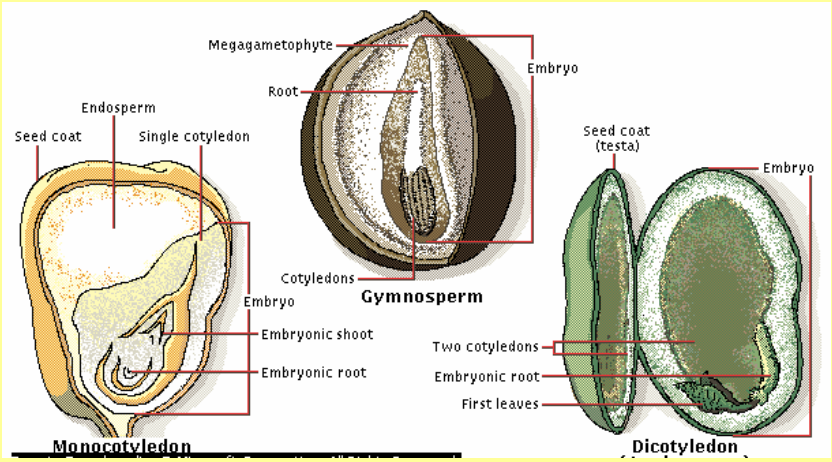
NQF Level: 3 US No: 116272

Facilitator Guide

Primary Agriculture

Anatomy and physiology of crop plants



Facilitator: . . . . . .

Company: . . . . . .

Commodity: . . . . . Date: . . . . . .

The availability of this product is due to the financial support of the National Department of Agriculture and the AgriSETA. Terms and conditions apply.

agriculture
Department:
Agriculture
REPUBLIC OF SOUTH AFRICA

AgriSETA

Before you get started...

Dear Facilitator,

This Facilitator Guide (together with the relevant Learner Guide) is aimed at facilitators who will be assisting learners wishing to complete the following unit standard:

Title:	Demonstrate a basic understanding of the physiological functioning of the anatomical structures of the plant				
US No:	**116272**	**NQF Level:**	3	**Credits:**	4

T
his guide contains all necessary facilitation instructions to ensure that learners will attain the expected competencies required by the above-mentioned unit standard. This guide is designed to be used during the presentation of a learning session based on this unit standard. The full unit standard is attached at the end of the relevant Learner Guide. Learners are advised to read the unit standard at their time. Please discuss the unit standard with the learners to ensure that they understand what is expected from them to achieve the outcomes of the unit standard.

This unit standard is one of the building blocks in the qualifications listed below. Please mark the qualification you are currently facilitating, because that will be determined by the context of application:

Title	ID Number	NQF Level	Credits	Mark
National Certificate in Animal Production	49048	3	120	❒
National Certificate in Plant Production	49052	3	120	❒

Please mark the learning program the learners are enrolled in:

Are you enrolled in a:	Y	N
Learnership?	❒	❒
Skills Program?	❒	❒
Short Course?	❒	❒

Note to Facilitator: If you are presenting this module as part of a full qualification or learnership, please ensure that you have familiarised yourself with the content of the qualification.

Please explain the above concepts to the learner.

There are three guides, namely the Learner Guide (with activities), Assessor Guide and the Facilitator Guide.
These guides have been developed to address specific aspects of the learning experience. You therefore need to use these guides complementally to one another.

Make this an enjoyable learning experience!

Context of Application ...

Primary Agriculture is a diverse sector and a wide range of commodities is being produced for both national and international market. Each commodity has its own production requirements and practices. You will be facilitating the learning process within a specific context where a specific agricultural commodity is being produced. The learning material has been written in a **generic** manner, as it is aimed to be available on national level and should be relevant to be applied within a variety of commodities. It is therefore inclusive of all agricultural commodities and crop in this field. Therefore, the examples that are being used in the materials may not always be applicable to your specific community, commodity, environment or region.

