

Agriculture

Year 1

SECTION

3

PRINCIPLE OF CROP PRODUCTION



FOOD PRODUCTION AND NATURAL RESOURCE CONSERVATION

Principles Of Agriculture In Food Production

INTRODUCTION

This section will be covering lessons in crops, their importance and how they are classified. Knowledge and understanding of crops and their classification will assist you in distinguishing between food crops and other plants and classifying them accordingly based on their uses, origin, growth cycle, and botanical classification. Understanding the principles, practices and techniques of crop production will be treated in the subsequent lessons. The principles of crop production will enable you understand the concepts and guidelines that govern the cultivation of crops to ensure optimal yields, quality, and sustainability. These principles encompass the various stages and practices that farmers and agricultural professionals follow to manage crops from soil preparation to harvest. By understanding and applying these principles and practices, you can optimise crop yields, improve quality, and reduce environmental impact. In the final lesson of the section, you will explore the fundamental principles, practices, and techniques essential for successful crop production which is aimed at providing you with the knowledge and skills needed to optimise crop yields, improve soil health, and ensure sustainable farming methods.

At the end of this section, you will be able to:

- Explain the meaning and importance of crops
- Describe the classification of crops with examples
- Explain the meaning of the Principles of Crop Production
- Discuss the stages of crop production and its related practices
- Apply the principles in crop production practices

Key Ideas

- Crops are plants cultivated or grown for various purposes such as food, fibre, medicinal or ornamental purposes.
- Crops are an essential component of agriculture and form the foundation of our food supply.
- The importance and uses of crops include economic significance, livelihoods and rural development, environmental benefits, trade and global exchange, industrial and

commercial uses and food security.

- Crops can be classified based on origin, growth cycle, botanical classification and uses.
- Principles of crop production entail the scientific and systematic approaches to crop cultivation which is aimed at maximising yields, crop quality and sustainability. It involves understanding crop physiology, soil science and geology guided by the principles of agronomy, horticulture and agricultural engineering. The stages of crop production include;
 - Pre- planting: soil testing and analysis, land preparation, seed selection and planning.
 - Planting: sowing seeds, transplanting, and establishing the crop.
 - Post planting: nutrient management, water management, pruning and training, monitoring crop progress, controlling pests and diseases, and preparing for harvest.
 - Harvesting: gathering the crop, handling and storing.
- Fertilisers can be natural or synthetic.
- Record keeping in crop production is the systematic documentation of various farming activities, inputs, and outputs.
- Diseases in crop production are abnormal conditions in plants caused by pathogens or environmental factors, leading to impaired growth, reduced yields and sometimes plant death.

MEANING AND IMPORTANCE OF CROPS

Meaning of Crops

Crops are plants that are cultivated or grown for various purposes such as for food, fibre, medicinal or ornamental value . Crops are an essential component of agriculture and form the foundation of our food supply.

Importance and Uses of Crops

1. **Economic importance:** Crops contribute to national and global economies by generating income and employment opportunities. Crop production and trade create jobs in farming, processing, transportation, marketing and related industries. Cash crops generate revenue through exports and help to stimulate economic growth.
2. **Livelihoods and rural development:** Crops are a lifeline for many rural communities, especially in developing countries. Farming and crop production provide livelihoods for farmers and their families, helping to alleviate poverty and promote rural development. Crop cultivation supports rural economies by creating income-generating activities and improving living standards.
3. **Environmental benefits:** Certain crops, such as legumes, help improve soil fertility through nitrogen fixation and reducing the need for synthetic fertilisers. Crops also play a role in carbon sequestration, helping to mitigate climate change.

Additionally, crop cultivation in the form of agroforestry or mixed cropping systems can contribute to biodiversity conservation and ecosystem resilience.

4. **Trade and global exchange:** Crops are traded globally, fostering international relations and exchange. Countries specialise in the production of specific crops based on their climatic conditions, resources and expertise. This interdependence promotes trade, enhances food availability and allows consumers to access a wide variety of crops throughout the year.
5. **Industrial and commercial uses:** Many crops serve as raw materials for various industries such as textiles, pharmaceuticals, biofuels, cosmetics and construction. Examples include cotton for clothing, sugarcane for ethanol production and oil seeds for biofuel manufacturing.
6. **Food security:** Crops are the primary source of food for humans and animals. They provide essential nutrients, vitamins and minerals necessary for healthy diets. Crops such as grains, fruits and vegetables form the basis of our daily meals and contribute to global food security.

