

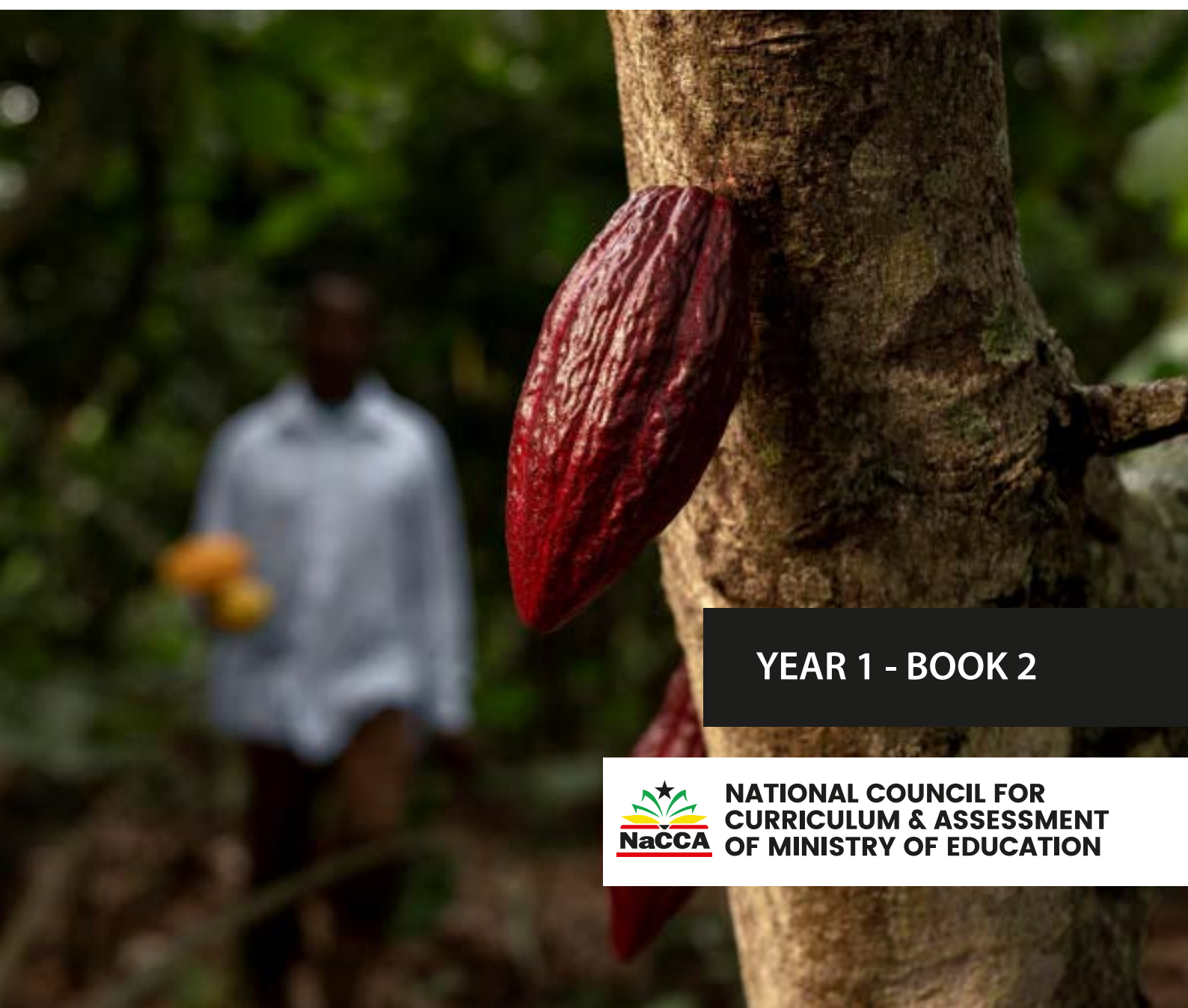


**MINISTRY OF EDUCATION**

# **AGRICULTURE**

## **For Senior High Schools**

### **TEACHER MANUAL**



**YEAR 1 - BOOK 2**



**NATIONAL COUNCIL FOR  
CURRICULUM & ASSESSMENT  
OF MINISTRY OF EDUCATION**

# MINISTRY OF EDUCATION



REPUBLIC OF GHANA

## Agriculture

For Senior High Schools

**Teacher Manual**

Year One - Book Two



**NATIONAL COUNCIL FOR  
CURRICULUM & ASSESSMENT  
OF MINISTRY OF EDUCATION**

## **AGRICULTURE TEACHER MANUAL**

Enquiries and comments on this manual should be addressed to:

The Director-General

National Council for Curriculum and Assessment (NaCCA)

Ministry of Education

P.O. Box CT PMB 77

Cantonments Accra

Telephone: 0302909071, 0302909862

Email: [info@nacca.gov.gh](mailto:info@nacca.gov.gh)

website: [www.nacca.gov.gh](http://www.nacca.gov.gh)



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# CONTENTS

<b>INTRODUCTION</b>	<b>1</b>
<b>Learner-Centred Curriculum</b>	<b>1</b>
<b>Promoting Ghanaian Values</b>	<b>1</b>
<b>Integrating 21st Century Skills and Competencies</b>	<b>1</b>
<b>Balanced Approach to Assessment - not just Final External Examinations</b>	<b>1</b>
<b>An Inclusive and Responsive Curriculum</b>	<b>2</b>
<b>Social and Emotional Learning</b>	<b>2</b>
<b>SUMMARY SCOPE AND SEQUENCE</b>	<b>3</b>
<b>SECTION 4: ANIMAL PRODUCTION AND MANAGEMENT</b>	<b>4</b>
<b>Strand: Food Production and Natural Resource Conservation</b>	<b>4</b>
Sub-Strand: Principles of Agriculture in Food Production	
4	
<i>Theme or Focal Area: Meaning and Importance of Farm Animals</i>	6
<i>Theme or Focal Area: Classification of Animals with Examples</i>	7
<i>Theme or Focal Area: Distribution of Farm Animals in Ghana and West Africa</i>	12
<i>Theme or Focal Area: Meaning and Objectives of the General Management Practices in Animal Production</i>	15
<i>Theme or Focal Area: Management Systems Involved in Animal Production</i>	16
<i>Theme or Focal Area: Skills in Farm Animal Husbandry Practices for Rearing Animals</i>	21
<b>SECTION 5: SOIL, FOREST AND CLIMATE CHANGE</b>	<b>26</b>
<b>Strand: Food Production and Natural Resource Conservation</b>	<b>26</b>
Sub-Strand: Principles of Natural Resource Conservation in Agriculture	26
<i>Theme or Focal Area: Meaning and Importance of Forestry and Forest Management</i>	28
<i>Theme or Focal Area: Concepts and Importance of the Interrelations between Forestry and Agriculture</i>	31
<i>Theme or Focal Area: Discuss Agroforestry Practices and Systems in Forest Management</i>	33
<i>Theme or Focal Area: Meaning and Nature of Soil</i>	36
<i>Theme or Focal Area: Describe the Physical and Chemical Properties of Soils and Their Importance</i>	39
<i>Theme or Focal Area: Examine and Discuss the Composition of Soil and their Importance</i>	44
<i>Theme or Focal Area: Meaning and Effects of Climate Change on Food Production and their Mitigating Strategies</i>	47

<b>SECTION 6: CROP AND ANIMAL HEALTH ISSUES</b>	<b>52</b>
<b>Strand: Agriculture, Health and Environment</b>	<b>52</b>
Sub-Strands:	52
1. Health Issues in Crop Production	52
2. Health Issues in Animal Production	52
<i>Theme or Focal Area: Meaning and Importance of Farm Hygiene and Sanitation in Crop Production</i>	54
<i>Theme or Focal Area: Farm Hygiene and Sanitation Activities in Crop Production</i>	56
<i>Theme or Focal Area: Application of Farm Hygiene and Sanitation in Crop Production</i>	59
<i>Theme or Focal Area: Meaning and Importance of Farm Hygiene and Sanitation in Animal Production</i>	63
<i>Theme or Focal Area: Farm Hygiene and Sanitation Activities in Animal Production</i>	66
<i>Theme or Focal Area: Application of Farm Hygiene and Sanitation in Animal Production</i>	69
 <b>SECTION 7: CONCEPT OF AGRICULTURAL ECONOMICS, AGRIBUSINESS AND COMMUNICATION</b>	 <b>73</b>
<b>Strand: Agricultural Economics, Agribusiness and Communication</b>	<b>73</b>
Sub-Strands:	73
1. Economics for Agriculture	73
2. Communication in Agriculture	73
3. Agribusiness Management	73
<i>Theme or Focal Area: Meaning and importance of Agricultural Economics</i>	75
<i>Theme or Focal Area: Farm as Economic Unit</i>	79
<i>Theme or Focal Area: Application of the Principles of Agricultural Economics</i>	83
<i>Theme or Focal Area: Meaning and Importance of Agriculture Communication</i>	87
<i>Theme or Focal Area: Strategies for Effective Communication in Agriculture</i>	89
<i>Theme or Focal Area: Meaning and Importance of Agribusiness</i>	92
<i>Theme or Focal Area: Activities of Agribusiness Management</i>	94
<i>Theme or Focal Area: Procedure for Writing an Agribusiness Plan</i>	98
 <b>ACKNOWLEDGEMENTS</b>	 <b>102</b>

# INTRODUCTION

The National Council for Curriculum and Assessment (NaCCA) has developed a new Senior High School (SHS), Senior High Technical School (SHTS) and Science, Technology, Engineering and Mathematics (STEM) Curriculum. It aims to ensure that all learners achieve their potential by equipping them with 21<sup>st</sup> Century skills, competencies, character qualities and shared Ghanaian values. This will prepare learners to live a responsible adult life, further their education and enter the world of work.

This is the first time that Ghana has developed an SHS Curriculum which focuses on national values, attempting to educate a generation of Ghanaian youth who are proud of our country and can contribute effectively to its development.

This Book Two of the Teacher Manual for Agriculture covers all aspects of the content, pedagogy, teaching and learning resources and assessment required to effectively teach Year One of the new curriculum. It contains information for the second 13 weeks of Year One. Teachers are therefore to use this Teacher Manual to develop their weekly Learning Plans as required by Ghana Education Service.

Some of the key features of the new curriculum are set out below.

## Learner-Centred Curriculum

The SHS, SHTS, and STEM curriculum places the learner at the center of teaching and learning by building on their existing life experiences, knowledge and understanding. Learners are actively involved in the knowledge-creation process, with the teacher acting as a facilitator. This involves using interactive and practical teaching and learning methods, as well as the learner's environment to make learning exciting and relatable. As an example, the new curriculum focuses on Ghanaian culture, Ghanaian history, and Ghanaian geography so that learners first understand their home and surroundings before extending their knowledge globally.

## Promoting Ghanaian Values

Shared Ghanaian values have been integrated into the curriculum to ensure that all young people understand what it means to be a responsible Ghanaian citizen. These values include truth, integrity, diversity, equity, self-directed learning, self-confidence, adaptability and resourcefulness, leadership and responsible citizenship.

## Integrating 21<sup>st</sup> Century Skills and Competencies

The SHS, SHTS, and STEM curriculum integrates 21<sup>st</sup> Century skills and competencies. These are:

- **Foundational Knowledge:** Literacy, Numeracy, Scientific Literacy, Information Communication and Digital Literacy, Financial Literacy and Entrepreneurship, Cultural Identity, Civic Literacy and Global Citizenship
- **Competencies:** Critical Thinking and Problem Solving, Innovation and Creativity, Collaboration and Communication
- **Character Qualities:** Discipline and Integrity, Self-Directed Learning, Self-Confidence, Adaptability and Resourcefulness, Leadership and Responsible Citizenship

## Balanced Approach to Assessment - not just Final External Examinations

The SHS, SHTS, and STEM curriculum promotes a balanced approach to assessment. It encourages varied and differentiated assessments such as project work, practical demonstration, performance assessment, skills-based assessment, class exercises, portfolios as well as end-of-term examinations and final external assessment examinations. Two levels of assessment are used. These are:

- **Internal Assessment (30%)** – Comprises formative (portfolios, performance and project work) and summative (end-of-term examinations) which will be recorded in a school-based transcript.



- External Assessment (70%) – Comprehensive summative assessment will be conducted by the West African Examinations Council (WAEC) through the WASSCE. The questions posed by WAEC will test critical thinking, communication and problem solving as well as knowledge, understanding and factual recall.

The split of external and internal assessment will remain at 70/30 as is currently the case. However, there will be far greater transparency and quality assurance of the 30% of marks which are school-based. This will be achieved through the introduction of a school-based transcript, setting out all marks which learners achieve from SHS 1 to SHS 3. This transcript will be presented to universities alongside the WASSCE certificate for tertiary admissions.

### **An Inclusive and Responsive Curriculum**

The SHS, SHTS, and STEM curriculum ensures no learner is left behind, and this is achieved through the following:

- Addressing the needs of all learners, including those requiring additional support or with special needs. The SHS, SHTS, and STEM curriculum includes learners with disabilities by adapting teaching and learning materials into accessible formats through technology and other measures to meet the needs of learners with disabilities.
- Incorporating strategies and measures, such as differentiation and adaptative pedagogies ensuring equitable access to resources and opportunities for all learners.
- Challenging traditional gender, cultural, or social stereotypes and encouraging all learners to achieve their true potential.
- Making provision for the needs of gifted and talented learners in schools.

### **Social and Emotional Learning**

Social and emotional learning skills have also been integrated into the curriculum to help learners to develop and acquire skills, attitudes, and knowledge essential for understanding and managing their emotions, building healthy relationships and making responsible decisions.

### **Philosophy and vision for each subject**

Each subject now has its own philosophy and vision, which sets out why the subject is being taught and how it will contribute to national development. The Philosophy and Vision for Agriculture is:

**Philosophy:** Every learner will be engrained with the principles of Agriculture, Food and Natural Resource Management to develop interest and appreciate the enterprises in Agriculture to advance their potentials to the fullest through climate-awareness, learner-centred pedagogies, and emerging technologies in an enabling environment supported by resourceful teachers for world of work, continuous education and life-long learning.

**Vision:** Learners equipped with entrepreneurial, technological, and climate-smart skills and competencies capable of creating and managing agricultural enterprises to contribute to food security. Learners equipped to proceed to further study, world of work and adult life with emphasis on continuous education and life-long learning.

## SUMMARY SCOPE AND SEQUENCE

S/N	STRAND	SUB-STRAND	YEAR 1			YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI	CS	LO	LI
1.	Concept of Agriculture in an Industrialising Society	Agriculture and Society	2	2	5	2	2	5	1	1	3
		Agriculture and Industry	1	1	3	2	2	4	-	-	-
2.	Modern Technical and Mechanised Agriculture	Modern Technical Agriculture	1	1	3	2	2	4	-	-	-
		Modern Mechanised Agriculture	3	3	7	2	2	6	1	1	2
3.	Food Production and Natural Resource Conservation	Principles of Agriculture in Food Production	4	4	11	2	2	4	2	2	6
		Principles of Natural Resource Conservation in Agriculture	3	3	8	3	3	7	1	1	3
4.	Agriculture and Health	Health issues in crop production	1	1	3	1	1	3	1	1	3
		Health issues in animal production	1	1	3	1	1	3	-	-	-
5.	Agriculture Economics, Agribusiness and Communication	Economics for Agriculture	1	1	3	1	1	3	1	1	3
		Communication in Agriculture	1	1	2	1	1	2	-	-	-
		Agribusiness management	2	2	3	1	1	4	1	1	2
<b>Total</b>			<b>20</b>	<b>20</b>	<b>51</b>	<b>18</b>	<b>18</b>	<b>45</b>	<b>8</b>	<b>8</b>	<b>22</b>

### Overall Totals (SHS 1 – 3)

Content Standards	<b>46</b>
Learning Outcomes	<b>46</b>
Learning Indicators	<b>118</b>



## SECTION 4: ANIMAL PRODUCTION AND MANAGEMENT

**Strand: Food Production and Natural Resource Conservation**

**Sub-Strand:** Principles of Agriculture in Food Production

### Learning Outcomes:

1. *Use the Knowledge acquired on the Importance, Classification and Distribution of Breeds of Farm Animals for Economic Empowerment in Society.*
2. *Use the Understanding of and the Skills in the Management Practices of Farm Animals for Rearing Animals.*

### Content Standards:

1. Demonstrate knowledge and understanding of the importance, classification and distribution of breeds of farm animals.
2. Demonstrate knowledge, understanding of and skills involved in the general management practices of farm animals.

### INTRODUCTION AND SECTION SUMMARY

Animal production contributes significantly to the Agricultural economy of most countries. The production of animals provides meat, milk and eggs which are important sources of nutrients. They also provide raw materials such as hides and skin (leather) to make clothing, belts and shoes. Therefore, an understanding of production practices is essential for their sustainability. This section is to help learners to know the importance, classification and distribution of farm animals as well as the general management systems. The section will also equip learners with the skills and ability to use basic Agricultural tools including ear tag applicator, burdizzo and drenching gun to perform basic animal husbandry practices. General husbandry practices such as weaning, dehorning, identification, and control of cannibalism among others will be known by learners. This section has links with subjects such as Applied Technology and Engineering, due to the use of tools.

**The weeks covered by the section are:**

**Week 12:** Meaning, importance, classification and distribution of farm animals

**Week 13:** Meaning, objectives and general management systems in animal production.

**Week 14:** Skills involved in the general management practices of farm animals.

### SUMMARY OF PEDAGOGICAL EXEMPLARS

The suggested pedagogical exemplars to be used are initiating talk for learning, experiential learning, think-pair-share, project-based learning, managing talk for learning and collaborative learning. The teacher should use initiating talk for learning, think-pair-share and collaborative learning to enable learners to share their views and experiences on the meaning, importance, classification, and distribution of farm animals and the general animal husbandry practices. For project-based and experiential learning, learners will be required to surf the Internet, watch a video, draw a map or create a diagram, visit a farm and have hands-on practice on the use of basic tools used in animal husbandry management practices. Learners should be given ample time to undertake the project and present their results at an agreed time if the time allocated for it in class is insufficient. critical thinking,

communication, digital literacy and collaboration skills of learners will be enhanced as they surf the Internet and share their views and experiences. Gifted and talented learners should be assigned extra tasks and made to support their peers in feasible and applicable activities. Learners should also be guided by the teacher and technician during the hands-on practice.

### **ASSESSMENT SUMMARY**

The assessment for this section will cover the meaning, importance, classification and distribution of farm animals, the meaning and objectives of the general management practices in animal production, types of farming systems, animal husbandry practices and the application of the skills involved in animal husbandry practices. The teacher should ask questions on the above considering different abilities and proficiencies of learners. The questions should have a balance of the various depth of knowledge, that is, Level 1 (recall/reproduce/remember), Level 2 (skills of conceptual understanding), Level 3 (strategic reasoning) and Level 4 (extended critical thinking and reasoning) assessments. Summative and formative assessments using strategies such as group discussions, presentations, homework, class exercises, class tests and project-based work should be given. The teacher should accept varying numbers of demonstrations, and oral and written responses. He/she should develop rubrics to score group presentations and assignments.

**WEEK 12****Learning Indicators:**

1. *Explain the meaning and importance of farm animals.*
2. *Describe the classification of animals with examples.*
3. *Analyse the distribution of farm animals in Ghana and West Africa.*

**Theme or Focal Area: Meaning and Importance of Farm Animals****1. Meaning of Farm Animals**

Farm animals are animals typically raised or kept for various purposes, such as food production, labour/draught, companionship and other products or services. These animals are often domesticated and require proper care, shelter, and nutrition to ensure their health and well-being.

**2. Importance of Farm Animals**

- a. **Food Production:** Farm animals are a major source of animal protein, including meat, milk, and eggs. These products are essential for human nutrition and are essential sources of nutrients such as vitamins, minerals, and amino acids.
- b. **Economic Value:** Farm animal production generates substantial economic value through the sale of livestock and livestock products. This includes revenue from meat, dairy, eggs, and other animal-derived products. The livestock sector contributes to Agricultural GDP and overall economic growth.
- c. **Employment and Rural Development:** Raising farm animals creates employment opportunities across the value chain. From animal rearing and husbandry to processing, distribution, and marketing, the livestock sector provides jobs for a diverse range of people, especially in rural areas. This helps stimulate rural development and reduce poverty by generating income and improving livelihoods.
- d. **Export Earnings:** Livestock and livestock products can be significant export commodities for many countries. Countries with a competitive advantage in livestock production can earn foreign exchange by exporting meat, dairy products, and other animal-derived goods. These exports contribute to trade balances and economic stability.
- e. **Livestock-Based Industries:** Farm animals also support a range of ancillary industries. These include animal feed production, veterinary services, meat processing, dairy processing, leather and textile industries, and other value-added sectors. These industries provide additional economic opportunities and contribute to the overall diversification of the economy.
- f. **Cultural and Social Significance:** Farm animals have cultural and social importance in many societies. They are used for festivals, funerals, naming ceremonies, payment of dowries and other cultural practices. Farm animals also provide companionship and emotional support to individuals.

**Learning Tasks:**

1. State the meaning and importance of farm animals.
2. Explain the meaning and importance of farm animals.
3. Discuss the meaning and socio-economic importance of farm animals.

## Pedagogical Exemplars

**Initiate talk for learning:** Learners brainstorm in pairs to review the meaning of farm animals in Agriculture. Learners should be assisted with leading questions that will help them to come up with the meaning of farm animals. Others should be guided to explain the meaning of farm animals. Allow talented learners to give further explanation to the meaning of farm animals. Where necessary allow learners to surf the Internet for the meaning of farm animals. The teacher should monitor learners during browsing and learners familiar with internet search should support others.

**Experiential learning:** All learners watch videos/pictures/charts on the importance of farm animals and discuss their observations in pairs. Learners work in pairs to state the importance of farm animals. Others work in pairs to explain the importance of farm animals. Challenge learners who can discuss the socio-economic importance of farm animals to the national economy to do so.

## Key Assessments

**Assessment Level 1:** List at least one (1) importance of farm animals.

**Assessment Level 2:** What are farm animals?

**Assessment Level 3:** Examine three (3) reasons for keeping large-scale farm animals.

**Assessment Level 4:** Why are farm animals important for the socio-economic development of the country?

## Theme or Focal Area: Classification of Animals with Examples

### 1. Classification of Farm Animals Based on their Feeding Habits

#### a. Ruminants:

Ruminants are animals that have a specialised digestive system capable of breaking down plant material (cellulose-rich plant matter) through a process called rumination. They have a four-chambered stomach that allows them to ferment and digest fibrous plant material efficiently. Ruminants typically regurgitate their food and chew it again, a process known as “chewing the cud”. These animals primarily feed on grass, leaves, and other plant materials. Examples of ruminants are Cattle (e.g., cows, bulls, oxen), Sheep, Goats, Deer and Bison.



**Fig. 1a wk12:** Cattle (*Ruminants*)



**Fig. 1b wk12:** *Deer and Bison (Ruminants)*



Goats



Sheep

**Fig. 2 wk. 12:** *Goat and Sheep (Ruminants)*

**b. Non-ruminant Omnivores:**

Non-ruminant omnivores are animals that have a simple stomach like humans but can consume a variety of food sources, including both plant and animal matter. These animals can be fed a mixed diet that includes grains, seeds, fruits, vegetables and occasionally some animal protein. They have a more flexible digestive system that allows them to utilise a broader range of food sources. Examples are Pigs, Chickens, Turkeys and Duck.



Pig



Fowl

**Fig. 3 wk. 12:** *Non-Ruminants*



### c. Non-ruminant Herbivores:

Non-ruminant herbivores are animals that have a simple stomach and consume a primarily plant-based diet. They lack the specialised digestive system of ruminants but are adapted to efficiently process plant material. These animals primarily consume grass, hay and other plant material. Their digestive system is designed to extract nutrients from fibrous plant matter. e.g., Horses, Donkeys, Rabbits and Guinea pigs.



**Fig. 2:** *wk. 12 Rabbits and Guinea pig (Non-Ruminant herbivores)*

#### i. Cattle

Cattle are classified into various breeds based on their characteristics, such as size, colouration and milk or meat production.

- **Holstein:** Known for its high milk production. Holsteins are the most common dairy breed worldwide.
- **Angus:** A popular beef cattle breed known for its marbled meat and adaptability to various climates.
- **Hereford:** Recognised for their red body colour with a white face, Herefords are versatile beef cattle.
- **Brahman:** Adapted to hot climates, Brahman cattle have distinctive humps and loose skin.
- **Jersey:** Small-sized cattle breed known for their high butterfat content in milk.
- **N'dama:** Indigenous to West Africa, N'dama cattle are known for their trypano-tolerance, which enables them to resist certain diseases transmitted by tsetse flies.
- **Boran:** Originating from East Africa, Boran cattle are heat-tolerant and highly adapted to grazing in arid and drought-prone areas.
- **Afrikaner:** Indigenous to southern Africa, Afrikaner cattle are known for their adaptability to harsh environments and good meat quality.

#### ii. Pigs

Pig breeds differ in terms of size, coat colour, meat quality and adaptation to specific production systems. Some notable pig breeds include:

- **Yorkshire:** Large white pigs are known for their high-quality meat and mothering ability.
- **Duroc:** Reddish-brown pigs with good growth rates and excellent meat quality.
- **Hampshire:** Black pigs with a white belt around the shoulders, known for their meat yield and muscle quality.
- **Berkshire:** Black pigs with white markings on their face, feet, and tail, valued for their marbled meat.

### iii. Poultry

Poultry breeds encompass chickens, turkeys, ducks and geese. They are categorised based on their purpose, such as egg-laying, meat production, or ornamental value. Examples include:

- **Leghorn:** A common breed of chicken known for its prolific egg-laying abilities.
- **Cornish Cross:** A hybrid meat chicken breed with rapid growth and efficient feed conversion.
- **Broad Breasted White:** A breed of turkey that has been selectively bred for its larger size and meat production.
- **Pekin:** A popular breed of domestic duck known for its meat and egg production.  
**Rhode Island Red:** Is perhaps the world's best-known fowl. It is a dual-purpose chicken, hardy and peaceful.
- **Wyandottes:** These are good, medium-weight chickens for small family flocks kept under rugged conditions. Their attractive "curvy" shape, generally good disposition and many attractive colour patterns make them a good choice for fanciers as well as farmers.
- **Rhode Island White:** Moderately-sized and completely white chicken. Have long, broad and deep bodies which are carried horizontally, giving them an oblong and brick-like appearance. Their breasts are deep, full and well-rounded. Their heads are fairly deep and are inclined to be flat on top rather than round.

### iv. Sheep

Sheep breeds vary in size, wool quality, meat production and adaptability to different environments. Some prominent sheep breeds include:

- **Djallonke (West African Dwarf):** Found throughout west Africa. It is a trypano-tolerant breed. The mature one measures about 40-55cm at the shoulder and weighs about 20-35kg. The coat colour is usually white or a mixture of black and white. The head is small with a strip profile and the ears are small.
- **Fulani or Sahel Breed (Uda and Ouda):** Found throughout the Sahel and Savanna zones. A mature ram measures about 75-85 cm at the shoulder and weighs 60-70kg. It has floppy ears, a long tail and long legs. The mane profile is convex. The coat colour is dark, head and forequarter with white hind quarter.
- **Merino:** Known for their high-quality fine wool, Merinos are popular for wool production.
- **Dorset:** A breed valued for both meat and wool, adaptable to various climates.
- **Suffolk:** A meat sheep breed with excellent growth rates and carcass quality.
- **Dorper:** Developed in South Africa, is one of the most widely distributed sheep breeds in Africa. They are known for their adaptability to arid and semi-arid regions, excellent meat quality, and fast growth rates. Dorpers have a white body with a black head or can be completely white.
- **Red Maasai:** Is indigenous to East Africa, particularly Kenya and Tanzania. They are adapted to tropical and semi-arid regions and are known for their high resistance to common sheep diseases and good adaptability to grazing in harsh conditions.
- **Karakul:** Originated in Central Asia but is found in various parts of Africa, including Namibia and South Africa. They are raised for their meat, wool, and pelts. Karakul sheep are known for their unique fat-tailed conformation and their ability to withstand extreme climatic conditions.
- **Afrikaner:** Is indigenous to southern Africa, primarily South Africa. They are well-adapted to harsh environments, including semi-arid regions, and are known



for their hardiness and adaptability to extensive grazing systems. Afrikaner sheep have a white body with a distinctive fat tail.

- **Bonga:** This is found in Ethiopia, particularly in the southwestern parts of the country. They are adapted to the humid and tropical climate of the region and are raised for both meat and fibre production.

