The availability of this product is due to the financial support of the National Department of Agriculture and the AgriSETA. Terms and conditions apply.
Dear Learner - This Learner Guide contains all the information to acquire all the knowledge and skills leading to the unit standard:

**Title:** Evaluate, adjust and implement factors influencing agricultural enterprises  
**US No:** 116293  
**NQF Level:** 4  
**Credits:** 3

The full unit standard will be handed to you by your facilitator. Please read the unit standard at your own time. Whilst reading the unit standard, make a note of your questions and aspects that you do not understand, and discuss it with your facilitator.

This unit standard is one of the building blocks in the qualifications listed below. Please mark the qualification you are currently doing:

<table>
<thead>
<tr>
<th>Title</th>
<th>ID Number</th>
<th>NQF Level</th>
<th>Credits</th>
<th>Mark</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Certificate in Animal Production</td>
<td>48979</td>
<td>4</td>
<td>120</td>
<td>☐</td>
</tr>
<tr>
<td>National Certificate in Plant Production</td>
<td>49009</td>
<td>4</td>
<td>120</td>
<td>☐</td>
</tr>
</tbody>
</table>

Please mark the learning program you are enrolled in:

Your facilitator should explain the above concepts to you.

This Learner Guide contains all the information, and more, as well as the activities that you will be expected to do during the course of your study. Please keep the activities that you have completed and include it in your **Portfolio of Evidence.** Your PoE will be required during your final assessment.

**What is assessment all about?**

You will be assessed during the course of your study. This is called *formative assessment.* You will also be assessed on completion of this unit standard. This is called *summative assessment.* Before your assessment, your assessor will discuss the unit standard with you.

Assessment takes place at different intervals of the learning process and includes various activities. Some activities will be done before the commencement of the program whilst others will be done during programme delivery and other after completion of the program.

The assessment experience should be user friendly, transparent and fair. Should you feel that you have been treated unfairly, you have the right to appeal. Please ask your facilitator about the appeals process and make your own notes.
Your activities must be handed in from time to time on request of the facilitator for the following purposes:

♦ The activities that follow are designed to help you gain the skills, knowledge and attitudes that you need in order to become competent in this learning module.

♦ It is important that you complete all the activities, as directed in the learner guide and at the time indicated by the facilitator.

♦ It is important that you ask questions and participate as much as possible in order to play an active roll in reaching competence.

♦ When you have completed all the activities hand this in to the assessor who will mark it and guide you in areas where additional learning might be required.

♦ You should not move on to the next step in the assessment process until this step is completed, marked and you have received feedback from the assessor.

♦ Sources of information to complete these activities should be identified by your facilitator.

♦ Please note that all completed activities, tasks and other items on which you were assessed must be kept in good order as it becomes part of your Portfolio of Evidence for final assessment.

Enjoy this learning experience!
How to use this guide …

Throughout this guide, you will come across certain re-occurring “boxes”. These boxes each represent a certain aspect of the learning process, containing information, which would help you with the identification and understanding of these aspects. The following is a list of these boxes and what they represent:

**What does it mean?** Each learning field is characterized by unique terms and definitions – it is important to know and use these terms and definitions correctly. These terms and definitions are highlighted throughout the guide in this manner.

**ACTIVITY**

You will be requested to complete activities, which could be group activities, or individual activities. Please remember to complete the activities, as the facilitator will assess it and these will become part of your portfolio of evidence. Activities, whether group or individual activities, will be described in this box.

**Examples**

Examples of certain concepts or principles to help you contextualise them easier, will be shown in this box.

**How am I doing?**

The following box indicates a summary of concepts that we have covered, and offers you an opportunity to ask questions to your facilitator if you are still feeling unsure of the concepts listed.

**My Notes …**

You can use this box to jot down questions you might have, words that you do not understand, instructions given by the facilitator or explanations given by the facilitator or any other remarks that will help you to understand the work better.

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What are we going to learn?

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What will I be able to do?

When you have achieved this unit standard, you will be able to:

♦ Learners are capable of evaluating and adjusting the enterprise and production processes of animal and crop enterprises. In addition they will be well positioned to extend their learning and practice into other areas of agriculture, specifically crop production and animal production systems. This training will benefit the profession by equipping learners with adequate skills to improve productivity and performance.

♦ Learners will understand the importance of the application of business principles in agricultural production with specific reference to enterprise planning.

♦ They will be able to operate farming practices as businesses and will gain the knowledge and skills to move from a subsistence orientation to an economic orientation in agriculture. Farmers will gain the knowledge and skills to access mainstream agriculture through a business-orientated approach to agriculture.

Learning Outcomes

At the end of this learning module, you must is able to demonstrate a basic knowledge and understanding of:

♦ Role and function of soil and water samples, weather information, vegetation, infrastructure, breed characteristics, production cycles, records, markets, health and hygiene within production processes.

♦ Description, characteristics and properties of vegetation, infrastructure, weather, production cycles, markets within production processes.

♦ Observation of the effects of weather patterns, soil and water characteristics, market trends, breed and stock characteristics / performance, health and hygiene conditions, infrastructure conditions, vegetation quality and quantity influencing production processes.

♦ Purpose of vegetation, infrastructure, weather, production cycles, markets within production processes.

♦ Implications of ineffective practices on production processes.

♦ Knowledge of specific livestock and crop characteristics so as to compare and evaluate within production processes and environmental conditions.

♦ Regulations and legislation related to production processes.

♦ Describe various production procedures as an integral part of the production process.

♦ Communication and reporting skills.

♦ Understand the procedures and principles that are followed to determine the viability of an enterprise.
What do I need to know?

It is expected of the learner attempting this unit standard to demonstrate competence against the unit standard:

♦ NQF 3: Interpret factors influencing agricultural enterprises, and plan accordingly.

My Notes ...

......................................................................................................................................................
Session 1

Management of natural resources

After completing this session, you should be able to:
SO 1: Evaluate and adjust production processes so that the required natural resources are managed sustainable.

In this session we explore the following concepts:
- The production of Agricultural commodities
- Soil and water samples
- Use of weather forecast in management
- Production processes
- Production economic principles
- Evaluation of production processes
- The use of Market information to adjust program

1.1 Introduction

Definition:

Production: Production is the co-ordinating process which combines capital and labour in its various forms - raw materials, processed goods and equipment of all kinds, plant, technology, the workforce and management - in order to create a commodity. (Giles and Stansfield).

The production of Agricultural commodities is subjected to various internal production factors such as:

- International economical factors such as the fluctuation between the rand-value against the dollar of pound.
- The international fuel price has an effect on the transportation and thus the production costs as a whole.
- Diseases such as bird flu or Foot and Mouth affects the export of meat to other countries.
The production process is also influenced by external factors which the farmer/producer can not control:

- Various climatic conditions according to the agri-ecological region the production takes place.
- The relative non-elasticity of the demand for the agricultural projects.
- The difficulty of agricultural production to adapt to changes in demand.
- Structural production changes require time.
- The importance of natural resources in the production process and the fact that land is the most important capital asset.
- Movable assets and agricultural products are non-durable and dispersed.
- The seasonal nature of agricultural production.

External factors influencing production of Agricultural commodities

In order to produce a product that is of value and will fill the needs of the market, the producer/farmer/manager must take into account the external and internal factors.

There are three essential ingredients in the production process to achieve the above:

- Building a production plan, one must have consider the marketing opportunities, availability of fixed resources and the production facilities available
- Obtain the necessary resources or a combination there-of and use it in the proper way
Implement these plans and concentrate on the required levels of production and performance with appropriate supervision.

The task of the farmer or the farm manager is to manage the production activities in such a way that the natural resources are used effectively; high production is attained; production costs at an acceptable ratio, that production systems are adapted to suit the climatic and economical environment. The productive use of these resources is one of the key areas to success. Natural resources include soil, water, climate, vegetation and topography.

Please complete Activity 1.1: Individual Activity
Make use of newspapers or articles in agricultural magazines and illustrate the effect of external factors on agricultural production.
- Concentrate on the production enterprises you are working in.
- Make suggestions how local producers can overcome the external factors or prevent the effect thereof.
- Describe the responsibility of the local producer towards the industry or production enterprise he/she is working in.

Understand the production Cycle

In the previous unit standards you learned how to take soil and water samples, how to cultivate the soil and how to look after plants and animals. This knowledge is of no use if you cannot interpret and apply it to the production process. A soil sample report is just a report if (filed somewhere) not put it to use. The aim of soil samples
and the analysis there-of is to provide the producer with information to correct wrongdoings of the past and prevent unnecessary production costs.

The purpose of this information is explained under the following headings:

- Recommendations of soil and water sample analysis are evaluated and the relevant enterprises are adjusted accordingly.
- Processes are adjusted by allowing for the weather forecasts
- The production cycle processes are evaluated, adjusted and incorporated into the relevant enterprises
- Production processes according to observation and reports are evaluated and adjusted
- Production records is adjusted according to the evaluation of market information
- Production is adjusted according to the evaluation of market information.

Experience, judgement and intuition are valuable attributes to the farmer/producer in order to harmonise productivity and increased productivity economically.

Productivity is the rate at which goods are produced and the quantity produced in relation to work, time and money needed in the production process.

Optimal use is to exploit natural resources in such a way that the best production can be achieved without detrimental causes to these resources.

Efficiency can be sustained by ensuring that the relation between maximum production and cost effect is at the best level. There is no sense in applying more inputs than necessary as it will only increase the costs and not the production level.

If we want to stay on our farms and get rewarded for our work, we must farm with nature and we need to manage the natural resources in such a way that it will still be available for our children to enjoy the fruit of the land.

### 1.2 Soil and water samples

The farmer or manager must know his soil to be successful in crop production. To be able to know the soil the farmer can send soil samples for analysis to determine the following:

- Soil type
- Nutrient status of the soil
- To determine the texture of the soil
- Recommendations for the specific crop to be planted
To really know and understand the soil used for agriculture production, you can dig a hole, about 2 meters deep, to determine the soil’s profile at different soil levels. (Ask your extension officer to assist you with this.) The soil profile will also reveal the effect of compaction, drainage of water and the soil’s potential.

The farmer or the manager must be able to plan the cultivation program for the specific crop. Different tillage programs can be used in crop production, depending on the soil type, soil fertility and the crop to be produced.

**Production systems**

- **No-till production system**

  With this system, the soil is left undisturbed from planting to harvesting. A prerequisite of this system is that 30% of the soil must be covered with plant residue after planting to reduce water erosion effectively. Weeds are chemically controlled by spraying e.g. Roundup. In most cases this system is combined with precision farming and movement of implements on one tract.

