



MINISTRY OF EDUCATION

Agriculture

TEACHER MANUAL



YEAR 1 - BOOK 1



NATIONAL COUNCIL FOR
CURRICULUM & ASSESSMENT
OF MINISTRY OF EDUCATION

MINISTRY OF EDUCATION



REPUBLIC OF GHANA

Agriculture

Teacher Manual

Year One - Book One



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

AGRICULTURE TEACHERS MANUAL

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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 21st 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 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 this information for the first 11 weeks of Year One, with the remaining 13 weeks contained within Book Two. 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 21st Century Skills and Competencies

The SHS, SHTS, and STEM curriculum integrates 21st 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 adaptive 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

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SCOPE AND SEQUENCE

Agriculture Summary

S/N	STRAND	SUB-STRAND									
			YEAR 1			YEAR 2			YEAR 3		
			CS	LO	LI	CS	LO	LI	CS	LO	LI
	Concept of Agriculture in an Industrializing Society	Agriculture and Society	2	2	5	2	2	5	1	1	3
		Agriculture and Industry	1	1	3	2	2	4	-	-	-
	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
	Food Production and Natural Resource Conservation	Principles of Agriculture in Food Production	4	4	11	2	2	4	2	2	4
		Principles of Natural Resource Conservation in Agriculture	3	3	8	3	3	7	1	1	3
	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	-	-	-
	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
Total			20	20	51	18	18	45	8	8	20

Overall Totals (SHS 1 – 3)

Content Standards	46
Learning Outcomes	46
Learning Indicators	116

SECTION 1: MEANING AND IMPORTANCE OF AGRICULTURE

Strand: Concepts of Agriculture in an Industrialising Society

Sub-Strands:

1. Agriculture and Society
2. Agriculture and Industry

Learning Outcomes:

1. *Use the knowledge of the concepts in Agriculture to identify the career opportunities and to clear misconceptions about Agriculture.*
2. *Use the knowledge acquired in Agricultural education for further studies, world of work and adult life.*
3. *Use the knowledge acquired on the meaning, importance and the interdependence of Agriculture and industry to help promote growth and development of the Agricultural sector.*

Content Standards:

1. Demonstrate knowledge and understanding of the meaning, importance and the branches in Agriculture as a discipline.
2. Demonstrate knowledge and understanding of the meaning, importance and scope of Agricultural education.
3. Demonstrate knowledge and understanding of the meaning, importance and interdependence of Agriculture and industry.

INTRODUCTION AND SECTION SUMMARY

Agriculture is the backbone of Ghana's economy and contributes significantly to improving livelihoods. The study of Agriculture is indispensable to the survival of humans and the need for it to be studied. This section gives an overview of the concept of Agriculture. Learners will be exposed to the importance, branches, career opportunities, and misconceptions in Agriculture and how to dispel them. The difference between Agriculture and Agricultural Science will be exposed. Also, learners will appreciate the various types of Agricultural education and opportunities for further education in Agriculture for the world of work and adult life. Additionally, this section will bring to light the economic challenges of Agriculture in an industrialising society and their solutions, and the interdependence between Agriculture and industry for economic development. All these will be achieved through well-crafted pedagogical exemplars such as project-based learning, experiential learning, collaborative learning and field trips. This section has links with the study of Business, Economics and Social Studies as it involves the industries in Agriculture and the activities of Agriculture in the community. It must be noted that, this week is an introduction to the course content and the rest of the weeks will delve deeper into the different aspects of Agriculture.

The Weeks covered by the Section are:

Week 1: Importance, branches, career opportunities and dispelling of misconceptions in Agriculture.

Week 2: Meaning, importance and scope of Agricultural education.

Week 3: Meaning, importance and interdependence of Agriculture and industry.

SUMMARY OF PEDAGOGICAL EXEMPLARS

The teacher should employ pedagogies such as initiating talk for learning, think-pair-share, structuring talk for learning, experiential learning and project-based learning. These strategies should be used in 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. The teacher should assist learners to design questionnaires on misconceptions in Agriculture and how to analyse the data obtained. He/she should give the administration of the questionnaires to learners as take-home activity. Resource person should be used to talk about institutions that offer Agriculture and their entry requirements. Teacher should locate an agro-based industry such as corn mill in the community where learners can embark on a field trip. The teacher should encourage all categories of learners to actively participate in the lesson. He/she should encourage learners to identify their capabilities and qualities and accept opinions from their peers. The teacher should ensure that learners respect divergent views and respect each other.

ASSESSMENT SUMMARY

The teacher should assign tasks to cover the importance, branches, career opportunities and dispelling of misconceptions in Agriculture. It should also cover the meaning, importance and scope of Agricultural education as well as the meaning, importance and interdependence of Agriculture and industry taking into consideration the various levels of proficiencies of the learners and the depth of knowledge required from the learners. This should be done via group discussions, presentations, homework, class exercises, class tests and project-based work. The teacher should accept varying number of oral and written responses. He/she should develop rubrics to score group presentations, portfolio and assignments.

WEEK 1**Learning Indicators**

1. *Explain the meaning and importance of Agriculture.*
2. *Discuss the branches of Agriculture and their related career opportunities.*
3. *Examine and dispel the misconceptions associated with the study of Agriculture.*

Theme or Focal Area 1: Meaning and Importance of Agriculture to Society**1. Meaning of Agriculture**

- a. The word Agriculture is derived from the Latin word, *agricultūra*, that is, “*ager*” which means “*field*”, and “*cultūra*” which means “*cultivation*” or “*growing*”.
- b. Agriculture is the art and science of cultivating the soil, growing crops and raising livestock.

2. Differences between Agriculture and Agricultural Science

Agriculture differs from Agriculture Science in terms of definition, scope, focus and goals.

a. Definition:

Agriculture: Agriculture refers to the practice of cultivating crops, raising livestock, and managing land for the purpose of producing food, fiber and other agricultural products for human consumption or use.

Agricultural Science: Agricultural science, on the other hand, is the scientific study of agriculture. It encompasses a wide range of disciplines including agronomy, horticulture, animal science, soil science, agricultural engineering, agricultural economics and more.

b. Scope:

Agriculture: Agriculture primarily deals with practical aspects of farming and agricultural production. It involves activities such as planting, cultivating, harvesting, animal husbandry, and farm management.

Agricultural Science: Agricultural science, on the other hand, is broader in scope and involves both theoretical and applied research aimed at understanding the principles and processes underlying agricultural production. It encompasses scientific study, experimentation, and innovation in various areas of agriculture to improve productivity, sustainability, and efficiency.

c. Focus:

Agriculture: The focus of agriculture is on the day-to-day practices and operations involved in farming and agricultural production. Farmers and agricultural producers are primarily concerned with implementing effective techniques and strategies to maximize yields and profitability.

Agricultural Science: Agricultural science focuses on advancing knowledge and understanding in various aspects of agriculture through scientific inquiry and research. It involves investigating the biology, chemistry, physics, ecology, economics, and social dimensions of agriculture to develop innovative solutions to agricultural challenges.

d. Goals:

Agriculture: The primary goal of agriculture is to produce food, feed, fiber and other agricultural commodities to meet human needs and demands.

Agricultural Science: The goals of agricultural science include advancing scientific knowledge, developing sustainable agricultural practices, improving crop yields and quality, enhancing animal health and welfare, conserving natural resources and addressing global challenges such as food security and climate change.

3. Importance of Agriculture to Society

- a. **Food Security:** Agriculture is the backbone of Ghana's food security. Ghanaians rely on Agriculture for their daily sustenance, and the sector provides the country with a significant portion of its food supply. Agriculture ensures that Ghanaians have access to an adequate and nutritious diet, reducing the risk of hunger and malnutrition.
- b. **Employment and Livelihoods:** Agriculture is a major source of employment and livelihood for a significant portion of the population, particularly in rural areas. Smallholder farmers and Agricultural workers make up a significant part of the workforce, contributing to poverty reduction, income generation, and economic stability. It helps create sustainable livelihoods, enhance social services, and reduce regional disparities.
- c. **Foreign Exchange and Trade:** Ghana exports various Agricultural products, such as cocoa, cashew nuts, timber, and fish, which generate foreign exchange earnings for the country. Agricultural exports contribute to Ghana's trade balance, enhance its international competitiveness, and promote economic stability.
- d. **Environmental Sustainability:** Sustainable Agriculture practices can be crucial for protecting Ghana's natural resources and environment. Implementing practices such as Conservation Agriculture, Agroforestry, and Organic Farming can help maintain soil fertility, prevent land degradation, preserve biodiversity, and mitigate climate change impacts.
- e. **Cultural Heritage:** Agriculture is deeply intertwined with Ghana's cultural heritage. Traditional farming practices, indigenous crops, and Agricultural rituals hold cultural and historical significance. Preserving and promoting these traditions helps maintain cultural identity, foster community cohesion, and support cultural tourism.

Learning Tasks

1. Brainstorm the meaning of agriculture and agricultural science.
2. Make a list of the importance of agriculture.
3. Make a presentation on how agriculture will impact your life and society.

Pedagogical Exemplars

Initiating talk for learning: Teacher puts learners in mixed-ability groups to brainstorm and come up with the meaning of agriculture and agricultural science as well as the importance of agriculture. Learners share their ideas with the whole class. Teacher should assist learners with difficulties with leading questions that will help them to come up with the difference between agriculture and agricultural science, and the importance of agriculture. Learners who can give further details should be encouraged to do so.

Think-pair-share: Learners individually list the importance of Agriculture to society and share with a peer in their group.

Teacher should guide learners with difficulties with leading questions that will help them to come up with importance of Agriculture to society. Confident learners should be guided with probing question to give further explanation of the importance of Agriculture to the society.

Structuring talk for learning: In their mixed-ability/ability groups (where appropriate), learners make a presentation on how Agriculture will impact their life and society in a plenary session.

The teacher should ensure that all learners take part in gathering information for the presentation. The teacher should also assign roles equitably to learners in the groups.

Key Assessments

Assessment Level 1: List three (3) reasons why Agriculture is important to society.

Assessment Level 2: Explain the meaning of the agriculture and agricultural science.

Assessment Level 3: Analyse at least two (2) reasons why Agriculture should be studied in Ghana as a developing country.

Assessment Level 4: How can Agriculture be used to solve the youth unemployment situation in Ghana to boost the Ghanaian economy.

Theme or Focal Area 2: Major Branches of Agriculture and their Descriptions

1. Major Branches of Agriculture

- a. Crop Science
- b. Animal Science
- c. Agribusiness
- d. Horticulture
- e. Agricultural Economics
- f. Agricultural Mechanisation
- g. Forestry
- h. Aquaculture
- i. Olericulture
- j. Irrigation
- k. Soil Science

2. Description of some Major Branches of Agriculture

- a. **Crop Science:** is the science and art of producing, processing and marketing of crops.
- b. **Animal Science:** is the science and art of producing, processing and marketing of animals.
- c. **Agribusiness:** it deals with crop and animal production, as well as their processing, transportation, distribution and marketing.
- d. **Horticulture:** it deals with growing plants that are used by people for food, medicinal and aesthetic purposes.
- e. **Agricultural Economics:** an applied field of economics concerned with the application of economic theories in optimising the production and distribution of food, fibre and other Agricultural products.

- f. **Agricultural Mechanisation:** it deals with the study and operations of Agricultural machinery, tools and equipment and the development of improved implements and equipment.

3. Career Opportunities that Exist in Agriculture include:

- a. **Agriculture Tutor/Lecturer:** Teaches Agriculture in the formal educational institutions.
- b. **Agriculture Entrepreneur:** Sets up Agricultural business or businesses related to Agriculture.
- c. **Forestry Officer/Forest Ranger:** Responsible for conservation, protection and sustainable management of forest and other natural resources.
- d. **Agriculture Economist:** Analyse economic data and trends in the Agricultural sector, assess market conditions and provide insight for decision-making in farming and agribusiness.
- e. **Animal Scientist:** Oversees the care, breeding and management as well as processing of animal products.
- f. **Crop Scientist:** Studies and improves crop production techniques and plant genetics to maximise yield and sustainability.
- g. **Agriculture Engineer:** Designs and develops new Agricultural machinery, equipment and systems to enhance productivity and efficiency.
- h. **Soil Scientist:** Studies and improves soil to maximise yield and productivity.
- i. **Food Scientist/Technologist:** Conducts research and develops new food products, improves food safety measures and ensures quality control in the production process.
- j. **Agriculture Extension Officer:** Assists farmers and rural communities by providing them with on-the-job Agricultural education, training, and technical advice on crop cultivation, livestock management, and sustainable practices.
- k. **Agriculture Biotechnologist:** The use of biological tools and techniques to improve crop and animal production.
- l. **Horticulturist:** Focuses on the cultivation and management of fruits, vegetables, medicinal and ornamental plants.
- m. **Precision Agriculture Specialist:** Utilises technology, such as global positioning systems (GPS) and remote sensing to optimise crop and animal production.
- n. **Veterinary Officer:** They diagnose and treat injuries, illnesses and diseases in animal.

Learning Tasks

1. Surf the internet for branches of Agriculture and list them.
2. Draw a chart of the branches of Agriculture.
3. Investigate and report on the career opportunities in Agriculture in your community.

Pedagogical Exemplars

Think-pair-share: Teacher ask learners to individually surf the internet for the branches of Agriculture, list them and discuss in pairs. Teacher should support learners with links to websites, where they can get the required information. Learners should be monitored not to veer into unauthorised websites. Teacher should ensure that all learners participate in the activities and discourage few learners from hijacking the activity.

Project-based learning: Teacher puts learners in mixed-ability/mixed-gender groups (where applicable) and task them to create a flow chart to show the branches of Agriculture and their descriptions and make a presentation in class. Teacher should assist learners with examples of flow charts to enable them undertake the task. All learners should be encouraged to take part in creating the flow chart on the branches of Agriculture). Challenge learners who can give further details on the branches of Agriculture to do so.

Collaborative learning: In their groups, learners investigate and report on the career opportunities in Agriculture that exist in their community. Teacher should guide learners with pictures of people in the various fields of Agriculture to enable them come up with the careers in Agriculture. Confident learners should be probed further to come up with careers in Agriculture that may not be available in their community.

Key Assessments

Assessment Level 1: Identify at least two (2) careers in your community that are Agricultural related.

Assessment Level 2: Investigate and report on at least two (2) career opportunities that exist in Agriculture.

Assessment Level 3: Write for or against the motion that crop science has contributed more to Ghana's economy than animal science.

Assessment Level 4: Justify your choice of a career in Agriculture for a brighter future.

Theme or Focal Area 3: **Misconceptions in Agriculture and how to Dispel them**

1. Misconceptions in Agriculture

- a. **Agriculture is a low-status occupation:** Agriculture is a less prestigious and lower-paying occupation compared with other professions. This misconception can discourage young people from pursuing careers in Agriculture, leading to a shortage of skilled Agricultural workers.
- b. **Agriculture is only for rural areas:** Many people associate Agriculture primarily with rural areas and believe that, it is not relevant or feasible in urban or peri-urban settings. However, urban farming initiatives such as rooftop gardens and hydroponics are gaining traction and showcasing the potential for Agriculture in urban environments.
- c. **Modern farming practices are not applicable or affordable:** Many believe that modern farming practices, such as the use of technology, improved seeds, and fertilisers are not suitable or accessible for small-scale farmers. However, there are initiatives and organisations working to promote and support the adoption of these practices, including providing training and access to affordable inputs.
- d. **Agriculture is solely reliant on rain-fed:** Due to the prevalent rain-fed Agricultural practices in some societies, there is a misconception that Agriculture is entirely dependent on rainfall. However, there is a growing recognition of the importance of irrigation systems, water management techniques, and the use of drought-resistant crop varieties to mitigate the effects of climate variability and improve Agricultural productivity.
- e. **Agriculture is a male-dominated field:** There is a perception that Agriculture is predominantly a male occupation, with limited opportunities for women. While gender disparities exist in the sector, women play a crucial role in Agriculture, especially in small-scale farming and post-harvest activities. Efforts are being made to empower women in Agriculture and promote gender equality in the sector.

- f. **Traditional farming methods are superior:** Traditional farming practices and knowledge are deeply rooted in some cultures and heritage. However, there is a misconception that traditional methods are always more effective or sustainable than modern approaches. While traditional knowledge should be respected and preserved, combining it with modern innovations can lead to more efficient and sustainable Agricultural systems.
- g. **Agriculture is solely about food production:** Many people primarily associate Agriculture with food production, overlooking its broader contributions. Agriculture also encompasses areas such as agribusiness, value addition, rural development, employment generation, bio-fuel production and export opportunities.

2. Suggestions to Dispel Misconceptions in Agriculture

- a. **Curriculum integration:** Integrate Agricultural education into the school curriculum at various levels. Develop age-appropriate modules that cover key Agricultural concepts, sustainable farming practices, crop diversity, soil conservation, and the importance of Agriculture to the economy. This ensures that accurate information is taught to students from an early age.
- b. **Practical learning experiences:** Organise practical activities and field visits to farms, Agricultural research centres, and agribusinesses. These experiences allow learners to witness firsthand the realities of modern Agriculture, understand the challenges faced by farmers, and debunk misconceptions by engaging with professionals in the field.
- c. **Resource person/experts:** Invite Agricultural experts, successful farmers, and professionals from the Agricultural sector to give talks, presentations, and interactive sessions in schools. Their knowledge and experiences can help dispel misconceptions, provide accurate information, and inspire learners to consider careers in Agriculture.
- d. **Hands-on projects:** Encourage learners to engage in hands-on projects related to Agriculture. These projects can involve cultivating small gardens within the school premises, experimenting with different farming techniques, or conducting research on specific Agricultural topics. By actively participating in these projects, learners gain practical knowledge, challenge misconceptions, and develop a deeper understanding of Agriculture.
- e. **Agricultural clubs and extracurricular activities:** Establish agricultural clubs or extracurricular activities focused on Agriculture. These platforms provide opportunities for learners to learn, discuss, and engage in Agricultural activities outside the regular curriculum. Activities may include debates, quizzes, agricultural fairs, and community outreach programmes, all aimed at dispelling misconceptions and promoting accurate Agricultural knowledge.
- f. **Collaboration with local farmers and Agricultural organisations:** Foster partnerships between schools and local farmers, Agricultural cooperatives, and organisations. These collaborations can facilitate mentorship programmes, internships, or apprenticeships, enabling learners to work alongside farmers and gain practical experiences. By interacting with farmers directly, learners can dispel misconceptions and develop a more nuanced understanding of Agriculture.
- g. **Information resources:** Provide learners with access to reliable and up-to-date information resources related to Agriculture. Establish school libraries or resource centres with books, journals, online databases and other materials that offer accurate information on modern farming practices, Agricultural innovations and the importance of sustainable Agriculture.
- h. **Teacher training and professional development:** Conduct teacher training programmes and workshops to equip educators with updated knowledge and teaching methodologies in Agriculture. By empowering teachers with the necessary skills and knowledge, they can effectively convey accurate information to learners, address misconceptions, and inspire interest in the Agricultural sector.