#### v. Goats

- **West Africa Dwarf Goat:** They are indigenous to the forest and savanna zones of West Africa but are easily adapted to humid conditions (forest zone). They are plump, small-sized animals less than 50cm high at withers. Their colour is variable but grey-brown or dark colour is common among them.
- **West Africa Long-Legged Goat:** They are long-legged but medium to large-sized.
- They have tall, slender bodies with long necks, small heads, and slightly convex faces. Their horn sizes are variable. The average adult weight is 30kg. The average height of withers is 50-85cm. Their colour is mainly white, black or brown or black with white combinations.
- **Nubian:** Nubian goats, also known as Anglo-Nubians, are a dual-purpose breed originating from England. They have long ears and are recognised for their high milk production and good meat quality.
- **Toggenburg:** Toggenburg goats come from Switzerland and are known for their distinctive light brown colour with white markings. They are a dairy breed with good milk production and are well-suited for mountainous and rugged terrains.
- **Nigerian Dwarf:** Originating from West Africa, Nigerian Dwarf goats are small-sized dairy goats. Despite their small stature, they produce a significant amount of milk with high butterfat content. They are also popular as pets or for exhibition purposes.
- **Cashmere:** Cashmere goats are primarily raised for their luxurious and valuable cashmere wool which is highly sought after in the textile industry. They have a dual-purpose trait and can also be used for meat production.
- **Angora:** Angora goats are renowned for their long and silky mohair fibre, which is used in the production of high-quality textiles. They require specific shearing techniques to collect their luxurious fleece.
- **Red Sokoto:** Also known as Maradi or Sahel is an indigenous breed found across West Africa. They are well-adapted to arid and semi-arid regions and are known for their high fertility, tolerance to drought, and resistance to diseases.
- **Cameroon:** Also known as Dwarf or African Dwarf goats are native to Cameroon and are found in various parts of West and Central Africa. They are small-sized goats raised for meat and milk production.

#### Learning Tasks

1. Classify farm animals with examples.
2. Explain the classifications of farm animals with specific examples.
3. Describe the various characteristics of farm animals with specific examples.

## Pedagogical Exemplars

**Think-pair-share:** Learners individually identify farm animals in their community classify the animals and share with their peers. Learners should be supported with leading questions to list the classification of the various farm animals in their community. Where possible, the teacher should show learners pictures or charts to support them in classifying the farm animals. The teacher should guide others to explain the various classifications of farm animals with specific examples. Encourage learners with the ability to list, classify and describe the various characteristics of farm animals to do so. Such learners should also be made to support other learners.

**Project-based learning:** Put learners in gender-based/mixed-ability groups (where applicable) to create a diagram of the various classifications of farm animals and their examples. All learners should be involved in this activity. Learners can also be allowed to surf the Internet for information on the classification of farm animals to aid them in their drawing. The teacher should monitor the contents of what learners browse. Fast learners and those who are good at drawing should support slow learners in the creation of the diagram.

## Key Assessment

**Assessment Level 1:** State the classification of farm animals.

**Assessment Level 2:** Explain the difference between ruminants and non-ruminants.

**Assessment Level 3:** Why would you consider rabbits as non-ruminants even though they feed on forages?

**Assessment Level 4:** How are non-ruminant herbivores different from the ruminants?

## Theme or Focal Area: Distribution of Farm Animals in Ghana and West Africa

### 1. Distribution of farm animals in Ghana

- a. **Cattle:** Cattle are found throughout Ghana, but they are more concentrated in the northern regions such as the Upper East, Upper West, Savannah, North East and the northern regions. These regions have extensive grasslands and savannahs that provide suitable grazing areas for cattle. Cattle rearing is an important livelihood activity for many pastoral communities in these regions.
- b. **Sheep and Goats:** Sheep and goats are distributed across the country, with varying concentrations in different regions. In the northern regions, particularly the Upper East and Upper West, there is a significant population of sheep and goats due to the suitability of the arid and semi-arid environments for these species. The Volta, Brong-Ahafo and Ashanti regions also have substantial populations of sheep and goats.
- c. **Poultry:** Poultry production, including chickens, ducks and turkeys, is widespread across Ghana. Guinea fowl production is mostly prevalent in the northern part of Ghana. Poultry farms and backyard poultry rearing can be found in both urban and rural areas. Major poultry production areas include the Greater Accra Region, Ashanti Region, Eastern Region, and Brong-Ahafo Region.
- d. **Pigs:** Pig farming is prevalent in various parts of Ghana, with higher concentrations in the Ashanti, Eastern and Greater Accra regions. Pigs are often raised in smallholder and commercial farms, providing a source of income and meat for local consumption.
- e. **Aquaculture:** Fish farming is gaining prominence in Ghana, particularly in areas with access to water bodies such as rivers, lakes and reservoirs. Regions such as Ashanti, Eastern, Central and Volta have a significant presence of fish farms and aquaculture activities.

- f. **Other Livestock:** Other farm animals such as rabbits and snails are also reared in Ghana, although their distribution may vary based on local demand and cultural preferences.

## 2. Distribution of farm animals in Africa

- a. **Cattle:** Cattle are widely distributed across Africa and are found in various regions of the continent. They are particularly prominent in sub-Saharan countries, including countries such as Nigeria, Sudan, Ethiopia, Tanzania and South Africa. The distribution of cattle is influenced by factors such as the availability of grazing land, water resources and cultural significance, as well as the demand for meat, milk and hides.
- b. **Sheep and Goats:** Sheep and goats are distributed throughout Africa and are often found in arid and semi-arid regions. They are well-suited to these environments and provide a valuable source of meat, milk and fibre for local communities. Countries such as Sudan, Somalia, Ethiopia, Nigeria and Morocco have significant populations of sheep and goats.
- c. **Poultry:** Poultry farming is widespread across Africa, with chickens being the most common type of poultry raised. Poultry production is prevalent in both rural and urban areas, and it plays a crucial role in providing a source of protein, income and livelihood for many communities. Major poultry-producing countries in Africa include Nigeria, South Africa, Egypt, Ethiopia and Kenya.
- d. **Swine:** Pig farming is practised in various parts of Africa, although it is more concentrated in specific regions. Countries such as Nigeria, Uganda, Kenya, South Africa and Ghana have notable pig populations. Pig farming is often driven by factors such as market demand for pork, cultural preferences, religious beliefs and economic opportunities.
- e. **Other Livestock:** Other farm animals such as horses, donkeys, rabbits and various types of poultry (e.g., ducks, turkeys, geese), are also raised in different parts of Africa. Their distribution is influenced by local practices, specific cultural preferences and economic considerations.

## 3. Factors that affect the distribution of farm animals

The distribution of farm animals is influenced by various factors such as climate, geography, cultural practices and economic activities.

- a. **Climate and Geography:** Different farm animal species have specific climate and geographical requirements. Some animals thrive in hot and arid regions, while others prefer cooler and more temperate climates. The availability of suitable grazing land, water resources and the ability to tolerate specific weather conditions play a significant role in determining the distribution of farm animals.
- b. **Cultural Practices and Traditions:** Cultural practices, traditions and historical factors can also impact the distribution of farm animals. Certain communities or ethnic groups may have preferences for specific animal species or have traditional knowledge and skills in rearing particular breeds. Cultural factors can influence the choice of animals for farming, the husbandry practices employed and the importance placed on different livestock species.
- c. **Economic Considerations:** Economic factors, including market demand, profitability and cost of production, play a crucial role in the distribution of farm animals. Farmers are likely to raise animals that are in high demand and offer good economic returns. Market accessibility, transportation infrastructure, and the availability of support services such as veterinary care and animal feed also influence the distribution of farm animals.
- d. **Resource Availability:** The availability of natural resources such as land, water and forage, influence the distribution of farm animals. Animals that require extensive grazing areas or access to specific types of vegetation will be concentrated in regions where these resources are abundant. Conversely, animals that can adapt to limited resources or alternative feeding systems may be found in more resource-constrained areas.
- e. **Government Policies and Interventions:** Government policies, regulations and interventions related to Agriculture and livestock production can influence the distribution

of farm animals. For example, subsidies or incentives provided for specific livestock species or breeds may encourage farmers to focus on those animals. Government interventions in disease control, breeding programmes and extension services can also shape the distribution of farm animals.

- f. Environmental and Disease Considerations:** Environmental factors such as soil quality, water availability, prevalence of specific diseases and pest pressure can affect the distribution of farm animals. Some regions may be more prone to certain diseases, making it more challenging to rear specific animal species or breeds. Farmers may choose animals that are resistant or resilient to prevalent diseases in their area.

### Learning Tasks

1. List the breeds and factors that affect the distribution of farm animals.
2. Explain the factors that affect the distribution of farm animal breeds in Ghana.
3. Discuss the factors that influence the distribution of farm animal breeds in West Africa.

### Pedagogical Exemplars

**Managing talk for learning:** Put learners in mixed-gender/mixed-ability groups (where appropriate) to watch videos/pictures on the distribution of farm animals in Ghana and West Africa and discuss what they have observed in their groups. Learners should be supported to list the breeds and factors that affect the distribution of farm animals. Others should be guided to explain the factors that affect the distribution of farm animal breeds in Ghana. Allow those who can discuss the factors that influence the distribution of farm animal breeds in West Africa on their own to do so.

**Project-based learning:** Learners surf the Internet for a map of West Africa and Ghana showing the distribution of the breeds of farm animals. Learners individually draw maps of West Africa and Ghana to show the distribution of the breeds of farm animals. Where feasible, the teacher should provide learners with maps showing the distribution of farm animals in West Africa and Ghana for learners to trace. The teacher should ensure that all learners take part in the drawing and those who are good at drawing should be made to support those that are weak.

### Key Assessments:

**Assessment Level 1:** State three (3) breeds of farm animals in your community.

**Assessment Level 2:** Explain three (3) factors that affect the distribution of farm animals in West Africa.

**Assessment Level 3:** Identify two (2) breeds of farm animals, their characteristics and the reasons for which they are reared in Ghana.

**Assessment Level 4:** Draw a map of Ghana and West Africa showing the breeds and distribution of the farm animals. Provide the reasons for your distribution.

**WEEK 13****Learning Indicators:**

1. *Explain the meaning and objectives of the general management practices in animal production.*
2. *Discuss the management practices involved in animal production.*

**Theme or Focal Area: Meaning and Objectives of the General Management Practices in Animal Production****1. Meaning of General Management Practices in Animal Production**

General management systems in animal production refer to the comprehensive approaches and methodologies applied to efficiently and effectively raise and care for animals for various purposes, such as food production, fibre or other agricultural products. These systems encompass a wide range of practices and strategies that cover every aspect of animal husbandry, aiming to optimise productivity, animal welfare and overall sustainability.

**2. Objectives of the General Management Systems in Animal Production**

- a. **Animal Health and Welfare:** Ensuring the well-being and health of animals is a primary objective. This involves providing proper nutrition, appropriate housing, preventive healthcare measures to minimise disease and stress, and addressing societal concerns about animal Agriculture.
- b. **Genetic Improvement:** Breeding management and genetic selection are used to continuously improve desirable traits in animals, such as growth rate, disease resistance, and reproductive efficiency leading to improved productivity and profitability.
- c. **Resource Efficiency:** Efficient use of resources, including feed, water and land, is an important objective to minimise waste, and reduce greenhouse gas emissions and environmental impact while maximising production efficiency.
- d. **Disease Prevention and Control:** Implementation of biosecurity measures and disease control protocols helps prevent the spread of infectious diseases and maintains herd or flock health.
- e. **Financial Viability:** General management systems aim for economic viability, ensuring that the animal production system is profitable and sustainable in the long term.
- f. **Compliance with Quality and Safety of Animal Products:** Meeting legal and regulatory requirements related to animal husbandry. Ensuring that animal products, such as meat, milk, eggs and wool meet quality standards and are safe for human consumption is a crucial objective in animal production.

**Learning Tasks**

1. State the objectives of general management practices in animal production.
2. Explain the meaning of general management practices in animal production.
3. Discuss the benefits of the objectives of proper management systems for keeping farm animals.

## Pedagogical Exemplars

**Managing Talk for Learning:** Learners in mixed-ability/ability groups (where applicable) discuss the meaning and objective of the general management practices involved in animal production. Slow learners should be assisted with probing questions that will help them list the meaning and objectives of general management practices in animal production. Challenge others to explain the meaning and objectives of general management practices in animal production. Let learners with the ability to delve deeper into discussing the benefits of the objectives of proper management systems for keeping farm animals to do so.

**Managing Talk for Learning:** Learners in mixed-ability/ability groups (where applicable) watch videos/pictures of managing farm animals and discuss the objectives of the general management practices involved in animal production. All learners should take part in watching the video/pictures and discussing the objectives of the general management practices involved in animal production). Confident and eloquent learners should be allowed to play lead roles in the discussion under the guidance of the teacher. All learners should be tolerant and respect each other's views. Learners should be appreciated for good submissions.

## Key Assessments

**Assessment Level 1:** State three (3) objectives of the management practices involved in farm animal production.

**Assessment Level 2:** Explain the meaning of general management practices involved in animal production.

**Assessment Level 3:** How will proper management systems for keeping animals benefit them?

**Assessment Level 4:** Why will proper management of animals benefit humans?

## Theme or Focal Area: Management Systems Involved in Animal Production

1. **Management systems in animal production** refer to the organised approaches and strategies used to raise and care for animals in a way that optimises productivity, animal welfare and sustainability. These systems can vary significantly based on the species being raised, the scale of production, available resources and specific goals of the operation. The three major types of animal management systems in Ghana are Extensive, Semi-intensive and Intensive systems.

- a. **Extensive System:** This system involves allowing animals to graze or feed freely in large, open areas such as pastures or rangelands. No elaborate housing, feeding, watering and medication are provided. Extensive grazing is commonly used for cattle, sheep and other livestock. It promotes natural foraging behaviour and can be well-suited to regions with abundant grazing land.

### Advantages:

- Utilises natural forage resources and reduces feed costs.
- Allows animals to exhibit natural behaviours and social interactions.
- Generally, requires lower capital investment in housing and infrastructure.

### Disadvantages:

- May result in lower production efficiency compared with intensive systems.
- Vulnerable to fluctuations in forage availability and quality due to weather conditions.
- Requires extensive land and may not be suitable for high-density production.
- Animals can easily be stolen or knocked down by vehicles as they roam in search of feed.



- Animals are also exposed to bad weather, predators and disease conditions.

**b. Semi-Intensive System:** In this system, animals are housed and also allowed to roam freely on their own in search of feed. It combines both intensive and extensive systems.

**Advantages:**

- Natural forage utilisation and feed cost is better than the intensive system.
- Animals have better chances of exhibiting their natural behaviours compared with the intensive system.
- Capital investment is less intensive compared with the intensive system.
- Better control of feeding and health management than the extensive system
- The animal also has some level of protection against predators and adverse weather and predation.

**Disadvantages:**

- Capital intensive compared with the extensive system
- May require more land compared with the intensive system.
- Animals can easily be stolen or knocked down by vehicles when they are released for feeding.
- Animals are also exposed to some level of bad weather, predators and disease transmission during roaming.

**c. Intensive Systems:** In this system, animals are housed in confined spaces, such as barns or feedlots, where their environment, nutrition and health are carefully managed. Intensive confinement is commonly used for poultry and swine production, as it allows for high-density stocking and close monitoring of animals.

**Advantages:**

- Allows for high-density stocking, maximising production per unit area.
- Provides precise control over nutrition, health and environmental conditions.
- Protects animals from adverse weather and predation.

**Disadvantages:**

- Requires significant capital investment in housing and equipment.
- Potential for environmental and welfare concerns in crowded conditions.
- Dependency on external feed sources may increase production costs.

**d. Other farming systems**

**i. Integrated Farming Systems (IFS):** These systems involve integrating multiple components of agricultural production. For example, animal production can be combined with crop farming, allowing for nutrient recycling and improved overall sustainability.

**Advantages:**

- The combination of diverse agricultural activities can lead to increased overall productivity and income for farmers.
- Optimises the use of resources, such as land, water and nutrients. For example, animal waste can be recycled as fertiliser for crops, reducing the need for external inputs, and crop residues can be used as feed for animals.
- By diversifying their farming activities, farmers can reduce their dependence on a single commodity and spread risks associated with climate variability or market fluctuations.



**Disadvantages:**

- Implementing and managing a diverse farming system can be more complex which may require a higher level of expertise and planning and may demand more labour due to the diverse range of activities involved.
- Transitioning to an IFS may require significant initial investments in infrastructure and equipment which can be a barrier for some farmers.
- Integrating livestock and crops may increase the risk of disease transmission between animals and plants if not managed carefully.

- ii. Organic Farming Systems:** Organic farming practices prohibit the use of synthetic chemicals and genetically modified organisms. In organic animal production, animals are raised under organic principles, including access to outdoor areas and organic feed.

**Advantages:**

- Prohibits the use of synthetic chemicals and genetically modified organisms.
- Addresses consumer demand for organic products and sustainable practices.
- Emphasises animal welfare and environmental stewardship.

**Disadvantages:**

- Stringent organic certification requirements and potential paperwork burden.
- Organic feed costs may be higher than conventional feed.
- Limitations on certain medications and treatments can be challenging.

- iii. Aquaculture Systems:** Aquaculture involves raising aquatic organisms such as fish, shrimp and shellfish, in controlled environments. Various aquaculture systems, including pond-based, cage-based, and recirculating aquaculture systems are used for different species.

**Advantages**

- Aquaculture can produce a high amount of protein-rich seafood, contributing to global food security and nutrition.
- Many aquatic species have a high feed conversion efficiency, meaning they convert feed into body mass more efficiently than terrestrial livestock.
- Well-managed aquaculture systems can help reduce the pressure on wild fish stocks and support sustainable seafood production.
- Aquaculture allows for the production of a wide range of species and products; thereby, catering for various market demands and consumer preferences.
- Aquaculture provides employment opportunities and contributes to the economy, particularly in rural and coastal areas.

**Disadvantages**

- Poorly managed aquaculture systems can lead to environmental issues such as water pollution, habitat degradation and disease transmission.
- Some aquaculture feeds rely on wild fish stocks which can contribute to overfishing and ecological imbalance.
- Escaped farmed fish can interact with wild populations, potentially affecting genetic diversity and ecological dynamics.
- Some aquaculture practices raise social and ethical concerns, such as the treatment of farmed animals and labour conditions.
- The introduction of non-native species for aquaculture purposes can lead to the establishment of invasive species, posing risks to local ecosystems.

- iv. Integrated Livestock-Wildlife Systems (ILWS):** It involves the coexistence and interaction of domestic livestock with native wildlife in a shared environment. This approach seeks to harness the benefits of both livestock production and wildlife conservation within the same landscape.

#### Advantages

- Integrating livestock and wildlife promotes biodiversity by creating a more diverse habitat, which benefits both domestic animals and native wildlife.
- It enhances ecosystem services, such as nutrient cycling and seed dispersal, through the interaction of livestock and wildlife.
- The presence of both domestic and wild animals in the landscape can create opportunities for cultural and ecotourism experiences.
- Wildlife can utilise leftover feed and crop residues from livestock, contributing to nutrient recycling in the ecosystem.

#### Disadvantages

- Coexistence with wildlife can increase the risk of disease transmission and predation between domestic animals and wildlife, potentially affecting both populations.
- Uncontrolled grazing can lead to overgrazing and habitat degradation, impacting both livestock and wildlife populations.
- In some regions, there may be legal and regulatory challenges related to the interaction between livestock and protected wildlife species.
- The economic viability of ILWS may be challenging to achieve, particularly in regions with limited market demand for products from integrated systems.

#### Learning Tasks

1. Define management systems in animal production.
2. State the advantages and disadvantages of the major management systems for keeping farm animals in Ghana.
3. Explain other farming systems available worldwide.

#### Pedagogical Exemplars

**Experiential learning:** Learners in mixed-ability/ability groups (where applicable) embark on a visit to an animal farm on campus/nearby farm or watch videos/pictures to observe the management systems practised. Learners then discuss the management practices observed and write a report on them. All learners should take part in the visit or watch the video/pictures on management systems practised. Fast learners should lead slow learners under the guidance of the teacher in the discussion and report writing. Advance arrangements should be made for the farm visit. The farm visit should be made outside the normal classroom period at an agreed time by the teacher, learners and farm manager/attendant.

**Initiating talk for learning:** In mixed-ability/ability groups (where applicable), learners surf the Internet for the advantages and disadvantages of the types of management systems involved in farm animal production. Let some learners surf the Internet and list the advantages and disadvantages of the types of management systems. Allow others to surf the Internet and explain the advantages and disadvantages of the types of management systems. Challenge others to discuss the advantages and disadvantages of the types of management systems after surfing the Internet. Learners with no or little exposure to surfing the Internet should be supported by those familiar with the use of the Internet. The

teacher should monitor the content of what learners browse. Learners interested in leading the class for discussions should be allowed to do so.

**Think-pair-share:** Learners individually surf the internet to outline the factors involved in the choice of a suitable environment for keeping and managing farm animals. In pairs, learners present their findings in a plenary session in class. The teacher should ensure that the pictures/videos used do not reinforce gender stereotypes about animal farming. Where the material reflects traditional gender roles, teachers should identify and discuss it with the learners. All learners should be made to take part in the class discussions, especially learners with speech problems, the shy type and those with indiscernible health conditions. Allow those willing to take up leadership roles to do so.

### **Key Assessments**

**Assessment Level 1:** List the major types of animal farming systems in Ghana.

**Assessment Level 2:** Discuss two (2) advantages and two (2) disadvantages of the semi-intensive system practised in animal production.

**Assessment Level 3:** Why would you choose an intensive system over the extensive system of keeping farm animals?

**Assessment Level 4:** Why would you advise a farmer to practice organic farming in Ghana?

## WEEK 14

**Learning Indicator:** *Apply the skills in farm animal management practices for rearing animals*

### Theme or Focal Area: Skills in Farm Animal Husbandry Practices for Rearing Animals

#### 1. Tagging:

**Description:** Tagging involves attaching identification tags such as ear tags, to animals for individual identification, record-keeping and tracking purposes.

**Instruments:** Ear tags, ear tag applicator.



Ear tagging applicator



Ear tagging cutter

**Fig. 1 wk14:** *Some livestock tagging equipment*

#### 2. Debeaking:

**Description:** Debeaking is the trimming or shaping of the beaks of poultry, primarily in commercial egg-laying hens, to prevent feather-pecking and cannibalism.

**Instruments:** Electric debeaker, infrared debeaker, or hot-blade debeaker.



**Fig. 2 wk14:** *An automatic debeaker*



**Fig. 3 wk 14:** *A handheld electric debeaker*

#### 3. Dehorning/Disbudding:

**Description:** Dehorning is the removal of horns from certain livestock species to reduce the risk of injuries to animals and handlers, and minimise aggressive behaviour.

**Disbudding:** This is the arrest of the horn growth at the early stage of the animal when the horn root is in the form of a bud.

**Instruments:** Dehorning saw, dehorning guillotine and dehorning paste. Disbudding iron or dehorner, pain management/local anaesthetic, hemostatic agent powder (to stop any bleeding), restraint equipment, and an assistant to restrain the calf. Safety equipment: Personal Protective Equipment (PPE), fire extinguisher, disinfectant,



An electric dehorner



Dehorning saw

**Fig. 4 wk 14:** *Some dehorning equipment*



A hand-held disbudding iron



Local anaesthetic administration

**Fig 4a wk 14:** *Some disbudding equipment*

#### 4. Castration:

**Description:** Castration is the removal of the testicles from male animals to control breeding, improve meat quality and manage behaviour.

**Instruments:** Castration knife or scalpel and emasculator or burdizzo, rubber rings (elastator) for banding.



**Fig. 5 wk 14:** *Some castration equipment*

**5. Vaccination:**

**Description:** Vaccination involves administering vaccines to animals to protect them from specific infectious diseases.

**Instruments:** Syringes, needles, vaccine bottles and appropriate vaccination techniques.

**6. Ear notching:**

**Description:** Ear notching is a method of permanent identification used in some livestock species such as pigs, where specific notches or cuts are made in the ear tissue to represent unique identification codes.

**Instruments:** Ear notcher or ear punch.



**Fig. 6 wk. 14:** *Some ear notching equipment*

**7. Weaning:**

**Description:** Weaning is the process of gradually separating young animals from their dams or herds to encourage independent feeding and promote growth and development.

**Instruments:** No specific instruments are required; may involve separate pens or enclosures.

**8. Tail Docking:**

**Description:** Tail docking involves shortening the tail of certain livestock species, such as sheep or cattle, to improve hygiene and prevent soiling and flystrike.

**Instruments:** Docking shears or rubber rings (elastator) for banding.

**9. Teeth Clipping:**

**Description:** Teeth clipping is the trimming of sharp teeth, primarily in piglets and rodents, to prevent injuries and improve feeding.

**Instruments:** Teeth clippers or nippers.

**10. Hoof Trimming:**

**Description:** Hoof trimming involves the regular trimming of hooves in livestock to maintain proper hoof health and prevent lameness.

**Instruments:** Hoof trimmers or hoof knives.

**11. Mouthing:**

**Description:** Mouthing is the examination of teeth and oral cavities in some animal species such as cattle to estimate age.

**Instruments:** Dental speculum, rasps.

**12. Sex Reversal:**

**Description:** It involves the change of sex in fish, typically from females to males. This process results in a population with predominantly one sex which is beneficial for specific production goals such as faster growth rates and reduced competition for resources.



**Instruments: Hormones** (e.g., 17 $\alpha$ -Methyltestosterone) are commonly used to induce sex reversal in fish. The hormone is usually administered through feed or immersion.

### 13. Cannibalism Control:

**Description:** Cannibalism control involves implementing measures to prevent aggressive behaviour and the consumption of smaller or weaker animals e.g., fish by larger individuals within a population.

**Instruments:** Providing sufficient hiding places, enrichment structures, or barriers within tanks or ponds can help reduce aggressive interactions. Grading fish by size can also help minimise cannibalism.

### 14. Immuno-stimulation:

**Description:** It involves enhancing the immune response of fish to protect them against specific diseases and pathogens.

**Instruments:** Vaccines specifically developed for fish are administered through various methods, such as immersion, injection, or oral delivery.

### Learning Tasks

1. State the various animal husbandry practices.
2. Identify the tools for performing various animal husbandry practices.
3. Explain the various animal husbandry practices and the reasons for performing them.

### Pedagogical Exemplars

**Collaborative learning:** The teacher puts learners in mixed-ability/mixed-gender groups (where appropriate) to discuss the various animal husbandry practices and the tools used for performing those activities. Learners with difficulty should be assisted with leading questions that will help them identify the various animal practices. Gifted and talented learners should be challenged to give further explanations on the various animal husbandry practices.

**Experiential learning:** In mixed-ability/mixed-gender groups (where appropriate) learners perform hands-on farm practical activities, or watch videos/pictures of some of the management practices for learners to replicate them through guided interaction with a master craftsman/technician. All learners should be encouraged to take part in the hands-on farm practices especially females and learners with different forms of disabilities, ensuring the safety of the learners and the welfare of the animals. Fast learners should play leading roles. Learners write a report on the skills in the management practices of farm animals observed and present their report to the class.

### Key Assessments

**Assessment Level 1:** List three (3) animal husbandry practices.

**Assessment Level 2:** Explain three (3) husbandry practices in animal production and their advantages.

**Assessment Level 3:** Describe a step-by-step procedure for carrying out the following:

- a. Dehorning,
- b. Debeaking,
- c. Ear tagging.

**Assessment Level 4:** How would you advise a farmer to carry out weaning on his/her farm?



## Section 4 Review

Farm animals are animals typically raised or kept for various purposes such as food production, source of employment, income, companionship (pet), cultural purposes and other products or services. Farm animals are classified based on their feeding habits: ruminants (cattle, sheep and goats) and non-ruminants (pigs, chickens, turkeys, ducks, grasscutters, rabbits, guinea pigs). The factors influencing the distribution of farm animals in West Africa are climate and geography, cultural practices and tradition, economic considerations, resource availability, government policies and interventions, and environmental and disease concentration. The objectives of the general management systems of keeping farm animals include animal health and welfare, genetic improvement, resource efficiency, disease prevention and control, environmental stewardship, financial viability and compliance with the quality and safety of animal products. Management systems in animal production refer to the organised approaches and strategies used to raise and care for animals in a way that optimises productivity, animal welfare and sustainability. The major systems are extensive, semi-intensive and intensive systems. Some general animal management practices are tagging, dehorning, disbudding, debeaking, castration and vaccination.

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## SECTION 5: SOIL, FOREST AND CLIMATE CHANGE

**Strand: Food Production and Natural Resource Conservation**

**Sub-Strand:** Principles of Natural Resource Conservation in Agriculture

### Learning Outcomes:

1. *Use the knowledge acquired to manage and conserve forests.*
2. *Use the knowledge acquired to describe the nature, importance, composition and properties of soil.*
3. *Use the knowledge acquired to explain the relationship between climate change and food security.*

### Content Standards:

1. Demonstrate the knowledge and understanding of the meaning, importance and principles of forestry and forest management.
2. Demonstrate knowledge and understanding of the nature, importance, composition and properties of soil.
3. Demonstrate the knowledge and understanding of climate change to Food security.

### INTRODUCTION AND SECTION SUMMARY

Effective management and conservation of forests, along with understanding soil properties and combating climate change, are crucial components of sustainable food production and natural resource conservation, ensuring food security and environmental resilience. This section deals with the importance and principles of forestry and forest management, the composition and properties of soil and soil profile, and the effect of climate change on food production and strategies to mitigate against them. All these will be achieved through well-crafted pedagogical exemplars such as project-based learning, experiential learning, collaborative learning and fieldwork. The section has links with the study of Forestry and Geography.