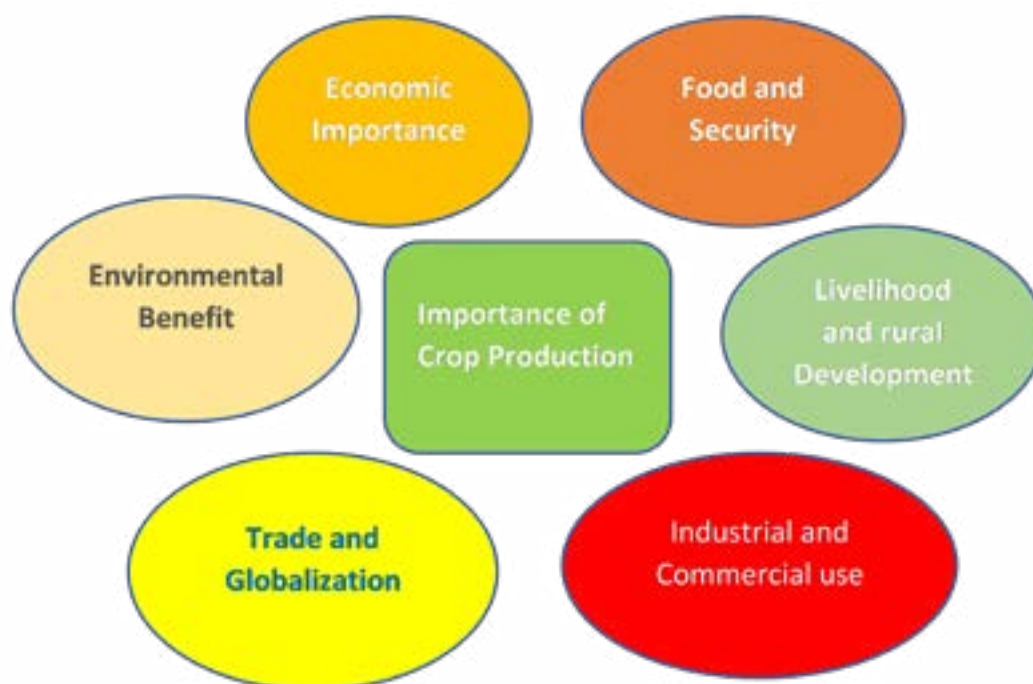


Fig.3.1: A diagram showing the importance of crop production

Activity 3.1: Brainstorming the meaning of crops in Agriculture

1. What comes into mind when you hear the term 'crops'?
2. Individually write your thoughts and ideas on a piece of paper.
3. Share your thoughts and ideas with your peer for feedback and fine-tune the meaning of crops in agriculture.

Activity 3.2: The importance of crops in Agriculture

1. Watch videos/look at pictures on different types of crops (click [here](#))
2. Write down the names of at least 9 identified crops in the video/pictures
3. Why do you think these plants are referred to as 'crops' instead of just plants, share your thoughts with your peers.
4. With the help of the internet and other resources come up with the importance and uses of the crops identified in a table below

Name of crop	Importance/uses

5. From the above activity provide reasons on the importance and uses of crops and share with your peer for feedback.

CLASSIFICATION OF CROPS

Crops can be classified into several categories based on:

1. Origin

- a. **Indigenous crops:** These are crops that are native to a particular region or country. They have evolved and been cultivated by indigenous communities over generations. Indigenous crops are well-adapted to the local environment and often have cultural and historical significance. E.g., cassava, okra, plantain, millet and sorghum.
- b. **Exotic crops:** Exotic crops, also known as introduced or non-native crops, are those that are not naturally found in a particular region but have been introduced from other regions or countries. These crops are usually brought in for their economic value, new agricultural opportunities or specific purposes. E.g., cabbage, carrot, lettuce, apples and cashews.

2. Growth Cycle

- a. **Annual crops:** Annual crops complete their full life cycle within a year. They are sown, grow, reproduce, and die in a single growing season. Examples include maize (corn), wheat, rice, soya beans and most vegetables.
- b. **Biennial crops:** Biennial crops have a life cycle that spans two (2) years. They usually grow vegetatively in the first year and complete reproduction in the second year before dying. It must be noted that some vegetables, although biennial, are harvested in the first year. They can grow to their full potential and produce seeds in the second year. Examples include carrots, beets, onions, and some types of cabbage and okra. These are biennial crops but they are harvested mostly as annual crops.
- c. **Perennial crops:** Perennial crops have a life cycle of more than two (2) years. They continue to grow and produce crops for several years once established. Examples include cocoa, citrus cashew, mango, avocado, cola, coffee and some forage grasses.



Maize



Wheat



Cucumber



Pea



Carrot



Tomato



Sweet Potato



Cabbage



Cocoa



Citrus

Fig. 3.2: Classification of crops based on growth cycle.

3. Botanical Classification

- a. **Poaceae (grasses):** Crops such as wheat, rice, corn, barley and oats belong to the grass family.
- b. **Solanaceae (nightshades):** Crops like tomatoes, potatoes, peppers and eggplants belong to this family.
- c. **Leguminosae/Fabaceae (legumes):** Leguminous crops include beans, peas, lentils, soya beans, and peanuts.

- d. **Rosaceae (rose family):** Fruits like apples, pears, cherries and strawberries belong to this family.
 - e. **Brassicaceae (mustard family):** Crops such as cabbage, broccoli, cauliflower and kale belong to this family.
4. Uses
- a. **Food crops:** These crops are grown primarily for human consumption. Examples include grains (wheat, rice, maize, barley), fruits (apples, bananas, oranges), vegetables (tomatoes, lettuce, carrots), legumes (beans, peas, lentils) and oilseeds (soya beans, sunflower seeds, canola (rapeseed)).
 - b. **Cash crops:** These crops are grown for commercial purposes, primarily for sale rather than personal consumption. Cash crops include cotton, tobacco, coffee, tea, cocoa,
 - c. **Industrial crops:** These crops are cultivated for non-food purposes and are used in industries to produce materials or substances. Examples include cotton (used for textiles), rubber trees (for latex production), flax (for linen) and sugarcane (for ethanol production).
 - d. **Feed crops:** These crops are grown as animal feed for livestock and poultry. Common feed crops include corn, soya beans, alfalfa and various types of grasses.
 - e. **Horticultural crops:** These crops include fruits and vegetables mainly grown for food and ornamental plants which are grown for aesthetic purposes, landscaping and gardening. Examples of fruits and vegetables include: citrus, mango, pineapple carrot, lettuce etc. Examples of ornamental plants: whistling pine, royal palm, araucaria etc.
 - f. **Medicinal crops:** These crops are cultivated for their medicinal properties and are used in the production of drugs/pharmaceuticals or herbal remedies. Examples include aloe vera, ginseng, chamomile and echinacea.

