THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

134/1 SCIENCE AND PRACTICE OF AGRICULTURE 1

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2000**

Instructions

1. This paper consists of ten (10) questions in sections A, B and C.
2. Answer five (5) questions choosing at least one (1) question from each section.
3. Each question carries twenty (20) marks.
4. Cellura phones are not allowed in the examination room.
5. Write your Examination Number on every page of your answer booklet(s).

SECTION A

AGRICULTURAL ENGINEERING AND LAND PLANNING

1. (a) Describe the construction of a mouldboard plough.

A mouldboard plough is constructed as a strong metal implement designed to cut, lift, and turn soil. It consists of a rigid frame to which all working parts are attached, allowing the plough to withstand high soil resistance during operation. The frame supports the working components and connects the plough to animal or tractor power.

The plough has a curved mouldboard made of steel, which is designed to lift and invert the soil slice. The mouldboard is shaped to ensure smooth turning of the soil and effective burial of weeds and crop residues.

The share is fixed at the bottom front of the plough and is made of hardened steel. It cuts horizontally into the soil, separating the furrow slice from the ground.

The landside is attached behind the share and runs along the unploughed land. It provides lateral stability and prevents the plough from being pushed sideways during operation.

The frog acts as the central base onto which the share, mouldboard, and landside are bolted. It ensures correct alignment and firmness of all working parts.

1. (b) Explain the function of the following parts of a mouldboard plough:

(i) Share

The share cuts through the soil horizontally at the required depth. It slices the soil ahead of the mouldboard, allowing the furrow slice to be lifted and turned efficiently.

(ii) Landside

The landside resists the sideways pressure created when the soil is being turned. It keeps the plough moving in a straight line and maintains uniform furrow width.

(iii) Frog

The frog supports and holds together the share, mouldboard, and landside. It ensures proper alignment of these parts so that the plough works efficiently without excessive wear.

(iv) Mouldboard

The mouldboard lifts, turns, and inverts the soil slice after it has been cut by the share. This action buries weeds and crop residues while leaving a rough surface suitable for further tillage.

1. (c) State two conditions under which a mouldboard plough performs poorly.

A mouldboard plough performs poorly in very dry and hard soils because excessive soil resistance reduces penetration and increases wear on the working parts.

It also performs poorly in stony soils since stones obstruct soil inversion and can damage the share and mouldboard.

2. (a) Explain the meaning of land surveying as used in agriculture.

Land surveying in agriculture is the science and art of measuring land to determine boundaries, sizes, shapes, and relative positions of farm features. It provides accurate information needed for proper land use planning and development.

2. (b) Describe the use of each of the following surveying instruments:

(i) Ranging rods

Ranging rods are used to align straight lines during surveying. They help the surveyor maintain direction when measuring distances or setting out boundaries.

(ii) Pegs

Pegs are used to mark fixed points on the ground such as corners, boundaries, or stations. They provide reference points during and after surveying operations.

(iii) Measuring tape

A measuring tape is used to measure distances accurately on the ground. It is essential for determining lengths, widths, and perimeters of farm plots.

2. (c) State two limitations of chain surveying on large farms.

Chain surveying is time-consuming on large farms because many measurements are required, increasing labour and time costs.

It is also less accurate on uneven or rugged terrain since obstacles interfere with straight-line measurements.

3. (a) Distinguish between primary tillage and secondary tillage.

Primary tillage is the initial deep soil working operation that breaks and turns the soil to prepare land for planting. It is usually done to loosen soil and bury weeds.

Secondary tillage is the shallow soil working operation carried out after primary tillage. It refines the seedbed by breaking clods and leveling the surface.

3. (b) Name two implements used in each type of tillage.

Primary tillage implements include the mouldboard plough and disc plough.

Secondary tillage implements include the harrow and cultivator.

3. (c) Explain one function of each implement named in (b).

A mouldboard plough cuts and turns the soil to bury weeds and residues.

A disc plough cuts and partially turns soil, especially in hard or trashy fields.

A harrow breaks large soil clods and smoothens the soil surface.

A cultivator loosens soil and controls weeds without turning the soil deeply.

4. (a) Explain the working principle of a knapsack sprayer.

A knapsack sprayer works by pressurizing liquid inside a tank using a hand-operated pump. The pressure forces the spray mixture through a nozzle where it is atomized into fine droplets.