- **Stubble-mulch tillage**

  This system implies that soil is tilled with a chisel plough or implements with discs, spring-tines and v-shaped blades before planting, but without burying or disturbing the plant residue on the land. Weeds are controlled chemically and/or mechanically.

- **Reduced tillage**

  This system implies that any tillage system is used, but which leaves 15 - 30% of the soil surface covered with stubble. Weeds are controlled chemically or mechanically.

- **Conventional tillage**

  Conventional tillage usually implies a plough action or an intensive range of cultivations before planting. To maintain and conserve moisture, at least 50-60 % of the soil surface should be covered after planting.
<table>
<thead>
<tr>
<th>Tillage system</th>
<th>Advantage</th>
<th>Disadvantage</th>
</tr>
</thead>
</table>
| No-till       | Lowest fuel consumption  
               Quicker adaptation to optimum planting date  
               Lower machinery cost  
               Best control of wind and water erosion | Higher application of herbicide and intensive herbicide management necessary  
               Requires:  
               Higher management inputs  
               Specialised or adapted implements  
               More expensive equipment  
               Possible compaction of soil and accumulation of nutrients in top soil  
               Earlier occurrence of leaf diseases  
               Possible over-population of insects |
| Stubble mulching | Fuel saving compared to conventional tillage  
                   Good control/ better management of:  
                   Wind and water erosion  
                   Soil compaction  
                   Weed control | Soil preparation dependant on spring rains  
                   Greater possibility of leaf diseases |
| Reduced tillage | Greater fuel economy than conventional tillage  
                   Control of:  
                   Wind erosion  
                   Insect population  
                   Accumulation of nutrients not a problem | Poor management of soil erosion  
                   Need better weed management |
| Conventional tillage | Good weed and insect control  
                     Lowest management input | Highest:  
                     Fuel consumption  
                     Machinery costs  
                     Waiting period for suitable soil water  
                     No control of water and soil erosion |
When using any of these tillage systems, it is very important to ensure that a compacted layer, that may impair plant growth, does not occur in the effective root zone of the soil. If such a confined layer is detected, it should be broken by using a ripper implement to ensure better drainage, conservation and utilisation of water.

### Precision farming

Precision farming is the use of modern technology - to collect data regarding the soil, environment and production - where the application of inputs is needed and thereby saving costs.

The following example can explain this concept.

**Example**

Step 1 - use a GPS (Global positioning system) to record the co-ordinates of your land and feed it into a computer. A map, showing the precise location and size of the field/land, is drawn.

Step 2 - take soil samples of the land. Every sample must be accompanied by a number and the co-ordinates (GPS). The results of the soil analysis are then fed into the computer to present a clear picture on the soil situation.

Step 3 - combine the info (from soil samples) and the requirements for a specific crop to determine the quantity and which fertiliser will be needed.
Soil samples are taken from the land with regular intervals. Each sample spot is marked with a GPS to plot the outcome on the land map.

The result of the soil analysis is indicated on the land map by using different colours - separating and showing areas with deficiencies in or beneficial nutrients.

Planting equipments or fertiliser spreaders are fitted with sensors that interpret the information to adjust the application according to the land’s fertiliser status or pH status. This ensures that shortages are addressed but also bring about a saving in the quantity of fertiliser applied.

All the info collected provides the farmer with a clear picture and exact situation on the farm and enables him to determine the plant density and fertiliser application according to the soil and the expected yield.
The map will also indicate areas where lime must be applied, saving input costs as specific areas receive different applications and not one application for the land as a whole.

When the crop is planted and sprayed, the information is also recorded and saved.

Precision farming also includes soil moisture sensors and climatic data collectors for irrigation areas to assist with the scheduling of irrigation.
Please complete Activity 1.2:
Individual Activity
At your place of work:
Indicate how the information obtained from soil samples can or should be utilised by management?
1. Indicate how precision farming can be implemented?
2. How does precision farming assist with cost saving?

1.3 Use of weather forecast in management

Weather forecast is given on the radio, television and in the newspapers on a daily basis. If you have access to the internet you can get the forecast from the www.weatherforecast.co.za. You can even get the weather forecast on your cell phone by dialling 082162 and follow the prompts.

Progressive farmers have their own electronic weather station on the farm to provide them with information needed for various activities such as:

- Production planning for the next season by using long term predictions. (When to plant what.)
- Use the medium term predictions to plan planting dates
- Short term predictions - weekly- to plan week's activities e.g. cutting of hay and the spraying of crops.
- Scheduling of irrigation is also a very important function where the weather stations and weather information play a very important role.

The South African weather service makes long, medium and short term predictions and the farmers should use this in their planning. Although the predictions may not be 100% accurate, it provides an indication of what to expect.

Producer's organisations such as SA Grain and the ARC (Institute for Soil, Water and Climate) also provide long term predictions to their members to assist them with the planning. Many farmers keep their own records to give them an idea what is happening on their own farm.
Evaluate, adjust and implement factors influencing agricultural enterprises

Primary Agriculture  NQF Level 4  Unit Standard No: 116293

Weather information can also be obtained via internet from the following websites

www.graansa.co.za

www.arc.gov.za

www.weathersa.gov.za

**Types of forecast**

The following is an example of the different types of forecasts that can be obtained from the SA Weather service

**Polokwane**

Tuesday, June 10 2008  
Current Time: 03:28:02 PM SAST  
Top of Form

<table>
<thead>
<tr>
<th>LOW 9°C</th>
<th>HIGH 16°C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sunrise</td>
<td>6:41AM</td>
</tr>
<tr>
<td>Sunset</td>
<td>5:22PM</td>
</tr>
<tr>
<td>Wind Speed</td>
<td>22km/h</td>
</tr>
<tr>
<td>Wind Direction</td>
<td>N</td>
</tr>
<tr>
<td>Humidity</td>
<td>51%</td>
</tr>
<tr>
<td>Dew Point</td>
<td>5</td>
</tr>
<tr>
<td>Comfort Level</td>
<td>9°C</td>
</tr>
<tr>
<td>Chance of Rain</td>
<td>30%</td>
</tr>
<tr>
<td>Moonrise</td>
<td>12:01PM</td>
</tr>
<tr>
<td>Moonset</td>
<td>12:00AM</td>
</tr>
<tr>
<td>Moon Phase</td>
<td>First Quarter</td>
</tr>
</tbody>
</table>

**7 Day Forecast**

<table>
<thead>
<tr>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
</tr>
</thead>
<tbody>
<tr>
<td>7°C - 18°C</td>
<td>8°C - 20°C</td>
<td>7°C - 21°C</td>
<td>6°C - 22°C</td>
<td>6°C - 21°C</td>
<td>5°C - 21°C</td>
<td>12°C - 17°C</td>
</tr>
</tbody>
</table>

- Long term predictions

The weather activities in other parts of the world and the water temperature at the south sea can influence the weather patterns in South Africa, Southern Africa and Australia. Very important is El Niño and la Niña patterns in the Pacific Ocean. El Niño pattern causes dry conditions in South Africa whilst the La Niña pattern has the opposite effect on the weather. It is important that the farmer take note of the long term predictions and also to look at the weather patterns in his area. To observe
what is happening in nature, the farmer will also obtain information that can assist in decision making.

- Medium term predictions

Medium term predictions will provide information concerning the present production season. Farmers normally use this information to determine planting dates, plant density, top dressing or not and suitable cultivars for the production season. (The SA. Weather service is constantly busy to improve on their prediction techniques to provide better services to the public.)

- Short term forecasts

Short term forecasts are for a few days only, maximum a week. The forecast is normally made for three days or is given on a daily basis. This can be used to assist with activities such as harvesting, cutting of fodder and planting. The Weather service also issue warnings regarding the possibility of veld fires, approaching cold spells (to protect animals) and strong winds.

Different equipment can be used to predict and record weather patterns. Modern technology makes it possible for more accurate predictions. It is very important to record the weather on a daily basis. This can be used for later reference and to assist in elimination of previous mistakes. (Some people observe the reaction of the insects, birds and wild animals to predict the weather.)

- Accuracy

No one can predict the outcome of certain weather patterns with 100 % accuracy. The Weather service makes use of models to do their predictions and work on probabilities. The weather patterns are observed, and according to the previous experience and available information the outcome is predicted. Patterns such as the influx of moist air from the tropical region can bring rain while a cold front moving over the country can cause rain in certain areas.

- Use of forecast

The forecast obtained from the SA Weather service or any other weather service can be used for the following purposes

- Planting or cultivation of crops
- Cutting or mowing of pastures or fodder crops
- Spraying of crops before rain to prevent the remedy being washed from the plants
- Wind direction and strength needed when you make fire breaks to prevent run away fires
- Temperature - when to protect plants and animals against cold weather
- Scheduling of irrigation - using wind, temperature and evaporation to calculate the amount of water needed
- Harvesting of certain crops - fruit
1.4 Production processes

The production cycle processes are appraised, adjusted and incorporated into the relevant enterprises. Herewith are a few guidelines to follow during the different stages of the production process. The aim of production is to produce the best possible product at the most efficient cost. The production process can be more refined and improved as the producer gain more experience to determine what works well and what don’t.