This presents you, the facilitator, with the challenge to **contextualise** the learning material. It is imperative that you, the Facilitator and Assessor interpret and present activities, case studies and projects related to the material in such a way that learners can easily identify and apply their knowledge within their own context. This will require from you to add examples of crop, which are applicable to the community or farm. Learners must be guided with examples from their own communities, commodities, environment or regions. This should be done by complementing the learning material with:

- Examples relevant to the commodity,
- Including commodity specific requirements,
- Including operating procedures of the farm,
- Including agricultural practice specific requirements,
- Agricultural markets,
- Guiding learners to write these specifics down in the learning guide, etc.

The contextualisation of the learning material is a very important step in preparing for and facilitating the learning experience and enough time and effort should be put into this exercise.

According to the qualifications mentioned on page 2, this module could be contextualised to fit the following groups of commodities:

Plant Production	Animal Production	
• Organic production, • Hydroponic production, • Perma-culture production, • Agronomy, • Horticulture, • Natural resources harvesting.	• Small stock production, • Large stock production, • Dairy production, • Pig production, • Poultry production, • Game, • Aqua / mari culture, • Commercial insects • Animal fibres harvesting, • Bee keeping,	• Natural resources harvesting, • Organic production, • Perma-culture production, • Eco/Agri Tourism, • Agro Chemicals, • Horse Breeding, • Etc.

How to use this guide ...

Throughout the guide information is given specifically aimed at you, the facilitator, to **assist** in the actual presentation of the learning material and/or facilitation of the learning process. Although this guide contains all the information required for attaining competency in this unit standard, references to additional resources, both printed and electronic, are provided for additional reference by the facilitator and further study by the learner.

Please note that the purpose of this information is merely to **guide** you, the facilitator, and is provided as a suggestion of possibilities. It remains the responsibility of every facilitator to re-assess the learner/s in each learning situation throughout the learning process in order to stay in touch with their specific learning needs. This should be the determining factor in the choice of the learning approach to follow.

Use the different boxes listed below for identification purposes:

Instructions regarding **activities**, whether group or individual activities will be described in this box.

Facilitators' Tip ...

My Notes ...

You can use this box for your own notes/comments.

What & How will you be Facilitating?

The Learning Experience...

On completion of this module, the learners will be able to:

- The learner will be able to identify and describe pertinent physiological processes of different plant structures.
- Learners will gain specific knowledge and skills in plant anatomy and physiology and will be able to operate in a plant production environment implementing sustainable and economically viable production principles.
- They will be capacitated to gain access to the mainstream agricultural sector, in plant production, impacting directly on the sustainability of the sub-sector. The improvement in production technology will also have a direct impact on the improvement of agricultural productivity of the sector.

Learners will specifically be able to:

- Monitor the common insects associated with the specific agricultural enterprise.
- Demonstrate a basic knowledge of trapping, monitoring and recording the incidence of pests, diseases and weeds
- Collect insects not familiar and that had been identified.
- Monitor the symptoms of disease associated with the agricultural enterprise.
- Monitor and report the incidence of weeds in the agricultural enterprise.

Learners will also gain basic knowledge of:

- Basic safety requirements related to the propagation environment, tools and procedures.
- Basic hygiene requirements for the propagation environments.
- Growing media - wet and dry.
- Weeds, pest and diseases.
- The safe handling of hormone and Chemicals preparations (rooting powders and plant protection substances).

Learning Assumed to be in Place:

- It is assumed that a learner attempting this unit standard will show competence against the following unit standards or equivalent:
- NQF 2: Recognise and identify the basic functions of the ecological environment.
- NQF 2: Demonstrate a basic understanding of the structure and functions of a plant. .

Remember to do a diagnostic assessment of the learner's prior learning and ensure that they are starting at the correct level.

Aims and Objectives

Aims

1. Demonstrate an understanding of the structure and basic functioning of a plant cell.
2. Describe the effect of the environmental on the physiology and germination of the seed.
3. Describe the anatomy of the root ,stem and leaf in relation to its function in the translocation of water and nutrients
4. Demonstrate an understanding of the anatomy and physiology of a leaf
5. Identify and describe the anatomical structures of a flower in relation to fruit and seed development

