UACE P515/2 Principles and practices of agriculture2 2009

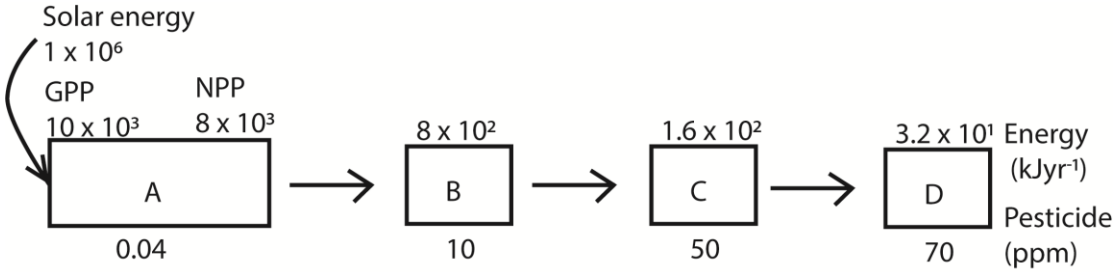
Instructions

- This paper consists of sections: **A, B, C, D and E**
- Answer **question 1** in section A and four other questions, selecting **one** from each of the sections **C, D and E.**
- Write your answers in the answer booklets provided
- Any additional question(s) answered will not be marked

SECTION A (20MARKS)

Question1 is compulsory

1. The figure below shows the transfer of energy in kJyr-1 (on top) and the amount of pesticide in parts per million (at the bottom) at different levels in the food chain in an ecosystem. Study the figure and answer the questions that follow:



Key: GPP = Gross primary production
NPP = Net primary production

(a)(i)What organisms occupy A on the diagram? (01marks)

(ii) What is the percentage of incident energy absorbed by the organisms at level A? (02marks)
(iii) Where does the rest of the energy which is not absorbed at level A Go?(02marks)

(b) Calculate the percentage of energy of the net primary production in the organism at level A which is transferred to organism at
(i) Level B (01 marks)

(ii) Level C (01 marks)
(iii) Level D (01 marks)

(c) What conclusions can be made from your answer in (b) about the transfer of energy along trophic levels? (02marks)
(d) Explain why all the energy at one trophic level is not transferred to the next trophic level. (03marks)
(e) (i) Describe the trend of the pesticide concentration from organisms at level A to those of level D. (02marks)
(ii) Explain the trend of the concentration of pesticide in e(i) (03marks)
(iii) Suggest one property of the pesticides. Explain your answer (02marks)

SECTION B (20MARKS)

CROP PRODUCTION

Answer **one** question from this section

2. (a) Explain why seedlings of most vegetables are raised in a nursery bed.(06marks)
(b) Explain what should be considered when designing a crop rotation program (06marks)
(c) Explain the role of crop rotation in maintaining soil fertility.
3. (a) Explain how each of the following affects crop growth
(i) soil pH (03marks)
(ii) soil temperature (02 marks)
(iii) soil microorganisms (03marks)

(b) Explain how cultural methods can be used to control crop pests and diseases. (12marks)

SECTION C (20MARKS)

ANIMAL PRODUCTION

Answer **one** question from this section

4. (a) Describe the procedure of preparing a brooder house for receiving one-day old chicks. (10marks)
(b) Outline the recommended practices for proper management of litter in deep litter house. (10marks)

5. (a) Explain the criteria used in selecting animals to be used as breeding stock. (12marks)
   (b) How can a high breeding efficiency be maintained on a farm?(08marks)

SECTION D (20MARKS)

AGRICULTURAL ENGINEERING

Answer **one** question from this section

6. (a) What are properties of a good lubricant? (05marks)
   (b) Describe how oil may be contaminated. (09 marks)
   (c) Explain how the level of engine oil in a tractor can be checked before is taken to the field for work. (06marks)
7. (a) Explain how power produced by a tractor engine may be utilized. (06marks)
   (b) Describe the procedure for hitching a disc plough onto the three point linkage of a tractor. (08 marks)
   (c) How is a disc plough maintained in good working conditions. (06marks)

SECTION D (20MARKS)

AGRICULTURAL ECONOMICS

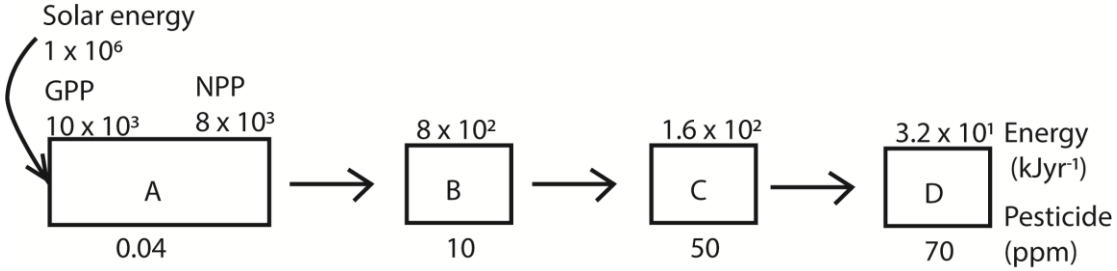
Answer **one** question from this section

