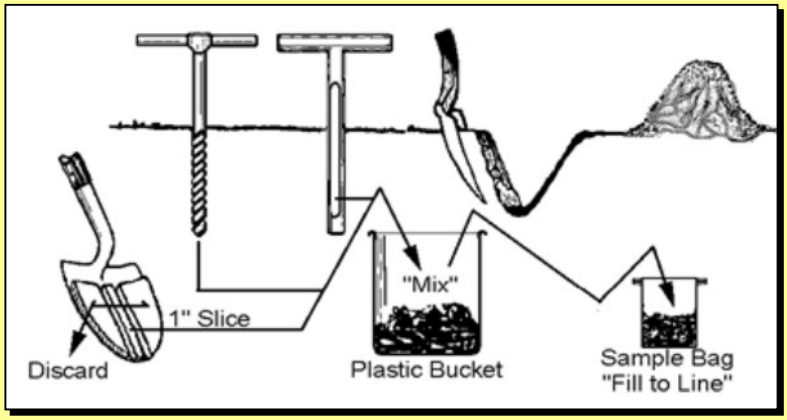

**NQF Level: 1** **US No: 116156**

# Learner Guide

## Primary Agriculture

# Collect Agricultural Data




My Name: . . . . . .

My Workplace: . . . . . .

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

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REPUBLIC OF SOUTH AFRICA

AgriSETA

# Before we start...

Dear Learner,

This Learner Guide contains all the information to acquire all the knowledge and skills leading to the unit standard:

| | | | | | |
|---|---|---|---|---|---|
| **Title:** | Collect agricultural data | | | | |
| **US No:** | **116156** | **NQF Level:** | 1 | **Credits:** | 2 |

The full unit standard is attached at the end of this module. 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:

| Title | ID Number | NQF Level | Credits | Mark |
|---|---|---|---|---|
| National Certificate in Animal Production | 48970 | 1 | 120 | |
| National Certificate in Mixed Farming Systems | 48971 | 1 | 120 | |
| National Certificate in Pant Production | 48972 | 1 | 120 | |

Please mark the learning program you are enrolled in:

Your facilitator should explain the above concepts to you.

| Are you enrolled in a: | Yes | No |
|---|---|---|
| Learnership? | | |
| Skills Program? | | |
| Short Course? | | |

You will also be handed a Learner Workbook. This Learner Workbook should be used in conjunction with this Learner Guide. The Learner Workbook contains the activities that you will be expected to do during the course of your study. Please keep the activities that you have completed as part of your Portfolio of Evidence, which will be required during your final assessment.

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.

**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.


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


This box indicates a **summary** of concepts that we have covered, and offers you an opportunity to **evaluate** your **own progress** and / or 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?

**What will I be able to do?** . . . . . 5

**What do I need to know?** . . . . . 5

**Learning Outcomes** . . . . . 5

**Let's talk about Agricultural Data Collection** . . . . . 6

**Session 1: Elementary Methods of Data Collection** . . . . . 7

The different elementary methods of data collection in Agriculture (Interpreting a gauge; Measuring; Observing; Collecting samples; Counting; Scouting); The advantages and disadvantages of different methods of data collection.

**Session 2: Collect and Report on Collected Agricultural Data** . . . . . 17

Biological data; Physical and economical data; The correct methods to apply data collection; How & why we should collect data accurately; Required reporting formats; Identifying, noting and reporting on basic deviances in data.

**Session 3: Use and Maintain Data Collection Equipment** . . . . . 22

Using and maintaining data collection equipment correctly; Recording tools; How to use, store, repair and clean different types of recording tools.

**Session 4: Health & Safety Measures Applicable to Data Collection** . . . . . 24

Important health and safety measures for collection methods and equipment; Health and safety measures required for the safe collection of data; Appropriate protective garments and tools to be used during data collection; Applicable hygiene standards to maintain throughout the process of data collection.

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**Excerpt: SAQA Unit Standard 116156**

# What will I be able to do?

**When you have achieved this unit standard, you will:**

- be able to collect routine agricultural data on instruction and will also be able to apply prescribed methods of data collection for agricultural purposes. In addition you will be well positioned to extend your learning and practice into more complex areas of data collection.
- be fully conversant with a narrow range of data collection procedures and contribute to the agricultural landscape in this regard.
- understand the importance of the application of business principles in agricultural production with specific reference to information systems and technology.
- 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-oriented approach to agriculture.

# What do I need to know?

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

- Functional literacy and numeracy.
- NQF 1: Select, use and care for hand tools and basic equipment and infrastructure.

