

University of Fort Hare

Degree Examinations

Special Exam

November 2017

AGE 411

Analytical Techniques in Agricultural Economics

Time: 3 Hours

Marks : 100

Examiners

Internal Examiner

Prof A Mushunje

Prof M Aliber

External Examiner

Dr P Chaminuka

Instructions

Answer **ALL** questions from section A and any **two** questions from section B

SECTION A

Question One (20)

1. Write short notes (including examples if necessary) to explain the following:
 - a) Dependent and independent variable
 - b) Probability and non-probability samples
 - c) Unstructured and structured interviews
 - d) Test-retest reliability and split-halves reliability
 - e) Closed ended and open-ended questions (20)

Question Two (15)

2. You would like to do a survey of smallholder farmers in OR Tambo District Municipality, EC Province, South Africa to find out the farmers who have adopted GMO maize. You obtain from the Local Municipality Extension Officer a list of all active farmers in the municipality to draw your sample from this list.
 - i. What is your sampling frame? (2)
 - ii. What is your target population? (2)
 - iii. Explain how you would draw a simple random sample for the study. (3)
 - iv. Assume the Extension Officer's list contains information about dryland and irrigation farmers. . You then could select a stratified random sample, stratifying on farming method. What main benefit can result from using a stratified random sample instead of a simple random sample? (2)

- v. How might you obtain a cluster sample? When should you consider using this type of sampling design? (3)
- vi. Which type of sampling design is most appropriate for this research problem? Explain. (3)

Question Three (35)

3. A concern has been raised about the “**Lack of market information, no access to credit and poor road infrastructure**” as constraints faced by both the emerging large-scale farmers and the smallholder farmers of the Eastern Cape Province South Africa. You are the Agricultural Economist at Department of Agriculture Forestry and Fisheries, Bisho. With the depth and breadth of your training in agricultural economics you are asked to lead a team that conducts a survey that will generate results that are representative of the entire Eastern Cape Province. The time frame is six months and the budget is R50 000. Referring to the above request, answer the following questions:
- a) Formulate a topic for your research in this area (2)
 - b) State two (2) research objectives for your study (2)
 - c) Suggest two (2) hypotheses related to these objectives (2)
 - d) Explain the research design that you think would be appropriate for the study, giving reasons for the choice of design (4)
 - e) Part of the study is a farmer survey. List 10 major related variables that you would use in the farmer survey (5)
 - f) If the required sample size for your study is 50 households, and your objective is to obtain the most **feasible representation sample (given the resources and time you have)** from the province, state the sampling method that you would use, describe the procedure and the justification for using this particular type of sampling. Assume the district has four (4) sub-districts and six (6) villages in each sub-district. (10)

- g) List and briefly discuss the ethical issues that may apply to this study (10)

SECTION B

Answer any two questions

Question Four (15)

Four crops can be grown each year- wheat, barley, oats and chicken peas. Each crop has specific per hectare requirements for labour and ox-power.

- (i) 1 ha of wheat requires 43,50 man days and 42,60 ox-power
- (ii) 1 ha of barley requires 56,10 man days and 38,10 ox-power
- (iii) 1 ha of oats requires 57,60 man days and 34,80 ox-power
- (iv) 1 ha chicken peas requires 79,20 man days and 43,50 ox-power

Available man days= 495 man days per annum

Available ox-power days= 300 ox-power days per annum

Wheat gives a GM of R2744

Barley gives a GM of R2438

Wheat gives a GM of R3046

A chicken pea gives a GM of R5000

The farmers can sell only 0,75 tonnes of chicken peas each year due to limited market. Chicken pears yields 1,5 tonnes per ha
The farmer has 10 ha of land out of which 7,5 is arable

Formulate a linear programming model for this problem

Question Five (15)

A farm owner wants to know how many hectares of three different crops to plant on three different plots in order to maximize profit. The farmer's tract of land consists of 2000ha. He has subdivided the tract into three plots and has contracted with three local farm families to operate the plots. The farm owner has instructed each sharecropper to plant three crops: maize, peas and soybeans. The size of each plot has been determined by the capabilities of each local farmer. The plot sizes, crop restrictions, and profit per ha are given in the following tables:

Table 1: Plot sizes

Plot No	1	2	3
Hectarage	500	800	700

Table 2: Crop restrictions and Profits

Crop	Maximum hectarage	Profit/ha
Maize	900	R600
Peas	700	R450
Soybeans	1000	R300

Any of the three crops may be planted on any of the plots; however, the farm owner has placed the following restrictions on the farming operation. At least 60% of the plot must be under cultivation. The owner's objective is to determine how much of each crop to plant on each farm in order to maximize profit.

Formulate a linear programming model for this problem.

Question Six (15)

You are provided with a dataset concerning 12 smallholder crop farmers in the Keiskammahoek area. The table below shows what has been captured for two of the variables in the dataset. You may assume that 'land area' refers to the amount of land that was cropped in the 2012/13 season.

Obs	Land area (HA)	Gross farm income 2012/13 (Rand)
1	0.5	2 000
2	1.2	5 800
3	0.4	2 100
4	0.6	0
5	1.1	4 600
6	0.9	4 100
7	0.4	1 900
8	1.0	2 700
9	276.8	2100
10	0.6	2 200

11	0.8	2 500
12	1.3	4 900

- a) You wish to understand the relationship between land area and gross farm income. The first step is to look at your data and determine whether there are possibly any problems with them. Are there, and if so, what do you do about it/them, if anything? (2)
- b) The next thing you do is make a scatter plot of the data, or of the adjusted data, depending on how you dealt with part (a). Before starting on the plot, consider which variable should be plotted along the horizontal axis, and which along the vertical axis. Explain your thinking in one sentence. (3)
- c) Having completed the scatter plot, you determine that there is some kind of linear relationship between the two variables. Write out a model for such a linear relationship. For sake of convenience, label the land area variable 'HA' and the income variable 'GF'. Explain what all the terms are in the model. (2)
- d) You run a linear regression using the two variables using the (ordinary) least squares method. You obtain the following results:

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	148.1928	615.2928	0.240849	0.8157
HA2	3819.277	700.2823	5.453911	0.0006
R-squared	0.278052 Mean dependent var			3280.000
Adjusted R-squared	0.761559 S.D. dependent var			1431.239

- Evaluate and interpret your results in a few sentences. Then, as best you can, superimpose the fitted regression line onto your scatter plot. (3)
- e) Suppose you learn about two other farmers in the same area, namely Ntombi and Busi. In 2012/13, Ntombi farmed an area of 0.6 hectares, while Busi farmed 2.1 hectares, but in 2006/07. What would you predict each woman's gross farm income to have been for their respect production years? (3)
- f) You wonder whether you could improve your model, for instance by considering other variables. Write out a new linear model, and justify the changes you have made. (2)