AGRICULTURAL ECONOMICS III
(PRODUCTION ECONOMICS)

This topic entails the following:

- Parameter of national development
- Factors of production
- Law of diminishing returns
- Farm planning and budgeting
- Agricultural services
- Risks and uncertainities
- How to adjust to risks and uncertainities.

The following relevant questions and their answers in this topic will greatly motivate and help the user to comprehend and understand the required concepts and practices:

1. State **four** ways of increasing labour efficiency on the farm

2. The table shows egg production from individual birds with varying mounts of layers mash

100 layers (Fixed number)	Layers mash Kgs/week	Total egg production per week	Marginal production per week
100	0	140	0
100	10	155	15
100	20	180	25
100	30	240	60
100	40	340	100
100	50	470	130

(a) Sketch a graph representing the total egg production per week against amount of feed given

(b) Identify the type of production function represented by the graph in (a) above

3. (a) What are the uses of farm records to a farmer?

(b) Explain **four** ways in which a farmer may improve Labour productivity in the farm

(c) Outline the process followed in land adjudication

4. Name any **three** types of agricultural services available to the farmer

5. Outline **four** management guideline questions which assist a farm manager in making accurate

farm decisions

6. Give **four** ways of improving labour productivity

7. List **four** variable inputs in sorghum production

8. List **four** agricultural support services available to a crop farmer in Kenya

9. Define the following as used in Agricultural economics:-
(a) Gross domestic product (GDP)

(b) Per capita income

10. Explain the various ways in which farmers may adjust to risks and uncertainties

11. (a) The table below represents the yield of maize in 90kg bags in response to application of
different quantities of planting fertilizer
(i) Fill in the blank spaces

Input 50kg bag fertilizer	Out put 90kg bag maize	Average product (AP)	Marginal product (MP)
0	6	-	-
1	10	-	-
2	24	-	-
3	31	-	-
4	36	-	-
5	40	-	-
6	43	-	-
7	43	-	-
8	40	-	-

(ii) Suggest the best level of production in relation to the inputs and output

(b) A farmer is considering undertaking the production of either maize or beans. Study the
following information about the two crops then answer the questions that follow:

(i) Maize

Yield per hectare	5,500 kg
Price	15 per kg

Cost of cultivation / ha	Kshs. 3000
Amount of seeds/ha	25kgs
Cost of DAP fertilizer/bag	Kshs.1,500
Amount of DAP fertilizer/ha	3bags
Cost of seeds/kg	Kshs.100
Labour requirements/ha	50 man days
Cost of labour	Kshs.150 per man day
Amount of CAN fertilizer/bag	3 bags
Cost of CAN fertilizer/bag	Kshs.1000