# Learning Outcomes

You must is able to demonstrate a basic knowledge and understanding of:

- Different methods of data collection.
- Different methods of recording data.
- Different methods of presenting data.
- The names and functions of data collection tools and equipment.
- The descriptions and properties of the source of the data being collected.
- The description and properties of the data collection equipment.
- Sensory cues related to the measurement of the data, the data collection equipment and the source of the data.
- The purpose for learning about Information technology.
- The purpose of the data being collected.
- The correct procedures for collecting the data.
- All relevant rules, laws and regulations related to the source of the data and the data itself.
- The relationship between the data and information generated by it.

# Let's Talk about Agricultural Data Collection!

## What is Agricultural Data?


***Agricultural Data***

The process of gathering information, such as profit margins per cultivar, pest and disease infestations, weather and climatic information, rainfall, costs, economic conditions – and analysing it to be able to find patterns that will help us work more efficiently, sustainably and profitably on a farm.

## What kinds of data do we collect?

- Occurrence of pest and disease infestations.
- Weather and climatic information – year on year.
- Rainfall.
- Costs of agricultural inputs.
- Prevailing economic conditions in the sector, country and internationally.
- Production costs per crop.
- Soil and fertilisation costs and applications.
- Pest and Weed Control application programs and statistics.
- Profit margins per cultivar / per crop / per block / per orchard / per Hectare.

## The reasons why we would collect Agricultural Data

Patterns of the environment include rainfall, climate, dry cycles, original vegetation, seasons, movement patterns of animals, etc. Processes of the biophysical environment include the interaction and the relationship between food webs, human activities, soil, climate, water, plants, animals and solar energy.

It is always useful to have detailed records and data in order to ensure that we make optimum decisions in order to maximise profits, production and quality, whilst keeping risks and problems to a minimum.

**My Notes ...**

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# Session 1 Elementary Methods of Data Collection

*After completing this session, you will be able to:*
**SO 1: Demonstrate knowledge of different elementary methods of data collection.**

In this session we are going to examine the following concepts:

- The different elementary methods of data collection in Agriculture:
  - Interpreting a gauge.
  - Measuring.
  - Observing.
  - Collecting samples.
  - Counting.
  - Scouting.
- The advantages and disadvantages of different methods of data collection.


Please complete practical activity **1.1** in your workbook

**My Notes ...**

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## 1.1 Elementary Methods of Data Collection that are Important in Agriculture

### Interpreting a Gauge

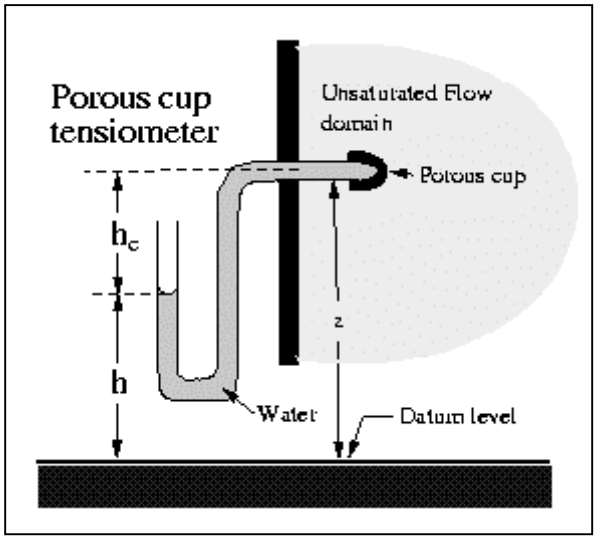
The most commonly read gauge on a farm, is normally that of a **tensiometer**.


***Tensiometer:***
A device for estimating soil moisture levels by measuring the negative hydraulic pressure of water in soil; a porous, permeable ceramic cup connected through a tube to a manometer or vacuum gauge. (It works exactly like the root of a plant).

Irrigation requires a relatively high investment in equipment, fuel, maintenance and labour, but offers a significant potential for increasing net farm income. Frequency and timing of water application have a major impact on yields and operating costs.

To schedule irrigation for most efficient use of water and to optimise production, it is desirable to frequently determine the soil water conditions throughout the root zone of the crop being grown. A number of methods for doing this have been developed and used with varying degrees of success, but the two methods, which have proven most practical for field use, are tensiometers and electrical resistance meters.

A tensiometer is a sealed water-filled tube, equipped with a porous tip installed in the ground to the desired root zone (Figure 1). In dry soil, water is drawn out of the instrument, reducing the water volume in it and creating a partial vacuum. This is registered on the gauge. The drier the soil, the higher the reading. Irrigation reverses this action. The vacuum created by dry soil draws water back into the instrument from the soil. This in turn results in a lower gauge reading.




