UNIVERSITY OF KWAZULU-NATAL
SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES
DISCIPLINE OF AGRICULTURAL ECONOMICS
EXAMINATION: JUNE 2013

SUBJECT, COURSE & CODE: AGEC750 RESEARCH METHODOLOGY & LINEAR PROGRAMMING

DURATION: 3 HOURS **TOTAL MARKS: 100**

Internal Examiners: Prof GF Ortmann, Dr E Wale and Mr MAG Darroch
External Examiner: Prof B Grove

NOTE: THIS PAPER CONSISTS OF 6 PAGES, PLEASE SEE THAT YOU HAVE THEM ALL.

ANSWER SECTIONS A AND B IN SEPARATE BOOKS

SECTION A: RESEARCH METHODOLOGY

Answer ALL Questions in this section.

QUESTION 1

Answer the following questions concisely and completely. Make sure that your answers are clear in flow and content.Use examples whenever necessary.

1.1. A researcher is working on a study that examines the impact of growing improved varieties of tomato on farm gross margin. In the sample, there are 100 farmers who grew improved varieties and 100 others who grew the local varieties. The researcher calculated the average gross margin per hectare for farmers who grew improved varieties (R 25,000) and for those who grew local varieties (R 17,000). She/He then concluded that R 8,000 is the impact (in terms of gross margin per hectare) of using improved varieties of tomato. Critically evaluate this conclusion. **[5]**

1.2. The following are the number of small farmers in 10 Districts (A to J) of KwaZulu-Natal Province: 80, 90, 100, 120, 130, 150, 180, 200, 210 and 240. If you wish to draw a sample of 150 farmers using proportionate random sampling, how many farmers would you draw from each district? **[3]**

1.3. A researcher aims to examine the impact of education on technology adoption and crop productivity. The farming population to be studied had a multi-cultural structure, with different farmers within each cultural group. If culture affects propensity to go to school, what sampling design would the researcher have to apply to control the variability in culture/education level. Explain and motivate your answer. **[4]**

1.4. Suppose that you are reading a research report on adoption of fertilizer by farmers in KwaZulu-Natal. The report shows that farmers adopting fertilizer have managed to increase their incomes by 25 percent. It then concludes that if other farmers follow suit, they will be able to increase their incomes by the same percentage. Critically evaluate this conclusion? **[3]**

1.5. A researcher has to always be aware of the fact that empirical correlation does not necessarily mean causation. Why is this distinction important? What other conditions must be fulfilled for a researcher to establish a cause and effect relationship? Can they ever be completely satisfied in agricultural economics research? **[4]**

1.6. Suppose that UKZN has set up a research team to undertake a research project on market access and farmers' welfare. The team has decided to design a questionnaire and collect primary data. You are called upon to assist the team in the questionnaire design. What are the guiding principles you would advise them to follow in constructing the questionnaire? Use examples where appropriate. **[5]**

1.7. Suppose you are commissioned to do research for the Agricultural Research Council (ARC). The ARC has requested you to prepare two research reports. One is a technical report addressed to the ARC research committee and another one is a media or policy brief meant to serve the public and inform policy makers. How would you differentiate these two research reports (in terms of content, technical complexity focus and style)? Motivate and explain. **[5]**

1.8. Consider the following statement of a Specific Research Problem:

"How will the consumption of standard brown bread in South Africa change if a new tax of 50c per loaf of standard brown bread is imposed?"

Specify and *explain* a General Objective and two Specific Objectives that you would use to research this problem. **[5]**

1.9. What is a Research Hypothesis? Illustrate your answer using examples of *both* Quantitative and Qualitative Research Hypotheses. **[4]**

[38]

QUESTION 2

Indicate whether the following statements are **TRUE** or **FALSE** and briefly motivate your answer.

2.1. Quantitative research is superior to qualitative research. **[2]**

2.2. In field survey research the interviewer should be a neutral medium through which questions and answers are transmitted. **[2]**

2.3. Demarcating the population before starting sampling enables a researcher to enhance external validity. **[2]**

2.4. A well-structured Research Proposal *benefits both* the student researcher and members of staff. **[3]**

2.5. The *main purpose* of a Conceptual Framework is to analyse the General Research Problem stated in a Research Proposal. **[3]**

[12]

SECTION B: LINEAR PROGRAMMING

Answer ALL Questions in this section.