#### The weeks covered by the section are:

**Week 15:** Meaning and Importance of Forestry and Forest Management, interrelations between forestry and Agriculture and agroforestry practices and systems in Agriculture.

**Week 16:** Meaning and importance of soil, the importance of soil profile in agricultural production and the physical and chemical properties of soils.

**Week 17:** Soil components and their importance.

**Week 18:** Meaning and effects of climate change on food production and their mitigating strategies.

### SUMMARY OF PEDAGOGICAL EXEMPLARS

The teacher should employ different pedagogies such as initiating talk for learning, think-pair-share, structuring talk for learning, experiential learning, collaborative learning and project-based learning in teaching this section. These strategies should be used in mixed-ability, ability, gender-based (where appropriate) and mixed-gender groupings, in pairs and individual learning. The teacher should identify a forest or a farm that practices agro-forestry where learners can embark on a field visit to

have a first-hand experience of agro-forestry practices and systems for sustainable Agriculture. The teacher should assist learners who find difficulties in undertaking any of the activities in the form of guiding and leading questions, and provision of internet resources, pictures and other materials. Learners who are capable of providing more detailed information should be encouraged. Teachers should ensure that the videos/pictures used do not reinforce stereotyping about the forest. Where the material reflects traditional gender roles and other forms of stereotypes, the teacher should identify and discuss it with the learners. Learners who have hearing and sight challenges should be well positioned during the picture/video watching. Learners who have phobias about forest surroundings should be counselled before the nature walk.

### **ASSESSMENT SUMMARY**

The teacher should assign tasks to cover the meaning and importance of forestry and forest management, principles of forestry and forest management in Agriculture, and concepts and importance of the interrelations between forestry and Agriculture. The tasks should also cover the meaning and nature of soil, the meaning of soil profile and its importance in agricultural production, the physical and chemical properties of soils and their importance and how they can be determined in the field and the meaning and effects of climate change on food production and their mitigating strategies.

This should be done through group discussions, presentations, homework, class exercises, class tests and project-based work. The teacher should accept varying numbers of oral and written responses. He/she should develop rubrics to score group presentations and project works.

**WEEK 15****Learning Indicators:**

1. *Explain the meaning, importance and principles of forestry and forest management.*
2. *Discuss the concepts and the importance of the interrelations between forestry and Agriculture.*
3. *Discuss agroforestry practices and systems in forest management.*

**Theme or Focal Area: Meaning and Importance of Forestry and Forest Management****1. Meaning of Forestry**

Forestry is the science, art, and practice of managing forests and woodlands to achieve various objectives, including conservation, sustainable timber production, biodiversity preservation and the provision of ecosystem services. It involves the planning, implementation and monitoring of activities aimed at maintaining and enhancing the health, diversity and productivity of forest ecosystems.

**2. Meaning of Forest Management**

Forest management is the process of planning and implementing practices to achieve specific objectives in forested areas. It involves making informed decisions about the use, conservation and restoration of forests to optimise their productivity and ecological integrity. The primary goal of forest management is to balance the sustainable utilisation of forest resources with the protection of forest ecosystems and the provision of ecosystem services.

**3. Importance of Forestry and Forest Management:**

- a. **Environmental Conservation:** Forests play a vital role in maintaining biodiversity, supporting various plant and animal species, and providing habitat for wildlife. Forest management helps protect these ecosystems and preserves critical biodiversity.
- b. **Carbon Sequestration and Climate Change Mitigation:** Forests act as significant carbon sinks, absorbing carbon dioxide from the atmosphere and mitigating climate change. Proper forest management can enhance carbon sequestration and contribute to global climate change mitigation efforts.
- c. **Sustainable Timber Production:** Forest management ensures that timber is harvested sustainably, balancing the demand for wood products with the need to maintain forest health and productivity.
- d. **Water Regulation:** Forests regulate water flow, improve water quality, and reduce the risk of floods and droughts. Well-managed forests help maintain a stable water supply for both human use and ecosystems.
- e. **Recreation and Tourism:** Forests provide recreational opportunities such as hiking, camping, and wildlife observation, contributing to the well-being of communities and supporting tourism industries.
- f. **Cultural and Traditional Values:** Forests hold cultural significance for many communities, and forest management can help preserve cultural heritage and traditional practices.
- g. **Economic Development:** Forestry supports local economies by providing jobs, income from timber sales, and other forest-based products and services.
- h. **Erosion Control and Soil Protection:** Forests help prevent soil erosion and protect watersheds, ensuring the long-term sustainability of agricultural lands and maintaining soil fertility.

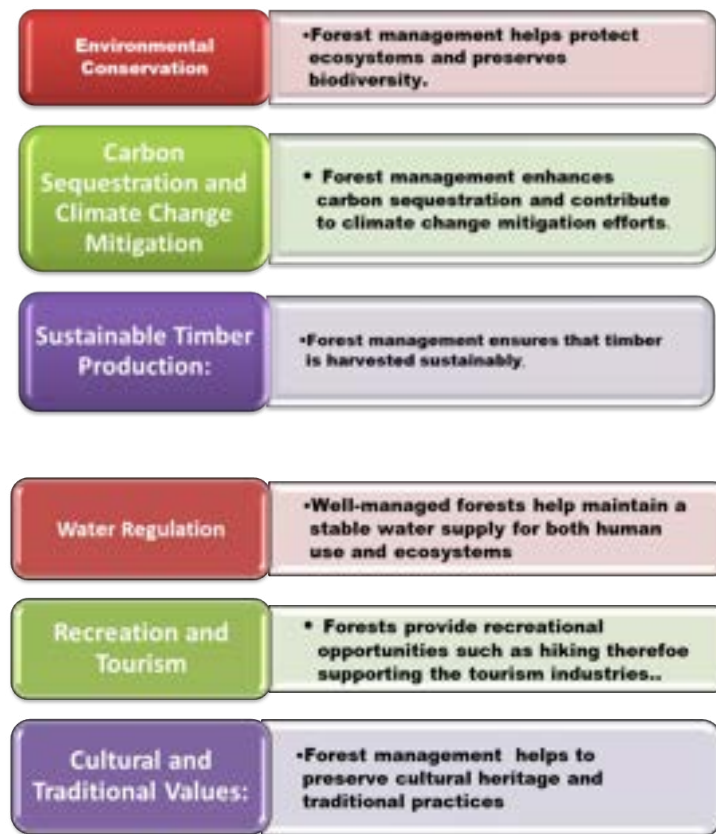


Fig.1 wk15: Importance of forestry and forest management

#### 4. Principles of forestry and forest management in Agriculture

The principles of forestry and forest management in Agriculture revolve around sustainable practices that balance environmental, social and economic aspects to ensure the long-term health and productivity of forest ecosystems. Here are some key principles:

- a. **Sustainable Forest Management:** Ensuring that forest resources are used in a way that meets current needs without compromising the ability of future generations to meet their own needs. It involves maintaining the health and productivity of forests through responsible harvesting, reforestation, and conservation practices.
- b. **Biodiversity Conservation:** Preserving the diversity of plant and animal species within forest ecosystems to maintain ecological balance and support the various functions and services that forests provide.
- c. **Ecosystem Approach:** Managing forests as integrated and complex ecosystems, considering the interactions between living organisms, non-living components, and human activities to achieve sustainable outcomes.
- d. **Community Engagement and Participation:** Involving local communities and stakeholders in forest management decisions, recognising their traditional knowledge and ensuring their livelihoods are considered in planning and implementation.
- e. **Adaptive Management:** Continuously monitoring and evaluating forest conditions and management practices, and adjusting strategies as needed based on new information and changing circumstances.
- f. **Conservation of Forest Soils:** Protecting Forest soils from degradation and erosion through responsible management practices which are crucial for maintaining water quality and supporting plant growth.
- g. **Fire Management:** Implementing measures to prevent and control wildfires, as well as using controlled burns as part of forest management strategies to maintain ecosystem health.

- h. **Timber Harvesting and Regeneration:** Conducting timber harvesting in a way that promotes natural regeneration and minimises the impact on forest ecosystems.
- i. **Forest Certification:** Seeking third-party certification to ensure that forest management practices meet recognised sustainability standards and criteria.

### Learning Tasks

1. Differentiate between forest and forest management.
2. Discuss the importance of forest and forest management.
3. Discuss the sustainable agricultural practices that ensure the long-term health and productivity of the forest ecosystems.

### Pedagogical Exemplars

**Managing Talk for learning:** Learners in pairs brainstorm to come up with the meaning of forestry and forest management in Agriculture. Provide leading questions to guide learners with difficulties in coming up with the definitions for forestry and forest management. Allow exceptional learners to give detailed explanations of the terms forestry and forest management.

**Experiential learning:** In mixed-ability groups, learners visit a nearby forest/watch a video/picture of a forest and discuss the importance of forestry and forest management in Agriculture. Learners present a report on their observations during the visit to the forest.

All learners should be encouraged to take part in the report writing however, some learners should take lead roles in the report writing.

**Think-pair-share:** In pairs, learners discuss the principles of forestry and forest management in Agriculture and present their thoughts to the whole class. Ensure that the learners who form the pair are not at the same level in terms of their proficiency. Assist learners with challenges with leading questions to come up with the principles of forestry and forest management in Agriculture.

### Key Assessments

**Assessment Level 1:** Define the following terms i. Forest ii. Forest management

**Assessment Level 2:** Discuss at least three (3) importance of forest and forest management in Agriculture.

**Assessment Level 3:** Describe at least three (3) sustainable practices that ensure the long-term productivity of the forest ecosystem.

**Assessment Level 4:** Write a report on the importance of forestry and forest management based on observations made during the visit to a nearby forest or a video watched on a forest.



## Theme or Focal Area: **Concepts and Importance of the Interrelations between Forestry and Agriculture**

### 1. **Concepts and importance of the interrelations between forestry and Agriculture**

The interrelations between forestry and Agriculture refer to the close and dynamic relationships that exist between forestry and Agriculture in terms of land use. Forestry and Agriculture are interconnected and often coexist in landscapes, influencing each other through various interactions and shared benefits. Understanding these interrelations is essential for sustainable land-use planning, resource management and achieving broader environmental and socio-economic goals.

Here are some key concepts of their interrelations:

- a. **Land Use and Landscape Integration:** Agricultural and forested areas are frequently integrated into landscapes, creating mosaic patterns of land use. The proximity of Agriculture to forests can lead to increased biodiversity, microclimate regulation, and soil conservation in agricultural areas. Similarly, forests benefit from ecological interactions with Agricultural lands such as pollinator movement and soil nutrient cycling.
- b. **Agroforestry:** Agroforestry is a prime example of the interdependence of Agriculture and forestry. It involves intentionally integrating trees with crops and/or livestock on the same piece of land. Agroforestry systems can enhance agricultural productivity through improved soil fertility, microclimate regulation and pest control provided by the trees. At the same time, the crops and livestock contribute to the livelihoods and income of farmers.
- c. **Water Resource Management:** Forests play a crucial role in regulating water flow and quality in watersheds. Well-managed forests act as natural sponges, storing and gradually releasing water which benefits Agriculture by ensuring a stable water supply for irrigation and other uses.
- d. **Biodiversity and Ecosystem Services:** Forests are vital reservoirs of biodiversity and provide various ecosystem services that support Agriculture such as pollination, pest regulation and soil protection. Maintaining or restoring forest ecosystems can enhance these services and benefit agricultural productivity.
- e. **Climate Change Mitigation and Adaptation:** Forests sequester carbon dioxide from the atmosphere, helping to mitigate climate change. Integrating trees into agricultural landscapes or implementing agroforestry practices can contribute to carbon sequestration and climate change adaptation.
- f. **Livestock Grazing in Forests:** In some regions, livestock grazing is practised in forested areas. Sustainable grazing management can promote biodiversity conservation, and soil protection, and enhance livestock productivity.
- g. **Forest Fuelwood and Agro-residue Use:** Forests can provide a source of fuelwood for cooking and heating, reducing pressure on agricultural resources. Agro-residues from crop production can also be used as biomass for energy generation.
- h. **Economic and Social Benefits:** Both Agriculture and forestry contribute significantly to local and national economies, generating employment, income and economic development. Many rural communities rely on both sectors for their livelihoods and social well-being.



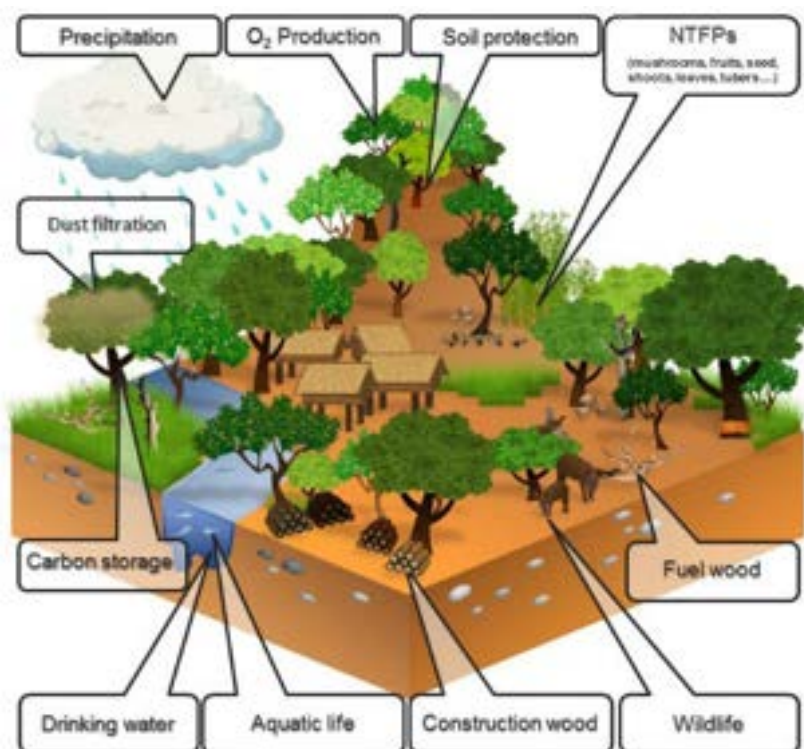


Fig. 2 wk15: *Interrelationship between Agriculture and forestry*

### Learning Tasks

1. State the interdependences between Agriculture and forestry
2. Explain the interdependences between Agriculture and forestry.
3. Prepare a diagram to show the interdependence between Agriculture and forestry

### Pedagogical Exemplars

**Talk for learning:** In mixed ability groups, surf the internet to come up with interdependence of Agriculture and forestry. Provide support for learners who have challenges with websites and links to come up with the interdependence between Agriculture and industry. Encourage talented learners to explain the interdependence between Agriculture and forestry. Ensure that learners do not switch to other sites which are not related to the topic.

**Project-based learning:** In mixed-gender groups (where applicable) learners prepare a diagram to show the interdependence of Agriculture and forestry and present their results. Ensure that all learners participate in the group activity. Groups with difficulties in preparing the diagram should be assisted with guiding questions. Learners should be encouraged to elect their group leaders.

### Key Assessments

**Assessment Level 1:** State at least three (3) interrelationships between Agriculture and forestry.

**Assessment Level 2:** Discuss at least three (3) ways that Agriculture depends on the forest.

**Assessment Level 3:** How does Agriculture ensure sustainable management of the forest?

**Assessment Level 4:** Prepare a diagram to illustrate the interdependence between Agriculture and forestry.

## Theme or Focal Area: **Discuss Agroforestry Practices and Systems in Forest Management**

### 1. Definition of Agroforestry

Agroforestry is a land-use system that integrates the growing of trees with crops and/or livestock on the same piece of land. It involves the deliberate planting and management of trees alongside Agricultural activities to optimise productivity and enhance ecological resilience.

### 2. Practices and systems in forest management

Here are some common agroforestry practices and systems in forest management:

- a. **Alley Cropping (Agrisilviculture):** Alley cropping involves the planting of trees or shrubs at regular intervals in rows within an agricultural field. Crops are then grown in the spaces between the tree rows. This system provides shade, reduces wind erosion, improves soil fertility through nutrient cycling, and provides timber or other tree products.
- b. **Silvopasture:** It is the combination of tree planting with livestock grazing. Trees are spaced to allow for grazing underneath, providing shade and forage for livestock. Silvopastoral systems enhance livestock productivity, improve soil quality, and sequester carbon.
- c. **Windbreaks:** Windbreaks consist of trees or shrubs planted along the edges of fields or farms to reduce wind speed and protect crops and livestock. They act as physical barriers, preventing wind erosion and reducing stress on plants and animals.
- d. **Agroforestry Gardens:** Home gardens are multi-layered agroforestry systems found around households. They typically include fruit trees, timber trees, vegetables, and medicinal plants. Home gardens provide diverse food sources, support biodiversity, and contribute to household nutrition and income.
- e. **Taungya System:** The Taungya system involves the temporary association of crops with tree planting. Farmers cultivate annual crops between newly planted tree seedlings to make productive use of land during the early establishment of the trees. Once the trees mature, the agricultural component is gradually phased out.
- f. **Forest Gardens (Food Forests):** Forest gardens mimic natural forests by combining food-producing trees, shrubs, and herbs in layered arrangements. These systems are designed to be self-sustaining, providing food, fuel, and other resources while supporting biodiversity.
- g. **Community Forest Management:** Community forest management involves collaborative efforts by local communities to manage and utilise forest resources sustainably. Agroforestry practices such as fruit tree plantations, can be integrated into community-managed forests to diversify income sources and enhance ecosystem services.
- h. **Forest Farming:** Forest farming refers to the cultivation of non-timber forest products (NTFPs) under the canopy of existing forests or agroforestry systems. Examples include cultivating mushrooms, medicinal herbs, or fruits in the understory of a forest.
- i. **Fodder and Protein Banks:** Planting trees that provide fodder and protein-rich leaves for livestock grazing, enhancing animal nutrition.
- j. **Shelterwoods and Woodland Grazing:** Utilising forests or woodlands for livestock grazing while maintaining the forest canopy for shade and ecosystem benefits.
- k. **Woody Hedgerows:** Planting rows of trees or shrubs along agricultural fields as living fences or windbreaks to protect crops and provide additional resources.
- l. **Apiculture:** Introducing beekeeping in agroforestry systems to enhance pollination and honey production.
- m. **Multipurpose Woodlots:** Establishing small woodlots with multiple tree species for various purposes such as fuelwood, timber, fruit, and fodder.



**Fig. 3 wk15:** *Some agroforestry practices*

### Learning Tasks

1. State at least two (2) agroforestry practices in Agriculture.
2. Describe at least two (2) agroforestry practices in Agriculture.
3. Make a presentation on the agroforestry practices in Agriculture in your community.

### Pedagogical Exemplars

**Experiential learning:** Learners in mixed-ability groups take a nature walk to an agro-forestry site in their community/watch a video/picture recording on agro-forestry systems and describe the various agroforestry practices and systems in forestry management for sustainable Agriculture. In the same mixed-ability groups, learners present their reports in a plenary session for feedback. Encourage all learners to take an active role in the report writing. Ensure that all learners put on protective gear e.g., wellington boots before embarking on the nature walk. Learners with sight challenges should be seated near the TV screen during the video watching.

## Key Assessments

**Assessment Level 1:** State two (2) agro-forestry systems and practices for sustainable Agriculture.

**Assessment Level 2:** Describe two (2) agro-forestry systems and practices for sustainable Agriculture and give their importance

**Assessment Level 3:** Explain how agro-forestry systems and practices ensure sustainable Agriculture.

**Assessment Level 4:** Present a report on the different types of agroforestry practices in Agriculture based on the visit to the agroforestry site or a video/picture on agroforestry practices watched.

**WEEK 16****Learning Indicators:**

1. *Explain the meaning, importance and nature of soil.*
2. *Describe the physical and chemical properties of soils and their importance.*

**Theme or Focal Area: Meaning and Nature of Soil****1. Meaning of Soil**

Soil is a critical natural resource and the foundation of Agriculture. It is the upper layer of the earth's crust, consisting of mineral particles, organic matter, water, air and living organisms. Soil provides a medium for plant growth and serves as a reservoir for nutrients and water essential for supporting crops. The quality and health of the soil directly impact agricultural productivity and sustainable food production.

**2. Importance of Soil in Agricultural Production**

- a. **Nutrient Supply:** Soil is the primary source of essential nutrients for plant growth. It stores and releases nutrients such as nitrogen, phosphorus, potassium, and micronutrients which are vital for the development of healthy crops.
- b. **Water Retention:** Soil acts as a reservoir, holding water for plant roots to access during dry periods. Proper water retention ensures continuous plant growth and helps withstand drought conditions.
- c. **Root Anchorage:** Soil provides a stable medium for plant roots to anchor and support plants. Strong root systems enhance plant stability and allow efficient nutrient uptake.
- d. **Aeration and Gas Exchange:** Soil pores allow air to reach plant roots, facilitating oxygen uptake and carbon dioxide release during respiration. Adequate aeration is essential for root health and overall plant growth.
- e. **Soil Buffering:** Soil acts as a buffer against extreme pH changes, helping maintain a stable and suitable environment for plant roots and microorganisms.
- f. **Biological Support:** Soil is teeming with diverse microorganisms such as bacteria, fungi, and earthworms that play crucial roles in nutrient cycling, organic matter decomposition, and promoting soil health.
- g. **Organic Matter Decomposition:** Soil facilitates the breakdown of organic matter such as plant residues and animal waste, into simpler nutrients that can be absorbed by plants.
- h. **Habitat for Beneficial Organisms:** Soil provides habitat and refuge for beneficial organisms such as pollinators and predators that support plant growth and protect against pests.
- i. **Carbon Storage:** Soil is a significant carbon sink, sequestering carbon dioxide from the atmosphere. Healthy soils with high organic matter content contribute to climate change mitigation.
- j. **Filtration and Purification:** Soil acts as a natural filter, removing pollutants and impurities from water as it percolates through the soil profile.
- k. **Seedbed for Germination:** Soil provides a suitable seedbed for germination, offering the necessary conditions of moisture, temperature, and nutrients for seeds to sprout and develop into seedlings.





Fig. 1 wk16: Some importance of soil in Agriculture

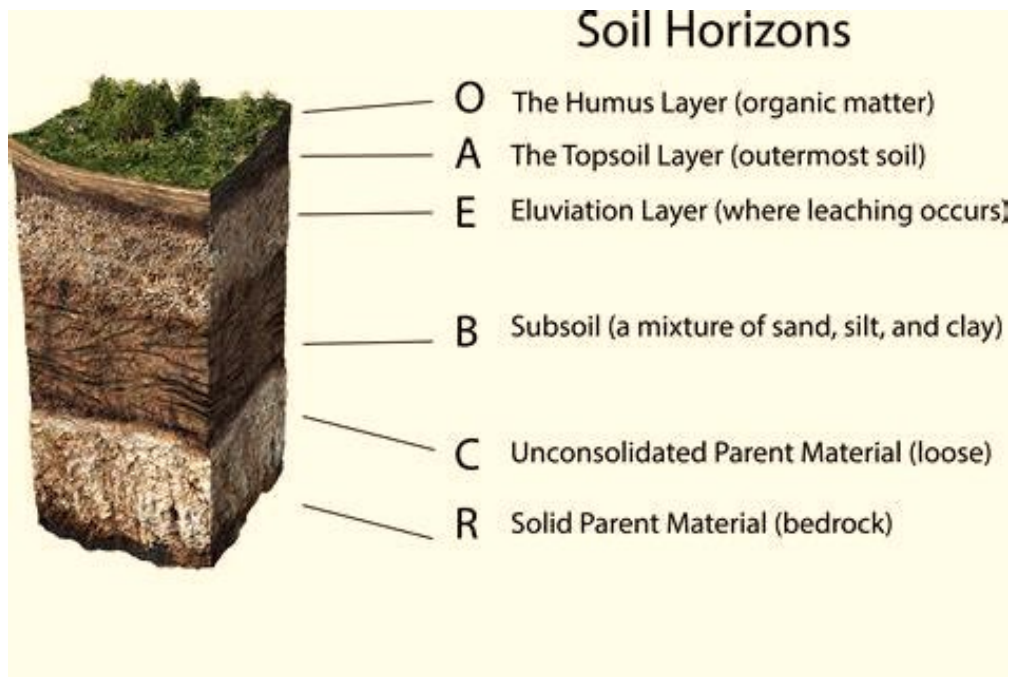
### 3. Meaning of Soil Profile

It is a vertical section of the soil that extends from the surface to the parent material or bedrock below. It represents a cross-section of the various layers or “horizons” that make up the soil, each exhibiting distinct properties, composition, and characteristics.

A typical soil profile consists of several layers or horizons, each denoted by a letter symbol:

- a. **O Horizon (Organic Layer):** This topmost layer consists of decomposed organic matter (humus) like leaves, twigs, and plant residues. It is the layer where humus is concentrated and plays a crucial role in nutrient cycling.
- b. **A Horizon (Topsoil):** The A horizon is a mixture of mineral particles, organic matter, and microorganisms. It is the primary layer for plant growth and contains most of the soil’s nutrient content.
- c. **E Horizon (Eluviation Layer):** This horizon may be present in some soils, and it is characterised by the leaching (seepage) or removal of clay, iron, and other minerals from the A horizon to lower layers.
- d. **B Horizon (Subsoil):** The B horizon is often referred to as the subsoil and contains accumulated materials leached from the A horizon. It may have different characteristics from the topsoil.
- e. **C Horizon (Parent Material):** The C horizon is the layer where weathered parent material or bedrock is found. It forms the basis for the development of upper horizons.
- f. **R Horizon (Bedrock):** The R horizon is the unweathered bedrock or consolidated rock that lies beneath the soil horizons.





**Fig. 2 wk16:** Soil profile showing the various layers/horizons

#### 4. Importance of Soil Profile in Agriculture Production:

- a. **Soil Fertility Assessment:** By studying the soil profile, farmers and soil scientists can assess the fertility and nutrient status of the soil. This information guides the application of fertilisers and amendments to optimise crop productivity.
- b. **Drainage and Water Management:** Soil profiles help identify soil layers with different drainage characteristics, enabling farmers to adopt appropriate irrigation and water management practices.
- c. **Crop Suitability and Varietal Selection:** Different soil horizons may influence crop suitability and adaptation. Understanding the soil profile aids in selecting suitable crop varieties for specific areas.
- d. **Nutrient Management:** The soil profile provides insight into nutrient availability and nutrient-holding capacity, allowing farmers to tailor nutrient management practices accordingly.
- e. **Soil Erosion Control:** Knowledge of the soil profile helps in adopting erosion control measures that protect the topsoil, prevent soil degradation, and maintain soil productivity.
- f. **Soil Health Assessment:** Soil profiles contribute to assessing soil health, including factors such as soil structure, organic matter content, and biological activity.
- g. **Soil Classification and Land Use Planning:** Soil profiles aid in classifying soils and formulating land use plans, matching land use practices with soil capabilities.

#### Learning Tasks

1. Explain the function of soil in Agriculture.
2. Discuss the various stratifications of the soil profile.
3. Discuss the importance of soil profile in Agricultural production.

## Pedagogical Exemplars

**Managing Talk for Learning:** Brainstorm learners to come up with the meaning of soil. Assist learners with difficulty with leading questions to come up with the definition of soil in Agriculture production. Allow learners who are capable of coming up with detailed explanations of the meaning of soil in Agricultural production.

**Collaborative learning:** Learners in ability groups discuss the functions of soil in Agricultural production. Assist groups with challenges with other materials to come up with the importance of soil in Agricultural production. Capable learners should be encouraged to provide detailed explanations of their ideas.

**Experiential learning:** Learners in mixed-gender groups dig a pit of about 1m x 1m x 2m to discuss the various stratifications of the soil profile. All learners should be encouraged to take active parts in digging the pit and observing the soil profile. Assist learners with difficulties with guiding questions to identify the soil profile stratifications.

**Managing Talk for Learning:** Learners in the ability groups discuss the importance of soil profile in Agricultural production. learners with difficulties should be assisted with guiding questions and other materials to help them come up with the importance of soil profile in Agricultural production. Capable learners should be encouraged to provide information on the importance of soil profile in Agricultural production.

**Experiential learning:** In mixed gender/ability groups (where appropriate) learners create a chart of the soil profile of their pit and label the layers.

Encourage all learners to take part in the practical activity of creating the chart. Encourage learners to elect Group leaders to coordinate the activities.

## Key Assessments

**Assessment Level 1:** State at least three (3) importance of soil in Agriculture production.

**Assessment Level 2:** Explain at least three (3) horizons in a soil profile.

**Assessment Level 3:** Draw and label the soil profile of the soil in your school farm. Indicating the various horizons/layers and their importance in Agriculture.

**Assessment Level 4:** Why is it important for a farmer to know the profile of his/her soil before cultivation? Discuss at least three (3).

## Theme or Focal Area: Describe the Physical and Chemical Properties of Soils and Their Importance

### 1. Physical Properties of Soils:

- a. **Texture:** Soil texture refers to the relative proportions of sand, silt, and clay particles in the soil. It influences soil structure, water-holding capacity, drainage and aeration. Sandy soils have larger particles, allowing for good drainage but have lower water-holding capacity. Clay soils have smaller particles, retaining more water but may have poor drainage.
- b. **Structure:** Soil structure refers to the arrangement of soil particles into aggregates or crumbs. Soil with good structure has well-defined aggregates, providing space for air and water movement. Proper soil structure promotes root penetration and supports plant growth.
- c. **Porosity:** Porosity is the percentage of pore spaces or voids in the soil. It influences water infiltration and storage, as well as air circulation in the soil. High porosity allows water and air movement, benefiting root health.