The instrument is in effect a "dummy root," equipped with a gauge that continuously registers how hard the roots are working. A gauge reading of 50 indicates the same amount of moisture whether in sandy or clay soil. Because of the tensiometer's unique principle of operation, it needs no calibrations, under normal operating conditions, for various types of soil. The extension worker or grower can plot the tensiometer readings on a graph during the growing season. Such a record is useful in planning future irrigation requirements and making year-to-year comparisons. Generally, tensiometers continuously show the available soil moisture in the crop's root zone. The tensiometer covers the entire range of soil moisture required for maximum growth. Growers quickly learn the range of tensiometer readings in which they should start or stop irrigation to produce best results for their crops and conditions. The following interpretations of tensiometer readings have proven practical or useful under field conditions (also see Figure 2).

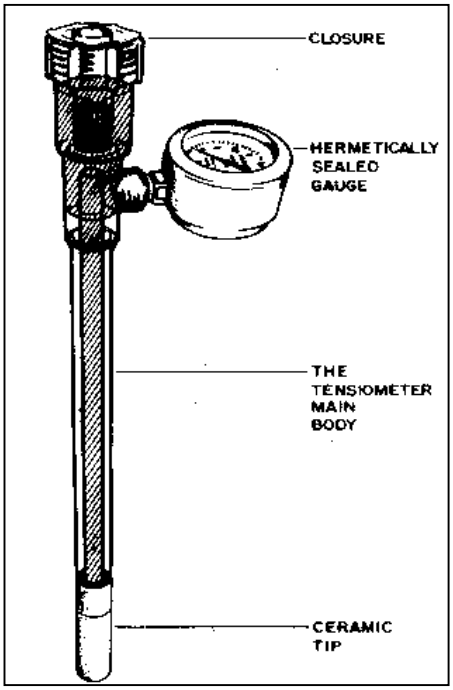
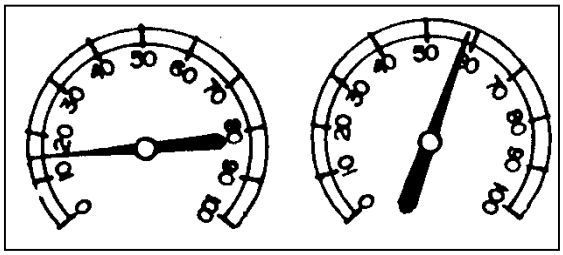



***Figure 1.*** *Typical tensiometer and its parts. Source: James (1988).*



- **Readings 0–10: Saturated soil** — These readings often occur for a day or two following irrigations. Continued readings in this range indicate over irrigation, danger of waterlogged soils, inadequate root aeration, root rot, or high water table.
- **Readings 10–30: Field capacity** — Growers should discontinue irrigations when readings in this range occur, to prevent waste of water through percolation and waste of nutrients through leaching.
- **Readings 30–60: Usual range for starting irrigations** — Root aeration occurs anywhere in this range. In general, in hot dry climates or coarse-textured soils, farmers should start irrigating when they see readings in the lower part of this range; in the upper part of this range, in cool, humid climates or soils with high water-holding capacity. Starting irrigations in this range ensures readily available soil moisture at all times, which is essential for maximum growth. It also provides a safety factor, with a reserve of soil moisture to compensate for such practical problems as delayed irrigations or inability to obtain a uniform distribution of water to all portions of the crop.
- **Readings 70 and higher: Stress range** — A reading of 70 does not necessarily indicate that the crop is using all available moisture, but that readily available moisture is getting dangerously low for ensuring maximum growth.
- **Readings of 80–85: Top range of accuracy of the tensiometers** — The number of tensiometers for an installation varies widely with crop and local conditions.

***Figure 2.*** *Tensiometer readings. Source: James (1988). Note: The reading on the left says soil has adequate water; the one on the right says soil moisture is low.*

## Measuring

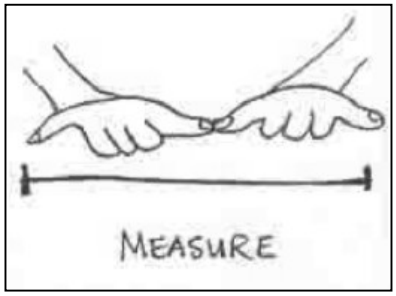
When applying the basics of collecting Agricultural Data, you will almost constantly be required to measure.
But measurement may mean different things to different people. So let's explore a few of the basics to ensure we all agree to the same terminology:

***The International System of Units (SI)***

All systems of weights and measures, metric and non-metric, are linked through a network of international agreements supporting the **International System of Units**. The International System is called the **SI**, using the first two initials of its French name *Système International d'Unités*.

**There are seven SI base units:**

- the **meter** for distance,
- the **kilogram** for mass,
- the **second** for time,
- the **ampere** for electric current,
- the **kelvin** for temperature,
- the **mole** for amount of substance, and
- the **candela** for intensity of light.



