FACULTY OF AGRICULTURE - UNIVERSITY OF RUHUNA

THIRD EXAMINATION IN B. Sc. Agricultural Resource Management & Technology / B. Sc. Agribusiness Management (PART I) – June 2017

SS3101 Land Resource Management   **Time: 03 Hours**

Answer **05 (FIVE)** questions only

Each question carries a total marks of 100

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1. **I.** a) What is meant by land use? *(5 marks)*

b) State **five** major uses of land. *(10 marks)*

c) Differentiate the terms 'land use planning' and 'land suitability evaluation'. (15 marks)

II. a) What is meant by soil spatial variability? *(5 marks)*

b) Give examples for small, medium and large-scale variability of soil. *(20 marks)*

c) State the **five** steps involved in mapping the soil of a given area. *(20 marks)*

d) List modern technologies used for soil investigations and mapping. *(10 marks)*

e) What are the main steps involved in a soil survey? *(15 marks)*

2. **I.** a) What do you mean by a "problem soil"? *(5 marks)*

b) Explain briefly the salinization process in soil. *(15 marks)*

c) List **five** characteristics of an alkaline soil. *(10 marks)*

d) i) What do you mean by the 'Sodium Adsorption Ratio (SAR)'? *(10 marks)*

ii) A researcher who is measuring the SAR in soil founds that the water extracted from soil contains soluble divalent cations of X 1.41 meq/l and Y 0.54 meq/l and soluble Sodium (Na) 0.48 meq/l. What would be the SAR value of this soil? *(10 marks)*
Assume that the X and Y are the parameters needed to calculate SAR.

II.   a)   Name a place where you can find acid sulfate soils in Sri Lanka. *(5 marks)*

b)   Explain briefly the formation of acid sulfate soils. *(15 marks)*

c)   Name **five** common liming materials that can be used to ameliorate a problem soil. *(5 marks)*

d)   An agricultural field with 5 ha in extent shows soil acidic problem. Cation Exchange Capacity (CEC) and base saturation percentage (% BS) of the soil are 15 cmolc/kg (or meq/100g soil) I and   40 respectively. Average bulk density of the soil is 1.6 Mg/m^3 and the root zone depth is 15 cm. The % BS should be increased up to 70% by adding <u>hydrated lime</u> [$Ca(OH)_2$].

     i)   Calculate the mass of soil in the given area. *(10 marks)*

     ii)   Assuming purity of the hydrated lime [$Ca(OH)_2$] is 100% , calculate the $Ca(OH)_2$ amount needed (in kilograms) to achieve the required base saturation level. The molecular weight of $Ca(OH)_2$ is 136. *(15 marks)*

3.   I.   a)   What is meant by soil erosion? *(5 marks)*

b)   Name **five** climatic factors affecting soil erosion. *(5 marks)*

c)   Explain briefly the following processes of water erosion.

- Splash erosion *(10 marks)*
- Sheet erosion *(10 marks)*
- Rill erosion *(10 marks)*
- Gully erosion *(10 marks)*

II.   a)   State the Universal Soil Loss Equation and name all the basic factors used in the equation. *(10 marks)*

b)   From the factors you mentioned in **II. a)**, what are the factors that would determine the highest potential soil loss of a particular area? *(10 marks)*

c)   Briefly explain the factors you have mentioned in **II. b)**. *(20 marks)*

d)   For a <u>bare flat land</u>, the rainfall factor is 115. Soil erodibility factor is 0.2. Slope length and gradient (L×S) factor is 0.05.

Calculate the average annual soil loss (give units). State all the assumptions. *(10 marks)*

4. I. a) Name the type of erosion that occurs as the first effect of rain drop impact. *(5 marks)*

    b) Discuss briefly the consequences of the type of erosion you have mentioned in **I. a)**. *(10 marks)*

    II. a) State the erosion control principles *(10 marks)*

    b) Explain briefly the following terms:
      i)   No-till farming *(10 marks)*
      ii)   Contour plowing *(10 marks)*
      iii) Buffer strip *(10 marks)*

    c) Explain briefly the erosion control principles that are related to the each of the terms given above [**b) i, ii, iii**]. *(10 marks)*

    d) Explain the importance of organic manure amendments and maintaining soil fertility levels in erosion control. *(15 marks)*

5. I. a) How do you define land degradation? *(10 marks)*

    b) State the main causes of land degradation. *(20 marks)*

    c) Out of the list given above (**b**) and in your view, what is the most severe cause of land degradation in Sri Lanka? *(10 marks)*

    II. a) Differentiate on-site and off-site impacts of land degradation. *(20 marks)*

    b) Explain briefly an <u>off-site</u> impact of land degradation using a Sri Lankan example. *(20 marks)*

    c) It is believed that land degradation is one of the most critical problems affecting the future economic development in Sri Lanka. State **five** important manifestations of the land degradation problem in the country. *(20 marks)*

6. I. a) What is meant by sustainable land management? *(10 marks)*

    b) Why do we need to adopt sustainable land management practices? *(10 marks)*

    c) State the principles for sustainable land management in farming systems. *(20 marks)*

d) What are the new technologies/options that could be used in sustainable land management? *(20 marks)*

II. a) What are ecosystem services? *(10 marks)*

b) State the types of ecosystem services generated by sustainable land management. *(30 marks)*