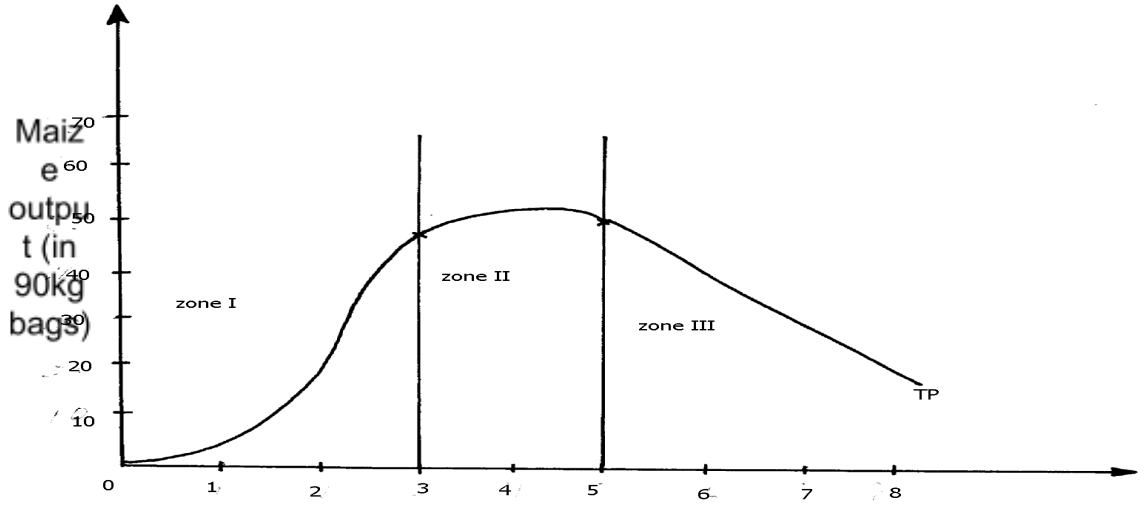
(ii) Beans

Yield per hectare	5000kg
Price	50per kg
Cost of cultivation / ha	KShs.3600
Labour requirements/ha	75 man days
Cost of labour	Kshs. 200 per man day
Cost of DAP fertilizer/bag	Kshs. 1500
Amount of DAP fertilizer/ha	2bags
Cost of seeds/kg	Kshs.800
Amount of seed/ha	20kg
Amount of CAN fertilizer/bag	1bag
Cost of CAN fertilizer/bag	Kshs.1,000
Cost of sprays	Kshs.3,000

(i) Calculate the gross margins for each crop
(14mks)

(ii) From your calculation, which crop is profitable to grow?

12. Below is a graphical representation of the law of diminishing returns.



NPK fertilizer input (in 50kg bags)

(a) Explain what happens in each of the three zones marked I and III in relation to the output
of maize and the NPK fertilizer input
(b) Which of the three is a rational zone of production

13. Give **four** variable costs in maize production
14. A farmer has the following yield from a two hectare millet crop enterprise at Oluch irrigation schemes.

Study it and prepare his gross margin. is it profitable to grow millet? He spent the following in his operations

Weed	800/=
Seeds	20kg/ha
Irrigation	600/=/ha
Ploughing	500/=/ha
Clearing the land	1200/=
Cost of seeds	300/= /10kg bag
Planting	400/= /ha
Harvesting	1200/= /ha
Yield	32bags
DAP fertilizer	2 bags at 10 000/= /50kg bags
CAN fertilizer	2 bags at 700/= /50kg bags
Gunny bags	40/= /bag
Transport to market	2000/=

14. A farmer has the following yield from a two hectare millet crop enterprise at Oluch irrigation schemes. Study it and prepare his gross margin. is it profitable to grow millet? He spent the following in his operations

Weed	800/=
Seeds	20kg/ha
Irrigation	600/=/ha
Ploughing	500/=/ha
Clearing the land	1200/=
Cost of seeds	300/= /10kg bag
Planting	400/= /ha
Harvesting	1200/= /ha
Yield	32bags
DAP fertilizer	2 bags at 10 000/= /50kg bags
CAN fertilizer	2 bags at 700/= /50kg bags
Gunny bags	40/= /bag
Transport to market	2000/=

(20mks)

15. What is profit maximization in Agricultural Economics

16. a) A farmer is considering undertaking the production of either maize or beans. Study the following information about the two crops and then answer the questions that follow:

Maize	
Yield per hectare	5500kg
Price	Kshs.15 per kg
Cost of cultivation/ ha	Kshs. 3000/=
Amount of DAP fertilizer/ bag	Kshs.1500/=
Amount of DAP fertilizer/ ha	3 bags
Cost of seed/ Kg	Kshs.100
Labour requirements / ha	50 man days
Cost of labour	Kshs.150 per man day
Amount of CAN fertilizer	3 bags
Cost of CAN fertilizer/ bag	Kshs.1000