Activity 3.3: Classification of crops

1. Make a list of some of the common crops grown in your locality.
2. Among the crops listed, identify the ones that can be put into the same group.
3. Write the justification for the grouping.
4. With the help of the internet and other resources, identify the various classes/categories of crops, examples of crops that fall in the class and the reasons for classification. Present your findings in the table below to the class.

Class of crops	Example of crops	Reason for the classification

Activity 3.4 Indigenous and Exotic Crops in your Locality

1. Take a study trip to a market in your locality. Identify and document the indigenous and exotic crops sold in the market.
2. Prepare a presentation on the exotic and indigenous crops and present to the class.

Activity 3.5: Creation of a Diagram on the Classification of Crops

1. With the classification of crops in the above activity, create a chart/classification tree of the crops with main class/category of classification as the trunk, sub-class as the branches and the example of crops as the sub-branches. e.g., classification based on growth cycle as the trunk, Annual crops, Biennial crops and Perennial crops as the branches and maize wheat, rice, soya beans as sub-branches for annual crops.
2. Present the chart to your peers for feedback.

EXTENDED READING

- Exotic series by Eric Amoah
- Adwinsa series by Sosu George Mensah, Emile. N. Kwarteng and Agya Baffour Antwi.

PRINCIPLES OF CROP PRODUCTION

In this lesson we will be looking at the fundamentals of cultivating crops otherwise known as the principles of crop production. It is a vital aspect of agriculture which plays a significant role in the economy, food security and sustainable development of a country.

Principles of Crop Production

Are the fundamental guidelines and concepts that guide the practices and decision-making processes involved in growing crops. These principles encompass various aspects of crop production and are aimed at optimising crop yield, quality, sustainability and ensuring food security.

Key principles of Crop Production

1. **Crop selection:** Choosing the right crop species and varieties is crucial for successful crop production. Factors such as climate, soil type, water availability, market demand and pest resistance should be considered during the selection process.
2. **Soil management:** Soil is the foundation of crop production. Proper soil management practices ensure optimal fertility, structure and nutrient content. Techniques like soil testing, organic matter addition, crop rotation and erosion control are employed to maintain soil health and productivity.
3. **Nutrient management:** Nutrients are essential for plant growth. Effective nutrient management involves understanding the nutrient requirements of crops and applying fertilisers or organic amendments accordingly. This requires considering soil nutrient levels, crop nutrient uptake, and employing appropriate timing and application methods.
4. **Water management:** Water is a critical resource in crop production. Efficient water management practices aim to conserve water, minimise wastage and provide adequate moisture to crops at different growth stages. Techniques such as irrigation scheduling, precision irrigation, and water-saving technologies are utilised for optimal water use.
5. **Pest and disease management:** Crop pests and diseases can cause significant yield losses. Integrated Pest Management (IPM) strategies are employed to control pests and diseases while minimising environmental impact. This includes cultural practices, biological control, use of resistant crop varieties and judicious application of pesticides when necessary.
6. **Weed management:** Weeds compete with crops for resources and can reduce yields. Weed management involves a combination of cultural practices (crop rotation, tillage), mechanical methods (hand-weeding, mowing), and chemical control (herbicides) to suppress weed growth and prevent seed production.

7. **Climate-smart practices:** With climate change beginning to have an impact on agriculture, adopting climate-smart growing practices is vital. These practices focus on enhancing crop resilience to extreme weather events, improving resource efficiency and reducing greenhouse gas emissions. Examples include conservation agriculture, agroforestry and precision farming.
8. **Monitoring and record-keeping:** Regular monitoring of crops, soil, pests and diseases is essential for timely interventions and decision-making. Maintaining detailed records of inputs, yields, and observations helps track performance, assess profitability and identify areas for improvement.

Activity 3.6: Brainstorming the Meaning and Principles of Crop Production

1. Write down what you think of when you hear the term principles of crop production. You can use the internet to generate more ideas.
2. Write down your thoughts and ideas on a piece of paper.
3. Share your thoughts and ideas with your peers for feedback and fine tune the meaning and principles of crop production.

Activity 3.7: Key Principles of Crop Production

1. Using the following questions, as a guide to describe the key principles of crop production:
 - a. What are the key factors that affect crop growth and development?
 - b. How do farmers prepare the soil for planting crops?
 - c. What is the importance of proper seed selection and planting techniques?
 - d. How do crops obtain the necessary nutrients and water for growth?
 - e. What methods are used to control pests and diseases in crops?
 - f. How do farmers ensure optimal crops yield and quality?
 - g. What role does intercropping and crop rotation play in sustainable agriculture?
 - h. How do environmental factors like climate, temperature and soil type impact crop production?
 - i. What technologies and tools are used in modern crop production?
2. Based on the answers to the above guided questions, compile the principles of crop production and share with your peers to fine tune your thoughts.
3. Select one principle and discuss in depth with your peer guided by the following.

- a. What it means?
 - b. Why it is important?
 - c. How it affects crop growth and yield?
 - d. Examples of real-world farming practices or scientific studies that support its importance.
4. Summarise the key points in a chart or diagram illustrating the principles of crop production by definition, importance, effects on crop growth and yield.

