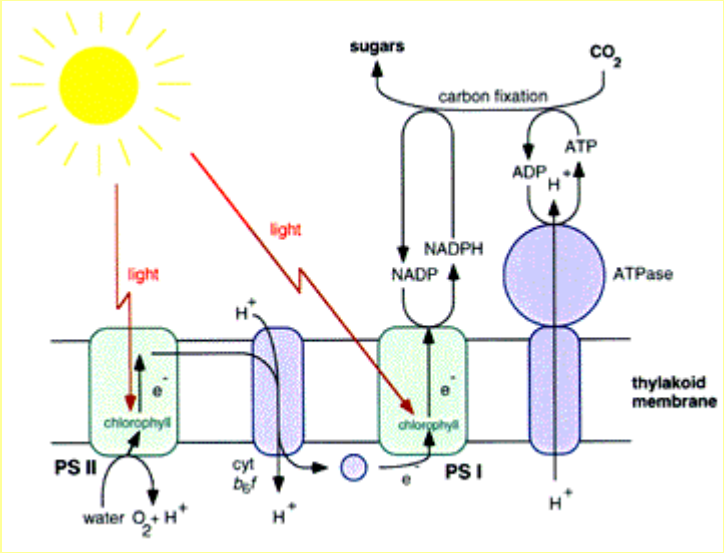

**NQF Level: 4** **US No: 116295**

# Facilitator Guide

## Primary Agriculture

# Basic plant growth physiology




Facilitator: . . . . . .

Company: . . . . . .

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

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# 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 processes in plant growth and development | | | | |
| **US No:** | **116295** | **NQF Level:** | 4 | **Credits:** | 3 |

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 | 48979 | 4 | 120 | ❒ |
| National Certificate in Plant Production | 49009 | 4 | 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,<br>• Hydroponic production,<br>• Perma-culture production,<br>• Agronomy,<br>• Horticulture,<br>• Natural resources harvesting. | • Small stock production,<br>• Large stock production,<br>• Dairy production,<br>• Pig production,<br>• Poultry production,<br>• Game,<br>• Aqua / mari culture,<br>• Commercial insects<br>• Animal fibres harvesting,<br>• Bee keeping, | • Natural resources harvesting,<br>• Organic production,<br>• Perma-culture production,<br>• Eco/Agri Tourism,<br>• Agro Chemicals,<br>• Horse Breeding,<br>• 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.

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# What & How will you be Facilitating?

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# The Learning Experience...

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

- The learner will be able to identify the different physiological processes involved in growth and development of a plant.
- Learners will gain specific knowledge and skills in plant physiology and anatomy 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 also gain basic knowledge of:**

- The person is able to demonstrate a basic knowledge of:
- Transpiration, respiration and photosynthesis.
- Gaseous exchange, osmosis and translocation.
- Cell division.
- Laws of nature.

**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 3: Demonstrate a basic understanding of the physiological functioning of the anatomical structures of the plant.
- NQF 3: Incorporate basic concepts sustainable farming systems into practical farm activities.


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**

- Demonstrate an understanding of the processes involved in cell division with relation to growth and development of the plant.
- Describe the process of transpiration and its role in water uptake by a plant.
- Describe the process of respiration in relation to gaseous exchange in the plant
- Demonstrate an understanding of the process of photosynthesis.
- Demonstrate an understanding of the maturity and ripening of fruit.

**Objectives**

- The process of mitosis is described.
- Secondary growth in plants with reference to the development of secondary vascular tissue and growth of a plant is explained.
- Cell division with reference to a) germination, b) pollination, and c) fertilisation is explained
- The concept of osmosis and how it occurs is explained
- Osmosis is illustrated
- The movement of water from the root to the leaves is explained and illustrated
- The role of the stomata with reference to transpiration is explained.
- The role of transpiration in relation to water use efficiency of the plant is explained.
- The concept of wilting is explained
- The transfer of gases between the plant and its external environment is described
- The process of respiration and when it occurs in plants is explained
- The process of respiration in relation to climacteric and non-climacteric fruit is described.
- The influences of respiration on the ripening of fruit are discussed.
- The effect environmental factors have on the process of photosynthesis is demonstrated and explained.
- The light phase of photosynthesis is discussed and described.
- The process of cell division and differentiation in fruit is explained
- The role of ethylene in fruit maturity and ripening is explained.
- The function of ethylene in the manipulation of fruit ripening and harvesting is explained

# 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 | 17.5 hours | 22.5 hours | 8 |
| **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** | 8 hours | 4 hours | 4 Hours | 1 |
| **Session 2** | 10 hours | 4 hours | 6 Hours | 4 |
| **Session 3** | 10 Hours | 4 hours | 6 hours | 2 |
| **Session 4** | 10 Hours | 4 hours | 6 hours | 1 |
| **Preparation for Assessment & revision** | 1 hour | 0.5 hour | 0.5 hour | NA |

# 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 4 should develop learners who demonstrate an ability to:-***

- Take responsibility for their own learning within a supervised environment.
- Take decisions about and responsibility for actions.
- Evaluate their own performance against given criteria.
- Take the initiative to address any shortcomings they find.
- Communicate and present information reliably and accurately in writing and verbally.
- Gather relevant information, analysis and evaluation skills.
- Use their knowledge to solve common problems within a familiar context; adjust an application of a common solution within relevant parameters to meet the needs of small changes in the problem or operating context; motivate the change using relevant evidence.
- Apply essential methods, procedures and techniques of the field or discipline; apply and carry out actions by interpreting information from text and operational symbols or representations.
- Understand the organisation or operating environment as a system within a wider context.
- Demonstrate a fundamental knowledge base of the most important areas of one or more fields or disciplines, in addition to the fundamental areas of study an informed understanding of the key terms, rules, concepts, established principles and theories in one or more fields or disciplines.

