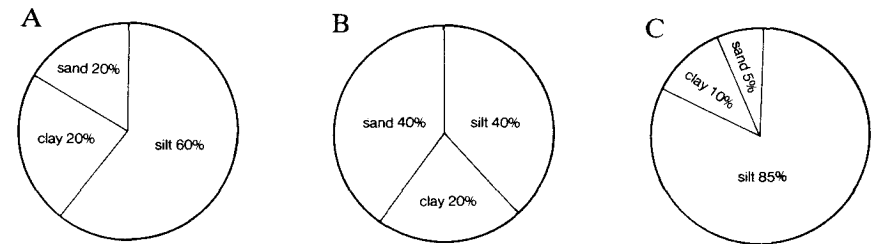
- a) clay
- b) loamy sand
- c) silty clay

Now look at this example:



This soil is called a silty clay loam. This is because it contains a large amount of silt, a considerable quantity of clay but only a comparatively small amount of sand.

Now identify the soils illustrated by the following pie charts and explain their names:



Section 2 Development

3. Read this:

The composition of inorganic fertilizers is usually defined by their content of nitrogen (N), phosphorus pentoxide (P₂O₅) and potash (K₂O). Thus every fertilizer has a N:P₂O₅:K₂O ratio. The table below gives the formulations of some commercial fertilizers:

	N	P ₂ O ₅	K ₂ O
Fertilizer 1	18	18	0
Fertilizer 2	12	52	0
Fertilizer 3	20	11	0
Fertilizer 4	11	24	11
Fertilizer 5	16	16	8

Table 1: Composition of some commercial fertilizers in use in Australia

Identify each fertilizer from the following descriptions:

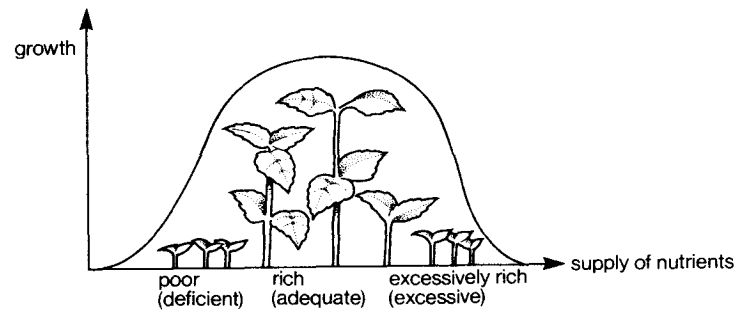
- This fertilizer is rich in nitrogen, contains a moderate amount of phosphorus, but has no potassium content.
- This fertilizer is fairly rich in both nitrogen and phosphorus, but is relatively poor in potassium.
- This fertilizer is rich in both nitrogen and phosphorus, but has no potassium content.
- This fertilizer contains a moderate amount of both nitrogen and potassium and has a relatively high concentration of phosphorus.
- This fertilizer is fairly rich in nitrogen, has a very high concentration of phosphorus, but no potassium content.

Now look at this table showing the composition of different kinds of farmyard manure. Write descriptions of their nutrient content in the same way.

	N		P ₂ O ₅		K ₂ O
Horse	14.2	:	4.8	:	12.4
Cow	4.9	:	2.8	:	1.4
Sheep	20.6	:	7.0	:	19.8
Poultry	20.0	:	16.0	:	8.0

Table 2: Nutrient content of different types of farmyard manure (kg/tonne)

4. Look and read:



An *insufficient* { *amount* / *quantity* } of nutrients stunts plant growth.

A soil { *lacking* / *deficient* } in nutrients and organic matter produces low yields.

A *deficiency* of nutrients can reduce yields.

An *adequate* / *sufficient* supply of nutrients is necessary for healthy plant growth.

A soil *rich* in nutrients and organic matter produces optimum yields.

A soil { *excessively rich in* / *containing an excessively high concentration of* } nutrients and organic matter may produce damaged plants.

An *excessive amount* of nutrients may damage the plant.

An *excess* of nutrients can damage plants.

Practise each of the above expressions in describing the effect on plant growth of different amounts of the following nutrients:

Nutrient	Effect of adequate supply	Effect of deficiency	Effect of excess
N	improves quantity and quality of leaf crops	stunts growth	produces soft growth
P	promotes rapid growth and root formation	turns leaves purple	
K	improves quality of seeds, fruits and tubers	turns leaves brown	
Ca	helps healthy growth of root crops	weakens cells and roots	
Mg	helps healthy growth of arable crops		reduces yield
Na	improves yield of grain, root and field crops	limits growth	causes poor soil structure
Mn	aids respiration and action of enzymes	limits growth	causes discolouration of leaves in beans
Zn	helps fruit production	limits growth	
Co	not necessary for most plants; essential for N-fixation in legumes	severely restricts growth	