8. (a) Explain the factors that influence the efficiency of labor on a farm (14marks)
   (b) Give the qualities of a good entrepreneur. (06marks)
9. (a) Explain how farmers in Uganda would benefit from being members of a farmers' organization (12marks)
   (b) What are advantages and disadvantages of using a farmers' organization as a channel for credit to farmers? (08marks)

END

Suggested answers

1. The figure below shows the transfer of energy in kJyr-1 (on top) and the amount of pesticide in parts per million (at the bottom) at different levels in the food chain in an ecosystem. Study the figure and answer the questions that follow:



Key: GPP = Gross primary production
NPP = Net primary production

(a)(i)What organisms occupy A on the diagram? (01mark)

Producers

(ii) What is the percentage of incident energy absorbed by the organisms at level A? (02 marks)
Percentage = $\frac{GPP}{solar\ energy} x\ 100\%$

$= \frac{10\ x\ 10^3}{1\ x\ 10^6}\ x\ 100\% = 1\%$

(iii) Where does the rest of the energy which is not absorbed at level A Go? (02 marks)
It is reflected into the atmosphere as heat or absorbed by non-living organism

(b) Calculate the percentage of energy of the net primary production in the organism at level A which is transferred to organism at

(i) Level B (01 mark)
$\frac{8\ x\ 10^2}{8\ x\ 10^3}\ x\ 100\% = 10\%$

(ii) Level C (01 mark)
$\frac{1.6\ x\ 10^2}{8\ x\ 10^3}\ x\ 100\% = 2\%$

(iii) Level D (01mark)

(iv) $\frac{3.2\ x\ 10^1}{8\ x\ 10^3}\ x\ 100\% = 0.4\%$

(c) What conclusions can be made from your answer in (b) about the transfer of energy along trophic levels? (02 marks)
The energy transfer from producers along the trophic levels reduces

(d) Explain why all the energy at one trophic level is not transferred to the next trophic level (03marks)

- Energy is lost through respiration, excretion, egestion death and decomposition
- Not all materials ingested is digested.

(e) (i) Describe the trend of the pesticide concentration from organisms at level A to those of level D. (02 marks)

In pesticide concentration in organisms increases with the increase in trophic levels from A to D.

(ii) Explain the trend of the concentration of pesticide in e(i) (03marks)

The consumer at high trophic eats several organism and accumulates the pesticide in its tissues

(iii) Suggest one property of the pesticides. Explain your answer (02marks)

It is non-biodegradable because it accumulates in the organisms along the trophic levels.

SECTION B (20MARKS)

CROP PRODUCTION

Answer **one** question from this section

2. (a) Explain why seedlings of most vegetables are raised in a nursery bed.(06marks)
   - Seeds of most vegetables are very small and therefore difficult to plant at a correct depth and spacing.
   - To protect delicate seedlings from harsh environmental conditions
   - To enable a farmer provide the necessary care like watering not easy in the field
   - To enable farmers obtain many seedlings
   - To protect delicate seedlings from pests and disease
   - To reduce seed wastage

   (b) Explain what should be considered when designing a crop rotation program (06marks)
   - Nutrient requirement of the crops
   - Rooting system of crops: deep and shallow rooted crops should alternate.
   - Botanical families to which the crops belong: crops should be rotated from one family to another.
   - Cover crops: the rotation should include cover crops to control soil erosion
   - Pest and disease control: crops affected by the same pests and diseases should not be grown in succession.
   - Rest phase should be included in the rotation
   - Growth habits of the crops: crawling crops should be alternated with erect crops.
   - Water requirement of the crops: crops that required a lot of water should be grown during wet seasons and those that require less water in dry seasons.
   - Ease of weeding: crops which are easy to weed should alternate with crops difficult to weed.
   - Inclusion of legumes such as beans, peas, groundnuts in the cycle to add nitrogen

(c) Explain the role of crop rotation in maintaining soil fertility.