Fig. 3 wk1: A woman operating a tractor

Fig. 1 wk. 1: *A woman operating a tractor*

Fig. 4 wk1: Women engaged in Agriculture

Fig. 2 wk. 1: *Women engaged in Agriculture***Fig. 3 wk. 1:** *There is money in the soil***Fig. 4 wk. 1:** *Mechanical farming***Learning Tasks:**

1. Identify the misconceptions associated with Agriculture.
2. Discuss the misconceptions associated with Agriculture.
3. Discuss the misconceptions associated with Agriculture and how to dispel them.

Pedagogical Exemplars

Think-pair-share: Learners individually identify the misconceptions in Agriculture and share their thoughts with a peer. Teacher should assist learners with leading questions that will help them to come up with the misconceptions in Agriculture, others should be probed further to give explanations as to why Agriculture faces such misconceptions.

Project-based learning: The teacher should put learners in pairs to design a questionnaire on misconceptions in Agriculture. Learners administer the questionnaire in the community and tally their results. The teacher then assists learners to analyse their data with Microsoft Excel. All learners should take part in designing and administration of the questionnaire on the misconception of Agriculture in the community. Some learners should be selected to play leading roles in entering data for analysis. Other learners should assist the group in analysing data obtained from the questionnaire.

Talking point: The teacher puts learners in mixed-ability/mixed-gender groups (where applicable) to discuss how to address the misconceptions identified in their community. Learners make a presentation on the misconceptions and how to dispel them at a plenary session. The teacher should use pictures that dispel misconceptions about Agriculture to guide learners in the preparation of their presentation. The teacher should ensure that all learners participate in the discussion.

Key Assessments

Assessment Level 1: List at least two (2) misconceptions in Agriculture.

Assessment Level 2: Make a presentation on how to dispel at least two (2) misconceptions about Agriculture in the community.

Assessment Level 3: Assess the effects of at least three (3) misconceptions in Agriculture.

Assessment Level 4: Research on the misconceptions in Agriculture in your community, how it has affected Agricultural development and suggest possible remedies.

WEEK 2**Learning Indicator(s):**

1. *Explain the meaning and importance of Agricultural education.*
2. *Describe the types of Agricultural education.*

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

Agricultural education is the instruction, teaching, and training surrounding Agriculture as well as the management of land and natural resources. Agricultural education is frequently geared toward those preparing for careers in Agriculture, farming, extension services and related disciplines. Agricultural education is usually delivered in a classroom, laboratory or in the field. Agriculture is offered at the Universities (University of Ghana, University for Development Studies), Technical Universities (Sunyani Technical University, Tamale Technical University), Colleges of Education (Kibi College of Education, Presbyterian College of Education), and Agriculture Colleges (Kwadaaso Agricultural College, Ejura Agricultural College). Agricultural Education also includes on-farm training and workshops delivered to farmers and farm workers for continuous professional development. Agricultural education (formal, non-formal and informal) is very essential for life-long learning.

2. Importance of Agricultural Education

The importance of Agricultural Education are:

- a. **Stimulates interest in the Agriculture industry and basic survival skills:** By this, more farmers can meet the growing population's food demand. In addition, learners learn the basics of how to grow crops or livestock, which can generate income for their livelihood.
- b. **Offers opportunity for further education:** It provides the pre-requisite skills, knowledge and qualifications for higher education.
- c. **Offers career opportunities:** Agricultural education offers career opportunities to learners in various fields of Agriculture.
- d. **Promote food security:** Through Agricultural education, a large number of people acquire the knowledge and skills for cultivation of crops and rearing of animals. This leads to food sufficiency and low cost of living since most expenditures are made on food.
- e. **Educates on global Agriculture:** Learners can learn about global Agriculture through Agricultural education programmes. These programmes inform them about the issues affecting Agriculture worldwide, which can lead to them choosing careers that would help address those issues.
- f. **Agricultural Education combines knowledge from other studies:** Education in Agriculture is one of the few disciplines that combines knowledge from other studies. For example, learners apply topics from *Geology* and *Ecology*, as they learn how various plants thrive in different climates. They utilise *Biology*, *Physics*, *Mathematics* and *Chemistry* when learning about crop plantation and harvesting. As a result, they can put their knowledge to work.

Learning Tasks

1. Identify institutions in Ghana that offer Agricultural education.
2. Surf the internet for the meaning and importance of Agricultural education
3. Examine how Agricultural education can help shape Agricultural development in Ghana.

Pedagogical Exemplars

Think-pair-share: Learners individually think about the meaning of Agricultural education and share it with his/her peers. Teacher should ensure that learners with difficulty are assisted with leading questions to define Agricultural education. teacher should challenge other learners to further explanations to the meaning of Agricultural education.

Problem-based learning: In mixed-gender/gender groups (where applicable), learners surf the internet to come up with the importance of Agricultural education and make a presentation in class.

The teacher should help learners with suitable website links, that they can access the information needed for the presentation. The teacher should monitor learners not to veer into unapproved sites. The teacher should ensure that all learners fully participate in the activity to prevent a few learners from hijacking the activity. Confident learners should be given leading roles in presenting their findings.

A resource person makes a presentation on the entry requirements for pursuing Agriculture and related courses, as well as specialisations at higher educational institutions to all learners. Learners listen to the resource person and ask questions for clarification.

Key Assessments

Assessment Level 1: Identify two (2) institutions that offer Agricultural education in Ghana and indicate their location.

Assessment Level 2: What is Agricultural education?

Assessment Level 3: To what extent is Agricultural education beneficial to society?

Assessment Level 4: Debate on the topic, Ghana's economy cannot survive without Agricultural education?

Theme or Focal Area 2: Types of Agricultural Education**1. Formal Agricultural Education**

Formal Agricultural education refers to structured educational programmes offered by educational institutions such as Universities, Colleges, and Senior High Schools. These programmes can include master, degree, diploma and certificate programmes in fields *like Agronomy, Horticulture, Animal Science, Agricultural Engineering, Agricultural Economics*, etc. Formal Agricultural education provides comprehensive theoretical knowledge and practical training for students pursuing careers in Agriculture.

2. Informal Agricultural Education

Informal Agricultural education refers to the learning that occurs through daily Agricultural practices, interactions within farming communities, and traditional knowledge transfer. It takes place outside of formal educational institutions and does not follow a structured curriculum or specific educational

framework. Informal Agricultural education is often hands-on, experiential, and rooted in local contexts. It includes learning from older generations, community demonstrations, field observations, and informal discussions among farmers.

3. Non-formal Agricultural Education

Non-formal Agricultural education lies between formal and informal education. It refers to organised learning activities that are outside the formal educational system but have a structured framework and specific learning objectives. Non-formal Agricultural Education programmes are designed to address the educational needs of specific target groups, such as farmers, rural communities, or Agricultural workers. These programmes often utilise alternative teaching methods, practical demonstrations, workshops, Farmer field schools, vocational training programmes for farmers and extension services to deliver agricultural knowledge and skills.

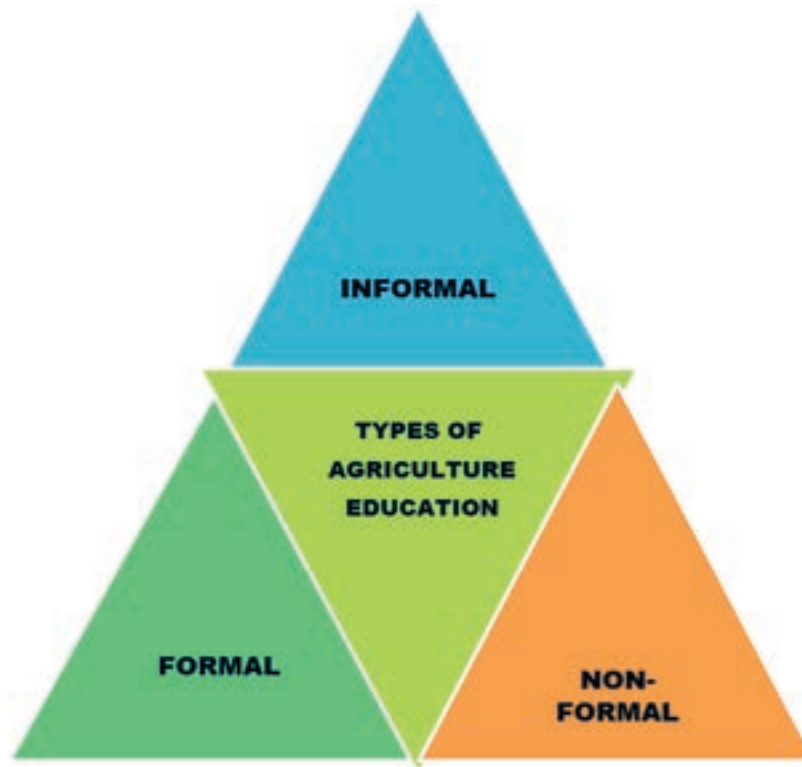


Fig. 1 wk2: *Types of Agricultural Education*

Learning Tasks

1. State the types of Agricultural education.
2. Differentiate between formal and informal Agricultural education.
3. Discuss the types of Agricultural education.

Pedagogical Exemplars

Problem-based learning: In mixed-ability/mixed-gender groups (where applicable), learners surf the internet to come up with the types of Agricultural education. The teacher should assist learners with website links to where, they can access information on the types of Agricultural education. The

teacher should monitor learners not to veer into unapproved sites. The teacher should ensure that all learners fully participate in the activity to prevent a few learners from hijacking the activity.

Use Talk for learning: Learners discuss the characteristics of the various types of Agricultural education in a mixed-gender group. Teacher should provide additional support to learners who might need it. Encourage learners to delve deeper into bringing out more characteristics of the various types of Agricultural education.

Key Assessments

Assessment Level 1: State the types of Agricultural education.

Assessment Level 2: Why is informal Agricultural education important?

Assessment Level 3: Compare and contrast at least two (2) characteristics of formal and non-formal education.

Assessment Level 4: How can Agricultural education enhance the livelihoods of individuals and promote economic development of the nation.

WEEK 3**Learning Indicator(s):**

1. *Explain the meaning, types and importance of industry in Agriculture.*
2. *Discuss the interdependence of Agriculture and industry.*
3. *Analyse the challenges and solutions of Agriculture in an industrialising society.*

Theme or Focal Area 1: Meaning, Types and Importance of Industries in Agriculture**1. Meaning of Industry in Agriculture**

Industry in Agriculture refers to the entire value chain of Agricultural activities, from the cultivation or rearing of crops and livestock to the various stages of processing, packaging, transportation, marketing and ultimately reaching consumers. types of industries within Agriculture include:

- a. **Agro-processing industry:** This industry encompasses the processing and value addition of Agricultural products. It includes activities such as milling, grinding, sorting, canning, freezing, drying, and packaging of crops, livestock products, and other Agricultural commodities.
- b. **Agricultural Machinery Industry:** This industry is focused on the manufacturing, distribution, and maintenance of agricultural machinery and equipment. It includes the production of tractors, harvesters, irrigation systems, sprayers, and other farm implements.
- c. **Input Supply Industry:** This industry involves the production and supply of inputs necessary for Agricultural activities, including seeds, fertilisers, pesticides, veterinary medicines, feed, and other Agricultural inputs.
- d. **Agricultural Services Industry:** This industry provides various services to support Agricultural activities, such as consulting, Agricultural research, extension services, logistics, marketing, and financial services tailored to the specific needs of the Agricultural sector.

2. Importance of Industry in Agriculture

- a. **Food Security and Nutrition:** Agriculture involves the production of crops, livestock, and fisheries, which are essential for meeting the growing global demand for food. A robust Agricultural industry contributes to reducing hunger, malnutrition, and dependency on food imports.
- b. **Economic Growth and Employment:** Industries in Agriculture generates employment opportunities, particularly in rural areas where Agriculture is a primary source of livelihood. The industry contributes to the gross domestic product (GDP) of many countries through the production, processing, and trade of Agricultural products.
- c. **Rural Development and Poverty Alleviation:** Agriculture forms the backbone of many rural economies. The industry supports rural communities by providing income opportunities, promoting infrastructure development, and reducing rural-urban migration. It plays a crucial role in poverty reduction and improving the livelihoods of smallholder farmers, who often constitute a significant portion of the Agricultural workforce.
- d. **Trade and Exports:** Agricultural products are essential commodities in international trade. The Agricultural industry enables countries to export their surplus Agricultural produce, contributing to foreign exchange earnings and improving trade balance. It allows countries

to access global markets, fostering economic growth and strengthening international trade relations.

- e. Innovation and Technological Advancements:** The Agricultural industry drives innovation and technological advancements. *Research and Development in Agricultural Sciences, Machinery, Biotechnology, And Digital Agriculture* contribute to increased productivity, efficiency, and resilience in the sector. The industry continually adapts to new technologies and practices to address emerging challenges, improve yields and optimise resource utilisation.

Learning Tasks

1. Define industry in Agriculture?
2. Discuss the types of industries in Agriculture and their importance.
3. Identify the agro-based industries in your community and what they produce.

Pedagogical Exemplars

Think-pair-share: The teacher asks learners to think about the meaning of industry in Agriculture and share their thoughts in pairs. The teacher provides clues to learners with difficulties to guide them to define the meaning of industry in Agriculture. Encourage other learners who are capable to delve deeper into bringing out further explanation of the meaning of industries in Agriculture.

Inquiry-based learning:

Put learners in mixed-ability/gender-based groups (where applicable) for them to surf the internet to come up with the types of industries in Agriculture and their importance in promoting growth and development. Teacher should assist learners with website links to where, they can access information on the types of industries in Agriculture and their importance in promoting growth and development. Teacher should monitor learners not to veer into unapproved sites. Teacher should ensure that all learners fully participate in the activity to prevent a few learners from hijacking the activity. Learners who know how to surf the internet should be encouraged to assist those with difficulties.

Problem-based learning:

In the same groups, learners prepare a table to show the agro-based industries in their community and what they produce. All learners should be involved in the preparation of a table. Teacher should provide extra support to students who might need it.

Key Assessments

Assessment Level 1: Define industry in Agriculture?

Assessment Level 2: Discuss at least two (2) importance of industries in Agricultural production.

Assessment Level 3: Research on the agro-based Industries in your community and what they produce.

Assessment Level 4: What agro-based industry can be established in your community and why?

Theme or Focal Area 2: Interdependence between Agriculture and Industry

Ways Agriculture and Industry are Interdependent

1. **Processing and manufacturing industry:** Agriculture produces the basic raw materials for most industries, especially the agro-based industries. Agriculture also depends on industry for the processing of the produce into finished forms for value addition.
2. **Chemical industry (part of the supply industry):** This industry produces fertilisers, insecticides, pesticides and weedicides for the maintenance of soil fertility, prevention and treatment of diseases, pests and weeds. The workers in the chemical industry also depend on the produce from Agriculture for their survival. Agriculture provides the chemical industry with raw materials such as farmyard wastes for the manufacturing of organic fertilisers.
3. **Mechanical industry (part of the Supply Industry):** Various types of farm machineries and implements are manufactured by mechanical industry to increase Agricultural productivity. Agriculture intends to provide food to the workers in this industry.
4. **Financial Institutions:** Farmers in the Agricultural sector get loans from the banks and other financial institutions to expand and sustain their farming enterprises. Farmers on the other hand save with these banks and financial institutions to sustain the financial institutions.
5. **Transport industry:** They are involved in moving Agricultural produce from the farm gate to the marketing and processing centres. The transport industry also depends on the funds obtained from the evacuation of Agricultural produce to sustain their business.
6. **Research:** Researchers carry out experiments to come up with Agricultural innovations, new techniques and technologies to improve crop and animal production. Agriculture in turn provides specimens to researchers for their experiments, feedback on their research outcomes and food for consumption.

Learning Task

1. List the interdependencies between Agriculture and industry.
2. Explain the interdependencies between Agriculture and industry,
3. Discuss how the interdependency between Agriculture and industry promotes Agricultural development.

Pedagogical Exemplars

Project-based learning: Put learners in mixed-gender/mixed-ability groups (where appropriate) to investigate the interdependence between Agriculture and industry in their community. Teacher should assist learners with leading questions to help them establish the interdependency between Agriculture and industry in their community. Teacher should challenge learners with the ability to give further examples of the interdependency between Agriculture and industry.

Experiential learning: In mixed-ability/mixed-gender groups (where applicable), learners watch a video, pictures or embark on a field trip to a farm and an agro-based industry such as corn mill. Learners identify how the farm and the agro-based industry depend on each other and build a portfolio. All learners should be involved in the portfolio building. Talented learners should be encouraged to assist those with difficulties.

Key Assessments

Assessment Level 1: Identify the specific raw materials used for producing the following Agricultural products in Fig. 1 wk3.



Fig. 1 wk 3: *Agricultural produce obtained from animals and plants*

N/B: Teacher should add more examples of Agricultural products for learners to identify their raw materials.

Assessment Level 2: Discuss the interdependency between Agriculture and the chemical industry.

Assessment Level 3: Research on the impact of financial institutions on the development of Agriculture.

Assessment Level 4: How have the research institutions influenced the growth of Agriculture in Ghana?

Theme or Focal Area 3: Challenges of Agriculture in an Industrialising Society

1. Challenges of Agriculture in an Industrialising Society

- a. **Declining Workforce:** Industrialisation often leads to rural-urban migration as people seek employment opportunities in non-Agricultural sectors. As a result, the Agricultural sector may experience a declining workforce, leading to labour shortages and reduced Agricultural productivity.
- b. **Income Disparity:** Industrialisation can contribute to income disparities between the Agricultural and industrial sectors. Non-Agricultural industries, such as manufacturing or services, often offer higher wages and better working conditions compared with Agriculture. This income disparity can create economic inequalities and discourage individuals from pursuing Agricultural occupations.
- c. **Technological Advancements:** As industrialisation progresses, the industrial sector often experiences rapid technological advancements and innovation. However, the Agricultural sector may lag behind in terms of adopting and benefiting from these technological advancements. Limited access to modern Agricultural technologies, such as improved seeds, mechanisation, precision farming, and digital tools, can impede Agricultural productivity and efficiency, affecting competitiveness and income generation.

- d. **Land and Resource Constraints:** Industrialisation can lead to increased demand for land, water, and other natural resources for non-Agricultural purposes such as urbanisation and industrial expansion. This can result in land fragmentation, conversion of Agricultural land for industrial use, and competition for water resources. Agricultural producers may face challenges in securing sufficient land and resources for sustainable Agricultural practices.
- e. **Access to Finance and Credit:** Agricultural development often requires significant investments in infrastructure, machinery, inputs, and technology. However, access to finance and credit can be limited in an industrialising society, especially for smallholder farmers or rural Agricultural enterprises. The lack of financial resources and limited access to credit can hinder Agricultural investments, modernisation efforts, and productivity improvements.
- f. **Market Integration and Price Volatility:** Industrialisation can lead to increased market integration and globalisation, exposing Agricultural producers to international market dynamics. Agricultural products face price volatility due to factors such as fluctuating global demand, trade policies, and market competition. Agricultural producers may struggle to adapt to market fluctuations and secure stable incomes, particularly if they lack access to market information, market infrastructure, and price stabilisation mechanisms.