Objectives

1. The structure of a plant cell is illustrated and explained.
2. The functions of the different components of a plant cell are described.
3. The role of a plant cell in relation to plant growth is explained.
4. The role of the plant cell in relation to metabolic processes of the plant is described.
5. Describe the effect of the environmental on the physiology and germination of the seed.
6. The effect of certain environmental factors on seed germination is described.
7. The process of imbibition and the rupturing of the seed coat are explained.
8. The role that the environment plays on the activation of endogenous hormones during germination is explained.
9. Describe the anatomy of the root and stem in relation to its function in the translocation of water and nutrients.
10. The basic anatomy of the root is illustrated.
11. The characteristics of the xylem vessels and how it functions in the movement of water up a plant is explained.
12. Transport refers to movement of water and nutrients from the roots upwards
13. The transport of organic food by the phloem vessels is explained.
14. The role of the cambium in the growth of the vascular bundles is explained.
15. Demonstrate an understanding of the anatomy and physiology of a leaf.
16. The structure of the leaf includes but is not limited to cuticle, mesophyl, stomata and vascular bundles.
17. The basic anatomical structure of a leaf is explained.
18. An understanding of the function of stomata and its role in gaseous exchange and transpiration is demonstrated.
19. The different types of leaf-hairs and their role in transpiration and plant protection are described.
20. Identify and describe the anatomical structures of a flower in relation to fruit and seed development.
21. Anatomical structures of a flower may include but is not limited to sepals, pistils and petals.
22. The structure of a flower in relation to pollination is described and illustrated.
23. The process of pollination and the importance of cross-pollination in relation to agricultural systems are explained.
24. Pollination refers to, but is not limited to the transfer of pollen to the stigma by insects.
25. The process of fertilisation of the ovule and the development of the fruit is explained.
26. The development of seeds is described.

Learning Program Time Frames

	Total time allocated (hours)	Theoretical learning time allocated (hours)	Practical learning time allocated (hours)	Activities to be completed
Complete Program (including summative assessment)	40 hours	13 hours	27 hours	10
Learner Orientation and "Ice Breaker"	0.5 hour	0.5 hour		NA
Purpose, Introduction and Learner Directions	0.5 hour	0.5 hour		NA
Session 1	7 hours	2 hours	5 hours	4
Session 2	7 hours	2 hours	5 hours	2
Session 3	7 hours	2 hours	5 hours	2
Session 4	7hours	2 hours	5 hours	1
Session 5	7 hours	2 hours	5 hours	1
Preparation for Assessment & revision	4 hours	2 hours	2 hours	NA

My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Tips for level of learning

Remember the following before you get started:

Typically, a learning programme leading to the award of a qualification or unit standards at level 3 should develop learners who demonstrate an ability to:-

- Operate within clearly defined contexts.
- Work and learn within a managed environment.
- Actively contribute to team effectiveness.
- Take position on available information, discuss the issues and reach a resolution; produce a coherent presentation and report, providing explanations for positions taken.
- Summarise and interpret information relevant to the context from a range of sources.
- Use their knowledge to select appropriate procedures to solve problems within given parameters.
- Apply skills in measuring the environment using key instruments and equipment operational literacy and numeracy skills; use basic procedures and operations to complete complex tasks.
- Understand the organisational and operating environment as a system.
- Understand one or more fields or discipline's key concepts and knowledge, in addition to the fundamental areas of study.

Facilitator's Checklist & Training Aids

Learner support strategies:
Learners are supplied with all resources and aids as required by the programme – including: ▪ Objects & devices such as equipment, protective clothing, safety gear, etc. ▪ Learner Guides and Learner Workbook ▪ Visual aids, etc.

Use this checklist below during your preparation to ensure that you have all the equipment, documents and training aids for a successful session.