There are also other units of measure derived from SI – some of these that you might encounter include:

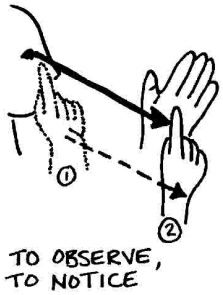
- the **newton** for force and the **pascal** for pressure;
- the **joule** for energy and the **watt** for power;
- the **degree Celsius** for everyday measurement of temperature;
- the traditional mathematical units for measuring **angles** (degree)
- the traditional units of civil **time** (minute, hour, day, and year);
- two **metric** units commonly used in ordinary life: the liter for volume and the ton (metric ton) for large masses;
- **knot**, units traditionally used in meteorology;
- the **hectare**
- the **bar**, a pressure unit

## Observing

Definition

***Observing:***

Observation basically means watching something and taking note of anything it does. For instance, you might observe a bird flying by watching it closely. The sciences of biology and astronomy have their historical basis in observations by amateurs, therefore Agricultural data is often much enhanced by focused observation.




### How and what to observe?

Observation is one of the most important aspects of collecting Agricultural Data. It is a skill developed through dedicated action and meticulous methodology.

### Observation for Feeding 10 billion people

The FAO (Food and Agriculture Organization of the United Nations) estimates the number of undernourished people in the world at over 840 million – mostly living in developing countries of the Asian-Pacific and sub-Saharan Africa regions. Above all other goals that are the focus of international cooperation among countries, the eradication of famine might be considered to be the most universally supported.

The United Nations Millennium Declaration, adopted by the world's leaders at the Millennium Summit of the United Nations in 2000, captured the aspirations of the international community for the new century. It spoke of a world united by common values and striving with renewed determination to achieve decent standards of living for every man, woman and child. The first of the eight agreed 'Millennium Development Goals' is to "Eradicate extreme poverty and hunger" – with the specific target of reducing by half the number of undernourished people by 2015.

### Information needs

Global agricultural production systems must be enhanced, well maintained, and reliable if we are to routinely meet the food requirements of the Earth's projected

10 billion inhabitants beyond 2050. Sustainable development practices, consistent with protection of biodiversity and ecosystems, are seen as the key. Such practices require a broad range of information on all scales. Parameters of importance include:

- land-cover, land-use, and vegetation state;
- crop yield, land degradation, and desertification;
- soil characteristics such as fertility and moisture levels;
- freshwater availability including from rainfall, fluxes in small water bodies, and groundwater resources;
- total irrigated area;
- population distribution, production intensity, and food provision.

This data is required at various (from local to global) scales and requires fusion of multiple datasets quantifying both the physical state of the land and socio-economic parameters. Such information will help provide food producers with:

- information on changes in land usage and productivity,
- improved market supply and demand forecasts, and
- seasonal and inter-annual action plans - taking account of seasonal forecasts and predictions of major climatic events such as El Niño.

## Collecting Samples

There are various well-known and tried and trusted methods of sampling. Before we explore these different methods, let us first decide what types of things we could possibly sample and what those samples could tell us.


***Agricultural Sampling:***

Removing and/or examining a portion of an entire set (i.e., examining three leaves per plant on 20 plants in a 4 hectare field).

### ♦ Scientific methods of sampling:

- **Random sampling** - collecting samples based on chance, rather than on making conscious choices for each sample; ensures that the samples collected are likely to show an accurate estimate of the situation.
- **Systematic sampling** - Samples taken in a periodic and regular fashion.
- **Cluster sampling** - is sampling in which groups, not individuals, are randomly selected.
- **Stratified sampling** - A sampling pattern in which the site is divided into (usually) non-overlapping sub-areas. Different sampling densities and sampling patterns are used in the different sub-areas.
- **Quota sampling** - The selection of a predetermined number of elements from different sectors of the population.


Please complete practical activity **1.2** in your workbook

**My Notes ...**

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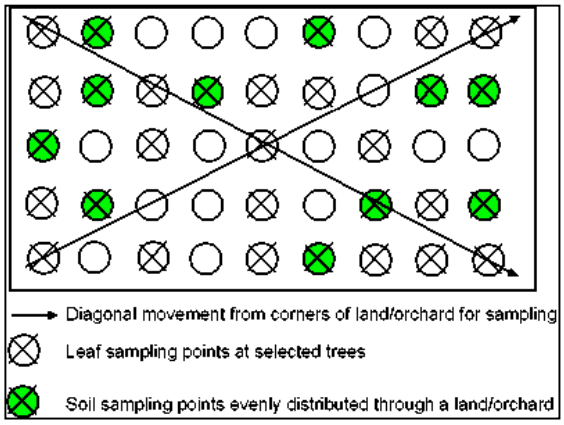
### *What do we sample in terms of Agri-business?*

