ASSESSOR GUIDE

Irrigation

Title:	**Develop Suitable Irrigation Systems**						
Applied Title:	**Develop Suitable Irrigation Systems for Subtropical Fruit Production**						
Field:	Agriculture and Nature Conservation						
Sub-Field:	Primary Agriculture						
SETA (SGB):	AgriSETA						
Skills Area:	Irrigation						
Context:	Subtropical fruit Production						
US No:	116414	**Level:**	5	**Credits:**	10	**Notional Hours:**	100
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NQF Level 5

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Directions

Please Note: There is a separate assessment guide for the learner. The learner must use this guide to prepare himself / herself for the assessment.

This assessment guide contains all necessary activities and instructions that will enable the assessor and learner to gather evidence of the learner's competence as required by the unit standard. This guide was designed to be used by a trained and accredited assessor who is registered to assess this specific unit standard as per the requirements of the AgriSETA ETQA.

Prior to the delivery of the program the facilitator and assessor must familiarise themselves with content of this guide, as well as the content of the assessment guide for learners.

The assessor, facilitator and learner must plan the assessment process together, in order to offer the learner the maximum support, and the opportunity to reflect competence.

The policies and procedures that are applicable during the execution of this assessment are available on the website of the Citrus Academy, contained in a document named Policies and Procedures for Assessment, and must be strictly adhered to. The assessor must familiarise himself with this document before proceeding.

This guide provides step-by-step instructions for the assessment process of:

US No:	116414	**Level:**	5	**Credits:**	10

The step-by-step instructions agree and are conducted in concert with the steps described in the learner assessment guide. The steps are as follows:

Step	***Description***	***Timeframe***
1	Learner assessment contract	Before delivery of program
2	Learner Declaration of Authenticity	Before delivery of program
3	Diagnostic Assessment of Learning Assumed to be in Place	Before delivery of program
4	Assessment Plan for Gathering of Evidence	Before delivery of program
5	Learner Formative Assessment Activities	During delivery of program, assessment after delivery of program
6	Summative Assessment	After delivery of program
7	Integrated Summative Assessment Tool	After delivery of program
8	Re-assessment Procedures	After completion of assessment
9	Documentation	After completion of assessment
10	Administration and Completion of Portfolio of Evidence	After completion of assessment

Step 1

Pre-Assessment Briefing and Checklist

A pre-assessment briefing for learners is held before the delivery of the program. Use the checklist below to ensure that all these points are addressed and discussed with the learners.

Pre-Assessment Briefing Checklist		
	√	X
Organise resources – people, equipment, venue, etc.		
Explain the purpose of the assessment		
Discuss the standards or criteria to be used		
Discuss assessment roles and accountabilities		
Decide on assessment venues		
Negotiate evidence required, and where or how this evidence may be gathered		
Explain the methods of assessment that will be used during the gathering and summing up of evidence		
Negotiate the date of submission for the activity workbook and the date for the summative assessment		
Discuss resources required for the assessment e.g. equipment, materials, etc.		
Explain the procedure if the learner is found to be not yet competent		
Explain the appeal and review procedures		
Identify any potential learning barriers and negotiate strategies to overcome these		
Complete and sign the assessment plan with the learner		

The learner and assessor must sign the **Learner Contract** in the learner assessment guide.

Step 2

Learner Declaration of Authenticity

The learner is requested to complete and sign the Declaration of Authenticity in the learner assessment guide. This should be checked and co-signed by the assessor.

The format is as reflected in the learner assessment guide.

Step 3

Diagnostic Assessment of Learning Assumed to be in Place

In the learner assessment guide, the learner is asked to indicate whether they have completed the learning assumed to be in place as prescribed by the unit standard.

The assessor must guide the learners through this step, explaining in detail the content of the mentioned learning areas, because names of learning programs do not always agree with the names of the unit standards, and learners might indicate the incorrect information.

If learners indicate that they have not yet completed the mentioned unit standards, the assessor should prescribe an action plan to allow the learner to obtain the skills required by recommending additional training, competence portfolios, or the relevant RPL assessment for the given unit standards.

The format is as reflected in the assessment guide for learners. Please read it and familiarise yourself with its content.

Step 4

Assessment Plan for Gathering of Evidence

A pro-forma assessment plan for this unit standard has been drafted in the learner assessment guide. Explain the plan to the learner and complete the dates and signatures as indicated.

The format for the assessment plan is as reflected in the assessment guide for learners. Please read it and familiarise yourself with its content. Make a note of the dates agreed upon in the table provided below.