<table>
<thead>
<tr>
<th>Crops</th>
<th>Production Activity</th>
<th>Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1) Planning</td>
<td>Plan the activities for the next season and draw up:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Land use plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Order the required inputs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure that tractors and equipment are in working condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operators are trained in different activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Labourers know what is expected – work hours arranged</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Work out a work production schedule and get marketing agreements in place</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Activity and equipment use plan</td>
</tr>
<tr>
<td></td>
<td>2) Preparation phase</td>
<td>Cultivation preparation - Primary and secondary cultivation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure a good seed bed for the plants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Record expenses and activities - ensure effective use of equipment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Keep to time schedules</td>
</tr>
<tr>
<td></td>
<td>3) Planting phase</td>
<td>Final land preparation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Supervise planting activities:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>planter and spray equipment are correctly calibrated</td>
</tr>
<tr>
<td></td>
<td></td>
<td>planting as decided – plant density, depth, fertiliser application, seed treatment (if necessary)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>correct working speed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>calibration tests - regularly at various places</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Correct cultivars planted</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If permanent crops are planted e.g. trees make sure proper care is taken with the preparation of the soil</td>
</tr>
<tr>
<td></td>
<td>4) Germination</td>
<td>Ensure that top soil is lose - if not loosen specially after a heavy rain storm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Observe if germination takes place at the correct time</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Correlate % germinated plants with trial sample</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Re-plant areas with poor germination</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Look for cut worms, apply bait if necessary</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cover where needed to protect young plants</td>
</tr>
</tbody>
</table>
5) Growth stage

- Record the different growth stages of the crop together with rainfall and the temperature
- If applicable - ensure irrigation during critical periods to eliminate stress
- Control weed and pests - to reduce stress
- Protection against pest and diseases
- Weed control

6) Pollination

- Pollination is a critical period - ensure that there is enough plants for successful pollination
- Removal of unwanted materials
- Irrigation during this period essential

7) Fruit /grain setting

- Plants must not be drought or heat stressed as it will effect fruit or grain setting negatively
- Where possible - ensure sufficient moisture to the plant

8) Harvesting

- (Next to planting the most important phase)
- Make sure crop if ready to be harvested - not to early or too late.
- Dry enough - grain; or at the correct physiological stage - fruit & veggies
- Use correct harvesting methods
- Prevent breakage, damage or wastage

9) Post harvesting actions

- Grading or classification of the products
- Correct packaging - according to different grades
- Pack only good quality, remove damaged products
- Make use of cold chain where necessary
- Transport - prevent damaging

Please complete Activity 1.3:

Individual Activity
1. Use the production enterprise (at your place of work) and evaluate it according to the main headings provided. Give, in a logical order, as much detail as possible.
2. Explain how the following can be used/ applied in the production process
   - Soil samples and analysis
   - Leave samples and analysis
   - Weather forecast

Production economic principles

In the book Finance and the Farmers (Van Zyl, J et al) of Standard Bank, planning is defined as “the managerial task that involves purposeful deliberation on the future objectives of a business or a section thereof, the means and activities involved, the problems that may be experienced and the formulation of the most suitable plan of action for the attainment of these goals”

Production planning primarily involves making choices and decisions - that means - selecting the most profitable and sustainable alternative for your production enterprise from other passable alternatives. There are many risks and uncertainties associated with farming. Detailed planning is therefore absolutely necessary. There are, as mentioned earlier, many factors that influence the production process and to assist the farmer or manager to make the correct decisions, production economics must be used and understood to assist with decision making.
Production economic principles comprise of a set of norms or rules that will ensure that choices or decisions will lead to maximum profit. The rules are applied in the following order or steps:

- Obtain and collect physical and biological data and process it into useful information
- Collect price data for the commodities produced and process it in useful data
- Apply the relevant economic rules regarding to decision making to achieve maximum profit

♦ Marginality

Marginality is a very important concept in production economics. It explains how changes will affect a farming business - how changes in one factor will affect the profit or the economical situation as a whole - or how will the applications of additional fertiliser affect the crop results?

Marginality refers to an alteration of one factor (increase or decrease) in a process as the cause of the change of another factor - what will the additional income be?

Marginal changes are calculated by determining the difference between the original value and the new value which resulted from the change in the controlled factor.

The change in the input is indicated with Δ (the Greek letter delta)

E.g. changes in wheat production = Δ wheat production and Δ fertiliser

The second important concept in the production economics is the production faction. The production function indicates the relationship between different quantities or amounts of a specific output and a specific input, while all the other outputs stay the same or constant. This production function can be presented as a table, a graph or a mathematical equation.

\[ Y = f(X_1, X_2, X_3, \ldots, X_n) \]

\[ Y \]
  = Output (maize production)

\[ X_1 \]
  = Variable input (e.g. nitrogen fertiliser N)

\[ X_2, X_3, \ldots, X_n \]
  = Inputs that remain constant (irrigation, cultivation, P + K)

The production function provides the basic data which could be used to make deductions from production.

The Total Production (TP) and the input level are required to determine the production. It can also be used to calculate the average production and the marginal production:

Average production = \[
\frac{\text{Total Production (TP)}}{\text{Input level}}
\]
Average production is the total production divided by the input level. It is the production per input unit. The Average production will increase and then decrease as more units of the input is required.

<table>
<thead>
<tr>
<th>Input Level (n)</th>
<th>Total Production</th>
<th>Average Production</th>
<th>Marginal Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>23</td>
<td>11.5</td>
<td>23 - 10 = 13</td>
</tr>
<tr>
<td>3</td>
<td>33</td>
<td>11</td>
<td>33 - 23 = 10</td>
</tr>
<tr>
<td>4</td>
<td>36</td>
<td>9</td>
<td>36 - 33 = 03</td>
</tr>
<tr>
<td>5</td>
<td>36</td>
<td>7.2</td>
<td>36 - 36 = 0</td>
</tr>
<tr>
<td>6</td>
<td>33</td>
<td>5.5</td>
<td>36 - 33 = -3</td>
</tr>
</tbody>
</table>

\[
\text{Marginal production (MP)} = \frac{\Delta \text{Total production}}{\Delta \text{Input level}}
\]

The marginal production (MP) is the difference between the total productions (23 - 33 = 13), divided by the difference in the input level (2-1=1).

If 20 kg of N is applied, the average production will be 11.5 kg while the marginal production will increase to 13 kg. For every kg of N fertiliser added, the yield will increase with 13 kg up to 30 kg of N where the yield will only increase by 10 kg per kg N applied.

This can be illustrated in a graph

**Graph.1 Typical production function in Agriculture**
Production in the first phase indicates that the average production (AP) constantly increases. The marginal production (MP) is higher than the average production: Maximisation of profit occurs constantly by adding additional units of fertilizer.

In the Second phase the total production rate still increases, although in a decreasing way until it reaches point C where the increasing rate equals zero. The average production (AP) curve decreases throughout, as does the Marginal production (Mp) curve. The MP lies below the AP curve and MP = 0 at point F correlates with point C on graph 1.

In the third phase the total production starts to decline which means the MP curve is negative form point F onwards.

Graph 2: Marginal Production and Average production

- Diminishing marginal returns

The law of diminishing returns states that, as additional units of a variable input are applied in combination with one or more fixed input(s), the marginal returns will eventually start to decrease.

For further evaluation of the production function the:

- **Input/output ratio**: how much of an input or how much production is necessary to determine the most profitable input or production level.
- **Profit involves money**: thus, to maximise profits, income and costs must be considered. The price of inputs and output (product) must be known. The golden rule for decision making is: **The optimum input application level or the optimum production level is the level at which the maximum profit is achieved**. For maximum profit the marginal income (MI) should be equal to the marginal cost (MC).
• **Input / input ratios**: - how to produce. The question to be asked is “Will another input combination produce the same result at a lower cost?” Will it be possible to substitute one input with another?

Four rates of substitution are possible:

- A **fixed rate of substitution** uses inputs in the production process according to a fixed ratio and no other substitution takes place - e.g. seed is treated with a specific fungicide or pesticide and non other.

- A **constant rate of substitution** is where one input $X_1$ can always be substituted in the same ratio with other inputs $X_2$ in order to generate the same production - e.g. replacement of fertiliser with compost or manure at a constant rate of 5 parts manure to 1 part fertiliser

- An **increasing rate of substitution** is where the quantity of input $X_1$ increases, fewer and fewer units of $X_2$ must be used to replace one unit of input $X_1$. E.g. LAN fertiliser is needed for nitrogen but urea can be used that is cheaper as long as it is done in the correct ration, as urea contains more N as LAN per unit.

- A **decreasing rate of substitution**: - as the quantity of $X_1$ decreases, more and more units of $X_2$ are required to replace one unit of input $X_1$ - e.g. the use of grazing ($X_1$) in comparison to a concentrate ($X_2$) to produce milk - as the grazing decreases in nutritional value, the quantity of concentrates added to the cows’ diet must increase to maintain the same production level.

- **Output/ output ratios** - what to produce? It is necessary to determine the physical relationship between products. The following output relations can occur:
  
  - **Joint products** - where the production of one product automatically generates the other e.g. wool and mutton
  
  - **Supplementary products** - are obtained where the change in the production of one product has no effect on the production of another product. e.g. beef cattle and goats
  
  - **Complementary products** - the increase in the production of one product also results in the increase of the production of the other e.g. (1) a combination of cattle and goats - goats prevent and control bush-encroachment, thus making more grazing available to the cattle or (2) the crop rotation with leguminous plants will lead to higher production.
  
  - **Antagonistic products** - one product claims the input of another product with adversely affects - e.g. cattle and blue wildebeest cannot graze together as the wildebeest is the carrier of the disease bovine malignant catarrh (Snotsiekte) that is fatal to cattle.

Van Zyl J (et all) expresses the rule for decision making as: Profit is maximised when two outputs or products are produced using a given number of limited inputs, where the physical rate of substitution of the two products is equal to the inverse price ratio of the products.
1.5 Evaluation of production processes

Many of you might have heard older people saying: “What worked for my dad is working for me”. There is truth in the saying but you need to advance with technology and you need to evaluate the production process.

To evaluate, is to measure. To evaluate the production process, you need to measure it against a standard or a benchmark. To make the correct and informed decisions you need to measure the budget vs. actual expenditures: marketing results vs. grading standards and marketing results vs. prices your products obtained - are products downgraded due to poor quality?

The marketing information will be discussed in the next section. To evaluate the production process, you will need the following records:

<table>
<thead>
<tr>
<th>Records</th>
<th>Reason why it is important</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Activity records</td>
<td>To determine the costs (production cost) and where activities can be combined or reduced to save on input costs without compromising quality. It will also assist with budgeting and eliminate unnecessary expenses.</td>
</tr>
<tr>
<td>2 Production records</td>
<td>Inputs used: seed, fertiliser, pesticides, herbicides, implement costs, planting dates, rainfall stats, irrigation scheduling, temperature. This is important to plan for the next season and to correct mistakes, improve quality of work and to reduce unnecessary expenditure. The yield records can be incorporated with the land plan and soil samples to make predictions for the next season regarding cultivation, lime and fertiliser application.</td>
</tr>
<tr>
<td>3 Soil samples</td>
<td>To be taken every 3 years - this will help to determine if there was an improvement or not and what the present status of the soil is. Can the amount of fertiliser be reduced? Application quantities (fertiliser) may differ from area to area according to the soil analysis. Marginal soil can be taken out of the production process and used for grazing.</td>
</tr>
<tr>
<td>4 Weed and pest control program</td>
<td>Crop rotation, use of herbicides and alternative crops can assist in reduction of weeds and pests - that will save costs. Evaluate the effectiveness of the program used. Use weather information before spraying to prevent the</td>
</tr>
</tbody>
</table>
Several ratios can be used to determine the financial position of a farming business - the solvency, liquidity and profitability ratios.