QUESTION 3

State whether the following statements are **TRUE or FALSE** and justify your answer with a minimum of reasons:

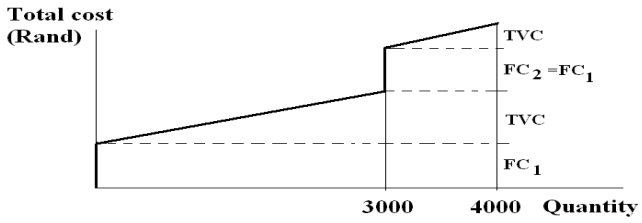
3.1 The cost of own resources included as constraints in a LP model must also appear in the objective function otherwise the LP model will not maximise producer surplus. **(3)**

3.2 The DUAL PRICE of a resource constraint included in a MOTAD model provides an estimate of its VMP. **(3)**

3.3 The Savage regret or minimax criterion offers a convenient way of dealing with covariance between enterprise net incomes. **(2)**

3.4 When constructing an LP model, the modeller must ensure that the denominators of production coefficients are consistent along each row and that their numerators are measured in the same units down each column. **(3)**

3.5 Given the total cost curve in the figure below, it would not be necessary to include a sequence constraint in a MIP model of this infrastructure because $FC_1=FC_2$ **(3)**



3.6 A sector LP model can predict free market equilibrium by maximising a linear approximation of social welfare. **(3)**

[17]

QUESTION 4

4.1 Study the following mini-matrix and answer the questions below (show your workings):

	Lactating cows	Dry cows	Heifers 12 -24 months	Heifers <12 months	RHS
Lactating–dry cows	-1	4			E 0
Cows-heifers 12-24	1	1	-5		E 0
Cows-heifers < 12			1.1	-1	E 0

(a) What proportion of the total cows does not produce milk? **(2)**
(b) What proportion of the total cows is replaced each year? **(2)**
(c) What is the mortality rate for heifers less than 12 months old? **(2)**

4.2 Construct a normative supply function for Sunflower (SFSELL) given the following extract from an LP solution:

VARIABLE	VALUE	REDUCED COST
SFSELL	300.00	0.00

RANGES IN WHICH THE BASIS IS UNCHANGED:

		OBJ COEFFICIENT RANGES	
VARIABLE	CURRENT COEF	ALLOWABLE INCREASE	ALLOWABLE DECREASE
SFSELL	2000.00	INFINITY	25.00

(2)
[8]

QUESTION 5

5.1 Study the following MOTAD model and answer the questions below:

	Onions (ha)	Tomatoes (ha)	D1 (R)	D2 (R)	D3 (R)	RHS
Irrigated land (ha)	1	1				L 8
GM (R)	10000	18000				E 100000
GM Deviations:						
T1 (R)	-1000	2500	1			G 0
T2 (R)	1500	-4000		1		G 0
T3 (R)	-500	1500			1	G 0
0.5TAD (R)			1	1	1	Min!

(a) The solution combines 5.5 ha of Onions with 2.5 ha of Tomatoes and has an objective function value of 1750. Explain how you would interpret this value.

(2)

(b) The solution has a dual price of 8375 for the irrigated land constraint. Explain how you would interpret this value.

(2)

5.2 Reconstruct the MOTAD model in question 5.1 to maximise Wald's maximin criterion.

(5)

5.3 Discuss the potential usefulness of the Wald's maximin criterion to a farmer, comparing it to other LP farm planning approaches such as MOTAD and Baumol's E-L criterion.

(6)
[15]

QUESTION 6

Construct a LP model to predict the market equilibrium for Crop A in South Africa given that the total area of land suited to Crop A is 0.30 million hectares, the average yield of Crop A is 20 tons per hectare, the variable cost of growing Crop A is R20000 per hectare, the price elasticity of demand for Crop A is -0.5, and that 4 million tons of Crop A were consumed last year at an average price of R2000 per ton. Use quantity levels of 3, 4 and 5 million tons to segment consumer demand in the market.

[10]