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Ministry of Education and Sports

HOME-STUDY LEARNING

SENIOR 6

AGRICULTURE

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This material has been developed as a home-study intervention for schools during the lockdown caused by the COVID-19 pandemic to support continuity of learning.

National Curriculum Development Centre
P.O. Box 7002,
Kampala- Uganda
www.ncdc.go.ug

FOREWORD

Following the outbreak of the COVID-19 pandemic, government of Uganda closed all schools and other educational institutions to minimize the spread of the coronavirus. This has affected more than 36,314 primary schools, 3129 secondary schools, 430,778 teachers and 12,777,390 learners.

The COVID-19 outbreak and subsequent closure of all has had drastically impacted on learning especially curriculum coverage, loss of interest in education and learner readiness in case schools open. This could result in massive rates of learner dropouts due to unwanted pregnancies and lack of school fees among others.

To mitigate the impact of the pandemic on the education system in Uganda, the Ministry of Education and Sports (MoES) constituted a Sector Response Taskforce (SRT) to strengthen the sector's preparedness and response measures. The SRT and National Curriculum Development Centre developed print home-study materials, radio and television scripts for some selected subjects for all learners from Pre-Primary to Advanced Level. The materials will enhance continued learning and learning for progression during this period of the lockdown, and will still be relevant when schools resume.

The materials focused on critical competences in all subjects in the curricula to enable the learners to achieve without the teachers' guidance. Therefore effort should be made for all learners to access and use these materials during the lockdown. Similarly, teachers are advised to get these materials in order to plan appropriately for further learning when schools resume, while parents/guardians need to ensure that their children access copies of these materials and use them appropriately.
I recognise the effort of National Curriculum Development Centre in responding to this emergency through appropriate guidance and the timely development of these home study materials. I recommend them for use by all learners during the lockdown.

Alex Kakooza
Permanent Secretary
Ministry of Education and Sports

ACKNOWLEDGEMENTS

National Curriculum Development Centre (NCDC) would like to express its appreciation to all those who worked tirelessly towards the production of home–study materials for Pre-Primary, Primary and Secondary Levels of Education during the COVID-19 lockdown in Uganda.

The Centre appreciates the contribution from all those who guided the development of these materials to make sure they are of quality; Development partners - SESIL, Save the Children and UNICEF; all the Panel members of the various subjects; sister institutions - UNEB and DES for their valuable contributions.

NCDC takes the responsibility for any shortcomings that might be identified in this publication and welcomes suggestions for improvement. The comments and suggestions may be communicated to NCDC through P.O. Box 7002 Kampala or email admin@ncdc.go.ug or by visiting our website at http://ncdc.go.ug/node/13.

Grace K. Baguma
Director,
National Curriculum Development Centre

ABOUT THIS BOOKLET

Dear learner, you are welcome to this home-study package. This content focuses on critical competences in the syllabus.

The content is organised into lesson units. Each unit has lesson activities, summary notes and assessment activities. Some lessons have projects that you need to carry out at home during this period. You are free to use other reference materials to get more information for specific topics.

Seek guidance from people at home who are knowledgeable to clarify in case of a challenge. The knowledge you can acquire from this content can be supplemented with other learning options that may be offered on radio, television, newspaper learning programmes. More learning materials can also be accessed by visiting our website at www.ncdc.go.ug or ncdc-go-ug.digital/. You can access the website using an internet enabled computer or mobile phone.

We encourage you to present your work to your class teacher when schools resume so that your teacher is able to know what you learned during the time you have been away from school. This will form part of your assessment. Your teacher will also assess the assignments you will have done and do corrections where you might not have done it right.

The content has been developed with full awareness of the home learning environment without direct supervision of the teacher. The methods, examples and activities used in the materials have been carefully selected to facilitate continuity of learning.

You are therefore in charge of your own learning. You need to give yourself favourable time for learning. This material can as well be used beyond the home-study situation. Keep it for reference anytime.

Develop your learning timetable to ca ter for continuity of learning and other responsibilities given to you at home.

Enjoy learning

TERM ONE

TOPIC 1: DAIRY PRODUCTION

Lesson 1: **Clean Milk Production**

Learning outcomes

By the end of the lesson, you should be able to:

a) State the sources of milk contamination on the farm
b) Outline the precautions to take to produce clean milk on the farm
c) Describe how a strip cup is used to detect mastitis

Learning materials:

- Strip cup
- Milk bucket
- Milking salve
- Milk sieve / milk strainer
- Grooming brush

Introduction:

In the previous lessons before outbreak of corona virus, you learnt about the importance of dairy farming, characteristics of good dairy animals, establishment of a dairy herd, management of dairy animals and milking techniques.

In this lesson, you will learn how production of clean milk can be ensured on the farm.

Have you ever seen milk containing hair, flies, a lot of water or milk, which has a bad smell? What do you think causes all these and how can a farmer avoid milk contamination? Milk is contaminated as a result of unhygienic milker, providing animals with feeds containing strong smell such as silage, accidental addition of chemicals such as paraffin, insecticides, drugs to milk, leaving milk uncovered which exposes it to flies and dirt, use of dirty equipment such as buckets, pails, towels, milking animals in dirty environment, and many others.

Activity

1. What are the causes of unpleasant flavours in milk?
2. What factors contribute to milk quality?
3. Describe how you would use a strip cup to detect mastitis?

Summary

In this lesson, you have learnt that:

- Milk is contaminated due to feeding animals on feeds with strong smell such as silage, dirty milking utensils, unhygienic milking place, addition of water or solids in milk, milking dirty animals, among others.
- Use of clean milking utensils, keeping milking animals healthy, straining milk with a sieve, covering milk, grooming animals, cleaning milking places, healthy milker, removing plants with strong smell around the milking parlor, regular use of a strip cup to detect mastitis, and others are some of the precautions to take to produce clean milk on the farm.

References:

1. Sabiiti, E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges. Animal Production. Kampala: Fountain Publishers.
2. Musangi, R.S. (1984) Dairy Husbandry in East Africa. Nairobi: Longman Group Limited.

TOPIC 1: DAIRY PRODUCTION

Lesson 2: Determining specific gravity/ density of milk

Learning outcomes:

By the end of the lesson, you should be able to determine the specific gravity of milk.

Learning materials:

- Milk sample
- Measuring cylinder
- Lactometer or other locally available and used tools/equipment

Introduction

In lesson 1, you learnt about causes of milk contamination such as addition of water or solids in milk.

In this lesson you will learn how to determine the density or specific gravity of milk using a lactometer.

Have you ever bought milk containing a lot of water or solids such as ripe bananas/maize flour?

Normal milk has a density of 1.032; addition of water to milk lowers its density and when solids such as flour are added to milk, its density rises beyond normal.

To determine the density of milk, a measuring cylinder is filled with milk, dip the lactometer into the milk and allow it to float, when the lactometer reaches stationery position the reading is taken at the meniscus of the stem. Normal milk has density of 1.032. If higher, solids such as ripe bananas have been added to milk and if the reading is lower water has been added. This sample of milk is said to be adulterated.

Activity:

1. Get a half litre of fresh milk and divide it into three portions. In the first portion add water, add maize flour to the second portion, and do not add any anything in the remaining portion. Dip a lactometer in each milk sample and record the results.

2. What features enable the lactometer to carry out its function?

Summary:

In this lesson, you have learnt that the lactometer is used to determine whether milk is adulterated with water or solids (Specific gravity of milk).

Addition of water to milk lowers the specific gravity of milk while addition of solids raises the specific gravity of milk.

References:

1. Sabiiti, E.N. et al., (2010). Agriculture Principles and Practices for Schools and Colleges. Animal Production. Kampala: Fountain Publishers.
2. Musangi, R.S. (1984). Dairy Husbandry in East Africa. Nairobi: Longman Group Limited.

TOPIC 1: DAIRY PRODUCTION

Lesson 3: Milk Processing

Learning outcomes

By the end the lesson, you should be able to:

a) State the reasons for processing milk.
b) Describe the stages involved in milk processing

Learning materials:

- Heat source
- Milk container
- Homogenizer
- Sugars
- Vitamins

Introduction:

Lesson 2 introduced you to determining the density of milk using a lactometer.

In this lesson you will learn the stages involved in milk processing.

Have you ever seen or consumed dairy products such as yoghurt, cheese, butter, powdered milk, ice cream, and others? How do you think these products are processed?
Milk is a highly perishable product and its quality deteriorates very rapidly if it is maintained at room temperature.
Milk is processed to improve its quality, reduce its bulkiness and prolong its shelf life.
The stages involved in milk processing include: **homogenization** (breaking down fat globules in milk into smaller droplets so that they can be uniformly mixed in milk), **Blending** (mixing milk of high butter fat content with that of low butter fat content so as to get milk of standard butter fat content), **pasteurization** (heating milk to a certain temperature for a specific period of time to kill micro- organisms), **skimming** (removing fats from milk and remain with milk containing 0.1% fat), **centrifuging** (removal of sediments from milk), **fortification** (addition of minerals, vitamins and lactose to milk to improve its nutritive value), **condensing** (heating milk to a certain temperature followed by removal of water from milk), and others.