Learner and Assessor Assessment Plan		
Unit Standard	Develop Suitable Irrigation Systems	
Registration Number	116414	
Step	***Description***	***Completion / Submission Date***
Step 5	Learner Formative Assessment Activities	
Step 6	Summative Assessment	
Step 7	Integrated Summative Assessment	
Step 8	Re-Assessment Procedures	
Step 9	Documentation	
Step 10	Administration and Completion of Portfolio of Evidence	

Step 5

Learner Formative Assessment Activities

The Learner Assessment Guide contains comprehensive activities and worksheets that the learner must complete during the delivery of the learning program. It is imperative that these activities be completed as part of the learning process in order to give the learner the opportunity to develop the skills, knowledge and attitudes that are required for competence.

Learners must complete all the activities in the workbook.

Learners must be encouraged to take control of their learning by indicating areas in the workbook where they experience difficulty.

Learners hand in the Learner Assessment Guide to the assessor or the facilitator, only if the facilitator is a subject matter expert, for the assessment of the formative assessment activities. The assessment of these activities must be done according to the prescribed benchmarks and according to the marking matrix that follows.

The learner must not move on to the next step before this step has been completed and learners show sufficient capacity and readiness for summative assessment. If problems areas are identified, the learner should be guided with a developmental action plan, which is documented separately and signed by the learner, the facilitator and the assessor.

Model answers are provided below. Where there is variation between learner circumstances, marking matrixes are provided to gather evidence against the activity.

Activity 1 – Research and Discover
Research the irrigation system used on the farm where you work and answer the questions below.
No model answers provided due to variation in irrigation systems. Please use the marking matrix below to gather evidence against this activity.

Describe the system.
Why was this system chosen?
How effective is the system in terms of the available water?
How effective is the system in terms of the soil type?
How effective is the irrigation system in terms of the climatic conditions?
How economic is the installation of such an irrigation system?
How economically does the irrigation system operate?
Is the system compatible with fertigation? Motivate your answer.
Is the system compatible with the water quality? Motivate your answer.
Describe how the irrigation system suits the rooting depth of the crop.
Describe how the irrigation volume is managed and varied with the aid of the irrigation system.
How will the irrigation system assist the plants during times of water stress?

If you had to install a new irrigation system, which system would you recommend and why would you recommend this system?

Criteria	***Evidence Assessment***				***Commentary***
	0 No evidence found	**1 Evidence found but lacking / incorrect**	**2 Evidence found, but can improve**	**3 Evidence complete and accurate**	
Irrigation system accurately described in terms of type and operation					
Reasons for choice of system identified					
System evaluated against water availability					
System evaluated against soil type					
System evaluated against climate					
Economy of installation of system evaluated					
Economy of running of system evaluated					
Compatibility for fertigation of system evaluated					
System compatibility with water quality evaluated					
System's suitability with crop root depth evaluated					
Irrigation volume management explained					
Method of system assisting plants during times of stress explained					
Own recommendation in terms of new irrigation system made					
Choice of new irrigation system motivated					
Total:	**/42**				

Activity 2 – Worksheet

Complete the worksheet below.

Give a brief description on the following:	
Flood irrigation	**In flood irrigation water is channelled to the crop by furrows in the ground. This means that the area that is irrigated must have a constant slope that is not too steep. In some instances basins that can be filled with water are made around the crop plants.**
Mobile irrigation systems	**Mobile, or moving, irrigation systems irrigate while the system is moving and includes systems such as centre pivots, linear systems and motored cannon sprays. The centre pivot consists of sections that are supported by wheels and rotates around a fixed point called a tower. The linear system is similar to the centre pivot in the sense that it is also steel sections supported on wheels. The linear system however moves in linear motion across a field. Motored cannon sprays are water cannons, or large sprinklers, mounted on trailers. A mechanism is provided, usually a water powered winch, which propels the trailer trough the field.**
Static irrigation systems	**Static systems are systems that stand still, or are static, while it irrigates. It includes systems such as permanent and non-permanent sprinkler systems and micro-jet and drip systems.**

Name three possible water sources on a farm.

- **The enlisted water allocation from an irrigation scheme**
- **Storage and holding dams**
- **Free streams and fountains**
- **Boreholes**

A farm is enlisted for 60ha and has an allocation of 9,500m³/ha/annum. Calculate the total annual allocation.

Enlisted ha x Allocation per ha
= 60ha x 9,500m³/annum
= 570,000 m³/annum

Name three factors that influence irrigation efficiency negatively.

- **Evaporation of the water as it is applied from the emitter to the ground.**
- **Mist drift, when the wind carries mist that is formed during irrigation outside the root-zone area.**
- **The wetted area is larger than the root-zone area, which is usually because of system design.**
- **The wetted depth is greater than the root depth.**

Name and discuss three types of impurities found in irrigation water.