STAGES OF CROP PRODUCTION AND ITS RELATED PRACTICES

Stage One: Pre-Planting Stage

The pre-planting stage involves all the activities undertaken before sowing or planting the crops. This stage typically includes the following steps:

Site Selection:

It involves choosing the most suitable location for cultivating crops. The selection of an appropriate site can significantly impact the success and productivity of the crop. Here are some key factors to consider during site selection:

a. Climate and weather conditions:

Temperature range: Different crops have specific temperature requirements for optimal growth and development. Consider the temperature range and fluctuations throughout the growing season.

Rainfall and water availability: Evaluate the average rainfall patterns, water sources and potential for irrigation to ensure sufficient water for crop needs.

b. Soil Characteristics:

Soil type and texture: Assess the soil type (e.g., sandy, loamy, clay) and texture to understand its drainage capacity, water-holding capacity and nutrient retention abilities.

Soil fertility: Evaluate the soil's fertility status by considering factors like organic matter content, nutrient and pH levels. Soil fertility can greatly influence crop growth and yield potential.

Soil depth: Ensure the soil is deep enough to support proper root development for the chosen crop and allow for nutrient and water absorption.

c. Topography and drainage:

Slope and elevation: Consider the slope and elevation of the land, as they can affect water drainage, erosion potential and suitability for mechanised farming or irrigation systems.

Drainage conditions: Assess the natural drainage patterns of the site, avoiding areas prone to waterlogging or poor drainage or those areas that dry out quickly that can hinder crop growth.

Sunlight exposure: Ensure the site receives adequate sunlight for the specific crop's photosynthetic needs. Avoid areas with excessive shading from trees, structures, or neighbouring crops.

d. **Access to Infrastructure and Services:**

Proximity to markets: Consider the distance to potential markets for selling the harvested crops, reducing transportation costs and ensuring timely delivery.

Availability of utilities: Consider the accessibility to water sources, electricity and other necessary utilities required for irrigation, processing or storage facilities.

Transportation and logistics: Evaluate the ease of access to roads, transportation networks and infrastructure for transporting inputs and outputs efficiently.

e. **Pest and Disease Pressure:**

Historical pest and disease incidence: Gather information on the prevalence of pests and diseases in the area and consider crop rotations or pest management strategies accordingly.

Presence of potential vectors: Evaluate the presence of insects or other air, water or soil borne organisms that can spread diseases or cause damage to crops.

Legal and regulatory considerations: Zoning and land use regulations ensure compliance with local zoning regulations and land-use restrictions for agricultural activities.

Land Preparation:

- a. **Clearing the land:** Removing any existing vegetation, rocks or debris from the field.
- b. **Ploughing:** Breaking up the soil to loosen it and facilitate root penetration, water infiltration and nutrient distribution.
- c. **Harrowing:** Breaking up lumps and clods of soil, levelling the field and preparing a suitable soil medium (seedbed).

Soil testing and Analysis:

- a. **Soil analysis:** Testing the soil samples to determine nutrient content, pH level, organic matter content and other relevant factors.
- b. **Interpreting soil test results:** Assessing the nutrient deficiencies or imbalances, pH levels and any corrective actions required.

Seed Selection:

- a. **Choosing suitable crop varieties:** Considering factors such as yield potential, disease resistance, adaptability to the local climate and market demand.
- b. **Selecting certified seeds:** opt for high-quality seeds that have undergone quality testing and certification.

Seed Treatment:

- a. **Seed cleaning:** Removing debris, broken seeds or impurities from the seed lot.
- b. **Seed priming:** Soaking seeds in water or a special chemical solution to enhance germination rates and promote uniform emergence.
- c. **Seed coating:** Applying fungicides, insecticides or other treatments to protect seeds against pests, diseases or adverse environmental conditions.

Field Planning:

- a. **Determining crop rotation sequence:** Deciding on the order in which different crops will be planted in successive seasons to optimise nutrient utilisation, manage pests and diseases, and improve soil health.
- b. **Field layout and spacing:** Planning the arrangement and spacing of crops within the field to maximise productivity and ease of cultivation.

Irrigation Planning:

- a. **Assessing water availability:** Evaluating the water source, availability, and potential irrigation methods.
- b. **Designing irrigation systems:** Determining the type of irrigation system (e.g., sprinkler, drip) and planning the layout of irrigation lines or infrastructure.

Preparing equipment and Inputs:

- a. **Procuring farming equipment:** Ensuring the availability and proper functioning of necessary tools, machinery, and implements for land preparation and planting.
- b. **Arranging fertilisers and other inputs:** Procuring fertilisers, soil amendments, and other necessary inputs based on soil test results and crop requirements.

Stage Two (2): Planting Stage

This stage involves the actual sowing or planting of seeds or seedlings in the prepared field. This stage includes the following activities:

1. **Sowing method:** Depending on the crop type, seeds can be sown through broadcasting (uniformly spreading seeds on the field either by hand or by machinery), drilling (placing seeds at a specific depth and spacing), transplanting (transferring seedlings from nursery beds) or direct seeding (sowing seeds directly into the field without preparing a seedbed).

2. **Spacing and depth:** Ensuring the seeds or seedlings are placed at the appropriate spacing and depth to allow for proper growth and development.
3. **Watering and irrigation:** Providing sufficient moisture to aid seed germination or support the establishment of transplanted seedlings. This may involve watering the field or using irrigation techniques such as sprinkler irrigation or drip irrigation.
4. **Fertiliser application:** Applying fertilisers based on soil test recommendations or crop-specific requirements. This can be done either at the time of planting or as a top-dressing later during the crop's growth.