- Rotating crops of different rooting system enables plants to absorb nutrients at different soil layers
- Different crops prefer different nutrients which prevent soil exhaustion.
- Some plants like legumes fix nitrogen to the soil
- Crops rotation improves soil structure such as those with fibrous roots.
- Crop rotation controls pests and diseases by breaking their life cycles
- Crop rotation controls some weeds such as striga
- Resting helps regain fertility
- Nutrient recycling i.e. deep rooter against shallow rooter
- Conserve soil moisture when cover crops are planted

Control soil erosion by maintain soil structure or planting cover crops,

3. (a) Explain how each of the following affects crop growth

(i) soil pH (03marks)

- Affects availability of plant nutrients e.g. low pH makes phosphorus and molybdenum unavailable while high pH makes manganese and potassium less available.
- At low pH, iron and aluminium become excessively available and become toxic to the plants.
- Very low pH inhibits nitrogen fixation
- pH determines the types of crops that can grow in an area e.g. tea and pineapples prefer low pH.
- Control prevalence of disease causing organisms, e.g. fungal disease are common in acidic soils.
- It influences the type of fertilizer to be applied e.g. sulphates of ammonia should not be applied to acidic soil.

(ii) soil temperature (02 marks)

- warm temperature encourages decomposition of organic matter to release plant nutrients
- low temperature discourages germination
- high temperature encourage drying of the soil
- increase in temperature increase cell wall permeability
- low temperature lowers the rate of photosynthesis and respiration
- very high temperature cause wilting and death of the plant
- affects solubility of nutrients
- affects absorption of water and nutrients i.e. warm temperature encourages absorption
- alternate hot and cold temperature promotes weathering
- Influence nutrient loss from the soil for instance volatile ammonium compounds are lost on hot weather.

(iii) soil microorganisms (03marks)

- fix nitrogen to the soil

- decompose organic matter to release nutrients
- some cause diseases to the crops
- denitrifying bacteria reduce nitrogen from the soil
- compete for oxygen in the soil with roots
- some organisms produce toxic substances that cause disease to the crops

(b) Explain how cultural methods can be used to control crop pests and diseases. (12marks)

- Plant resistant/tolerant plants to diseases
- Timely weeding to remove alternative hosts or breeding grounds
- Crop rotation to prevent building up host specific diseases
- Spraying with recommended chemicals to control vectors or to kill disease causing agents
- Seed dressing can be used to destroy spores on the seeds
- Heat treatment can be used to destroy spores on the seeds.
- Sterilizing soil by heat to kill pathogens
- Early planting to escape buildup of pests and diseases
- Proper spacing to minimize spreading of diseases
- Quarantine to restrict movement of diseased plant materials
- Destruction of crop residues that contain pathogens
- Pruning to reduce micro-climate that favor growth of microorganisms
- Disinfect tools to prevent spread of diseases
- Proper hygiene

SECTION C (20MARKS)

ANIMAL PRODUCTION

Answer **one** question from this section

4. (a) Describe the procedure of preparing a brooder house for receiving one-day old chicks. (10marks)
   - Ensure that the temperatures are not below 280C by providing a heat source.
   - Set up a brood guard around the heat source to protect chicks from the heat source.
   - Hung a thermometer in each brooder guard to monitor the temperatures of the heat source.
   - Check all bulbs to ensure that they are in good order to provide light intensity of about $4W/M^2$ of floor area.
   - The bulbs should be hanged at least 2m high so that they can give enough light over a wide area.
   - Put / lay down mold free litter to a minimum depth of 5cm and cover it with paper.
   - Put clean feeders around the brooder guard like spokes of a wheel.
   - Provide 2 – 3 drinkers for every hundred chicks depending on the type.

- The bird population per brooder preferably shouldn't exceed 200 as management becomes very difficult.
- Brooder house should be well ventilated

(b) Outline the recommended practices for proper management of litter in deep litter house. (10marks)

- Turn the litter daily to keep it loose and dry to prevent caking
- The perches should be evenly distributed throughout the poultry house to avoid accumulation of droppings in localized areas.
- Litter should be protected from rain to protected it from deterioration
- Manage drinkers so that the litter is kept dry
- Use enough litter to effectively absorb moisture from droppings
- Remove over stayed litter from the poultry house
- Provide adequate ventilation to keep the litter dry
- Regularly disinfect the litter
- Regularly dry the litter in the sunshine
- Maintain the right number of birds to prevent excessive fouling of litter.

5. (a) Explain the criteria used in selecting animals to be used as breeding stock. (12marks)

- Age: young animals should be selected since they have a long productive stage
- Level of performance: only animals with high production level should be selected
- Animals that produce high quality produces are selected
- Health animals are selected
- Animals well adaptable to the environmental conditions are preferred for selection
- Selected animals should have good temperament behavior for easy handling
- Selected animals should be resistant to parasites and diseases
- Select animals for high breeding efficiency and mothering ability
- Select animals that have high growth rate
- Feed conversion ratio of the breed i.e. should have a high ability of converting feeds into products like milk , meat and eggs
- Availability of market for animal products for the animal being bred
- Animal body conformity should confirm the breed and type
- History of success of the breed in the environment
- Fertility of the animal being considered
- Availability of the breed with in the environment

(b) How can a high breeding efficiency be maintained on a farm?(08marks)

- Good feeding: Breeding animals should be fed well but excessive fattening should be avoided as it may reduce the fertility.