Beans	
Yield per hectare	Kshs.5000
Price	Kshs.50 per kg
Cost of cultivation/ ha	Kshs.3600
Labour requirements/ ha	75 man- days
Cost of labour	Kshs.200 per man day
Cost of DAP fertilizer/ bag	Kshs.1500
Amount of DAP fertilizer/ ha	2 bags
Cost of seed/ kg	Kshs.80
Amount of seed/ ha	20kg
Amount of CAN fertilizer/	1 bag
Cost of CAN fertilizer/ bag	Kshs.1000
Cost of sprays	Kshs.3000

i) Calculate the gross margin for each crop

ii) From your calculation which crop is profitable to grow

b) Discuss **five** factors considered when planning a farm

17. Using the data provided in the table below, make an interpretation and advice the farmer on which crop to grow ;

Type of crop	**Gross margin (Ksh)**
Cotton	18,400
Ground nuts	20,050

18. Outline **three** advantages of budgeting in farm business

19. A farmer has 1 Ha piece of land on which he grows maize. His farm record on maize production for nine years is as shown in the table below:

Year	Fertilizer applied (bags)	Total output of maize (bags)
1995	0	4
1996	2	10
1997	4	28
1998	6	42
1999	8	52
2000	10	60
2001	12	66
2002	14	66
2003	16	64

(a) i) Using an appropriate scale, with input on the X-axis draw a graph to show the relationship between inputs and total output

(ii) From the graph you have drawn, how many bags of maize would the farmer produce if he applied 9bags of fertilizer?

Calculate the farmers marginal products and average products for the years

(i) From the data given, what rate of fertilizer application would the farmer choose if he wanted to grow maize in 2004?

(ii) Give an explanation for your choice in (c) (i) above

(b) Assuming that the average price of fertilizer over the years recorded was shs. 1,200/= per bag and the price of maize was ksh.1000/= per bag :

Calculate the gross income for the years 2002 and 2003

Calculate the net income for the year 1999. (Assume no other costs were incurred)

20. Name five types of costs incurred in a farming business

22. List any four sources of credit to farmers.

23. List **three** ways in which labour peaks can be overcome in the farm (1½ mks)

24. State **four** ways of improving farm labour productivity

25. A farmer had a plot of land measuring 5 hectares in which be intended to plant maize.

He was advised to apply 150 kg of P_20 per hectare at planting and 200kg N per hectare during top dressing. The fertilizer available in the market was Calcium Ammonium Nitrate containing

20% N and Di-ammonium phosphate 46% $P_2 0_5$. Calculate.

(a) (i) The amount of Di—ammonium phosphate required

(ii) The amount of calcium ammonium nitrate required

(b) Baraka farm manager plans to grow Irish potatoes or maize for grains. Study the information
below and answer the questions that follow:

Irish potatoes
Cost of fertilizers/ha_____ Ksbs 10,000.
Labour requirements/ha _____ Kshs 50 man - days
Yield /ha _____ 10,000kg
Seed potato/ha _____Kshs20, 000
Cost of labour _____ Kshs 200 per man day
Cost of fungicides_____ Kshs 5000
Cost of ploughing_____ Kshs 4000
Selling price of potatoes per kg _____ Kshs 30.

Maize
Yield per hectare _____Kshs.7,500kg
Selling price of maize per kg _____Kshs 20.
Cost of ploughing /ha _____Kshs.4000
Seed maize/ha _____Kshs.3000
Labour requirement /ha _____ 200 man days.
Cost of fertilizers /ha _____Kshs 10,000
Cost of top dressing fertilizers _____Kshs 4,800
Cost of labour _____Kshs 150 per man - day

(i) What is gross margin?

(ii) Calculate the gross margin of each of the crops

(iii) From the calculation above which crop should the farm grow?