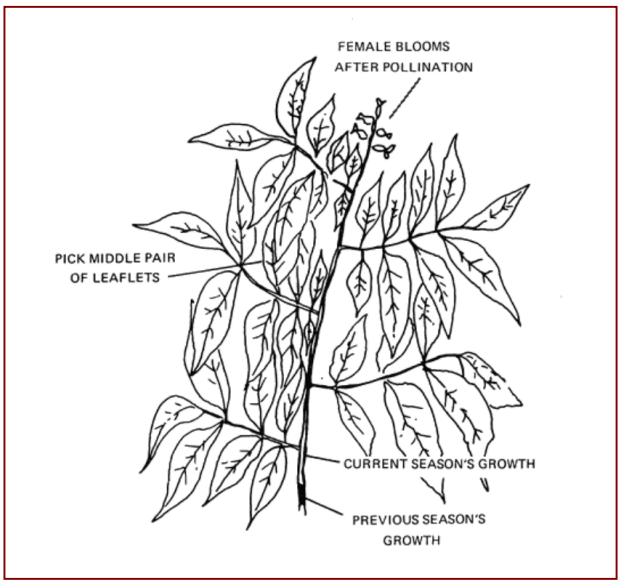
The most important things that we sample on a farm, and the reasons why we sample are:

| What we sample: | Why we sample it: |
|---|---|
| **Leaves** | To determine whether the plant's fertilisation needs.<br>To check for pests and diseases. |
| **Soil** | To determine the structure and fertility of the soil for correction and soil preparation purposes. |
| **Fruit** | To determine ripeness or for fruit grading purposes. |

## Leaf Sampling

A single leaf or soil sample should be representative of an area not greater than 3 ha. However, if there are soil variations separate leaf and soil samples must be taken and the orchard management adapted accordingly.




***Sample:*** *7-months-old fully developed hardened-off leaves from fruit-bearing twigs*

**Taking representative soil and leaf samples**

- The time of leaf sampling as well as leaf position is very important and is shown in the figure. Leaf analysis is only applicable for producing mango trees (normally a tree age of 5 years and older).
- Select about 20 healthy trees by walking diagonally from the corners through the orchard (see figure). The trees should be homogeneous in appearance and representative of the orchard.
- Exceptionally good or poor trees must not be sampled.
- The 20 selected trees must be clearly marked, for example with paint, so that both the soil and leaf samples can be taken from the same trees every year.
- Where possible, pick 4 leaves from alternate sides of the tree at about shoulder height. Eighty leaves per sample should be sufficient.
- Different cultivars should be sampled separately.
- Leaves sampled must be free of sunburn, disease and insect damage.
- Leaf samples should be collected in the morning, after the dew has dried off.
- Leaf samples should not be taken if trees are under stress i.e. drought or high temperatures. After a heavy downpour, wait at least 2 weeks before taking samples.
- After sampling, leaves should be placed in clean, perforated or open plastic bags.
- If samples cannot be delivered immediately (within 48 hours), they can be stored in a refrigerator and should be transported in a cooler bag. The sample must be accompanied by the relevant orchard information including previous production figures, tree age and fertiliser programs of the past. Any problems concerning the specific orchard, such as small fruit, should be mentioned.

## Soil Sampling

♦ **Sampling depth:**

- Topsoil 0 - 300 mm.
- Subsoil 300 - 600 mm.

♦ **Number of samples:** A sample comprises of a combination of at least 10 sub samples. A composite sample should not represent more than 3 ha. Samples from different orchards or lands should not be combined.

♦ **Distribution of sampling points:** Take samples by walking diagonally from the corner through the orchard or land. In an established orchard, topsoil and subsoil samples should be taken at the same trees selected for leaf sampling. Soil samples must be taken under the canopy of trees in the middle between the stem and the drip area perimeter.

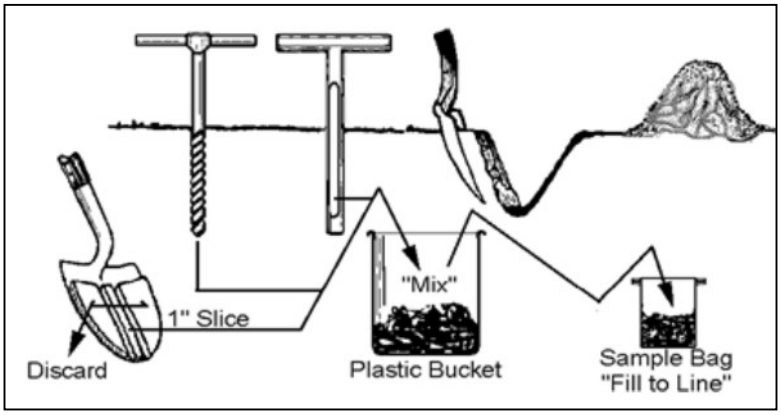
♦ **Method of sampling:** Clear the soil surface of debris, leaves and fertiliser. A soil sample must not be taken too soon after fertilising because this will contaminate the soil sample and lead to an incorrect analysis. The top and subsoil samples are taken by removing a core of soil from the top 0 to 300 mm and then from 300 to 600 mm soil depth, respectively.