- d. **Bulk Density:** Bulk density is the mass of dry soil per unit volume, indicating soil compaction. Lower bulk density allows for better root penetration and water infiltration, while higher bulk density can limit root growth and water movement
- e. **Water-Holding Capacity:** Water-holding capacity refers to the ability of soil to retain water after excess water drains away. Soils with high water-holding capacity can support plants during dry periods.

## 2. Chemical Properties of Soils:

- a. **pH:** Soil pH is a measure of soil acidity or alkalinity on a scale from 0 to 14, with 7 being neutral.
- b. **Cation Exchange Capacity (CEC):** CEC is the soil's ability to retain and exchange cations (positively charged ions such as calcium, potassium, magnesium, and others).
- c. **Organic Matter Content:** It is the proportion of organic materials present in the soil matrix. It includes various types of decomposed plant and animal residues, such as dead leaves, roots, crop residues and microbial biomass.
- d. **Nutrient Content:** Soils contain essential nutrients such as nitrogen (N), phosphorus (P), potassium (K), and micronutrients (e.g., iron, zinc) which are required for plant growth.
- e. **Cation Ratios:** It refers to the relative proportions of different positively charged ions or cations, present in the soil. These cations include calcium ( $\text{Ca}^{2+}$ ), magnesium ( $\text{Mg}^{2+}$ ), potassium ( $\text{K}^+$ ), sodium ( $\text{Na}^+$ ), hydrogen ( $\text{H}^+$ ), and others.

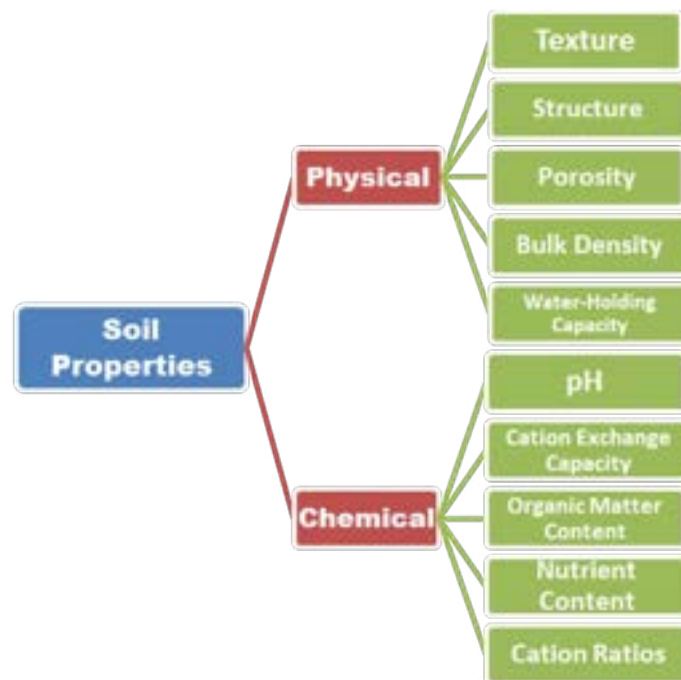


Fig. 3 wk16: *Physical and chemical properties of soil.*

## 3. Importance of Physical and Chemical Properties of Soils:

- a. **Optimising Crop Productivity:** Understanding soil physical and chemical properties helps optimise soil management practices, leading to improved crop productivity and higher yields.
- b. **Water Management:** Knowledge of soil texture and porosity assists in efficient water management practices, preventing waterlogging and drought stress.
- c. **Nutrient Management:** Soil nutrient content and pH data guide appropriate fertiliser strategies to meet plant nutrient requirements.
- d. **Soil Health Assessment:** Physical and chemical properties provide insights into soil health, helping to assess its overall condition and identify potential limitations for plant growth.

- e. **Land Use Planning:** Soil properties influence land use decisions, such as crop selection, irrigation requirements, and conservation practices.
- f. **Sustainable Agriculture:** Understanding soil properties is essential for implementing sustainable agricultural practices that protect soil health and promote long-term soil fertility.

#### 4. Determination of Basic Soil Chemical and Physical Properties on the field:

The determination of soil chemical and physical properties involves various laboratory and field-based methods. Some basic chemical and physical properties can easily be done by the farmer on the field. For more accurate soil analysis, the farmer should consult the extension officers for assistance. Below are some common techniques used to determine some soil properties:

- a. **Soil pH: Method:** The soil pH can be determined by using a litmus paper, soils that turn blue litmus to red or maintain the red colour are acidic and soils which turn red litmus blue or maintain their blue colour are alkaline.
- b. **Organic Matter Content:** Visual assessment of soil colour and texture can provide some indication of organic matter content. Soils high in organic matter tend to be darker in colour and have a crumbly texture with a granular structure.
- c. **Soil Structure: Method:** Soil structure can be assessed in the field by carefully digging a soil pit or using a soil auger to extract a soil core. The soil profile is observed and described, noting the size and shape of aggregates, their distinctness and the presence of any layers or horizons. Common terms used to describe soil structure include granular, blocky, prismatic, platy, and columnar.
- c. **Soil Texture:** In the field, wet soils can be felt between the fingers to determine the soil texture. Soils that feel gritty and have large, coarse particles are sandy, sticky soils with small, fine particles are clay and soils that feel smooth, soapy and/or powdery with medium-sized particles are silt. By observing these characteristics, farmers can estimate the relative proportions of sand, silt, and clay in their soil and use the soil textural triangle to determine the type of soil.
- e. **Porosity: Method:** The soil porosity can also be inferred based on the different soil textures. Sandy soils are highly porous, while silt is moderately porous with clay being less porous.
- f. **Water-Holding Capacity:** Water-holding capacity of the soil can also be assessed based on the soil texture. Soils with higher clay and organic matter content tend to have greater water-holding capacity compared with sandy soils.



Fig. 4 wk16: Soil textural triangle

## 5. Organisations that Provide Soil Analysis Support for Farmers

Although farmers can determine some of the soil properties on their own, it is important to seek professional services for accuracy. The following organisations can assist farmers with the process of determining the physical and chemical properties of soil in Ghana;

- a. **Research institutions** such as Soil Research Institute (SRI) in Kwadaso in the Ashanti Region and Crop Research Institute (CRI) in Fumesua of Council for Scientific and Industrial Research (CSIR).
- b. **Agricultural Extension Services:** The Ministry of Food and Agriculture (MoFA) in Ghana provides agricultural extension services to farmers across the country. Farmers can contact their local MoFA office for assistance with soil testing and accessing soil management information.
- c. **University Agricultural Research Stations:** Several universities in Ghana have agricultural research stations and departments that conduct research on soil science and Agriculture.
- d. **Private Soil Testing Laboratories:** There are also private soil testing laboratories in Ghana that offer soil analysis services to farmers for a fee. Example SGS Ghana Limited in Accra.
- e. **Non-Governmental Organisations (NGOs):** Some NGOs working in Agriculture and rural development in Ghana may also provide soil testing services and technical assistance to farmers as part of their agricultural extension programmes.

### Learning Tasks

1. State the physical and chemical properties of soils.
2. Discuss the importance of the physical and chemical properties of soils in Agricultural production.
3. Describe how the chemical and physical properties (soil pH, organic matter content, soil structure, soil texture, porosity, water-holding capacity) of garden soils can be determined on the field by a farmer.

### Pedagogical Exemplars

**Think-pair-share:** Learners in pairs brainstorm to come up with the physical and chemical properties of soils and share their thoughts with the whole class. Examples: (soil texture, soil structure, soil water, soil pH, etc.). Assist learners with difficulties with leading questions to come up with the chemical and physical properties of soil. learners who are capable of giving more examples should be encouraged.

**Project-based learning:** Learners in mixed-ability groups, determine some physical and chemical properties (soil texture, soil structure, pH, porosity etc.) of the soil at different locations of the school garden. Learners then present their reports in a plenary session in class. Encourage all learners to take part in the determination of the chemical and physical properties of the soil in the school garden and the preparation of the presentation. Encourage capable learners to assist their group members in undertaking the activity and also in report writing and presentation.

## Key Assessments

**Assessment Level 1:** State at least 3 (three) physical and chemical properties of each of the soil.

**Assessment Level 2:** Discuss the importance of at least three (3) physical and chemical properties of soil in Agricultural production.

**Assessment Level 3:** Compare the characteristics of clay, sand and silt soils based on the following properties: a. Particle size b. water holding ability c. porosity d. texture

**Assessment Level 4:** Present a report on the chemical and physical properties of the soil samples at the school farm that were determined.



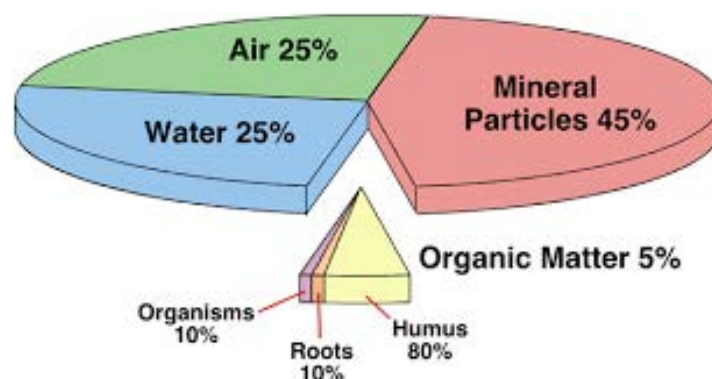
**WEEK 17**

**Learning Indicator:** *Discuss the composition of soil*

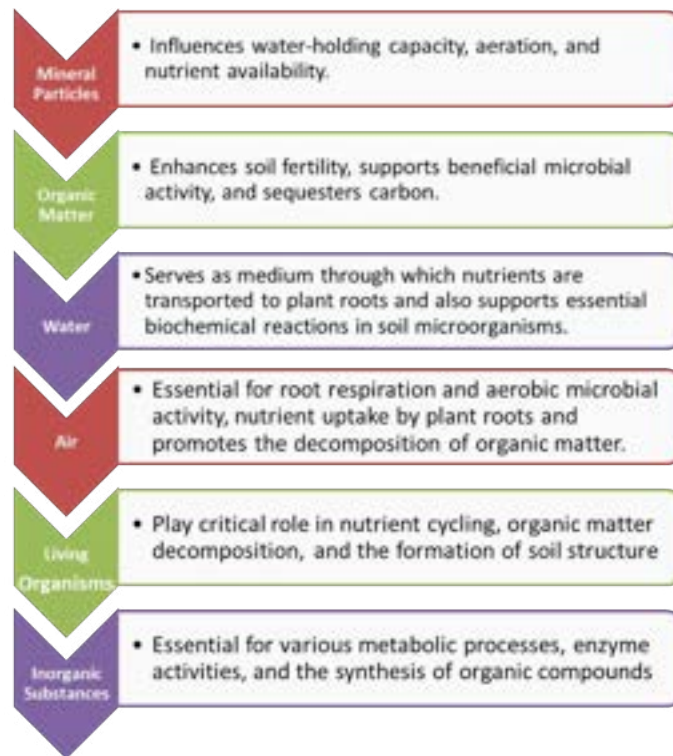
**Theme or Focal Area: Examine and Discuss the Composition of Soil and their Importance**

**1. Soil components and their importance**

- a. **Mineral Particles:** These are the inorganic components of soil, mainly derived from the weathering of rocks. The three primary mineral particle sizes are sand, silt, and clay, collectively referred to as soil texture. **Importance:** Soil texture influences water-holding capacity, aeration, and nutrient availability.
- b. **Organic Matter:** Organic matter includes the remains of dead plants, animals, and microorganisms in various stages of decomposition. It is often referred to as humus when fully decomposed. **Importance:** It enhances soil fertility, supports beneficial microbial activity and sequesters carbon, contributing to climate change mitigation.
- c. **Water:** Water is essential for soil life and plant growth. It occupies the pore spaces between soil particles and can be present in different forms, such as gravitational water, capillary water, and hygroscopic water. **Importance:** Water is the medium through which nutrients are transported to plant roots. It supports essential biochemical reactions in soil microorganisms. Adequate soil moisture is vital for seed germination, plant growth, and overall agricultural productivity.
- d. **Air:** Air fills the pore spaces between soil particles, coexisting with water. **Importance:** Soil air is essential for root respiration and aerobic microbial activity. It facilitates nutrient uptake by plant roots and promotes the decomposition of organic matter.
- e. **Living Organisms:** Soil is teeming with diverse living organisms, including bacteria, fungi, nematodes, earthworms, insects and other microorganisms. **Importance:** They improve soil fertility, suppress plant diseases and enhance soil health through symbiotic relationships with plants.
- f. **Inorganic Substances:** Inorganic substances in soil include various ions such as calcium (Ca), potassium (K), magnesium (Mg), phosphorus (P), and trace elements (e.g., iron, zinc). **Importance:** Inorganic substances are essential nutrients for plant growth and development. They are crucial for various metabolic processes, enzyme activities, and the synthesis of organic compounds.



**Fig. 1 wk17:** *Composition of soil*



**Fig. 2 wk17:** *Soil compositions and their importance*

### Learning Tasks

1. List the composition of soil.
2. Describe the compositions of soil.
3. Describe the importance of the compositions of soil in Agricultural production.

### Pedagogical Exemplars

**Think-Pair-Share:** Learners examine soil samples provided and share their thoughts with their peers on the composition of the soil. Examples (moisture, organic matter, particles, organisms, etc.). Encourage all learners to examine the soil samples and share their thoughts. Learners having difficulties should be guided with leading questions to come up with the composition of soil and share. Learners who are capable of giving more details on the composition of soil should be encouraged.

**Talk for learning:** Learners in ability groups discuss the importance of the various components of soil in Agricultural production. Groups facing difficulties should be assisted with guiding questions and other materials to assist them in the activity. Groups that can come up with more detailed information should be encouraged.

**Experiential learning:** Learners in ability groups identify the compositions of soil samples from various positions of the school farm. Learners then write and present their reports in class for assessment. All learners should be encouraged to take an active role in the activity. Group members should be encouraged to elect group leaders who will coordinate their work.

### Key Assessments

**Assessment Level 1:** List at least three (3) components of a garden soil.

**Assessment Level 2:** Discuss at least three (3) importance of the composition of soil in Agricultural production.

**Assessment Level 3:** Analyse the composition of a given soil sample.

**Assessment Level 4:** Present a report on the composition of soil samples from different positions on the school garden/farm.

**WEEK 18****Learning Indicators:**

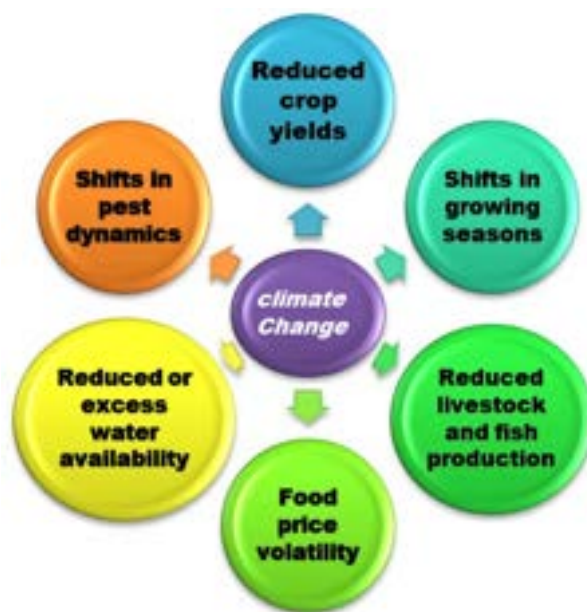
1. *Explain the meaning and effects of climate change on food production.*
2. *Discuss the effects of climate change on food production and the mitigating strategies*

**Theme or Focal Area: Meaning and Effects of Climate Change on Food Production and their Mitigating Strategies****1. Meaning of climate change**

Climate change refers to long-term shifts and alterations in weather patterns and average conditions of temperature, precipitation, wind patterns, ecosystem disruptions and other aspects of the Earth's climate system. It is primarily driven by human activities, specifically the release of greenhouse gases (GHGs) into the atmosphere, which trap heat and lead to global warming. The release of GHGs, primarily carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O), from human activities such as burning fossil fuels, deforestation, industrial processes, and intensive agricultural practices has significantly increased atmospheric concentrations of these gases. This increase in GHGs leads to the greenhouse effect, trapping heat in the Earth's atmosphere and causing global temperatures to rise.

**2. Effects of climate change on food production**

- a. **Crop Yields:** Changes in temperature, precipitation patterns and extreme weather events can adversely affect crop yields. Heatwaves, droughts, floods, and storms can damage crops, reduce their productivity, and lead to crop failures. Additionally, rising temperatures can disrupt pollination processes and decrease crop quality.
- b. **Shifts in Growing Seasons:** Climate change can alter the timing and duration of growing seasons. Changes in temperature and rainfall patterns may cause shifts in planting and harvesting times, affecting crop development and productivity. Some regions may experience shorter growing seasons or reduced suitability for certain crops.
- c. **Water Availability:** Changes in precipitation patterns can result in water scarcity or excess water in different regions, impacting irrigation practices and water availability for Agriculture. Droughts can lead to water stress for crops while increased rainfall can cause waterlogging and soil erosion.
- d. **Pests and Diseases:** Climate change can influence the geographic distribution and prevalence of pests, weeds, and crop diseases. Warmer temperatures and altered climatic conditions can create more favourable environments for pests and diseases leading to increased infestations and crop damage.
- e. **Shifts in Pest Dynamics:** Climate change can disrupt natural pest control mechanisms. For example, changes in temperature and rainfall patterns can affect the abundance and activity of beneficial insects, impacting their ability to regulate pest populations.
- f. **Livestock and Fisheries:** Climate change also affects livestock and fisheries. Rising temperatures, reduced water availability, and changes in forage quality impact livestock production and health. In fisheries, changes in ocean temperature and acidity can disrupt ecosystems and lead to shifts in fish populations, affecting fishing industries and food sources.
- g. **Food Price Volatility:** Climate change-related disruptions to food production can contribute to increased price volatility in global food markets. Reduced crop yields, supply chain disruptions, and increased demand for food can drive up prices, making food less affordable and exacerbating food insecurity.



**Fig. 1 wk18:** *Effects of climate change on food production*

### 3. Mitigating strategies of climate change effects on food production

Climate change poses significant threats to global food production (availability, accessibility and utilisation of food for all individuals). The following are the mitigating strategies for the effects of climate change.

- a. Developing and promoting climate-resilient crop varieties that can withstand temperature fluctuations, drought, and pests.
- b. Implementing sustainable soil management practices such as conservation Agriculture and agroforestry, to improve soil health, water retention, and nutrient availability.
- c. Investing in agricultural research and technology to develop climate-smart farming techniques and precision Agriculture methods.
- d. Monitoring and early warning systems to detect and respond to pest and disease outbreaks promptly.
- e. Promoting integrated pest management practices that minimise chemical pesticide use and rely on natural pest control methods.
- f. Conducting research on pest and disease resistance in crops and developing resistant crop varieties.
- g. Implementing efficient irrigation techniques such as drip irrigation and precision irrigation to minimise water wastage.
- h. Developing and improving water storage and management infrastructure, including rainwater harvesting systems and small-scale reservoirs.
- i. Promoting water-use efficiency and conservation practices among farmers and encouraging the adoption of drought-tolerant crop varieties.
- j. Enhancing livestock management practices, including improved animal housing, feeding, and health management to mitigate heat stress and disease risks.
- k. Promoting sustainable and climate-resilient aquaculture practices.
- l. Strengthening marine conservation and fisheries management to protect fish populations and preserve aquatic ecosystems.

Combating the impacts of climate change on food security requires a multi-faceted approach involving policy interventions, technological advancements, and international collaboration.

### Learning Tasks

1. Explain the meaning of climate change in Agricultural production.
2. Discuss the effect of climate change on Agricultural production.
3. Discuss how the impact of climate change on food production can be minimised.

### Pedagogical Exemplars

**Initiating talk for learning:** Brainstorm learners to come up with the meaning of climate change. Learners with difficulties should be assisted with leading questions, pictures and other materials to come up with the meaning of climate change. Learners who can give detailed explanations of the meaning of climate change should be encouraged.

**Experiential learning:** Learners watch videos/pictures on the effect of climate change and discuss the effect of climate change on food production in ability groups and make a presentation to the whole class. Learners with sight challenges should be seated near the television during the video/picture watching. Groups with difficulties should be supported with other materials and online resources to assist them carry out their activity. Groups who can provide more information should be encouraged.

**Initiating talk for learning:** Learners in ability groups discuss the strategies that can be used to mitigate the effects of climate change on crop production and present their findings to the whole class. Groups with challenges should be assisted with guiding questions and other resources and materials to assist them in their activity. Groups who can provide detailed explanations of their ideas should be encouraged.

### Key Assessments

**Assessment Level 1:** Define climate change.

**Assessment Level 2:** State three (3) effects of climate change on food production.

**Assessment Level 3:** Discuss how climate change is affecting food production.

**Assessment Level 4:** Discuss at least three (3) effects of climate change on food production and suggest how they can be mitigated.

## Section 5 Review

Forest management is of great importance in agricultural production such as environmental conservation, carbon sequestration, climate change mitigation, sustainable timber production, water regulation, recreation and tourism, cultural and traditional values, economic development, erosion control and soil protection. Sustainable forest management, biodiversity conservation, ecosystem approach, community engagement and participation, adaptive management, conservation of forest soils, fire management, timber harvesting and regeneration and forest certification are some of the principles of forestry and forest management in Agriculture. Forest and Agriculture are interrelated in areas such as land use and landscape integration, agroforestry, water resource management, biodiversity and ecosystem services, climate change mitigation and adaptation, livestock grazing in forests, forest fuelwood and agro-residue use, and economic and social benefits. Agroforestry is a land-use system that integrates trees with crops and/or livestock on the same piece of land. Examples of agroforestry are agrisilviculture, silvopasture, taungya system, fodder and protein banks, shelterwoods, woodland grazing, apiculture, and multipurpose woodlots are some agroforestry practices. Nutrient supply, water retention, root anchorage, aeration and gas exchange, biological support, organic matter decomposition, habitat



for beneficial organisms, carbon storage and seedbed for germination are some functions and importance of soil. A soil profile is the cross-section of the various layers or horizons that make up the soil. A typical soil profile consists of the O Horizon (Organic Layer), A Horizon (Topsoil), E Horizon (Eluviation Layer), B Horizon (Subsoil), C Horizon (Parent Material) and R Horizon (Bedrock). The physical properties of soil are; soil texture, soil structure, porosity, bulk density and water-holding capacity. Soil pH, Cation Exchange Capacity (CEC), Organic Matter Content, Nutrient Content and Cation Ratios are some chemical properties of soil. The physical and chemical properties of soil help to optimise crop production, manage soil Water and Nutrients, assess soil health, plan land use and sustain Agriculture. Mineral particles, organic matter, water, air, living organisms and inorganic substances are compositions of the soil. Climate change refers to long-term shifts and alterations in weather patterns and average conditions of temperature, precipitation, wind patterns, ecosystem disruptions and other aspects of the Earth's climate system. Climate change can cause reduced crop yields, shifts in growing seasons, reduced or excess water availability, increased prevalence of pests and diseases, shifts in pest dynamics, reduced livestock and fish production and food price volatility. Climate change poses significant threats to global food security including the availability, accessibility, and utilisation of food for all individuals. Some of the ways of mitigating the impact of climate change on food security include Implementing sustainable soil management practices such as conservation Agriculture and agroforestry; Promoting integrated pest management practices that minimise chemical use; Developing and improving water storage and management infrastructure such as rainwater harvesting systems and climate-resilient aquaculture practices; Combating the impacts of climate change on food security requires a multi-faceted approach involving policy interventions, technological advancements and international collaboration.

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## SECTION 6: CROP AND ANIMAL HEALTH ISSUES

Strand: Agriculture, Health and Environment

Sub-Strands:

1. Health Issues in Crop Production
2. Health Issues in Animal Production

**Learning Outcomes:**

1. *Use the knowledge and skills acquired to produce healthy and quality food crops for human consumption*
2. *Use the knowledge and skills acquired to improve animal production activities.*

**Content Standards:**

1. Demonstrate knowledge, understanding and skills of basic farm hygiene and sanitation in crop production
2. Demonstrate knowledge, understanding and skills of basic farm hygiene and sanitation in animal production.

### INTRODUCTION AND SECTION SUMMARY

Hygiene and sanitation issues are some of the most critical issues affecting crop and animal production in Ghana. Successful crop and animal production depend on a hygienically clean and healthy environment to produce hygienic and healthy crops and animal products for consumption. Producing crops and animals from a hygienic environment reduces losses through diseases, insect attacks, parasite and worm infestation as well as poor storage. It also reduces the cost of production to the barest minimum for profit maximisation. This also promotes high quality and high standard agricultural products put on the international market for the promotion of exports of agricultural goods. This section therefore intends to introduce learners to some of the best practices carried out on the farm to promote good soil health, crops and animal health and to increase crops and animal production for food security. It also exposes learners to the tools and equipment used in crop and animal farms to promote hygiene. At the end of this section, learners are expected to acquire the skills and knowledge to maintain hygienic crop and animal farms, know how to use some farm tools and implements, how to maintain them, as well as the safety measures to observe during their use to keep sanitation and hygiene in farms. This section is relevant in other areas and directly linked with biology, chemistry and home economics

**The weeks covered by the section are:**

**Week 19:** Meaning and importance of farm hygiene and sanitation in crop production

**Week 20:** Meaning and importance of farm hygiene and sanitation in animal production

### SUMMARY OF PEDAGOGICAL EXEMPLARS

This section is to be taught using various pedagogical strategies and approaches. The teacher should use initiating talk for learning, managing talk for learning and collaborative learning to help learners share their general knowledge about all aspects of maintaining farm hygiene and sanitation tools and equipment used for carrying out farm hygiene and sanitation, and learn to tolerate and respect each other's views. The use of experiential and project-based learning will provide learners with

hands-on experience in the use of agricultural tools for the maintenance of hygienically clean and healthy farms and environments. Problem-based and enquiry-based learning strategies will enable learners to develop their analytical, critical thinking and problem-solving skills. The pedagogical exemplars should be applied in a variety of student groupings (mixed-ability, ability and mixed-gender groupings, in pairs and individual learning). Where a project cannot be undertaken in a class, learners should be given ample time to undertake the project and present their results at an agreed time. Gifted and talented learners should be assigned extra tasks and made to support their peers in feasible and applicable activities. Learners should also be guided by the teacher and technician in the use of tools and equipment for maintenance of farm hygiene in crop and animal farms as learners use them in the farms. The teacher should encourage all categories of learners to actively participate in the lesson and practical activities.

### **ASSESSMENT SUMMARY**

Assessments to be given should include areas such as the importance of farm hygiene and sanitation in crop and animal farms, effects of poor farm hygiene and sanitation in crop and farm animal production, tools and equipment used for keeping farm hygiene and sanitation safety measures to observe in during the performance of farm sanitation and hygiene activities. Teachers should also cover areas such as biosafety to prevent diseases in farm animals, vaccination and prevention of diseases, post-harvest management of waste in crop farms management of pests in crop farms among others. The teacher should ask questions in the aforementioned areas taking cognisance of balance evaluation of learner's ability to recall/reproduce, develop their skills of conceptual understanding, practice strategic reasoning, and engage in extended critical thinking and reasoning. The assessments should also be balanced in terms of the various levels of proficiencies of the learners and the depth of knowledge (DoK) required from the learners. Both summative and formative assessments using group discussions, presentations, homework, class exercises, class tests and project-based work should be given. The teacher should accept varying numbers of demonstrations, and oral and written responses. He/she should develop rubrics to score group presentations and assignments.

**WEEK 19****Learning Indicators:**

1. *Explain the meaning and importance of farm hygiene and sanitation and its effect on crop production*
2. *Describe the farm hygiene and sanitation activities in crop production*
3. *Apply farm hygiene and sanitation principles in the crop production process*

## Theme or Focal Area: **Meaning and Importance of Farm Hygiene and Sanitation in Crop Production**

### 1. **Meaning of farm hygiene and sanitation in crop production**

- a. **Farm hygiene** in crop production is the set of practices and measures implemented on crop farms to maintain cleanliness, prevent the spread of diseases and promote health.
- b. **Farm Sanitation** in crop production refers to the promotion of hygiene and the prevention of disease by maintaining sanitary conditions on crop farms.