- **Physical (e.g. suspended solids, e.g. sand, plastic pieces)**
- **Chemical (e.g. salts)**
- **Biological (e.g. algae)**

Name four possible water treatments to improve water quality.

- **Filtration**
- **Sedimentation**
- **Oxidation**
- **pH Adjustment**
- **Chlorination**

- **Acid Treatment**

Describe the following chemical water quality factors:

EC	**Refers to the ability of water to conduct electricity, and is an indication of the total dissolved salts in water.**
pH	**Is a measurement of the acidity or alkalinity of water.**
Sodium absorption ratio	**Is a measurement of the relation between sodium and calcium plus magnesium in the water. The higher this value, the more sodium is present, and the greater the hazard of degradation of the physical properties of the soil.**
TDS	**Refers to the total amount of dissolved salts in the water. The higher the salt content of the water, the more energy plants need to expend to absorb the water.**

How are different types of irrigation systems affected by water quality?

System	***Sensitivity to Water Quality***
Flood	**Not sensitive**
Pivot	**Not very sensitive, water may require screening, saline water can burn leaves**
Cannon	**Not sensitive, saline water can burn leaves**
Sprinkler system	**Not very sensitive, water may require screening, saline water can burn leaves**
Micro-jet	**Sensitive to blockage but to a lesser degree than drippers, requires filtration**
Drippers	**Sensitive to blockage, needs good physical water quality or good filtration**

In subtropical fruit production, why is it important to be able to irrigate the trees at any given time?

Subtropical fruit yield and quality are extremely sensitive to water stress. Water availability is critical especially during flowering and fruit set, which is the time with the highest peak water demand. Generally speaking, fruit trees requires regular irrigation at least two or three times a week, because these trees have shallow root systems with an average depth of only about 300mm. This limits the plant available water. The physiological processes of trees, and therefore their production, are very quickly influenced by water stress. Water requirements change depending on the prevailing weather conditions and the growth stage of the tree.

Explain why sandy soils have a lower water holding capacity than clay soils.

Sandy soils have a low water holding capacity, because water does not adhere well to sand particles. When irrigating sandy soils, the soil fills quickly to field capacity and all free water immediately starts to drain away. Sandy soils also have a lower water content at field capacity and because of this the volume of available water is quickly depleted. Sandy soils must be irrigated with short stand-times at regular intervals. Clayey soils have a high water holding capacity because the water adheres well to the clay particles. This translates to a high water content at field capacity but also a higher water content at wilting point, and sometimes more plant available water. The higher plant available water means that stand-times can be longer and irrigation intervals spaced further apart.

Activity 3 – Workplace Report

Obtain a copy of an irrigation schedule for an irrigation block for 6 weeks from the farm where you are completing your practical duties. Explain how the irrigation schedule has been designed and why the irrigation volume changes.

No model answers provided due to variation in circumstances. Please use the marking matrix below to gather evidence against this activity.

Criteria	*Evidence Assessment*				*Commentary*
	0 No evidence found	**1 Evidence found but lacking / incorrect**	**2 Evidence found, but can improve**	**3 Evidence complete and accurate**	
Example of irrigation schedule from own workplace attached					
Irrigation schedule design explained					
Irrigation volume changes identified and explained					
Total:	**/9**				

Activity 4 – Calculation Worksheet

Assumptions:

System Application Rate: 6mm/h
Block Area: 5ha

Using the assumptions above, complete the calculations below. Show the formulas and every step in the calculation.

Calculate the flow rate per hour.

Flow rate per hour = Application rate per hour x Area
= 6mm/h x 5ha
= 0.006m/h x 50,000m²
= 300m³/h

Calculate the water usage for the block per week if the block is irrigated 5.5hours per week.

Application rate: 6mm/h
i.e. Total water usage: 60m³/ha/h
Flow rate: 300m³/h
Irrigation time: 5.5 h/week
Total water usage: 1,650m³/week

Activity 5 – Report

Draw up a water usage data table for an irrigation block on the farm where you are completing your practical duties according to the example.

Date	*Pump Meter Reading (m³)*	*Water Use at Pump (m³)*	*Meter Reading Section 1 (m³)*	*Water Use Section 1 (m³)*	*Hours Irrigated Section 1*			*Meter Reading Section 2 (m³)*	*Water Use Section 2 (m³)*	*Hours Irrigated Section 2*		
					1.1	*1.2*	*1.3*			*2.1*	*2.2*	*2.3*