To determine the production activities, a diagnostic analysis of the farming results need to be done. Various efficiency analyses can be applied, depending on the size of the farming business, the type of enterprise and the purpose of the analysis.

The following criteria or standards can be developed for the analysis:

- Criteria based on comparing the farm’s records for year-to-year
- Average criteria for a region or area as obtained from study groups, cooperative services that assist farmers with data collection and interpretation and also the Department of Agriculture.
- Criteria based on the results of the top performers of the different groups in the region
- General accepted norms - in so far that these norms have been developed for and adjusted to suit the particular circumstances of the farming business.
- Criteria obtained from research results regarding physical and financial performances.

For this diagnostic purpose, the records of the farming business must contribute towards the development of evaluation criteria, and must be able to identify gaps in the production process. Deficiencies in a farming business are usually diagnosed by using efficiency criteria.

### General Criteria

This is criteria that are applicable to the farming business as a whole;

- Net farm income per hectare
- Net farm income per R 100.00 capital investment
- Gross margin for the farm business as a whole
- Return on total capital investment
- Gross margin per hectare
- Interest earnings on own capital
- Increase or decrease in the net value of the farming business.

### Investment criteria

This criterion takes into account the investment that was made in the farming business - what amount is invested in land, fixed improvements and livestock.

- Land value per ha
  - Value of improvements per ha
  - Total farm value per ha
  - Capital investment in livestock per large stock unit (LSU)
  - Value of livestock per hectare
Evaluate, adjust and implement factors influencing agricultural enterprises

Primary Agriculture  NQF Level 4  Unit Standard No: 116293

- Machinery and equipment
  - Capital investment in power machinery
  - Capital invested in implements per hectare arable land
  - Capital investment in vehicles per ha

**Utilisation of machinery**

To determine the efficiency of machinery used, only the cost that is directly related to the cultivation - variable cost – are used

- Vehicle costs per hectare
- Power machinery costs per hectare cultivated land
- Tractor costs per litre fuel used
- Tons harvested per tractor
- Cultivation costs per unit harvested

**Utilisation of labour**

Only the direct locatable costs regarding labour can be used

- Labour cost per hectare (full –time) per month
- Gross production value per R100 labour costs
- Net farm income per R100 labour costs
- Labour efficiency percentage - that is the total number of labour days worked by labourers as a percentage of the maximum number of available working days.
- Labourers per day per yield-unit harvested
- Hectares cultivated per labourer per day

**Crop cultivation**

Gross margin per hectare

Effective utilisation of cultivated land:

- Hectares cultivated per tractor unit
- Ratio of hectare cash crops to hectare fodder
- Cultivation costs per hectare arable surface area
- Yield per hectare harvested, per 100 mm rainfall or per irrigation cycle

**Measurement of practice**

- Kilogram seed used per hectare
- Yield per hectare
- Fertiliser applied per ha
- Fertiliser cost per ha
- Cultivation cost per ha

The gross margin per hectare can be used for comparing the profitability of crop enterprises with each other, provided that production practices and fixed costs requirements are more or less the same.
1.6 The use of market information to adjust program

Agricultural products are subjected to the market force of supply and demand. If there is an oversupply of a product on the market, the prices tend to be low. The opposite is also true; if there is an undersupply of a product the price is high due to the large demand. The producer must bear in mind that agricultural production is seasonal. It is therefore very important to use market information to have products on the market when the price is high.

Other information obtained from marketing information

- Quality of the product. The cheapest way of adding value to your product is to ensure that it is of the best quality that you can produce. Ensure that the product is not bruised during the picking or harvesting process. Take care with the packaging and handling of products to (transport) and at the market (offloading) itself.

- The consumer might develop a different taste - it is necessary that the producer adjust to the new demand as quickly as possible.

- The classification standards can change - if the producer do not adapt he will not be able to sell his product.

The producer must form a partnership between him and his marketing agents to ensure that he obtain information and advice on what and when to produce.

After you completed the assessment or analysis of the production process you need to make adjustments to the production process to ensure the profitability of the enterprise. The adjustments can be introduced immediately in enterprises where there is a constant production e.g. dairy or piggery. In other seasonal enterprises the changes will be made over time and the result of the change will in most cases only be seen at the end of the production season.

There are basically three changes that can be made

- Change the production process
- Change the products produced
- Close the production enterprise

Useful information for planning market related changes can be obtained from the RSA – food security bulletin on the web site of the National Department of Agriculture www.nda.gov.za
Please complete Activity 1.5:
**Individual Activity**
Use the production enterprise you are involved with and answer the following questions.
1. Study the production process and break it up in the different production segments.
2. Evaluate the different production segments and recommend improvements regarding the use of machines, labour and efficiency of the production system.
3. How can the market information be used to assess the production process?

<table>
<thead>
<tr>
<th>Concept (SO 1)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommendations of soil and water sample analysis are evaluated and the relevant enterprises are adjusted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processes are adjusted to take account of weather forecasts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The production cycle processes are appraised, adjusted and incorporated into the relevant enterprises.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production processes according to observation and reports are evaluated and adjusted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production records are appraised and the outcomes are incorporated into the production processes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Production is adjusted according to the evaluation of market information.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**My Notes ...**

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Session 2 Evaluation of infrastructure

After completing this session, you should be able to:
SO 2: Compare and evaluate infrastructure factors affecting requirements

In this session we explore the following concepts:

- Factors affecting the role and function of infrastructure for the relevant enterprises are evaluated and adjusted.
- Production or on farm production infrastructure
- On-farm processing facilities:
- Legislation that play a role in infrastructure

The role of infrastructure is to support the production process or to make the production of products possible. The role of infrastructure is also to conserve the natural resources and to ensure optimal use of the natural resources.

Infrastructure can be classified into the following groups:

- Production infrastructure or on farm production infrastructure
- On farm processing facilities
- Agro-processing
- Wholesale markets and trading centres
- Information and communication facilities
- Farm to market infrastructure

2.1 Production or on-farm production infrastructure

This will include all the facilities or infrastructures that will be needed for the production of the different commodities on the farm. The type of infrastructure will differ from farm to farm according to the products produced, agro ecological region where the farm is situated, the topography of the farm and the financial position of the farmer and his/her personal choice.
Basic facilities need to be in place for the production of different commodities and as the quality and quantity of the product or production increases and with that, the quality of management, the facilities will also improve.

<table>
<thead>
<tr>
<th>Crop / product</th>
<th>Infrastructure</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain production</td>
<td>Lands, contours, water ways, Irrigation, pipe line and pumps, sprinklers, Fences around the lands, Access roads</td>
<td>Mechanical cultivation - Tractors, cultivation implements, Animal traction, draught animals with implements, Hand cultivation with hand equipment</td>
</tr>
<tr>
<td>Fruit</td>
<td>Lands, contours, water ways, Irrigation, pipe line and pumps, sprinklers, Fences around the lands, Access roads, Trellises, Shade or hail netting</td>
<td>Mechanical cultivation - Tractors, cultivation implements, Animal traction, draught animals with implements, Hand cultivation with hand equipment</td>
</tr>
<tr>
<td>Vegetables</td>
<td>Lands, contours, water ways, Irrigation, pipe line and pumps, sprinklers, Fences around the lands, Green houses or net houses, Access roads</td>
<td>Mechanical cultivation - Tractors, cultivation implements, Animal traction, draught animals with implements, Hand cultivation with hand equipment</td>
</tr>
<tr>
<td>Animal Production</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dairy cattle</td>
<td>Milking shed or parlour, Feeding barn, storage barn, Camps, feeding space, calf pens, handling facilities, Milking machine, bulk cool tank</td>
<td>Roads for collecting milk, Camp must be well drained to prevent build up of mud and dung</td>
</tr>
<tr>
<td>Beef cattle, Sheep and goats</td>
<td>Camps, Handling facilities, Loading facilities, In case of sheep - shearing shed / shed that can be used for this purpose, If animals are grazing on irrigated pastures the irrigation will be additional</td>
<td>Fire breaks needed, water supply to different camps with water troughs, Scale is necessary for performance testing – to measure growth</td>
</tr>
<tr>
<td>Game farming</td>
<td>Game fences, bomas to keep new game and equipment for the catching of game, water holes, Roads and water provision</td>
<td>If Game is used for hunting, accommodation for hunters, slaughtering facilities, transport, Fire breaks</td>
</tr>
<tr>
<td>Poultry</td>
<td>Depending on the system used and the type of poultry - broiler house with equipment, Layers need cages or nest boxes in case of free range chickens</td>
<td></td>
</tr>
</tbody>
</table>
Please complete Activity 2.1:

**Individual Activity**

1. Use the production enterprise on your farm and write down the infrastructure needed to produce the crop or product.
2. Determine if you can add additional facilities that will assist with the production.

### 2.2 On-farm processing facilities

Where value is added to the product by means of sorting and packaging on the farm, provision must be made for the correct infrastructure. Products such as potatoes, tomatoes and onions are normally packed on the farm. After harvesting it is normally washed, sorted for size or damaged products and packed into the appropriated packaging. To be able to do this there must be washing facilities, sorting lines and packaging facilities. Provision must also be made for the needs of the workers - ablution facilities and a place to eat. Most of the products are placed on pallets for easier handling. A Forklift is essential to assist with the loading of the pallets onto the vehicles that will transport it to the market.

**Agro-processing**

Where the products are not processed on the farm, the facilities must be available to transport it to the nearest processing or collection point. Roads play a vital role the transportation process, therefore the condition of the roads will affect the quality of the products - eliminate bruises. In the case of grain, care must be taken to reduce or prevent wastage or spillage.

Milk must be transported in cool tankers where the quality of the milk must be ensured; the temperature must remain cold enough to prevent bacteria from multiplying. Vegetables, flowers and fruit are also products that must be kept cold and the cold chain must be maintained at all times.

Processing facilities can be a wide range of different facilities, from a silo to store the grain, a factory that cans vegetables or fruit, a pack house to store fruit and a milk-processing plant\factory.