### 2. **Importance of farm hygiene and sanitation**

- a. **Disease Prevention:** Proper hygiene practices help prevent the spread of diseases in crops. Maintaining clean and sanitary conditions reduces the risk of pathogen transmission and minimises the likelihood of disease outbreaks, which can have devastating consequences for crops and the productivity of the farm.
- b. **Food Safety:** Farm hygiene and sanitation play a crucial role in ensuring food safety. Contamination of crops with pathogens or harmful substances can pose risks to human health. Proper sanitation practices on farms help minimise the presence of contaminants and maintain the quality and safety of crop food products.
- c. **Environmental Protection:** Adequate waste management and sanitation practices on farms help protect the environment. Proper disposal of plant waste and agricultural chemicals reduces the risk of pollution to soil, water bodies, and nearby ecosystems. It promotes sustainable farming practices and minimises the environmental impact of agricultural activities.
- d. **Compliance with Regulations:** Farm hygiene and sanitation practices are often regulated by local, regional, and national authorities. Compliance with these regulations is essential for farm operations to meet legal requirements and ensure public health and safety. Adhering to proper hygiene and sanitation standards helps farmers demonstrate their commitment to responsible and sustainable agricultural practices.

### 3. **The effects of farm hygiene and sanitation on crop production**

- a. **Disease Prevention:** Proper farm hygiene practices can help prevent the introduction and spread of plant diseases. Maintaining clean equipment, tools, and irrigation systems, as well as practising good sanitation in storage and handling areas, reduces the risk of pathogen transmission and the establishment of disease-causing organisms. This can help protect crops from infections and subsequent yield losses.
- b. **Pest Management:** Farm hygiene practices can indirectly impact pest management. Removing crop residues, weeds, and other potential pest habitats helps reduce pest populations by eliminating their food sources and breeding sites. Proper sanitation practices can also help control certain pests, such as removing infested plant materials or properly disposing of harvested crop residues that may harbour pests or their eggs.
- c. **Soil Health:** Good farm hygiene practices, such as proper waste management and the incorporation of organic matter into the soil, contribute to maintaining soil health. Healthy

soils support vigorous crop growth, nutrient availability, and water-holding capacity, which are essential for optimal crop production. By ensuring clean and sanitary conditions, farm hygiene practices can indirectly promote soil health and fertility.

- d. **Quality and Marketability of Produce:** Farm hygiene and sanitation practices contribute to the quality and marketability of agricultural produce. Clean and well-maintained storage facilities and processing areas help prevent contamination, decay, and post-harvest losses. Proper sanitation practices also reduce the risk of cross-contamination during handling and packaging, ensuring that crops meet quality standards and food safety requirements.



**Fig. 1 wk19:** *Effects of good hygiene in crop production*

### Learning Tasks:

1. Explain the meaning and importance of farm hygiene and sanitation in crop production
2. Discuss the importance of farm hygiene and farm sanitation in crop production
3. Discuss the effects of poor farm hygiene and sanitation in crop production

### Pedagogical Exemplars

**Initiating talk for learning:** In mixed-ability/mixed-gender groups (where applicable) learners brainstorm to come up with the meaning of farm hygiene and sanitation. Ensure that all learners fully participate in the discussions. Learners with difficulty should be assisted with clues and leading questions to come up with their explanations. Talented learners should be challenged to delve deeper with probing questions to come up with more explanations for farm hygiene and sanitation.

**Experiential learning:** Learners in gender-based groups visit a nearby crop farm to observe the farm hygiene and sanitation practices carried out on the farm or watch videos/pictures on the farm environment to see some of the activities and procedures that are carried out on the farm for maintenance of farm hygiene and sanitation. Ensure that all learners strictly adhere to the farm safety protocols during the visit. Learners with difficulty should be assisted. Learners who can undertake some of the farm hygiene activities such as weeding, application of pesticides etc. should be allowed to do so under the strict supervision of the teacher or the farm technician.

**Collaborative learning:** Learners in mixed-gender groups discuss the sources of contamination and pollution on the farm and write a report for plenary presentation in class. The group members should be encouraged to elect leaders who will take lead roles in the report writing and the presentation.



Groups with difficulties should be assisted with links to internet resources and other learning materials to assist them in their work.

**Initiating talk for learning:** Learners in mixed-ability groups discuss the importance of farm hygiene and sanitation activities at the farm site and during the various stages of crop production. Ensure that all learners actively participate in the activity. Use leading questions to encourage learners with difficulty to come up with the importance of farm hygiene and sanitation. Use probing questions to challenge learners who are capable of delving deeper and providing a detailed explanation.

**Initiating talk for learning:** Learners in the mixed-gender groups discuss the effect of poor hygiene and sanitation on crop production. Examples: Health effects on humans and animals, rotting/spoilage of crops, disease and pest build-up, increase in cost of production, death of humans and animals, foul smell on the farm, water contamination, etc. Assist groups with difficulties with links to internet resources and other learning materials to assist them with the activity.

## Key Assessments

**Assessment Level 1:** Explain the meaning of farm hygiene and sanitation.

**Assessment level 2:** State and explain at least three (3) importance of farm hygiene and sanitation.

**Assessment level 3:** Discuss at least three (3) effects of maintaining poor hygiene in crop production.

**Assessment Level 4:** Analyse the economic implications of good farm hygiene in crop production.

## Theme or Focal Area: **Farm Hygiene and Sanitation Activities in Crop Production**

### 1. Examples of Farm hygiene and sanitation activities in crop production are:

- a. **Practicing Crop Rotation:** Implementing crop rotation practices helps break disease cycles and reduce the buildup of pathogens and pests in the soil. By rotating different crops with varying nutrient requirements, disease susceptibility, and growth habits, farmers can disrupt the life cycles of pests and diseases, improving crop health.
- b. **Sanitation Practices in Field Preparation:** Proper sanitation practices should be followed during field preparation. This includes removing crop residues, weeds, and other potential sources of pathogens and pests. Clearing debris and maintaining clean field conditions help reduce the risk of disease and pest outbreaks.
- c. **Using Clean Seeds and Planting Material:** Using high-quality, disease-free seeds and planting materials is essential for establishing healthy crop production. Proper seed treatment and disinfection methods such as hot water treatment or seed coating can help control seed-borne pathogens and ensure the production of healthy seedlings.
- d. **Proper Irrigation and Water Management:** Maintaining proper irrigation and water management practices is important for preventing the spread of waterborne diseases and reducing moisture-related issues. Avoiding over-irrigation and minimising waterlogging can help prevent diseases such as root rot and foliar diseases caused by excessive moisture.
- e. **Pest and Disease Monitoring:** Regular monitoring of crops for pests and diseases allows for early detection and timely intervention. Implementing integrated pest management (IPM) strategies, such as scouting, trapping, and use of biocontrol agents can help manage pests and diseases effectively while minimising the use of chemical pesticides.
- f. **Proper Use and Storage of Inputs:** Ensuring proper handling, storage, and application of agricultural inputs, such as fertilisers and pesticides, is essential for farm hygiene. Following manufacturer instructions, maintaining clean and organised storage areas, and avoiding cross-contamination between different inputs help prevent unintended impacts on crop health and reduce environmental risks.

- g. **Field Hygiene and Weed Control:** Implementing good field hygiene practices such as removing diseased plant material and managing weed populations can help reduce the spread of diseases and pests. Controlling weeds is important as they can harbour pests and diseases, compete with crops for nutrients and water, and provide alternate hosts for pathogens.
- h. **Proper Post-Harvest Hygiene:** Proper post-harvest hygiene practices are crucial for maintaining the quality and safety of harvested crops. This includes cleaning and sanitising storage and processing facilities, proper handling to minimise damage and bruising, and implementing appropriate storage conditions to prevent spoilage and contamination.

### Field Hygiene and Weed Control

Controlling weeds prevent the harboring of pests and diseases, competition with crops for nutrients and water, and prevent alternate hosts for pathogens

### Post-Harvest Hygiene

Proper post-harvest hygiene practices are important for maintaining quality and safety of harvested crops

### Pest and Disease Monitoring

Regular monitoring of crops for pests and diseases allows for early detection and timely intervention.

### Crop Rotation

By rotating different crops with varying nutrient requirements, disease susceptibility, and growth habits, farmers can disrupt the life cycles of pests and diseases, improving crop health.

### Clean Seed and Planting Material

Using high-quality, disease-free seeds and planting materials is essential for establishing healthy crops

### Irrigation and Water Management

Maintaining proper irrigation and water management practices is important for preventing the spread of waterborne diseases and reducing moisture-related issues.

Fig. 2 wk19: Management activities for good farm hygiene

## 2. Some of the tools for maintaining farm hygiene and sanitation are:

- a. **Hoe:** A hoe is a handheld tool with a long handle and a flat or angled blade. It is used for weeding, breaking up clumps of soil, and creating furrows for planting.
- b. **Cutlass:** Consists of a short, curved blade with a sharp edge and a sturdy handle. It is designed for cutting through vegetation, such as tall grass, weeds, brush etc.
- c. **Rake:** A rake has a long handle and a series of tines or teeth. It is used to level the soil, remove debris, and create a smooth seedbed. Rakes are also helpful for gathering leaves and other materials.
- d. **Hand Fork:** A hand fork, also known as a garden fork or hand cultivator, is a small handheld tool with multiple tines. It is used for loosening soil, aerating the root zone, and removing weeds around established plants.
- e. **Pruning Shears:** Pruning shears or secateurs are handheld tools used for cutting and removing dead or diseased plant parts such as branches, leaves, or stems. Regular pruning helps eliminate potential sources of infection and improves air circulation within the crop canopy.
- f. **Scissors or Harvest Knives:** Clean and sharp scissors or harvest knives are used for harvesting crops without causing unnecessary damage. They help ensure a clean cut, reducing the risk of contamination and post-harvest diseases.
- g. **Hand Sprayers:** Hand sprayers or sprayer bottles are used to apply various treatments such as fungicides, insecticides, or foliar fertilisers. They allow targeted application, minimising chemical drift and ensuring effective control of pests and diseases



**Fig. 3 wk19:** Some tools for maintaining good farm hygiene in crop production.

### Learning Tasks

1. Identify and explain the farm hygiene activities in crop production.
2. Discuss the importance of farm hygiene and sanitation activities in crop production.
3. Discuss the basic tools used for maintaining farm hygiene and sanitation in crop production.

## Pedagogical Exemplars

**Initiating talk for learning:** In mixed-gender/ability groups (where applicable) learners brainstorm to come up with examples of activities that are carried out to keep their backyard gardens and school farms clean. Guide learners with difficulty with leading questions to help them come up with examples. Encourage all learners to participate. Learners who can provide detailed information should be encouraged to do so.

**Collaborative learning:** Learners in mixed-gender groups discuss farm hygiene and sanitation activities at the farm site and during the various stages of crop production. Learners then build a portfolio on farm hygiene and sanitation activities at the farm and during the various stages of crop production for assessment. Ensure that all learners actively participate in the portfolio building. Encourage talented learners to take lead roles and also assist learners with difficulties.

**Initiating talk for learning:** Learners in mixed-ability/mixed-gender groups (where applicable) discuss the tools, equipment and chemicals required for undertaking farm hygiene and sanitation activities at the farm site and during the various stages in crop production. Example: cutlass, rake, dustbins, disinfectants, powered soap, insecticides, fungicides, herbicides etc. Teachers should use pictures or realia of some of the farm tools, equipment and chemicals to guide learners with difficulty to come up with further examples of the tools for maintaining farm hygiene. Challenge talented learners to give more examples. Use probing questions to guide learners to explain the functions of the tools identified. Strict safety measures should be adhered to when handling the chemicals.

## Key Assessments

**Assessment Level 1:** State at least three (3) activities of maintaining farm hygiene and sanitation.

**Assessment Level 2:** Identify at least three (3) farm hygiene and sanitation tools and explain their roles in maintaining farm hygiene.

**Assessment Level 3:** Draw and label at least four (4) tools used in maintaining good hygiene in crop production activities.

**Assessment Level 4:** Explain why rake and hand fork are considered as farm hygiene and sanitation tools.

## Theme or Focal Area: **Application of Farm Hygiene and Sanitation in Crop Production**

### 1. Examples of farm hygiene and sanitation activities in crop production

#### a. Field Preparation:

- Clearing and removing crop residues and weeds from the field before planting.
- Proper disposal of crop debris to reduce the risk of disease and pest carryover.
- Cleaning and maintenance of equipment, tools and machinery used in field preparation to prevent contamination.

#### b. Seed and Planting Material Management:

- Using certified, disease-free seeds and healthy planting materials.
- Implementing seed treatment and disinfection methods to control seed-borne pathogens.
- Proper storage of seeds and planting materials in clean and dry conditions to maintain their quality.

- c. **Irrigation and Water Management:**
    - Employing appropriate irrigation practices to avoid over-irrigation and waterlogging.
    - Regular maintenance and cleaning of irrigation systems to prevent blockages and the growth of pathogens.
    - Monitoring water quality to ensure its suitability for crop irrigation.
  - c. **Pest and Disease Management:**
    - Regular monitoring of crops for pests and diseases through scouting and trapping.
    - Implementing integrated pest management (IPM) strategies, including the use of natural predators, cultural practices, and targeted pesticide applications.
    - Applying appropriate fungicides or bactericides to control plant diseases when necessary.
  - d. **Weed Control:**
    - Implementing weed control measures to reduce competition for resources and minimising weed-related pest and disease problems.
    - Using mechanical methods (such as ploughing, hoeing, or mulching) or applying herbicides judiciously to manage weeds effectively.
  - e. **Fertiliser and Chemical Input Management:**
    - Following manufacturer instructions for the safe handling, storage, and application of fertilisers and agrochemicals.
    - Maintaining accurate records of input usage and ensuring proper calibration of equipment during application.
    - Preventing cross-contamination between different inputs and minimising their environmental impact.
- 2. Post-Harvest Handling and Storage:**
- a. Cleaning and sanitising storage facilities and equipment to prevent post-harvest contamination.
  - b. Properly handling and packaging harvested crops to minimise physical damage and bruising.
  - c. Implementing appropriate storage conditions, including temperature and humidity control, to prevent spoilage and preserve quality.
- 3. Waste Management:**
- a. Implementing proper waste management practices, including the disposal of crop residues and other organic waste.
  - b. Managing agricultural waste in compliance with environmental regulations and guidelines.
  - c. Composting or utilising organic waste as a source of nutrients for future crops, when applicable.





**Fig. 4 wk19:** Management activities for maintaining good farm hygiene in crop production

### Learning Tasks:

1. Explain at least three (3) activities that are carried out to maintain good farm hygiene in crop production.
2. Discuss the appropriate time or period to carry out the specific farm hygiene and sanitation activities in crop production.
3. Discuss at least three (3) importance of farm hygiene activities with respect to time/period of application.

### Pedagogical Exemplars

**Experiential learning:** Learners in gender-based/mixed ability groups (where applicable) undertake farm hygiene and sanitation activities at the school farm or a nearby farm under the guidance of a technician. Ensure that all learners actively participate in activities such as weeding, pest control, etc. Guide learners with difficulties. Ensure strict adherence to all the safety protocols on the farm to



prevent injuries. Learners build a portfolio of their activities at the farm and present it in a plenary session in the class.

**Initiating talk for learning:** Learners in mixed-ability groups discuss the appropriate periods to undertake farm hygiene and sanitation activities in crop production. For instance, field preparation activities such as land clearing, seed and planting materials management, pest control etc. Learners identify specific farm activities and their appropriate farm hygiene activities. Learners with difficulty should be assisted with leading questions to guide them to come up with their examples.

**Collaborative learning:** Learners in mixed-ability groups discuss the importance of performing farm hygiene and sanitation activities concerning the period they are undertaking. For instance, post-harvest handling and storage of crops to improve shelf life, proper disposal of waste after harvesting to prevent pest build-up in the next planting season, etc. Use leading questions and clues to guide learners with difficulty to give scenarios that call for specific farm hygiene activities. Challenge talented learners to give further details.

### Key Assessments

**Assessment Level 1:** State and explain at least three (3) activities that can be undertaken to maintain farm hygiene

**Assessment Level 2:** Discuss at least two (2) importance of the following farm hygiene and sanitation activities: i. seed management, ii. pest control and iii. waste management

**Assessment Level 3:** Create an individual portfolio on farm hygiene and sanitation activities in crop production.

**Assessment Level 4:** Discuss at least three (3) benefits of undertaking post-planting farm hygiene activities in crop production.

**WEEK 20****Learning Indicators:**

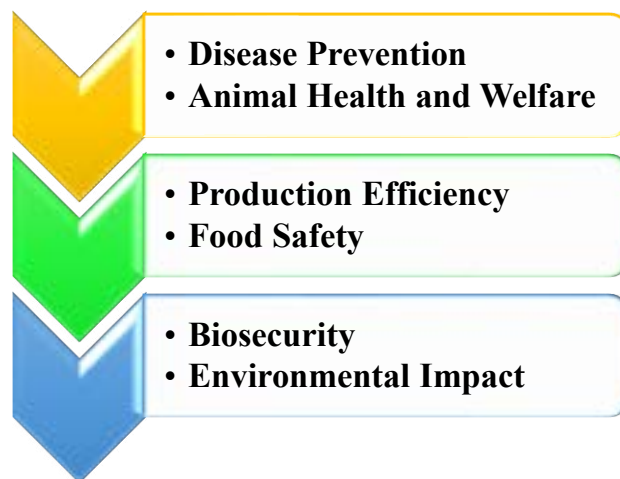
1. *Explain the meaning and importance of farm hygiene and sanitation and its effect on animal production.*
2. *Discuss the farm hygiene and sanitation activities in animal production.*

**Theme or Focal Area: Meaning and Importance of Farm Hygiene and Sanitation in Animal Production****1. Meaning of Farm hygiene and sanitation in animal production**

- a. **Farm hygiene** in animal production is the set of practices and measures implemented on animal farms to maintain cleanliness, prevent the spread of diseases, and promote health.
- b. **Sanitation** in animal production refers to the promotion of hygiene and prevention of disease by the maintenance of sanitary conditions on animal farms.

**2. Importance of farm hygiene and sanitation in animal production**

- a. **Disease Prevention:** Good hygiene practices help prevent the spread of diseases among animals. Clean and well-maintained facilities such as barns, stables, or pens, reduce the presence of pathogens, parasites, and vectors that can cause infections. Regular cleaning, disinfection, and waste management help control disease transmission and minimise the risk of outbreaks.
- b. **Animal Health and Welfare:** Clean and hygienic environments promote better animal health and welfare. Animals raised in clean surroundings are less prone to stress, injuries, and disease. They have improved immunity, reduced exposure to harmful pathogens, and a lower likelihood of developing infections or respiratory problems.
- c. **Production Efficiency:** Hygiene and sanitation directly impact production efficiency in animal farming. By maintaining clean and well-ventilated housing, animals are more comfortable, leading to better feed conversion rates, growth, and reproduction. Reduced disease incidence means fewer veterinary interventions, lower mortality rates, and improved overall productivity.
- d. **Food Safety:** Ensuring farm hygiene and sanitation is crucial for producing safe and high-quality animal products for human consumption. Proper cleaning and disinfection practices minimise the risk of foodborne pathogens contaminating meat, milk, eggs, or other animal-derived products. This helps protect consumer health and maintain public confidence in the safety of agricultural products.
- e. **Biosecurity:** Hygiene practices are essential components of a farm's biosecurity measures. Strict hygiene protocols, including proper cleaning, disinfection, and quarantine procedures, help prevent the introduction and spread of infectious diseases. Maintaining biosecurity reduces the risk of economic losses, protects neighbouring farms, and preserves the overall integrity of the livestock industry.
- f. **Environmental Impact:** Farm hygiene and sanitation contribute to environmental sustainability. Proper waste management such as manure handling and disposal, prevents water and soil contamination, reducing the risk of nutrient runoff and environmental pollution. By implementing sustainable waste management practices, farmers can minimise their ecological footprint and maintain the health of surrounding ecosystems.



**Fig. 1 wk20:** *Importance of farm hygiene and sanitation in animal production*

### 3. Effects of poor hygiene on animal production

- a. **Increased Disease Risk:** Poor hygiene creates an environment conducive to the spread of diseases among animals. Accumulation of manure, dirty bedding, and inadequate cleaning and disinfection of facilities can lead to the proliferation of pathogens, parasites, and disease vectors. This increases the risk of infectious diseases such as bacterial or viral infections, parasite infestations, and respiratory illnesses, negatively impacting animal health and productivity.
- b. **Reduced Animal Health and Welfare:** Animals kept in unclean and unsanitary conditions are more susceptible to various health issues and welfare problems. Exposure to high levels of ammonia, dust, or harmful gases due to poor ventilation can cause respiratory problems, eye irritations, and discomfort. Lack of clean bedding and unhygienic environments can lead to skin infections, hoof problems, and stress-related conditions, compromising the overall well-being of the animals.
- c. **Lower Productivity and Growth Rates:** Poor hygiene negatively impacts animal productivity and growth. Animals that are constantly exposed to unsanitary conditions have reduced feed intake, poorer nutrient absorption, and impaired growth rates. The energy that should be utilised for growth and production is diverted to fighting off infections and dealing with health issues.
- d. **Increased Medication Use and Costs:** Inadequate hygiene practices often result in increased dependence on medications such as antibiotics and veterinary treatments to control and treat diseases. Excessive medication usage not only increases costs for farmers but also contributes to the development of antibiotic resistance, posing a threat to both animal and human health.
- e. **Lower Reproductive Performance:** Poor hygiene can negatively impact reproductive performance in animals. It can lead to infections of the reproductive tract, reduced fertility rates, increased rates of abortion, and decreased conception rates. These reproductive issues can have long-term implications on the breeding success and genetic progress of animal populations.
- f. **Food Safety Concerns:** Poor hygiene practices in animal production can compromise food safety. Contamination of animal products such as meat, milk, and eggs, with harmful pathogens poses a risk to consumer health. Consumption of contaminated food products can lead to foodborne illnesses and negatively impact the reputation of the livestock industry.
- g. **Environmental Pollution:** Inadequate waste management and poor hygiene practices can result in environmental pollution. Improper disposal of manure and wastewater can contaminate water sources, contribute to the spread of pathogens and pollutants, and

negatively impact local ecosystems. This pollution can harm aquatic life, degrade soil quality, and pose risks to human and environmental health.

- h. **Increased Economic Losses:** Poor hygiene practices can lead to significant economic losses in animal production. Costs associated with increased disease treatment, medication usage, reduced productivity, and higher mortality rates can impact the profitability and sustainability of farming operations. Additionally, reputation damage due to food safety concerns can result in decreased consumer trust and market value.

### Learning Tasks

1. Discuss the meaning of farm hygiene and sanitation in animal production.
2. Discuss the benefits of undertaking farm hygiene and sanitation in animal production.
3. Analyse the effects of poor farm hygiene on animal production.

### Pedagogical Exemplars

**Initiating talk for learning:** Learners into ability groups (where applicable) to brainstorm to come up with the meaning of farm hygiene and sanitation in animal production. Provide clues and leading questions to guide learners with difficulty in coming out with the meaning of farm hygiene in animal production.

**Experiential learning:** learners in gender-based groups visit a nearby animal farm to observe and take part in some of the activities to maintain farm hygiene or watch videos/pictures recording/pictures of the farm environment and activities and procedures that are carried out on the farm. Learners should be encouraged to fully participate in the activities. Learners should observe all safety protocols to prevent any injuries on the farm. Learners with hearing or sight problems should be assisted by placing them at a vantage place to aid seeing and hearing. Challenge learners with better understanding to delve deeper to give further understanding.

**Collaborative learning:** Learners in mixed-gender groups discuss the sources of contamination on the animal farm and write a report for plenary presentation in class. Let the talented learners lead the group discussions to allow learners with difficulty to draw inspiration from them. Use pictures and leading questions to guide learners with difficulty in identifying the sources of contamination.

**Initiating talk for learning:** Learners in mixed-ability groups discuss the importance of farm hygiene and sanitation activities at the farm site and during the various management practices in animal production. Ensure that all learners actively participate in the discussions. Use probing questions to guide learners with difficulty in coming up with the importance of maintaining farm hygiene in animal production. Challenge talented learners to explain their ideas.

**Initiating talk for learning:** Learners in mixed-gender groups to discuss the effects of poor hygiene on animal production. Show pictures of poorly managed farms with animals showing signs and symptoms of diseases caused by poor hygienic conditions and ask learners to assess the effects of poor hygienic conditions on farm animals. Use leading questions to help elicit responses from learners with difficulties. Capable learners should be encouraged to provide further explanations and examples of the effect of poor sanitation on animal production.

### Key Assessments

**Assessment Level 1:** Explain farm hygiene and farm sanitation in animal production.

**Assessment Level 2:** State and explain at least three (3) activities in maintaining proper farm hygiene and sanitation in animal production.

**Assessment Level 3:** Discuss at least four benefits of maintaining proper farm hygiene and sanitation in animal production.

**Assessment Level 4:** Analyse at least four (4) effects of keeping farm animals under poor hygienic conditions.

### Theme or Focal Area: **Farm Hygiene and Sanitation Activities in Animal Production**

#### 1. **Activities that promote farm hygiene and sanitation in animal production:**

##### a. **Clean and Safe Housing:**

- Providing clean and well-maintained housing facilities for animals that are properly ventilated and designed to meet their specific needs.
- Regularly cleaning and disinfecting animal housing areas, including floors, walls, and equipment, to minimise the build-up and transmission of pathogens.
- Ensuring proper waste management systems such as manure collection and removal, to prevent contamination and odour issues.

##### b. **Biosecurity Measures:**

- Implementing biosecurity protocols to control the entry and spread of diseases onto the farm. This includes measures such as controlled access, quarantine procedures for new animals, and restricted movement of personnel and equipment.
- Maintaining proper hygiene practices for visitors, including the provision of disinfection stations and appropriate protective clothing.

##### c. **Feed and Water Management:**

- Providing animals with clean and uncontaminated feed and water.
- Storing and handling feed properly to prevent contamination by pests, mould, or toxins.
- Regularly cleaning and disinfecting water sources and feeding equipment to ensure water quality.

##### d. **Animal Health Management:**

- Implementing vaccination programmes and preventive health measures as recommended by veterinarians.
- Regular monitoring of animal health, including routine inspections, early disease detection, and appropriate treatment.
- Isolating sick animals to prevent the spread of diseases within the herd or flock.

##### e. **Waste Management:**

- Proper management and disposal of animal waste, including manure and bedding materials.
- Implementing strategies for waste storage, handling, and utilisation such as composting or proper storage for future use as fertiliser.
- Adhering to regulations and guidelines for waste management to prevent environmental pollution and ensure sustainable practices.

##### f. **Hygiene Practices for Personnel:**

- Ensuring that farm workers follow good personal hygiene practices, including proper handwashing and use of personal protective equipment.
- Providing training on hygiene protocol to farm personnel to minimise the risk of disease transmission between animals and humans.

**g. Cleaning and Sanitising Equipment:**

- Regularly cleaning and sanitising animal equipment, such as feeding troughs, water dispensers, and handling tools to prevent disease transmission.
- Following proper cleaning procedures and using suitable disinfectants for effective sanitation.

**h. Pest and Parasite Control:**

- Implementing pest and parasite control measures to prevent infestations and reduce the risk of disease transmission.
- Using appropriate pest control methods, such as insecticides or biological control agents, following recommended guidelines.

**i. Record-Keeping and Documentation:**

- Maintaining accurate records of animal health, vaccination programmes, medication usage and other relevant information. Tracking and documenting any disease outbreaks or unusual incidents for traceability and future prevention.



**Fig. 2 wk20:** *Activities that promote farm hygiene and sanitation in animal production*

**3. Tools for maintaining farm hygiene and sanitation**

- Hoe:** A hoe is a handheld tool with a long handle and a flat or angled blade. It is used for weeding around farmhouses to prevent hiding places of snakes that can attack farm animals.
- Cutlass:** Consists of a short, curved blade with a sharp edge and a sturdy handle. It is designed for cutting through vegetation, such as tall grass, and weeds to keep the farm environment clean and tidy.
- Rake:** A rake has a long handle and a series of tines or teeth. It is used to remove waste and helps gather leaves and other materials.
- Shovels and Pitchforks:** These tools are used for removing manure and soiled bedding from animal enclosures. Regularly cleaning and removing waste helps prevent the spread of diseases and reduces odour.
- Wheelbarrows and Carts:** These are used to transport manure, soiled bedding, and other waste materials to designated disposal areas. They make the process of waste management more efficient.
- High-Pressure Washers:** High-pressure washers are effective for cleaning animal enclosures such as barns, poultry houses, and stalls. They help remove dirt, debris, and pathogens from surfaces, reducing the risk of infections.
- Scrub Brushes and Brooms:** These tools are used to scrub and sweep floors, walls, and other surfaces to remove dirt and organic matter. They are particularly useful for cleaning areas that cannot be easily reached by a high-pressure washer.



- h. **Disinfectants and Cleaning Solutions:** Various disinfectants and cleaning solutions are used to kill pathogens and sanitise surfaces. Common disinfectants include chlorine-based solutions, quaternary ammonium compounds, and hydrogen peroxide-based products.
- i. **Sprayers and Foggers:** Sprayers and foggers are used to apply disinfectants and sanitisers to large areas or hard-to-reach areas, ensuring comprehensive coverage and effective pathogen control.
- j. **Pest Control Tools:** Effective pest control is essential for maintaining farm hygiene. Tools such as traps, insecticides, fly control devices and rodent bait stations are commonly used to manage pests that can spread diseases or damage farm structures.
- k. **Personal Protective Equipment (PPE):** PPE, including gloves, masks, goggles, and coveralls, should be worn by farm workers to protect themselves from potential hazards, including pathogens and chemicals during cleaning and sanitation tasks.
- l. **Waste Management Equipment:** Animal farms generate a significant amount of waste, including manure and soiled bedding. Proper waste management tools such as composting systems or manure spreaders are necessary to handle and dispose of waste efficiently and minimise environmental impact.