Stage Three: Post-planting Stage

The post-planting stage involves the activities carried out after the crops have been planted or transplanted. This stage includes the following steps:

1. **Weed control:** Implementing weed control measures to prevent weed competition and ensure unhindered crop growth. This may involve manual weeding, mechanical cultivation, mulching, or herbicide application.
2. **Pest and disease management:** Monitoring the crops for pests and diseases and taking appropriate measures for their control. This includes implementing integrated pest management strategies, scouting for pests, and applying pesticides or biocontrol agents when necessary.
3. **Crop monitoring and care:** Regularly inspecting the crops for growth, health, and any signs of stress. This includes monitoring water requirements, ensuring proper plant support (if needed), and taking corrective actions to address any other growth issues.
4. **Harvest preparation:** As the crops start nearing maturity, prepare for the upcoming harvest by arranging necessary equipment, labour, and storage facilities.

Pre planting operations



Land clearing by a tractor



construction of beds

Planting operations



A farmer transplanting seedlings



Seedlings planted in drills

Post planting operations



Farmers controlling weeds manually using hoe



A farmer managing her vegetable crops

Fig 3.3: Stages of crop production.

Activity 3.8: Stages of crop production.

1. With the help of the internet and other resources describe the stages of crop production. Use the following questions as a guide;
 - a. What are the initial activities taken before planting a crop? (e.g. soil preparation)
 - b. What activities are carried out during the planting process? (e.g. sowing seeds)
 - c. How do farmers support crop growth and development? (e.g., irrigation)
 - d. What actions are taken to protect crops from pests and diseases? (e.g. Pest management)
 - e. How do farmers prepare for harvest? (e.g. monitoring maturity)

Share your answers with your peers by comparing and combining your responses to create a detailed list of the stages of crop production and present it to the class.

Activity 3.9: Description of the various stages of crop production

1. Study the diagrams below carefully



PICTURE 1



PICTURE 2



PICTURE 3

Using the following questions as a guide, describe the various stages of crop production;

- a. What activities are being carried out in the respective pictures above?
 - b. What are the purposes of the activities?
 - c. How do the activities impact crop growth and yield?
2. Based on the above activity, create a chart or diagram illustrating the various stages of crop production. Include all activities carried out at each stage.

EXTENDED READING

- Eric A. (2018). General Agriculture Textbook for S.H.S.
- SN link.springer.com

HANDS-ON AND OBSERVATION OF FARM PRACTICAL ACTIVITIES TO ACQUIRE SKILLS IN PRINCIPLES OF CROP PRODUCTION

The activities under this topic will help you understand how farmers, agronomists and agricultural professionals apply the principles, practices and techniques of crop production to grow healthy and productive crops sustainably. The lessons will also enable you to gain deeper appreciation for the importance and complexities of crop production. The lessons also have links with subjects such as chemistry due activities on soil chemical properties testing.

Principles of crop production: They are the fundamental guidelines and concepts that govern the cultivation of crops to ensure optimal yields, quality and ensure sustainability.

Principles of Crop Production Practices

1. **Land preparation:** This is the crucial step in crop production that involves preparing the soil for planting. This involves the clearing of the fields, removing rocks, removing debris, levelling the land and preparing seedbeds if needed using basic agricultural tools such as hoe, cutlass and rakes.
2. **Soil sampling and analysis:** This is the process of collecting and testing soil samples from different areas of the farm to determine its physical and chemical properties, fertility status and any contaminants that may be present.
3. **Seed selection and planting:** Choose seeds of high quality that are suitable for your climate, soil type and market demand. Consider factors like yield potential, disease resistance and drought tolerance. Perform simple seed quality checks by soaking seeds in water to check their viability. Select seeds from reputable sources or certified seed companies. Observe proper seed planting techniques, including seed depth, spacing and planting density.
4. **Irrigation installation and management:** Effective irrigation installation and management are crucial in crop production for efficient water use, plant health and plant development. Learn about different irrigation methods and their application. Gain knowledge in irrigation scheduling, monitoring and adjusting irrigation systems accordingly via observation.
5. **Fertiliser application:** Learn about effective fertiliser application which is crucial for optimal crop growth, yield and quality while minimising environmental impact. Learn about different fertilisers, their application methods and timing of application. Gain hands-on experience in fertiliser application using knapsack sprayer, broadcasting and drilling.
6. **Weed control:** Weeds compete with crops for nutrients, water, sunlight and harbour pests and disease. Participate in weed control activities like manual

weeding, hoeing, or using knapsack sprayers to limit the growth and spread of weeds on your farm.

7. **Pest and disease monitoring/control:** Observe how to regularly monitor crops for pest and disease infestations. Learn to identify common pests and diseases that affect your crops and use proper methods or techniques, including spraying with pesticides or insecticides, trapping, regular weeding, trapping and implementing appropriate control measures.
8. **Crop harvesting and post-harvesting handling:** Observe crop harvesting activities, including proper techniques, timing and handling of crops. Learn about post-harvest practices such as cleaning, sorting, grading, packaging, storage and marketing by observation and practice where applicable.
9. **Record keeping and data analysis:** Learn how to keep records on all the activities conducted in your crop production, including input applications, disease control, water usage, equipment and yields. Design a simple farm record table for crop management practices in the field.



Fig. 3.4: Hands-on farm practical skills to acquire when performing practical farm activity in crop production.

