

University of Fort Hare

Main Examinations

June 2023

AGE 316

Analytical Techniques in Agricultural Economics

Time: 3 Hours

Marks : 100

Examiners

Internal Examiner

Prof A Mushunje

Dr GA Eynade

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External Examiner

Dr J Zuwarimwe

Instructions

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

SECTION A

Question One (15)

- a) Write short notes (including examples if necessary) to explain the following:
- a) Cross-sectional and Longitudinal research
 - b) Exploratory and Descriptive research
 - c) Correlational and Exploratory research (15)

Question Two (20)

- a) Explain the role of **maturation** and **test effect** in a pre-test/post-test research design and how these biases do not affect time-series research design. (10)
- b) List five (5) units of analysis in social scientific research (5)
- c) With the aid of a table, distinguish between the following research terminologies and give relevant examples related to Agricultural Economics where necessary: (5)
- i) Research objective and Research hypothesis
 - ii) Longitudinal study and panel study

Question Three (35)

- (a) List two probability and non-probability sampling each and give two advantages and disadvantages of each type (10)
- (b) Funding has been made available for any research in the broad area of **“Adoption of robotic engineering among commercial farmers in South Africa”** With the depth and breadth of your training in Agricultural Economics and also as part of your research project for next semester (AGE401), you are asked to lead the team that is going to carry out a study on the above topic. The time frame for the study is 6 months and your budget is R25, 000. Referring to the above request, answer the following questions:
- i) Formulate a topic for your research in this area (2)
 - ii) State two (2) research objectives for your study (2)
 - iii) Suggest two (2) hypotheses related to these objectives (2)
 - iv) Explain the research design that you think would be appropriate for the study, giving reasons for the choice of design (4)
 - v) Part of the study is a farmer survey. List 10 major related variables that you would use in the farmer survey (5)
 - vi) List and briefly discuss the ethical issues that may apply to this study (10)

SECTION B

Answer any two questions

Question Four (15)

Below is given the data for a linear programming transportation problem

Storage locations	SUPPLY	Amount of maize in store (tonnes)
A		600
B		1500
C		1000
Total		3100

Cities	DEMAND	Amount of maize demanded (tonnes)
L		1700
M		800
N		500
Total		3000

Cost of shipping and Handling of maize is given in the table below:

Storage locations	Cities		
	L	M	N
A	R20	R40	R30
B	R35	R28	R22
C	R50	R18	R26

The objective function is to minimize the transportation cost and yet meet the demand for the different cities.

Formulate a linear programming model for this problem

Question Five (15)

A farmer has 700 hectares of land and plan to plant maize and soybeans. Each hectare of maize costs R500 to plant, maintain and harvest, while each hectare of soybeans costs R280 to plant, maintain and harvest. The farmer has a crop loan of R140 000 available to cover costs. Each hectare of maize will yield 5000kg of maize and each hectare of soybeans 1500kg. The farmer has contracted to sell the maize and soybeans for R3/kg and R6/kg, respectively. However, the farmer must store both the maize and soybeans for several months after harvest in his storage facility, which has a maximum capacity of 12 000 000kg. The farmer wants to know how many acres of each crop to maximise profit.

Formulate a linear programming model for this problem and solve it graphically

Question Six (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.