Other facilities that will play a role in the marketing of agricultural products are:

- Wholesale markets and trading centres
- Information and communication facilities
- Farm to market infrastructure

Please complete Activity 2.2:

1. Evaluate the enterprise or Agri-business you are involved with and identify the infrastructure and facilities needed.
2. Identify all the problems or shortages of facilities and what can be done to address these problems.
3. Indicate how you will go about to rectify the required adjustments to the infrastructure and how it will be integrated and implemented in the production process.
Regulations and legislation regarding natural sources and infrastructure:

A farming enterprise is evaluated according to certain regulations and legislations. Appropriate adjustments must be made and implemented to comply with these regulations and legislations.

There are several legislations that play a role in the provision of facilities and infrastructure, depending on the type of product that is produced.

Soil conservation and the conservation of natural resources are also regulated by rules and regulations. These are necessary as it prevent the deterioration of natural resources and the negative effect that development may have on e.g. vlei-lands or any other sensitive area.

Animal health and safety act: - regulates Bio security, animal health and hygiene, the transportation of animals and animal products.

Food Safety and Quality acts: - regulates the fresh produce markets to ensure that the produce is of the best possible quality - the municipalities will play a role with the marketing of fresh produce.

Hygiene is of crucial importance in sectors such as dairy, abattoirs or other on-farm processing facilities.

Regulations, concerning the export of products to foreign countries such as Europe, the USA and U.K. are also in place.

Factors affecting infrastructure

The infrastructure on the farm will depend largely on the following:

- The type of product produced and the production process.
- The topography of the farm is playing a role in the design of the buildings, contours, waterways etc.
- The financial position of the farmer. Unfortunately, if the farmer is battling to make ends meet he/she will not spend money on infrastructure. Only when sufficient funds are available will he/she start to spend on improving the infrastructure.
- The history of the farming unit and its age will influence the state of development. Farmers, starting from scratch, may start with a development plan to get the facilities in place, as the development of the farm takes place over time and as funds are available.
- The needs of the products produced is also a determining factor

2.3 Legislation that play a role in infrastructure

The following legislations are of importance regarding the infrastructure on a farm. Information of these acts can be obtained from the National Department of Agriculture (NDA) web page
Soil conservation act
Protection of livestock act
Water legislation - can be found on the web site of the Department of water affairs and forestry - www.dwaf.gov.za
Legislation such as the Groundwater resource assessment and management (GRAM) and NGIS regulations
Legislation regarding hygiene at dairies, abattoirs and food processing plants:

ANIMAL PRODUCTS

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>PUBLISHED</th>
<th>INDUSTRY DISPENSATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy and imitation dairy products</td>
<td>No. R. 2580 of 20 November 1987</td>
<td>17 July 2000</td>
</tr>
<tr>
<td></td>
<td>No. R. 2581 of 20 November 1987</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tables of Regulation 2581</td>
<td></td>
</tr>
<tr>
<td>Eggs</td>
<td>No. R. 25 of 8 January 1999</td>
<td></td>
</tr>
<tr>
<td></td>
<td>English</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Afrikaans</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tables</td>
<td></td>
</tr>
<tr>
<td>Ice cream</td>
<td>Draft document</td>
<td></td>
</tr>
<tr>
<td>Meat</td>
<td>No. R. 863 of 1 September 2006</td>
<td></td>
</tr>
<tr>
<td></td>
<td>English</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Afrikaans</td>
<td></td>
</tr>
<tr>
<td>Mohair</td>
<td>No. R. 864 of 27 June 1997</td>
<td></td>
</tr>
<tr>
<td>Poultry meat</td>
<td>No. R. 946 of 27 March 1992</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No. R. 988 of 25 July 1997</td>
<td></td>
</tr>
</tbody>
</table>

(Source: www.nda.gov.za)

Provincial and municipal regulations regarding buildings and structures
Regulations regulating the transport of livestock
Export and quality regulations both local and overseas can also be obtained from the NDA website (Select the regulations applicable to your industry)
Please complete Activity 2.3:

Cases study. Read the following section on orchard planning and site selection

**ORCHARD PLANNING AND SITE SELECTION**

Optimising production and quality of any fruit type necessitate selection. Fruit with a good appearance - same size, good colour on the inside as well as outside will stimulate anybody's appetite. In the past far too little attention was given to this aspect as far as olives are concerned and therefore very little written information exists. The discussion below will be far from adequate but, will at least form a base to work from. Aspect plays a major role in olive production. In the Western Cape of South Africa, the north-western slopes are normally hot but with big variations in temperature. The soil conditions are usually on the poor side and subjected to strong north-westerly winds. The oil quality of olives produced in this area is normally poor on these slopes while table olives will battle to attain a good acceptable size.

Varieties with low chilling requirements and tolerance to harsh conditions should be planted on these slopes. Select more vigorous varieties for the hot slopes. Southern slopes are cooler but with much more south-easterly winds and are not suitable to vigorous, alternate bearing varieties. High chilling requirement varieties like Sevillano may benefit on these slopes. It is probably more suitable for table olives. Eastern slopes are most probably the best suited to olive growing as these slopes usually provide better fruit.

Wind is essential for pollination but can also cause poor fruit set, floral abortion, fruit let drop, fruit shrivel, wind marks and sandblasting – factors that can influence quality as well. It is therefore essential to select varieties less affected by wind – such as Mission. When these windy conditions do exist, one should seriously consider planting windbreaks to optimise the crop and quality.

Frost is also a major consideration when selecting the area for olives. Select sites where temperatures will not drop below 10°C. Select varieties – e.g. Mission – that are more frost resistant.

Soil variation should, without doubt, be taken into consideration. Use more vigorous upright varieties on poorer soils and less vigorous varieties on the better soils. Kalamata will produce a larger yield in soil with good buffer capacity i.e. good water holding capacity, high cation exchange capacity and without water logging potential. Irrigation blocks should also be laid out according to soil types. Proper soil analysis is most important prior to any planning and should form the base of farm planning, cultivar selection and tree spacing.

Sunlight is fundamental in fruit farming. Olive trees should be orientated north-south for best results (between 30° east to 30° west of true north), but where trees remain free standing and not touching each other in the row, row orientation is not that important. When orientation is planned, consider - water drainage down the row (minimum slope 3-5%); the wind directions; and for mechanical purposes, the slope (in the row) must be less than 16% although short distances of 20-25% can be tolerated (danger for tractor drivers, etc).

Distance from the infrastructure and the water supply should also be considered. Rather plant olives (for oil purpose) and varieties resistant to bruising further away from the processing area while the more sensitive types closer to the facilities. It will also be practical and profitable to plant early varieties, such as Manzanilla and Barouni, further away from the water source as these varieties are more drought resistant and will thus only need irrigation water for a shorter period – lessening pumping costs. (Also concentrate on early varieties in case of water shortages).
Site selection is all about common sense - knowing the different characteristics and your farm and selecting the cultivar most suited for each area - the perfect match will present pure joy for years on end while a bad choice will keep you fighting problems all the way.

Although the article is about the establishment of olive orchards, it brings out very important aspects regarding planning and facilities.

1. Identify the effect of the topography on the cultivar choice or the type of production
2. Identify the climatic requirements for the different cultivars.
3. How are these factors used in planning?
4. Identify the needs for infrastructure
5. How is the infrastructure designed to fulfil the functions identified?

### Concept (SO 2)
<table>
<thead>
<tr>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factors affecting the role and function of infrastructure for the relevant enterprises are evaluated and adjusted.</td>
<td></td>
</tr>
<tr>
<td>Required adjustments to the infrastructure are integrated and implemented.</td>
<td></td>
</tr>
<tr>
<td>According to relevant regulations and legislation the enterprise is evaluated, and adjustments made and implemented where appropriate.</td>
<td></td>
</tr>
</tbody>
</table>

### My Notes ...

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Session 3: Production stock

After completing this session, you should be able to:
SO 3: Evaluate and adjust required stock– live stock and crops

In this session we explore the following concepts:

- Deficiencies in production regarding stock are evaluated and adjusted to ensure optimum production
- The characteristics and needs of livestock and crops are evaluated and adjustments to the enterprises are made accordingly
- The suitability of resources for specific enterprises are evaluated and adjusted and appropriate changes implemented

3.1 Deficiencies in production regarding stock are evaluated and adjusted to ensure optimum production

- Suitability for production
- Adoption to climatic conditions
- Production system and intensity scale
- Immunity and resistance against disease and pests
- Quality of stock – effect of genetics
- Feeding conditions and natural resources
Livestock

The breeding stock or the production units used to produce the different products should be suitable for the purpose they are meant for. Stock showing deficiencies will have a negative effect on the production and productivity of the production unit.

The following deficiencies can influence the production process:

<table>
<thead>
<tr>
<th>Deficiency</th>
<th>Influence on the production process</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Physical deficiencies</td>
<td></td>
</tr>
<tr>
<td>- Feet, hooves and legs</td>
<td>Affects the ability of the animal to walk, stand and grazing. Foot rot and the cutting of hooves</td>
</tr>
<tr>
<td>- Head and mouth</td>
<td>Skew mouth, undershot or overshot jaws, teeth - affects the ability of animals to eat, restrict animals to certain foodstuffs - worn teeth vs. grazing.</td>
</tr>
<tr>
<td>- Back</td>
<td>Able to carry the body weight, reproduction</td>
</tr>
<tr>
<td>- Mammary system</td>
<td>Especially with mammals where milk production is important for either production or raising of the young</td>
</tr>
<tr>
<td>- Reproductive system</td>
<td>If the male animal experience problems with the reproduction system - no milk or calves</td>
</tr>
<tr>
<td>2 Genetic deficiencies</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Breeding value - animal do not have outstanding genetic potential to breed pure and true to breed characteristics</td>
</tr>
<tr>
<td></td>
<td>Production potential animal do not have genetic potential to produce quality and the required quantity of the product</td>
</tr>
<tr>
<td>3 Adaptation to environment</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Climatic conditions - how do the animals deal with climatic conditions such as heat stress or extreme cold conditions? Animals in the warmer areas of the country and closer to the tropical areas can experience Tropic degeneration</td>
</tr>
<tr>
<td>4 Feed uptake and conversion</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Feed conversion - Animals with low feed conversion ratios will need more feed to reach the target weight and will be less economical. Animals with a high feed conversion ratio will be more efficient in feedlots and intensive meat production systems. Some breeds are growing slow and mature too late.</td>
</tr>
<tr>
<td>5 Immunity against diseases and pests</td>
<td>Diseases caused by ticks - animals that are resistant to diseases, pests and parasites are easier to manage and at lower costs. The mortality ratio of theses animals are also lower.</td>
</tr>
</tbody>
</table>

To be able to evaluate the deficiency of animals the producer/farmer need to know:

- the breed characteristics of the animals he is using for production
• characteristics of functional efficient animals
• the ideal animal for the product produced

The characteristics and needs of livestock and crops are evaluated and adjustments to the enterprises are made accordingly.