Activity 3.10: Brainstorming to Come up with the Various Farm Practical Activities Involved in Crop Production

1. You are given a piece of land to cultivate with a crop of your choice. As an agriculturist, come up with practical activities you will perform before and after planting your seeds or seedlings. Use the following questions as a guide;
 - a. What activities will you undertake to prepare the land for planting?
 - b. What methods will you use for planting the crops?
 - c. How will you manage the soil fertility and nutrients of your farm?
 - d. What practices and methods will you use to control weeds, pests and diseases?
 - e. What techniques will you use for harvesting and post-harvest handling of your crops?
 - f. How will you store and preserve your crops for future use?
2. Share your activities with your peers for feedback and refine each other's work.

Activity 3.11: Perform Simple Farm Activities in Crop Production

1. Visit the school farm or a backyard garden and carry out the activities listed below. Seek guidance from a technical person or surf the internet/watch a video (click [here](#)) on how the activities are done.

Caution: Activities that involves the use of sharp tools and chemicals should be performed only under the guidance of a technician or a professional and the appropriate PPE worn.

2. Prepare a presentation on how you carried out the activities for a class presentation.

RM ACTIVITIES (TASK)	METHOD
Measuring soil temperature	
Checking soil texture	
Testing seed viability	
Controlling weeds, pests and diseases	
Fertiliser application	
Storage of harvested crops	
Maintaining soil moisture	

Activity 3.12: Performing Crop Production Activities Using Tractors

1. Observe a technician/watch a documentary/video (click [here](#)) of a farmer performing crop production activities such land preparation, weed control, post-harvest management of crops using tractors and designing farm records. Under the technician's guidance, perform agreed farm activities using the appropriate equipment. Prepare a presentation on the activities for a class presentation. Use the following questions as a guide;
 - a. What activity did you undertake?
 - b. What equipment did you use for the activity?
 - c. What is the importance of the activity in crop production?
 - d. What records did you make during the crop production activities?

Caution: The operation of the tractors should be done only under the guidance of a technician and the appropriate PPE worn.

REVIEW QUESTIONS

Review Question 3.1

1. Your sister in basic six wants to know what crops are and the difference between crops and other plants. Explain with examples what crops are and give at least three differences between crops and other plants.
2. In a tabular form, classify the following crops under annuals, biennials and perennials; onion, maize, pepper, tomato, millet, cassava, soya bean, banana, yam, plantain, sweet potato, lettuce, pumpkin, mango, cocoa, garden egg, cashew, okro, coffee, oil palm.
3. How does crop production influence global trade and international relations?

Review Questions 3.2

1. What are the key principles of crop production?
2. How do farmers apply the principles of crop production to ensure optimal yields?
3. Mr. Afriyie is a young farmer who has just inherited a small farm from his grandmother. The farm has been in use by the family for generations, but Afriyie has limited experience with farming. He wants to produce crops sustainably and efficiently but does not know where to start.

Task:

Afriyie has approached you as a seasoned agricultural expert, for guidance. He wants to understand the meaning and key principles of crop production to ensure a successful harvest.

Use these questions as a guide:

- a. What advice would you give to Afriyie about preparing the soil for planting?
 - b. How would you explain the importance of seed selection and genetics to Afriyie?
 - c. What nutrient and water management strategies would you recommend for Afriyie's farm?
 - d. How would you guide Afriyie in managing pests and diseases on his farm?
 - e. What sustainable agriculture practices would you encourage Afriyie to adopt?
4. How do the principles of crop production impact the environment?
 5. How do farmers determine the optimal time for planting and harvesting?

6. Mr. Adu Agyei, a multi-millionaire, wants to venture into farming but he is challenged with the choice of site for the farm. Suggest three factors that Mr. Adu Agyei should consider in the choice of site for the farming.
7. What are the effects of the following practices in crop production:
 - a. Weed management?
 - b. Soil testing?

Review Questions 3.3

1. Your school wants to venture into maize production in the upcoming growing season. Discuss the crop production activities that will be carried out, before, during and after growing the maize, including the harvesting and post-harvesting practices.
2. How will you execute the following activities or practices in crop production?
 - a. Soil preparation for planting
 - b. Managing soil fertility
 - c. Planting seeds or seedlings
 - d. Managing soil moisture
 - e. Controlling weeds
 - f. Controlling pests and diseases
 - g. Harvesting your crops
 - h. Handling your crops after harvesting
 - i. Managing waste on your farm
3. A farmer in the rural community who has access to sophisticated equipment and tools wants to conduct the following tests before cultivating his crops;
 - a. Soil pH,
 - b. Soil texture and
 - c. Seed viability

How will you assist the farmer accurately and correctly undertake the tests?

ANSWERS TO REVIEW QUESTIONS

Answers to Review Questions 3.1

1. Crops are plants which are cultivated or grown for various purposes such as food, fibre, medicinal and ornamental purposes. Crops form an essential component in Agriculture and the foundation for our food supply.
2. Difference between crop plants and non-crop plants.

CROP PLANTS	NON-CROP PLANTS
Deliberately cultivated	Not deliberately planted/natural
Most of them are edible	Few of them are edible
Usually found on the immediate environment	Usually found in the wild

3.

a. Economic impact

Trade balance:

- Export revenue: Countries that are major crop producers and exporters, such as the United States, Brazil, and Australia, generate substantial revenue from agricultural exports. This contributes to their trade balance and overall economic stability.
- Import dependency: Nations that lack sufficient domestic crop production, such as Japan and many Middle Eastern countries, rely heavily on imports to meet their food demands, making them dependent on global trade networks.