Now use the table to diagnose possible reasons for the following problems (refer to Glossary if necessary):

- bronze leaves on apple trees
- chlorotic leaves in beans
- 'leaf scorch' in corn
- disintegration of new tissue in plants
- stunted bean plants
- production of excessively small cabbages

Section 3 Reading

5. Read the passage and answer these questions:

- a) Which of these would you expect to find in tropical soils?
Discuss and explain your answers.
 - (i) soil erosion
 - (ii) nutrient deficiency
 - (iii) an excessive amount of water
 - (iv) an insufficient quantity of water
 - (v) an excess of nutrients
- b) How much kaolinite clay do tropical soils usually contain?
- c) What is this section of the reading passage about?
 - (i) tropical soils and their management
 - (ii) the differences between tropical and temperate soils
 - (iii) the differences between tropical and temperate soil management

The management of tropical soils involves different principles from those of temperate soils. This is because both the climate and the soils are different. In the tropics there is a low temperature range and a high average temperature. The rainfall is usually very heavy in the rainy season but inadequate in the dry season, where there is one.

Tropical soils contain a large amount of kaolinite clay and if they are low in iron and aluminium, their structure may be excessively poor and unstable. If, on the other hand, the soil contains adequate amounts of iron and aluminium, their oxides and hydroxides will cement the kaolinite particles together in relatively large aggregates and this will improve soil structure.

When managing tropical soils, therefore, two basic principles are involved. The first is to use a method of farming which involves a minimum of clean cultivation since the latter leaves the soil bare and consequently liable to water erosion and loss of nutrients by leaching. The second is to use a method which maintains sufficient organic matter in the surface soil. This helps to keep bases and phosphates available in the soil, is a good source of plant nutrients and maintains good structure in the surface soil.

Now answer the following:

- d) Give two ways in which tropical climates differ from temperate climates.
- e) Name two common bases found in some tropical soils.
- f) Name two factors which improve soil structure and explain their effect.
- g) Explain why a soil may contain insufficient phosphates.
- h) Give one function of iron oxide in the soil.

6. Continue reading the passage and answer these questions:

- a) What helps to retain nitrate in the soil?

- b) What is this section about?
 - (i) microbiological activity in the rainy season
 - (ii) how wet and dry seasons are important for soil management
 - (iii) the effect of excessive rainfall

The tropical climate, especially the sequence of wet and dry periods, is also an important factor as it affects the availability of nitrogen in the soil. If the soil becomes too dry, microbiological activity drops to a low level and therefore there is a lack of nitrate. After dry weather, however, moderate rainfall increases the level of microbiological activity. This in turn increases the rate of decomposition of organic matter and there is in consequence a surplus of nitrate. On the other hand, excessive rainfall washes the nitrate into the subsoil, too deep for roots to use unless the soil structure is relatively good. In this case some of the nitrate is retained in the surface soil.

This gives, therefore, two further important principles in tropical soil management. The first of these is to prepare the land and sow the crops early enough to use the surplus nitrogen after the dry season. The second is to grow crops with sufficiently deep roots to use nitrogen before it is washed into the subsoil.

7. Say whether these statements are true or false. Correct the false statements.

- a) Too low a temperature causes insufficient microbiological activity.
- b) Moderate rainfall is good for plant growth.
- c) When there is a lack of nitrate, microbiological activity drops to a low level.
- d) Excessive rainfall provides too much nitrate for plant growth.
- e) If roots are too shallow, plants cannot use nitrate after heavy rain.
- f) There is inadequate nitrate for crops sown early in the wet season.

8. Reread the passage in exercises 5 and 6 making notes where necessary to answer the followings:

- a) List the main characteristics of tropical soils and climate.
- b) List the important principles involved in the management of tropical soils.
- c) Explain the reasons for these principles by referring to the characteristics of tropical soils and climate.
- d) Do you think any of these principles can apply to the management of temperate soils? Give reasons for your answer.
- e) Think of a title for the passage.

Section 4 Listening

9. Read this:

Deficiencies or excesses of minerals and vitamins can have harmful effects on chicks and laying hens. Listen to the passage and number the effects in the order in which you hear them:

- a) low feed efficiency
- b) small eggs
- c) reduced phosphorus absorption
- d) weak bones
- e) low thyroid function
- f) thin shells
- g) low egg production
- h) poor bone formation
- i) slow growth and high thirst

Number these minerals and vitamins in the order in which you hear them:

Vitamin A Ca NaCl P

10. Listen to the passage again. Copy and complete the tables:

Nutrient	Effect of deficiency	Effect of excess	Nutrient	Effect of deficiency	Effect of excess

Chicks

Laying hens

Now give possible explanations for the following:

- a) inadequate egg production
- b) insufficiently strong bones