



Africa University

College of Health Agriculture and Natural Science

**NACP209 SOIL FERTILITY AND PLANT NUTRITION
END OF SEMESTER EXAMINATION**

MAY 2024

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DURATION: THREE (3) HOURS

INSTRUCTIONS

1. Do not write your name on the answer sheers
2. Begin your answer for each question on a new page
3. Credit is given for neat presentation.
4. This paper is comprised in Section A and any two question in Section B

SECTION A (60 MARKS)

Question 1

- a) Define the following:
- i. Soil fertility. [2]
 - ii. Hidden hunger. [2]
 - iii. Luxury consumption. [2]
- b) Differentiate the following:
- i. Nitrogen leaching from denitrification. [2]
 - ii. Phosphorus fixation and immobilisation. [2]
- c) Outline factors limiting the following in cropping systems:
- i. Attainable yield. [3]
 - ii. Actual yield. [3]
- d) Advise on how to correct soil P deficiency for better crop production. [4]
- e) Describe the any 4 factors underpinning legume use in soil fertility management. [10]
- f) A farmer in Mutare intends to grow maize and groundnut targeting 7 t ha⁻¹ and 2 t ha⁻¹, respectively. Table 2 is showing soil analysis result of the field.

Table 2. Chemical characteristics of soils at 0-0.3 m depth from Mutare.

Site	Texture range ^a FAO class	pH (CaCl ₂)	Initial-N mg kg ⁻¹	^b Incubate d-N mg kg ⁻¹	^c Available-P	^d Exch. K	^e Exch. Ca	^f Exch. Mg
			cmol(+)kg ⁻¹					
Vumba	mgSL	3.9	9	15	7	1.28	0.41	4.29

^afg=fine-grained; mg=medium-grained; SC=Sandy-clay; SCL=Sandy-clay-loam General fertility range interpretation: adapted from Refs. [3, 21, 39]. ^bMineral-N measured after a 14-day incubation of soil at field capacity and at 35 °C: <20=very low; 20-30=low; 30-40=medium; >40=high. ^cAvailable-P (resin-extracted): <7=very low; 7-15=low; 15-30=medium; 30-50=high. ^dExchangeable-K: <0.15=very low; 0.15-0.3=low; 0.3-0.5=medium; >0.5=high. ^eExchangeable-Ca: <5=very low; 5-10=low to medium; >10=high ^f Exchangeable-Mg: <0.1=very low; 0.1-0.2=low to medium; >0.2=high.

- i. Interpret the analytical results of field. [4]
- ii. Provide lime and fertilizer recommendations for the two crops, showing calculation and reasoning where possible. [6]

Question 2

Parent material, soil management, vegetation and location of site have strong influence on soil fertility. Explain.

[20]
[60]

SECTION B (40 MARKS)

Answer any two questions.

Question 3

Describe ways of restoring soil fertility in sub Saharan Africa.

[20]

Question 4

Explain the value of soil organic matter in building and managing soil fertility.

[20]

Question 5

Fertilizer management is a function inherent soil fertility and governed by **four** laws.

Explain

[20]

Question 6

Describe the interactions of N, P and micronutrients in yield and nutritional security.

[20]

THE END