### Learning Tasks

1. Discuss the activities that promote hygiene and sanitation in farm animals.
2. Identify tools for keeping farm hygiene and sanitations and discuss their functions.
3. Assess the benefits of proper use of the farm hygiene and sanitation tools in animal production.

### Pedagogical Exemplars

**Initiating talk for learning:** Learners in mixed-ability groups brainstorm to come up with examples of activities that are carried out to keep their animal pens clean. Use leading questions to guide learners to tell how they take care of their farm animals at home to keep them clean and healthy. Show pictures of some of the farm hygiene and sanitation activities to learners with difficulty observing to come up with some of the activities carried out to maintain farm hygiene in animal farms.

**Collaborative learning:** Learners in mixed-gender groups discuss farm hygiene and sanitation activities at the farm site and during the various management practices in animal production. Learners then build a portfolio on the farm hygiene and sanitation activities at the farm and during the various management practices in animal production for assessment. Support groups with difficulties with links to online resources and other learning materials to assist them in their activities. Encourage learners who are capable of coming up with detailed examples and information.

**Initiating talk for learning:** Learners in mixed-ability groups discuss the tools, equipment and chemicals required for undertaking farm hygiene and sanitation activities at the farm site and during the various management practices in animal production. Show realia and pictures of tools, equipment and chemicals used for carrying out farm hygiene and sanitation operations to guide learners with difficulty in identifying some of the tools and equipment and their functions. Learners who are talented and can give further examples and their functions. Adhere to strict safety precautions when handling the chemicals.

**Project-based learning:** Learners in mixed-ability groups identify various farm hygiene tools, equipment and chemicals and their functions from their homes and community to build a portfolio and present it in class. Encourage active participation of all learners in the activity.

## Key Assessments

**Assessment level 1:** Identify at least three (3) activities that promote good farm hygiene and sanitation in animal production.

**Assessment level 2:** Discuss at least three (3) farm hygiene activities and their benefits.

**Assessment Level 3:** Draw and state the functions of at least five (5) tools commonly used in maintaining good hygiene in animal production.

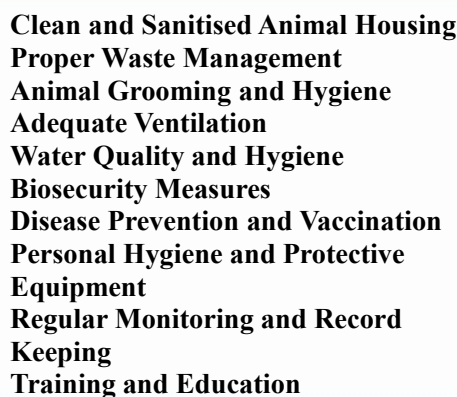
**Assessment level 4:** Discuss at least five (5) effects of poor hygienic and sanitation conditions in farm animal production.

## Theme or Focal Area: **Application of Farm Hygiene and Sanitation in Animal Production**

### 1. Farm Hygiene and Sanitation Activities in Animal Production

- a. **Clean and Sanitised Animal Housing:** Maintaining clean and sanitised animal housing is essential. Regular cleaning and disinfection of barns, stalls, coops, and other enclosures help prevent the build-up of pathogens, parasites, and harmful bacteria. This promotes healthier living conditions for the animals and reduces the risk of disease transmission.
- b. **Proper Waste Management:** Effective waste management is crucial to prevent the accumulation of manure and soiled bedding, which can harbour pathogens and attract pests. Implementing proper waste management systems such as composting or manure storage, helps minimise environmental pollution and reduces the risk of contamination.
- c. **Animal Grooming and Hygiene:** Regular grooming of animals, including brushing, hoof trimming and bathing, when necessary, helps maintain their cleanliness and overall health. It also allows for early detection of any health issues such as skin diseases or parasites.
- d. **Adequate Ventilation:** Proper ventilation in animal housing is important for maintaining good air quality and reducing the build-up of moisture, ammonia, and odours. Adequate airflow helps minimise respiratory problems and improves the overall comfort of the animals.
- e. **Water Quality and Hygiene:** Providing clean and fresh water is essential for animal health and performance. Regularly cleaning and sanitising water troughs, pipes, and drinkers helps prevent the growth of harmful bacteria and ensures a safe water supply for the animals.
- f. **Biosecurity Measures:** Implementing biosecurity measures is crucial to prevent the introduction and spread of diseases on the farm. This includes controlling access to the farm, practising proper quarantine procedures for new animals, and implementing hygiene protocols for visitors, vehicles, and equipment.
- g. **Disease Prevention and Vaccination:** Following vaccination protocol and implementing disease prevention measures such as regular parasite control helps reduce the risk of disease outbreaks and improves the overall health of the animals.
- h. **Personal Hygiene and Protective Equipment:** Practising good personal hygiene, such as handwashing before and after handling animals reduces the risk of disease transmission between animals and humans. Farm workers should also wear appropriate personal protective equipment (PPE) to protect themselves and prevent the spread of diseases.
- i. **Regular Monitoring and Record Keeping:** Regular monitoring of animal health, production parameters, and hygiene practices is important for identifying potential issues and implementing corrective measures promptly. Keeping detailed records of vaccinations, treatments, and hygiene protocols helps track progress and ensures compliance with regulations.
- j. **Training and Education:** Providing training and education to farm workers about proper hygiene and sanitation practices is essential. It helps create awareness, promotes a culture

of cleanliness and responsibility, and ensures that everyone involved in animal production understands and follows the necessary protocols.



**Clean and Sanitised Animal Housing**  
**Proper Waste Management**  
**Animal Grooming and Hygiene**  
**Adequate Ventilation**  
**Water Quality and Hygiene**  
**Biosecurity Measures**  
**Disease Prevention and Vaccination**  
**Personal Hygiene and Protective Equipment**  
**Regular Monitoring and Record Keeping**  
**Training and Education**

**Fig. 3 wk20:** *Application of farm hygiene and sanitation in animal production.*

### Learning Tasks

1. Discuss the activities involved in managing hygienic and sanitised farm animals.
2. Discuss how to promote biosecurity measures on your school farm to control and prevent animal diseases in animal production.
3. Analyse disease prevention and vaccination as better approaches to promoting healthy farm animals

### Pedagogical Exemplars

**Initiating talk for learning:** Learners in mixed-ability groups identify the activities involved in keeping their school animal farms or farm animals in their homes and their pens clean and tidy. Provide learners with difficulty with clues or leading questions to guide them to come up with some examples of activities such as grooming, ventilation, vaccination etc. Use pictures or videos of some of the activities to guide learners to identify and describe the hygienic and sanitation activities.

**Experiential learning:** Learners in gender-based groups undertake farm hygiene and sanitation activities at the school animal farm or a nearby animal farm under the guidance of a technician. Ensure active participation of all learners in the hygiene and sanitation activities. Ensure that learners who can perform the tasks play leading roles to encourage learners with difficulty to draw inspiration from. Learners then build portfolios on their activities at the farm and present them in a plenary session in the class.

**Collaborative learning:** Learners in mixed ability groups discuss the biosecurity measures such as controlling access to the farm, proper quarantine measures, etc., carried out in the animal farm for disease prevention or reduction of spread. Guide learners with difficulty with scenarios and clues to assist them in identifying some of the biosecurity measures carried out on animal farms. Challenge talented learners with probing questions to come up with detailed explanations of the biosecurity activities identified.

**Initiating talk for learning:** Learners in mixed-ability groups discuss and analyse vaccination as a way to prevent diseases in farm animals in their school animal farms or farm animals in their homes. Provide learners with difficulty with clues or use leading questions to guide them to describe how vaccination is carried out.

## Key Assessments

**Assessment level 1:** State and explain at least three (3) farm hygiene and sanitation activities carried out in the school animal farm to prevent and control disease.

**Assessment level 2:** Explain at least three (3) biosecurity measures in animal production and state one (1) benefit of each.

**Assessment level 3:** Discuss at least four (4) importance of vaccination as a means of disease prevention in animal production.

**Assessment Level 4:** Discuss at least three (4) economic implications of farm hygiene and sanitation activities in animal production in Ghana.

## Section 6 Review

Farm hygiene in crop and animal production is the set of practices and measures implemented on crop and animal farms to maintain cleanliness, prevent the spread of diseases and promote the health of the soil, crops, animals and to produce healthy products. Farm sanitation, on the other hand, refers to the promotion of hygiene and prevention of disease by maintenance of sanitary conditions on crop and animal farms.

Practising good hygiene in farms will promote disease prevention, food safety, environmental protection, quality and marketability of produce and compliance with regulations. Some management practices that ensure good farm hygiene and sanitation in crop production are crop rotation, use of clean seed and planting material, irrigation and water management, pest and disease monitoring, proper use and storage of inputs, field hygiene and weed control and post-harvest hygiene. These activities can be carried with tools such as a hoe, cutlass, rake, hand fork, pruning shears, scissors or harvest knives, and hand sprayers. Activities that ensure good farm hygiene in crop production are clearing and removing crop residues and weeds from the field before planting, using certified, disease-free seeds and healthy planting materials, employing appropriate irrigation practices to avoid over-irrigation and waterlogging, regular monitoring of crops for pests and diseases through scouting and trapping, implementing weed control measures to reduce competition for resources and minimising weed-related pest and disease problems.

Farm hygiene and sanitation in animal production promotes disease prevention, animal health and welfare, production efficiency, food safety, biosecurity and positive environmental impact. Poor hygiene in animal production leads to increased disease risk, reduced animal health and welfare, lower productivity and growth rates, increased medication uses and costs, lower reproductive performance, poor food safety, environmental pollution and increased economic losses. Some activities that promote farm hygiene and sanitation in animal production are; clean and safe housing, biosecurity measures, feed and water management, animal health management, waste management, hygiene practices for personnel, cleaning and sanitising equipment, pest and parasite control and record-keeping and documentation. Hoe, cutlass, rake, shovels and pitchforks, wheelbarrows and carts, high-pressure washers, scrub brushes and brooms, disinfectants and cleaning solutions, sprayers and foggers, pest control tools, personal protective equipment and waste management equipment are some of the tools used for maintaining farm hygiene and sanitation. Clean and sanitised animal housing, proper waste management, animal grooming and hygiene, adequate ventilation, water quality and hygiene, biosecurity measures, disease prevention and vaccination, personal hygiene and protective equipment, regular monitoring and record keeping, and training and education are some farm hygiene and sanitation practices in animal production.

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# SECTION 7: CONCEPT OF AGRICULTURAL ECONOMICS, AGRIBUSINESS AND COMMUNICATION

Strand: **Agricultural Economics, Agribusiness and Communication**

## Sub-Strands:

1. Economics for Agriculture
2. Communication in Agriculture
3. Agribusiness Management

## Learning Outcomes:

1. *Use the knowledge acquired to describe the principles of Agricultural economics and establish a school business enterprise.*
2. *Use the knowledge acquired to describe the concept of Agricultural communication.*
3. *Use the knowledge acquired to describe agribusiness management.*
4. *Prepare a business plan.*

## Content Standards:

1. Demonstrate knowledge and understanding of the meaning of the basic principles of Agricultural economics.
2. Demonstrate knowledge and understanding of the concept of communication in Agriculture.
3. Demonstrate knowledge and understanding of activities involved in agribusiness management.
4. Demonstrate the knowledge, understanding and skills of writing a business plan.

## INTRODUCTION AND SECTION SUMMARY

This section encompasses Agricultural economics, agribusiness and communication. Agricultural economics deals with the principles and concepts of efficient allocation and utilisation of scarce and limited resources. Agribusiness also deals with the marketing and distribution of goods and services within the agricultural value chain. Communication on the other hand ensures the effective dissemination of relevant information to promote agricultural activities. Agricultural economics, agribusiness and communication provide a solid foundation for designing and evaluating agricultural policies, the impact of government interventions, marketing of Agricultural goods and the spread of relevant information in the agricultural sector for the growth of the economy. Therefore, this section will expose learners to the basic principles and general tenets of agricultural economics, agribusiness and communication, and the application of agricultural economics and agribusiness principles through effective communication for the production of goods and services, marketing and distribution in the agricultural value chain, and the effective use of scarce and limited agricultural resources to improve agricultural production and livelihood of the people. Pedagogical strategies such as think-pair-share, managing talk for learning, project-based learning, problem-based and enquiry-based learning would be used by the teacher to assist learners in imbibing the principles and concepts of agricultural economics, agribusiness and agricultural communication. This section has links with subjects such as Economics, Business Management, Home Economics and Principles of Accounting.



**The Weeks covered by this section are:**

**Week 21:** Meaning, importance, the farm as an economic unit and application of the principles of Agricultural economics in the management of an agricultural enterprise.

**Week 22:** The meaning, importance, branches and strategies for effective communication in communication in Agriculture.

**Week 23:** Explain the meaning, importance, and the activities carried out in agribusiness management and outline their functions.

**Week 24:** Definition and procedure for writing an agribusiness plan.

**SUMMARY OF PEDAGOGICAL EXEMPLARS**

This section will be delivered using a variety of pedagogical strategies. The teacher should use think-pair-share and managing talk for learning to guide learners to discuss what they know about agricultural economics, agribusiness and communication. This will enable learners to express themselves and tolerate and respect each other's views. The use of project-based learning will provide learners with practical experience in the application of agricultural economics, agribusiness and communication principles to develop their entrepreneurial and communication skills for a better life. Problem-based and enquiry-based learning will equip learners with analytical, critical thinking and problem-solving skills. The pedagogical strategies and approaches should be applied in various student groupings (mixed-ability, ability and mixed-gender groupings, in pairs and individual learning). The teacher should make room for project work to be undertaken outside the normal classroom lesson when necessary. Learners should be encouraged to go the extra mile to achieve greater heights. Learners with the ability to do more should be allowed to do so and be allowed to support others. The teacher should ensure that all learners take an active part in all activities.

**ASSESSMENT SUMMARY**

Assessments will embrace the meaning and importance of the farm as an economic unit and the basic principles of agricultural economics; meaning, importance, branches and strategies for effective communication in Agriculture; and meaning, importance and the activities carried out in agribusiness management; and how to write a business plan. The teacher should ask varying questions in these areas considering the abilities of learners to recall/reproduce, develop their skills of conceptual understanding, and strategic reasoning and engage in extended critical thinking and reasoning. The assessments should also be balanced in terms of testing the various levels of proficiencies of learners and their depth of knowledge (DoK). Both summative and formative assessments using group discussions, presentations, homework, class exercises, class tests and project-based work should be given. The teacher should accept varying numbers of demonstrations, and oral and written responses. He/she should develop appropriate marking schemes to evaluate presentations, projects and other assignments.

**WEEK 21****Learning Indicators**

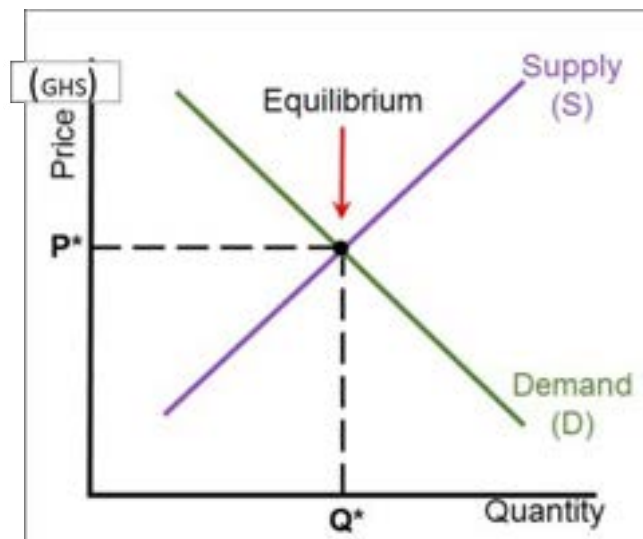
1. Explain the meaning and importance of the basic principles of Agricultural economics.
2. Discuss the farm as an economic unit.
3. Apply the principles of Agricultural economics in the management of an agricultural enterprise.

**Theme or Focal Area: Meaning and importance of Agricultural Economics****1. Meaning of Agricultural Economics**

Agricultural economics is a branch of economics that focuses on the application of economic principles and concepts for the agricultural sector. It involves the study of how resources are allocated, decisions are made and markets function within the agricultural industry. Agricultural economics combines elements of both economics and agricultural science to analyse and understand the economic aspects of agricultural production, consumption, and distribution.

**2. Principles of Agricultural Economics**

- a. **Scarcity:** Scarcity is a fundamental principle in economics that applies to Agriculture as well. It recognises that resources such as land, labour, capital and technology are limited or finite, while the demands for agricultural goods and services are unlimited. Agricultural economics examines how scarce resources are allocated to maximise agricultural production and address the needs of society.
- b. **Supply and Demand:** The principle of supply and demand explores the relationship between the quantity of agricultural products supplied by producers and the quantity demanded by consumers. Agricultural economics analyses factors that influence supply, such as input prices, technology and government policies, as well as factors that affect demand such as consumer preferences, income, and population. Understanding supply and demand dynamics helps explain price determination and market equilibrium in agricultural markets.



**Fig. 1 wk21:** Demand and Supply Graph

- c. **Marginal Analysis:** Marginal analysis involves evaluating the incremental changes or additions in costs, benefits or outputs associated with a specific decision or activity. Agricultural economists use marginal analysis to assess the trade-offs and make decisions at the margin, considering the costs and benefits of producing additional units of output,

adopting new technologies or making changes in resource allocation. This principle helps optimise resource utilisation and improve efficiency in agricultural production.

- d. **Comparative Advantage:** The principle of comparative advantage recognises that countries or regions should specialise in producing goods or services in which they have a lower opportunity cost compared with others. In Agriculture, this principle guides trade and specialisation decisions based on factors such as climate, natural resources and production efficiency. Comparative advantage promotes efficiency, international trade and mutually beneficial exchanges in the global agricultural market.
- e. **Efficiency and Productivity:** Efficiency refers to the ability to produce the maximum amount of output from a given set of inputs or resources. Productivity measures the output per unit of input. Agricultural economics emphasises the importance of improving efficiency and productivity in agricultural production through better resource management, technological advancements, innovation and best management practices. Enhancing efficiency and productivity contributes to sustainable agricultural development and increased competitiveness.
- f. **Rational Decision Making:** Rational decision-making assumes that individuals, including farmers and consumers, make choices based on their preferences and in a manner that maximises their well-being or utility. Agricultural economics examines the factors that influence decision-making such as information, prices, risk and incentives. Understanding rational decision-making processes helps predict and analyse farmers' behaviour, consumer choices, and the impacts of policies and interventions.
- g. **Externalities and Public Goods:** Externalities are the unintended positive or negative effects of agricultural activities on third parties or the environment. Public goods are goods or services that are non-excludable and non-rivalrous, meaning they are available to all and their consumption by one person does not reduce availability for others. Agricultural economics examines the impacts of externalities, such as pollution or ecosystem services, and the provision of public goods such as agricultural research or extension services. It explores ways to internalise external costs or provide public goods efficiently.
- h. **Role of Government:** Agricultural economics recognises the role of government in shaping agricultural policies, regulations, and interventions. It examines the impacts of government actions on agricultural markets, production decisions, income distribution, food security, and environmental sustainability. Understanding the role of government helps assess the efficiency, equity, and effectiveness of agricultural policies and interventions.

### 3. Factors affecting Agricultural production

- a. **Land:** Land is a crucial factor of production in Agriculture. It includes not only the physical space available for agricultural activities but also the natural resources and fertility of the land. Land provides the foundation for crop cultivation, livestock rearing and other agricultural activities.
- b. **Labour:** Labour encompasses the physical and mental effort exerted by individuals involved in agricultural production. It includes activities such as planting, harvesting, animal care, machinery operation and farm management. Labour can be classified as hired labour, family labour or contracted labour.
- c. **Capital:** Capital refers to the financial resources, machinery, equipment, infrastructure and technologies used in agricultural production. It includes investments in tractors, irrigation systems, farm buildings, vehicles, storage facilities and other physical assets. Capital plays a vital role in improving productivity, efficiency and mechanisation in Agriculture.
- d. **Entrepreneurship:** Entrepreneurship represents the managerial skills, knowledge and decision-making ability of individuals involved in agricultural production. Entrepreneurs or farm managers combine the other factors of production to plan, organise and manage agricultural operations. They make strategic decisions related to resource allocation, marketing, risk management and innovation.

- e. **Technology:** Technology is an increasingly important factor of production in modern Agriculture. It includes advances in agricultural machinery, biotechnology, precision farming, irrigation systems, genetic engineering and other scientific innovations. Technological advancements enhance productivity, efficiency and sustainability in agricultural production.
- f. **Inputs:** Inputs include various resources used in agricultural production such as seeds, fertilisers, pesticides, feed, energy (e.g., fuel, electricity) and water. Inputs are essential for crop cultivation, livestock production and other agricultural activities. The choice and management of inputs significantly influence the productivity and environmental impact of agricultural systems.

Factors affecting Agricultural production	<ul style="list-style-type: none"> <li>• Land</li> <li>• Labour</li> <li>• Capital</li> <li>• Entrepreneurship</li> <li>• Technology</li> <li>• Inputs</li> </ul>
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**Fig. 2 wk21:** *Factors affecting Agricultural production*

#### 4. Importance of Agricultural Economics

- a. **Efficient Resource Allocation:** Agricultural economics helps in optimising the allocation of scarce resources such as land, labour, capital and technology in agricultural production. It provides insights into efficient resource management, ensuring that resources are utilised productively and sustainably, thereby increasing agricultural productivity.
- b. **Farm Profitability and Sustainability:** Agricultural economics assists farmers in making informed decisions regarding production techniques, input usage, crop selection and risk management strategies. By analysing costs, revenues and market conditions, it helps farmers maximise profits, enhance farm sustainability and improve their overall economic well-being.
- c. **Food Security and Availability:** Agricultural economics contributes to ensuring food security by studying factors influencing food production, consumption and distribution. It examines the drivers of food supply and demand, price stability, and the impacts of policies on food availability, accessibility, and affordability.
- d. **Policy Development and Evaluation:** Agricultural economics provides a solid foundation for designing and evaluating agricultural policies. It analyses the impacts of government interventions, trade policies, subsidies and regulations on the agricultural sector, rural communities and the overall economy. This helps policymakers make informed decisions to promote agricultural development, income redistribution and environmental sustainability.
- e. **Market Efficiency and Stability:** Agricultural economics investigates the functioning of agricultural markets, price determination and market structures. By studying supply and demand dynamics, market integration, and the impacts of market interventions, it helps identify factors that contribute to market inefficiencies, price fluctuations and market failures. This knowledge can inform policy interventions aimed at improving market efficiency and stability.
- f. **Rural Development and Poverty Alleviation:** Agricultural economics plays a vital role in rural development efforts. By analysing the economic dynamics of rural areas, it helps identify strategies to improve livelihoods, reduce poverty, enhance rural infrastructure and promote economic diversification beyond Agriculture.

- g. **Environmental Sustainability:** Agricultural economics addresses the sustainability challenges faced by the agricultural sector. It examines the economic implications of natural resource management, sustainable farming practices and environmental regulations. Studying the trade-offs between agricultural production and environmental conservation helps develop policies and incentives that promote environmentally sustainable Agriculture.
- h. **International Trade and Global Relations:** Agricultural economics provides insights into international trade in agricultural commodities and its impacts on domestic and global markets. It helps policymakers, farmers and agribusinesses understand the effects of trade policies, tariff barriers and trade agreements on agricultural trade, competitiveness and economic welfare.

Importance of Agricultural economics	<ul style="list-style-type: none"> <li>• Efficient Resource Allocation</li> <li>• Farm Profitability and Sustainability</li> <li>• Food Security and Availability</li> <li>• Policy Development and Evaluation</li> <li>• Market Efficiency and Stability</li> <li>• Rural Development and Poverty Alleviation</li> <li>• Environmental Sustainability</li> <li>• International Trade and Global Relations</li> </ul>
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**Fig. 3 wk21:** *Importance of Agricultural economics*

### Learning Tasks

1. Define agricultural economics
2. Explain the principles of agricultural economics
3. Discuss the importance of agricultural economics and the factors that affect agricultural production

### Pedagogical Exemplars

**Think-pair-share:** Learners individually think about what they know about **Agricultural Economics** and share with a peer in their group. Teachers should guide learners with difficulties with leading questions that will help them to come up with the meaning, principles, factors and importance of **Agricultural Economics**. Confident learners should be guided with probing questions to give further explanations. The teacher should also assign roles equitably to learners in the groups.

**Inquiry-based learning:** In mixed-gender groups, learners surf for information from the Internet on agricultural economics, its principles, importance and factors. They then discuss their findings in class. The teacher should help learners with suitable website links so that they can access the information needed for discussion. The teacher should monitor learners not to veer into unapproved sites. The teacher should ensure that all learners fully participate in the activity. Confident learners should be given leading roles in discussing their findings.



## Key Assessments

**Assessment Level 1:** List the principles of agricultural economics

**Assessment Level 2:** Explain the meaning of agricultural economics.

**Assessment Level 3:** How would you convince a farmer of the need to consider agricultural economics in his/her farming enterprise?

**Assessment Level 4:** How would you harness the factors that affect Agricultural production to increase food production?

## Theme or Focal Area: Farm as Economic Unit

### 1. Farm as an economic unit

A farm can be considered as an economic unit, also known as a farming enterprise or agricultural business, due to the following reasons:

- a. **Production:** A farm operates to produce agricultural goods or services such as crops, livestock, dairy products, poultry or horticultural products. It combines various inputs such as land, labour, capital and technology, to produce output for sale in the market. The farm's production activities generate revenue and contribute to the overall economic activity.
- b. **Profitability:** The economic unit perspective emphasises the farm's profitability as a primary objective. Farms aim to generate positive net income by selling their output at prices that cover production costs and provide a return on investment. Profitability is crucial for the financial viability, sustainability, and long-term growth of the farm.
- c. **Resource Allocation:** Treating the farm as an economic unit involves making decisions regarding the allocation of scarce resources such as land, labour, capital and technology. The farm manager or owner considers factors such as cost, productivity, market demand and profitability to optimise the use of resources and maximise the farm's output and profitability.
- d. **Cost and Revenue Analysis:** An economic unit approach involves analysing and managing the costs and revenues associated with farm operations. It requires monitoring and controlling expenses such as input costs, labour costs, machinery maintenance and overhead expenses. **Revenue analysis** focuses on understanding market prices, market demand, marketing strategies and sales volume to optimise the farm's income generation.
- e. **Risk Management:** Farms face various risks such as weather events, market volatility, disease outbreaks and input price fluctuations. Considering the farm as an economic unit involves assessing and managing these risks. Farm managers employ risk management strategies such as insurance, diversification hedging or forward contracting to minimise the negative impact of risks on the farm's financial performance.
- f. **Financial Management:** The economic unit perspective emphasises the importance of sound financial management. Farms maintain financial records, prepare budgets and analyse financial statements to assess the farm's financial position, profitability, liquidity and solvency. Financial management helps guide investment decisions, access financing and ensure the farm's financial stability.
- g. **Planning and Decision-making:** The economic unit concept involves strategic planning and decision-making at the farm level. Farmers analyse market conditions, input prices, technological advancements, and policy changes to make informed decisions about production levels, crop choices, livestock management, capital investments, marketing strategies and resource allocation. Planning and decision-making contribute to the farm's competitiveness and long-term success.
- h. **Compliance and Regulations:** Farms need to comply with various regulations and policies related to Agriculture, environment, labour, health and safety. Treating the farm as an



economic unit involves understanding and adhering to these regulations to ensure legal compliance and mitigate any associated risks or penalties.

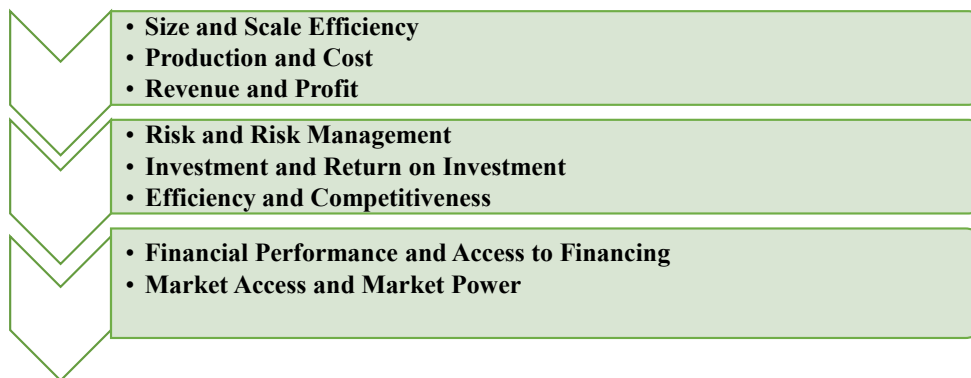
- i. **Contribution to the Economy:** Farms as economic units play a vital role in the overall economy. They contribute to employment generation, rural development, food production, income generation, export earnings, and overall economic growth. Considering the farm as an economic unit helps recognise its economic significance and impact at the local, regional, and national levels.