(d) Describe the environmental factors that may lead to poor yields in crop production

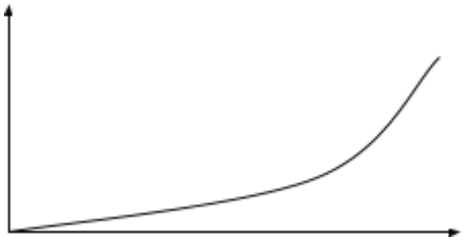
AGRICULTURAL ECONOMICS III
(PRODUCTION ECONOMICS)

1. four ways of increasing labour efficiency on the farm

- Training them
- Giving incentives

- Supervision
- Good operator – worker relationship
- Farm mechanization
- Assigning tasks according to skills & specialization
- Proper remuneration : Attractive salaries

2. a) graph representing the total egg production per week.



b) - Increasing returns production function.

3. (a) - Help to determine the value of the farm/ determine assets and liabilities.

- Provide history of the farm.
- Assist in planning and budgeting in various fields.
- Helps to detect losses or theft in the farm.
- Assists when sharing losses or profits (dividends)for communal owned farms/ partnership.
- Help to settle disputes in the farm among heirs.
- Help to support insurance claim e.g. against fire and theft.
- Provide labour information like terminal benefits, NSSF due, Sacco dues for all employees.
- Help to compare the performance of different enterprises within a farm or other farms.
- Help in the assessment of income tax to avoid over or under taxation.
- Records, helps to show whether the farm business is making profit or losses. This information helps in obtaining credit.

(10 x 1 = 10 mks)

(b) - Training worker e.g. in F.T.C's, during field days, Agricultural shows, through demonstrations and workshops.

- Measuring farm operations to supplement the labour force.
- Providing incentives to workers such as attractive wages, free protective wear, housing, medical facilities, proper feeding, rewarding good workers. Et.c
- Supervising and counseling workers.
- Creating good operator - worker relationships.
- Assigning specific tasks to the labor force.

(c) - Establishment of land ownership.
- Measurement of land size.
- Description of the land.

- Recording and mapping of the surveyed land.
- Solving objections if any.
- Submission of the maps and records to the district land office registration

4. Three types of agricultural services available to the farmer

- Credit
- Extension and training
- Agricultural research
- Banking
- Artificial insemination
- Veterinary

5. Four management guideline questions which assist a farm manager in making accurate farm decisions

- What product to produce?
- How much to produce?
- What to produce?
- For whom to produce?

6. - Training

- Farm mechanization
- Labor supervision
- Giving incentives and improving terms and conditions of service
  Assign specific tasks

7. - Fertilizers - Seeds
- Pesticides -Casual labor

8. - Banking

- Extension and training
- Credit facility
- Agricultural research
- Marketing
- Farm input supplies
  Tractor hire service

9. (a) Is the sum total of goods and services produced by a country within a period of one year (b) -Per capital income: Is the gross national income divided by the number of people living in a country

10. -Diversification- Setting up several and different enterprises on the farm. If one fails the farmer cannot incur total loss.

- Contracting- farmers can enter into contract with consumers. It guarantees a constant fixed market for goods/services
- Insurance- Taking an insurance cover to compensate them incase of loss
- Input rationing- Farmers can control the quantities of inputs used in various enterprises to reduce losses

- Flexibility in production methods- Ability to change from one enterprise to another in response to demand changes
- Adopting modern methods of production e.g. disease control, irrigation, mechanization e.t.c.

11. Application of fertilizer

Input 50kg bag fertilizer	Out put 90kg bag maize	Average product (AP)	Marginal product (MP)
0	6	-	0
1	10	10	4
2	24	12	14
3	31	10.33	7
4	36	9	5
5	40	8	4
6	43	7.18	3
7	43	6.14	0
8	40	5	-3

(ii) The best level of production in relation to the inputs and out put is level 3

(b) (i) Gross margins for the crops

(i) Maize

Value of maize/incomve	5,500 x 15 = 82,500/= (1mk)
Cost of labour	50x 150 = 7,500/= (1mk)
Cost of cultivation /ha	1 x 3,000 = 3,000/= (1mk)
Cost of seed	25 x 100 = 2,500/= (1mk)
Cost of DAP fertilizer	3 x 1,500 = 4,500/= (1mk)
Cost of C.AN fertilizer	3 x 1000 = 3,000/= (1mk)
Total variable costs	20,500/= (1mk)
GM for maize	82,500 – 20,500 = 62,000 (1mk)

