

UNIVERSITY OF KWAZULU-NATAL
SCHOOL OF AGRICULTURAL EARTH AND ENVIRONMENTAL SCIENCES
DISCIPLINE OF AGRICULTURAL ECONOMICS
EXAMINATIONS: NOVEMBER 2014

SUBJECT, COURSE AND CODE: **AGRICULTURAL PRODUCTION ECONOMICS AND
PRICE ANALYSIS – AGEC 370**

DURATION: 3 HOURS

TOTAL MARKS: 100

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**NOTE: THIS PAPER CONSISTS OF 5 PAGES. PLEASE SEE THAT YOU HAVE ALL OF THEM.
PLEASE ANSWER SECTION A AND SECTION B IN SEPARATE BOOKS**

INSTRUCTION: Students are to answer **ALL** questions in both **Sections A and B**, and are required in their own interest to write legibly.

SECTION A: PRODUCTION ECONOMICS

QUESTION 1

Indicate whether the following statements are **TRUE** or **FALSE**, **GIVING REASONS** for each of your answers (use diagrams and calculations to support your answers where appropriate).

- 1.1 Stage II of the classical production function begins where the physical efficiency of the variable input is at zero. (2)
- 1.2 If capital is limiting, the VMP of each variable input tends to be lower than its price when profit is at its maximum attainable level. (2)
- 1.3 The VMP curve for a variable input is a firm's derived demand curve for that input. (2)
- 1.4 A profit maximizing maize farmer will aim at maximum maize yield per hectare. (2)
- 1.5 A profit maximizing farmer who produces two products, will, if possible, produce where the relationship between the products is complementary. (2)
- 1.6 The law of diminishing marginal returns explains why most production possibility curves (frontiers) are convex to the origin. (2)
- 1.7 If a production function exhibits increasing returns to scale the producer should reduce the scale of operation. (2)

- 1.8 A risk-averse farmer will be indifferent between two enterprises that yield the same expected profit. (2)

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QUESTION 2

- 2.1 The following production function was estimated for a Tomato enterprise at McFern Farm:

$$T = 1.4N^{0.25}L^{0.20}$$

where; T = Tomato yield (tons per hectare)

N = Nitrogen (tons per hectare)

L = Lime (tons per hectare)

- 2.1.1 What are the elasticities of production for Nitrogen and Lime and how should these estimates be interpreted? (3)
- 2.1.2 Derive an expression for the marginal physical product (MPP) of Nitrogen and Lime. (2)
- 2.1.3 Given that Nitrogen costs R200 per ton and Lime costs R800 per ton, what is the least cost combination of Nitrogen and Lime required to produce a tomato yield of 5.1 tons per hectare? (7)
- 2.1.4 Derive an expression for the value of marginal product (VMP) of Nitrogen given that Tomato sells for R2 000 per ton. (2)
- 2.1.5 How much Nitrogen and Lime should the farmer use to maximize gross margin per hectare? (3)

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QUESTION 3

- 3.1 Mr Ayanbonga, who is farming in northern KwaZulu-Natal, is considering growing maize, soybeans and wheat during the coming season. He is concerned about the risk (variability in gross margin per hectare) of growing these crops and would like to establish a risk-efficient combination of these crops. He obtained the following real gross margin data over five years from his neighbour:

	Real Gross Margins (R/Ha)		
Year	Maize	Soyabeans	Wheat
2009	800	900	-1000
2010	-600	800	1200
2011	1000	-500	700
2012	-100	400	300
2013	700	-200	900

Mr Ayanbonga has 100 hectares of arable land available for growing these crops. Labour is limited to 5000 hours per season and capital to R400 000. Maize requires 50 labour hours and R4000 capital per hectare, soyabeans 30 labour hours and R2000 capital per hectare, and wheat 60 labour hours and R5000 capital per hectare.

- 3.1.1 Express the problem of minimising risk (deviations in gross margins) for a given level of farm gross margin as a MOTAD model in matrix format, taking all available data into account. (12)
- 3.1.2 Briefly explain the Expected Income (E) - Variance (V) concept and how the E-V boundary could be derived from the above example. (5)

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SECTION B: AGRICULTURAL PRICE ANALYSIS

QUESTION 4

Indicate whether the following statements are **TRUE or FALSE**, **GIVING REASONS** for each of your answers (use diagrams to aid your answers where possible):

- 4.1 When a country imposing tariff is a 'large country', all of the tax is paid and absorbed by the consumers of the importing country. (2)

- 4.2 The demand for an agricultural input is a function of the marginal value product of the output produced using the input. (2)
- 4.3 A price index represents the actual level of price. (2)
- 4.4 An index that uses current period weights understates price increases and overstates price decreases. (3)
- 4.5 According to the symmetry condition, cross price elasticity of demand for beef with respect to pork equals the cross price elasticity of demand for pork with respect to beef. (2)
- 4.6 If wheat and maize compete for agricultural inputs, an increase in the price of wheat relative to the price of maize affects maize supply. (2)
- 4.7 Poultry farmers in South Africa have to be concerned about export subsidies paid to beef farmers in the US. (3)
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QUESTION 5

Answer the following questions concisely and completely.

- 5.1 Explain the following concepts / principles in your own words. Relate your explanations to agricultural price analysis
- 5.1.1 Asset fixity (3)
- 5.1.2 Export parity price (3)
- 5.1.3 Price discrimination (3)
- 5.2 Briefly indicate how each of the following events would be expected to affect the SA demand for and / or supply of wine and explain your reasoning.
- 5.2.1 A 10% increase in the cost of labour used on the wine farm. (2)
- 5.2.2 A report indicating that alcohol consumption reduces life expectancy. (3)
- 5.2.3 A 15% decrease in the price of a substitute to wine (2)
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QUESTION 6

The following questions might need calculations and interpretations, please show the necessary steps which lead to your final answer and interpret your results.

- 6.1 Suppose that the market for an agricultural product can be represented by the following equations:

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Demand: $QD = 100 - 10 \cdot P$ Supply: $QS = -20 + 5 \cdot P$

where P is the price (in Rands) per unit and Q represents quantity in units consumed per year. Given these demand and supply functions,

- 6.1.1 Calculate the consumer surplus and producer surplus at the equilibrium (2)
- 6.1.2 If government decides to set the market price for this product at R5/unit, how does this affect consumers and producers? (2)
- 6.1.3 If producer and consumer surplus are taken as welfare measures, what is the impact of the price policy (b) on social welfare? (2)
- 6.1.4 Do you support the price policy stipulated in '6.1.2'? Justify on economic grounds. (2)
- 6.2 Suppose that the RSA, a "small country", is net importer of rice. The Rand equivalent world price of rice is R8, 000/ton (ignore shipping and insurance costs), domestic rice production is 500,000 tons/annum, while domestic consumption is 900,000 tons/annum. The estimated own-price elasticity of demand and own-price elasticity of supply for rice in the RSA are -0.60 and 0.80, respectively. Suppose that the RSA government decides to introduce an *ad valorem* tariff on rice imports which is 25% of the value of an imported ton of rice.
- 6.2.1 Estimate the domestic rice production and consumption levels per annum after the *ad valorem* tariff. (3)
- 6.2.2 Estimate the total expenditure on rice imports after the *ad valorem* tariff. (2)
- 6.2.3 Estimate the RSA government revenue per annum from rice imports after the *ad valorem* tariff. (2)
- 6.2.4 Estimate the RSA producers' total rice revenue after the *ad valorem* tariff. (2)
- 6.2.5 What is the impact of the tariff on world price of rice? (1)

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