2. Solutions to the Economic Challenges facing Agriculture in an Industrialising Society:

- a. **Diversification and Value Addition:** Encourage Agricultural production by promoting the production of diverse crops and animals. Emphasise value addition through processing, packaging, and branding of Agricultural products to capture higher margins and expand market opportunities.
- b. **Technology Adoption and Innovation:** Facilitate access to modern Agricultural technologies, such as improved seeds, efficient irrigation systems, precision farming techniques, and digital tools. Promote research and development, extension services, and training programmes to enhance technological literacy among farmers and encourage innovation in Agricultural practices.
- c. **Access to Finance and Credit:** Improve access to affordable credit and financial services for Agricultural producers, especially smallholder farmers and rural enterprises. Establish dedicated loan programmes, microfinance initiatives, and risk-sharing mechanisms to support investments in Agriculture.
- d. **Market Information and Infrastructure:** Strengthen market information systems to provide timely and accurate data on prices, demand trends, and market opportunities. Enhance infrastructure, including storage facilities, transportation network (2), and marketplaces, to reduce post-harvest losses, improve market access, and facilitate efficient supply chains.
- e. **Capacity-Building and Entrepreneurship:** Invest in Agricultural education, vocational training, and extension services to build the capacity and skills of farmers, agribusinesses, and rural communities. Foster entrepreneurship by providing business development services, mentoring programmes, and access to networks that support Agricultural start-ups and value chain integration.
- f. **Policy and Regulatory Support:** Formulate and implement policies that create an enabling environment for Agricultural development. This includes ensuring fair trade practices, reducing trade barriers, providing targeted subsidies, promoting sustainable farming practices, and protecting farmers' rights. Strengthen regulatory frameworks to ensure food safety, quality standards, and environmental sustainability.
- g. **Rural Infrastructure Development:** Invest in rural infrastructure, including roads, irrigation systems, electricity, and connectivity, to improve access to markets, reduce production costs,

and enhance the overall Agricultural ecosystem. Develop agro-industrial clusters or zones that provide integrated infrastructure and services for agribusiness activities.

- h. Public-Private Partnerships:** Foster collaboration between the public sector, private enterprises, and civil society organisations to leverage resources, expertise, and knowledge. Encourage public-private partnerships in research and development, extension services, market linkages, and investment promotion to foster innovation, enhance efficiency, and create a supportive ecosystem for Agricultural development.

Learning Tasks:

1. List the challenges facing Agriculture in an Industrialising Society.
2. Suggest solutions to the challenges facing Agriculture in an industrialising society
3. Write an essay on the economic challenges facing Agriculture in an industrialising society and suggest solutions.

Pedagogical Exemplars

Talk for learning: Teacher puts learners in mixed-gender/ability groups (where applicable) to discuss the various challenges facing Agriculture in an industrialising society. Teacher should assist learners with difficulty in identifying the challenges facing Agriculture in an industrialising society. Talented learners should be challenged to explain further the challenges facing Agriculture in an industrialising society.

Collaborative learning: Learners in mixed ability groups write an essay on the challenges of Agriculture in an industrialising society, suggesting possible solutions. Teacher should ensure that all learners participate in the activity. Teacher should encourage talented learners to assist group members with difficulty in information gathering and writing of the essay.

Key Assessments

Assessment Level 1: State at least two (2) challenges facing Agriculture in an industrialising society.

Assessment Level 2: Provide solutions to the following challenges facing Agriculture in an industrialising society: i) Declining workforce: and ii) Technological advancement

Assessment Level 3: How will you deal with an identified challenge in Agriculture in your community.

Assessment Level 4: What advice would you give to an investor who wants to venture into farming to overcome anticipated challenges.

Section 1 Review

Agriculture refers to the practice of cultivating soil, producing crops, and raising livestock for food, fiber and other products. Agricultural science, on the other hand, is the study of the science and technology involved in the various aspects of agriculture. Agriculture can also be said to be the art, science and business of cultivating crops and raising animals. It ensures food security, employment and livelihood, economic growth, foreign exchange and trade and cultural heritage. The branches of Agriculture are Crop Science, Animal Science, Agribusiness, Horticulture, Agricultural Economics, Agricultural Mechanisation, Forestry, Aquaculture and Soil Science. The career opportunities in Agriculture include: Agriculture Tutor/Lecturer, Entrepreneur, Economists, Engineer and Biotechnologist, Food Scientists, Animal and Crop Scientists, Forestry and Extension Officers. The misconceptions in Agriculture are low status occupation, Agriculture is only for rural areas, modern farming practices are not applicable or affordable and Agriculture is sole reliant on rain-fed farming. Practical learning experiences, using resource persons/experts, establishment of Agricultural clubs and extra curricula activities, competition and exhibitions are some of the ways of dispelling misconceptions in Agriculture. Agricultural Education is any training in Agriculture. The importance of Agricultural education is increasing self-sustainability, stimulate interest in the Agriculture industry, promote informed decision-making and sustain the national economy. Formal, non-formal and informal education are the types of Agricultural education. The types of Agriculture industry are Agro-processing, Agricultural Machinery, Input Supply and Agricultural Services Industry. Agriculture and industry are interdependent, e.g., Agriculture provides basic raw materials for processing and manufacturing industry, while processing and manufacturing industry provides markets for sale of Agricultural produce. Declining Workforce, Income Disparity, Market Integration and Price Volatility, Technological Advancements, Land and Resource Constraints, Access to Finance and Credit and Diversification and Value Addition in an industrializing society are some of the challenges facing Agriculture; these can be resolved through: Technology Adoption and Innovation, Access to Finance and Credit, Market Information and Infrastructure, Capacity-Building and Entrepreneurship, Policy and Regulatory Support, Rural Infrastructure Development and Public-Private Partnerships.

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SECTION 2: TOOLS AND MACHINERY OF AGRICULTURE

Strand: Modern Technical and Mechanised Agriculture

Sub-Strand: Modern Technical Agriculture

Learning Outcomes:

1. *Use the knowledge and skills acquired in measurements to determine the physical attributes of Agricultural inputs and produce.*
2. *Use the knowledge and skills acquired to operate farm machines and power and observe the necessary safety measures in Agricultural production.*
3. *Use the knowledge and skills acquired to select and employ the appropriate farm machine and power for Agricultural production.*
4. *Use the knowledge and skills acquired to operate and maintain simple farm machines and implements in Agricultural production.*

Content Standards:

1. Demonstrate knowledge, understanding and skills of measurements, measuring tools and their uses in Agricultural production
2. Demonstrate knowledge and understanding of the meaning, importance and safety measures, as well as skills in operating farm machines and power.
3. Demonstrate knowledge, understanding and skills of the types and uses of farm machines and power, and factors affecting their efficiency.
4. Demonstrate knowledge and skills in operating and repairing simple farm machines and implements in Agricultural production.

INTRODUCTION AND SECTION SUMMARY

Agricultural tools are used to facilitate and ease operations in animal production, crop production and other Agricultural related activities to boost food production and to promote food security. They range from simple tools to complex motorised machines. Their use has contributed positively to the reduction in the use of animal draught, which has the potential of negatively affecting the welfare of animals. This section deals with tools, their maintenance and use for Agricultural production. At the end of this section, learners are expected to acquire the skills of operating some farm tools and machines, how to maintain them, as well as the safety measures to observe during their use. Also, general safe working practices, such as the importance of PPE, awareness of hazards, carrying out risk assessments will be known by learners. This section has links with subjects such as Applied Technology, Engineering, Manufacturing and Robotics due to the involvement of tools and machines.

The Weeks covered by the Section are:

Week 4: Measurements, measuring tools and their uses in Agricultural production

Week 5: Meaning, importance and safety measures, as well as skills in operating farm machines and power.

Week 6: Meaning, importance and safety measures, as well as skills in operating farm machines and power.

Week 7: Types and uses of farm machines and power, and factors affecting their efficiency.

Week 8: Operating and repairing simple farm machines and implements in Agricultural production.

SUMMARY OF PEDAGOGICAL EXEMPLARS

This section is to be taught using various pedagogical exemplars. The teacher should use think-pair-share, managing talk for learning and collaborative learning to help learners to share their general knowledge about all aspects of Agricultural tools, learn to tolerate and respect each other's view. The use of experiential and project-based learning will provide learners with hands-on experience in the use of Agricultural tools. Problem-based and inquiry-based learning 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 to take measurements in the field and to operate farm machines observing all the safety measures. The teacher should encourage all categories of learners to actively participate in the lesson and practical activities, and exhibit honesty in measurements and recordings.

ASSESSMENT SUMMARY

Assessments to be given should encompass areas such as Agricultural tools, their uses, maintenance and safety measures to observe in during their operations. The teacher should ask questions in the afore-mentioned 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 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 number of demonstrations, oral and written responses. He/she should develop rubrics to score group presentations and assignments.

WEEK 4**Learning Indicator(s):**

1. *Outline the uses and maintenance procedures for measuring tools used in Agricultural production.*
2. *Relate the indigenous measuring tools to the standardised units of measurements in Agricultural production.*
3. *Demonstrate the use of simple scientific measuring tools to calculate parameters related to the various Agricultural sectors.*

Theme or Focal Area 1: Measuring Tools in Agriculture, their Uses and Maintenance**Measuring tools in Agriculture, their uses and maintenance**

1. **pH Meter:** A pH meter measures the acidity or alkalinity of the soil. Soil pH levels is important for determining soil suitability for different crops. It can be maintained by cleaning the dirt after use and keeping it in a cool dry place.
2. **Thermometer:** A thermometer measures temperature. It is crucial for monitoring ambient and soil temperature, as well as taking animal temperatures. It can be maintained by cleaning the dirt after use and keeping it in a cool dry place. Avoid exposing them to extreme temperatures, excessive force, or harsh chemicals that may affect their functionality.
3. **Rain Gauge:** A rain gauge is used to measure the amount of rainfall, which is important for irrigation planning and water resource management. It can be maintained by cleaning the dirt after use and keeping it in a cool dry place. Avoid exposing them to extreme temperatures, excessive force, or harsh chemicals that may affect their functionality.
4. **Anemometer:** An anemometer measures wind speed and direction. It is valuable for assessing wind patterns that may affect crop growth, chemical application, or the operation of wind-dependent equipment like wind turbines or windbreaks. It may also help in building shelter and protection for farm animals. Avoid exposing them to harsh chemicals that may affect their functionality.
5. **Grain Moisture Meter:** A grain moisture meter measures the moisture content in harvested grains. It aids in determining the optimal moisture level for storage and processing, preventing spoilage, mould growth, and maintaining grain quality. Avoid exposing them to extreme temperatures, excessive force, or harsh chemicals that may affect their functionality.
6. **Tensiometer:** A tensiometer measures soil moisture tension or suction. It provides real-time information on soil moisture availability and helps farmers determine the appropriate timing for irrigation, ensuring efficient water use and avoiding over- or under-watering. Avoid exposing them to extreme temperatures and harsh chemicals that may affect their functionality. Clean off the soil after use and store it in a cool dry place.
7. **Plant Height/Length Measuring Tools:** Various tools such as measuring tapes, rulers, or laser rangefinders are used to measure plant height or length. This information is valuable for assessing crop growth, monitoring plant development, and determining growth rates. Avoid exposing them to extreme temperatures and harsh chemicals that may affect their functionality. Clean off the soil after use and store them in a cool dry place.
8. **Weighing Scale:** Weighing scales are used to measure the weight of Agricultural produce, such as harvested crops, livestock, or feed. Accurate weight measurements are crucial for yield

estimation, trading, and monitoring feed or fertiliser application rates. Avoid exposing them to extreme temperatures and harsh chemicals that may affect their functionality. Clean off the soil after use and store them in a cool dry place.

- 9. Leaf Area Meter:** A leaf area meter measures the total leaf surface area of plants. It helps in determining crop growth, estimating photosynthetic potential, and assessing plant health. Avoid exposing them to extreme temperatures and harsh chemicals that may affect their functionality. Clean off the soil after use and store in a cool dry place.
- 10. Chlorophyll Meter:** A chlorophyll meter measures the chlorophyll content in plant leaves. It provides information about the plant's nutrient status, photosynthetic activity, and helps in diagnosing nutrient deficiencies or stress conditions. Avoid exposing them to extreme temperatures and harsh chemicals that may affect their functionality. Clean off the soil after use and store it in a cool dry place.
- 11. Nitrate Test Strips:** Nitrate test strips are used to measure the nitrate levels in soil or plant tissues. They help in monitoring soil fertility, optimising fertiliser application, and preventing excessive nitrate leaching. Avoid exposing them to extreme temperatures and harsh chemicals that may affect their functionality. Clean off the soil after use and store in a cool dry place.
- 12. Electrical Conductivity (EC) Meter:** An EC meter measures the electrical conductivity of a soil solution. It indicates the soil's salinity level, which is crucial for managing irrigation, nutrient management, and assessing soil quality. Avoid exposing them to extreme temperatures and harsh chemicals that may affect their functionality. Clean off the soil after use and store in a cool dry place.
- 13. Dissolved Oxygen Meter:** A dissolved oxygen meter measures the oxygen levels in water bodies, such as ponds, lakes, or aquaculture systems. It helps in monitoring water quality and ensuring proper oxygen levels for aquatic organisms. Avoid exposing them to extreme temperatures and harsh chemicals that may affect their functionality. Store in a cool dry place.
- 14. Vernier Calliper:** A vernier calliper is a precision measuring instrument that can be used for length (outer diameter, inner diameter, or thickness of seeds, stems, pipes, or machine parts), depth (depth of holes, trenches, or any other recessed areas in Agricultural equipment or structures), and step (height or steps of objects, which can be useful for assessing irregular surfaces or determining height differences) measurements. Vernier callipers require lubrication to maintain smooth movement and prevent friction. Apply a small amount of suitable lubricant according to the manufacturer's recommendations.
- 15. Pipette** is a laboratory tool used for precise liquid measurement, mixing and transfer. Handle with care to prevent accidental drops, impacts, or mishandling that could lead to damage or inaccuracies. Avoid exposing them to extreme temperatures, excessive force, or harsh chemicals that may affect their functionality.



Fig. 1 wk4: Types of Agricultural measuring tools



Fig. 2a wk4: Basic Agricultural farm tools

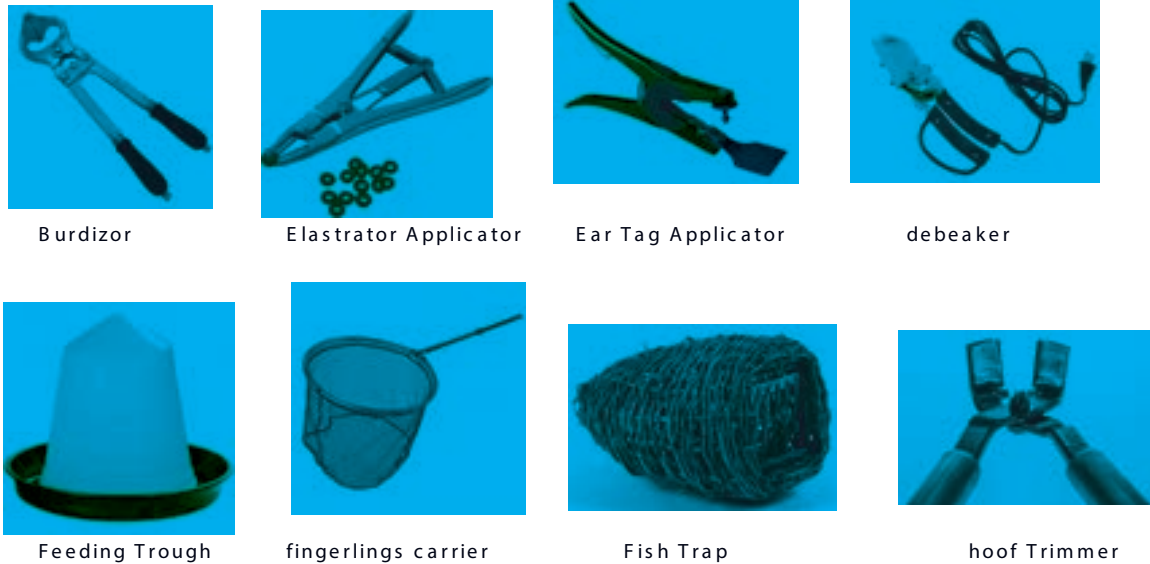


Fig. 2b wk4: *Basic Agricultural farm tools*

Learning Tasks

1. List Agricultural measuring tools used in your community.
2. Discuss how to maintain the listed Agricultural measuring tools.
3. Demonstrate how measuring tools are used in Agricultural production.

Pedagogical Exemplars

Think-pair-share: Learners individually list examples of Agricultural tools and instruments and their use(s) and share with a peer. Teacher assists learners with realia/pictures of tools and instruments to help learners list examples of tools and instruments in Agricultural production. The teacher should challenge talented students to list more tools and instruments in Agriculture production that are not part of the realia/pictures provided.

Collaborative learning: Teacher puts learners in mixed-ability/gender-based groups (where applicable) to watch video/pictures on the appropriate uses and maintenance of some tools and instruments in Agricultural activities and discuss their observations in groups. Encourage all learners to take active participation in the activities. Learners with sight or hearing difficulties should be seated in a way they can benefit from the video/picture. Learners should be assisted with leading questions to come up with their observations.

Experiential learning: Learners in their groups, guided by the instructor/technician, demonstrate measurements in the laboratory and field using the measuring instruments provided. Encourage all learners to take active participation in the activities. Learners with difficulties in using the tools and instruments should be given the necessary support. All safety protocols in the laboratory and the field should be strictly observed.

Key Assessments

Assessment Level 1: Sate at least three (3) basic farm tools and instruments used in Agricultural activities.

Assessment Level 2: Make a photo album of at least five (5) Agricultural tools and instruments commonly used in your community.

Assessment Level 3: Discuss the use of the following tools in Agricultural production: a. Metre rule b. A pair of callipers c. Spring balance d. Pipette.

Assessment Level 4: Discuss the maintenance of at least three (3) basic farm tools commonly used in your community to ensure ease of Agricultural activities and longevity of the tools.

Theme or Focal Area 2: Indigenous Measuring Tools and Standard Units of Measurement in Agriculture Production

Indigenous Measuring Tools

1. **“Bolga” Basket:** The Bolga basket is a traditional woven basket used for measuring grain or produce. Farmers fill the basket with a specific crop, such as maize or millet, to estimate the quantity by volume.
2. **“Tin” Containers:** Local tin containers, often repurposed cans or containers, are used to measure smaller quantities of Agricultural commodities. These containers have a specific volume that farmers are accustomed to using as a reference point. For example, a farmer may use a tin container to measure the quantity of seeds or grains to be sown or sold.
3. **Hand Span:** The hand span is an indigenous method of estimating the width or length of an area or object. Farmers may use their hand spans to measure the spacing between crop rows, the distance between plants during transplantation, or the length of certain Agricultural tools.
4. **“Gyinam” Stick:** The “gyinam” stick is a locally made measuring stick used for estimating plant height. It is typically made from a long, straight stem of a specific tree or plant. Farmers use the stick as a reference to measure the height of crops, such as maize or cassava, during different growth stages.
5. **“Olonka” or paint containers:** An “olonka” is a traditional measuring container made from a standard-sized paint tin or similar container. It is often used as a reference unit for measuring volumes and trading food commodities like gari (processed cassava granules) or maize in local markets or households.