Price fluctuations:

- Supply and demand: Crop production levels directly affect global supply and demand dynamics. A bumper harvest can lead to lower prices, while poor yields due to adverse weather conditions can spike prices.
- Market volatility: Events like droughts, floods, or pest infestations can cause significant fluctuations in crop yields, leading to volatility in global food prices and affecting economic stability, particularly in developing nations.

b. Food security

Access to food:

- Global supply chains: Efficient production and trade of crops ensures a stable supply of food to various parts of the world. Countries with inadequate agricultural production depend on imports to achieve food security.

- Trade policies: Tariffs, quotas, and trade restrictions can impact the availability and affordability of crops, influencing food security in importing nations.

Humanitarian aid:

Emergency relief: In times of famine or natural disasters, countries with surplus crop production can provide humanitarian aid to affected regions, fostering international cooperation and goodwill.

c. Environmental sustainability

Sustainable practices:

- Global standards: International trade agreements often include provisions for sustainable farming practices, which can encourage environmentally friendly production methods worldwide.
- Resource management: Crop production for export can lead to overuse of resources like water and soil, causing environmental degradation if not managed sustainably.

d. Geopolitical dynamics

Trade Relations:

- Bilateral and multilateral agreements: Countries often negotiate trade agreements to secure stable and favourable terms for importing and exporting crops. These agreements can strengthen diplomatic ties and economic cooperation.
- Trade disputes: Disagreements over tariffs, subsidies, and market access for crops can lead to trade disputes, affecting international relations. For example, the U.S.-China trade war included significant agricultural components.

Strategic alliances:

- Food diplomacy: Nations use crop exports as a tool for diplomacy, offering favourable trade terms to strengthen alliances or to gain political leverage.
- Dependency and influence: Countries that control large portions of global crop exports can exert influence over dependent nations, impacting international politics and alliances.

e. Technological and industrial impact

Innovation and development:

- Agricultural technology transfer: Countries leading in agricultural technology, such as genetically modified crops and advanced farming techniques, can influence global production standards through technology transfer and collaboration.
- Investment in infrastructure: Trade-driven crop production encourages investment in infrastructure, such as transportation, storage, and processing facilities, enhancing global trade efficiency.

f. Social and cultural impact

Cultural Exchange:

- Dietary changes: The global trade of crops leads to the exchange of food cultures, introducing new foods and culinary practices to different regions.
- Rural development: Crop production for global markets can drive rural development, providing employment and improving living standards in farming communities

Answers to Review Questions 3.2

1. Key principles of crop production

The key principles of crop production include soil preparation, seed selection, irrigation, fertilisation, and pest management.

2. Applying the principles of crop production to ensure optimal yields

Farmers apply the principles of crop production by correctly preparing the soil, selecting suitable seeds, irrigating, and fertilising crops and managing pests and diseases.

3. Answers to help Mr. Afriyie understand the principles of crop production before he starts his farming;

Preparing the soil for planting:

- Test the soil to determine its pH level and nutrient content.
- Add organic matter like compost or manure to improve the soil fertility and structure.
- Till the soil to a depth of 8-10 inches to loosen and aerate it.
- Level the land to ensure even water distribution.
- Consider conservation tillage or no tillage farming to reduce soil disturbance.

Seed selection and genetics:

- Choose high quality seeds suitable for your climate and soil type.
- Consider disease resistant and climate tolerant varieties.
- Understand the genetic potential of the seed and their adaptability to your farm.
- Select seeds with desirable traits like drought tolerance or pest resistance.

Nutrient and water management:

- Conduct a soil test to determine nutrient deficiencies.
- Apply fertilisers and amendments based on soil test results.
- Implement the conservation agriculture practices like mulching and cover cropping.

- Use efficient irrigation systems and monitor water usage.
- Consider drip irrigation and precision agriculture techniques

Pest and diseases management:

- Monitor fields regularly for signs of pests and diseases.
- Use integrated pest management (IPM) techniques like crop rotation and biological control.
- Apply fungicides and pesticides judiciously and only when necessary.
- Consider organic and sustainable methods like neem oil and biopesticides.

Sustainable agriculture practices:

- Adopt conservation agriculture and generative agriculture practices.
- Implement crop rotation, intercropping and agroforestry.
- Use cover crops, mulch and compost to enhance soil health.
- Consider organic farming and permaculture principles.

4. Principles of crop production impact on the environment

The principles of crop production can impact the environment positively or negatively, depending on the practices used. Sustainable practices like conservation agriculture can reduce environmental impact. It can also protect and preserve vulnerable wildlife species by not exposing them to harmful chemicals.

5. Determining the optimal time for planting and harvesting

Farmers determine the optimal time for planting and harvesting based on factors like weather, soil conditions and crop maturity.

6 Three factors to consider in the choice of site for a farm

- Soil requirements: the type of soil, depth, drainage, texture, organic matter content, pH, fertility etc.
- Biotic factors and prevalence of pests and diseases.
- Accessibility to the land.
- Access to and closeness of labour supply and cost.

7. Effects of the following practices in crop production:

a. Weed management.

Reduction in weed growth - increased crop yield - improved crop quality

b. Soil testing.

Optimised fertiliser application - improved soil fertility -increased crop yields – reduced environmental pollution.

Answers to Review Questions 3.3

1.