## 2. Inter-relationships among the economic properties of a farm

The economic properties of a farm are interrelated and influence one another in various ways. Here are some key inter-relationships among the economic properties of a farm:

- a. **Size and Scale Efficiency:** The size of the farm can impact its scale efficiency. Larger farms may benefit from economies of scale, where they can produce more output per unit of input, leading to lower average costs. As the farm size increases, it may be able to invest in more advanced technology, utilise specialised labour, and negotiate better prices for inputs and outputs. Scale efficiency, in turn, affects the profitability and competitiveness of the farm.
- b. **Production and Cost:** The production activities of a farm have a direct impact on its costs. The choice of production techniques, input usage and production levels influence the cost structure of the farm. Efficient production practices can lead to cost savings, while inefficient or wasteful production methods can increase costs. Managing production costs effectively is crucial for farm profitability and competitiveness.
- c. **Revenue and Profit:** The revenue generated by the farm is a key driver of its profitability. Revenue depends on factors such as output levels, market prices, sales volume and market access. Maximising revenue requires optimising production and marketing strategies to achieve higher prices and increased sales. Profitability, in turn, affects the financial viability and sustainability of the farm.
- d. **Risk and Risk Management:** Farms face various types of risks, including market risks, weather risks and input price risks. The economic properties of the farm such as the size, diversification of enterprises and financial stability, influence its risk exposure and ability to manage risks. Effective risk management strategies, such as insurance, hedging and diversification can help mitigate the adverse effects of risks on farm income and financial stability.
- e. **Investment and Return on Investment:** Investments in the farm such as land, machinery, infrastructure and technology, affect its productivity and profitability. The economic properties of the farm such as its financial resources, access to credit and expected returns, influence investment decisions. Evaluating the return on investment helps farmers assess the profitability and feasibility of potential investments and make informed investment choices.
- f. **Efficiency and Competitiveness:** The economic properties of the farm, including production efficiency, cost efficiency and scale efficiency, contribute to its overall competitiveness. Efficient farms can produce goods or services at a lower cost or higher quality compared with their competitors, giving them a competitive advantage. Enhancing efficiency through better resource management, technological advancements and improved practices is crucial for maintaining competitiveness in the agricultural industry.
- g. **Financial Performance and Access to Financing:** The financial performance of the farm, including profitability, liquidity, and solvency, affects its ability to access financing. Financial institutions consider the economic properties of the farm, such as profitability, collateral value and repayment capacity, when evaluating loan applications. Good financial performance improves the farm's creditworthiness and increases its chances of obtaining favourable financing terms.
- h. **Market Access and Market Power:** The economic properties of the farm can influence its market access and market power. Factors such as farm size, product differentiation,

branding and market relationships can impact a farm's ability to access markets and negotiate favourable terms. Market access and market power affect the farm's ability to generate revenue, capture value in the supply chain and influence market outcomes.



**Fig. 3 wk21:** Key inter-relationships between the economic properties of a farm

### 3. Importance of farm as an economic unit

Considering the farm as an economic unit is important for several reasons:

- a. **Decision-making:** Treating the farm as an economic unit allows farmers to make informed decisions about resource allocation, production techniques, input usage, marketing strategies and risk management. By analysing costs, revenues and profitability at the farm level, farmers can optimise their decision-making process and improve overall farm performance.
- b. **Profitability:** Viewing the farm as an economic unit helps farmers focus on maximising profits. By considering the costs and returns associated with different farm enterprises or activities, farmers can identify the most profitable ventures and allocate resources accordingly. This approach contributes to the long-term financial viability and sustainability of the farm.
- c. **Resource Management:** Treating the farm as an economic unit facilitates efficient resource management. Farmers can analyse the utilisation of resources such as land, labour, capital and technology within the farm. This allows them to identify opportunities for resource optimisation, minimise waste and achieve higher productivity levels.
- d. **Cost Control:** Managing costs is crucial for farm profitability. By considering the farm as an economic unit, farmers can closely monitor and control various cost factors such as input prices, labour expenses and overhead costs. This enables them to implement cost-saving measures, improve efficiency, and enhance their competitive position.
- e. **Performance Evaluation:** Viewing the farm as an economic unit provides a framework for evaluating the farm's performance over time. Farmers can assess key financial indicators such as gross margin, net income, return on investment and efficiency ratios. This evaluation helps identify strengths, weaknesses, and areas for improvement, guiding future decision-making and strategic planning.
- f. **Risk Management:** Understanding the farm as an economic unit helps farmers assess and manage risks effectively. By considering the financial implications of various risks such as market fluctuations, weather events and input price volatility, farmers can implement risk mitigation strategies such as diversification, insurance and hedging to protect their economic interests.
- g. **Planning and Investment:** Treating the farm as an economic unit provides a basis for long-term planning and investment decisions. Farmers can analyse the financial feasibility and potential returns of different investment options, expansion plans, and technology adoption. This supports sound investment decisions and facilitates the growth and development of the farm.

- h. **Benchmarking and Comparisons:** By considering the farm as an economic unit, farmers can benchmark their performance against industry standards or similar farms. This allows them to identify areas of improvement, learn from best practices and make necessary adjustments to enhance their competitive position.
- i. **Access to Financing and Support:** Financial institutions and agricultural support organisations often require a clear understanding of the farm as an economic unit when assessing loan applications or providing assistance. By presenting a comprehensive economic analysis of the farm, farmers can improve their chances of securing financing and accessing support programmes.
- j. **Policy Advocacy:** Treating the farm as an economic unit provides a solid foundation for advocating policies that support the economic viability and sustainability of the agricultural sector. By demonstrating the importance of farms as economic units and highlighting their contributions to local economies, policymakers can be better informed when making decisions that impact Agriculture.

Overall, considering the farm as an economic unit allows farmers to make informed decisions, optimise resource allocation, control costs, manage risks, evaluate performance, plan for the future, access financing and support, and advocate for favourable policies.

### Learning Tasks

1. List the importance of farm as an economic unit.
2. Explain the key inter-relationships between the economic properties of a farm.
3. Identify an agricultural enterprise on your school campus or community and discuss why it is an economic unit.

### Pedagogical Exemplars

**Managing talk for learning:** Learners in mixed-ability groups discuss the importance of farm as an economic unit and the inter-relationship(s) between the economic properties of a farm. The teacher should use pictures, show videos or documentaries that will provide information on the farm as an economic unit and their inter-relationship(s). Learners with visual or hearing difficulties should be given the needed support when viewing pictures, videos or documentaries.

**Project-based learning:** The teacher puts learners in mixed-ability groups and tasks them to identify an agricultural enterprise on their school campus or community, find out why it is an economic unit and write a report on it. Teachers should assist learners with examples of questions to ask and observations to make to enable them to identify why the farm is an economic unit. All learners should be encouraged to take part in the task. Challenge learners who can ask further questions besides what the teacher has given on why the farm is considered an economic unit to do so.

### Key Assessments

**Assessment Level 1:** Outline the importance of farm as an economic unit.

**Assessment Level 2:** Explain two (2) reasons for considering the farm as an economic unit.

**Assessment Level 3:** Use a future wheel to describe two (2) inter-relationships among the economic properties of the farm.

**Assessment Level 4:** Why will you consider decision-making and risk management as a significant component of the farm as an economic unit?

## Theme or Focal Area: **Application of the Principles of Agricultural Economics**

### 1. Meaning of an Agriculture enterprise

An Agriculture enterprise refers to a business venture that is involved in agricultural production, processing or related activities. It encompasses activities such as crop cultivation, livestock rearing, dairy farming, poultry production, aquaculture, horticulture, agro-processing and agricultural services.

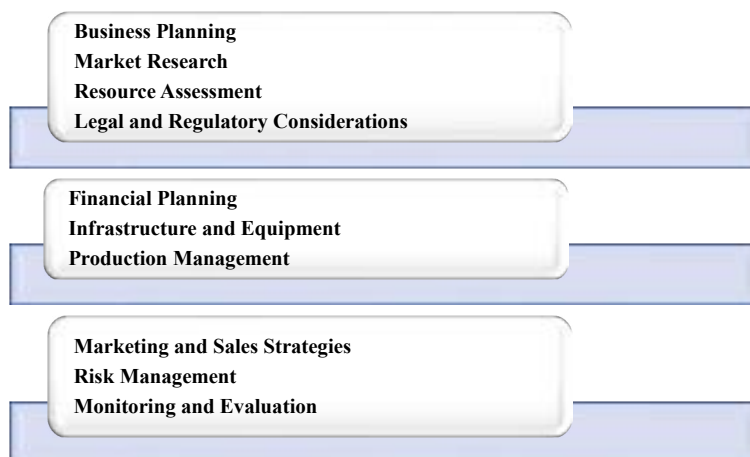
### 2. Steps involved in setting up an Agriculture enterprise

Setting up an agricultural enterprise involves consideration of some steps such as:

- a. **Business Planning:** Start by developing a comprehensive business plan that outlines your objectives, target market, production activities, marketing strategies, financial projections and resource requirements. A business plan serves as a roadmap for your enterprise and helps attract financing and investment.
- b. **Market Research:** Conduct market research to identify potential customers, market demand and competitors. Understand consumer preferences, market trends and pricing dynamics in your target market. This information will help you determine the types of products to produce, the appropriate scale of production and potential marketing strategies.
- c. **Resource Assessment:** Assess the resources required for your agricultural enterprise, including land, labour, capital and technology. Evaluate the availability and suitability of land for your intended agricultural activities. Determine the labour requirements and consider whether you will utilise family labour, hire employees or outsource certain tasks. Evaluate the capital investment needed for infrastructure, machinery, equipment and initial working capital. Assess the technological requirements to optimise production and efficiency.
- d. **Legal and Regulatory Considerations:** Understand the legal and regulatory requirements related to starting an agricultural enterprise. This includes permits, licenses, land use regulations, environmental regulations, zoning restrictions and compliance with food safety standards. Ensure that you comply with all applicable laws and regulations to avoid legal issues and penalties.
- e. **Financial Planning:** Develop a detailed financial plan that includes start-up costs, operational expenses, revenue projections and cash flow analysis. Determine the potential sources of funding, such as personal savings, loans, grants or investments. Consider the financial feasibility of the enterprise and establish a system for financial management, record keeping and accounting.
- f. **Infrastructure and Equipment:** Assess the infrastructure and equipment needed for your agricultural activities. This may include farm buildings, irrigation systems, fencing, storage facilities, processing equipment, machinery, vehicles and tools. Determine the appropriate scale and capacity of infrastructure and equipment based on your production goals and budget.
- g. **Production Management:** Develop a production plan that includes crop or livestock selection, cultivation practices, breeding programmes, feed management, pest and disease control measures and harvesting or processing techniques. Implement efficient production systems and techniques that align with sustainable and environmentally friendly practices.
- h. **Marketing and Sales Strategies:** Develop marketing and sales strategies to effectively promote and sell your agricultural products. Identify target markets, distribution channels, pricing strategies and branding opportunities. Consider direct sales to consumers, farmers' markets, wholesale buyers, retailers or value-added processing options. Utilise online platforms and social media to reach a wider customer base.
- i. **Risk Management:** Identify and assess potential risks and develop risk management strategies. This includes risks related to production, market volatility, weather events,

diseases and financial factors. Implement risk mitigation measures such as insurance, diversification and contingency planning to minimise the impact of unforeseen events.

- j. **Monitoring and Evaluation:** Continuously monitor and evaluate the performance of your agricultural enterprise. Track key performance indicators, financial metrics, production yields, customer feedback and market trends. Regularly review your business plan and adjust strategies as needed to adapt to changing conditions and improve profitability.



**Fig. 4 wk21:** Steps involved in setting up an agricultural enterprise

### 3. Applications of the Principles of Agriculture

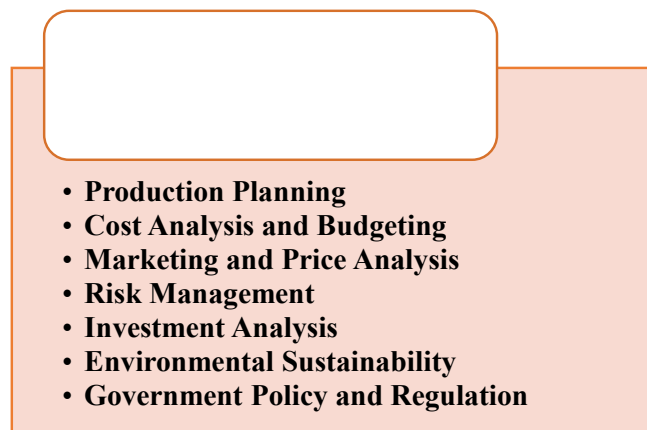
Some ways these principles can be applied:

- Production Planning:** Principles such as supply and demand analysis, comparative advantage and rational decision-making can guide production planning. Farm managers can assess market demand, analyse input prices and consider the farm's competitive advantage to determine which crops or livestock to produce. Rational decision-making principles can help optimise resource allocation, taking into account factors such as input costs, labour availability and market potential.
- Cost Analysis and Budgeting:** Principles of cost analysis and budgeting help farm managers monitor and control expenses. By conducting cost analysis, farm managers can identify the major cost drivers and evaluate the efficiency of various inputs and production practices. Budgeting involves estimating revenue and expenses for a specific period and comparing them to make informed financial decisions. This ensures that costs are managed effectively and resources are allocated optimally.
- Marketing and Price Analysis:** Understanding market dynamics and applying principles of supply and demand and comparative advantage can assist in marketing strategies. Farm managers can analyse market trends, identify target markets and develop pricing strategies based on production costs and market conditions. Price analysis helps assess the competitiveness of the farm's products and determine the optimal pricing strategy to maximise revenue and market share.
- Risk Management:** Principles such as risk analysis, diversification and efficiency can guide risk management decisions. Farm managers can assess various risks, including price volatility, weather events, and market fluctuations, and develop risk management strategies accordingly. Diversification of crops or livestock, insurance coverage and adopting efficient production practices help mitigate risks and safeguard the farm's financial stability.
- Investment Analysis:** When considering capital investments, principles of marginal analysis, cost-benefit analysis, and financial management are applied. Farm managers can evaluate the incremental costs and benefits associated with an investment, assess the potential returns and consider factors such as the payback period, return on investment



and financial feasibility. This helps make sound investment decisions that contribute to the farm's long-term profitability.

- f. **Environmental Sustainability:** Principles of sustainability and externalities guide the management of agricultural enterprises with a focus on environmental stewardship. Farm managers can adopt practices that minimise negative environmental impacts, promote soil and water conservation, reduce chemical use, and enhance biodiversity. Incorporating sustainability principles ensures the long-term viability of the farm while addressing societal and environmental concerns.
- g. **Government Policy and Regulation:** Understanding the role of government in Agriculture and applying principles of agricultural economics helps navigate government policies, regulations and programmes. Farm managers can stay informed about agricultural policies, subsidies, trade agreements and environmental regulations. By aligning their management practices with relevant policies, they can optimise benefits, comply with regulations and take advantage of available support programmes.



**Fig 5 wk21:** *Application of the principles of Agricultural enterprise*

### Learning Tasks

1. Define agricultural enterprise.
2. Explain the steps involved in setting up an agricultural enterprise.
3. Discuss the ways the principles of agricultural enterprise can be applied.

**Think-pair-share:** Learners individually brainstorm to come up with the meaning of agricultural enterprise and share their findings with their peers. The pair should then search the Internet for information on the steps involved in setting up an agricultural enterprise and how the principles of Agricultural enterprise are applied. Learners should be supported with leading questions to help them explain the meaning of agricultural enterprise. Where possible, the teacher should support learners with relevant websites or charts/pictures of the steps involved in setting up an agricultural enterprise and how the principles of Agricultural enterprise are applied. The teacher should monitor the content of what learners browse. Encourage learners with the ability to use the Internet to assist their peers.

**Project-based learning:** The teacher should put learners in mixed-ability groups to list the various principles and analyse how they affect Agricultural enterprise for presentation in class. The teacher should assist learners in analysing how the principles affect Agricultural enterprise. All learners should take part in preparation before and during the presentation. Some learners should be selected to play leading roles in the group work. Learners should respect and tolerate each other's views.



### **Key Assessments**

**Assessment Level 1:** Outline the steps involved in setting up an agricultural enterprise.

**Assessment Level 2:** Explain the meaning of Agricultural enterprise to a farmer.

**Assessment Level 3:** Analyse how three (3) principles of Agricultural economics can be applied in the management of an agricultural enterprise.

**Assessment Level 4:** How can marketing and price analysis affect the establishment of an agricultural enterprise?

**WEEK 22****Learning Indicators:**

1. Explain the meaning and importance of Agricultural communication.
2. Outline the strategies for effective communication and the various branches of communication in Agriculture.

**Theme or Focal Area: Meaning and Importance of Agriculture Communication****1. Meaning of Agricultural communication**

Agricultural communication refers to the exchange of information, ideas and knowledge related to agricultural practices, policies, innovations and issues among various stakeholders within the agricultural sector and with the broader society. It involves effective communication strategies and channels to disseminate agricultural information, educate and engage farmers, policymakers, researchers, consumers and the public.



Source: Hashem et al. (2021).

Fig 1 wk 22: Agricultural information and communication technologies

**2. Importance of Agriculture communication**

- a. **Knowledge Sharing and Capacity Building:** Agricultural communication facilitates the sharing of knowledge, research findings and technological advancements within the agricultural community. It helps farmers, extension workers, researchers, and policymakers stay updated with the latest innovations, scientific breakthroughs, and best practices. This enables capacity building and promotes continuous learning and improvement in agricultural practices.
- a. **Farmers' Empowerment:** Effective agricultural communication empowers farmers by providing them with relevant information and resources to make informed decisions. It enhances their understanding of market opportunities, price trends, value-added practices

and sustainable farming methods. Empowered farmers are better equipped to manage risks, adopt new technologies, access finance, and improve their livelihoods.

- b. **Policy Advocacy and Engagement:** Agricultural communication plays a vital role in advocating for farmer-friendly policies, addressing agricultural challenges, and influencing policy decisions. It helps bridge the gap between farmers, policymakers and other stakeholders by facilitating dialogue, sharing insights and conveying the needs and perspectives of the agricultural community. Effective communication can shape policies that promote sustainable Agriculture, rural development and food security.
- c. **Consumer Awareness and Education:** Agricultural communication plays a critical role in educating consumers about food production, safety, nutrition and sustainability. It helps create awareness of the benefits of locally produced food, organic farming, fair trade practices, and responsible consumption. Communication campaigns can address misconceptions, build trust, and promote informed choices among consumers.
- d. **Crisis Communication and Risk Management:** In times of agricultural crises such as disease outbreaks, natural disasters, or market disruptions, effective communication is crucial. It enables rapid dissemination of information, crisis management strategies, and coordination among stakeholders. Transparent and timely communication helps manage risks, minimise panic, and maintain public confidence in the Agriculture sector.
- e. **Innovation and Technology Adoption:** Agricultural communication plays a significant role in promoting the adoption of innovative technologies and practices. It disseminates information about new tools, techniques and research findings that can enhance agricultural productivity, resource efficiency and sustainability. Communication channels and platforms facilitate knowledge transfer and encourage farmers to embrace new approaches.
- f. **Collaboration and Networking:** Agricultural communication fosters collaboration and networking among diverse stakeholders in the agricultural sector. It brings together farmers, researchers, policymakers, agribusinesses, NGOs and other actors to share experiences, collaborate on projects and address common challenges. Effective communication facilitates the exchange of ideas, expertise and resources, leading to innovation and synergies.

Importance of Agricultural communication	<ul style="list-style-type: none"> <li>• Knowledge Sharing and Capacity Building</li> <li>• Farmers' Empowerment</li> <li>• Policy Advocacy and Engagement</li> <li>• Consumer Awareness and Education</li> <li>• Crisis Communication and Risk Management</li> <li>• Innovation and Technology Adoption</li> <li>• Collaboration and Networking</li> </ul>
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**Fig. 2 wk21:** *Importance of Agriculture communication*

### Learning Tasks

1. Define agricultural communication.
2. Outline the importance of Agricultural communication.
3. Explain the importance of agricultural communication.

## Pedagogical Exemplars

**Building on what others say:** Learners work in pairs to bring out the meaning, branches and importance of communication as well as strategies for effective communication after watching a video or documentary on agricultural communication. Learners discuss their observations and ideas by building on what their peers have said. The teacher should guide learners with difficulties with leading questions that will help them to come up with the meaning, branches, importance and strategies for effective communication. The teacher should ensure that each student takes an active part in the discussion.

**Structuring talk for learning:** Learners work in mixed-ability groups to bring out and discuss the meaning and importance of agricultural communication. The teacher should assist learners with difficulties with leading questions that will help them to come up with the meaning and importance of agricultural communication. Learners who can only define and list the importance of Agriculture should be allowed to do so. Those who can give further details on the meaning and importance of agricultural communication should be encouraged to do so.

## Key Assessments

**Assessment Level 1:** List the importance of agricultural communication.

**Assessment Level 2:** Explain the meaning of agricultural communication.

**Assessment Level 3:** Justify three (3) reasons for the application of communication in Agriculture.

**Assessment Level 4:** Justify the reason why communication in Agriculture is important in bringing innovations in agricultural production.

## Theme or Focal Area: Strategies for Effective Communication in Agriculture

### 1. Strategies for effective communication in Agriculture

Effective communication in Agriculture can be achieved through:

- a. **Understand the Audience:** Identify and understand your target audience, whether it is farmers, policymakers, consumers or other stakeholders. Consider their needs, knowledge level, language preferences and the communication channels they are most likely to use. Tailor your messages and communication approach accordingly to resonate with your audience.
- b. **Use Clear and Simple Language:** Avoid technical jargon and use clear, simple language that is easily understandable by the intended audience. Communicate complex agricultural concepts in a way that is relatable and accessible. Use visuals, diagrams and real-life examples to enhance clarity and comprehension.
- c. **Choose Appropriate Communication Channels:** Utilise a mix of communication channels to reach your target audience effectively. This may include traditional channels such as radio, television, print media, and face-to-face interactions, as well as digital platforms such as websites, social media, mobile applications, and email newsletters. Select the channels that are most accessible and widely used by your target audience.
- d. **Tell Compelling Stories:** Stories have a powerful impact on people's understanding and engagement. Share success stories, case studies and testimonials that highlight the positive impact of agricultural practices or innovations. Use storytelling techniques to evoke emotions, inspire action and create a personal connection with your audience.
- e. **Provide Practical and Actionable Information:** Focus on providing practical and actionable information that farmers or other stakeholders can implement in their operations or daily lives. Offer step-by-step guidance, tips and best practices that are relevant and

achievable. Support the information with visuals, demonstrations or hands-on training to enhance understanding and application.

- f. **Build Relationships and Trust:** Invest in building relationships and trust with your audience. Be transparent, credible and responsive to their needs. Establish yourself as a reliable source of information by consistently delivering accurate and timely content. Engage in two-way communication, listen to feedback and address concerns promptly to foster trust and long-term engagement.
- g. **Monitor and Evaluate:** Continuously monitor and evaluate the effectiveness of your communication efforts. Gather feedback from your audience, measure engagement levels and assess the impact of your communication initiatives. Use this information to refine your strategies, improve the relevance of your messages and adapt to the evolving needs of your target audience.

## 2. Branches of Agriculture Communication

- a. **Agricultural Extension:** Agricultural extension involves the communication of agricultural knowledge, information and technologies to farmers, rural communities and other stakeholders. It is aimed at bridging the gap between research and practice by delivering technical advice, training programmes, demonstrations, and field visits to enhance farmers' skills, knowledge and adoption of best practices.
- b. **Science Communication:** Science communication in Agriculture focuses on communicating scientific research and advancements to a broader audience, including farmers, policymakers, students and the general public. It involves translating complex scientific concepts into accessible and engaging language, utilising various communication channels and strategies to promote understanding and appreciation for agricultural research and innovations.
- c. **Agri-Marketing Communication:** Agri-marketing communication focuses on promoting agricultural products, services and brands to targeted markets. It involves developing marketing strategies, conducting market research, designing promotional materials, advertising, public relations and building relationships with customers and stakeholders. Agri-marketing communication aims to create awareness, generate demand and enhance the reputation and competitiveness of agricultural products.
- d. **Rural Communication:** Rural communication focuses on communication and information needs specific to rural communities and agricultural regions. It involves addressing the unique challenges faced by rural populations such as limited access to information, technology and resources. Rural communication aims to empower rural communities, promote development initiatives and facilitate two-way communication between rural populations and external stakeholders.
- e. **Crisis Communication:** Crisis communication in Agriculture deals with communicating effectively during agricultural crises or emergencies. This includes outbreaks of diseases, natural disasters, food safety scares or market disruptions. Crisis communication aims to provide accurate and timely information, manage public perception, minimise panic and coordinate responses among stakeholders to address the crisis effectively.
- f. **Policy Communication:** Policy communication focuses on facilitating communication and engagement between policymakers, agricultural organisations and stakeholders. It involves advocating for farmer-friendly policies, disseminating policy information, organising policy dialogues and forums, and providing input to policy-making processes. Policy communication aims to ensure that policies align with the needs and aspirations of the agricultural sector and promote sustainable Agriculture.
- g. **Consumer Education and Communication:** Consumer education and communication in Agriculture aims to raise awareness, educate and engage consumers on food production, safety, nutrition and sustainable farming practices. It involves communicating information about food labelling, certifications, responsible consumption and the benefits of locally

produced and sustainable food. Consumer education and communication play a crucial role in building trust, fostering informed choices and promoting sustainable food systems.

### Learning Tasks

1. Outline the strategies for effective communication.
2. Explain the branches of communication in Agriculture.
3. Discuss how social media platforms such as Facebook, WhatsApp, TikTok, YouTube, X, Instagram and LinkedIn can be used to promote agricultural production.

### Pedagogical Exemplars

**Managing talk for learning:** Put learners in mixed-ability groups to watch a documentary on strategies for effective communication and discuss what they have observed in their groups. Learners should be supported to list the breeds and factors that affect the distribution of farm animals. Others should be guided to explain the factors that affect the distribution of farm animal breeds in Ghana. Allow those who can discuss the factors that influence the distribution of farm animal breeds in West Africa on their own to do so.

**Enquiry-based learning:** In pairs, learners investigate using the Internet for information on the strategies, branches and social media platforms for communication and report on their findings. The teacher should support learners with videos that demonstrate the use of social media platforms such as Facebook, WhatsApp, TikTok, YouTube, X, Instagram and LinkedIn. The teacher should also allow some learners to demonstrate how to communicate effectively in class by reporting on the investigations made via the Internet.

### Key Assessments

**Assessment Level 1:** List four (4) branches of agricultural communication.

**Assessment Level 2:** Explain three (3) strategies for effective communication in an agricultural set-up.

**Assessment Level 3:** Identify two (2) branches of agricultural communication and describe the role of each in promoting Agricultural production.

**Assessment Level 4:** Justify the reason for which telling compelling stories is an effective strategy for communication in Agriculture.



**WEEK 23****Learning Indicator(s):**

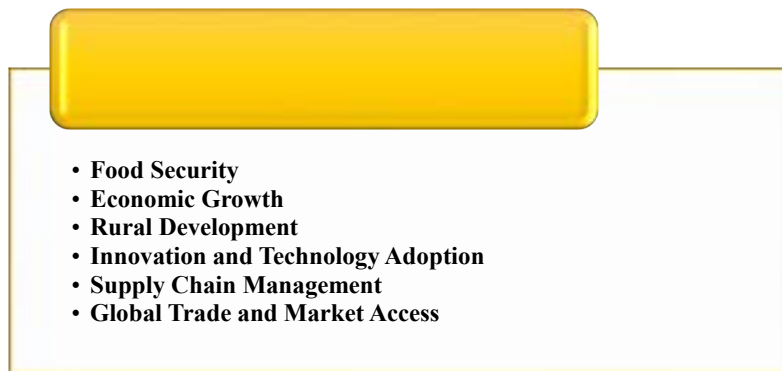
1. *Explain the meaning and importance of agribusiness management.*
2. *Catalogue the activities carried out in agribusiness management and outline their functions.*

**Theme or Focal Area: Meaning and Importance of Agribusiness****1. Meaning of Agribusiness**

Agribusiness management refers to the application of management principles and practices in the agricultural sector, encompassing the planning, organising, coordinating and controlling of agricultural activities, resources and operations. It involves managing various aspects of agricultural enterprises, including production, marketing, finance, human resources and strategic decision-making. Agribusiness management focuses on optimising productivity, profitability and sustainability in agricultural operations.