(ii) Beans

Value of beans/income	5,000 x 500 = 250,000/= (1mk)
Cost of labour	75 x 200 = 15,000/= (1mk)
Cost of cultivation /ha	1 x 3,600 = 3,600/= (1mk)
Cost of seed	20 x 80 = 1,600/= (1mk)
Cost of DAP fertilizer	2 x 1,500 = 3,000/= (1mk)
Cost of C.AN fertilizer	1 x 1000 = 1,000/= (1mk)
Total variable costs	27,200/= (1mk)
GM for beans	250,000 – 27,200 = 222,800 (1mk)

(b) (ii) The crop which is profitable from the calculation is that : (1mk)

- It is more profitable to grow beans than maize

12. a) ZONE I

- For each additional unit of input applied the output of maize increased at an increasing

rate because the fertilizer resources are underutilized √1
(1x2=2 mks)

ZONE II

- For each additional unit of input applied the output of maize increased at a decreasing

rate because the resources are used to the maximum√1
(1x2=2 mks)

ZONE III

- For each additional unit of input applied the output of maize decreases because

the fertilizer/ resources are excessively applied√1
(1x2=2 mks)

b) ZONE II

13. Give four variable costs in maize production

- Cost of fertilizer
- Cost of seeds
- Cost of pesticide
- Cost of weeding
- Cost of harvesting
- Cost of casual labour
- Cost of fuel

14.

ITEM	QUANTITY	NO. OF UNITS	COST PER UNIT	TOTAL VARIABLES COST
Weeding	-	-	-	800 00
Seeds	20kg	2	300	600 00
Irrigation	-	2ha	600	1200 00
Ploughing	-	2ha	500	1000 00
Clearing land	-	-	-	1200 00
Planting	-	2ha	400	800 00
Harvesting	-	2ha	1 200	2400 00
DAP fertilizer	-	2	10 000	20 000 00
DAN fertilizer	2bags	2	700	1400 00
Gunning bags		32	40	1280 00
transport	2bags 32 -	-	-	2000 00
Total variable cost				32 680 00
income		32bags	1200	38 400 00

Gross margin=total revenue-total variable cost
= 38400-32680 = 5720.00

15.

- Profit maximization is the profit in a production process where the highest net returns (Net revenue) on invested capital is realized/ when the difference between total revenue (TR) and total cost (TC) is the highest point in a production process/ where profit is highest
- Is where marginal revenue (MR) is equal to or almost equal to marginal costs

16. a) i) Gross margins for the crops

Value of maize/ income	55000 X 15 = 82500	1 mark
Cost of labour	50 X 150 = 7500	1 mark
Cost of cultivation/ ha	1 X 3000 = 3000	1 mark
Cost of seed	25 X 100 = 2500	1 mark
Cost of DAP fertilizer	3 X 1500 = 4500	1 mark
Cost of CAN fertilizer	3 X 1000 = 3000	1 mark
Total variable costs	20500	1 mark
GM for maize	82500- 20500 = 62000	1 mark

ii) Beans

Value of beans/ income	5000 X 500 = 250000	1 mark
Cost of labour	75 X 200 = 15000	1 mark
Cost of cultivation/ ha	1 X 3600 = 3600	1 mark
Cost of seed	20 X 80 = 1600	1 mark
Cost of DAP fertilizer	2 X 1500 = 3000	1 mark
Cost of CAN fertilizer	1 X 1000 = 1000	1 mark
Cost of sprays	3000	1 mark
Total variable costs	27200	1 mark
GM for beans	250000 – 27200 = 222800	1 mark

iii) It is more profitable to grow beans than maize 1 mark

b)

- Size of the farm
- Climatic conditions
- Fairness objectives and preferences
- Existing market conditions
- Available resources
- Expected returns