### Characteristic of livestock

To list all the animal breeds and characteristics in this space will not be possible. The learner should however concentrate on the animal breeds used in his or her industry and area. You cannot compare beef cattle with dairy animals. You also need to take into account the production system used - breeds used for extensive beef cattle production in the semi arid areas of our country vs. breeds used for production in an intensive production area.

Please complete Activity **3.1:**

1. Define the ideal animal for your production system. Collect information from the different breeder associations on the breeds applicable in your production system and compare it with the breeds you identified as ideally for your area.

Use US 116385 to assist you with the breed standards

### Crops

The same as for livestock, the producer need to select the crop and cultivar that will fit that area and farming circumstances best.

The wine maker use grapes from a specific cultivar to make a specific wine.

The maize farmers in different areas use different cultivars depending on the climate, heat units, length of the growth season, production potential of the soil, production system used and the purpose for production.

Plant breeders are constantly trying to find better cultivars or to improve on the existing cultivars. Genetic modified Organisms (GMO's) are in the news due to the consumer concerns. These cultivars changed plant production as a whole and are contributing to the cutting of production costs on the one side and increasing yield on the other side – thus improving income.

♦ Characteristic of crops

The crop farmer must be able to evaluate the best crop for his purpose. The seed companies supply detailed information to enable the producer to make an informed decision.

To be able to make the correct cultivar choice the producer must keep the following in mind

• The production purpose
• The production aims – what does the producer aim to produce and the anticipated yield
Evaluate, adjust and implement factors influencing agricultural enterprises

Primary Agriculture NQF Level 4 Unit Standard No: 116293

Version: 01 Version Date: July 2006

- Soil conditions and topography
- Intensity of the production system – irrigation or dry land
- Disease and pest resistance
- Cultivation system
- Harvesting time and marketing

The producer must analyse his/her situation at first and then collect the production data and set production aims or goals. This must then be used as the starting point for the selection of the different cultivars to be planted. It is always a good policy not to put all the eggs in one basket - use more than one cultivar to spread the risk and ensure good end results.

The producer should make use of a multi-discipline approach and put together a panel of experts that can advise him and his production team on the best possible solutions.

Please complete Activity 3.2:

Use the production system where you are working as an example:
1. What is the production goals and policy? Draw up a plan indicating the type of product, the quality of product and the production system that is or should be followed.
2. Use the production policy and information obtained from seed or plant material suppliers to evaluate and compare the different cultivars regarding the following
   - Products produced
   - Production potential
   - Production requirements
3. Make your recommendations regarding the correct cultivars.

The suitability of resources for specific enterprises are evaluated and adjusted, and appropriate changes are implemented

The decision to produce a certain crop on a certain farm or production unit should be an informed decision and not an instinctive, spur of the moment decision because other farmers or producers in the same area did so well and made so much money.

When a production decision is made, the producer must evaluate the following criteria:

- Is there a market for the product that I want to produce and what are the market requirements?
- What soil conditions\type is needed for the product?
- Climatic conditions – heat and cold, wind and hail?
- Need of water - are there sufficient water resources available?
- Distance from the market and facilities needed?
- Infrastructure – availability and provision costs?
- Cost to change machinery and equipment to suite the new production system or enterprise?
- Transition time – how much time is needed and how much time available?

Considering these factors, time-consuming and costly, do you still want to make a change from one production enterprise to another? The producer must make sure
that he evaluate all the different possibilities and evaluate the different scenarios, before he makes a final decision.

The production must be sustainable over the long term and the producer must be given the opportunity to grow into the production of the different products. The different pitfalls can only be eliminated and avoided by means of experience. The best will be to start changing step-by-step and develop the new production process over time.

Please complete Activity 3.3:
Select a new production system of your choice and apply the following
1. Use the criteria given to evaluate the choice of system and the sustainability thereof.
2. Identify the natural resources needed for the production of the product
3. Identify the infrastructure needed for the production of the product
4. Supply market analysis that can be used for the production decisions
5. Motivate your decision by using different examples and proof the sustainability of the project.

<table>
<thead>
<tr>
<th>Concept (SO 3)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
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<tr>
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</tbody>
</table>

My Notes ...
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4  Harvesting procedures

After completing this session, you should be able to:
SO 4: Evaluate and adjust harvest procedures required

In this session we explore the following concepts:

♦ The criteria for successful harvesting are evaluated, adjusted and implemented into the enterprise
♦ Harvest practices are evaluated and adjustments are implemented
♦ Good health and hygiene principles are evaluated and harvesting procedures are adjusted
♦ Health and hygiene regulations and legislation are evaluated and adjustments made as required.
♦ Products are evaluated and adjusted accordingly to quality standards.

4.1  Harvesting

Harvesting is the process of gathering the matured products from the fields with the purpose of selling it or use it for own consumption.

Harvesting marks the end of the growth season for that particular crop – maize, fruit, veggies, hay, etc. It is a very important time on the farming calendar as all time and energy is focused on removing the product from the field/orchard/land as fast as possible to ensure good quality produce and to prevent deterioration – especially fruit and veggies – by the time it reaches the market.

Criteria for harvesting

Harvesting can only start when the crop or product is at the correct physiological stage – fruit must have the correct size, colour and sugar content whilst grain must be dry.

In the case of animals, “harvesting” of milk and eggs takes place on a daily basis. Products such as mohair, wool and feathers are “harvested” once or twice a year. Meat products are “harvested” when an animal is slaughtered.

Adjustments and implementation

Various methods are used during the harvesting process:

<table>
<thead>
<tr>
<th>Product</th>
<th>Harvesting method</th>
<th>Equipment used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter Grain - wheat,</td>
<td>Mechanical harvesting</td>
<td>Combine harvester- self</td>
</tr>
</tbody>
</table>
Evaluate, adjust and implement factors influencing agricultural enterprises

| Oats, barley | Mechanical harvesting | Combine harvester - self propelled or tractor driven. |
| Summer grains - maize, sorghum, sunflower | Mechanical harvesting | Combine harvester - self propelled or tractor driven. |
| Fruit | Hand picking | Picking baskets and trailers for transport |
| Grapes - wine | Hand and Machine picking | Picking baskets and grape harvester |
| Nuts | Picking it from the floor/ground | Containers to collect |
| Vegetables | Hand picking | Wash and sort |
| Carrots, potatoes, onions | Mechanical or labourers - harvesting from the ground. | Harvester, bags or crates, bins, transport to pack houses - processing, washing and sorting equipment |
| Beans and peas | Mechanical Harvesting | Harvester, transport, bulk handling |
| Fodder products | Mechanical - cutting, raking and baling or ensiling. | Mower/conditioner rake, baler, transport, bale loader storage facilities |
| Animal Products | | |
| Milk | Milking machines + labour | Bulk tank, transport, pumps, washing equipment |
| Eggs | Collection by hand | Sorting, packaging |
| Meat products | Transported to an abattoir to be slaughtered | Transport to abattoir, transport of carcass, processing and storage facilities |

The following factors will determine the equipment used for harvesting

- **The type of product produced.** Different equipment is used for different crops and products

- **The volume of a product to be harvested.** Grain products - e.g. maize fields cover great areas - will mainly be mechanically harvested. Using expensive and sophisticated farm machinery such as combine harvesters saves time and will be more cost effective.

- **The weather conditions.** If the weather is not favourable for harvesting or only allow a short harvesting period, it will be worth while to make use of contractors or machinery to assist and get the harvest done in as short time as possible to ensure a quality product.

- **The market situation.** Producers always aim for the highest or best price for their products. These prices are determined by ‘supply and demand’. It is therefore important for the producer to ‘read’ the market – he must either be early with his products or hold back (if possible) to supply in time of shortages. (The producer must at some stage get hold of extra labour or equipment to enable him/her to be early on the market.)
• **The level of intensification.** The more intensive the farming operation, the more sophisticated the harvesting equipment will be to ensure that a product of very high quality is produced.

• **The type of product.** Fresh produce - at the correct physiological stage - must be harvested in a short time span and reach the market quickly to ensure good quality.

Please complete Activity 4.1:
1. Describe the harvesting process of the products you are farming with.
2. Describe the harvesting method and the equipment used.

### Evaluation of harvesting practices and adjustments

The producer must evaluate the harvesting process to determine the following;

- Quality of the harvest – wastage, breaking of grain, damaging of the product.
- Speed or duration of the process
- Handling of the products
- Grading and sorting
- Alternative methods
- Quality of the product

### Health and hygiene regulations and legislation

Various crops and animal products are produced on farms. The quality of these products is regulated by regulations. This is necessary to protect the consumer and to ensure that the products meet the set standards.

In unit 2 the legislation regarding hygiene was mentioned. Use the same source to find the regulations applicable to your enterprise. The Directorate food safety and quality amends these regulations from time to time and it is their function to ensure that the regulations are applied and that the products comply with these regulations.

Products earmarked for export must also comply with a set of rules provided by the European Parliament. These strict regulations are applicable, not only to the hygiene of export products, but to the facilities where the products were processed or produced as well. These regulations can also be obtained from the NDA web site or from your local extension officer.

### Product evaluation quality control

It is the function of the farmer to supply the market with products that are clean, hygienic and of good quality. The quality of the product will determine the price and it will also lead to consumer satisfaction.

It is very important that the producer is aware of the consumer’s and market’s preferences. If products that do not meet with the requirements of the consumers, it will result in wastage - a loss in income! The same money, time, labour, etc. is needed to produce an inferior product vs. a quality product - the only difference will be the income on the market.
The farmer’s management is thus forced by regulations - domestic and export - as well as the consumers to produce quality products.

Various processes of quality control should be in place to ensure the best quality products.

- Production process – during the production process the manager, in his/her section, must enforce quality control at all times to ensure that the end product is not degraded due to machines not functioning well.
- On farm processing – during the processing on the farm quality control must be in place to ensure that only the best quality is processed and packed for the market.
- At the farm gate – the last on farm quality control should be at the last point to ensure the products are loaded correctly, handled correctly and that the transport will not effect the product.
- Market control – The market agents are also obligated, to some extend, to do quality control before a product is sold. It is therefore important that the farmer communicates with the market agents to obtain information that can aid with the improvement of quality.
- Local authorities (municipalities) appoint their own inspectors to ensure that products comply with regulations.
- The Department of Health is responsible to ensure that hygiene at dairies, abattoirs and other processing facilities are adhered to. Facilities must be approved and certified on a regular basis. The Directorate Food Safety and other similar bodies are responsible for quality standards at supermarkets and other sales points.
- Appointed agencies are responsible for the inspection and certifying of export products to ensure these meet and comply with requirements of importing country.