Activity:

1. Give reasons why milk is a highly perishable product

2. Describe the different forms of processed milk.

3. Outline the steps to follow when preparing milk for sale.

Summary:

In this lesson you have learnt that:

a) Milk is highly perishable and needs to be processed to increase its quality, reduce bulkiness, and lengthen its shelf life.
b) The stages in milk processing include; pasteurization, cooling, condensing, evaporation, fortification, culturing, homogenization, drying, blending and centrifuging

References

1. Musangi, R.S. (1984). Dairy Husbandry in East Africa, Long man group limited, Nairobi Kenya

2. Beinimpaka, A.B. et al. (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan Publishers Ltd.

TOPIC 1: DAIRY PRODUCTION

Lesson 4: Milk Products

Learning outcomes

By the end of the lesson, you will be able to state the types of milk products and how they are prepared on the farm.

Learning materials

- Butter fat
- Cream
- Curd knives
- Table salt
- Rennin enzyme
- A culture containing bacteria
- Butter churn (type available in the locality)

Introduction:

Fluid milk is highly perishable, which makes its keeping quality very poor. The problem of perishability is overcome by converting milk into products which can be stored over a long period.

The main products obtained from fluid milk are cream, ghee, cheese, and butter.

Other milk products include yoghurt and ice cream.

Yoghurt is a semi solid food prepared by fermenting milk using bacteria.

The steps involved in preparation of yogurt include: milk is first blended and homogenized, milk is then pasteurized to kill germs, it is cooled to inoculation temperature, a culture containing bacteria is added, and fermentation is allowed to take place, then packed, and refrigerated until it is used.

Activity

1. Describe how cheese, butter, cream, and ice cream are prepared on the farm.

Summary:

In this lesson you have learnt that milk is processed to increase its life span and improve its quality.

The main products obtained from milk include yoghurt, ice cream, butter, ghee, and cheese.

Yoghurt is a product obtained from fermentation of milk.

References:

1. Sabiiti, E.N. et al. (2010) Agriculture Principles and Practices for Schools and Colleges. Animal Production. Kampala: Fountain Publishers.
2. Musangi R.S. (1984). Dairy Husbandry in East Africa. Nairobi: Longman Group Limited.

TOPIC 2: PASTURE MANAGEMENT

Lessons 5: Pasture conservation

Learning outcomes

By the end of the lesson, you should be able to:

a) Give reasons for pasture conservation,
b) State ways in which pastures are conserved.
c) Describe the factors affecting the quality of pastures preserved

Learning materials:

- Pasture species
- Molasses
- Polythene sheet

Introduction:

In the previous lessons on pasture management, you learnt about the importance of feeding animals on pastures, types of pastures, steps to follow when establishing a pasture, and methods of grazing animals.

In this lesson, you will learn how pastures/ forage can be preserved for future use.

Pasture conservation / preservation is the practice of storing pastures that are abundant during the wet season for use during period of scarcity.

There are two main forms of conserving pastures. These are hay and silage.

Silage is the fermented fodder used to feed animals.

Hay is partially dried pastures fed to animals during period when there are no fresh pastures.

The steps involved in preparing hay include: select suitable pasture species, harvest it at the onset of flowering, cure/ dry the cut pasture partially under shade, make bundles out of the material (baling), and then store the material in leak proof shelter.

To prepare silage, follow the following steps: select suitable pasture species or any other material that can be used to make silage e.g. young maize plants, potato vines etc., harvest the pasture at the onset of flowering, wilt the material in sunshine for a few hours to reduce moisture content, chop the material into small pieces, put the chopped material into the pit (silo), compact the material to remove air, add additives such as molasses, cover the material with polythene sheet, place a layer of soil on top, dig a trench around the pit to direct off the run off, allow the material to stay in a pit for a month to undergo fermentation.

Activity:

1. Explain the factors that affect the quality of silage
2. What are the advantages of using silage over hay?
3. Give reasons why most livestock farmers do not preserve pastures

Summary

In this lesson, you have learnt that:

- There are two main forms of conserving pastures which are hay and silage.
- Stored hay and silage can provide forage during periods when supply of fresh forage is inadequate.
- Reasons for pasture conservation include: to ensure continuous production and protects animals from losing condition. Preserved pastures can be sold to those in need, prevents wastage of excess forage, and reduces chances of overgrazing which usually occurs during the dry season.

References

1. Collins, M. and Owens, V.N. (2003). Preservation of Forage as Hay and Silage
2. Beinempaka A.B. et al. (1990). Principles and Practices of Agriculture, Volume 1. London: Macmillan Publishers Ltd,

TOPIC 3: POPULATION

Lesson 6: Effects of population on agriculture production

Learning outcomes.

By the end of the lesson, you should be able to:

a) define population
b) state the factors that contribute to population size changes in Uganda
c) explain the influence of population size on agricultural production

Learning materials

- Uganda Atlas 2020
- Uganda Bureau of Statistics (UBOS), 2018. Uganda National Household Survey 2016/2017. Kampala, Uganda; UBOS.

Introduction

Population is the number of people living in a given area in a given period of time. Some parts of Uganda have high population compared to other parts due to factors such as fertility rates, food availability, emigration, immigration, traditional beliefs, family planning, security, early marriages, among others.

Population size affects agricultural production due to its influence on market size for agricultural produce, labour availability for farming, size of land available for farming, and others.

Activity:

1. Explain the consequences of a high population on agricultural production
2. What measures can be taken to meet the food demands of the growing population in Uganda.

Summary:

In this lesson, you have learnt that:

a) Factors that contribute to population size changes include; fertility rate, immigration, emigration, early marriages, security, health facilities, and others.

b) The population size has an impact on agricultural production due to its influence on market size, labour availability, size of land available for farming, and exploitation of natural resources such as forests, swamps, and soils.

References:

1. Kizito, G. et al, (2017). Vocational Agriculture for 'A' level and Colleges.
2. Akubilo, C.J.C. (1984). Agricultural Economics and Farm Management. London: Macmillan Publishers Ltd.

TOPIC 4: GENDER AND AGRICULTURAL PRODUCTION

Lesson 7: Gender roles in agricultural production.

Learning outcomes:

By the end of the lesson, you should be able to:

a) Define gender and gender roles.
b) Give roles of women / girls in agricultural production
c) Give roles of men/ boys in agricultural production

Learning materials

- Charts
- Films
- Slides
- Videos depicting the roles of boys/men and girls/women in crop and livestock production.
- Resource persons on gender issues.

Introduction:

In the previous lesson, you learnt about influence of population growth rate on agricultural production.

In this lesson, you will learn about roles of women/ girls and men/ boys in crop production and livestock production.

Gender refers to socially and culturally constructed roles, duties, and responsibilities of women/girls and men/ boys in a society.

Gender roles refer to socially defined tasks, responsibilities, and behaviors that are considered appropriate for men and women.

Have you ever noticed differences in the duties of men and women in crop growing and animal production?

The gender roles allocated to men by society in Uganda give them leadership, power, control, and authority while women are made to play a supportive role.

Roles of men or boys include: acquisition of land, opening up the land in preparation for planting, purchasing and use of chemicals, looking for markets and sale of produce, budgeting and spending of proceeds, and milking animals.

Women plant seeds, weed, mulch, harvest, head loading and transportation of produce from the farm, post-harvest handling such as drying and winnowing of produce.

Activity:

1. What factors limit women's participation in commercial farming?
2. Suggest the ways of increasing women participation in commercial farming.
3. What factors limit acquisition of land by women for farming?

Summary

In this lesson, you have learnt roles of women and men in agriculture

Women performance is, however, hindered due to less access to productive resources, limited access to technology and innovation, cultural norms in societies, physical limitations, lack of collateral security, inequalities in sharing proceeds from the sale of products, additional reproductive roles, among others

References

1. GoU (1997). The National Gender Policy Kampala, Uganda
2. MoES (2010). The National Education Gender Mainstreaming Policy, Kampala
3. Kirimani, M.U., East Africa Agriculture: NCDC revised syllabus.

TERM TWO

TOPIC 1: URBAN AND PERI-URBAN FARMING

Lesson 1: Benefits of urban and peri-urban farming

Learning outcomes:

By the end of the lesson, learners should be able to:

a) Distinguish between urban and peri-urban farming
b) Give characteristics of urban farming
c) State the benefits of urban and peri-urban farming
d) Outline the problems associated with urban and peri-urban farming.

