THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

134/2 **AGRICULTURE 2**

(For Both School and Private Candidates)

Time : 3 Hours **ANSWERS** **Year : 2001**

Instructions

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

1. (a) Define each of the following terms as used in plant pathology:

(i) Wilt

(ii) Damping-off

(iii) Mosaic

(iv) Leaf scorch

(v) Root rot

Wilt is a condition in plants where leaves and stems lose turgidity, droop, and collapse due to blockage or destruction of water-conducting tissues, usually caused by fungi or bacteria.

Damping-off is a disease of seedlings characterized by rotting of stems at the soil line, leading to seedling collapse. It is commonly caused by soil-borne fungi such as Pythium and Rhizoctonia.

Mosaic refers to a viral disease symptom where leaves develop irregular patches of light and dark green, giving a mottled appearance. It is commonly seen in crops like cassava, tobacco, and maize.

Leaf scorch is a symptom where leaf margins or interveinal tissues dry up and turn brown, often due to fungal or bacterial infection, or extreme water stress.

Root rot is the decay of root tissues caused mainly by soil-borne fungi, leading to poor nutrient uptake, stunted growth, and eventual plant death.

(b) Explain six methods farmers may use to prevent post-harvest losses due to fungal spoilage.

One method is proper drying of harvested crops to reduce moisture content, since fungi thrive in humid conditions.

Another method is storing produce in clean, well-ventilated, and dry facilities to minimize fungal growth and contamination.

Farmers can also apply recommended fungicides or seed treatments before storage to suppress fungal pathogens.

Using hermetic storage technologies, such as airtight bags or silos, reduces oxygen levels and prevents fungal growth.

Sorting and grading harvested produce to remove infected or damaged items prevents spread of fungi during storage.

Practicing good hygiene by cleaning storage structures, tools, and containers reduces the chances of fungal contamination.

(c) Rice tungro disease is a serious viral disease in rice-growing regions.
(i) Name the causative single or viruses involved.
(ii) Describe symptoms of rice tungro infection in young rice plants.
(iii) Give three control strategies applicable to manage rice tungro.
(i) Rice tungro disease is caused by a combination of two viruses: Rice tungro bacilliform virus (RTBV) and Rice tungro spherical virus (RTSV).

(ii) In young rice plants, symptoms include stunted growth, yellow to orange leaf discoloration, reduced tillering, and delayed flowering. Infected plants often appear shorter than healthy ones.

(iii) Control strategies include planting resistant rice varieties, controlling green leafhopper vectors through insecticides or integrated pest management, and practicing crop rotation or synchronous planting to break the virus transmission cycle.

2. (a) Describe the mode of action of each of these categories of herbicides:
(i) Contact herbicides
(ii) Systemic herbicides
(iii) Pre-emergence herbicides
(iv) Post-emergence herbicides
(v) Selective herbicides
(vi) Non-selective herbicides
Contact herbicides kill only the plant tissues they directly touch, causing rapid injury to leaves but not moving within the plant.

Systemic herbicides are absorbed and translocated within the plant's vascular system, killing both above- and below-ground tissues.

Pre-emergence herbicides act on weed seeds or seedlings in the soil before they emerge above ground.

Post-emergence herbicides are applied to actively growing weeds after they have emerged from the soil.

Selective herbicides target specific weeds while leaving crops largely unaffected.

Non-selective herbicides kill almost all plant types, used in areas where total vegetation control is needed.

(b) What environmental factors influence the effectiveness of herbicides? Explain five.
Soil moisture affects herbicide uptake, as dry soils reduce absorption and effectiveness.

Temperature influences herbicide activity, with extremes reducing plant metabolism and uptake.

Soil type and organic matter content determine herbicide persistence and availability.

Rainfall can either activate soil-applied herbicides or wash away foliar sprays, reducing effectiveness.

Wind speed affects spray drift, reducing herbicide deposition on target weeds.

(c) For each of the following pests, do the following: False codling moth, aphids, and maize stem borer. For each pest: (i) name a host crop; (ii) describe the type of damage; (iii) suggest two control measures.
False codling moth affects citrus fruits. The larvae bore into fruits causing rotting and premature fruit drop. Control measures include field sanitation and pheromone traps.

Aphids infest crops like beans. They suck plant sap causing leaf curling, stunting, and transmitting viruses. Control measures include insecticidal sprays and encouraging natural predators such as ladybird beetles.

Maize stem borer attacks maize. Larvae tunnel into stems, weakening plants and reducing yield. Control measures include timely planting and use of resistant maize varieties.

3. (a) Explain what is meant by:
(i) Hybrid vigour (heterosis)
(ii) Recessive trait
(iii) Codominance
(iv) Genetic drift

Hybrid vigour refers to improved performance of offspring compared to parents due to crossing of genetically diverse individuals.

A recessive trait is expressed only when an organism inherits two copies of the recessive allele, otherwise it remains masked.

Codominance is when both alleles in a heterozygote are fully expressed, producing a phenotype showing traits of both parents.