♦ **Packaging of samples:** Sub samples from an orchard or land should be combined in the respective bucket (not a fertiliser bag) and mixed thoroughly. A sample of about 2 kg is taken from the composite sample and dispatched in a clean, strong bag.

## Soil and Leaf Sampling Procedures

Soil and leaf samples are required for making fertilizer recommendations. A soil or leaf analysis is no better than the procedures used to collect the sample. For samples to be representative of the area tested, follow these steps for sampling:

♦ **Soil Sampling Procedures:**



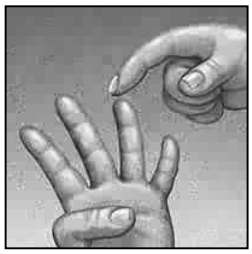

1. Soil samples may be conveniently taken when leaf samples are pulled. Soil sample bags are available from your laboratory agent. They should be used for submitting samples to the laboratory. Supply all the information asked for on the soil sample bags.
2. Use a spade, trowel, soil sampling tube, auger or other tool which can take a thin vertical slice of soil to a depth of 25 - 30 cm.
3. Take at least 12 or 15 cores or thin slices at random over the area to be sampled. In general, one composite sample consisting of 12 - 15 cores should be taken for each block of trees. If possible, sample under the predominant variety. (For example: Stuart.) Place samples in a clean plastic bucket or other non-metal container and mix well. Fill the soil sample bag at least 3/4 full. **Do not use a galvanized bucket** if the soil is to be analyzed for zinc or other micronutrients.

4. Cores should be pulled within the drip line, **not** between rows. The area included in one sample should have been uniformly fertilized and limed in the past. When collecting the sample, avoid high or low spots, eroded areas, and areas along roads and fences. Sample problem areas within an orchard separately.

♦ **Leaf Sampling Procedures (An example of how it is done in the USA):**

1. Obtain plant analysis mailing kit from the area laboratory agent's office. One mailing kit per sample is required.
2. Sample trees between July 7th and August 7th. (Sampling can be extended into mid-August without affecting the results.)
3. Collect 100 middle-pair of leaflets from the middle leaf of this year's growth. Use terminal shoots exposed to the sun. Avoid twigs from the interior of the tree. Collect leaflets from all sides of the tree. Avoid leaflets damaged by insects and diseases.
4. Abnormal trees or trees not representative of the area should be sampled and sent separately. A complete and accurate description of abnormalities should accompany such samples.
5. Sample trees of the predominant variety in a given block. If Schley is the main variety, sample Schley; if Stuart is the main variety, then sample Stuart, etc.
6. Immediately upon collection, wipe leaves (entire surface, both top and bottom) with a damp cellulose sponge or cheesecloth to remove dust and spray residue. Do not allow the leaves to come into contact with rubber or galvanized containers. Partially air dry and place in the large envelope of the mailing kit.
7. Complete the questionnaire obtained in each mailing kit. Place the completed in the smaller envelope together with a cheque made payable to The University of Georgia to cover any charges and mail it to the Plant Analysis Laboratory.
8. If recent soil test data were not available, it would be advisable to collect a soil sample and have it sent to the Soil Testing Laboratory.

## Counting



Counting plays a very big role in collecting Agri-data. A farmer may decide to count the number of weeds or pests in a specific area, in order to determine whether or not chemical pest control is necessary.

We also count the number of plants or trees in any given area, in order to determine:

♦ "how much" fertilizer we should give.
♦ "how many" fruit it delivered.
♦ "how much" money we spent to fertilise, pest control, etc. each and every plants.

## Scouting


***Agricultural Scouting:***

Systematic, regular monitoring of a crop or ornamental planting or landscape.

Scouting, or monitoring pest populations, is part of an Integrated Pest Management (IPM) system. IPM prescribes treating the portions of a farm or field that have identified higher than threshold levels of pests, rather than treating the whole field, resulting in using less applied farm chemicals.

Spotting signs of damage doesn't automatically mean you should take action. It all depends on the type of pest, the type of damage caused, the severity of infestation, and your own personal preferences. For instance, does the damage fall into any of the following categories?

- **Economic damage:** Some insects, such as termites, cause economic damage to a home, yard, or garden.
- **Health risk:** Some insects and related creatures are a concern because they carry disease. A good example is the tick, one species of which is responsible for transmitting Lyme disease.