Learning materials:

Urban, peri-urban and organic farms for either crops, animals or both

Introduction

In Uganda 80% of the population depends on agriculture as the main source of livelihood as pure subsistence or with little commercial farming

One of the major challenges to agricultural development is shortage of land. People living in cities and those in areas surrounding cities experience this problem but efforts have been made to ensure food security.

Urban farming refers to cultivation of crops and rearing of animals within the city while **peri-urban farming** refers to cultivation of crops and rearing of animals in areas surrounding the city.

Farmers grow crops in green houses, containers, sacks/ bags, on roof tops, verandas and in wooden boxes filled with soil.

Animals are kept in zero grazing units, fish are kept in cages, birds are reared under deep litter system, and small ruminants (goats and sheep) are tethered.

Activity

1. What are the benefits of urban and peri-urban farming?
2. Suggest the challenges of urban and peri-urban farming

Summary:

In this lesson you have learnt that:

a) Urban farming refers to growing of crops and rearing of animals with in cities while peri –urban refers to growing of crops and rearing of animals in the area around the city (city suburbs)

b) Urban and peri-urban farming involves growing vegetables in containers, back yard gardens, growing crops on verandas, roof tops, and in wooden boxes filled with soil, animals are kept in zero grazing units, birds and fish are kept in cages.

c) Urban and peri-urban farming has features, such as it is labour intensive, high value crops are grown, organic inputs are mainly used, limited space is used, relies heavily on irrigation rather than rainfall, it is market driven farming, and short term crops are grown.

References

1. Jeavons, J. (1991). How to grow more vegetables than you ever thought possible on less land than you can imagine?

2. M.U Kirimani NCDC revised syllabus 'A' level East Africa Agriculture

3. Kizito, G. et al. (2017). Vocational Agriculture for 'A' level and Colleges.

TOPIC 1: URBAN AND PERI-URBAN FARMING

Lesson 2: Organic Farming

Learning outcomes:

By the end of the lesson, learners should be able to:

i. Define organic farming
ii. State the practices involved in organic farming
iii. Apply the practices of organic farming in crop growing and animal rearing
iv. Suggest benefits and limitations of organic farming

Learning materials

- Organic fertilizers (manures)
- Organic mulch e.g. coffee husks and garden trash.
- Organic pesticides (mixture of ash, urine, and red pepper).

Introduction

In lesson 8, you learnt that in urban and peri-urban farming organic inputs are mainly used.

In this lesson, you will learn the practices involved in organic farming and the different inputs used.

Organic farming is a method of farming which employs the use of organic inputs to produce high quality products on the farm.

Examples of practices involved in organic farming include: crop rotation to maintain soil fertility, use of organic fertilizers to improve soil fertility, controlling pests using biological agents, treating animals using medicinal herbs instead of chemicals, use of natural seeds rather than genetically modified seeds, Recycling of agriculture wastes instead of destroying wastes, soil PH amendments using ash instead of chemicals, and rearing animals which are resistant to parasites.

Use of synthetic inputs such as artificial fertilizers, chemical pesticides such as DDT has challenges, such as destruction of soil structure, pollution of the environment, kills soil micro-organisms, and leave residues on produce which affect consumers. Chemicals are also expensive to acquire.

Activity:

1. Prepare an organic pesticide to control crop pests in the garden.
2. What are the benefits of organic farming in urban and peri- urban farming?
3. Suggest the problems associated with use of organic inputs in farming

Summary

In this lesson, you have learnt that:

a. Use of organic inputs to produce high quality products on the farm is termed as organic farming.
b. Synthetic inputs such as inorganic pesticides and inorganic fertilizers are expensive to acquire, pollute the environment, destroy soil structure, and kill useful soil living organisms.
c. Use of organic inputs does not pollute the environment; it improves soil structure, buffer soil PH. For example, organic matter provides food to soil, living organisms, and does not leave residues on products which affect consumers.

References

1. Kirimani, M.U. NCDC Revised Syllabus 'A' level East Africa Agriculture

2. Kizito, G. et al. (2017). Vocational Agriculture for 'A' level and Colleges

TOPIC 2: PRODUCTION THEORY

Lesson 3: Costs of Production

Learning outcomes:

By the end of the lesson, you should be able to:

a) define costs of production
b) describe the type of costs incurred in agricultural production

Introduction:

In the previous lesson, you learnt about factors of production such as land, capital, labour, and entrepreneurship and their roles in agriculture, types of production function and the law of diminishing returns.

In this lesson, you will learn the types of costs a farmer may incur.

Every enterprise requires inputs which a farmer has to provide at a cost.

Costs of production are expenses incurred in the production process.

The types of costs include:

a. **Fixed/ overhead costs**: these are costs which do not change with level of production such as salaries for permanent workers, depreciation of machinery, and interest on borrowed capital,
b. **Variable/ prime costs**: these are the costs which change with the level of production. They increase as the level of production increases and decrease as the level of production decreases such as wages for casual labour, transport costs, cost of inputs, and electricity bills.
c. **Explicit costs:** these are costs which are easy to recognize and quantify such as insurance, salaries/ wages, cost of inputs, and depreciation of machinery.
d. **Implicit costs**: these are costs which are not easily recognized and are sometimes forgotten when calculating costs of production such as family labour, managerial services, and interest on own capital.
e. **Marginal costs**: these are costs incurred in producing additional unit of out put
f. **Total costs**: this is the sum of fixed and variable costs.

Activity:

1. Explain the types of costs which a vegetable grower may incur.
2. What practical measures can be adopted to reduce those costs?

Summary:

In this lesson you have learnt about the different types of costs incurred in farming which include fixed, variable, implicit, explicit, total, marginal, and average costs. These costs incurred depend on the enterprise engaged by a farmer.

References

1. Tayebwa. B. M. (2004). Basic Economics. Kampala: Makerere University.
2. Sabiiti E.N.et al. (2010). Agriculture Principles and Practices for schools and Colleges, farm structure, machinery and Agricultural economics.
3. Beinempaka A.B. et al., (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan publishers Ltd.

TOPIC 3: PRICE THEORY

Lesson 4: Determination of prices of agricultural products

Learning outcomes:

By the end of the lesson, learners should be able to state ways in which prices of agriculture products are determined

Introduction:

Price is the exchange value of a commodity.

Prices determine the level of output, influence the profit level of a business, and influence consumption levels of products. Though forces of demand and supply indicate to the farmer what commodity to produce, prices enable the farmer to efficiently allocate resources.

Have you ever visited the market to establish how prices of agricultural commodities are determined?

You might have realized that prices are determined by bargaining, price leadership, forces of demand and supply, price legislation, international commodity agreements, contract agreement, collusion, auctioning, and others.

Activity:

1. Using illustration, describe the relationship between supply, demand, and price in a perfect market.
2. Explain the factors that influence the price of a commodity.

Summary

In this lesson you have learnt that:

a. Price is the exchange value of the commodity.
b. Prices of agricultural products are determined by forces of demands and supply, price leadership, auctioning, bargaining, resale price maintenance, price legislation, collusion, contract agreement, and others.
c. Prices are important because they enable the farmer to allocate resources efficiently, determine the level of output, influence the profit level of the business, indicate to the farmer what commodity to produce, and influence the consumption levels of produce.

References:

1. Tayebwa. B. M. (2004). Basic Economics. Kampala: Makerere University.

2. Sabiiti E.N. et al. (2010). Agriculture Principles and Practices for schools and Colleges, farm structure, machinery and Agricultural economics.
3. Beinempaka A.B. et al., (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan publishers Ltd.

TOPIC 3: PRICE THEORY

Lesson 5: Price fluctuation in agricultural products

Learning outcomes:

By the end of the lesson, you should be able to:

a. State the causes of price fluctuation in agricultural products.
b. Explain the ways in which prices can be stabilized.

Learning materials

- Videos
- Slides

Introduction:

In lesson 4, you learnt about determination of prices for agricultural products.

In this lesson, you will learn the causes of price instabilities in agricultural products and the remedies.

Price fluctuation/ instability refers to the sudden changes that occur in the price of agricultural products. Prices of agricultural products often rise and fall erratically.

Why do you think the price of matooke or milk changes?

a) Agricultural products are perishable which forces farmers to sell them immediately after harvesting at low price.
b) Bulkiness of agricultural products which makes their transportation from areas of plenty to areas of scarcity difficult.
c) Poor transport network which makes delivery of products from production areas to consumption areas difficult.
d) Natural hazards such as pests, disease, and drought which lower output,
e) Lack of farming groups such as co-operatives to increase bargaining power for better prices.
f) Variable quality of products which leads to variable prices.
g) Inadequate storage facilities which forces farmers to sell produce when prices are still low.
h) Seasonality of produce which causes prices to fall at harvesting time due to surplus of produce and rise in price after harvesting due to scarcity,
i) Competition from synthetic products which are cheaper forcing the farmer to lower prices of agricultural products,
j) Large number of small scale producers who individually cannot influence market prices.

