



1st SEMESTER 2017/2018

PAGE 1 of 3

UNIVERSITY OF SWAZILAND
MAIN EXAMINATION
PROGRAMME: BACHELOR OF SCIENCE IN
AGRONOMY, YEAR 3

COURSE CODE:	CPR 301
TITLE OF PAPER:	CROP NUTRITION
TIME ALLOWED:	2 HOURS
INSTRUCTIONS:	ANSWER ALL QUESTIONS

**DO NOT OPEN THIS QUESTION UNTIL PERMISSION HAS BEEN GRANTED BY
THE INVIGILATOR**

QUESTION: 1

The mean physical and chemical properties of the top 20cm soil across three cropping seasons are shown in Table 1 (i.e. 2001, 2002, and 2003), Luyengo campus, Swaziland. The cob weight and straw yield Maize (*Zea mays* L) are shown in Table 2. *You may illustrate your answers graphically if need be.*

- From the data presented in Tables 1 and 2, (a) which treatment is the best for the cob and straw yields across the three cropping season? And which of these would you recommend for maize. Give reasons. **[10 Marks]**
- Define the term critical level. What is the critical level of potassium and phosphorous growing maize? **[10 Marks]**
- What are the nutritional deficiency symptoms of K that can be observed in the control (or O treatment) of the nutrient is deficient in the soil in the first year of cropping? **[5 Marks]**

Table 1: Physical and chemical properties of the top soil (0-20 cm), Luyengo, Swaziland

Properties	----- cropping seasons -----		
	2001	2002	2003
pH-water	6.1	5.9	6.2
Organic matter (%)	0.85	1.43	2.13
Sand (%)	81	83	79
Silt (%)	10	10	12
Clay (%)	9	7	9
Texture	Loamy Sand	Loamy Sand	Loamy Sand
Total N (%)	0.05	0.09	0.10
Available P (mg/kg)	5.7	4.3	6.0
K (cmol/kg)	0.14	0.23	0.32
Mg (cmol/kg)	1.6	1.8	1.5
Ca (cmol/kg)	4.3	3.8	3.9
Na (cmol/kg)	0.01	0.17	0.18
ECEC (cmol/kg)	6.20	6.15	6.34

Table 2: Effect of K application on the cob weight and straw yield of Maize, Luyengo Campus

	K rates (Kg/ha)	Cob weight (Kg/ha)	Straw yield (Kg/ha)
2001 cropping season	0	12.40c*	0.34b
	20	19.20ab	0.44ab
	40	19.10b	0.52ab
	60	22.60a	0.57a
2002 cropping season	0	12.30c	0.32b
	20	19.80b	0.60a
	40	22.50a	0.70a
	60	20.70b	0.67a
2003 cropping season	0	17.80	0.42
	20	18.40	0.43
	40	19.0	0.48
	60	21.0	0.52
		NS	NS

*Means with same letter in same column are not significantly different at 5% (DMRT); NS= not significant

QUESTION 2

- a. Describe how the processes of mass flow, diffusion, and root interception affect nutrient uptake in a named crop plant. **[12 marks]**
- b. Show in a tabular form, six macronutrients and six micronutrients and state the mechanism by which of these nutrients would be absorbed into the plant roots by these processes (i.e. mass flow, diffusion, and root interception) **[13 Marks]**

QUESTION 3

- a. Enumerate and briefly explain three factors that should be considered before fertilizer application **[3 marks]**.
- b. List the seventeen essential nutrient elements and present in a tabular form which of these are macro-nutrients and micro-nutrients, the uptake forms from the soil solution, and which of these are mobile, immobile or somewhat immobile in the soil solution. **[12 Marks]**
- c. Write short notes on Liebig's law of minimum, and Mitscherlich's law **[10 marks]**

QUESTION 4

- a. Briefly explain these terminologies illustrating your answers with examples: (i) nutrient interaction in crop plants, (ii) Diagnosis Recommendation Information Systems (DRIS), (iii) Dilution effect and (iv) toxicity symptoms. **[4 marks]**
- b. Enumerate and briefly discuss the effect of soil reaction (pH) on forms of phosphorus in the soil. Present your answer in a tabular form. **[8Marks]**
- c. Phosphorus is an important nutrient elements in the soils of Swaziland. Mr. Gama analysed his soils and plant for Phosphorus. He finds out that the soils on his farm have deficiency of P. State and discuss, how you will help him to improve the management of P on his farm if he wants to grow maize crop in the next cropping season. **[13 marks]**