4. (b) State four faults that may occur during its operation.

Leakage of spray mixture may occur due to worn seals or loose connections.

Blocked nozzles may occur due to dirt or chemical residues.

Uneven spraying may result from damaged nozzles or irregular pumping.

Loss of pressure may occur due to faulty pump washers.

4. (c) Explain one remedy for each fault stated in (b).

Leakage can be corrected by replacing worn washers and tightening connections.

Blocked nozzles can be cleared by cleaning with clean water and soft materials.

Uneven spraying can be corrected by replacing damaged nozzles.

Loss of pressure can be solved by repairing or replacing the pump assembly.

5. (a) A farmer uses a knapsack sprayer calibrated to deliver 600 litres per hectare.

(i) Calculate the amount of spray mixture required to cover 0.75 hectares.

Amount required = 600 litres × 0.75
Amount required = 450 litres

(ii) If the sprayer tank capacity is 15 litres, calculate the number of refills required.

Number of refills = 450 ÷ 15
Number of refills = 30 refills

5. (b) State two advantages of proper sprayer calibration.

Proper calibration ensures correct application rates, preventing under-application or wastage of chemicals.

It also protects crops from chemical damage and reduces environmental pollution.

SECTION B

SOIL SCIENCE

6. (a) Define soil formation.

Soil formation is the process by which rocks are weathered and transformed into soil through physical, chemical, and biological processes over time.

6. (b) Explain the role of each of the following factors in soil formation:

(i) Parent material

Parent material determines the mineral composition and texture of the soil formed.

(ii) Climate

Climate influences the rate of weathering and organic matter decomposition.

(iii) Living organisms

Plants and microorganisms add organic matter and aid soil mixing.

(iv) Time

Time allows gradual development of soil horizons and maturity.

7. (a) Explain the term soil texture.

Soil texture refers to the relative proportion of sand, silt, and clay particles in the soil.

7. (b) Describe the soil textural classes using the soil textural triangle.

The soil textural triangle classifies soils into groups such as sandy, loamy, and clay soils based on particle proportions.

7. (c) State two agricultural limitations of sandy soils.

Sandy soils have low water-holding capacity.

They also have low nutrient retention.

8. (a) Define soil organic matter.

Soil organic matter consists of decomposed plant and animal residues in the soil.

8. (b) Explain four functions of soil organic matter in crop production.

It improves soil structure and aeration.

It increases water-holding capacity.

It supplies nutrients through decomposition.

It supports beneficial soil organisms.

8. (c) State two sources of organic matter added to agricultural soils.

Farmyard manure is a major source of organic matter.

Crop residues also contribute organic matter.

SECTION C

RURAL ECONOMY

9. (a) Explain the meaning of gross margin as used in farm management.

Gross margin is the difference between total revenue and total variable costs in a farming enterprise.

9. (b) A farmer planted 3 hectares of beans. The following costs were incurred.

(i) Calculate total revenue.

Total revenue = 2,400 kg × 1,200
Total revenue = Tshs 2,880,000

(ii) Calculate total variable costs.

Total variable costs = 45,000 + 90,000 + 30,000 + 120,000
Total variable costs = Tshs 285,000

(iii) Calculate gross margin.

Gross margin = 2,880,000 − 285,000
Gross margin = Tshs 2,595,000

(iv) Determine the gross margin per hectare.

Gross margin per hectare = 2,595,000 ÷ 3
Gross margin per hectare = Tshs 865,000

9. (c) State two uses of gross margin analysis to farmers.

It helps farmers compare profitability of different enterprises.

It assists in planning resource allocation efficiently.

10.(a) Explain the meaning of agricultural marketing.

Agricultural marketing is the process of moving agricultural products from producers to consumers through various activities.

10.(b) Describe four functions of agricultural marketing.

It facilitates exchange between buyers and sellers.

It provides storage of produce.

It enables transportation of goods.

It involves price determination.

10.(c) Explain four problems faced by farmers in marketing agricultural produce.

Poor transport infrastructure increases costs.

Price fluctuations reduce income stability.

Lack of market information affects decision-making.

Presence of many middlemen reduces farmer profits.

10.(d) State two measures that can be taken to improve agricultural marketing efficiency.

Improving rural transport networks enhances market access.

Providing reliable market information improves pricing decisions.