Activity:

1. What are the effects of price fluctuation?
2. Explain the measures that can be taken to stabilize prices for agricultural products.

Summary:

In this lesson you have learnt about characteristics of agricultural products that make marketing difficult leading to price instability, such as perishability, bulkiness, variable quality of products, long gestation period, seasonality of produce, and inelastic demand.

However, there are other factors that cause price changes such as poor transport network, few manufacturing industries use agricultural products as raw materials which creates surplus production, lack of farmers' groups, and inadequate processing facilities to add value to produce.

References

1. Tayebwa. B. M. (2004). Basic Economics. Kampala: Makerere University.
2. Sabiiti E.N. et al., (2010). Agriculture Principles and Practices for schools and Colleges, farm structure, machinery and Agricultural economics.
3. Beinempaka A.B. et al. (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan publishers Ltd.

TOPIC 4: MARKETING OF AGRICULTURAL PRODUCTS

Lesson 6: Marketing functions

Learning outcomes:

By the end of the lesson, you should be able to:

a) Define market, marketing, and marketing functions.

b) Describe the various marketing functions.

(c) Devise effective strategies for profitable marketing of agricultural products.

Learning materials:

- Charts
- Slides
- Videos

Introduction:

A market is a place where buyers and sellers meet and transact certain commodities at agreed prices. The types of markets include perfect and imperfect markets. A perfect market is a market where prices are determined by forces of demand and supply.

Imperfect market is a market where prices are influenced by other factors other than demand and supply. Imperfect market is grouped into monopoly, oligopoly and oligopsony. **Monopoly** is a market situation where there is one seller of the product which has no close substitute and the price is determined by the seller.

Oligopoly is a state of limited competition in which the market is shared by a small number of producers e.g. dealers in beer, fuel, and telecom services.

Oligopsony is a state of market in which only a small number of buyers exists for the product.

Marketing functions are defined as specialized activities that are carried out to accomplish the marketing process. They include buying, assembling, transportation, processing, storage,

grading, standardization, packaging, financing, risk bearing, advertisement, collecting and analysis of market information, and selling.

Activity

1. Explain the stages involved in marketing of agricultural products.

2. Suggest ways in which marketing of agricultural products can be improved.

3. Give reasons for carrying out each of the following processes in marketing agricultural products.

i. Packaging
ii. Advertisement
iii. Storage
iv. Processing

4.What are the problems associated with marketing of agricultural products?

Summary:

In this lesson you have learnt that:

a) There are two types of markets that is perfect and imperfect market.

Imperfect market is grouped into monopoly, oligopoly, and oligopsony.

b) Marketing functions are activities which are performed during the delivery of products from producers to consumers and they include: buying, assembling, transportation, storage, processing, grading, standardization, advertisement, packaging, financing, risk bearing, and others.

References:

1. Tayebwa. B. M. (2004). Basic Economics. Kampala: Makerere University.
2. Sabiiti E.N.et al. (2010). Agriculture Principles and Practices for schools and Colleges, Farm Structure, Machinery and Agricultural Economics.
3. Beinempaka A.B. et al. (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan Publishers Ltd.

TOPIC 5: FARM PLANNING AND MANAGEMENT

Lesson 7: Farming Efficiency

Lesson outcomes:

By the end of the lesson, you should be able to:

a) State two types of farming efficiency.

b) Describe the types of efficiency standards.

c) Outline the objectives of assessing farmers from time to time.

d) Suggest ways of improving farming efficiency.

Learning materials:

- Slides
- Videos

Introduction:

The major objective of efficiency in agricultural production is to maximize profit.

There are two types of farming efficiency that is technical and economic efficiency.

Technical efficiency is the measure of physical output per unit of input while **economic efficiency** is the measure of the profitability of an enterprise.

A farmer who obtains the highest output from use of inputs is said to be technically efficient. The one who spends less to produce output is said to be economically efficient.

Efficiency standards refer to the criteria that is used to measure /assess the performance of an individual enterprise on the farm or the whole farm

There are two types of efficiency standards that is partial and overall efficiency standards.

The assessment of the performance of a particular farm enterprise is called **partial efficiency** standards and the assessment of the performance of a farm as one unit is termed as **overall efficiency standards.**

Partial efficiency standards are grouped into two: Yield index and system index.

When the actual output is compared with the expected output (yield), this is known as **yield index.**

When the yield of a particular enterprise is compared with that on a similar farm, this is termed as **system index**.

Efficiency in farming is influenced by many factors which include: Farming methods employed, records kept, price of output, health status of the farmer, type of enterprise undertaken, mechanization level, size of the farm, managerial expertise, intensification of production, quality of inputs used, availability of capital, among others.

Activity:

1. James and Patrick are two farmers engaging in poultry enterprises which are located in different places. Patrick's poultry enterprise performs better than James' poultry enterprise. Explain the causes of differences in performance of the two poultry enterprises.
2. What are the reasons for assessing farmers from time to time?

Summary:

In this lesson you have learnt that;

a) There are two types of farming efficiency namely technical and economic efficiency.

b) There are two types of efficiency standards that is partial and overall efficiency standards.

c) Yield index and system index are the two forms of partial efficiency standards.

d) Assessing performance of farmers enables the farmers to find out whether the enterprise is profitable or not, compares profitability of various enterprises on the farm, guides the farmer in decision making. It also helps the famer to know the weakness in the enterprises, and therefore select the most profitable one.

References:

1. Tayebwa. B. M. (2004). Basic Economics. Kampala: Makerere University.
2. Sabiiti E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges, Farm Structure, Machinery and Agricultural Economics.
3. Beinempaka A.B. et al. (1990)., Principles and Practices of Agriculture, Volume 2. London: Macmillan Publishers Ltd.

TOPIC 6: AGRICULTURAL ENGINEERING AND FARM MECHANIZATION

Lesson 8: Principle of working of simple machines

Learning outcomes:

By the end of the lesson, you should be able to:

a) Define machine

b) State the different types of simple machines.

c) Describe the working of simple machines

d) Give the farming activities which are based on the working of simple machines.

Learning materials:

- Knife
- An axe
- Inclined planes
- Wheel and axle
- Levers (claw hammer, pair of pliers, craw bar, wheel barrow, fishing rod, nut cracker, hedge shear, and burdizzo).
- Gears

Introduction:

The farm is a busy unit with a lot of tasks to be accomplished. This drives a farmer to devise means of simplifying work with help of a device known as a machine. Thus, a machine is a device which simplifies work.

Before we look at the working of simple machines, it is important to define the terms related to the working of simple machines. These include:

a) **Work**: is a product of force applied on a particle and the displacement the particle makes.

Work = force x distance

The S.I unit for work is Joule (J)

b) **Power**: is the rate of doing work.

$$\text{Power} = \frac{\text{force x distance}}{\text{Time}}$$

Power is measured in watts. (W)

c) **Energy**: is the ability to do work.

d) **Load**: is the weight being lifted by the machine.

e) **Effort**: is the force applied on the machine to move the load.

f) **Mechanical advantage (M.A):** is the ratio of load to effort.

$$\text{M.A} = \frac{Load\ (N)}{Effort\ (N)}$$

g) **Velocity ratio (V.R)**: is the ratio of effort distance to load distance

$$\text{V.R} = \frac{\text{Effort distance}}{\text{Load distance}}$$

h) **Efficiency**: is the ratio of mechanical advantage to velocity ratio expressed as a percentage.

$$\text{Efficiency} = \frac{\text{mechanical advantage}}{\text{Velocity ratio}} \ x\ 100$$

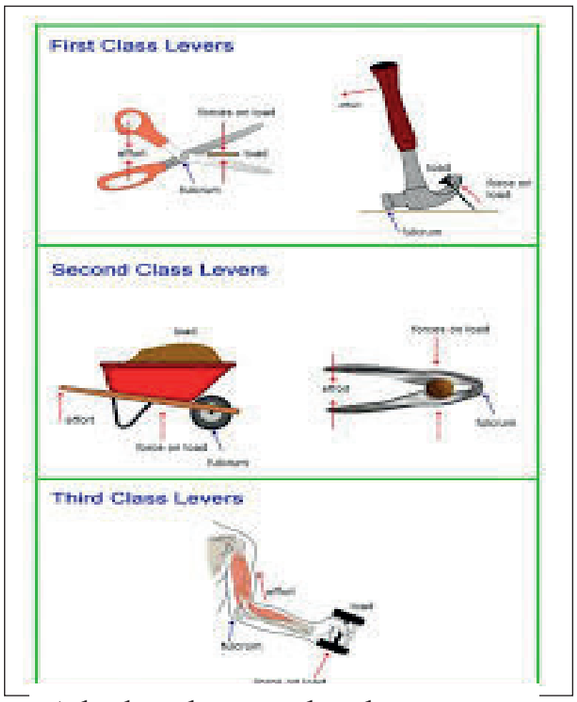
i) **Force**: is any action which changes or tries to change an object from its state of rest or from state of uniform motion.

