"Investing in Africa's Future"

COLLEGE OF BUSINESS, PEACE, LEADERSHIP AND GOVERNANCE

NMEC 211: AGRICULTURAL ECONOMICS

END OF SECOND SEMESTER EXAMINATIONS

APRIL/MAY 2022

LECTURER: G. MANDEWO

DURATION: 3 HOURS

INSTRUCTIONS

Answer **Question number 1** and **Any other THREE Questions** .

Total possible mark is **100.**

Start **each** question on a new page in your answer

Booklet.

1. Read a case study below

Nitrogen fertilizer use in US Agriculture

Fertilizer is an organic or inorganic material, of natural or synthetic origin, that is added to soil as a nutrient to promote plant growth. Recent studies have found that a large percentage of crop yields are attributable to commercial fertilizer use, causing a large percentage of the population to rely on synthetic nitrogen fertilizer. Mined inorganic fertilizers have been used for many centuries. Chemical, synthesized inorganic fertilizers were developed during the industrial revolution leading to the British Agricultural Revolution, and the industrial Green Revolution of the twentieth century. Nitrogen fertilizers are made using the Haber-Bosch process (1915), which combines natural gas and nitrogen gas with a catalyst at elevated temperature and pressure to produce ammonia. Ammonia is then converted into nitrogen fertilizers such as anhydrous ammonium nitrate and urea. The use of commercial inorganic fertilizers has increased rapidly in the last 50 years, rising almost 20-fold to the current rate of 100 million tons of nitrogen per year. In the United States, use of nitrogen in agriculture has increased steadily from 2.7 million nutrient tons in 1960 to over 12.2 million nutrient tons in 2010. Corn is the biggest user of nitrogen in US agriculture, with 5.6 million nutrient tons used in 2010, followed by wheat at 1.3 million nutrient tons, and cotton at 0.4 million nutrient tons. Applying excessive amounts of fertilizer has negative environmental effects, and wastes the growers' time and money. Negative environmental effects can include eutrophication, or serious oxygen depletion, in the ocean, especially in coastal zones, and lakes, causing the inability to sustain aquatic wildlife. As a result, application of nitrogen fertilizer is monitored and regulated in the United States. Agricultural runoff into groundwater has also been linked to "blue baby syndrome," and soil acidification. Another concern is global warming, resulting from increased levels of nitrous oxide, the third most important greenhouse gas after carbon dioxide and methane. Since the benefits of using nitrogen fertilizer are large and significant to feeding a growing world population, nations and groups will need to compare carefully these benefits of increased food production with the potential environmental costs.

Source: Stewart, W.M., Dibb, D.W., Johnston, A.E., and Smyth, T.J. (2005). "The Contribution of Commercial Fertilizer Nutrients to Food Production." Agronomy Journal 97: 1–6

(a) What are the side effects of using inorganic fertilizers? **[5 marks]**

(b) Suppose you have been contracted as a consultant to give advice on the balance between use of inorganic fertilizers and the negative side effects. What will be your advice and justification of the advice? **[5 marks]**

(c) Considering supply and demand for organic fertilizers, in the context of supply and demand model

(i) What is the effect of government introduction of subsidies to organic fertilizer production? **[5 marks]**

(ii) Suppose the government decides to discourage production of artificial fertilizers through an introduction of taxes. Discuss how effective this policy will be. **[5 marks]**

(iii) Markets work efficiently with forces of supply and demand. Why is it necessary to introduce government intervention in the market? **[10 marks]**

(d) What is the rationale of introducing agricultural economics to students who are specializing in economics? **[10 marks]**

2. In the context of economics of production you are required to explain the following concepts using a concrete agricultural example.

(a) Production function **[5 marks]**
(b) Substitutability of factors of production **[5 marks]**
(c) Returns to scale **[5 marks]**
(d) Economies of scale **[5 marks]**

3. (a) The profit-maximizing level of input use can be found by setting MR = MC. Why is optimization impossible when MC is not equal to MR? **[5 marks]**

(b) When the price of an input increases, the quantity demanded of that input will decrease. Why? **[5 marks]**

(c) When the output price increases, a business firm will increase the amount of input that it uses. In the context of agricultural production explain the statement above. **[5 marks]**

(d) A tax placed on an input will cause a business firm to purchase less of that input. Why? **[5 marks]**

4. (a) Economies of scale, returns to scale and substitutability of factors are three distinct factors. Explain how each is applicable to business. **[5 marks]**

(b) Explain two methods you would use to determine the minimum average variable cost (AVC) **[5 marks]**

(c) Of what relevance is the production surface? **[5 marks]**

(d) Make a clear distinction between economies of scale and returns to scale. **[5 marks]**

(e) Monopoly profit maximization is different from that of a firm in a perfectly competitive industry. Demonstrate. **[5 marks]**

5. (a) A Clear understanding of consumer demand is fundamental to profit maximisation. Explain with the aid of illustrative diagrams or otherwise this statement. **[10 marks]**

(b) Explain why, in modern firms, profit is more likely to be a constraint on managerial decision making rather than the firm's primary objective. **[5 marks]**

(b) Discuss whether profit maximization is a realistic objective for the management of a firm. **[5 marks]**

6. (a) Why does the assumption of competition result in a fixed price? Why is the price equal to the MR? **[5 marks]**

(b) Define the shutdown point for a firm in the short run and the long run **[5 marks]**

(c) Define and explain the terms elastic, inelastic, and unitary elastic **[5 marks]**

(d) Why does the quantity of beef demanded decrease when the price of beef increases? **[5 marks]**

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