

**National University of Lesotho - Faculty of Agriculture  
Department of Soil Science & Resource Conservation**

**SSR 610 - Fertilizer Technology**

**Final Examination Paper**

**January 2015**

**Total marks: 100**

**Time: 3 hours**

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**Instructions:**

**The paper consists of four (4) questions**

**All questions carry equal marks**

**Answer all questions**

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**Question 1 (25 marks)**

- a) What is a response curve? (2)
- b) How was Mitscherlich's concept different from Blackman's representation of the Liebig's Law? (8)
- c) What is soil test calibration and how can it be used to make fertilizer recommendations? (5)
- d) What is critical soil test value and its qualitative interpretation? (4)
- e) How can you determine the critical soil test using Cate-Nelson method? (6)

**Question 2 (25 marks)**

- a) Which economic principles are applied to response curves to determine optimum fertilizer rates and Maximum net profit (MNP) of fertilization? (10)
- b) Calculate the optimum fertilizer rates given the crop value and fertilizer price as:

$$\text{Crop Value} = V = -0.127x^2 + 15.17x + 1335$$

$$\text{Cost of fertilizer} = C = 10 + 0.40x$$

**Question 3 (25 marks)**

- a) Meeting the N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O requirements without over applying any of these nutrients is possible by blending various types of fertilizer to give the correct NPK ratio. If 18-0-18 + 3% iron (Fe) fertilizer is the only blend found in the market, how much of this fertilizer must be applied to supply 10 kg of N per hectare of maize. Calculate the amount of Fe that will be applied at the rate of application used to supply the needed nitrogen. Note: There is 18% N in 18-0-18 fertilizer = 1.8 kg of N per kg of fertilizer. (5)
- b) Salt index measures the salt concentration that fertilizer induces in the soil solution. Potassium and nitrogen fertilizers have high salt index than phosphorus fertilizers. Evaluate any three (3) combined fertilizers commonly used in Lesotho on the basis of composition, salt index, and application rate and method. (10)
- c) Using the table provided formulate a mixed fertilizer (NPK) from different materials and determine the salt index of a combined formulated fertilizer. (10)

**Question 4 (25 marks)**

- a) Urine is suitable as a fertilizer in agricultural application; however, micro-pollutants and pathogens contained in urine impose a major environmental threat on application of untreated urine. Describe any one (1) of the following three treatments of urine: Electro-dialysis; Struvite precipitation or Evaporation combined with nitrification (10)
- b) Explain any five (5) ways in which nitrogen fertilizers impacts negatively in the environment? (15)