After you identify a problem, determine the potential for damage and how much you or your landscape can tolerate. Once you know what you're up against, find out if the damage can be controlled with less-toxic strategies. Use pesticides as a last resort.


**Scouting Procedures**

There are normally very specific procedures that are applied for scouting pests and diseases.

**An example would be:**

**Scouting for Aphids Before Heading**

1. Make a minimum of 10 stops in each field.
2. Examine all plants in one row foot for aphids.
3. Counting all aphids is not necessary. Count various small groups of aphids until one is found with about 25 individuals.

Remember what a group of 25 aphids looks like. As individual plants are examined for aphids use die visual image of 25 to estimate the number on each plant. Record the total found. Practice with this technique until visual estimates of numbers are close to counted totals.

**Scouting for Aphids After Heading**

1. Examine heads while in the milk and dough stages.
2. Counting aphids in heads is impractical, and accurate scouting requires good skills at estimating aphid numbers. This can be acquired by examining heads closely to form a mental image of aphid numbers and then dissecting heads to determine the actual number of aphids. Practice making estimates of aphid numbers with 10 infested heads, until a reasonably accurate estimate (within 10 percent of the actual numbers) can be made.
3. When scouting commercial fields make 10 stops and examine 10 heads per stop. Record the number of aphids per head and calculate the average population per head.

It is important to get the correct scouting procedures, as related to the types of pests and diseases that might be relevant to your specific type of crop.


| Concept (SO 1) | I understand this concept | Questions that I still would like to ask |
|---|---|---|
| The different elementary methods of data collection in Agriculture. | | |
| Interpreting a gauge. | | |
| Measuring. | | |
| Observing. | | |
| Collecting samples. | | |
| Counting. | | |
| Scouting. | | |
| The advantages and disadvantages of different methods of data collection. | | |

**My Notes ...**

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# Session 2 Collect and Report on Collected Agricultural Data

*After completing this session, you will be able to:*
**SO 2: Collect and report on collected agricultural data by using prescribed collection methods.**

**In this session we are going to examine the following concepts:**

- ♦ Biological data.
- ♦ Physical and economical data, such as:
  - pests;
  - diseases;
  - agro-chemicals (usage, applications and stockholding);
  - crops (yields);
  - stock controls;
  - economic indicators; and
  - maintenance information.
- ♦ The correct methods to apply data collection.
- ♦ How & why we should collect data accurately.
- ♦ Required reporting formats.
- ♦ Identifying, noting and reporting on basic deviances in data.

## 2.1 Biological Data

This normally includes reports on:

- ♦ water quality;
- ♦ environmental impacts;
- ♦ occurrences of natural fauna and flora; and
- ♦ a count of invasive species, pests and diseased plants in the crop.

This type of report is important in terms of ensuring that Ecological Environments are not damaged and that the land, water and natural resources remain in optimum state for sustainable agricultural usage.

**My Notes ...**

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# 2.2 Physical and Economical Data

## Let's look at each in detail:

| Type of data | Correct Method of collection | Why we need this kind of report |
|---|---|---|
| **Pests data** | Sampling within individual fields is also done objectively. Surveyors strive to enter a given field without letting field conditions influence their choice of entrance location. Once in a field, a pest is sampled repeatedly along a transect with fixed spacing so as to try to achieve an accurate estimate of the pest conditions in that portion of the field.<br>Sampling is done by sweep netting, inspecting individual plants, inspecting a certain unit of the ground, or by other means depending on the crop and the target pest.<br>Typically a surveyor will employ multiple sampling methods in an individual field and will be estimating numbers of multiple insect species as well as the presence of disease or weeds. | A Pest Report can be used to decide when to scout and what to scout for, as well as to decide when or if a treatment should be applied. |
| **Diseases data** | These reports are normally a bit more complicated than pest reports. They normally include information on:<br>**The type of Crop**<br>There are specific crops with very specific disease vulnerabilities. Accordingly, we will try to determine whether our farm's crops are more or less affected than average.<br>**The type of Disease**<br>Only diseases that can cause us to lose our crop of that can have a financial impact on our crop are reported on.<br>**Pathogen**<br>This is the scientific name of the organism that causes the disease in the first place.<br>**Weather station and sensor location**<br>The location of weather monitoring equipment relative to the crop canopy. The sensors that monitor the environmental variables are important, and they should be located within the crop canopy in order to give accurate information.<br>**Input variables**<br>Measured environmental variables are recorded by automated weather stations or other types of monitoring equipment. Variables typically monitored include temperature, precipitation, relative humidity, and leaf wetness, wind. | These plant disease reports can be used to predict the timing of fungicide applications.<br>However, exercise caution when using these reports because disease control in the field depends on many additional variables, some of which may not be included in any one report.<br>Important variables include a fungicide's activity, such as whether a material is protective, eradicative, or curative, as well as fungicide coverage and the time intervals between applications.<br>Other variables that might affect disease control include additional environmental variables that might not be included in the model, host phenology or growth stage, and pathogen virulence. |