- Observing the rest period: Animals should be given a rest period of about 60 days to allow the uterus to return to normal
- Insemination at the right time: In case of artificial insemination, the cow should be inseminated towards the middle and late part of heat period as ovulation occurs 14 hours after the beginning of estrus.
- Observation of animals on heat: This should be done as early as possible more especially where artificial insemination is being used to avoid the animal missing service.
- Veterinary Attention: Animals that fail to conceive should be identified and examined to find out the causes and treated if possible.
- Pregnancy diagnosis: Animals should be diagnosed to find out whether they have conceived or not so that appropriate measures can be taken in time.
- Keep accurate breeding records for the herd to be used as reference were necessary
- Use teaser bulls for early detection of heat in farm animals for early service
- Maintain a good ratio of bulls to females to avoid over working the bulls which lowers fertility
- Use correct techniques of artificial insemination to ensure successful fertilization hence high breeding efficiency
- Females with abnormal discharges should examined and treated early enough
- Know a complete breeding history of the animals before buying it into the farm

SECTION D (20MARKS)

AGRICULTURAL ENGINEERING

Answer **one** question from this section

6. (a) What are properties of a good lubricant? (05marks)

- Should have high kinematic viscosity index
- Stable at varying temperatures
- Should be insoluble in water to protect the moving parts from rusting
- Have high boiling point
- Should have low freezing point
- Resistant to oxidation and corrosion
- Should high ignition temperature
- Cheap
- Readily available

(b) Describe how oil may be contaminated. (09 marks)

Oil can be contaminates with

- dirt
- water

- dust
- Cross contamination with other oils
- coolants
- abrasives
- Metal particles from metal part wear

(c) Explain how the level of engine oil in a tractor can be checked before is taken to the field for work. (06marks)

- Before you start the engine
- Open the hood and find and pull the dip stick from the engine
- Use a dry piece of cloth to wipe the oil wet straight end of the dip stick and return it into the engine
- Wait a few seconds and pull out the dipstick again to check the level from the calibrated part of the dipstick from where the oil ends
- To up if oils end below the recommended oil level of the engine, top up with at least a quarter liter of oil

7. (a) Explain how power produced by a tractor engine may be utilized. (06marks)

- Plowing and tilling
- Planting
- Harvesting
- Removing heavy objects like tree stamps and stones
- Transporting materials
- Spraying fertilizers
- Irrigating land
- Mowing and brush hogging

(b) Describe the procedure for hitching a disc plough onto the three point linkage of a tractor. (08 marks)

- Reverse the tractor to the plough and align the hitch points
- Connect the plough to the tractor's hitch using the appropriate pins and clips
- Ensure the hitch is secure and locked in place.

(c) How is a disc plough maintained in good working conditions? (06marks)

- Lubricate parts
- Tighten bolts
- Sharpen discs
- Replace worn out part
- Clean disc plough after work and dry it
- Apply oil to parts when not in use to prevent rusting

SECTION D (20MARKS)

AGRICULTURAL ECONOMICS

Answer **one** question from this section

8. (a) Explain the factors that influence the efficiency of labor on a farm (14marks)

- on job training
- effective supervision/management
- encouraging specialization
- providing incentives such as attractive salary
- improving technology
- timely payment of wages
- provision of job security
- division labor among employees
- favorable climate/temperature
- maintaining good health of workers

(b) Give the qualities of a good entrepreneur. (06marks)

- determination to face and withstand risks without giving up
- self-discipline such as punctuality and hard work
- self-awareness
- curiosity
- have passion for the business
- make decisions
- flexible and adaptable
- willing to take risks
- unafraid of failure

9. (a) Explain how farmers in Uganda would benefit from being members of a farmers' organization (12marks)

- Market farmers' produce
- Get farm inputs at reasonable price
- Offer banking/credit facilities
- Farmers get advisory services
- Members get dividends

- Members learn management skills
- Members get employment
- Members organize training session cheaply
- Easily obtain extension services
- Access cheap credit
- Higher profits

(b) What are advantages and disadvantages of using a farmers' organization as a channel for credit to farmers? (08marks)

Advantages of channeling credit through farmers' organizations/ cooperative

- Credit easily accessed by farmers.
- Guaranteed funds to the farmers.
- Farmers' organizations are in close touch with members and therefore aware of their ability and integrity.
- The organization can easily follow up the funds.
- Financial training from farmers' organizations is easily acceptable.

Disadvantages of channeling credit through farmers' organizations/ cooperative

- Lack of skill
- Political interference
- Corruption
- Farmers' organization often provide short term and not long term loans.
- Do not select project for members

END