- **Planning and site selection:** Assessing land suitability and testing the soil if it is good for crop production.
- **Land preparation:** Clearing and ploughing the land manually or mechanically, applying soil amendments and levelling of land for planting.
- **Seed selection and procurement:** Choosing high-quality, disease resistant maize varieties and purchasing seed from trusted and registered source.
- **Soil preparation for planting:** Final soil tillage and creating planting beds or rows if necessary.
- **Planting:** Sowing seed or transplanting seedlings and ensuring proper spacing.
- **Fertilisation and nutrient management:** Applying basal fertilisers at planting time and top dressings with additional nutrients during growth stages.
- **Irrigation management:** Installing irrigation systems, sprinkler systems, drip irrigation or rainwater harvesting. Scheduling regular watering.
- **Weed control:** Mechanical weeding or applying herbicides if necessary.
- **Pest and disease management:** Monitoring for pests and diseases and applying appropriate pesticides and fungicides. Keeping good sanitation on the farm.
- **Soil moisture management:** Mulching to retain moisture and ensure adequate drainage.
- **Harvesting:** Determine the optimal harvest time and use proper harvesting techniques to minimise crop damage.
- **Post-harvest handling:** Drying maize properly and storing in a pest-free environment.
- **Waste management:** Disposing of agricultural waste responsibly or composting the organic waste.
- **Record keeping:** Documenting all practices and expenses. Evaluating production efficiency for future improvements.

2.

- **Soil preparation for planting:** Clearing the field of debris and previous crop residues using cutlass, hoe or herbicides. Hand tools such as hoes, shovels, and digging forks to turn over the soil to a depth of about 6-8 inches. This helps break up compacted soil and incorporates organic matter.

- **Managing soil fertility:** Applying compost or manure to enrich the soil. Appropriate chemical fertilisers based on soil test results to address nutrient deficiencies. Crop rotation and cover cropping can be done to maintain soil health and fertility.
- **Planting seeds or seedlings:** Seeds can be sown by broadcasting, drilling method or planting at stake. Transplanting of seedlings from a nursery and then into the field.
- **Managing soil moisture:** Applying a layer of organic mulch (like straw, grass, or wood chips) to retain moisture and reduce evaporation. This is known as mulching. Water plants deeply but infrequently to encourage deep root growth. Avoid frequent shallow watering, which can lead to weak roots.
- **Controlling weeds:** Use of mechanical methods such as hoeing and the use of cutlass or herbicides and tilling to remove weeds. Mulching can be done to suppress weed growth.
- **Controlling pests and diseases:** Use integrated pest management techniques or applying fungicides and insecticides according to recommended guidelines to minimise pest and disease outbreaks. Maintain good field hygiene by removing and destroying infected plant material.
- **Harvesting your crops:** Using appropriate harvesting tools and techniques and handling crops gently to avoid bruising and spoilage such as hand-picking, sickle harvesting or cutting and gathering depending on the type of crops.
- **Handling crops after harvesting:** Cleaning and sorting crops to remove any damaged or diseased produce. Drying crops thoroughly and keeping them in a cool dry, well-ventilated place.
- **Managing waste on your farm:** Disposing of hazardous waste such as pesticides containers and recycling non-organic waste materials whenever possible. Collecting plant residues to create compost for future use.

3.

a. How to test for soil pH

Materials needed: soil sample, distilled water, clean container, litmus paper.

- Gather soil from multiple spots in the testing area to get a representative sample
- Combine samples in clean container.
- Take about 2 tablespoons of the mixed soil and add 2 tablespoons of distilled water and stir to create a soil slurry (suspension of insoluble particles usually in water).
- Insert the litmus paper (blue or red) into the soil and water mixture.

- If the blue litmus paper turns red it is acidic. If the red litmus paper turns blue it means the soil is alkaline.

b. How to test for soil texture

Feel method: Rub a small amount of moist soil between your fingers. If it feels:

- Gritty; it means it is sandy soil.
- Smooth; it means it silt.
- Sticks together; it means the soil is clay.

c. How to test for seed viability

Water Test Method

(**Note:** This method is quick and straightforward but works best for certain types of seeds)

Steps:

- Take a sample of the seeds you want to test.
- Fill a bowl or beaker with room temperature water.
- Place the seeds in the water and let them sit for about 15-30 minutes.
- **Observation:** Viable seeds will generally sink to the bottom, while non-viable seeds will float.

REFERENCES

1. Eric Amoah (2018) General Agriculture with Text of Practical's and Examinable Questions for West African Senior High Schools. Exotic Publications and Educational Consultancy Ltd.
2. Akinsanmi. O. (1975) Certificate Agricultural Science. Longman Singapore Publishers Pte Ltd.
3. Agriculture Curriculum (2023) for S.H.S.
4. Eric A. (2018). General Agriculture Textbook for S.H.S.
5. General Agriculture Textbooks for Senior Secondary Schools.
6. Acquah, G. (2002). Principles of Crop Production: Theory, Techniques and Technology. Publisher: Prentice Hall. ISBN 9780130221339. 4. Martin, J.H., Walden, R.P. and Stamp, D.L. (2006). Principles of Field Crop Production.
7. Martin, J.H., Walden, R.P. and Stamp, D.L. (2006). Principles of Field Crop Production. Publisher: Pearson Prentice Hall. ISBN 9780130259677.
8. Smith, R., Jones, L., & Williams, M. (2019). Sustainable crop production: Principles and practices. Cambridge University Press.

GLOSSARY

- **Fertiliser:** any substance added to soil or plants to provide essential nutrients that enhance growth and productivity.
- **Irrigation:** the artificial use of water to soil to help grow crops.
- **Pests:** organisms that cause damage to crop in the field and storage, leading to reduced yield and quality.

Acknowledgements



Ghana Education
Service (GES)



List of Contributors

Name	Institution
Dr. Esther Fobi Donkor	UENR, Sunyani
Stephen Owusu-Danso	Saviour SHS
Anthony Mensah	New Konkrompe SHS
Emmanuel Kakpenuba	Wa SHS