Preparation:	**Yes**	**No**
Qualification Knowledge – I have familiarised myself with the content of the applicable qualification		
Unit Standard Knowledge – I have familiarised myself with the content of all aspects of the applicable unit standard		
Content Knowledge – I have sufficient knowledge of the content to enable me to facilitate with ease		
Application knowledge – I understand the programme matrix & have prepared for programme delivery accordingly		
Contextualisation – I have included information which is specific		

to the commodity and practices related to the commodity		
Ability to respond to learners background & experience – I have studied the learner demographics, age group, experience & circumstances & prepared for programme delivery accordingly		
Enthusiasm & Commitment – I am passionate about my subject & have prepared my programme delivery to create a motivating environment with real commitment to success		
Enterprise knowledge – I know & understand the values, ethics, vision & mission of the workplace & have prepared my programme delivery, reporting & administrative tasks accordingly.		
Equipment check:		
Learner guides x 1 per learner		
Assessment guides x 1 per learner		
Writing materials & stationary (facilitator & learner)		
White board & pens		
Flip chart paper		
Proxima projector & screen		
Laptop & programme disk		
Sample Hand-outs and examples of laws and other relevant documents		
Safety gear as prescribed by unit standard and applicable legislation		
Documentation checklist:		
Attendance Register		
Course Evaluation		
Learner Course Evaluation		
Portfolios of evidence		

Contextualisation of Content!

Go through this module and indicate what specific **information** / **activities** / **examples** should be included in this module?

Contextualisation	
▪ Commodity specific?	
▪ Operating procedures of the farm?	
▪ Agricultural practices?	
▪ Agricultural markets?	

Session 1 Plant cell structure and function

Learner Guide: Page 8

After completing this session, the learner should be able to:

SO 1: Demonstrate an understanding of the structure and basic functioning of a plant cell.

Concept (SO 1)	Time frame	Activities related to the concept
The structure of a plant cell is illustrated and explained.	7 Hours	Activity 1 - 4
The functions of the different components of a plant cell are described.		
The role of a plant cell in relation to plant growth is explained.		
The role of the plant cell in relation to metabolic processes of the plant is described.		

My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Please allow learners to complete Activity 1 - 4 in their Learner Guides

Type of activity	Resources
1. Individual Activity	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
Draw a diagram of a cross section of a plant cell providing the identity of organelles. Ensure time is allowed for learners to present their presentations. All Learners must participate.	
Type of activity	**Resources**
2. Individual activity	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
In an essay, discuss the function of plant cells within plant tissues and structures. Ensure time is allowed for learners to present their presentations. All Learners must participate.	
Type of activity	**Resources**
3. Individual activity	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
Define the function the plant cell organelles. Ensure time is allowed for learners to present their presentations. All Learners must participate.	
Type of activity	**Resources**
4. Activity to be conducted in pairs	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
Prepare and present a poster that will discuss how plant cells are involved in plant growth. Ensure time is allowed for learners to present their presentations. All Learners must participate.	

My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Session 2 Seeds and their germination

Learner Guide: Page 14

After completing this session, the learner should be able to:

SO 2: Describe the effect of the environmental on the physiology and germination of the seed.

Concept (SO 2)	Time frame	Activities related to the concept
The effect certain environmental factors have on seed germination is described.	7 Hours	Activity 5 & 6
The process of imbibitions and the rupturing of the seed coat is explained.		
The role that the environment plays on the activation of endogenous hormones during germination is explained.		

My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Please allow learners to complete Activity 5 & 6 in their Learner Guides

Type of activity	Resources
5. Individual activity	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
Write an essay, discussing the process of imbibitions and the rupturing of the seed coat. Ensure time is allowed for learners to present their presentations. All Learners must participate.	
Type of activity	**Resources**
6. Individual activity	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
Develop a presentation on: The role that the environment plays on the activation of endogenous hormones during germination. The potential influence that the environment may have on seed germination. Use examples relevant to the crops grown at your place of work to highlight the process. Ensure time is allowed for learners to present their presentations. All Learners must participate.	

My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Session 3

Root and stem anatomy in relation to water and nutrient transportation

Learner Guide: Page 19

After completing this session, the learner should be able to:

SO 3: Describe the anatomy of the root and stem in relation to its function in the translocation of water and nutrients.

Concept (SO 3)	Time frame	Activities related to the concept
The basic anatomy of the root is illustrated.	7 Hours	Activity 7 & 8
The characteristics of the xylem vessels and how it functions in the movement of water up a plant is explained.		
The transport of organic food by the phloem vessels is explained.		
The role of the cambium in the growth of the vascular bundles is explained.		