Force = mass x acceleration due to gravity.

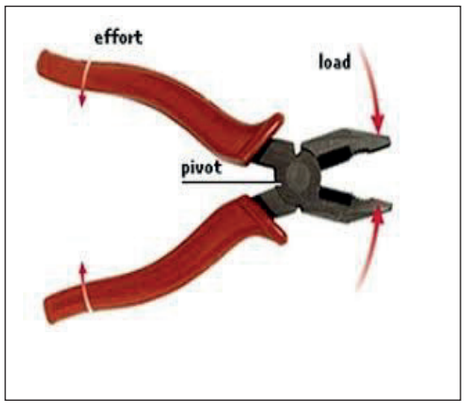
There are seven types of simple machines, namely wedges, pulleys, screws, levers, gears, inclined planes, wheel, and axle.

a) **Levers:** A lever is a rigid body capable of turning about a fixed point known as fulcrum (pivot).

Examples of levers include claw hammer, pair of pliers, wheel barrow, fishing rod, hedge shear, burddizo, sea saw, steel yard, nut cracker, and craw bar. All these are not constructed on the same plan and this brings about three classes of levers. That is first class lever, second class lever, and third class lever.

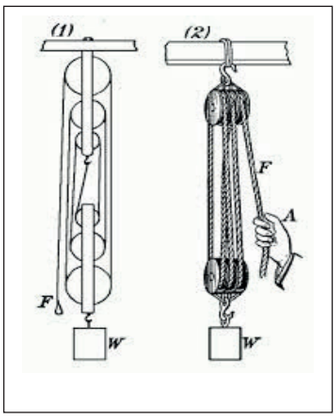


A hedge shear, a claw hammer,
a wheel barrow and a nut cracker

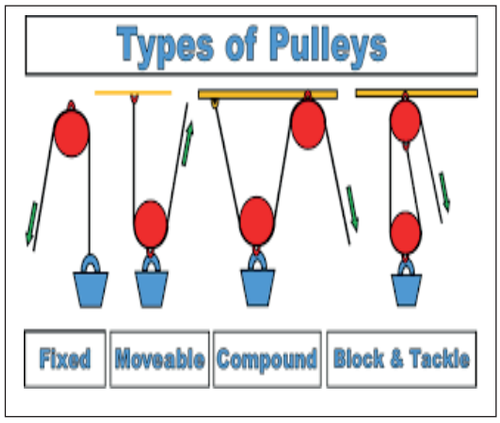


A pair plier

b) **Pulleys**; a pulley is a string /rope wound around a rotating wheel to lift or lower the load.

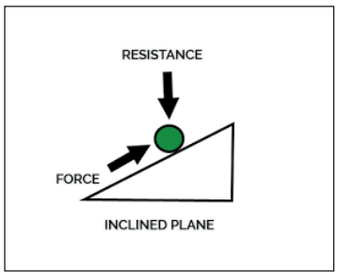


A block and a tackle system



The velocity ratio is equal to the number of wheels or pulleys.
Pulleys are used to drain water from a well, raising loads during building and construction, driving motors in milking machines, and operating a fan in a cooling system.

c) **Inclined plane**: it is a sloping edge on which a load is moved. It is used in loading and offloading animals or produce.



d) **Screws**: They are used to tighten objects, hold objects firmly like clamp, and raise objects like cars (screw jack).

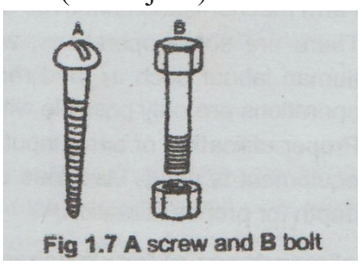
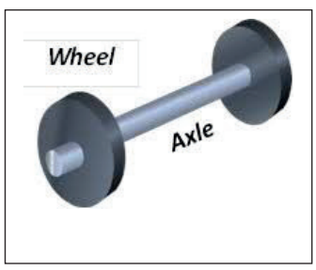
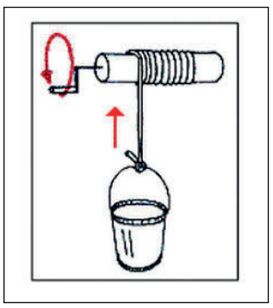


Fig 1.7 A screw and B bolt

e) **Wedges**: a wedge is a simple machine used to push two objects apart. A wedge is usually made of two inclined planes which meet to form a sharp edge. Wedges are used to split wood on the farm. Examples of wedges include: an axe, knife, etc.

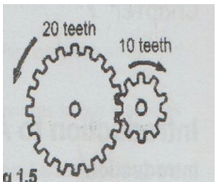
f) **Wheel and axle**: is a machine consisting of a rod that goes through the wheel to let the wheel turn. It is used to raise water buckets from wells.





g) **Gears**: these are toothed wheels of different diameters. Gears are used to change the direction of movement and / or increase the output speed or torque. The smaller wheel is called the driving wheel and the larger wheel is called the driven wheel.

Velocity ratio = $\frac{\textit{number of teeth on driven wheel}}{\textit{number of teeth on driving wheel.}}$



Activity 1

1a) with the help of examples define the following terms:

i) First class lever.

ii) Second class lever.

iii) Third class lever.

b) Outline the farming activities which can be done by levers.

Activity 2:

Use the following materials to construct a pulley

- A rope
- A stick
- Two supports / stand
- A piece of heavy material such as soil or sand tied in a cloth or bucket.

Procedure

- Support a tree / stick between two supports. Ensure that the tree/ stick can easily rotate between the supports / stand.
- Tie the rope over the soil.
- Run the rope over the tree or stick.
- Pull the free end of the rope slowly but continuously.

What happens to the soil or bucket?

Summary:

In this lesson you have learnt that;

a) A machine is a device which simplifies work.

b) There are many types of simple machines which carry out farming activities such as wedges, levers, wheel and axle, pulleys, inclined planes, gears, and screws.

c) Levers are categorized into three classes, that is first, second, and third class levers.

References:

1. Kirimani, M.U. A' Level East Africa Agriculture, Volume 3.

2. Kizito, G. et al. (2017). Principles and Practices of Agriculture for A- Level and Colleges

TOPIC 6: AGRICULTURAL ENGINEERING AND FARM MECHANIZATION

Lesson 9: Simple calculations in mechanics

Learning outcomes:

By the end of the lessons, you should be able to calculate work done, power, mechanical advantage, velocity ratio, and efficiency.

Learning materials

- Pulleys
- Gears
- Inclined planes
- Wheel and axle

Introduction:

In lesson 8, you learnt about application of simple machines in agriculture and the terms related to simple machines. In this lesson, you will learn simple calculations on mechanics.

Activity 1: calculate work done and power

From your knowledge, work is done whenever force moves through a distance. Therefore, work is the product of force and distance in the direction of force.

The SI unit of work done is Joule (J)

Now let's try out these problems.

a) A bag of produce of weight of 400N is lifted to a height of 3metres in 4 seconds. Calculate work done and power used.

Solution

Begin by writing the formula for work done.

Work done = force x distance.

400 x 3 = 1200 J

Divide work done by the time to obtain power

$$\text{Power} = \frac{\text{work done}}{\text{time taken}}$$

$$= \frac{1200}{4}$$

= 300 watts (w)

The SI unit of power is watts (W). A watt is defined as the power developed when one Joule of work is done in one second.

b) If a boy lifts 2.5 kg of maize flour from the flour on to his shoulder through a distance of 2 meters what is the work done by the boy?

Solution

Work done = force x distance.

But force is not given, so we can calculate force using the formula:

Force = mass x acceleration due to gravity.

Force = 2.5 x 10

= 25 N

OR

Force = 2.5 x 9.8

=24.5 N

Now let's calculate work done by multiplying force by distance

Work done = 25 x 2

= 50 J

OR

Work done = 24.5 x 2

=49 J

Activity 2: calculate mechanical advantage, velocity ratio, and efficiency.

