BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF AGRICULTURE AND ENVIRONMENTAL SCIENCE

AGC 227

Department of Crop Science
BSc Agricultural Science (Hons) Part II Examination
Soil Fertility Management

3 HOURS (100 Marks)

INSTRUCTIONS

Answer any ***FOUR*** questions. Each question carries 25 marks.

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1 Discuss the influence of soil microbes in soil fertility and plant mineral nutrition. **[25 marks]**

2 (a) Explain how uneven ion uptake by plants changes the external pH, especially in the rhizosphere. **[2 marks]**

(b) Highlight any five soil related benefits of increasing the organic matter content of sandy soils in communal lands. **[5 marks]**

(c) Illustrate with aid of calculations how low yielding maize subsistence farming on a soil with 4 % organic matter and a humus decomposition rate of 2 % per annum is possible for a few years without fertilization. **[8 marks]**

(d) Outline the functions of the following elements in the nutrition of maize.
(i) calcium, **[3 marks]**
(ii) sulphur, **[3 marks]**
(iii) potassium. **[4 marks]**

3 National selection of 2000 capable farmers, with minimum irrigable land of 100 ha of maize per head, was proposed under Command Agriculture to promote maize production with a set target yield of 10 t/ha. Seed, chemicals and fertilizers were provided. Examine the feasibility of such a strategy basing on soil fertility management factors. **[25 marks]**

4 (a) Define the term salinization **[2 marks]**

(b) Describe how salts affect the growth of plants. **[4 marks]**

(c) Describe how salinity due to waterlogging is remediated **[5 marks]**

(d) A sodic soil has an exchangeable sodium percentage [ESP] of 25% and cation exchange capacity of 20 cmol/kg. The ESP of the upper 15 cm of soil has to be reduced to about 5%. Calculate the amount of gypsum required. (mass of 15cm slice of soil covering one hectare = 2×10^6kg).

[14 marks]

5 Discuss the concept of nutrient use efficiency and the 4 Rs Nutrient Stewardship.

[25 marks]

6 Some of the consequences of poor soil fertility management are :

(i) acidity (ii) eutrophication (iii) compaction
(iv) nutrient mining (v) global warming

(a) Define each of the above terms and explain why it is a problem. **[10 marks]**

(b) Describe how crop and soil management practices bring about each of the problems (i-v) stated above. **[10 marks]**

(c) Recommend practical management steps for reducing each of the negative consequences highlighted above (i-v), whilst maintaining high production.

[5 marks]

END OF PAPER