Fig. 3 wk4: Types of Agricultural measuring tools

Learning Tasks

1. State any indigenous measuring tools used in your community.
2. Demonstrate how indigenous measuring tools are used in your community.
3. Discuss the implications of using indigenous measuring tools in Agricultural production.

Pedagogical Exemplars

Think-pair-share: Learners identify indigenous measuring tools in ability groups. Learners then discuss the uses of the indigenous measuring tools in their community. Teacher should use pictures to guide learners in the identification of the indigenous measuring tools. Learners with abilities should be challenged to give more examples of the indigenous measuring tools.

Project-based learning: Put learners in mixed ability groups to measure quantities of Agricultural inputs and products using the indigenous methods and the standardised measuring instruments to determine the actual measurements. Learners also prepare a table showing the equivalent values of indigenous measurement units and their corresponding standardised units. learners with difficulty in using the measuring instruments should be given the needed support. Teacher must ensure accurate measurements to avoid distortions. Teacher should challenge learners with abilities to compare more indigenous measurements with standardized measurements.

Initiating talk for learning: Learners discuss the implications of using the indigenous measuring tools in Agricultural activities in mixed ability groups. Teacher should ensure that all learners are involved in the discussion. Groups with difficulties should be given the needed support.

Key Assessments

Assessment Level 1: List at least two (2) indigenous measurement tools used in Agricultural activities.

Assessment Level 2: Explain how the hands span is used as a measuring tool in Agricultural activity.

Assessment Level 3: Discuss the implications of using indigenous methods of measurement in Agricultural activities.

Assessment Level 4: Undertake the following indigenous measurements and provide their standardised measurements:

- a) Weight of one bowl of maize
- b) Volume of one-quarter rubber bucket of water
- c) Volume of 1 bottle of coconut oil
- d) Weight of 1 head pan of wheat bran.

Theme or Focal Area 3: **Basic Parameters and their Calculations in Agriculture Production**

The following are some basic parameters measured in Agricultural Production and their calculations.

1. **Area of a Vegetable Bed:** Measure the length and width of the vegetable bed using a measuring tape or distance measuring wheel. Multiply the length by the width to calculate the area of the bed.
2. **Plant Population Density:** Determine the planting distance between rows and between plants within a row. Calculate the area of land dedicated to planting by multiplying the row distance by the plant distance. Divide the area of land by the recommended planting distance to estimate the number of plants.
3. **Hen Day Egg Production:** Count the number of eggs laid by a group of hens in a specific period (e.g., a day). Divide the total number of eggs by the number of birds to calculate the hen day egg production.
4. **Feed Conversion Efficiency (FCE):** Measure the amount of feed consumed by animals (feed intake). Measure the weight gain of the animals over a specific period. Divide the feed intake by the weight gain to calculate the feed conversion efficiency.
5. **Dosage of Veterinary Drugs:** Consult the drug's label or package insert for recommended dosage guidelines. Consider factors such as the animal species, weight, age, and specific condition being treated. Calculate the dosage based on the recommended dosage per unit of weight (e.g., milligrams per kilogram) and adjust accordingly.
6. **Heart Rate:** Locate the pulse point in the animal (e.g., palpating the femoral artery in large animals or feeling the heartbeat through the chest in smaller animals). Count the number of heartbeats felt within a specific time frame (e.g., one minute) to determine the heart rate.
7. **Temperature:** Use a thermometer suitable for the specific purpose (e.g., rectal thermometer for animals). Place the thermometer in the appropriate location (e.g., rectum or mouth) and wait for the reading to stabilise to measure body temperature accurately.
8. **Humidity:** Measure humidity using a hygrometer or a digital humidity meter. Place the device in the desired area or environment to obtain the humidity reading.
9. **Mortality Rate:** Determine the total number of deaths within a specific time period. Divide the number of deaths by the total population (e.g., number of animals or plants) and multiply by 100 to calculate the mortality rate as a percentage.
10. **Dressing Percentage of Carcass:** Measure the live weight of the animal. Measure the dressed carcass weight (weight after removing internal organs, blood, and skin). Divide the dressed carcass weight by the live weight and multiply by 100 to calculate the dressing percentage.
11. **Stocking Rate:** Determine the total area of the fishpond by measuring its length and width. Divide the total area by the recommended area per fish (based on species and desired stocking density) and multiply the result by 100 to calculate the stocking rate.

Learning Tasks

1. List the parameters that are measured in Agricultural production.
2. Explain parameters used in Agricultural production.
3. Calculate the various parameters used in Agricultural production.

Pedagogical Exemplars

Initiating talk for learning: Teacher puts learners in ability/ gender-based groups (where appropriate) to discuss the various parameters that are taken in the various sectors of Agriculture. Teacher should prompt learners with difficulty with clues to help them come up with parameters that are measured in Agriculture. Talented learners should be challenged to explain more parameters measured in Agricultural production.

Inquiry-based learning: Learners in their groups research to come up with how the various parameters are calculated. Teacher should assist learners with difficulties with some form of information like formulae, to assist them on how to calculate the various parameters in Agricultural production. Other learners should be encouraged to calculate more complex parameters.

Collaborative learning: In the same groups, learners prepare a portfolio of the parameters taken in the various sectors of Agriculture and how they are calculated. Learners with difficulties should be given the needed support.

Key Assessments

Assessment Level 1: State at least two (2) parameters measured in Agricultural production.

Assessment Level 2: Explain the term feed conversion efficiency as a parameter in Agricultural production.

Assessment Level 3: Discuss the measurement of at least three (3) parameters used in Agricultural production.

Assessment Level 4: Calculate the following parameters in Agricultural production:

- a. The plant population on 2 hectares of maize farm planted at 50cm x 60cm with 2 plants/hill.
- b. The amount of fertiliser applied per plant if the application rate is 250kg/h.
- c. The live weight of a cow is 920kg and the dressed carcass weight is 370kg, calculate the dressing percentage.

WEEK 5**Learning Indicator(s):**

1. *Explain the meaning and importance of farm mechanisation and power in Agricultural production.*
2. *Describe the safety measures employed in operating farm machines and power in Agricultural production.*

Theme or Focal Area 1: Meaning and Importance of Farm Mechanisation and Power in Agriculture Production**1. Meaning of Farm Mechanisation and Power**

- a. **Farm Mechanisation** refers to the application of engineering principles and technology in Agricultural settings. It involves the design, maintenance, and repair of Agricultural machinery and equipment used in farming operations. Farm mechanisation encompasses a wide range of skills, including understanding the working principles of farm machinery, diagnosing and troubleshooting mechanical issues, performing routine maintenance and ensuring the efficient and safe operation of Agricultural equipment.
- b. **Farm Power** refers to the energy or force required to perform various Agricultural tasks. It includes both human power and mechanical power sources used on the farm.
- c. **Human power** involves the physical effort exerted by farm workers, such as manual tilling, harvesting, or carrying loads.
- d. **Mechanical power**, on the other hand, involves the use of machinery, engines, or motors to perform tasks, such as ploughing, planting, irrigation, and crop processing.

2. Importance of Farm Mechanisation and Farm Power

- a. **Increased Efficiency and Productivity:** Well-maintained and properly functioning machinery enables faster and more accurate completion of tasks, saving time and labour.
- b. **Cost Reduction:** Farm mechanisation helps optimise the performance of Agricultural machinery, reducing downtime and minimising repair costs. Efficient use of farm power sources, such as selecting the right machinery or power systems for specific tasks, can result in cost savings by maximising energy efficiency and minimising fuel consumption.
- c. **Improved Farm Operations:** Proper understanding and application of farm mechanisation principles enable farmers to make informed decisions about machinery selection, equipment modifications, or implementing technological advancements. This leads to improved farm operations, better resource management, and enhanced overall farm performance.
- d. **Safety Enhancement:** Regular inspections, repairs, and adherence to safety guidelines minimises the risk of accidents and injuries associated with machinery operation.



Fig. 1 wk5: *Some importance of farm machinery and power*

Learning Tasks

1. Explain the meaning of farm mechanisation.
2. Identify some of the farm machinery used in your community.
3. Explain the importance of farm mechanisation and farm power to Agricultural productivity.

Pedagogical Exemplars

Talk for learning: Learners in pairs brainstorm to come up with the meaning and importance of farm mechanisation and farm power. Teacher should use pictures/charts of farm machines and power to assist learners define farm mechanisation and power. Challenge gifted learners to give further explanation to the meaning and importance farm mechanisation and power.

Experiential learning: Learners in mixed-gender groups (where appropriate) embark on a field trip to a nearby farm/watch a video/picture on mechanisation in Agriculture to observe and document the machinery that is used in Agricultural activities and build a portfolio on their visit. Teacher should assist learners with difficulties with pictures and probing questions to help them build their portfolio on machinery used in Agricultural activities. All learners should be encouraged to participate in the activities. Teacher should ensure that all safety measures are adhered to when visiting the farm. Pictures/videos that portray gender bias should be avoided or when identified it should be discussed.

Project-based learning: In mixed-gender groups, learners present a report on the importance of mechanisation and farm power in Agricultural production. All learners should be encouraged to participate in the preparation of the report. Learners who are good with report preparation should be encouraged to support other learners.

Key Assessments

Assessment Level 1: State the meaning of farm machinery and farm power in Agricultural production.

Assessment Level 2: Discuss at least three (3) types of Agricultural machinery used in your community.

Assessment Level 3: Discuss the impact of farm machinery and farm power in commercial Agriculture.

Assessment Level 4: Present a report on the importance of farm machinery and power in Agricultural production based on the field trip/video watched.

Theme/Focal Area (s) 2: Safety Measures Employed in Operating Farm Machines and Power in Agricultural Production

Safety Measures Employed in Operating Farm Machines and Power

- 1. Personal Protective Equipment (PPE):** Wearing appropriate PPE is essential for operator safety. This includes items such as helmets, safety goggles, ear protection, overalls, gloves, and safety boots. PPE helps protect against potential hazards like flying debris, noise, chemicals, and falls.
- 2. Training and Education:** Proper training and education on the safe operation of farm machines is crucial. Operators should receive comprehensive training on the specific machinery they will be operating, including understanding controls, safety features, and safe operating procedures.
- 3. Machine Inspection and Maintenance:** Regular inspection and maintenance of farm machines is necessary to ensure they are in proper working condition. This includes checking for worn-out or damaged parts, proper lubrication, and keeping safety features, such as guards and shields, intact.
- 4. Safe Start-up and Shutdown Procedures:** Following correct start-up and shutdown procedures is crucial for operator safety. This includes ensuring the machine is stable, all safety guards are in place, and no one is in the danger zone before starting or stopping the machine.
- 5. Hazard Identification and Warning Signs:** Properly identifying and marking potential hazards on farm machines and in the working environment is essential. Clear warning signs, labels, and markings should be placed on machines to alert operators and others about potential dangers.
- 6. Safe Operating Procedures:** Operators should follow established safe operating procedures for each specific farm machine. This includes guidelines for proper speed, turning, manoeuvring, and avoiding risky behaviour such as operating machinery under the influence of drugs or alcohol.
- 7. Avoiding Overloading and Improper Use:** Farm machines have specified limits and uses. Operators should avoid overloading machinery beyond recommended capacities and using them for purposes they are not designed for, which can lead to accidents or damage.
- 8. Communication and Signalling:** Clear communication between operators and workers are important, especially when operating large machinery or during manoeuvres. Hand signals, radios, or other communication devices can be used to ensure effective coordination and prevent accidents.



Fig. 2 wk5: *Some examples of PPE used in Agriculture.*

Learning Tasks

1. Explain safety measures employed in operating farm machines.
2. Discuss examples of PPE used in Agricultural production.
3. Demonstrate the correct usage of PPE's: in Agricultural production.

Pedagogical Exemplars

Problem-based learning: In ability groups learners brainstorm to come up with examples of safety measures that need to be observed during Agricultural activities. Teacher should use videos/pictures to guide learners to identify safety measures employed during Agricultural activities. Gifted learners should be challenged to give more examples of the safety measures employed during Agricultural activities. Teacher should ensure that videos used are not gender bias.

Experiential learning: Put learners in mixed gender groups to visit farm machinery workshop or watch a video/picture on activities that are carried out at a farm site/machinery workshop and discuss the safety measures that should be put in place to avoid injuries. The teacher should ensure that all the safety protocols at the farm machinery workshop are strictly adhered to. learners should be guided with probing questions to come up with safety measures employed in Agricultural activities aside what they observed at the machinery workshop.

Experiential learning: Learners in gender-based groups perform a farm activity such as preparation of beds, application of fertilisers etc. and demonstrate the safety measures that should be put in place before performing the activity. All learners should be encouraged to participate in the activity. Learners who have difficulties in performing the activities should assisted.

Experiential learning: Learners in mixed ability groups demonstrate the appropriate use of some PPEs in Agricultural production. Learners with difficulties should be assisted by a master craftsman in doing the activities. Every learner should be given the opportunity to practice the appropriate use of the PPEs in Agricultural production. This can be achieved when learners practice on a rota basis.

Key Assessments

Assessment Level 1: State two (2) Agricultural activities and their appropriate PPEs.

Assessment level 2: Explain at least two (2) safety measures that should be employed in operating a farm machine.

Assessment Level 3: Demonstrate how some PPE should be put on correctly before commencing a spraying exercise.

Assessment Level 4: Prepare a table showing at least three (3) farm activities involving the use of machinery and the possible safety measures that should be put in place to avoid accidents and injuries or damage.

WEEK 6

Learning Indicator(s): *Apply the knowledge and skills of safety measures in handling accidents and injuries of an Agricultural worker using appropriate first aid.*

Theme/Focal Area (s) 1: Injuries in Agricultural Production**1. Meaning and causes of Injuries in Agricultural Production**

Injuries in Agricultural production refer to physical harm or damage suffered by individuals involved in farming (crop, animal and fish) and other Agricultural activities.

2. Causes of Injuries in Agricultural Production

- a. **Machinery and Equipment:** Working with farm machinery such as tractors and combine harvesters can pose significant risks, including entanglement, crushing, and amputation hazards.
- b. **Slips, trips and falls:** Farming involves working in various terrains, such as uneven ground (e.g., fields) or slippery surfaces, which can increase the risk of slips, trips and/or falls, resulting in injuries.
- c. **Chemical Exposure:** Pesticides, fertilisers and other chemicals used in Agricultural production can lead to health issues and injuries if not handled properly or if safety measures are not followed.
- d. **Animal-Related Incidents:** Livestock, such as cattle can cause injuries through kicks, bites, or trampling.
- e. **Falls from Heights:** Working at heights, such as operating machinery on elevated platforms can lead to falls and serious injuries.

3. Type of Injuries in Agricultural Production

- a. **Abrasions:** Superficial injuries that involve scrapes or grazes to the skin. They usually result from friction or rubbing against a rough surface.
- b. **Lacerations:** Cuts or deep wounds that result from sharp objects or tools.
- c. **Bruises:** Also known as contusions occur when blood vessels beneath the skin rupture due to blunt force or trauma. They often appear as discoloured areas on the skin.
- d. **Fractures:** Broken bones resulting from significant force or impact on the skeletal system.
- e. **Burns:** Injuries caused by exposure to heat, fire, chemicals, electricity, radiation or friction.
- f. **Dislocations:** Displacement of a bone from its normal position at a joint.
- g. **Strains:** Injuries to muscles or tendons which are the fibrous tissues that connect muscles to bones.
- h. **Sprains:** Injuries to ligaments which are the connective tissues that join bones together at joints.
- i. **Puncture Wounds:** Deep injuries caused by sharp objects penetrating the skin, such as nails, needles, or shards of glass.
- j. **Crush injuries:** Injuries that occur when a body part is squeezed or compressed between two (2) objects, such as large livestock, heavy machinery or collapsing structures.
- k. **Poisoning:** Poisoning refers to the harmful effect that occurs when toxic substances from herbicides, other pesticides, cleaning fluids, etc. enter the body through ingestion, inhalation, or skin absorption.
- l. **Skin Irritations:** Skin irritations refer to adverse reactions or inflammation of the skin.

- m. Respiratory problems:** Respiratory problems encompass a range of conditions affecting the lungs and the respiratory system. These problems may include coughing, wheezing, shortness of breath, occupational asthma, bronchitis, or other respiratory disorders.
- n. Eye injuries:** Eye injuries occur when the eyes are exposed to harmful substances, foreign objects, or trauma. In Agricultural settings, eye injuries can result from flying debris, particles, chemicals, or direct impact from tools or equipment.

Learning Tasks

1. State the meaning and causes of injuries associated with Agricultural production.
2. Discuss the causes of injuries in Agricultural production.
3. Discuss the types of injuries associated with Agricultural production.

Pedagogical Exemplars

Manage talk for learning: Learners in pairs brainstorm to come up with the meaning of occupational injuries in Agricultural production. Teacher assists learners with leading questions to come up with the meaning of occupational injuries in Agriculture. Talented learners should be challenged to give further explanation to the meaning of occupational injuries in Agriculture.

Initiating talk for learning: Learners in ability groups discuss the causes of injuries in Agricultural production. Teacher should use scenarios of causes of accidents to guide learners in discussing the causes of injuries in Agricultural production. Learners with abilities should be challenged to delve deeper into the causes of injuries in Agricultural production.

Experiential learning: learners watch video/picture on the types of injuries in Agricultural production. Learners then discuss the types of injuries in Agricultural productions in mixed ability groups. Learners with sight or hearing difficulties should be seated in a way to help them benefit from the video/picture. Learners should be supported with leading questions to assist them in coming up with the types of injuries in Agricultural productions. Teacher should caution learners on the sensitivity of the video/picture before use.

Key Assessments

Assessment Level 1: Define occupational injuries in Agricultural production.

Assessment Level 2: Discuss at least three (3) causes of injuries in Agricultural production.

Assessment Level 3: Analysis of at least three (3) injuries that can occur at a farm site.

2. Implications of using Inappropriate First Aid Materials and Treatments of Wounds

- a. **Delayed or Inadequate Wound Healing:** Inappropriate first aid materials, such as non-sterile or dirty bandages, can introduce bacteria or contaminants to the wound, leading to infection and delaying the healing process.
- b. **Increased Risk of Infection:** Using non-sterile materials or applying chemicals that are not intended for wound care can increase the risk of infection.
- c. **Allergic reactions:** Some individuals may have allergies or sensitivities to certain materials or chemicals. Using inappropriate first aid materials or applying chemicals on wounds can trigger allergic reactions, ranging from mild skin irritation to severe allergic responses such as swelling, itching, or difficulty breathing.
- d. **Tissue Damage and Scarring:** Improper application of chemicals on wounds, especially those that are caustic or corrosive, can lead to tissue damage.
- e. **Prolonged pain and discomfort:** Using inappropriate materials or chemicals can cause unnecessary pain and discomfort for the individual.