A machine lifts a load of 400 N through a distance of 2 metres when an effort of 100 N is applied to it. If the distance moved by the effort is 16 meters, calculate the:

i. Mechanical advantage of the machine
ii. Velocity ratio of the machine
iii. Efficiency of the machine

Solution:

i. Mechanical Advantage (MA) = $\frac{\text{Load}}{\text{Effort}}$

$$MA = \frac{400\ N}{100N}$$

$$= 4$$

ii. $Velocity\ ratio = \frac{\text{Effort distance}}{\text{Load distance}}$

$$= \frac{16\ m}{2m}$$

$$= 8$$

iii. Efficiency $= \frac{\text{Mechanical Advantage}}{\text{Velocity Ratio}} \times 100$

$$= \frac{4}{8} \times 100$$

$$= \mathbf{50\%}$$

Now try these activities 3, 4, and 5:

Activity 3

A hydraulic machine has 120 teeth in the driven gear and 40 teeth in the driving gear. Calculate it's:

i. Velocity ratio
ii. Mechanical advantage if it is 80% efficient

Activity 4

A machine requires 6500 KJ to lift a bag of maize weighing 80 Kg through a vertical height of 10 meters

Calculate:

i. Work done by the machine
ii. Efficiency of a machine

Activity 5:

An effort of 250N raises a load of 1000N through 5 meters in a pulley system. If the effort moves 30 meters, calculate the:

i. Work done in raising the load
ii. Work done by the effort
iii. Efficiency

Summary

In this lesson you have learnt to calculate work done, power, mechanical advantage, velocity, and efficiency of simple machines.

References:

. M.U Kirimani A' Level East Africa Agriculture, Volume 3.

2. Kizito Gerald, et al (2017) Principles and Practices of Agriculture for A- Level and Colleges

TOPIC 6: AGRICULTURE ENGINEERING AND FARM MECHANIZATION

Lesson 10: Management of Work Animals

Learning Outcomes:

By the end of the lesson, you should be able to:

a) give the importance of animals as a source of farm power
b) select a good animal for traction
c) train traction animals
d) handle and care traction animals

Learning materials

- Ox-drawn implement such as ox plough
- Charts illustrating traction animal training procedures.
- Traction animals/ draught animals
- Animal feeds/ pastures
- Nose ring

Introduction

Traction/ draught/ draft animals are animals used to perform work on the farm. Such animals include oxen, horses, donkeys, camels, and mules. These animals plough land, weed, and transport produce.
Have you ever seen a work type animal? What features distinguish it from other animals?
These animals have features such as short stout legs, cool temperament (docile), well developed hump, short horns or polled, good adaptability to the local environment, freedom from parasites and diseases.
When choosing a draught animal, you consider health status, sex of the animal, age, breed, animal size, temperament, and adaptability to the environment.
Draught animals require training before they are used to perform work because trained animals can do more work in short time, are easier to control, pull heavy loads for longer time and they respond to voice commands.

Draught animals, such as beef and dairy animals require care to maximize power out put

Activity;
Use the following materials and participate in training a draught animal.
Materials

Ox plough, a cart, nose ring, logs, yoke, and rope.

Procedure

i. Select a juvenile bull of desirable qualities, such as short legs, well humped, and with cool temperament.
ii. Castrate the selected animal to reduce libido (sex desire) and make it docile.
iii. Punch a hole through the nose just behind the hard pad with help of a nose ring. Leave the nose ring in the hole and allow the wound in the nose to heal.
iv. Fix the rope on the nose ring and a halter around the head.
v. Start actual training.
    - Yoke the new ox with the old experienced one.
    - Teach the animals to walk freely in straight line, turn left and right and then stop.
    - Teach the animals how to pull logs starting with light logs and progressively replace with heavier logs.
    - Teach the animals how to pull a cart.
    - Teach the animals how to pull the ploughs for cultivation and weeding.
    - Continue training up to when they are quite efficient.

Summary:

In this lesson, you have learnt that:

a) Draught animals are animals used to perform work on the farm.
b) Draught animals are used for cultivating land, weeding gardens, and transporting produce.
c) Traction animals are selected basing on age, size, health status, temperament, adaptability to environment, and sex
d) Traction animals require training to be able to follow voice commands and efficiently perform work.
e) Traction animals require care such as good housing, provision of energy feeds, treating them against parasites and diseases, allowing them to rest after work, giving them appropriate work load, regular foot pairing, and disinfection to maintain foot grip.

References

1. . Kirimani, M.U. A' Level East Africa Agriculture, Volume 3.
2. Kizito, G. et al. (2017). Principles and Practices of Agriculture for A- Level and Colleges

3. Sabiiti, E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges. Farm structures, mechanization and agricultural economics. Kampala: Fountain Publishers.

TERM THREE

TOPIC 1: CROP PROTECTION

Lesson1: Weeds

Learning outcomes

By the end of the lesson, you will be able to:

a) Define weeds.
b) Give the economic importance of weeds.
c) State the characteristics of weeds which make them successful in crop gardens.
d) Give ways of controlling weeds.

Learning materials:

- Common weed plants in the locality.
- Mulching material

Introduction.

A weed is a plant growing where it is not wanted.

Weed species have developed some characteristics that make them survive much better than crops which include: some weeds produce very many seeds to increase chances of survival, some weeds are resistant to herbicides, possession of protective structures e.g. thorns that protect them from damage, they have a faster rate of growth than crop plants, they are hardy and more resistant to harsh conditions, they have fewer pests and diseases that attack them, some are parasitic to crops and therefore survive as long as crops are there, seeds of most weeds have high viability and long dormancy periods that enable them to germinate and grow at the right time, possession of efficient rooting system to enable them absorb nutrients, and production of toxic substances that make it difficult for other crops to grow around them.

Weeds are a problem to a farmer in many ways, such as they compete with crops for growth factors, some are parasitic to crops such as striga on cereals and rob nutrients from plants, weeds are alternate hosts for pests and disease causing organisms, under heavy infestation of weeds, harvesting of crops becomes difficult, they lower quality of crops, some weeds are alleloparthic which hinders crop growth, weed control increases the cost of production, while weeds growing among pastures lower palatability of pastures.

Weeds are classified according to lifespan, habitat, and morphology.

According to lifespan, weeds are classified as annual, biannual, and perennial. Annual weeds include black jack, gallant soldier, black night shade, thorn apple, and pig weed. Perennial weeds include oxalis, couch grass, nut grass, sodom apple, tick berry, wandering Jew, and spear grass.

According to morphology, some weeds are broad leaved and others are narrow leaved. Broad leaved weeds include black jack, Sodom apple, tick berry, amaranthus spp, thorn apple, etc. Narrow leaved weeds include star grass, spear grass, couch grass, wild finger millet, among others.

Damages caused by weeds can be controlled through application of suitable chemicals, employing cultural means such as crop rotation, cover cropping, mulching, proper spacing, flooding, early planting, controlled burning, trap cropping, use of clean planting materials, flooding, and use of correct seed rate.

Mechanical methods such as slashing and ploughing can also be employed to control weeds.

Activity

1. Design a weed album, indicating weed specie, lifespan, and its method of propagation.
2. What precautions should be taken when using herbicides?
3. State the advantages and disadvantages of controlling weeds through ploughing.

Summary:

In this lesson, you have learnt that:

a) Weeds are unwanted plants in the garden
b) Weeds have characteristics which make them successful in crop gardens.
c) Weeds can be controlled by chemicals, cultural means, mechanically or by integrated approach.
d) Weeds, are classified according to lifespan, habitat, and morphology

References

1. Ivens, G.W. (1971). East Africa Weeds and their Control. Oxford University Press
2. Sabiiti, E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges, Crop Production.
3. Beinempaka A.B. et al. (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan publishers Ltd.

TOPIC 1: CROP PROTECTION

Lesson 2: Crop Pests

Learning outcomes.

By the end of the lesson, you should be able to:

a) Define a pest
b) Give damages caused by pests on crops.
c) Categorize pests
d) Devise appropriate methods of controlling pests

Learning materials

- Hand lens
- Preserved specimens of pests
- Plant parts with pests

Introduction:

A pest is an organism which destroys crops and causes economic loss to a farmer. The most important crop pests include insects, nematodes, mites, birds, fungi, bacteria, rodents, and virus.

Insect pests are categorized according to mode of feeding, plant parts attacked, number of plant species they attack, stage of crop attacked, and where they attack.

According to mode of feeding, pests are grouped into two categories, that is those that feed by piercing and sucking plant sap and those that feed by biting and chewing plant parts. The piercing and sucking pests include aphids, mealy bugs, cotton stainer, thrips, and others. Biting and chewing pests include caterpillar, locusts, grass hoppers, beetles, termites, and others.