Please complete Activity 4.2:
Use the product that you are involved with and;
1) Draw a flow diagram to indicate the different steps in the
   • Production of the product
   • Processing of the product
   • Marketing of the product
2) Indicate how and where quality control is done at present
3) Evaluate the present quality control system and point out where you would recommend improvements and state why.
4) Draw up a quality control procedure for your production area; indicate who you would like to consult with to provide the necessary information.

The aim, during the harvesting process, should be to harvest a product at the right time and in the shortest possible period to obtain a quality product that will obtain the highest price.
### Concept (SO 4)

<table>
<thead>
<tr>
<th>Concept (SO 4)</th>
<th>I understand this concept</th>
<th>Questions that I still would like to ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>The criteria for successful harvesting are evaluated, adjusted and implemented into the enterprise.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvest practices are evaluated and adjustments are implemented.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good health and hygiene principles are evaluated and harvesting procedures are adjusted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health and hygiene regulations and legislation are evaluated and adjustments where required are included.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Products are evaluated and adjusted accordingly to quality standards.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### My Notes ...

...
Session 5

Post harvesting practices

After completing this session, you should be able to:
SO 5: Compare and integrate post harvest factors

In this session we explore the following concepts:

- The procedures for successful post harvesting practices are compared and integrated into relevant enterprise
- Post harvesting practices are evaluated and adjusted where necessary
- Good health and hygiene principles are assessed and adjustments are made where necessary
- Health and hygiene regulations and legislations are reviewed and changes are integrated into the procedures
- Products are evaluated and quality standards are adjusted accordingly.

5.1 Post-harvesting practices - crops

Post harvesting technology is described as “all the complex operations supported by biotechnologies that are resorted to, to ensure the optimal conservation of crops during and after harvest and through out all the stages of handling, storage, packaging, processing and distribution.”

Post harvesting constitutes the end of the harvesting operation and this is the last stage before the product reaches the consumer.

A number of aspects need to be addressed:

- Stage of harvesting
- Handling during harvesting
- Transportation
- Sorting, grading, washing
- Packaging
- Treatments
- Distribution to market
This is done to ensure that the consumers receive a product that will provide value for their money. Most of the vegetables and fruit, being perishable products, deteriorate because of a shorten shelf life caused by......

- wrong physiological stage at picking, wrong cultivar choice or variety, poor cultivation practice and pest control
- not handling it properly at harvesting or during transportation
- heat or cold treatment and storage
- Washing or wrong treatment
- Poor packaging and transportation

### Stage of harvesting

The point of harvesting is determined by the physiological stage of the crop or fruit. It can be measures in Brix or the sugar content of the fruit. A cultivar with a long shelf life will simplify the storage problem.

### Handling during harvesting

It is important that the product does not come in contact with soil during the harvesting process as soil contamination will contribute to the product’s (bad) appearance – thus, make use of picking bags\containers designed for this purpose. It is advisable to harvest early in the morning as the shelf live of withered veggies is shortened. A range of different treatments are needed to prevent deterioration after harvesting.

### Transportation

Transportation from the land to the sorting facilities also plays a role in the product’s quality and appearance – thus, the stacking of the bags\containers on each other must be done in such a way that bruising and rubbing is prevented. Transportation to the market is done in cooler (temperature controlled) trucks as a certain temperature must be maintained.

### Sorting, grading, washing

The pre-preparation of farm produce is very important – the moment a product reached the market, the farmer has no control on the selling price and will rely on the product selling it self. The product must therefore be graded – e.g. same appearance, acidity and firmness; sorted – e.g. same size, Brix and colour. It is not uncommon for a product to undergo further grading – distributors preparing it for large chains stores or supermarkets.

Washing – especially potatoes – is equally important and done before the sorting process commences. Some produce is washed in treated water, not for the cleaning as such, but to prevent bacteriological deterioration and decay.
Packaging

Packaging - for export - is done in cardboard boxes with absorption layers between the products. For the local market packaging is done in plastic or paper bags, depending on the type of product and the market it is intended for. According to regulations - for local and overseas market - the packaging must display information regarding the producer for tractability of the product.

Treatments

Produce undergoes treatment in regulated storage where the atmosphere is modified or controlled, ultra low oxygen storage, oxygen and ethylene adsorption is done to prolong the shelf life of the products.

Please complete Activity 5.1:
1) Study the post harvest practice of the product you are involved with and identify the different post harvesting activities involved.
2) Who is responsible for the post harvest practices - explain?
3) Evaluate the post harvest practices that the producer can control and indicate what improvements can be made if any.

Post harvesting - animal products

Meat producing farm animals are bred and fed on the farm. This includes the post harvesting process which entails dosage - especially piglets - castration - male lambs - dehorning etc. Although large enterprises (meat) are equipped with abattoirs, the norm is to sell the produce to butchers or feed lots. Cattle are dehorned to prevent injuries during transportation.

Other animal products can be divided into

<table>
<thead>
<tr>
<th>Fresh products or perishable products</th>
<th>Non-perishable products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>Wool</td>
</tr>
<tr>
<td>Eggs</td>
<td>Mohair</td>
</tr>
<tr>
<td>Meat</td>
<td></td>
</tr>
<tr>
<td>Hides</td>
<td></td>
</tr>
</tbody>
</table>

Milk

Milk must be cooled down to 5°C as soon as possible and be kept at that temperature during transportation and distribution. Post harvesting treatment of milk involves cooling, pasteurisation and in some cases homogenisation.

Apart from daily fresh milk usage, it is also used for making cheese, yoghurt, umkumasi, milk powder and long life milk.

Eggs

Eggs are stored in rooms where the temperature is lower than room temperature. Eggs are sorted according to size and weight and packed in egg containers - 1 dozen, 2.5 dozen or 5 dozen (so-called taxi packs) and in 30 dozen boxes when transported to different distribution points.
Non-perishable products

- Wool and mohair

After shearing wool is graded in classes according to the length, strength and thickness, measured in micron. The different classes are then baled (pressed) jute-bags which are properly marked and identified for trace ability before it is send down to the different wool markets.

It is very important for the producer to ensure the product is correctly classed to prevent penalties. The producer should also ensure that there is no contamination of the product with foreign materials such as plastic, baling twine or plant (weed) seeds.

Post harvesting practices are evaluated and adjusted where necessary

There are various organisations, locally or international, that set standards for the different products.

The following organisations are involved in the setting of standards:

<table>
<thead>
<tr>
<th>Product</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maize</td>
</tr>
<tr>
<td>2</td>
<td>Wheat</td>
</tr>
<tr>
<td>3</td>
<td>Milk</td>
</tr>
<tr>
<td>4</td>
<td>Meat</td>
</tr>
<tr>
<td>5</td>
<td>Oranges</td>
</tr>
<tr>
<td>6</td>
<td>Fruit</td>
</tr>
</tbody>
</table>

The aim is to ensure better quality product, reduce losses and obtain higher prices and higher net returns and continuous access to the markets.

The producers are normally held responsible for the quality of the product from the production point to the delivery at the market. When the product is collected on the farm or where the product is delivered to the workstation of co-operative packing facility, it becomes a shared responsibility.

Good health and hygiene principles

Hygiene is very important when working with fresh produce or perishable products. The hygiene can be divided into different categories:

<table>
<thead>
<tr>
<th>Hygiene</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working environment</td>
<td>The area where the product is handled as well as the equipment used in the harvesting or post harvesting process must be hygienic clean to prevent contamination of the product and prolong the shelf life of the product</td>
</tr>
</tbody>
</table>
| Workers | Measures must be taken to ensure that workers follow hygiene protocols and that they are aware of what is
To evaluate the hygiene, quality and post harvest practices the producer should do the following.

1. Draw up a check list to evaluate the different processes and stages of post harvesting activities. The checklist should be used to promote responsibility, accountability, eliminate problems and to measure work performance.

2. Keep records of production, classifications, and damaged products. Find ways to reduce the damaged products, thus improving the percentage packed.

3. Keep records of the different classes (%) that was attained from each cultivar or from each land. Draw graphs to illustrate the records.

4. Important to keep records of the selling prices from the different markets for the different products as well as discarded produce. Determine the cause to be able to take precautionary steps during the next season.

Health and hygiene regulations and legislations are reviewed and changes are integrated into the procedures. The farmer (management) and downwards to the lowest levels of workers must know these regulations and legislation regarding the products that are handled. Incentives should be linked to the marketable percentage (%) of the crop and the prices received for the quality products.

The whole production team must take responsibility for the product as every section contributes to the success of the product. It is a team effort and should be seen as a holistic process that cannot be fragmented as each one plays a very specific role and must be involved in the production process to understand the importance of his/her action.

An illustration of the different role players in the production process;
Please complete Activity 5.2:
1. Draw up a checklist that can be used to evaluate the different processes.
2. Explain how the checklist can be used to improve the quality of the produce.

**Products are evaluated and quality standards are adjusted accordingly**

The producer must always be responsive to changes and market tendencies to improve either the quality and quantity or cultivar. The producer that lags behind will not achieve success unless changes are made in good time.

It is therefore important that an in-depth evaluation is made regarding the whole production cycle – cultivation; pest, weed and disease control; pre-harvesting processes; harvesting methods; sorting or grading; packaging; cost and profitability – either for cutting costs or to please consumers. Market information is a crucial source of information.

The question that needs to be asked is - how can we improve on what we did? What steps can be taken to produce a better product?

The answers to these questions will ensure that production is sustainable and that every one involved in the production process will benefit by it!

<table>
<thead>
<tr>
<th>Concept (SO 5)</th>
<th>I understand this concept</th>
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<td></td>
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</tbody>
</table>
Am I ready for my test?

♦ Check your plan carefully to make sure that you prepare in good time.
♦ You have to be found competent by a qualified assessor to be declared competent.
♦ Inform the assessor if you have any special needs or requirements before the agreed date for the test to be completed. You might, for example, require an interpreter to translate the questions to your mother tongue, or you might need to take this test orally.
♦ Use this worksheet to help you prepare for the test. These are examples of possible questions that might appear in the test. All the information you need was taught in the classroom and can be found in the learner guide that you received.