3. Indigenous Ways of Providing First Aid to Injured Persons at a Farm Site

- a. **Medicinal Plants and Herbs:** Many indigenous communities have a deep understanding of local plants and their medicinal properties. Traditional healers or community members may use specific herbs, leaves, or roots to create poultices, infusions, or ointments to treat wounds, reduce inflammation, or alleviate pain.
- b. **Traditional Bandaging Techniques:** Indigenous communities may have their unique methods of bandaging wounds. This can include the use of natural fibres, such as plant leaves or tree bark, to create bandages or splints to immobilise injured limbs.
- c. **Heat and Cold Therapies:** Indigenous practices sometimes utilise heat or cold therapies for managing pain and inflammation. For example, applying heated or cooled natural substances, such as warmed stones or cold water, to the injured area may be believed to provide relief and reduce swelling.
- d. **Spiritual and Cultural Beliefs:** Indigenous first aid practices often incorporate spiritual and cultural beliefs. Ceremonies, prayers, or rituals may be performed alongside physical treatments to provide emotional support, invoke healing energy, or seek guidance from ancestral spirits or deities.
- e. **Traditional Bone Setting:** Some indigenous cultures have specialised individuals known as bone healers or traditional bone setters who possess unique knowledge and skills in setting fractures and dislocations.

4. Safety Measures in Handling Accidents and Injuries of an Agricultural Worker

- a. **Provide First Aid:** Apply appropriate first aid techniques to stabilise the injured worker while waiting for medical professionals to arrive. The specific first aid procedures will depend on the nature of the injury, but some common steps include:
- b. **Ensure the Injured Person** has an open airway and is breathing. Control bleeding by applying direct pressure to the wound with a clean cloth or bandage.
- c. **Immobilise** any suspected fractures or spinal injuries by keeping the injured person still and using splints or other appropriate immobilisation techniques.
- d. **Assess the Situation:** Assess the scene to ensure your safety and identify any potential hazards. Take necessary precautions to prevent further harm to yourself and others involved.

- e. **Call for Help:** If the injury is severe or life-threatening, immediately call for emergency medical assistance or instruct someone to do so. Provide accurate details about the location, nature of the injury, and any other relevant information.
- f. **CPR Administration:** Administer CPR (cardiopulmonary resuscitation) if necessary and if you are trained to do so.
- g. **Stay Calm and Provide Comfort:** Reassure the injured worker and try to keep them calm. Offer comfort and support while awaiting medical help. Keep them warm and provide reassurance that help is on the way.
- h. **Document and Report:** It is important to document the incident, including details of the injury, the first aid provided, and any witnesses. Report the incident to the appropriate authority within your organisation or follow the established reporting procedures.

Learning Task

1. Identify the contents of a first aid box and their importance.
2. Discuss the Implications of using inappropriate first aid materials and treatments of wounds.
3. Demonstrate indigenous ways of providing first aid to injured persons at a farm site.

Pedagogical Exemplars

Managed talk for learning: In ability/mixed-gender groups (where applicable), learners discuss the contents of a first aid box and their uses. E.g., bandage, gauze, plaster, string, alcohol, etc. Teacher assists learners with realia/pictures to identify some contents of a first aid box and their uses. Gifted learners should be guided with probing questions to come up with other contents of a first aid box which were not provided. Learners should be given opportunities to identify which of the contents they are familiar with.

Initiate talk for learning: Guided by a health worker or a first aider, learners in mixed-ability/mixed-gender groups (where applicable) discuss the implications of using inappropriate first aid materials and treatment of wounds. The health worker should use pictures of complications developed from the use of inappropriate first aid material in treatment of wounds to assist learners to appreciate the effects of using inappropriate first aid materials in treatments of wounds. Learners should be allowed to share experiences of using inappropriate first aid materials and applications of chemicals on wounds.

Manage talk for learning: Learners discuss the indigenous ways of providing first aid to injured persons at a farm site in mixed ability groups. Teacher should use leading questions to guide learners to come up with indigenous (local) ways of providing first aid to injured persons at a farm site. Learners should be allowed to share experiences of assisting injured persons using indigenous methods. Teacher should alert learners on the dangers of some of these indigenous first aids where appropriate.

Key Assessments

Assessment Level 1: State at least three (3) contents of first aid box.

Assessment level 2: What are the uses of the following in a first aid box *a.* bandage *b.* gauze *c.* plaster *d.* string *e.* alcohol.

Assessment Level 3: Discuss at least three (3) the implications of a using inappropriate first aid materials in the treatment of wounds.

Assessment Level 4: Prepare a table showing the injuries that can occur at a farm site and their corresponding first aid applicable in each case.

Theme/Focal Area(S) 3: General Safety Working Practices and Risk Assessments

1. General Safety Working Practices

- a. Training and Education:** Provide comprehensive training for all workers on safe work practices, machinery operation, and emergency procedures. Ensure that workers are familiar with the potential hazards associated with specific tasks and equipment.
- b. Personal Protective Equipment (PPE):** Require the use of appropriate PPE, such as gloves, safety goggles, hearing protection, and respiratory protection, depending on the task. PPE is important because it prevents physical injury, protection against chemical exposure, respiratory, hearing and eye protection, prevention of biological hazards, heat and sun protection, prevention of musculoskeletal injuries and provide safe means of handling. Regularly inspect and maintain PPE to ensure its effectiveness.
- c. Machinery Safety:** Conduct regular maintenance and inspections of all farm equipment to identify and address potential issues. Train operators on the safe operation of machinery and equipment. Keep guards and shields in place and ensure all safety features are functional.
- d. Chemical Handling and Storage:** Provide training on the proper handling, storage, and disposal of Agricultural chemicals. Ensure workers are aware of the location of emergency equipment, such as eyewash stations and emergency showers.
- e. Manual Handling:** Encourage proper lifting techniques to prevent musculoskeletal injuries. Provide mechanical aids when handling heavy loads and implement ergonomic practices.
- f. Fall Prevention:** Install guardrails, safety nets, or personal fall arrest systems when working at heights. Train workers on the proper use of fall protection equipment.
- g. Animal Handling:** Train workers on safe animal handling practices. Provide appropriate facilities and equipment for handling livestock.
- h. Emergency Procedures:** Develop and communicate emergency response plans, including evacuation procedures and first aid protocols. Ensure the availability of first aid kits and fire extinguishers.
- i. Field and Environmental Hazards:** Identify and address environmental hazards such as uneven terrain, wildlife, and adverse weather conditions. Implement measures to protect workers from extreme temperatures and sun exposure.
- j. Regular Safety Inspections:** Conduct regular safety inspections of the entire farm, including equipment, buildings, and work areas. Promptly address any identified hazards or issues. Communication: Foster open communication between workers and management regarding safety concerns. Encourage reporting of near misses and incidents for continuous improvement.
- k. Regulatory Compliance:** Stay informed about and comply with local, regional, and national safety regulations and standards.

2. Risk Assessment in operating Farm equipment and machinery

- a. Identification of Hazards:** The first activity in risk assessment is to identify potential hazards associated with the specific equipment, tools, or machinery being used. This could include moving parts, sharp edges, electrical components or environmental factors such as uneven terrain or adverse weather conditions.

- b. Assess Risks:** Once hazards are identified, evaluate the level of risk associated with each one. Consider the likelihood of an accident occurring and the potential severity of the consequences.
- c. Determine Appropriate Control Measures:** Develop control measures to mitigate or eliminate the identified risks. This could involve engineering controls such as machine guarding, administrative controls such as implementing safe operating procedures, or personal protective equipment (PPE) such as helmets, gloves, or safety goggles.
- d. Implement Control Measures:** Put the identified control measures into practice. This may involve modifying equipment, providing training to operators, or establishing safety protocols for using the equipment or machinery in specific conditions.

Learning Tasks

1. Identify general safety working practices at a farm site.
2. Discuss the general safety working practices at a farm site.
3. Assess the level of risk associated with operating a particular farm equipment or machinery.

Pedagogical Exemplars

Managing talk for learning: Learners in mixed ability groups discuss the general safety measures that are employed at a farm site. Teacher should use pictures/videos of the safety measures that are employed at a farm site to guide learners in coming up with the safety measures. Videos that depict gender biasness should be avoid. Learners with difficulties should be given the needed support.

Project-based learning: learners in ability groups assess the level of risk associated with the use of particular farm equipment and machinery and recommend the safety measure to put in place before operating the equipment or machinery. All learners should be encouraged to participate actively in the activity. Groups with difficulties in undertaking the risk assessment should be given the necessary support.

Key Assessment

Assessment Level 1: Identify at least three (3) safety measures that are employed at a farm site.

Assessment level 2: Discuss at least three (3) importance of observing safety measures at a farm site.

Assessment Level 3: Discuss the implications of not conducting a thorough risk assessment before operating farm machinery.

Assessment Level 4: Discuss the implications of wrongfully handling an injured Agricultural worker.

WEEK 7**Learning Indicator(s):**

1. *Describe the types and uses of farm machines and power in Agricultural production.*
2. *Describe the factors that affect the use of farm machines and power.*

Theme/Focal Area (s): Types and Uses of Farm Machines and Power in Agricultural Production**1. Machines and Implements Use in Crop Production**

- a. **Tractors:** Used for ploughing, planting, harvesting, hauling and general fieldwork. Tractors can be equipped with various attachments by means of power take-off (PTO) which transfers power from the tractor engine to the attached equipment.
- b. **Combine Harvesters:** Used for harvesting crops such as wheat, corn, soya beans and rice. Combine harvesters can cut, thresh, and separate grain from the chaff in a single operation.
- c. **Planters and Seed Drills:** Used for planting seeds in rows or directly into the ground. Planters and seed drills ensure proper spacing and depth for optimal crop growth.
- d. **Sprayers:** Used for applying pesticides fertilisers and other Agricultural chemicals to crops. Sprayers ensure precise and uniform application for insect pest, fungal disease and weed control.
- e. **Harvesters:** Used for harvesting specific crops such as fruits, vegetables and forage. Harvesters can be designed for different crops, like potato harvesters or grape harvesters.
- f. **Balers:** Used for compacting and baling harvested crops, such as hay, straw, or silage, into manageable and transportable bundles for storage or livestock feed.
- g. **Tillage Equipment:** Used for preparing the soil for planting by breaking up and smoothing the surface, incorporating crop residues and controlling weeds. Examples include ploughs, harrows, cultivators, and disc harrows.
- h. **Irrigation Systems:** Used for providing controlled water supply to crops for optimal growth. Irrigation systems can be sprinkler-based, drip irrigation or flood irrigation.

2. Machines and Implements Use in Animal Production

- a. **Feed Mixers:** Used for mixing and preparing animal feed, combining different ingredients like grains, forages and supplements to create a nutritionally balanced ration. Feed mixers ensure uniform distribution of feed components.
- b. **Silage Harvesters:** Used for harvesting and chopping forage crops, such as corn or grass, for ensiling. Silage harvesters cut the crops into small pieces and deposit them into trailers for transport and storage.
- c. **Milking Machines:** Used for mechanised milking of dairy animals, such as cows or goats. Milking machines automate the milking process, enhancing efficiency and reducing labour requirements.
- d. **Manure Spreaders:** Used for spreading animal manure onto fields as organic fertiliser. Manure spreaders help distribute manure evenly, improving soil fertility and nutrient recycling.
- e. **Ventilation Systems:** Used for providing optimal air circulation and temperature control in livestock buildings. Ventilation systems help maintain a comfortable and healthy environment for animals, particularly in intensive animal production systems.

- f. **Automatic Water Dispensers:** Used for supplying a continuous and clean water source to animals. Automatic water dispensers ensure that livestock have access to fresh water at all times, reducing labour associated with manual watering.
- g. **Cattle Scales:** Used for weighing livestock for monitoring growth, determining feed efficiency, and managing herd health. Cattle scales enable accurate weight measurement, aiding management decisions.
- h. **Automatic Egg Collectors:** Use for collecting eggs from poultry houses automatically. Automatic egg collectors reduce labour and handling stress on hens, improving efficiency in egg production.

3. Machines and Implements Use in Fish Production

- a. **Fish Feeders:** Used to distribute feed to fish in aquaculture systems.
- b. **Oxygenation Systems:** Such as aerators and diffusers are used to maintain adequate oxygen levels in fish ponds or tanks.
- c. **Filtration Systems:** They are employed to remove waste, excess feed, and other impurities from fish tanks or ponds.
- d. **Fish Graders:** Used to sort fish by size.
- e. **Fish Counters:** These are devices that automate the counting of fish in aquaculture systems.
- f. **Fish Vaccinators:** These are specialised equipment that facilitate the efficient and safe administration of vaccines to fish, often through injection or immersion methods.
- g. **Fish Processing Equipment:** Includes machinery used for cleaning, filleting, deboning, and packaging fish for the market.
- h. **Water Quality Monitoring Equipment:** Various instruments and sensors, such as pH meters, dissolved oxygen meters, and temperature probes, that are used to monitor and assess water quality parameters in fish production systems.
- i. **Boat and Netting Equipment:** In commercial fishing operations, boats, nets, and fishing gear are utilised for capturing fish from natural water bodies. These include trawlers, seine nets, gill nets, and other fishing implements.



Fig. 1 wk7: Machines used in Agriculture Production.



Fig. 2 wk7: Implements used in Agriculture Production.

3. Types of Farm Power Units and Their Uses

- a. **Human Power:** Human labour is employed in tasks such as manual harvesting, hand weeding, planting, and other activities that require dexterity and precision.

Advantages

- i. Cost-effective
- ii. Accessibility
- iii. Precision and flexibility
- iv. Environmentally friendly and sustainable
- v. Health and fitness.

Disadvantages

- i. Labour intensive
- ii. Time-consuming
- iii. Physical limitations
- iv. Limited capacity
- v. Seasonal and weather dependency
- vi. Skill requirements.

- b. **Animal (Draught) Power:** Animals, such as horses, oxen, and mules, are utilised for tasks like ploughing, pulling carts or wagons, harrowing, and transportation of goods on the farm.

Advantages

- i. Versatility as animals can perform a wide range of farm tasks, including ploughing, harrowing, cultivating, hauling, and transportation.

- ii. Animal power is a renewable energy source that does not rely on fossil fuels and is environmentally friendly.
- iii. Animals are often available on the farm or can be easily acquired or rented from nearby sources.
- iv. Low Cost as compared with the purchase, maintenance, and fuelling of machinery.
- v. Animals distribute their weight more evenly, reducing soil compaction and erosion. Also, their faeces add manure to the soil; thereby, conserving the soil.

Disadvantages

- i. Working with animals requires proper training, knowledge, and expertise.
 - ii. Requires regular care, including feeding, grooming, veterinary attention, and suitable shelter.
 - iii. Animals have physical limitations in terms of power and speed compared with mechanised equipment.
 - iv. Animals are subject to seasonal variations, such as periods of rest, breeding, or growth, which can impact their availability or performance.
 - v. Animal-powered operations may be slower and less efficient compared with mechanised alternatives.
- c. Mechanical Power:** Mechanical power involves the use of machines powered by engines or motors for a wide range of farm operations. E.g., Internal combustion engines (typically diesel or gasoline).

Advantages

- i. Mechanised equipment is typically more powerful and faster than manual or animal-powered methods.
- ii. Mechanised equipment can offer precise control over operations such as planting, fertilizing, spraying and harvesting.
- iii. Mechanisation reduces the time required to perform labour-intensive tasks, allowing farmers to focus on other important aspects of their operations.
- iv. Mechanisation reduces the need for a large workforce, especially for repetitive or physically demanding tasks.
- v. Machinery provides greater power and capacity compared with human or animal power.

Disadvantages:

- i. Mechanised equipment can be expensive to purchase, operate, and maintain.
 - ii. Most mechanical power units rely on fossil fuels such as gasoline, diesel or propane which can result in significant operating costs, vulnerability to fuel price fluctuations and environmental impacts.
 - iii. Operating and maintaining machinery requires technical knowledge and skills. Farmers need to be trained in equipment operation, maintenance, troubleshooting, and safety protocols.
 - iv. Mechanised operations, especially when not implemented sustainably, can have environmental consequences.
 - v. Can also cause soil compaction, erosion, noise pollution, and chemical runoff from machinery can negatively impact soil health, water quality, and biodiversity if proper management practices are not followed.
 - vi. Mechanised equipment may not be suitable or accessible for certain terrains, small plots, or in regions with limited infrastructure.
- d. Electrical power** plays a vital role in modern Agricultural operations. It is used for a variety of purposes on farms, including lighting, electric fences, water pumping, and operating milking machines.

Advantages

- i. Electrical power can be utilised to operate a wide range of Agricultural machinery and equipment, including irrigation systems, pumps, and milking machines.
- ii. Electrically powered machinery and equipment are generally more efficient than their non-electric counterparts.
- iii. Electrical power from the grid or generated by generators is generally reliable and consistent.
- iv. Compared with fossil fuel-powered alternatives, electrical power has a lower environmental impact.
- v. Electrical power enables automation and control systems in farm operations, improving efficiency and precision.

Disadvantages

- i. Establishing electrical power infrastructure on farms, including wiring, transformers, distribution panels, and connection to the grid, can involve significant upfront costs.
 - ii. Farms relying on electrical power from the grid are subject to potential power outages or disruptions.
 - iii. While electrical power may be cost-effective compared with some other power sources, farms still incur ongoing operating costs, including electricity bills.
 - iv. Electrical power is typically stationary and requires a fixed infrastructure.
 - v. While electrical power itself has a lower environmental impact, the generation of electricity can have environmental consequences depending on the energy source.
- e. **Renewable Energy Power:** Farms are increasingly adopting renewable energy systems like Solar Panels, Wind Turbines, Biogas, Water Turbines, Battery Systems to generate electricity, which can power various farm operations or contribute to grid supply. By integrating renewable energy sources into farm operations, farmers can reduce their carbon footprint, save on energy costs, and improve the sustainability of their Agricultural practices.

Advantages

- i. Renewable energy sources produce minimal greenhouse gas emissions and have a significantly lower environmental impact compared with fossil fuel-based power generation.
- ii. Over the long term, renewable energy can lead to cost savings for farms.
- iii. Renewable energy allows farms to become more self-sufficient and less reliant on external energy sources.
- iv. The adoption of renewable energy can stimulate rural economic development. Farms can become producers and sellers of renewable energy, contributing to job creation and revenue generation for local communities.
- v. Renewable energy sources provide long-term stability and price predictability.

Disadvantages

- i. The initial investment in renewable energy systems can be high, including the cost of equipment, installation, and maintenance.
- ii. Renewable energy sources, such as solar and wind, are subject to intermittency and variability.
- iii. Some renewable energy systems, such as large-scale solar or wind farms, require significant land or space.
- iv. Certain renewable energy technologies may still have technological limitations or require specialised knowledge for installation, operation, and maintenance.
- v. While renewable energy sources have a lower environmental impact, they still have some associated environmental considerations.



Fig. 3 wk7: Examples of sources of power used in Agricultural Production

Learning Tasks

1. Identify and describe the types of farm machinery and power.
2. Demonstrate the use of farm implements under the guidance of a technician.
3. Discuss the sources of farm power and their advantages and disadvantages.

Pedagogical Exemplars

Initiate talk for learning: In mixed-gender/mix ability groups (where applicable), learners embark on a field trip to a nearby mechanised farm or watch videos/pictures on farm mechanisation, to identify and describe the various farm machines and power. Learners then discuss the uses of the various farm machines. Teacher should ensure learners observe strict safety protocols at the mechanised farm. Videos that portray gender biases should be avoided. Learners with difficulties should be supported with leading questions to identify and describe the farm machines and power. Challenge learners with abilities to give more examples and further descriptions of the fam mechanization and power.