According to where pests attack, there are field pests, which attack crops when they are still in field and storage pests which attack crops in stores

What damages do pests cause on plants? They eat flowers and reduce seed production, leaf mining which reduces the leaf area for photosynthesis, eat leaves causing defoliation, for example army worms; they suck plant sap causing loss of plant vigor. Aphids; they make tunnels in the stem and interfere with transportation system within the plant. Maize stalk borers; bore into tubers and reduce food storage. Sweet potato weevils; eat plant roots leading to death of the whole plant. Nematodes and termites transmit crop diseases. Aphids transmit groundnut rosette. On the other hand, storage pests reduce seed viability; for example, mango fruit fly cause premature fall of fruits.

The following are very important when considering whether to control the pest or not: nature of pest damage, population of the pest, cost: benefit ratio, plant resistance, stage of development of the pest, influence on ecosystem.

Activity:

1. a) State the damages caused by pests on stored produce
   b) Outline the ways of controlling storage pests
2. Outline the factors that influence the level of attack/ damage of crop pests
3. a) Outline the desirable characteristics of a pesticide.
   b) State the effects of using pesticides on the environment.

Summary

In this lesson, you have learnt that:

a) Pests are organisms which destroy crops and cause economic loss to farmers
b) Pests are classified according to mode of feeding, plant parts attacked, number of plant species attacked, and where they attack.
c) The farmer considers many factors when deciding whether to control pests or not, which include population of the pest, nature of pest damage, influence on ecosystem, stage of development of a pest, plant resistance, and cost benefit ratio.

References:

1. Deputy J.M.S. (1986). Crop Pests of East Africa. Oxford university press.
2. Sabiiti E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges, Crop Production.
3. Beinempaka A.B. et al. (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan publishers Ltd.

TOPIC 1: CROP PROTECTION

Lesson 3: Crop Diseases

Learning outcomes.

By the end of lesson, you should be able to:

a) Outline signs of disease infestation in crops.
b) State the damages caused by diseases on crops.
c) Give the cause of crop diseases
d) Devise appropriate methods of controlling crop diseases.

Learning materials.

- Plant part attacked by a disease e.g. cassava mosaic, banana bacterial wilt, coffee leaf rust, tomato blight, etc.

Introduction:

In the previous lesson, you learnt about pests. In this lesson, you will learn about crop diseases.

A plant is said to be diseased when it fails to carryout the physiological process normally.

The condition for successful infection of crop diseases include; pathogen- host contact, pathogen must be in a pathogenic state, host plant must be in a susceptible stage, the plant variety must be susceptible to a particular race of the pathogen, and suitable environmental conditions for the pathogen.

Signs of disease attack include; rotting, mosaic, gummosis, necrosis, stunting, chlorosis, leaf curl, galls, lesions, wilting, and others.

Diseases are spread from one crop to another or from one garden to another through vectors (such as aphids and white flies) planting infected planting materials, wind, infected soil, irrigation water, rain splash, contact by weeds, contaminated tools, infected crop residues, infected mulching materials, and others.

What causes crop diseases? The causes are grouped into: biotic and abiotic causes.

Biotic agents which cause crop diseases are virus, fungi, and bacteria.

Abiotic / environmental causes include; nutrient deficiencies, air pollution. Shortage of oxygen, moisture extremes, lack of light, chemical injury, and others.

The general methods of controlling crop diseases include: quarantine, pruning, early planting, weeding, spraying with recommended chemicals, use of clean planting materials, observing a dead season, soil sterilization, use of clean tools, crop rotation, removal and destruction of affected plants, draining land to overcome fungal diseases, and planting resistant varieties.

Activity:

1. a) Outline the crop diseases that are caused by:

   i. virus
   ii. bacteria
   iii. fungi

   b) State the signs of viral diseases

2. a) Mention the signs of banana bacteria wilt.

   b) Describe how banana bacterial wilt spreads.

   c) Explain the measures that can be employed to control banana bacterial wilt.

Summary:

In this lesson, you have learnt that:

a. There are two major causes of crop diseases: biotic and abiotic causes.
b. For successful infection of crop diseases, environmental conditions for the pathogen must be suitable, pathogen- host contact, host plant must be susceptible, and pathogen must be in a pathogenic state.
c. A farmer can tell that a crop is diseased if he/she observes wilting, necrosis lesions, mosaics, chlorosis, galls, gummosis, rotting, streaks and others.

References:

1. Sabiiti E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges, Crop Production.
2. Beinempaka A.B. et al. (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan publishers Ltd.

TOPIC 2: AGRICULTURAL ENGINEERING AND FARM MECHANISATION

Lesson 4: Construction Materials

Learning outcomes

By the end of the lesson, you should be able to:

a) Identify types of materials required for construction work.

b) State the factors to consider when selecting materials for construction.

Learning materials

- Timber/wood
- Bricks
- Concrete
- Iron sheets
- Thatch
- Reeds
- Metals
- Glass
- Plastics
- mortar

Introduction:

There are many materials that may be used to erect farm structures, such as farm buildings, fences, water storage facilities, farm roads, and others.

When you look at a structure, for example, a farm building you can clearly see different construction materials which include bricks which make wall, floor and foundation, concrete which makes a concrete floor, foundation walls, slab, column beams and pillars, timber which is used in making roof, doors, ceiling and windows, mortar which is used for plastering walls, binding bricks, finishing floor, and rough casting walls.

Other materials used to construct farm structures are: glass which is fitted in doors and windows to allow light penetration, metals which are used for making windows and doors.

The choice of the construction materials depends on durability, availability, cost of buying the material, farmers' preference, purpose, availability of capital, flexibility, attractiveness, skills required to use the material, resistance to pests, soil conditions, among others.

Activity

1. Visit a construction site and observe how different materials are prepared for construction work.

2. How can the durability of construction materials be increased

Summary

In this lesson you have learnt that:

a) There are different construction materials required for erecting farm structures
b) Materials are mixed in different proportions according to the type of work to be done.
c) The choice of the construction materials depends on purpose, availability, cost of the material, acceptability, skills required to use the material, durability, flexibility, and others.

References:

1. Nkurunziza, P.C. (1985). Farm Structures, Tools and Machinery. Oxford University Press. Nairobi.
2. Mott, L.C Engineering Drawing and Construction. Second edition. Oxford: Oxford University Press.
3. Sabiiti, E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges: Farm Structures, Machinery and Agricultural Economics. Kampala: Fountain Publishers.

TOPIC 2: AGRICULTURAL ENGINEERING AND FARM MECHANISATION

Lesson 5: Farm tools and equipment

Learning outcomes:

By the end of the lesson, you should be able to:

a) Design and construct a livestock rearing equipment, such as a beehive, feeder, waterer, and resting box.

b) Give the criteria for selecting tools and equipment for farm use.

c) Handle and care for tools and equipment.

Learning materials:

- Pencils
- Try square
- Claw hammer
- Nails
- Tape measure
- Materials for constructing livestock rearing equipment such as nails and timber.

Introduction:

There are many tools and materials for constructing a livestock rearing equipment.

The choice of tools depends on cost of buying the tool, durability, purpose of the tool, availability, skills required for using the tool, availability of capital, guarantee, maintenance costs, safety of the tool to the operator, and others.

Activity 1:

Construct a poultry feeder using the following tools and materials. Tape measure, nails, jack plane, a piece of timber, claw hammer, and hand saw.

Activity 2:

What factors influence the size of the poultry feeder you have designed?

Activity 3

Describe the maintenance practices carried out on tools and equipment.

Summary:

In this lesson, you have learnt that:

a) Livestock rearing equipment can be constructed on the farm instead of buying them.

b) The choice of tool to use to design and construct a livestock rearing equipment depends on cost of buying tools, maintenance costs, durability, purpose, ease of using the material, and others.

References:

1. Nkurunziza, P.C. (1985). Farm Structures, Tools and Machinery. Nairobi: Oxford University Press.
2. Mott, L.C Engineering Drawing and Construction. Second edition. Oxford: Oxford University Press.
3. Sabiiti, E.N. et al. (2010) Agriculture Principles and Practices for Schools and Colleges: Farm Structures, Machinery and Agricultural Economics. Kampala: Fountain Publishers.

TOPIC 2: AGRICULTURAL ENGINEERING AND FARM MECHANIZATION

Lesson 6: Farm structures

Learning outcomes:

By the end of the lesson, you should be able to:

a) State the different types of farm structures.

b) Give the importance of farm structures

c) Design simple plans for farm structures.

Learning materials:

- Farm structure models
- Drawing boards
- Paper
- Pencil

Introduction:

In lesson 4, you learnt about the construction materials, such as timber, metals, concrete, mortar, glass, nails, asbestos, mud, reeds, bricks, bamboo, and others.

In this lesson, you will learn about the different types of farm structures that can be constructed out of those materials.