# Tips for the facilitator


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 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.
- Summarize 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 organizational 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:**<br>▪ Objects & devices such as equipment, protective clothing, safety gear, etc.<br>▪ Learner Guides and Learner Workbook<br>▪ 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 Cell division and plant growth

**Learner Guide: Page 7**

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

**SO 1: Demonstrate an understanding of the processes involved in cell division with relation to growth and development of the plant.**

| Concept (SO 1) | Time frame | Activities related to the concept |
|---|---|---|
| The process of mitosis is described. | 8 Hours | Activity 1 |
| Secondary growth in plants with reference to the development of secondary vascular tissue and growth of a plant is explained. | | |
| Cell division with reference to a) germination, b) pollination, and c) fertilization is explained. | | |


**Please allow learners to complete Activity 1 in their Learner Guides**

| Type of activity | Resources |
|---|---|
| Individual activity | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| Discuss cell duplication in plant cells | |

## My Notes ...

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# Session 2 Transpiration and water movement in crop plants

**Learner Guide: Page 10**

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

**SO 2: Describe the process of transpiration and its role in water uptake by a plant.**

| Concept (SO 2) | Time frame | Activities related to the concept |
|---|---|---|
| The concept of osmosis and how it occurs is explained. | 10 Hours | Activity 2.1 – 2.4 |
| Osmosis is illustrated. | | |
| The movement of water from the root to the leaves is explained and illustrated. | | |
| The role of the stomata with reference to transpiration is explained. | | |
| The role of transpiration in relation to water use efficiency of the plant is explained. | | |
| The concept of wilting is explained. | | |

## My Notes ...

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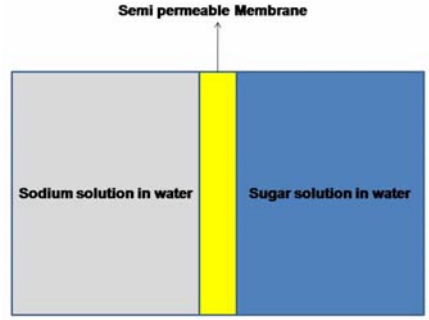
**Please allow learners to complete Activity 2.1 – 2.4 in their Learner Guides**

| Type of activity | Resources |
|---|---|
| 2.1. Individual activity | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| In the illustration below you are provided with two solutions separated by a partially permeable membrane. The membrane in the example is permeable to water and sodium, but not sugar.<br>Further more, the membrane separates two solutions a sodium solution in water (left) and a sugar solution in water (right). Assume that the solvent concentration is lower in the sugar solution.<br>1. Identify all the concentration gradients that exist at time zero i.e. just after all solutions were introduced.<br>2. What would the nett result of osmosis be at equilibrium?<br>  <br> | |

| Type of activity | Resources |
|---|---|
| 2.2. Groups of two | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| Develop a presentation in which you explain the movement of water from roots to leaves in a plant. | |

| Type of activity | Resources |
|---|---|
| 2.3. Groups of two | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| Develop a presentation in which you discuss the involvement of stomata in the process of transpiration. | |

| Type of activity | Resources |
|---|---|
| 2.4. Individual activity | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| Develop a presentation in which you discuss the of transpiration in relation to water use efficiency of the plant. | |

# Session 3 Plant respiration and gas exchange

**Learner Guide:**
**Page 17**

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

**SO 3: Describe the process of respiration in relation to gaseous exchange in the plant.**

**SO 5: Demonstrate an understanding of the maturity and ripening of fruit.**

| Concept (SO 3) | Time frame | Activities related to the concept |
|---|---|---|
| The transfer of gases between the plant and its external environment is described. | 10 Hours | Activity 3.1 & 3.2 |
| The process of respiration and when it occurs in plants is explained. | | |
| The process of respiration in relation to climacteric and non-climacteric fruit is described. | | |
| The influences of respiration on the ripening of fruit are discussed. | | |
| **Concept (SO 5)** | | |
| The process of cell division and differentiation in fruit is explained. | | |
| The role of ethylene in fruit maturity and ripening is explained. | | |
| The function of ethylene in the manipulation of fruit ripening and harvesting is explained. | | |
| The storage of fruit is explained with reference to ethylene and atmospheric factors. | | |


**Please allow learners to complete Activity 3.1 - 3.3 in their Learner Guides**

| Type of activity | Resources |
|---|---|
| 3.1. Individual work | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| Develop a presentation in which you discuss: The role of respiration in relation to cell metabolism. | |
| **Type of activity** | **Resources** |
| 3.2. Individual work | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| Develop a presentation in which you explain the physiology of Fruit ripening | |
| **Type of activity** | **Resources** |
| 3.3. Individual work | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| Discuss climacteric versus non-climacteric fruit. | |

## My Notes ...

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# Session 4 Photosynthesis

**Learner Guide: Page 23**

*After completing this session, the learner should be able to:*
**SO 4: Demonstrate an understanding of the process of photosynthesis.**

| Concept (SO 4) | Time frame | Activities related to the concept |
|---|---|---|
| The effect environmental factors have on the process of photosynthesis is demonstrated and explained. | 10 Hours | Activity 4 |
| The light phase of photosynthesis is discussed and described. | | |
| The dark phase of photosynthesis is discussed and described. | | |


**Please allow learners to complete Activity 4 in their Learner Guides**

| Type of activity | Resources |
|---|---|
| 4. Individual work | Learner guide, Stationery, earlier modules completed, presentation materials and equipment |
| **Instructions to give to the learners** | |
| Develop a presentation in which you explain the process of photosynthesis. | |

## My Notes ...

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# 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. | |