Experiential learning: Guided by a technician, learners in gender-based groups demonstrate the use of some of the farm implements in Agricultural production. Teachers should ensure that all the safety protocol are strictly observed. Learners should be guided to do a risk assessment before operating the farm implements. All learners should be given the opportunity to operate the farm implements and this can be done on a rota basis. Learners with difficulties should be given the needed assistance.

Talk for Learning: Learners in mixed-gender and/or mixed-ability groups, discuss the sources of power and the advantages and disadvantages in Agricultural operations. Teacher should ensure all

learners participate in the discussions. Teacher should use probing questions to guide learners to identify the sources of power in Agricultural productions and their advantages and disadvantages.

Key Assessments

Assessment Level 1: Identify at least four (4) farm implements and their use.

Assessment Level 2: Describe the uses of the following Agricultural machines: a) Combine Harvesters b) Feed Mixers c) Fish Vaccinators.

Assessment Level 3: Compare and contrast the uses of renewable and non-renewable sources of energy in Agricultural productions.

Theme/Focal Area (s) 2: Factors that Affect the use of Farm Machines and Power Sources

Key Factors that Influence the Efficiency of Farm Machines and Power Sources in Agricultural Production

- 1. Machine Selection:** Choosing the right machine for a specific task is crucial. The type of crop, field conditions, terrain, and desired level of automation should be considered when selecting a machine. Selecting a machine that is well-suited to the task at hand can enhance efficiency and productivity.
- 2. Maintenance and Upkeep:** Regular maintenance and upkeep of farm machinery is essential for optimal performance. Proper lubrication, cleaning, and timely repairs help prevent breakdowns, reduce downtime, and ensure efficient operation.
- 3. Operator Skill and Training:** The skill and training of the machine operator will significantly influence efficiency. Well-trained operators can operate machines more effectively, make appropriate adjustments, and address minor issues promptly, leading to improved efficiency and reduced fuel consumption.
- 4. Farm Management Practices:** Effective farm management practices, such as proper planning, scheduling and coordination, can enhance the overall efficiency of machinery operations. Optimal field layout streamlined workflow and well-managed logistics contribute to efficient machinery utilisation.
- 5. Field Conditions:** Field conditions, including soil type, moisture content, slope, and obstacles, impact machine efficiency. Proper field preparation, addressing drainage issues, and managing soil compaction can improve machine performance and reduce fuel consumption.
- 6. Weather Conditions:** Weather conditions, such as temperature, humidity, and precipitation, can influence machinery efficiency. Extreme weather conditions may impact machinery operation, harvesting schedules, and field access. Adapting machine settings and schedules accordingly can help maintain efficiency.
- 7. Power Source and Energy Efficiency:** The choice of power source for farm machines, such as diesel, gasoline, electricity, or renewable energy, can impact efficiency. Opting for energy-efficient machines and utilising efficient power sources can help reduce fuel consumption and minimise energy waste.
- 8. Load Management and Balancing:** Proper load management is crucial for efficient machinery operation. Overloading or underutilising machinery capacities can affect fuel efficiency and overall productivity. Balancing machine loads and optimising work distribution can improve efficiency.

9. **Technology and Automation:** Advances in technology and automation have contributed to increased efficiency in farm machinery. Precision Agriculture technologies, GPS guidance systems, telematics, and automation features enable precise operation, reduce overlaps, and optimise inputs, leading to improved efficiency.
10. **Machine Age and Condition:** Older machinery may have lower efficiency due to outdated technology and wear and tear. Upgrading to newer models with improved design, fuel efficiency, and advanced features can enhance overall machinery efficiency.
11. **Implementation of Best Practices:** Adhering to industry best practices and adopting efficient operational techniques can boost machinery efficiency. This includes proper calibration of equipment, maintaining appropriate working speeds, and avoiding unnecessary idle time.

Learning Tasks

1. State the factors that affect the efficiency of farm machines and power during Agricultural activities.
2. Discuss the factors that affect the efficiency of farm machines and power during Agricultural activities.
3. Make recommendations on how to use farm machines and power efficiently.

Pedagogical Exemplars

Problem-based learning: In mixed-ability groups, learners brainstorm to come up with the factors that affect the efficiency of farm machines and power during Agricultural activities. Teacher should use leading questions to guide learners to identify the factors that affect the efficiency of farm machines and power during Agricultural activities. Gifted learners should be probed further to come up with further explanations of the factors.

Experiential learning: In mixed-gender/mixed ability groups, learners visit a farm site/ farm machinery workshop or watch videos/pictures on the use of farm machines and power sources, and make recommendations on how the machines can be used efficiently. Teacher should ensure learners observe strict safety protocols at the farm site/ farm machinery workshop. Videos that portray gender biases should be avoided. Learners with difficulties should be supported with leading questions to make recommendations on how the machines can be used efficiently.

Key Assessments

Level 1 Assessment: State at least two (2) factors that affect the efficiency of farm machines and power during Agricultural activities.

Level 2 Assessment: Discuss at least two (2) effects of regular maintenance and operator skills and training on the efficiency of farm machines and power.

Level 3 Assessment: As a newly employed farm technician, discuss two (2) ways of ensuring the efficient use of the farm machines and power under your care.

WEEK 8**Learning Indicator(s):**

1. *Identify the principal parts of farm machines and implements, and state their functions.*
2. *Operate and maintain farm machines and implements in Agricultural production.*

Theme/Focal Area (s)1: Principal Parts of Farm Machines and Implements and their Functions**1. Parts of Farm Machines and Implements and their Functions**

- a. **Power Source:** Farm machines can be powered by various sources such as engines, electricity, by attachment to tractors, or human/animal power. The power source provides the energy required to operate the machine.
- b. **Chassis/Frame:** The chassis or frame forms the structural base of the machine, providing support and stability.
- c. **Transmission System:** The transmission system transfers power from the power source to the working components of the machine, enabling the desired operation. It may consist of gears, belts, chains, or hydraulic systems, depending on the machine.
- d. **Control System:** The control system includes levers, pedals, buttons, or electronic controls that allow the operator to manoeuvre and control the machine's operations.
- e. **Cutting/Working Components:** These parts are specific to the type of farm machine and implement. Examples include blades, discs, teeth, or tines. They are responsible for cutting, tilling, sowing, harvesting, or other specific tasks required in Agricultural operations.
- f. **Wheels/Tyres:** Wheels or tyres provide mobility to the machine, allowing it to move across the field or road. They may vary in size and design depending on the terrain and the machine's purpose.
- g. **Hitching/Attachment Mechanism:** Farm implements are often attached to tractors or other machines using hitching systems. These mechanisms ensure a secure connection between the implement and the machine, allowing for efficient operation.
- h. **Control Panels/Gauges:** Many modern farm machines feature control panels and gauges that provide information about various parameters such as speed, temperature, fuel levels, and other relevant data to monitor the machine's performance.

2. Parts of an internal combustion engine (Petrol and Diesel Engine)

The major parts of an internal combustion engine and their functions:

- a. **Cylinder Block:** The cylinder block is the main structure of the engine and houses the cylinders, pistons, and other vital components. It provides support and forms the combustion chambers.
- b. **Cylinder Head:** The cylinder head is mounted on top of the cylinder block and seals the combustion chambers. It contains intake and exhaust ports, valves, and spark plugs.
- c. **Pistons:** Pistons are cylindrical components that fit inside the cylinders. They move up and down within the cylinders, transmitting force generated by the combustion process to the crankshaft.
- d. **Connecting Rods:** Connecting rods connect the pistons to the crankshaft. They convert the linear motion of the pistons into rotational motion of the crankshaft.

- e. **Crankshaft:** The crankshaft is a vital component that converts the reciprocating motion of the pistons into rotary motion. It transfers power from the pistons to the drivetrain of the engine.
- f. **Camshaft:** The camshaft controls the opening and closing of the intake and exhaust valves. It is driven by the crankshaft and operates the valves through a series of lobes.
- g. **Valves:** Valves regulate the intake of air and fuel mixture and the exhaust of combustion gases. The intake valves allow the mixture to enter the combustion chamber, while the exhaust valves enable the expulsion of burned gases.
- h. **Intake and Exhaust Manifolds:** The intake manifold directs the air-fuel mixture from the carburettor or fuel injection system to the intake valves. The exhaust manifold collects and channels the exhaust gases away from the cylinders.
- i. **Fuel System:** The fuel system includes components such as the fuel tank, fuel pump, carburettor or fuel injectors, and fuel lines. It delivers fuel to the combustion chambers for the combustion process.
- j. **Ignition System:** The ignition system generates a spark to ignite the air-fuel mixture in the combustion chambers. It typically consists of spark plugs, ignition coils, and an ignition control module for petrol engines. Diesel engines however, do not have a traditional ignition system with spark plugs and distributors. Instead, they rely on the high temperature and pressure created during the compression stroke to ignite the fuel. This compression ignition process is a key characteristic that distinguishes diesel engines from gasoline engines.
- k. **Air Intake System:** The air intake system provides filtered air to the combustion chamber for the mixing with fuel for diesel engines.
- l. **Turbocharger:** A turbocharger increases the efficiency of the engine by compressing the incoming air before it enters the combustion chamber in diesel engines, allowing for more fuel to be burned.
- m. **Lubrication System:** The lubrication system ensures that all moving parts are adequately lubricated to reduce friction and prevent excessive wear. It includes an oil pump, oil filter, and oil passages.
- n. **Cooling System:** The cooling system regulates the engine temperature and prevents overheating. It typically includes a radiator, water pump, thermostat, and coolant passages.
- o. **Exhaust System:** The exhaust system guides and expels the combustion gases from the engine, typically through a series of pipes and a muffler.
- p. **Timing Belt/Chain:** The timing belt or chain synchronizes the rotation of the crankshaft and camshaft, ensuring precise valve timing.



Fig. 1 wk8: Typical petrol engine and some major parts



Fig. 2a wk8: Major parts of a diesel engine



Fig. 2b wk8: *Major parts of a diesel engine*

3. The Major Parts of a Disc Plough (sometimes called a disc harrow)

- a. **Frame:** The frame provides the structural support and stability for the disc plough. It is typically made of strong and durable materials such as steel.
- b. **Discs:** The discs are the cutting components of the disc plough. They are circular blades attached to the frame at a specific angle. The number and size of discs can vary depending on the plough's design.
- c. **Disc Gangs/Groups:** Discs are arranged in gangs or groups on the disc plough. A disc gang consists of multiple discs mounted together on a common axle. Gangs can be adjusted to control the working width and depth of the plough.
- d. **Disc Bearings:** Bearings are located at the centre of each disc, allowing them to rotate freely. They help reduce friction and provide smooth operation of the discs.
- e. **Disc Scrapers:** Disc scrapers are attached near the discs to prevent the accumulation of soil, weeds, or debris on the blades. They help maintain the cutting efficiency of the discs.
- f. **Hitching Mechanism:** The hitching mechanism allows the disc plough to be attached to a tractor or another pulling vehicle. It ensures a secure connection between the plough and the pulling vehicle.

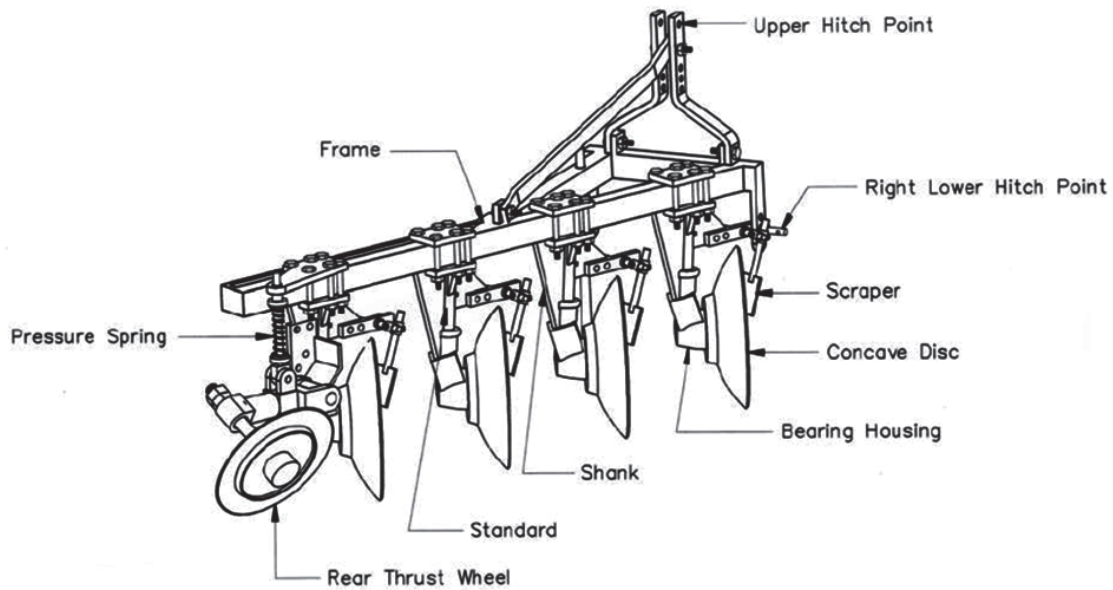


Fig. 2 wk8: A typical labelled disc plough

4. The Major Parts of a Harrow

- a. **Frame:** Similar to the disc plough, the harrow has a frame that provides support and stability during operation. It is usually made of sturdy materials such as steel.
- b. **Teeth/Tines:** Harrows have teeth or tines that are responsible for loosening and breaking up the soil. The number and arrangement of teeth/tines can vary depending on the harrow type.
- c. **Harrow Sections:** The harrow may consist of multiple sections, each containing several teeth/tines. These sections can be adjusted or folded to control the working width of the harrow.
- d. **Harrow Bars/Drawbars:** Harrow bars or drawbars are used to connect the harrow to the pulling vehicle. They provide a means for attachment and allow for easy manoeuvrability.
- e. **Levelling Bar:** Some harrows may feature a levelling bar that helps maintain an even and consistent working depth across the field. It helps to achieve a uniform seedbed or prepare the soil for planting.
- f. **Wheels:** Wheels are often attached to harrows to provide stability and control the working depth. They help to regulate the penetration depth of the teeth/tines into the soil.



Fig. 3 wk8: Picture of a seed harrow combined with a seed drill

Learning Tasks

1. Identify the major parts of farm machines and implements.
2. Describe the major parts of the internal combustion engine and their function.
3. Describe the major parts of farm machines and implements and state their functions.

Pedagogical Exemplars

Experiential learning: In mixed-gender groups, learners visit a mechanic shop or watch videos/pictures on Agricultural implements and machines, and with the help of a master craftsman learners identify the principal parts of some farm machines and implements. Teacher should ensure that learners observe all the safety protocol at the mechanic shop. If videos/picture are used it should not portray gender biases. Learners with difficulties should given the needed support.

Inquiry-based learning: Learners in ability groups surf the internet to come up with the description and functions of the parts of farm implements and machines and present a report on their findings. Teacher should provide learners with websites to help them gather information on the description and functions of the parts of farm implements and machines. Learners with abilities should assist others who might help. Teacher should ensure learners do not veer off to watch unapproved contents.

Key Assessments

Assessment Level 1: Identify at least three (3) parts of the disc plough.

Assessment Level 2: Discuss the functions of at least three (3) parts of a harrow.

Assessment Level 3: Describe the importance of the transmission and control system of a tractor.

Assessment Level 4: What are the similarities and differences between the ignition system of a petrol engine and a diesel engine.

Theme/Focal Area (s) 2: **Step-by-step Operation of some Farm Machines and Implements in Agricultural Production**

1. **Step-by-step operation of some farm machines and implements in Agricultural production**

a. **Mist Blower:**

Step 1: Wear protective gear: Put on appropriate protective clothing, including gloves, goggles, and a mask, to ensure your safety during operation.

Step 2: Adjust the settings: Set the desired spraying pattern, droplet size, and spray intensity using the controls provided on the mist blower.

Step 3: Start the mist blower: Turn on the mist blower's engine or power source according to the manufacturer's instructions. Ensure that all safety features are functioning correctly.

Step 4: Calibrate the mister blower to ensure that it is dispensing the correct amount of liquid per hectare through the selected nozzle.

Step 5: Prepare the pesticide solution: Dilute the pesticide according to the manufacturer's instructions and ensure proper mixing.

Step 6: Fill the mist blower: Pour the pesticide solution into the tank of the mist blower. Be cautious not to overfill it.

Step 7: Begin spraying: Hold the mist blower nozzle at the correct distance from the target area or crops. Move the mist blower steadily and evenly to ensure even coverage. Pay attention to wind direction to avoid drift. Continue spraying until the desired area is accurately covered.

Step 8: Once finished, turn off the mist blower and clean it thoroughly following proper cleaning and maintenance procedures at the area designed for washing pesticide so as to prevent the contamination of the environment.

b. Knapsack Sprayer:

Step 1: Wear protective gear: Put on protective clothing, including gloves, goggles, and a mask, to protect yourself from contact with the pesticide.

Step 2: Adjust nozzle and spray pattern: Adjust the nozzle to the desired spray pattern (fan or cone) and adjust the spray intensity by twisting the nozzle accordingly.

Step 3: Thoroughly inspect the sprayer for any fault such as leaks, damage to handles and proper functioning of all parts.

Step 4: Calibrate the knapsack to ensure that it is dispensing the correct amount of liquid per hectare through the selected nozzle.

Step 5: Prepare the pesticide solution: Dilute the pesticide or herbicide as instructed by the manufacturer, ensuring proper mixing.

Step 6: Fill the knapsack sprayer: Pour the prepared pesticide solution into the tank of the knapsack sprayer. Close the tank securely to prevent leakage.

Step 7: Strap on the knapsack sprayer: Position the knapsack sprayer on your back and secure the straps for comfortable and secure carrying.

Step 8: Prime and pressurise: Prime the sprayer by pumping the handle to build pressure in the tank. Ensure sufficient pressure for effective spraying.

Step 9: Start spraying: Direct the nozzle towards the target area or crops. Maintain a consistent speed and movement as you walk to achieve uniform coverage. Be mindful of wind direction to avoid drift.

Step 10: Complete the operation: Once you have covered the desired area, release the pressure by opening the release valve or depressing the lever.

Step 11: Clean the knapsack sprayer thoroughly following proper cleaning and maintenance procedures at the area designed for washing pesticide so as to prevent the contamination of the environment.

c. Lawn Mower:

Step 1: Inspect the lawn mower: Check the lawn mower for any visible damage or mechanical issues. Ensure the cutting blades are sharp and properly attached.

Step 2: Fuel and oil: Check the fuel and oil levels of the lawn mower and refill as necessary, following the manufacturer's recommendations.

Step 3: Safety precautions: Put on appropriate safety gear, including gloves, goggles, and closed-toe shoes, before operating the lawn mower.

Step 4: Start the engine: Depending on the type of lawn mower (electric or petrol-powered), follow the manufacturer's instructions to start the engine.