Genetic drift is the random change in allele frequencies in small populations due to chance events.

(b) Outline four characteristics which are desirable when selecting a new crop variety for drought-prone areas.

Early maturity ensures crops escape drought periods by completing growth quickly.

Deep root system allows plants to access water stored in deeper soil layers.

High water-use efficiency ensures crops produce good yields with limited moisture.

Resistance to heat stress reduces yield loss during high temperature conditions.

(c) Discuss three methods used in breeding cross-pollinated crops, giving advantages and disadvantages of each method.
(6 marks)

Mass selection involves selecting and planting seeds from desirable plants. Its advantage is simplicity, but it maintains genetic variability and lacks uniformity.

Hybridization involves crossing two genetically distinct parents to produce hybrids. It produces high-yielding varieties but requires controlled pollination and is expensive.

Recurrent selection improves population traits through repeated selection and recombination. It increases genetic gain over time but is slow and resource-demanding.

4. (a) Identify five viral diseases of major crops in Tanzania. For each, name the crop, virus, and one symptom.

Maize streak disease affects maize, caused by maize streak virus, with symptoms of chlorotic streaks on leaves.

Banana bunchy top disease affects banana, caused by banana bunchy top virus, showing bunched leaves.

Cassava mosaic disease affects cassava, caused by cassava mosaic virus, with mottled and twisted leaves.

Rice tungro affects rice, caused by tungro viruses, showing yellow-orange discoloration.

Tomato yellow leaf curl affects tomato, caused by tomato yellow leaf curl virus, showing upward leaf curling.

(b) Describe three advantages and three disadvantages of using chemical pesticides compared to biological control.

Advantages include rapid control of pests, reliability across diverse conditions, and wide availability.

Disadvantages include development of pest resistance, environmental contamination, and destruction of beneficial organisms.

(c) Explain epiphytotic disease:

(i) Define the term.

(ii) Describe four environmental and biological factors that can lead to epiphytotics.

(i) An epiphytotic disease is a plant disease outbreak that occurs over a large area and affects a high proportion of crops in a short period.

(ii) Favorable climate conditions such as high humidity encourage spread. Abundance of susceptible host plants increases disease severity. Presence of a virulent pathogen strain promotes rapid infection. High population of vectors accelerates transmission.

5. (a) Wheat rust is a major fungal disease. For wheat rust:

(i) What is the causative agent?

(ii) Describe five symptoms of wheat rust.

(iii) Suggest two control measures suitable for smallholder farmers.

(i) The causative agent is Puccinia spp., a fungal pathogen.

(ii) Symptoms include reddish-brown pustules on leaves, yellowing around pustules, leaf drying, reduced grain filling, and stunted growth.

(iii) Control measures include planting resistant varieties and practicing crop rotation with non-host crops.

(b) Give five symptoms that might indicate nutritional deficiency in maize plants.
Chlorosis of leaves indicates nitrogen deficiency.

Purple coloration of leaves suggests phosphorus deficiency.

Yellowing along leaf margins indicates potassium deficiency.

Stunted growth is a sign of multiple deficiencies.

Poor kernel development indicates nutrient imbalance.

(c) Define each of these:
(i) Quarantine
(ii) Resistant variety
Quarantine is a legal restriction to prevent movement of plant materials that may carry pests or diseases.

A resistant variety is a crop type bred to withstand or tolerate attack by specific pests or diseases.

(d) Give four advantages and three limitations of using resistant crop varieties to control plant diseases.
Advantages include cost-effectiveness, long-term protection, reduced pesticide use, and environmentally friendly control.

Limitations include possible breakdown of resistance, limited availability of resistant seeds, and reduced genetic diversity.

SECTION B

LIVESTOCK SCIENCE AND PRODUCTION

6. (a) Define each of these terms as used in animal nutrition:

(i) Metabolizable energy

(ii) Net energy for production

(iii) Crude protein

(iv) Forage quality

Metabolizable energy is the portion of energy in feed that is available to the animal after subtracting energy lost in feces, urine, and gases. It represents the energy that can be utilized for maintenance and production.

Net energy for production is the amount of energy available to an animal after meeting maintenance requirements. It is used for processes such as growth, lactation, reproduction, and work.

Crude protein is the total protein content of a feed estimated based on nitrogen content, usually calculated by multiplying nitrogen percentage by a factor of 6.25.

Forage quality refers to the nutritional value of forage for livestock, determined by factors such as digestibility, protein content, energy content, and palatability.

(b) A dairy cow eats 10 kg of feed containing 90% dry matter (DM) with a digestibility coefficient of 60%. Calculate the amount of digestible dry matter consumed.

First, determine the amount of dry matter:
Dry matter = 10 kg × 90% = 9 kg.

Next, apply digestibility:
Digestible dry matter = 9 kg × 60% = 5.4 kg.

Therefore, the dairy cow consumed 5.4 kg of digestible dry matter.

(c) Name and explain four factors that affect feed intake in ruminants.

Palatability of the feed affects intake, as animals consume more of feeds that are tasty, fresh, and less fibrous.