My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Please allow learners to complete Activity 7 & 8 in their Learner Guides

Type of activity	Resources
7. Individual Activity	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
Making use of detailed diagrams and describe and discuss the basic structure of a plant root. Ensure time is allowed for learners to present their presentations. All Learners must participate.	
Type of activity	**Resources**
8. Group Activity – groups of 2	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
Develop and present a presentation in which you describe how water and nutrients are transported in plants. Ensure that you cover water uptake from soil and the movement to sinks via roots and stems. The presentation should be 20 minutes long and must include a series of diagrams that illustrate the processes. Allow an additional 10 minutes for questions. Ensure time is allowed for learners to present their presentations. All Learners must participate.	

My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . .

. . . . . .

Session 4 Plant leaf structure and physiology

Learner Guide: Page 25

After completing this session, the learner should be able to:

SO 4: Demonstrate an understanding of the anatomy and physiology of a leaf.

Concept (SO 4)	Time frame	Activities related to the concept
The basic anatomical structure of a leaf is explained.	7 Hours	Activity 9
An understanding of the function of stomata and its role in gaseous exchange and transpiration is demonstrated.		
The different types of leaf-hairs and their role in transpiration and plant protection is described.		

My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

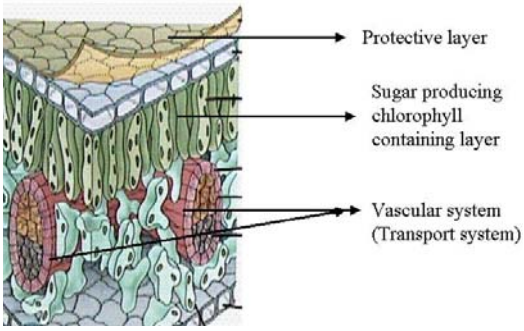
Activity Instructions

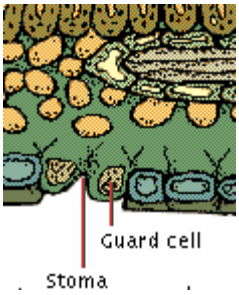
Please allow learners to complete Activity 9 in their Learner Guides

Type of activity	Resources
Activity to be conducted in pairs	Learner guide, Stationery, presentation material, resources.

Instructions to give to the learners

Discuss the structure and anatomy of plant leaves using the illustrations provided as reference. Discuss the structure in relation to the physiological processes of transpiration, photosynthesis and respiration. Ensure time is allowed for learners to present their presentations. All Learners must participate.





My Notes ...

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

. . . . . .

Session 5 Flowers and their relation to fruit

Learner Guide: Page 29

After completing this session, the learner should be able to:

SO 5: Identify and describe the anatomical structures of a flower in relation to fruit and seed development.

Concept (SO 5)	Time frame	Activities related to the concept
The structure of a flower in relation to pollination is described and illustrated.	7 Hours	Activity 10
The process of pollination and the importance of cross-pollination in relation to agricultural systems is explained.		
The process of fertilization of the ovule and the development of the fruit is explained.		
The development of seeds is described.		

Please allow learners to complete Activity 10 in their Learner Guides

Type of activity	Resources
Activity to be completed by groups of 2	Learner guide, Stationery, presentation material, resources.
Instructions to give to the learners	
Develop a presentation in which you discuss the purpose of flowers, their structure, pollination and seed development and the link to fruit development. Ensure time is allowed for learners to present their presentations. All Learners must participate.	

What will I do differently next time?

Take some time to **reflect** on your own activities as facilitator of this Unit Standard. Then write down five of the most important lessons you have learnt and include a motivation:

What will I do differently next time?	Motivate how or why (Give examples, reasons, etc.)
1.	
2.	
3.	
4.	
5.	

As facilitator, you have hands on experience in the application of the unit standard. And you might experience difficulties with the unit standard that the developers did not anticipate. Also, the unit standard will be revised at the end of the registration period. Your comments below can be an important contribution in the revision process and should be brought to the attention of either the AgriSETA ETQA manager or the SGB chairperson.

Please take some time to reflect on your experience and list a few of the difficulties you had to address.

Difficulties I had with the Unit Standard	Recommended Changes to Address the Difficulty
6.	
7.	
8.	
9.	
10.	