Step 5: Adjust cutting height: Set the cutting height to the desired level using the height adjustment lever or mechanism on the lawn mower. This should be done with the lawn mower switched off.

Step 6: Begin mowing: Push or walk behind the lawn mower in straight lines across the lawn. Maintain a consistent speed and overlap each pass slightly to ensure even cutting.

Step 7: Turn off the lawn mower: Once you have completed mowing the lawn, turn off the engine and allow it to cool down. Clean the mower deck of any grass clippings or debris.

d. Winnowing Machine:

Step 1: Wear protective gear: Put on protective clothing, including gloves, goggles, and a mask, to protect yourself before starting the machine.

Step 2: Prepare the winnowing area: Clear a suitable area for winnowing, preferably outdoors with minimal wind interference.

Step 3: Fill the winnowing machine: Pour the mixed grain and chaff into the winnowing machine's hopper or feeding mechanism.

Step 4: Start the winnowing machine: Switch on the winnowing machine's power source, such as an electric motor or engine, and ensure that it is running smoothly.

Step 5: Adjust settings: Depending on the winnowing machine, you may need to adjust airflow settings or sieve sizes to optimise separation efficiency.

Step 6: Feed the material: Slowly and evenly feed the mixed grain and chaff into the winnowing machine's feeding mechanism or hopper. Ensure a consistent flow for effective separation.

Step 7: Collect separated grains: As the winnowing machine generates airflow, the lighter chaff will be blown away while the heavier grains fall onto a collection area or container. Collect the separated grains for further processing or storage.

Step 8: Clean the winnowing machine: Once the winnowing process is complete, switch off the machine and clean it thoroughly, removing any residual chaff or debris.

2. Maintaining Farm Implements and Machines:

- a. Read the Manufacturer's Manual:** Familiarise yourself with the manufacturer's guidelines and recommendations for maintenance procedures, schedules, and specific requirements for each implement or machine. The manual provides essential information and instructions tailored to the particular model.
- b. Regular Cleaning:** After each use, clean the implement or machine thoroughly. Remove dirt, debris, and crop residues from all surfaces, including the moving parts. Use appropriate cleaning agents and tools while ensuring that electrical components are protected from water and moisture.
- c. Lubrication:** Lubricate the moving parts of the implements and machines as recommended by the manufacturer. Apply suitable lubricants such as oil or grease to reduce friction and prevent premature wear. Pay attention to pivot points, bearings, chains, and gears, ensuring they are properly lubricated.
- d. Inspect for Wear and Damage:** Regularly inspect all components, including blades, belts, chains, tyres and fasteners, for signs of wear, damage, or corrosion. Replace any worn or damaged parts promptly to maintain optimal performance and prevent further damage or safety risks.

- e. **Belt and Chain Tension:** Check the tension of belts and chains regularly. Adjust them to the recommended tension to ensure proper power transmission and prevent slippage or excessive strain on the components.
- f. **Electrical Systems:** Inspect electrical wiring, connections, and switches for any signs of wear, damage, or loose connections. Ensure proper insulation and address any issues promptly to avoid electrical hazards or malfunctions.
- g. **Calibration and Adjustment:** Calibrate implements or machines that require it, such as sprayers or seeders, to ensure accurate application rates or proper seed spacing. Adjust settings according to the specific requirements of your operation or crop.
- h. **Storage:** When not in use, store implements and machines in a clean, dry, and protected environment. Consider covering them to shield against dust, moisture, and sunlight. Follow any specific storage instructions provided by the manufacturer.
- i. **Regular Maintenance Schedule:** Establish a regular maintenance schedule based on the manufacturer's recommendations and the frequency of use. Create a checklist or calendar to keep track of maintenance tasks and ensure they are performed on time.
- j. **Safety Checks:** Prioritise safety checks, such as inspecting safety guards, shields and emergency stop mechanisms. Ensure that all safety features are in place and functioning correctly to prevent accidents and injuries.
- k. **Professional Servicing:** For more complex maintenance tasks or repairs, consult qualified professionals or authorised service centres. They have the expertise, tools and access to genuine parts to address more significant maintenance needs and ensure compliance with warranty requirements.

Learning Tasks

1. List farm machines and implements used in Agricultural production.
2. Demonstrate the operation of at least one (1) farm implement in Agricultural production.
3. Describe how a farm machine and implements can be maintained after use.

Pedagogical Exemplars

Experiential learning: With the help of a master craftsman/technician, learners in gender-based groups discuss the step-by-step operation of simple farm machines and implements.

The master craftsman demonstrates the operation of the simple farm machine and implements observing all the necessary safety measures. Learners in turn operate some of the simple farm machines and implements to perform an Agriculture activity. Teacher should ensure that all safety measures and protocols are strictly adhered to by learners before the operation of the farm machine and implements. Learners should be assisted to do risk assessment of the machine and implements to avoid accidents. Learners with difficulties in operating the machines should be assisted. All learners should be given the opportunity to operate the machine or implement and this can be done on a rota basis.

Experiential learning: All learners watch videos/pictures on the operation of complex farm machines and implements such as tractors, combined harvesters, etc. Teacher should ensure that videos that portray gender biases are not used. Learners with hearing or visual difficulties should be seated in such a way that they can benefit from the video.

Project-based learning: Master craftsman discusses with learners in gender-based groups the procedures for maintaining simple farm machines and implements.

The master craftsman demonstrates the procedures for the maintenance of some simple farm machines and implements.

Learners in gender-based groups practice the maintenance of a chosen farm machine and an implement. The teacher should ensure that all safety protocols are strictly adhered to. All learners should encourage actively participate in the activity. Learners with difficulties should be given the needed support.

Key Assessments

Assessment Level 1: List at least three (3) ways of maintaining farm machines and implements in Agricultural production.

Assessment Level 2: Describe the step-by-step procedure for operating any one of the following farm machines/implements: a) Mist blower b) Knapsack sprayer c) Lawn mower.

Assessment Level 3: Explain the importance of reading the manufacturer's manual before using a farm machine/implement.

Assessment Level 4: Practically demonstrate the operation and cleaning of one (1) selected farm implements.

Section 2 Review

The section deals mainly with farm tools, implements and machines; the safety measure in operating the farm tools, implements and machines as well as their maintenance. It also deals with risk assessment of farm implements and machines done before operating any machine to prevent accidents at the farm site. Injuries at farm sites, how to prevent them and the appropriate first aid administration as well as indigenous methods of handling injured persons at the farm site have been dealt with accordingly.

The following are some examples of standardised farm tools and their uses; pH Meter: A pH meter measures the acidity or alkalinity, Thermometer: Measures temperature, Rain Gauge: Measures amount of rainfall, Anemometer: Measures wind speed and direction, Grain Moisture Meter: Measures the moisture content in grains, Tensiometer: Measures soil moisture tension or suction, Plant Height/Length Measuring Tools: Measures plant height and length, Weighing Scale: Measures weight of Agricultural produce, Leaf Area Meter: Measures total leaf.

The following are some examples of indigenous measuring containers in Agricultural production; “Bolga” Basket: For measuring larger quantities of Agricultural produce such as grains, cereals and garden eggs, “Tin” Containers: For measuring small quantities of Agricultural produce such as seeds or grains, Hand Span: For estimating the width or length of an area or object, “Gyina” Stick: Locally made measuring stick for estimating plant height, “Olonka”: Use for measuring volume of food items such as gari, beans and rice.

The following are some parameters measured in Agricultural production; Area of a Vegetable Bed: Multiply the length by the width of the bed. Plant Population Density: Divide the area of land by the recommended planting distance and multiply by 100. Hen Day Egg Production: Number of eggs laid divided by the total population times 100. Feed Conversion Efficiency: Feed intake divided by weight gain. Heart Rate: Count the number of heartbeats felt within a specific time frame. Temperature: Use thermometer to measure temperature of animals via rectum, mouth, etc.

Farm mechanisation is the application of engineering principles and technology in Agricultural settings. Farm power is the energy or force required to perform various Agricultural tasks. It includes human and mechanical power. The importance of farm mechanisation and farm power include increased efficiency and productivity, cost reduction, improved farm operations and safety enhancement.

The safety measures employed in operating farm machines and power include; Training and education of operators, wearing of personal protective equipment (PPE), regular machine inspection and maintenance, ensuring safe start-up and shutdown procedures, prompt hazard identification and warning signs. Injuries in Agriculture are physical harm or damage suffered by individual(s) involved in Agriculture and its related activities. The causes of injuries in Agricultural production are from machinery and equipment, falls trips and slips, chemical exposure, animal-related incidents, overexertion and falls from heights. Examples of injuries in Agricultural production are abrasions, lacerations, contusions, fractures, burns, dislocations, concussions, strains and sprains, puncture wounds, crush injuries, skin irritations, respiratory problems, poisoning and eye injuries.

Some contents of first aid box are adhesive bandages, sterile gauze pads, adhesive tape, antiseptic solution or wipes, disposable gloves, scissors, tweezers, CPR mask or face shield, instant cold packs, pain relievers and emergency contact information. The implications of using inappropriate first aid materials are delayed or inadequate wound healing, increased risk of infection, allergic reactions, tissue damage and scarring, prolonged pain and discomfort. Indigenous ways of providing first aid to injured persons at a farm site involves the use of

medicinal plants and herbs, traditional bandaging techniques, heat and cold therapies, spiritual healing methods and traditional bone setting, the safety measures in handling accidents and injuries of an Agricultural worker are first to assess the situation to ensure you are safe to approach the injured person then to ensure that the injured person has an open airway and is breathing, immobilize any suspected fractures or spinal injuries, call for help, apply CPR administration, when necessary, stay calm and provide comfort, and document and report.

Tractors, combine harvesters, planters and seed drills, sprayers, harvesters, balers, tillage equipment and irrigation systems are examples of machines and implements used in crop production. The machines and implements used in animal production are feed mixers, silage harvesters, milking machines, manure spreaders, ventilation systems, automatic water dispensers, cattle scales and automatic egg collectors. The machines and implements use in fish production are fish feeders, oxygenation systems, filtration systems and fish graders.

Some key factors that influence the efficiency of farm machines and power during Agricultural activities include: machine selection, maintenance and upkeep, operator skill and training, farm management practices, field conditions, weather conditions, power source and energy efficiency, load management and balancing, technology and automation, machine age and condition, and implementation of best practices. The principal parts of farm machines and implements are power source, chassis/frame, transmission system, control system, cutting/working components, wheels/tyres, hitching/attachment mechanism and control panels/gauges. The major parts of an internal combustion engine are Cylinder Block, Cylinder Head, Pistons, Connecting Rods, Crankshaft, Camshaft, Valves, Intake and Exhaust Manifolds, Fuel System, Ignition System, Lubrication System and Cooling System. The major parts of a disc plough are Frame, Discs, Disc Gangs/Groups, Disc Bearings, Disc Scrapers and Hitching Mechanism. While Frame, Teeth/Tines, Harrow Sections, Harrow Bars/Drawbars, Levelling Bar and Wheels are the major parts of a harrow.

Please note that the operating procedures for operating farm machines and implements may vary slightly depending on the specific models and manufacturers of the machines and implements. Always refer to the manufacturer's instructions and guidelines for precise operation and safety considerations. To maintain farm implements and machines; read the manufacturer's manual before starting the machine, regular cleaning, lubrication, inspect for wear and damage, belt and chain tension, electrical systems, calibration and adjustment, storage, regular maintenance schedule, safety checks and professional servicing. Remember, this is a general procedure, and specific maintenance requirements can vary for different farm implements and machines. Always refer to the manufacturer's guidelines and seek professional assistance when needed to maintain the implements and machines effectively.

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SECTION 3: PRINCIPLES OF CROP PRODUCTION

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

Sub-Strand: Principles of Agriculture in Food Production

Learning Outcomes:

1. *Use knowledge of the identification and classification of crops in crop production for economic empowerment in society.*
2. *Use the knowledge and skills acquired in the crop production practices to establish a crop farm.*

Content Standards:

1. Demonstrate knowledge and understanding of the importance and classification of crops.
2. Demonstrate knowledge and understanding of the meaning, principles and stages of crop production.

INTRODUCTION AND SECTION SUMMARY

This section deals with crop production and the underlying principles governing its production. This is aimed at exposing learners to the basics of crop production to gain understanding and mastery to invigorate their interest in the art and science of crop production. It must be emphasised that crop production is an important component of Agriculture, promotes food security and boost Ghana's economy. This section is also very important because of the significant role crops play in the lives of humans and the industry. Crops serve as the main source of food for man and animals as well as raw materials for various agro-based and pharmaceutical industries. At the end of this section, learners are expected to demonstrate the knowledge and skills of the principles of crop production. Positive attitude towards work, patriotism, respect for divergent views, tolerance and resourcefulness will be promoted among learners in this section. The section has links with subjects such as Home Economics, Business and Economics as it involves food and its economic importance.

The weeks covered by the section are:

Week 9: Meaning and importance of crops

Week 10: Principles of crop production

Week 11: Apply the principles in the crop production practices

SUMMARY OF PEDAGOGICAL EXEMPLARS

The teacher should employ pedagogies such as initiating talk for learning, think-pair-share, structuring talk for learning, experiential learning and project-based learning. These pedagogies should be used in 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. Also, learners should be allowed to undertake certain practicals in rotation. Demonstrations by technicians and teachers should also be used during practical sections. The teacher should use videos, charts and ask learners to surf the internet for certain information to make lessons clearer. Ground rules should be set to discourage the teasing of learners in class as they express their ideas. Give learners with speech challenges enough time to

express their views. Encourage all categories of learners to actively participate in the lesson. Critical thinking, communication, digital literacy and collaboration skills of learners will be enhanced as they surf the internet, 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.

ASSESSMENT SUMMARY

The teacher should assign tasks to cover the importance of crop, classification of crops, meaning and importance of the principles of crop production, and stages involved in crop production. It should also cover the application of the principles of crop production. This should be done via group discussions, presentations, homework, class exercises, class tests and project-based work. The assessment should be both summative and formative and should take care of the various proficiency levels of learners. Learners' ability to answer questions that involve recall/reproduce/remember (Level 1), test their skills of conceptual understanding (Level 2), strategic reasoning (Level 3) and extended critical thinking and reasoning (Level 4). The teacher should accept varying number of oral and written responses. He/she should develop rubrics to score group presentations, portfolio and assignments. In addition, the teacher should assess the performance of learners and award marks for continuous assessment records and grading.

WEEK 9

Learning Indicator(s):

1. *Explain the meaning and importance of crops.*
2. *Describe the classification of crops with examples.*

Theme/Focal Area 1: **Meaning and Importance of Crops**

1. Meaning of Crops

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

2. Importance and Uses of Crops

- a. **Economic Importance:** Crops contribute to national and global economies by generating income and employment opportunities. Crop production and trade create jobs in farming, processing, transportation, marketing and related industries. Cash crops, in particular, generate revenue through exports and stimulate economic growth.
- b. **Livelihoods and Rural Development:** Crops are a lifeline for many rural communities, especially in developing countries. Farming and crop production provide livelihoods for farmers and their families, helping to alleviate poverty and promote rural development. Crop cultivation supports rural economies by creating income-generating activities and improving living standards.
- c. **Environmental Benefits:** Certain crops, such as legumes, help improve soil fertility through nitrogen fixation, reducing the need for synthetic fertilisers. Crops also play a role in carbon sequestration, helping to mitigate climate change. Additionally, crop cultivation in the form of agroforestry or mixed cropping systems can contribute to biodiversity conservation and ecosystem resilience.
- d. **Trade and Global Exchange:** Crops are traded globally, fostering international relations and exchange. Countries specialise in the production of specific crops based on their climatic conditions, resources and expertise. This interdependence promotes trade, enhances food availability and allows consumers to access a wide variety of crops throughout the year.
- e. **Industrial and Commercial Uses:** Many crops serve as raw materials for various industries such as textiles, pharmaceuticals, biofuels, cosmetics and construction. Examples include cotton for clothing, sugarcane for ethanol production and oilseeds for biofuel manufacturing.
- f. **Food Security:** Crops are the primary source of food for humans and animals. They provide essential nutrients, vitamins and minerals necessary for healthy diets. Crops such as grains, fruits and vegetables form the basis of our daily meals and contribute to global food security.

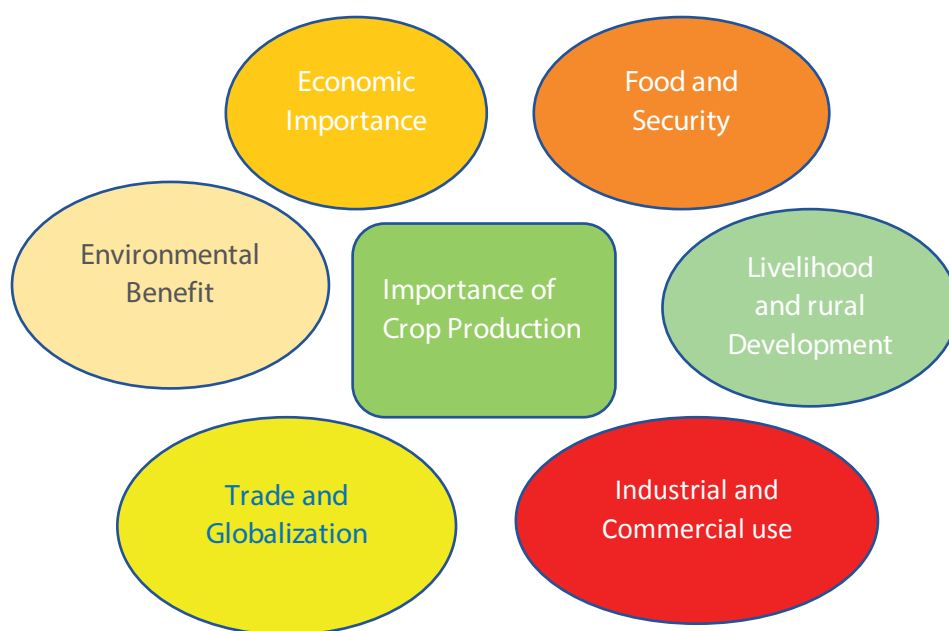


Fig. 1 wk9: A diagram showing the importance of crop production

Learning Tasks

1. *State the meaning and importance of crops.*
2. *Explain the meaning and importance of crop production.*
3. *Discuss the meaning and economic importance of crops to society.*

Pedagogical Exemplars

Initiate talk for learning: Put learners in pairs to brainstorm to find the meaning of crops in Agriculture. Learners should be assisted with leading questions that will help them to come up with the meaning of crops. Others should be guided to explain the meaning of crops. Fast learners should be challenged to give further explanations to the meaning of crops.

Experiential learning: All learners should be made to watch a video/pictures/charts on the importance and uses of crops and discuss their observations in pairs. The teacher should ensure that all learners stay focused while watching the video/pictures/charts to avoid anything that will distract their attention. Some learners should be assisted to state the importance of crops. Others should be probed further to explain or discuss the importance of crops.

Key Assessments

Assessment Level 1: Explain the meaning of crops.

Assessment Level 2: Analyse at least three (3) reasons for cultivating crops.

Assessment Level 3: Assess the impact of crop production on the economy of Ghana.

Assessment Level 4: To what extent is Ghana's industry dependent on crop production?