1. I am sure of this and understand it well
2. I am unsure of this and need to ask the Facilitator or Assessor to explain what it means

<table>
<thead>
<tr>
<th>Questions</th>
<th>1. I am sure</th>
<th>2. I am unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Use your own production system (as an example) and illustrate how the different sections can contribute to the quality of the product and sustainable production.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

My Notes ...

...
Checklist for practical assessment …

Use the checklist below to help you prepare for the part of the practical assessment when you are observed on the **attitudes** and **attributes** that you need to have to be found competent for this learning module.

<table>
<thead>
<tr>
<th>Observations</th>
<th>Answer Yes or No</th>
<th>Motivate your Answer (Give examples, reasons, etc.)</th>
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<tr>
<td>Can you identify problems and deficiencies correctly?</td>
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<td>Are you able to work well in a team?</td>
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<td>Do you work in an organised and systematic way while performing all tasks and tests?</td>
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<td>Are you able to collect the correct and appropriate information and / or samples as per the instructions and procedures that you were taught?</td>
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<td>Are you able to communicate your knowledge orally and in writing, in such a way that you show what knowledge you have gained?</td>
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<td>Can you base your tasks and answers on scientific knowledge that you have learnt?</td>
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<tr>
<td>Are you able to show and perform the tasks required correctly?</td>
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<tr>
<td>Are you able to link the knowledge, skills and attitudes that you have learnt in this module of learning to specific duties in your job or in the community where you live?</td>
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♦ The assessor will complete a checklist that gives details of the points that are checked and assessed by the assessor.
♦ The assessor will write commentary and feedback on that checklist. They will discuss all commentary and feedback with you.
♦ You will be asked to give your own feedback and to sign this document.
♦ **It will be placed together with this completed guide in a file as part of you portfolio of evidence.**
♦ The assessor will give you feedback on the test and guide you if there are areas in which you still need further development.
### Learner Information Form

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Bibliography

- **Books:**
  Finance and the Farmers

- **World Wide Web:**
  - www.weatherforecast.co.za
  - www.graansa.co.za
  - www.arc.gov.za
  - www.dwaf.gov.za
  - www.nda.gov.za

Terms & Conditions

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Evaluate, adjust and implement factors influencing agricultural enterprises

Learners are capable of evaluating and adjusting the enterprise and production processes of animal and crop enterprises. In addition they will be well positioned to extend their learning and practice into other areas of agriculture, specifically crop production and animal production systems. This training will benefit the profession by equipping learners with adequate skills to improve productivity and performance.

Learners will understand the importance of the application of business principles in agricultural production with specific reference to enterprise planning.

They will be able to operate farming practices as businesses and will gain the knowledge and skills to move from a subsistence orientation to an economic orientation in agriculture. Farmers will gain the knowledge and skills to access mainstream agriculture through a business-orientated approach to agriculture.

LEARNING ASSUMED TO BE IN PLACE AND RECOGNITION OF PRIOR LEARNING

It is assumed that a learner attempting this unit standard will demonstrate competence against the unit standard or equivalent:

- NQF 3: Interpret factors influencing agricultural enterprises, and plan accordingly.

UNIT STANDARD RANGE

Whilst range statements have been defined generically to include as wide a set of alternatives as possible,
all range statements should be interpreted within the specific context of application.

Range statements are neither comprehensive nor necessarily appropriate to all contexts. Alternatives must however be comparable in scope and complexity. These are only as a general guide to scope and complexity of what is required.

UNIT STANDARD OUTCOME HEADER
N/A

Specific Outcomes and Assessment Criteria:

SPECIFIC OUTCOME 1
Evaluate and adjust production processes so that natural resources required are managed sustainably.

OUTCOME RANGE
Natural resources include soil, water, climate, vegetation and topography.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
Recommendations of soil and water sample analysis are evaluated and the relevant enterprises are adjusted.

ASSESSMENT CRITERION 2
Processes are adjusted to take account of weather forecasts.

ASSESSMENT CRITERION 3
The production cycle processes are appraised, adjusted and incorporated into the relevant enterprises.

ASSESSMENT CRITERION 4
Production processes according to observation and reports are evaluated and adjusted.

ASSESSMENT CRITERION 5
Production records are appraised and the outcomes are incorporated into the production processes.

ASSESSMENT CRITERION 6
Production is adjusted according to the evaluation of market information.

SPECIFIC OUTCOME 2
Compare and evaluate infrastructural factors affecting requirements.

OUTCOME RANGE
Infrastructural requirements include fencing, housing, water supply, electricity, handling facilities, access and other.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
Factors affecting the role and function of infrastructure for the relevant enterprises are evaluated and adjusted.
ASSESSMENT CRITERION 2
Required adjustments to the infrastructure are integrated and implemented.

ASSESSMENT CRITERION 3
According to relevant regulations and legislation the enterprise is evaluated, and adjustments made and implemented where appropriate.

SPECIFIC OUTCOME 3
Evaluate and adjust required stock.

OUTCOME RANGE
All livestock and crops required for the relevant enterprise.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
Deficiencies in production regarding stock are evaluated and adjusted to ensure optimum production.

ASSESSMENT CRITERION 2
The characteristics and needs of livestock and crops are evaluated and adjustments to the enterprise are made accordingly.

ASSESSMENT CRITERION 3
The suitability of resources for specific enterprises are evaluated and adjusted, and appropriate changes implemented.

SPECIFIC OUTCOME 4
Evaluate and adjust harvest procedures required.

OUTCOME RANGE
All livestock and crops required for the relevant enterprise.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
The criteria for successful harvesting are evaluated, adjusted and implemented into the enterprise.

ASSESSMENT CRITERION 2
Harvest practices are evaluated and adjustments are implemented.

ASSESSMENT CRITERION 3
Good health and hygiene principles are evaluated and harvesting procedures are adjusted.

ASSESSMENT CRITERION 4
Health and hygiene regulations and legislation are evaluated and adjustments where required are included.

ASSESSMENT CRITERION 5
Products are evaluated and adjusted accordingly to quality standards.
SPECIFIC OUTCOME 5
Compare and integrate the post harvest factors.

OUTCOME RANGE
All livestock and crops required for the relevant enterprise.

ASSESSMENT CRITERIA

ASSESSMENT CRITERION 1
The procedures for successful post harvesting practices are compared and integrated into the relevant enterprise.

ASSESSMENT CRITERION 2
Post harvest practices are evaluated and adjusted where necessary.

ASSESSMENT CRITERION 3
Good health and hygiene principles are assessed and adjustments are made where necessary.

ASSESSMENT CRITERION 4
Health and hygiene regulations and legislation are reviewed and changes are integrated into the procedures.

ASSESSMENT CRITERION 5
Products are evaluated and quality standards are adjusted accordingly.

UNIT STANDARD ACCREDITATION AND MODERATION OPTIONS
The assessment of qualifying learners against this standard should meet the requirements of established assessment principles.

It will be necessary to develop assessment activities and tools, which are appropriate to the contexts in which the qualifying learners are working. These activities and tools may include an appropriate combination of self-assessment and peer assessment, formative and summative assessment, portfolios and observations etc.

The assessment should ensure that all the specific outcomes; critical cross-field outcomes and essential embedded knowledge are assessed.

The specific outcomes must be assessed through observation of performance. Supporting evidence should be used to prove competence of specific outcomes only when they are not clearly seen in the actual performance.

Essential embedded knowledge must be assessed in its own right, through oral or written evidence and cannot be assessed only by being observed.

The specific outcomes and essential embedded knowledge must be assessed in relation to each other. If a qualifying learner is able to explain the essential embedded knowledge but is unable to perform the specific outcomes, they should not be assessed as competent. Similarly, if a qualifying learner is able to perform the specific outcomes but is unable to explain or justify their performance in terms of the essential embedded knowledge, then they should not be assessed as competent.

Evidence of the specified critical cross-field outcomes should be found both in performance and in the essential embedded knowledge.

Performance of specific outcomes must actively affirm target groups of qualifying learners, not unfairly
discriminate against them. Qualifying learners should be able to justify their performance in terms of these values.

- Anyone assessing a learner against this unit standard must be registered as an assessor with the relevant ETQA.
- Any institution offering learning that will enable achievement of this unit standard or assessing this unit standard must be accredited as a provider with the relevant ETQA.
- Moderation of assessment will be overseen by the relevant ETQA according to the moderation guidelines in the relevant qualification and the agreed ETQA procedures.

**UNIT STANDARD ESSENTIAL EMBEDDED KNOWLEDGE**

The person is able to demonstrate a basic knowledge of:

- Role and function of soil and water samples, weather information, vegetation, infrastructure, breed characteristics, production cycles, records, markets, health and hygiene within production processes.
- Description, characteristics and properties of vegetation, infrastructure, weather, production cycles, markets within production processes.
- Observation of the effects of weather patterns, soil and water characteristics, market trends, breed and stock characteristics / performance, health and hygiene conditions, infrastructure conditions, vegetation quality and quantity influencing production processes.
- Purpose of vegetation, infrastructure, weather, production cycles, markets within production processes.
- Implications of ineffective practices on production processes.
- Knowledge of specific livestock and crop characteristics so as to compare and evaluate within production processes and environmental conditions.
- Regulations and legislation related to production processes.
- Describe various production procedures as an integral part of the production process.
- Communication and reporting skills.
- Understand the procedures and principles that are followed to determine the viability of an enterprise.

**UNIT STANDARD DEVELOPMENTAL OUTCOME**

N/A

**UNIT STANDARD LINKAGES**

N/A

**Critical Cross-field Outcomes (CCFO):**

**UNIT STANDARD CCFO IDENTIFYING**

Problem Solving: relates to all specific outcomes.

**UNIT STANDARD CCFO WORKING**

Teamwork: relates to all specific outcomes.

**UNIT STANDARD CCFO ORGANIZING**

Self organisation and management: relates to all specific outcomes.

**UNIT STANDARD CCFO COLLECTING**

Information evaluation: relates to all specific outcomes.

**UNIT STANDARD CCFO COMMUNICATING**

Communication: relates to all specific outcomes.
UNIT STANDARD CCFO SCIENCE
Science and Technology: relates to all specific outcomes.

UNIT STANDARD CCFO DEMONSTRATING
World as a set of related systems: relates to all specific outcomes.

UNIT STANDARD CCFO CONTRIBUTING
Self-development: relates to all specific outcomes.

UNIT STANDARD ASSESSOR CRITERIA
N/A

UNIT STANDARD NOTES
N/A

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