What structures are at your home? When you look around you may observe many physical constructions. These are some of the structures that can also be constructed on our farms for specific reasons. They include cattle crush, drainage channels, irrigation facilities, residential house, stores, fences, roads, water storage facilities, biogas plant, and others.

Farmers also construct structures to help in controlling external parasites through spraying or dipping such as cattle rush, spray race, and cattle dip.

Activity

1. Using examples, explain the importance of farm structures.
2. What factors influence the location of farm structures?
3. a) Why are stores important on the farm?
   b) What would you consider when designing crop storage facilities?

Summary:

In this

lesson, you have learnt that there are a variety of farm structures serving different purposes. These include: cattle dip, spray race, roads, farm buildings, irrigation facilities, water storage tanks, bio gas plant, and others.

References:

1. Nkurunziza, P.C. (1985). Farm structures, Tools and Machinery. Nairobi: Oxford University Press.
2. Mott, L.C. Engineering, Drawing and Construction. Second edition. Oxford: Oxford University Press.
3. Sabiiti, E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges: Farm Structures, Machinery and Agricultural Economics. Kampala: Fountain Publishers.

TOPIC 3: AGRICULTURAL POLICIES

Lesson 7: Implications of agricultural policies to agricultural development

Learning materials:

By the end of the lesson, you should be able to:

a) Define agricultural policy
b) State objectives of agricultural policy.
c) Describe the contribution of the government to agricultural development.

Learning materials:

- Brochures
- Posters
- Charts
- Video tapes depicting new agricultural technologies and research activities

Introduction:

Agricultural policy is a course of action formulated, adopted, and implemented by the government to achieve prescribed agricultural goals.

The objectives agricultural policies aim to achieve include: to promote food and nutritional security, enhance sustainable agricultural productivity, promote household income, provide employment opportunities, provide advisory services, provide agricultural credit/ finance to farmers, modernize agriculture, promote domestic and international trade, improve quality of agricultural products, stabilize prices for agricultural products, and others.

What has the government done to achieve these objectives in order to promote agricultural development?

The government of Uganda has promoted agricultural development through: promoting research in order to develop crop varieties and animal breeds that are high yielding and resistant to pests and diseases. Provision of extension services to train farmers on best agricultural practices, ensuring stable prices, and creating credit facilities through micro- finance and other commercial banks that offer finance for production. Also, provision of supportive infrastructure, such as water, electricity, and communication, and sensitizing and mobilizing farmers to produce commodities that are on high demand, improving marketing access by constructing and maintenance of feeder roads, and promoting agro processing. Promoting agricultural education to develop human capital to all stake holders in order to transform agriculture and developing land use and management policies that promote sustainable use of natural resources.

Activity:

1. What roles do agricultural research institutions play in agricultural development?
2. How has the government of Uganda contributed towards the modernization of agriculture?

Summary:

In this lesson you have learnt that:

a. Agricultural policy is a course of action which is formulated, adopted, and implemented by the government to achieve set agricultural goals.
b. Agricultural development refers to transformation of agriculture from subsistence to commercial production based on improved practices, technologies, and efficient marketing.
c. Current agricultural programmes in Uganda include plan for modernization of agriculture, national agricultural advisory services, programmes for elimination and alleviation of poverty (PEAP), and Agricultural sector programme support (ASPS)

References:

1. Beinempaka, A.B. et al. (1990) Principles and Practices of Agriculture, Volume 2. London: Macmillan publishers Ltd.
2. Sabiiti, E.N et al. (2010). Agriculture Principles and Practices for Schools and Colleges. Farm Structures, Machinery and Agricultural Economics. Kampala: Fountain Publishers.

TOPIC 3: AGRICULTURAL POLICIES

Lesson 8: Land Policies.

Learning outcomes

By the end of the lesson, you should be able to:

a. State the land tenure systems and their effect on agricultural production.
b. Describe the land reforms and their contribution to agricultural production.

Learning materials:

- Land policy documents
- Land titles/title deeds
- Resource persons on land issues, policies and law.

Introduction:

In the previous lesson, you learnt about agricultural policies, today you will learn about land policies.

How is land owned in your place?

The goal of the national land policy is to ensure sustainable utilization and management of Uganda's land resources for wealth creation, poverty reduction, and overall socio- economic and environmental development

The current land use policies are products of 8th October, 1995 constitution which made major changes in the law relating to land use.

The 1995 constitution reinstates the land tenure systems which had been abolished by land reform decree. Article 237 (3) of the constitution provides that land in Uganda shall be owned in accordance with the following land tenure systems: customary, freehold, Mailo, and leasehold.
Under customary communal land ownership, land belongs to a clearly defined group of people such as clan or whole community in specific areas. Every member of the clan has a right to use land but land is neither bought nor sold. In leasehold, the state or landlord transfers land use rights to an individual or group of people for a specified period of time which can be renewed when it expires.
In private/freehold land ownership, land is owned by private individuals. The land owner known as the landlord can register land and get a certificate. The Mailo land tenure system came into effect when Buganda kingdom signed the 1900 agreement. Mailo land has two categories, that is official and private Mailo. Official Mailo land is supposed to benefit specific officials such as Kabaka's

office, Katikiro, Ssaza, and Gombolola chiefs, and therefore not supposed to be sold, however, it can be leased.
Private Mailo land went to individuals who have perpetual ownership and are free to sell or pass on their rights to their heirs.

Land reform is a program undertaken by the government to re-organize or restructure the land tenure so as to permit better utilization of land resources.
The land reform policies include: land consolidation, land redistribution, land adjudication, land registration, settlement and resettlement schemes. The objectives of land reforms are: to reduce land conflicts, encourage conservations and improvement of land, increase productivity of both land and labour, promote increased production, promote commercialization of agriculture, achieve effective utilization of national land resources.

Activity:

1. a) What are the causes of land conflicts in Uganda?
   b) What can be done to reduce land conflicts?
2. a) How can a farmer benefit from having a land title?
   b) What information is contained on a land title?
3. a) Explain the causes of land fragmentation
   b) What are the effects of land fragmentation in agricultural production?

Summary:

In this lesson you have learnt that:

a) Land tenure refers to acquisition of rights to use land.
b) The land tenure systems in Uganda are freehold, communal, leasehold, state ownership and co-operative land tenure.
c) Land reform policies in Uganda are designed to re-organize or restructure land tenure so as to permit better utilization of land resources.

References:

3. Beinempaka, A.B. et al. (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan Publishers Ltd.
4. Sabiiti E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges. Farm Structures, Machinery and Agricultural Economics. Kampala: Fountain Publishers.

TOPIC 4: FARMING ORGANISATIONS AND THEIR MANAGEMENT

Lesson 9: Role of Farming Organizations in Agricultural Production and Development

Learning outcomes:

By the end of this lesson, you should be able to:

a) Define a farming organisation.
b) State the farmers' organizations in Uganda
c) Outline the principles of a cooperative society.

Learning materials

- Documents belonging to a farming organisation.
- Video clips

Introduction:

Farming organizations are the organisations involved in assisting farmers to produce, transport, store, process, and market agricultural products.

They include: farmers' clubs, national farmers' federation, and cooperatives.

A cooperative is a registered organisation of people who decide to work together to achieve a common objective.

A cooperative society is run under principles, such as democracy, cash dealings, neutrality, continuous expansion, cooperation, and promotion of members on merit, share of dividends basing on share capital, and provision of education to their members.

Cooperatives are classified according to the activities they perform and they include producer/ grower's co-operatives, consumer's co-operatives, savings and credit co-operatives, service co-operatives, and processing co-operatives.

How do farmers benefit from being members of a co-operative?

Members share overhead costs, it is easy to get extension services, it's easy to get loans to finance activities, members are able to sell their produce at fair prices, it is easy to process and add value to produce, farmers obtain inputs at reduced prices, farmers get profits which otherwise would go to middlemen, it is easy to transport produce, there is improved storage of farmers produce, and members learn from each other the new farming techniques.

Activity:

1. What problems hinder the progress of co-operatives in Uganda?

Summary:

In this lesson you have learnt that:

a) a cooperative has principles upon which activities are based.

b) Cooperatives are grouped according to activities they perform.

c) Farmers benefit a lot from being members of cooperatives; for example, they obtain inputs at reduced prices, share overhead costs, high bargaining power for better prices, easy to process produce, easy to transport produce, easy to store produce, and members learn from each other.

References.

1. Beinempaka, A.B. et al. (1990). Principles and Practices of Agriculture, Volume 2. London: Macmillan Publishers Ltd.
2. Sabiiti, E.N. et al. (2010). Agriculture Principles and Practices for Schools and Colleges. Farm Structures, Machinery and Agricultural Economics. Kampala: Fountain Publishers.

National Curriculum
Development Centre,
P.O. Box 7002,
Kampala.

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