Nutrient density influences intake since animals reduce feed consumption if energy-rich feeds meet their requirements quickly.

Environmental temperature affects intake; hot conditions reduce appetite while cooler conditions encourage more feeding.

Animal physiological state, such as pregnancy, lactation, or growth, determines intake since demand for nutrients increases in such stages.

7. (a) Explain five effects of overstocking on a pasture ecosystem.

Overstocking causes overgrazing which reduces plant cover and leads to land degradation.

It results in soil compaction due to trampling, which reduces water infiltration and root penetration.

Biodiversity is reduced as palatable species are overgrazed and unpalatable weeds dominate.

Nutrient depletion occurs as grasses are grazed faster than they can regenerate.

Erosion becomes common due to loss of vegetation cover, exposing soils to wind and water.

(b) Compare continuous grazing and rotational grazing by giving three advantages and three disadvantages of each system.

Continuous grazing provides easy management, reduced fencing costs, and animals can freely select their preferred forage. However, it leads to overgrazing, uneven pasture utilization, and poor recovery of grasses.

Rotational grazing allows pasture recovery, improves forage utilization, and reduces parasite build-up. However, it requires more fencing, greater management input, and higher labor costs.

(c) What is zero grazing? Explain four merits and two demerits of zero grazing.

Zero grazing is a system where animals are kept in confinement and forage is cut and carried to them instead of grazing freely.

Merits include efficient use of available land, reduced parasite infestation, improved manure collection, and easier monitoring of animal health.

Demerits include high labor requirement for forage collection and high initial cost of housing construction.

8. (a) Define epidemiology in livestock health, non-infectious disease, and zoonosis.

Epidemiology in livestock health is the study of distribution, causes, and control of animal diseases within populations.

A non-infectious disease is a condition in animals not caused by pathogens, but by nutritional, genetic, or environmental factors.

Zoonosis is any disease naturally transmitted between animals and humans.

(b) For each of the following parasites, give two control measures:
(i) Fasciola gigantica
(ii) Eimeria spp.
(iii) Ticks

Fasciola gigantica can be controlled by draining swampy pastures and strategic deworming of livestock.

Eimeria spp. can be managed by maintaining dry and clean housing and adding coccidiostats to feed or water.

Ticks can be controlled through regular dipping or spraying with acaricides and rotational grazing to break their life cycle.

(c) Outline five routine management practices that help maintain poultry health.

Maintaining clean and disinfected housing prevents buildup of pathogens.

Providing balanced and uncontaminated feed enhances immunity and growth.

Ensuring access to clean water prevents dehydration and disease spread.

Regular vaccination programs protect poultry against major diseases.

Proper stocking density reduces stress, aggression, and disease transmission.

9. (a) Describe the roles of each of the following hormones in the oestrus cycle of a cow:
(i) Follicle Stimulating Hormone (FSH)
(ii) Luteinizing Hormone (LH)
(iii) Progesterone
(iv) Estrogen

Follicle Stimulating Hormone stimulates growth and development of ovarian follicles.

Luteinizing Hormone triggers ovulation and formation of the corpus luteum.

Progesterone maintains pregnancy by supporting the uterine lining and preventing heat signs.

Estrogen induces heat behavior and prepares the reproductive tract for mating.

(b) Identify three signs that indicate a cow might be infertile.

Repeated failure to conceive after several services is a sign of infertility.

Irregular or absent heat cycles indicate reproductive disorders.

Abnormal discharge from the reproductive tract may suggest infections that cause infertility.

(c) Describe three methods of pregnancy diagnosis used in cows.

Rectal palpation involves physically feeling the uterus through the rectum to confirm pregnancy.

Ultrasound scanning provides a visual confirmation of embryo or fetus presence.

Hormonal assays measure progesterone levels in blood or milk to detect pregnancy.

10. (a) What is the carrying capacity of a pasture? How does stocking rate differ from it?
(i) Define both terms.
(ii) Give three ways in which overstocking can harm the productivity of livestock.

Carrying capacity is the maximum number of animals a pasture can support sustainably without degrading.

Stocking rate is the actual number of animals grazed on a unit of land at a given time.

Overstocking reduces feed availability, increases competition among animals, and lowers animal productivity due to malnutrition.

(b) Suggest six criteria to be used when selecting grass species for establishing improved pasture in dairy farms.

High palatability ensures animals consume the grass readily.

Good regrowth ability allows continuous grazing after cutting.

High drought tolerance ensures survival in dry seasons.

Nutritional value with adequate protein and energy supports milk production.

Resistance to pests and diseases reduces pasture loss.

Adaptability to local soil and climate ensures successful establishment.

(c) Explain four effective weed control measures in pastures.

Hand weeding or mowing removes weeds before they seed and spread.

Herbicide application controls persistent or widespread weeds.

Rotational grazing prevents overgrazing and encourages grass competitiveness against weeds.

Maintaining proper pasture fertility through manuring strengthens grasses to suppress weeds naturally.