Theme/Focal Area 2: Classification of Crops

Crops can be classified into several categories based on:

1. Origin

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

2. Growth Cycle

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

Some Example of Annual Crops



Maize



Wheat



Cucumber



Pea

Some examples of Biennial Crops



Carr



Tomato



Sweet Potato



Cabbage

Some examples of Perennial crop



Cocoa



Citrus

Fig. 2 wk9: Classification of crops based on growth cycle.

3. Botanical Classification

- a. **Poaceae (Grasses):** Crops such as wheat, rice, corn, barley and oats belong to the grass family.
- b. **Solanaceae (Nightshades):** Crops like tomatoes, potatoes, peppers and eggplants belong to this family.
- c. **Leguminosae/Fabaceae (Legumes):** Leguminous crops include beans, peas, lentils, soya beans, and peanuts.
- d. **Rosaceae (Rose Family):** Fruits like apples, pears, cherries and strawberries belong to this family.
- e. **Brassicaceae (Mustard Family):** Crops such as cabbage, broccoli, cauliflower and kale belong to this family.

4. Uses

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

Learning Tasks

1. Surf the internet for information on the classification of crops and list your answers.
2. Explain the differences between Annual, Biennial and Perennial crops and give examples.
3. Draw a diagram to show the various classifications of crops with examples and discuss them.

Pedagogical Exemplars

Initiating talk for learning: Teacher asks learners to surf the internet for information on the classification of crops, reasons for classifying them and differences among the classes. They then discuss their findings in class. The teacher and learners who are good at using the internet should guide learners with difficulty in surfing for the required information. The teacher should monitor all students to ensure that they stick to only authorised sites. The teacher should assign leadership role to eloquent learners to lead the discussion in class. Shy and slow learners should be encouraged to talk in class.

Experiential learning: Teacher asks learners to identify indigenous and exotic crops from their homes and the local market after class and report their findings the following day in class. The teacher should ensure that all learners embark on the trip to the local market to identify the indigenous and exotic crops. Fast learners should provide support for slow learners to report their findings.

Project-based learning: In mixed-ability groups, learners create a diagram to show the various classifications of crops with examples. Teacher should ensure that all learners, fully participate in creating the diagram to classify crops into the various categories. Students who are good at drawing should support those who need help.

Key Assessments

Assessment Level 1: Identify three (3) indigenous and three (3) exotic crops in your community.

Assessment Level 2: Classify the crops identified into annual, biennial and perennial crops.

Assessment Level 3: Discuss at least 5 cash crops and indicate their economic benefits to Ghana.

Assessment Level 4: Discuss five benefits of classifying crops in Agriculture.

WEEK 10**Learning Indicator(s):**

1. *Explain the meaning of the principles of crop production.*
2. *Discuss the stages of crop production and its related practices.*

Theme/Focal Area (s)1: Principles of Crop Production**1. Principles of Crop Production**

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

2. Key principles of Crop Production

- a. **Crop Selection:** Choosing the right crop species and varieties is crucial for successful crop production. Factors such as climate, soil type, water availability, market demand and pest resistance should be considered during the selection process.
- b. **Soil Management:** Soil is the foundation of crop production. Proper soil management practices ensure optimal fertility, structure and nutrient content. Techniques like soil testing, organic matter addition, crop rotation and erosion control are employed to maintain soil health and productivity.
- c. **Nutrient Management:** Nutrients are essential for plant growth. Effective nutrient management involves understanding the nutrient requirements of crops and applying fertilisers or organic amendments accordingly. This requires considering soil nutrient levels, crop nutrient uptake, and employing appropriate timing and application methods.
- d. **Water Management:** Water is a critical resource in crop production. Efficient water management practices aim to conserve water, minimise wastage and provide adequate moisture to crops at different growth stages. Techniques such as irrigation scheduling, precision irrigation, and water-saving technologies are utilised for optimal water use.
- e. **Pest and Disease Management:** Crop pests and diseases can cause significant yield losses. Integrated Pest Management (IPM) strategies are employed to control pests and diseases while minimising environmental impact. This includes cultural practices, biological control, use of resistant crop varieties and judicious application of pesticides when necessary.
- f. **Weed Management:** Weeds compete with crops for resources and can reduce yields. Weed management involves a combination of cultural practices (crop rotation, tillage), mechanical methods (hand-weeding, mowing), and chemical control (herbicides) to suppress weed growth and prevent seed production.
- g. **Climate-Smart Practices:** With climate change impacting Agriculture, adopting climate-smart practices is vital. These practices focus on enhancing crop resilience to extreme weather events, improving resource efficiency and reducing greenhouse gas emissions. Examples include conservation Agriculture, agroforestry and precision farming.
- h. **Monitoring and Record-Keeping:** Regular monitoring of crops, soil, pests and diseases is essential for timely interventions and decision-making. Maintaining detailed records of inputs, yields, and observations helps track performance, assess profitability and identify areas for improvement.

Learning Tasks

1. State the meaning and principles of crop production.
2. Discuss the meaning and key principles of crop production.
3. Analyse the meaning and effects of these principles on crop production.

Pedagogical Exemplars

Structuring talk for learning: Teacher guides learners to brainstorm to come up with the meaning and principles of crop production. Assist learners to come up with the meaning of the principles of crop production. Guide others to explain the meaning and principles of crop production. Allow others to discuss the meaning and principles of crop production. Use charts and leading questions when necessary to support learners.

Think-pair-share: Learners individually think about the meaning and key principles of crop production and write down their answers. Teacher puts learners in pairs, to discuss the key principles of crop production and analyse the effects of the principle on crop production. Teacher should provide extra support to some learners to explain the meaning and key principles of crop production. Teacher should allow others to discuss the meaning and key principles of crop production. Talented learners should be made to assist others in analysing the effects of the principles of crop production.

Key Assessments

Assessment Level 1: List the principles of crop production.

Assessment Level 2: Explain at least three (3) principles of crop production.

Assessment Level 3: Why is climate-smart practice as a principle of crop production important?

Assessment Level 4: How will the factors to consider in selecting a site for crop production increase crop yield?

Theme/Focal Area 2: Stages of Crop Production and its Related Practices

1. State One: Pre-Planting Stage

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

a. Site Selection:

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

i. Climate and Weather Conditions:

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

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

ii. **Soil Characteristics:**

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

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

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

iii. **Topography and Drainage:**

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

Drainage Conditions: Assess the natural drainage patterns of the site, avoiding areas prone to waterlogging or poor drainage that can hinder crop growth.

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

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

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

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

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

v. **Pest and Disease Pressure:**

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

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

vi. **Legal and Regulatory Considerations:**

Zoning and land use regulations: Ensure compliance with local zoning regulations and land-use restrictions for Agricultural activities.

b. Land Preparation:

i. **Clearing the land:** Removing any existing vegetation, rocks or debris from the field.

ii. **Ploughing:** Breaking up the soil to loosen it and facilitate root penetration, water infiltration and nutrient distribution.

iii. **Harrowing:** Breaking up lumps and clods of soil, levelling the field and preparing a suitable soil medium (seedbed).

c. Soil Testing and Analysis:

i. **Soil analysis:** Testing the soil samples to determine nutrient content, pH level, organic matter content and other relevant factors.

ii. **Interpreting soil test results:** Assessing the nutrient deficiencies or imbalances, pH levels and any corrective actions required.

d. Seed Selection:

i. **Choosing suitable crop varieties:** Considering factors such as yield potential, disease resistance, adaptability to the local climate and market demand.

ii. **Selecting certified seeds:** opt for high-quality seeds that have undergone quality testing and certification.

- e. **Seed Treatment:**
 - i. **Seed cleaning:** Removing debris, broken seeds or impurities from the seed lot.
 - ii. **Seed priming:** Soaking seeds in water or a solution to enhance germination rates and promote uniform emergence.
 - iii. **Seed coating:** Applying fungicides, insecticides or other treatments to protect seeds against pests, diseases or adverse environmental conditions.
- f. **Field Planning:**
 - i. **Determining crop rotation sequence:** Deciding on the order in which different crops will be planted in successive seasons to optimise nutrient utilisation, manage pests and diseases, and improve soil health.
 - ii. **Field layout and spacing:** Planning the arrangement and spacing of crops within the field to maximise productivity and ease of cultivation.
- g. **Irrigation Planning:**
 - i. **Assessing water availability:** Evaluating the water source, availability, and potential irrigation methods.
 - ii. **Designing irrigation systems:** Determining the type of irrigation system (e.g., sprinkler, drip) and planning the layout of irrigation lines or infrastructure.
- h. **Preparing Equipment and Inputs:**
 - i. **Procuring farming equipment:** Ensuring the availability and proper functioning of necessary tools, machinery, and implements for land preparation and planting.
 - ii. **Arranging fertilisers and other inputs:** Procuring fertilisers, soil amendments, and other necessary inputs based on soil test results and crop requirements.

2. Stage Two (2): Planting Stage

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

- a. **Sowing Method:** Depending on the crop type, seeds can be sown through broadcasting (uniformly spreading seeds on the field either by hand or by machinery), drilling (placing seeds at a specific depth and spacing), transplanting (transferring seedlings from nursery beds) or direct seeding (sowing seeds directly into the field without preparing a seedbed).
- b. **Spacing and Depth:** Ensuring the seeds or seedlings are placed at the appropriate spacing and depth to allow for proper growth and development.
- c. **Watering and Irrigation:** Providing sufficient moisture to aid seed germination or support the establishment of transplanted seedlings. This may involve watering the field or using irrigation techniques such as sprinkler irrigation or drip irrigation.
- d. **Fertiliser Application:** Applying fertilisers based on soil test recommendations or crop-specific requirements. This can be done either at the time of planting or as a top-dressing later during the crop's growth.

3. Stage Three: Post-planting Stage

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

- a. **Weed Control:** Implementing weed control measures to prevent weed competition and ensure unhindered crop growth. This may involve manual weeding, mechanical cultivation, mulching, or herbicide application.

- b. Pest and Disease Management:** Monitoring the crops for pests and diseases and taking appropriate measures for their control. This includes implementing integrated pest management strategies, scouting for pests, and applying pesticides or biocontrol agents when necessary.
- c. Crop Monitoring and Care:** Regularly inspecting the crops for growth, health, and any signs of stress. This includes monitoring for water requirements, ensuring proper plant support (if needed), and taking corrective actions to address any issues.
- d. Harvest Preparation:** As the crops near maturity, prepare for the upcoming harvest by arranging necessary equipment, labour, and storage facilities.

Pre planting operations



Land clearing by a tractor



Construction of beds

Planting operations



A farmer transplanting seedlings



Seedlings planted in drills

Post planting operations



Farmers controlling weeds manually using hoe



A farmer managing her vegetable crops

Learning Tasks:

1. List the stages of crop production

2. Explain the pre-planting activities that are carried out in crop production.
3. Discuss the planting and post-planting activities that are carried out in crop production.

Pedagogical Exemplars

Think-pair-share: Learners individually list the stages of crop production. Teacher puts learners in pairs to share their results. Some learners should be assisted with leading questions that will help them to list the stages of crop production. Others should be given the opportunity to list the stages of crop production by themselves. Furthermore, the teacher should check the answers of all learners and encourage those with the correct answers to support others.

Initiate talk for learning: Teacher puts learners in a mixed-ability or balanced ability groups to describe the various stages (pre-planting, planting and post-planting) of crop production. Learners should be given the flexibility to explain any of the stages of crop production. Those with the ability to discuss all the stages should be allowed to do so. They should also be encouraged to support other learners after class to catch up. Furthermore, the teacher should use videos, charts and diagrams on the various stages of crop production to make things clearer to learners where necessary.

Key Assessments

Assessment Level 1: State the stages involved in crop production.

Assessment Level 2: Explain any three (3) pre-planting activities involved in crop production.

Assessment Level 3: Discuss at least three (3) factors influencing the choice of site for the farm.

Assessment Level 4: What are the effects of the following practices in crop production:

- i. Weed management?
- ii. Application of fertilisers?
- iii. Soil testing?
- iv. Disease and pest management?

WEEK 11

Learning Indicator(s): *Apply the principles in the crop production practices*

Theme/Focal Area 1: Hands-on and Observation of Farm Practical Activities to Acquire Skills in the Principles of Crop Production

Land Preparation: Participate in land preparation activities such as clearing fields, removing rocks and debris, levelling the land and preparing seedbeds using basic Agricultural tools including hoe, cutlass and rakes.

Soil Sampling and Analysis: Take soil samples from different areas of your farm, following proper sampling techniques and perform simple tests such as pH, temperature and texture measurements of soil.

Seed Selection and Planting: Be involved in selecting appropriate seed varieties for different crops. Learn how to check seed quality including germination rates and disease resistance by observation. Perform simple seed quality checks by soaking seeds in water to check their viability. Observe proper seed planting techniques, including seed depth, spacing and planting density.

Irrigation Installation and Management: Observe the installation of irrigation systems, such as drip irrigation or sprinklers. Learn about different irrigation methods and their application. Gain knowledge in irrigation scheduling, monitoring soil moisture and adjusting irrigation systems accordingly via observation.

Fertiliser Application: Learn about different fertilisers and their application methods. Gain hands-on experience in fertiliser application using knapsack sprayer, broadcasting and drilling.

Weed Control: Participate in weed control activities like manual weeding, hoeing or using Knapsack sprayers.

Pest and Disease Monitoring: Observe how to regularly monitor crops for pest and disease infestations. Learn to identify common pests and diseases that affect your crop and integrated pest management techniques, including scouting, trapping and implementing appropriate control measures.

Crop Harvesting and Post-Harvest Handling: Observe crop harvesting activities, including proper harvesting techniques and timing. Learn about post-harvest handling practices, such as cleaning, sorting, grading and storage by observation and practice where applicable.

Record Keeping and Data Analysis: Observe how records are kept on activities, including input applications, disease control and yields. Design a simple farm record table for crop management practices on the field.

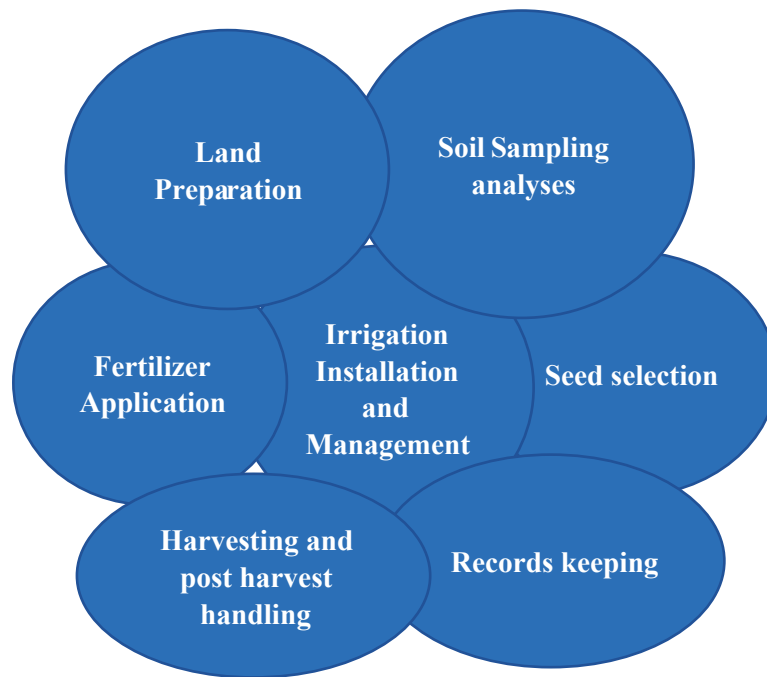


Fig. 1 wk11: Hands-on farm practical skills to acquire when performing practical farm activity in crop production.

Learning Tasks

1. List the various farm practical activities involved in crop production.
2. Explain the various farm practical activities involved in crop production.
3. Participate or observe the various farm practical activities involved in crop production.

Pedagogical Exemplars

Initiate talk for learning: Teacher puts learners in pairs to brainstorm to come up with the various farm practical activities involved in crop production. Some learners should be helped with leading questions to enable them to list the various farm practical activities involved in crop production. Others should be challenged to delve deeper by explaining the various farm practical activities involved in crop production. Learners should be allowed to surf the internet for information on the various farm practical activities involved in crop production. Also, videos, pictures or charts showing the various farm practical activities involved in crop production can be shown to learners if internet connectivity is a challenge. Ensure that all learners surf the internet or watch the video, pictures or charts on the various farm practical activities involved in crop production. Learners familiar with browsing should assist those that need help. The teacher should monitor the contents of what learners browse. Learners with visual or any form of learning impairments should be supported during the watching of videos, pictures or charts.

Project-based learning: In balanced ability or mixed gender groups (where appropriate), learners perform simple activities such as pH measurement using litmus paper, soil temperature using thermometer, soil texture using the fingers and soaking seeds in water to check their viability. Assign a specific task to a group and allow each group to share the observations with the rests. Learners should also be taken to the field in rotation to perform weeding using hoe and cutlass, levelling of soil using a rake and fertiliser application using drilling, broadcasting and by spraying. A special practical

section outside the normal classroom period should be used for these practical activities. The teacher should ensure that all learners participate in the practical activities. Each student should be made to produce a record of the activities performed on the field. Those that require any form of support should be assisted appropriately.

Experiential learning: Teacher put learners in mixed-ability or gender-based groups to observe or watch video of a technician/master craftsman driving a tractor, ploughing, harrowing, performing soil nutrient test, weed control, post-harvest management of crops and how to design farm records. The teacher should arrange with the technician/master craftsman and learners when these practical activities (either video or demonstration by technician/master craftsman) should be performed outside the classroom period. It should be a time favourable and agreed by all. The teacher should consciously make all learners, especially females and learners with different forms of disability to take part in this section. Learners should be made to present a report on their observations, what activities they have undertaken and what they have learnt.

Key Assessments

Assessment Level 1: State any three (3) farm practical activities involved in crop production.

Assessment Level 2: Explain land preparation activities in crop production.

Assessment Level 3: Describe how to test for soil pH.

Assessment Level 4: Examine the effects of weed control, disease and pest controls on crop production.

Section 3 Review

Crops are plants that are grown for food, fibre, medicine or ornamental purposes. Crops are needed for food security, economic importance, livelihoods and rural development, environmental benefits, trade and global exchange, industrial and commercial uses, and cultural and social significance. Crops are classified into: origin (indigenous and exotic crops), growth cycle (annual, biennial and perennial crops), botany (grasses, solanaceae, legumes, rosaceae and brassicaceae), uses (food, cash, industrial, feed, horticultural and medicinal crops). The principles of crop production are the fundamental guidelines and concepts that guide the practices and decision-making processes in the cultivation of crops. The key principles of crop production include: crop selection, soil nutrient management, water management and weed management. The principles of crop production come in stages: They are pre-planting stage (site selection checking availability of water, temperature requirement, soil characteristics such as texture, fertility, depth topography drainage, etc.), planting stage (sowing, spacing fertiliser application) and post planting stage (weed control, pest and diseases management, crop monitoring and care and harvesting. Hands-on practical skills can be acquired during soil sampling, land preparation, seed selection and planting, irrigation and installation, fertiliser application, weed control, pest and diseases management, harvesting and handling and records keeping.

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