**2. Importance of Agribusiness**

- a. **Food Security:** Agribusiness ensures a steady food supply by managing the production, processing, distribution and marketing of agricultural products. It contributes to ensuring that food reaches consumers efficiently and reliably, thus addressing food security concerns globally.
- b. **Economic Growth:** Agribusiness is a significant contributor to economic growth and development in many countries. It provides employment opportunities across various sectors, from farming to food processing, transportation, marketing and retail. Additionally, agribusiness generates revenue through exports, further stimulating economic growth.
- c. **Rural Development:** Agribusiness is often the backbone of rural economies. It provides livelihoods for millions of people living in rural areas, thereby reducing poverty and supporting sustainable development. Moreover, agribusiness investments in rural infrastructure such as roads, storage facilities and marketplaces can spur additional economic activities and improve living standards.
- d. **Innovation and Technology Adoption:** Agribusiness drives innovation in Agriculture by investing in research and development, leading to improved farming practices, crop varieties and animal breeds. Technology adoption in agribusiness such as precision Agriculture, drones, genetic engineering and biotechnology, enhances productivity, efficiency and sustainability in food production.
- e. **Supply Chain Management:** Agribusiness involves complex supply chains that link farmers, processors, distributors, retailers and consumers. Effective supply chain management ensures the timely delivery of quality products while minimising waste and costs. This requires coordination, logistics and investment in infrastructure and information systems.
- f. **Global Trade and Market Access:** Agribusiness facilitates international trade by connecting producers with consumers across borders. It allows countries to specialise in the production of certain agricultural commodities based on comparative advantages and trade them for goods they cannot produce efficiently. However, challenges such as trade barriers, subsidies and market volatility must be addressed to ensure fair and equitable trade.



**Fig. 1 wk23: Importance of Agribusiness**

### Learning Tasks

1. Define agribusiness management.
2. Explain the importance of agribusiness management.
3. Discuss the importance of agribusiness management.

### Pedagogical Exemplars

**Problem-based learning:** The teacher puts learners in mixed-ability groups and challenges them to find out the meaning and importance of agribusiness management via internet search. Learners then make a presentation on how to convince a friend to choose a particular agribusiness enterprise. All learners should be encouraged to take part in the presentation. The teacher should monitor learners to ensure that they use the right websites. Where necessary, the teacher should support learners with the right websites.

**Think-pair-share:** Learners individually think about the meaning and importance of agricultural agribusiness management and write down their answers. The teacher puts learners in pairs to discuss the meaning and importance of agricultural agribusiness management. The teacher should provide extra support to some learners to explain the meaning and importance of agribusiness management. The teacher should allow others to discuss the importance of agribusiness management. Talented learners should be made to assist others in understanding the meaning and importance of agricultural agribusiness management.

### Key Assessments

**Assessment Level 1:** What is agribusiness management?

**Assessment Level 2:** Explain the meaning of agribusiness management.

**Assessment Level 3:** Discuss any three (3) important aspects of agribusiness management.

**Assessment Level 4:** How can agribusiness management entice farmers to produce more food?

## Theme or Focal Area: **Activities of Agribusiness Management**

### 1. **Activities carried out in agribusiness management**

Activities in agribusiness management can vary depending on the specific enterprise and its objectives. However, some common activities carried out in agribusiness management include:

- a. **Strategic Planning:** Agribusiness managers develop long-term strategies to achieve organisational goals. This involves analysing market trends, identifying opportunities and threats, setting objectives, and formulating plans to allocate resources effectively.
- b. **Financial Management:** Agribusiness managers handle financial aspects such as budgeting, cash flow management, financial analysis and investment decisions. They assess the profitability of different activities, manage expenses, secure financing, and ensure compliance with financial regulations.
- c. **Production Management:** This involves planning and overseeing agricultural production activities, including crop cultivation, livestock rearing and aquaculture. Agribusiness managers optimise production processes, monitor yields, manage input resources (such as seeds, fertilisers, and feed), and implement quality control measures.
- d. **Supply Chain Management:** Agribusinesses operate within complex supply chains that involve multiple stakeholders, including suppliers, distributors, retailers and consumers. Managers coordinate the flow of goods and services, manage inventory levels, negotiate contracts and ensure timely delivery while minimising costs and risks.
- e. **Marketing and Sales:** Agribusiness managers develop marketing strategies to promote agricultural products and maximise sales. This involves market research, branding, advertising, pricing, distribution channel management and customer relationship management.
- f. **Risk Management:** Agribusinesses face various risks, including weather-related risks, price volatility, regulatory changes and supply chain disruptions. Managers implement risk management strategies such as insurance, hedging, diversification and contingency planning to mitigate these risks and ensure business continuity.
- g. **Human Resource Management:** Agribusiness managers recruit, train and manage employees to ensure optimal performance and productivity. This includes workforce planning, performance evaluation, compensation management and fostering a positive organisational culture.
- h. **Sustainability and Environmental Management:** With growing concerns about environmental sustainability, agribusiness managers focus on implementing practices that minimise environmental impact while maximising resource efficiency. This includes adopting sustainable farming techniques, reducing waste, conserving water and energy, and complying with environmental regulations.
- i. **Technology Adoption:** Agribusiness managers embrace technological innovations to enhance efficiency, productivity and competitiveness. This includes adopting precision Agriculture technologies, farm management software, Internet of Things (IoT) devices, drones and genetic engineering tools.
- j. **Government and Community Relations:** Agribusiness managers engage with government agencies, policymakers and local communities to address regulatory issues, obtain permits and build positive relationships. This may involve participating in advocacy efforts, community outreach programmes, and corporate social responsibility initiatives.

Activities in agribusiness management can vary depending on the specific enterprise and its objectives. However, some common activities carried out in agribusiness management include:



**Fig. 2 wk23:** *Common activities carried out in agribusiness management*

## 2. Functions of these activities in agribusiness management

The functions of these activities in agribusiness management are as follows:

- a. **Planning:** Establishing goals, formulating strategies, and creating action plans to guide the agricultural enterprise towards achieving its objectives.
- b. **Organising:** Structuring the resources, tasks, and responsibilities within the enterprise to optimise efficiency and coordination.
- c. **Controlling:** Monitoring and evaluating performance against set goals, ensuring compliance with standards and regulations, and taking corrective actions when necessary.
- d. **Coordinating:** Aligning various activities, departments, and stakeholders within the agricultural enterprise to work together towards common goals.
- e. **Decision-making:** Analysing information, evaluating alternatives, and making informed decisions to address challenges, seize opportunities, and optimise operations.
- f. **Leadership:** Providing guidance, motivation, and direction to employees and stakeholders, fostering a positive work culture, and promoting innovation and continuous improvement.
- g. **Communication:** Facilitating effective communication within the agricultural enterprise and with external stakeholders to ensure shared understanding, cooperation, and coordination.

## 3. Factors to consider in agribusiness management

- a. **Market Trends and Demand:** Understanding market dynamics, consumer preferences and emerging trends is crucial for making informed decisions about what to produce, how much to produce and how to position products in the market.
- b. **Weather and Climate Conditions:** Agriculture is heavily influenced by weather patterns and climatic variability. Agribusiness managers need to monitor weather forecasts, assess climate risks and implement strategies to mitigate the impact of adverse weather events on crop yields and livestock productivity.
- c. **Resource Availability and Management:** Managing natural resources such as land, water and soil fertility is essential for sustainable agricultural production. Agribusiness managers must optimise resource use, implement conservation practices, and invest in technologies that enhance resource efficiency.
- d. **Input Costs and Supply Chain Logistics:** Agribusinesses rely on inputs such as seeds, fertilisers, pesticides, feed and machinery. Managers need to monitor input prices, manage

- procurement logistics and negotiate favourable contracts with suppliers to minimise costs and ensure a reliable supply chain.
- e. **Regulatory and Policy Environment:** Agricultural enterprises are subject to various regulations related to food safety, environmental protection, labour practices and land use. Agribusiness managers must stay informed about regulatory requirements and compliance obligations to avoid legal issues and reputational damage.
  - f. **Financial Performance and Risk Management:** Analysing financial indicators, managing cash flow and assessing profitability are essential for making sound financial decisions. Agribusiness managers should also identify and mitigate risks related to market volatility, price fluctuations, currency exchange rates and interest rates.
  - g. **Technology Adoption and Innovation:** Embracing technological innovations can enhance productivity, efficiency and competitiveness in Agriculture. Agribusiness managers should evaluate new technologies, invest in research and development, and adopt digital tools that streamline operations and improve decision-making.
  - h. **Human Capital and Labour Management:** A skilled and motivated workforce is essential for the success of agribusiness operations. Managers should recruit, train and retain talent, foster a positive work environment and ensure compliance with labour regulations and safety standards.
  - i. **Market Access and International Trade:** Agribusinesses operate in a globalised market where trade agreements, tariffs and export/import regulations can affect market access and competitiveness. Managers need to monitor trade policies, identify export opportunities and navigate international market dynamics.



Fig. 3 wk23: Factors to consider in Agribusiness management

### Learning Tasks

1. Outline the functions of the activities in agribusiness management.
2. Explain the factors to consider in agribusiness management.
3. Discuss the activities carried out in agribusiness management.

### Pedagogical Exemplars

Problem-based learning: The teacher puts learners in mixed-ability groups and challenges them to find out the activities carried out in agribusiness management, the functions of these activities and factors to consider in agribusiness management via an internet search. Learners then make a presentation

on how to harness the factors that affect the establishment of agricultural development to promote agribusiness. All learners should be encouraged to take part in the presentation. The teacher should monitor learners to ensure that they use the right websites. Where necessary, the teacher should support learners with the right websites.

**Think-pair-share:** Learners individually think about the activities carried out in agribusiness management, the functions of these activities and factors to consider in agribusiness management and share with a peer in their group. They then surf the internet or watch a video on the activities carried out in agribusiness management. The teacher should support learners after surfing the internet or watching the video to use the activities observed to develop or establish a named animal or crop business e.g., Guinea fowl business or soybean business. The teacher should provide learners with all the necessary support they need to surf the internet or watch a video on how to develop a business plan.

### Key Assessments

**Assessment Level 1:** List the functions of the activities in agribusiness management.

**Assessment Level 2:** What role does agribusiness management play in Agricultural development?

**Assessment Level 3:** How can you harness the factors that affect the establishment of Agricultural development to promote the business?

**Assessment Level 4:** How can you apply the activities carried out in agribusiness management to establish a poultry business?



**WEEK 24**

**Learning Indicator(s):** *Describe the procedure for writing an agribusiness plan*

**Theme or Focal Area: Procedure for Writing an Agribusiness Plan**

**1. Definition of business plan:**

A business plan is a documented strategy for a business that highlights its goals and its plans for achieving them. Startup companies use business plans to get off the ground and attract outside investors and customers.

**2. General procedure for writing an agribusiness plan:**

- a. **Executive Summary:** Begin with an executive summary that provides a concise overview of your agribusiness venture. Include the mission statement, business concept, unique selling proposition, target market and key highlights of the plan.
- b. **Business Description:** Describe your agribusiness in detail. Explain the nature of your agribusiness, the specific products or services you will offer and the market niche you intend to target. Provide information on the legal structure of your business, location, facilities and any unique aspects that differentiate your venture.
- c. **Market Analysis:** Conduct a thorough analysis of the target market for your agribusiness. Identify your target customers, and their characteristics, preferences and needs. Analyse market trends, competition and market size. Include data on market demand, growth potential and market segmentation.
- d. **Marketing and Sales Strategy:** Outline your marketing and sales strategies to reach and engage your target customers. Describe your pricing strategy, distribution channels, advertising and promotional activities, and customer relationship management. Explain how you will position your agribusiness and differentiate it from competitors.
- e. **Organisational Structure:** Define the organisational structure of your agribusiness. Specify the roles and responsibilities of key personnel, including management, staff and advisory board members. Discuss any partnerships or strategic alliances that contribute to the success of your agribusiness.
- f. **Product or Service Line:** Provide detailed information about the products or services you will offer. Explain their unique features, benefits and value proposition. Include information on product development, quality control measures and any intellectual property rights associated with your offerings.
- g. **Operations and Production:** Describe the operational aspects of your agribusiness. Explain the production process, including sourcing of inputs, production techniques, equipment requirements and quality control measures. Discuss the operational challenges and how you plan to address them.
- h. **Financial Projections:** Develop comprehensive financial projections for your agribusiness. Include projected income statements, balance sheets and cash flow statements for at least three years. Include assumptions made in developing the projections such as pricing, sales volume, production costs and capital expenditures. Conduct sensitivity analysis to assess the financial viability under different scenarios.
- i. **Risk Analysis and Management:** Identify the risks and challenges that may impact your agribusiness. Analyse the potential risks, such as market risks, operational risks, financial risks and regulatory risks. Develop a risk management plan that outlines strategies for mitigating and managing these risks.
- j. **Implementation Plan:** Develop a timeline and action plan for the implementation of your agribusiness. Outline the key milestones, tasks and responsibilities. Identify any permits,

licenses or certifications required and discuss the steps to obtain them. Consider factors such as sourcing of inputs, production setup, marketing campaigns and financial requirements.

- k. **Monitoring and Evaluation:** Describe how you will monitor and evaluate the performance of your agribusiness. Identify key performance indicators (KPIs) that you will track regularly. Outline the mechanisms for reviewing progress, making necessary adjustments and ensuring the achievement of business goals.
- l. **Appendices:** Include any supporting documents, such as market research data, resumes of key team members, permits or licenses, supplier agreements or other relevant materials.



**Fig 1 wk24:** General format for writing an agribusiness plan

Remember, the structure and content of the agribusiness plan may vary based on your specific venture and the requirements of your target audience. It is essential to tailor the plan to your agribusiness's unique needs and present it professionally to attract potential investors, partners, or lenders.

### Learning Tasks

1. Define a business plan.
2. Explain the items needed to develop a business plan.
3. Develop an agribusiness business plan for a name animal and crop enterprise.

### Pedagogical Exemplars

**Think-pair-share:** Learners individually think about what they know about business plans and share with a peer in their group. They then surf the internet for information on the meaning, items and how a business plan is developed, for them to develop their agribusiness plan for a named animal or crop production, e.g., poultry or maize production. The teacher should provide learners with all the necessary support they need to surf the internet on how to develop a business plan. The teacher should show learners samples of a business plan and guide them in developing an agribusiness plan.

**Problem-based learning:** In mixed-ability group, learners watch a video or documentary on how to develop an agribusiness plan and discuss the procedures involved in preparing the plan. The teacher then guides learners to develop a business plan to source for a loan from the bank to start an Agricultural enterprise. Learners with visual and hearing challenges should be supported. Where necessary, the teacher should invite an expert to give a talk and practically take learners through how to develop a business plan. Learners should be allowed to express themselves and their views should be respected.

## Key Assessments

**Assessment Level 1:** List the procedures for drawing up a business plan.

**Assessment Level 2:** State the step-by-step procedure for drawing up a business plan.

**Assessment Level 3:** Explain the step-by-step procedure for drawing up a business plan.

**Assessment Level 4:** Write an agribusiness plan to source for a loan facility from a bank.

## Section 7 Review

Agricultural economics focuses on the application of economic principles and concepts to the agricultural sector. The principles of Agricultural economics are scarcity, supply and demand, marginal analysis, comparative advantage, efficiency and productivity, rational decision making, externalities and public goods and the role of government. Land, labour, capital, entrepreneurship, and technology inputs are the factors affecting Agricultural production. The importance of Agricultural economics includes efficient resource allocation, farm profitability and sustainability, food security and availability, policy development and evaluation, market efficiency and stability, rural development and poverty alleviation, environmental sustainability, and international trade and global relations. A farm is considered an economic unit, farming enterprise or agricultural business because it involves production, profitability, resource allocation, cost and revenue analysis, risk management, financial management, planning and decision-making, compliance and regulations, interactions with the market, contribution to the economy, size and scale efficiency, production and cost etc. Profitability, resource management, cost control, performance evaluation, risk management, planning and investment, benchmarking and comparisons, access to financing and support and policy advocacy are some of the important aspects of farm as an economic unit. An agricultural enterprise is a business venture that is involved in agricultural production, processing, or related activities. Setting up an agricultural enterprise involves; market research, resource assessment, legal and regulatory considerations, financial planning, infrastructure and equipment, production management, marketing and sales strategies, risk management and monitoring and evaluation. Production planning, cost analysis and budgeting, marketing and price analysis, risk management, investment analysis, environmental sustainability and government policy and regulation are some ways of applying the principles of agricultural enterprise as an economic unit.

Agricultural communication is the exchange of information, ideas and knowledge related to agricultural activities among stakeholders within the agricultural sector and the broader society. The importance of Agricultural communication includes; information dissemination, knowledge sharing and capacity building, farmers' empowerment, policy advocacy and engagement, consumer awareness and education, crisis communication and risk management, innovation and technology adoption. Effective communication in Agriculture can be achieved by: understanding your audience, using clear and simple language, choosing appropriate communication channels, engaging stakeholders, telling compelling stories, providing practical and actionable information, and building relationships and trust. Some of the branches of agricultural communication are agricultural extension, science communication, Agri-marketing communication, rural communication, crisis communication, policy communication, and consumer education and communication.

Agribusiness management is the application of management principles and practices in the agricultural sector. Integration of business principles, efficient resource allocation, risk management, financial management, human resource management, strategic planning and decision-making, and sustainability and environmental stewardship are some importance of Agribusiness. Some activities carried out in agribusiness management are; strategic planning,

financial management, production management, supply chain management, marketing and sales, risk management, human resource management, sustainability and environmental management, technology adoption, and government and community relations. Some of the functions of these activities in agribusiness management are; planning, organising, controlling, coordinating, decision-making, leadership and communication. Market trends and demand, weather and climate conditions, resource availability and management, input costs and supply chain logistics, regulatory and policy environment, financial performance and risk management, technology adoption and innovation, human capital and labour management, market access and international trade are some factors to consider in agribusiness management. The general procedure for writing an agribusiness plan is; an executive summary, business description, market analysis, marketing and sales strategy, organisational structure, product or service line, operations and production, financial projections, risk analysis and management, implementation plan, monitoring and evaluation, and appendices. Remember, the structure and content of the agribusiness plan may vary based on your specific venture and the requirements of your target audience. It is essential to tailor the plan to your agribusiness's unique needs and present it professionally to attract potential investors, partners, or lenders.

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The writing team was made up of the following members:

NaCCA Team	
Name of Staff	Designation
Matthew Owusu	Deputy Director-General, Technical Services
Reginald Quartey	Ag. Director, Curriculum Development Directorate
Anita Cordei Collison	Ag. Director, Standards, Assessment and Quality Assurance Directorate
Rebecca Abu Gariba	Ag. Director, Corporate Affairs
Anthony Sarpong	Director, Standards, Assessment and Quality Assurance Directorate
Uriah Kofi Otoo	Senior Curriculum Development Officer (Art and Design Foundation & Studio)
Nii Boye Tagoe	Senior Curriculum Development Officer (History)
Juliet Owusu-Ansah	Senior Curriculum Development Officer (Social Studies)
Eric Amoah	Senior Curriculum Development Officer (General Science)
Ayuuba Sullivan Akudago	Senior Curriculum Development Officer (Physical Education & Health)
Godfred Asiedu Mireku	Senior Curriculum Development Officer (Mathematics)
Samuel Owusu Ansah	Senior Curriculum Development Officer (Mathematics)
Thomas Kumah Osei	Senior Curriculum Development Officer (English)
Godwin Mawunyo Kofi Senanu	Assistant Curriculum Development Officer (Economics)
Joachim Kwame Honu	Principal Standards, Assessment and Quality Assurance Officer
Jephtar Adu Mensah	Senior Standards, Assessment and Quality Assurance Officer
Richard Teye	Senior Standards, Assessment and Quality Assurance Officer
Nancy Asieduwaa Gyapong	Assistant Standards, Assessment and Quality Assurance Officer
Francis Agbalenyio	Senior Research, Planning, Monitoring and Evaluation Officer
Abigail Birago Owusu	Senior Research, Planning, Monitoring and Evaluation Officer

<b>NaCCA Team</b>	
<b>Name of Staff</b>	<b>Designation</b>
Ebenezer Nkuah Ankamah	Senior Research, Planning, Monitoring and Evaluation Officer
Joseph Barwuah	Senior Instructional Resource Officer
Sharon Antwi-Baah	Assistant Instructional Resource Officer
Dennis Adjasi	Instructional Resource Officer
Samuel Amankwa Ogyampo	Corporate Affairs Officer
Seth Nii Nartey	Corporate Affairs Officer
Alice Abbew Donkor	National Service Person

<b>Subject</b>	<b>Writer</b>	<b>Designation/Institution</b>
Home Economics	Grace Annagmeng Mwini	Tumu College of Education
	Imoro Miftaw	Gambaga Girls' SHS
	Jusinta Kwakyewaa (Rev. Sr.)	St. Francis SHTS
Religious Studies	Dr. Richardson Addai-Mununkum	University of Education Winneba
	Dr. Francis Opoku	Valley View University College
	Aransa Bawa Abdul Razak	Uthmaniya SHS
	Godfred Bonsu	Prempeh College
RME	Anthony Mensah	Abetifi College of Education
	Joseph Bless Darkwa	Volo Community SHS
	Clement Nsorwineh Atigah	Tamale SHS
Arabic	Dr. Murtada Mahmoud Muaz	AAMUSTED
	Dr. Abas Umar Mohammed	University of Ghana
	Mahey Ibrahim Mohammed	Tijjaniya Senior High School
French	Osmanu Ibrahim	Mount Mary College of Education
	Mawufemor Kwame Agorgli	Akim Asafo SHS
Performing Arts	Dr. Latipher Osei Appiah-Agyei	University of Education Winneba
	Desmond Ali Gasanga	Ghana Education Service
	Chris Ampomah Mensah	Bolgatanga SHS, Winkogo



<b>Subject</b>	<b>Writer</b>	<b>Designation/Institution</b>
Art and Design Studio and Foundation	Dr. Ebenezer Acquah	University for Education Winneba
	Seyram Kojo Adipah	Ghana Education Service
	Dr. Jectey Nyarko Mantey	Kwame Nkrumah University of Science and Technology
	Yaw Boateng Ampadu	Prempeh College
	Kwame Opoku Bonsu	Kwame Nkrumah University of Science and Technology
	Dzorka Etonam Justice	Kpando Senior High Sschool
Applied Technology	Dr. Sherry Kwabla Amedorme	AAMUSTED
	Dr. Prosper Mensah	AAMUSTED
	Esther Pokuah	Mampong Technical College of Education
	Wisdom Dzidzienyo Adzraku	AAMUSTED
	Kunquyuri Philip	Kumasi SHTS
	Antwi Samuel	Kibi Senior High School
	Josiah Bawagigah Kandwe	Walewale Technical Institute
	Emmanuel Korlety	Benso Senior High Technical School
	Isaac Buckman	Armed Forces Senior High Technical School
	Tetteh Moses	Dagbon State Senior High School
	Awane Adongo Martin	Dabokpa Technical Institute
Design and Communication Technology	Gabriel Boafo	Kwabeng Anglican SHTS
	Henry Agmor Mensah	KASS
	Joseph Asomani	AAMUSTED
	Kwame Opoku Bonsu	Kwame Nkrumah University of Science and Technology
	Dr. Jectey Nyarko Mantey	Kwame Nkrumah University of Science and Technology
	Dr. Ebenezer Acquah	University for Education Winneba

Subject	Writer	Designation/Institution
Business Studies	Emmanuel Kodwo Arthur	ICAG
	Dr. Emmanuel Caesar Ayamba	Bolgatanga Technical University
	Ansbert Baba Avole	Bolgatanga Senior High School, Winkogo
	Faustina Graham	Ghana Education Service, HQ
	Nimako Victoria	SDA Senior High School, Akyem Sekyere
Agriculture	Dr. Esther Fobi Donkoh	University of Energy and Natural Resources
	Prof. Frederick Adzitey	University for Development Studies
	Eric Morgan Asante	St. Peter's Senior High School
Agricultural Science	David Esela Zigah	Achimota School
	Prof. J.V.K. Afun	Kwame Nkrumah University of Science and Technology
	Mrs. Benedicta Carbiliba Foli	Retired, Koforidua Senior High Technical School
Government	Josephine Akosua Gbagbo	Ngleshie Amanfro SHS
	Augustine Arko Blay	University of Education Winneba
	Samuel Kofi Adu	Fettehman Senior High School
Economics	Dr. Peter Anti Partey	University of Cape Coast
	Charlotte Kpogli	Ho Technical University
	Benjamin Agyekum	Mangoase Senior High School
Geography	Raymond Nsiah Asare	Methodist Girls' High School
	Prof. Ebenezer Owusu Sekyere	University for Development Studies
	Samuel Sakyi Addo	Achimota School
History	Kofi Adjei Akraasi	Opoku Ware School
	Dr. Anitha Oforiwah Adu-Boahen	University of Education Winneba
	Prince Essiaw	Enchi College of Education
Ghanaian Language	David Sarpei Nunoo	University of Education Winneba, Ajumako
	Catherine Eku Mensah	University of Cape Coast
	Ebenezer Agyemang	Opoku Ware School

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<b>Subject</b>	<b>Writer</b>	<b>Designation/Institution</b>
Physical Education and Health	Paul Dadzie	Accra Academy
	Sekor Gaveh	Kwabeng Anglican Senior High Technical School
	Anthonia Afosah Kwaaso	Junkwa Senior High School
	Mary Aku Ogum	University of Cape Coast
Social Studies	Mohammed Adam	University of Education Winneba
	Simon Tengan	Wa Senior High Technical School
	Jemima Ayensu	Holy Child School
Computing and Information Communication Technology (ICT)	Victor King Anyanful	OLA College of Education
	Raphael Dordoe Senyo	Ziavi Senior High Technical School
	Kwasi Abankwa Anokye	Ghana Education Service, SEU
	Millicent Heduvor	STEM Senior High School, Awaso
	Dr. Ephriam Kwaa Aidoo	University for Education Winneba
	Dr. Gaddafi Abdul-Salaam	Kwame Nkrumah University of Science and Technology
English Language	Esther O. Armah	Mangoase Senior High School
	Kukua Andoh Robertson	Achimota School
	Alfred Quaittoo	Kaneshie Senior High Technical School
	Benjamin Orrison Akrono	Islamic Girls' Senior High School
	Fuseini Hamza	Tamale Girls' Senior High School
Intervention English	Roberta Emma Amos-Abanyie	Ingit Education Consult
	Perfect Quarshie	Mawuko Girls Senior High School
	Sampson Dedey Baidoo	Benso Senior High Technical School
Literature-in-English	Blessington Dzah	Ziavi Senior High Technical School
	Angela Aninakwah	West African Senior High School
	Juliana Akomea	Mangoase Senior High School
General Science	Dr. Comfort Korkor Sam	University for Development Studies
	Saddik Mohammed	Ghana Education Service
	Robert Arhin	SDA SHS, Akyem Sekyere

Subject	Writer	Designation/Institution
Chemistry	Ambrose Ayikue	St. Francis College of Education
	Awumbire Patrick Nsobila	Bolgatanga SHS, Winkogo
	Bismark Tunu	Opoku Ware School
	Gbeddy Nereus Anthony	Ghanata Senior High School
Physics	Dr. Linus Labik	Kwame Nkrumah University of Science and Technology
	Henry Benyah	Wesley Girls High School
	Sylvester Affram	Kwabeng Anglican SHS
Biology	Paul Beeton Damoah	Prempeh College
	Maxwell Bunu	Ada College of Education
	Ebenezer Delali Kpelly	Wesley Girls' SHS
	Doris Osei-Antwi	Ghana National College
Mathematics	Edward Dadson Mills	University of Education Winneba
	Zacharia Abubakari Sadiq	Tamale College of Education
	Collins Kofi Annan	Mando SHS
Additional Mathematics	Dr. Nana Akosua Owusu-Ansah	University of Education Winneba
	Gershon Mantey	University of Education Winneba
	Innocent Duncan	KNUST SHS
Intervention Mathematics	Florence Yeboah	Assin Manso SHS
	Mawufemor Adukpo	Ghanata SHS
	Jemima Saah	Winneba SHS
Robotics	Dr. Eliel Keelson	Kwame Nkrumah University of Science and Technology
	Dr. Nii Longdon Sowah	University of Ghana
	Isaac Nzoley	Wesley Girls High School
Engineering	Daniel K. Agbogbo	Kwabeng Anglican SHTS
	Prof. Abdul-Rahman Ahmed	Kwame Nkrumah University of Science and Technology
	Valentina Osei-Himah	Atebubu College of Education
Aviation and Aerospace Engineering	Opoku Joel Mintah	Altair Unmanned Technologies
	Sam Ferdinand	Afua Kobi Ampem Girls' SHS

ACKNOWLEDGEMENTS

<b>Subject</b>	<b>Writer</b>	<b>Designation/Institution</b>
Biomedical Science	Dr. Dorothy Yakoba Agyapong	Kwame Nkrumah University of Science and Technology
	Jennifer Fafa Adzraku	Université Libre de Bruxelles
	Dr. Eric Worlawoe Gaba	Br. Tarcisius Prosthetics and Orthotics Training College
Manufacturing Engineering	Benjamin Atribawuni Asaaga	Kwame Nkrumah University of Science and Technology
	Dr. Samuel Boahene	Kwame Nkrumah University of Science and Technology
	Prof Charles Oppon	Cape Coast Technical University
Spanish	Setor Donne Novieto	University of Ghana
	Franklina Kabio Danlebo	University of Ghana
	Mishael Annoh Acheampong	University of Media, Art and Communication
Assessment	Benjamin Sundeme	St. Ambrose College of Education
	Dr. Isaac Amoako	Atebubu College of Education
Curriculum Writing Guide Technical Team	Paul Michael Cudjoe	Prempeh College
	Evans Odei	Achimota School

