Uva Wellassa University
Faculty of Animal Science and Export Agriculture
B.Sc. in Export Agriculture/
B.Sc. in Tea Technology and Value Addition/
B.Sc. in Palm and Latex Technology and Value Addition

End Semester Examination- March/ April, 2013
Year IV Semester I

Experimental Design and Analysis (EAG 401-0/ EAG 401-2)

Part II: Essay Questions

1.

a. What is the name of a Design of experiments in which all levels of a given factor are combined with all levels of every other factor in the experiment (all possible combinations of the levels of the factors are investigated.)?

b. The difference in response between the levels of one factor is not the same at all levels of the other factors. (e.g. the effect of factor A depends on the level of factor B). What is the name of this phenomenon?

c. The effect of fertilizer on the yield of potatoes was investigated in a 2^3 factorial experiment in CRD, involving 32 plots. There were 4 replications of each treatment combination, allocated at random to the plots. The factors were three fertilizer constituents: nitrogen (*A*), potassium (*B*) and dung (*C*). Each was either at a single level or absent. The yields of potatoes (kg) were recorded.

I. What are the treatments combinations used in the above experiment?

II. Write down the statistical model for the above experimental design.

III. Interpret the results from the ANOVA output given below. (You may assume the usual statistical assumptions are as reasonable).

SOV	DF	SS	MS	F	P- Value
A	1	3465.28	3465.28	10.32	0.0037
B	1	161170.03	161170.03	479.81	0.0001
A*B	1	344.53	344.53	1.03	0.3213
C	1	278817.78	278817.78	830.05	0.0001
A*C	1	810.03	810.03	2.41	0.1335
B*C	1	13986.28	13986.28	41.64	0.0001
A*B*C	1	124.03	124.03	0.37	0.5491
Error	24	8061.75	335.91		
Total	31	466779.71			

IV. Suppose that the field is divided into a 4X8 rectangular grid with plots running in an East direction within rows, and in a North direction within columns of the field. Suppose that there is a soil fertility gradient running in a North direction across the field from one of its boundaries to the opposite boundary. Describe a suitable experimental design which still has 4 replicates of each treatment combination.

[40 marks]

2. A baking technologist wishes to compare 4 different biscuit recipes. Mixing, forming and baking the biscuits from one recipe takes approximately 1½ hours.

   a. Suppose that the pilot plant can produce four bakes in a working day. Name and describe a suitable design with days as blocks.

   b. One of the response variables to be measured is average biscuit weight. Now suppose in part (i) that the technologist suspects that there may be aneffect (time effect) in the weights throughout the day due to the oven getting progressively hotter. Write down an appropriate *Latin square design* and explain its importance.

   c. Explain what is meant by a *balanced incomplete block design* with days as blocks. Suppose that the pilot plant can only produce three bakes in a working day. Suggest one of these designs if three bakes for each biscuit recipe are to be made.

[30 marks]

3.

   a. Giving examples, distinguish the Factorial experiments and Nested Experiments.

   b. By considering the given hints for each experiment, state the main plot and sub-plot in each split plot experiment example given below.

      I. In an experiment to evaluate irrigation method and fertilizer type.
      Hint: consider the management practices

      II. An experiment conduct with 5 concentrations of an insecticide and 4 varieties of green gram.
      Hint: Wish to have greater precision for varietal comparison

      III. In a fertilizer andvariety experiment
      Hint: expect the fertilizer effect to be much larger than the varietal effect

[15 marks]