17. - The farmer should grow groundnuts;

- The crop has a higher gross margin than cotton;

18. – The farmer may be able to estimate the required production resource e.g labour capital e.t.c

- Assists farmer when e.g. labour capital etc

- Assists farmer in making management decisions;
- Helps to reduce uncertainties in the production process;
- Shows progress or lock of progress in farm business;

19. (a) (i) See the graph paper

(ii) 56 bags; (1x1=1mk)

(b) Table – (16x ½ =8mks)

Year	Fertilizer applied (bags)	Maize output (bgs)	Marginal product	Average product
1995	0	4	-	-
1996	2	10	6	5
1997	4	28	18	7
1998	6	42	14	7
1999	8	52	10	6.5
2000	10	60	8	6
2001	12	66	6	5.5
202	14	66	0	4.7
2003	16	64	-2	4

(c) (i) 4 bags (1x1=1mk)

(ii) MP is maximum; AP is maximum;(2x1=2mks)

(d) Gross income = Total output x price per unit

in 2002 66 x 1000 = 66000/=(1x1=1mk

in 2003: 64 x 1000 = 64000/=(1x1=1mk)

(ii) Net income = Total income – Total cost

in 1999: Total income was 52 x 1000 = 52000/=

total cost was 8 x 1200 = 9,600/=

Hence 5200/= - 9600; (1mk)

= Shs. 42,400/= (1mk)

21.

- Flood costs (F.C)
- Variable costs (V.C)
- Total costs (T.C)
- Average costs (A.C)
- Marginal costs (M.C)

22.

- Co-operative societies
- Crop boards
- Commercial banks
- Agricultural finance corporation (A.F.C)
- Settlement fund trustees
- Hire purchase companies
- Insurance companies. (Any 4)

23. three ways in which labour peaks can be overcome in the farm

- Overtime working for casual labourers

- Greater use of casual workers
- Mechanization
- Use of contractors who may be engaged to do some work at a fee
- Cropping system devised such that ripening of crops could be at different times

Work study to devise new techniques of doing work more quickly and efficient

24 . - training
-giving incentives/motivation
-farm mechanization
-labour

25. (a) 1000kg of NAP con 46kg P_2O_5S

150 x 100 – 150
50
300kg of DAP per hectar
1ha = 300kg of DAP
5ha x 300
1 = 1500g of DAP

1 bag = 50kg
1500 x 1 = 1500kg
50 = 30bags pf DAP
N/B Approximation = 3obags

CAN
100kg contain 20kg of price N
200x 100 = 200kg
30 = 1000kg
I ha = 1000kg
5ha = 1000 x 5 = 5000kg
1bag = 50kg
5000 x 1 = 5000kg
50
= 100bags of CAN

(b) (i) – cross margin is variable cost – total revenue
Gross margin of irish potatoes
Cost of fert = shs 10000 x 5 = 50000
Cost labour requirement = 50 x 200 x 5 = 50,000
Cost of seed potatoes 20,000 x 5 = 100000
Cost of fungicides 5000 x 5 = 25000
Cost of ploughing 400 x 5 = 50,000
Total variable cost shs.145,000
Total revenue = shs.50,000 x 50 = shs.1,500,00
Gross margin shs. 1,500,000 – shs.145,000 =shs.1,255,100

(i) Maize
Cost of fert. shs 10000 x 5 = shs.50000

Cost of fert. shs. 4800 x 5 = shs.24000
Cost of maize seed shs.3000 x 5 = shs.15000
Cost f labour shs.200 x 150x 5 = shs.150000
Cost of ploughing shs.4000 x 5 = shs.20000
Total cost = shs.259000
Revenue 750000 X 5 X 20= Shs.750000
Gross margin = 750000
- 259000
Shs.481000
(ii)He should grow potatoes
- pests
Diseases
Unreliable rainfall
Change in temperature
Strong wind
Light aspect
Infertile soils