| Type of data | Correct Method of collection | Why we need this kind of report |
|---|---|---|
| **Agro-chemicals data** | This type of data report should include information such as wind speed, humidity and temperature, every fifteen minutes, types of chemicals applied.<br>Reasons for the application, results of the application.<br>It is important to compare year on year information and statistics.<br>It is also important to have regular stockholding and stock rotation reports, as agrochemicals do not have unlimited shelf life. | It is important to have this type of report in order to plan an effective spray program that will ensure that the crop yield and quality is optimum (at its best), without applying chemicals that will harm the environment, or limit the economic lifespan of the crop. |
| **Crop data** | This type of data report normally includes a list of the following:<br>• The type of crop and cultivar.<br>• Type of topography and soil the crop is planted on.<br>• The soil preparation and fertilisation actions that was affected.<br>• The spray program and quantities of agrochemicals, herbicides, pesticides and fertilisers applied.<br>• Plant manipulation actions taken.<br>• The grade, and quality of the crop yielded.<br>• The tonnage of the crop yielded.<br>• The price per ton income for the crop.<br>• The profitability of the crop.<br>• Notes on Economic and External factors that might contribute to the overall crop yield, quality and profitability.<br>This data report should be compared season on season and year on year. | It is important to have this type of report in order to plan an effective, cultivar selection, soil preparation actions, agrochemical application programs, plant manipulation and marketing actions that will ensure that the crop yield and quality is optimum (at its best), whilst ensuring maximum profitability. |
| **Stock control data** | It is important to have regular stockholding and stock rotation reports, as agrochemicals do not have unlimited shelf life. | It is important to have this type of report in order to plan effective, agrochemical application programs, whilst ensuring optimum cash flow and ensuring that stock does not expire. |
| **Economic indicator data** | These include indications of items such as the Rand vs Dollar exchange rate, the price of oil, the price of gold and many more. | An economic indicator is simply any economic statistic, such as the unemployment rate, GDP, or the inflation rate, which indicate how well the economy is doing and how well the economy is going to do in the future.<br>This will influence all our decisions in terms of crop planning, cash flow and help us to plan strategically for our commercial farm. |

| Type of data | Correct Method of collection | Why we need this kind of report |
|---|---|---|
| **Maintenance information** | Service technicians perform routine maintenance checks on diesel engines and on fuel, brake, and transmission systems to ensure peak performance, safety, and longevity of the equipment.<br>Maintenance checks and comments from equipment operators usually alert technicians to specific problems.<br>With many types of modern heavy and mobile equipment, technicians can plug diagnostic computers into onboard computers to diagnose a component needing adjustment or repair.<br>After locating the problem, these technicians rely on their training and experience to use the best possible technique to solve the problem.<br>If necessary, they may partially dismantle the component to examine parts for damage or excessive wear. Then, using hand-held tools, they repair, replace, clean, and lubricate parts as necessary.<br>In some cases, technicians calibrate systems by typing codes into the onboard computer. After reassembling the component and testing it for safety, they put it back into the equipment and return the equipment to the field.<br>Many types of heavy and mobile equipment use hydraulics, to raise and lower movable parts. When hydraulic components malfunction, technicians examine them for fluid leaks, ruptured hoses, or worn gaskets on fluid reservoirs.<br>Occasionally, the equipment requires extensive repairs, as when a defective hydraulic pump needs replacing.<br>In addition to conducting routine maintenance checks, service technicians perform a variety of other repairs.<br>• They diagnose electrical problems and adjust or replace defective components.<br>• They also disassemble and repair undercarriages and track assemblies.<br>• They weld broken equipment frames and structural parts, using electric or gas welders. | This will influence all our decisions in terms of crop planning, cash-flow and help us to plan strategically for our planting, pruning, harvesting and transportation / distribution actions. |

**My Notes ...**

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# 2.3 Methods to Apply Data Collection

How & why we should collect data accurately.


Please complete practical activity **2.1** in your workbook

**My Notes ...**

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# 2.4 Required Reporting Formats

Identifying, noting and reporting on basic deviances in data.


Please complete practical activity **2.2** in your workbook

**My Notes ...**

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| Concept (SO 2) | I understand this concept | Questions that I still would like to ask |
|---|---|---|
| Collecting and reporting on collected agricultural data by using prescribed collection methods. | | |
| Biological data. | | |
| Physical and economical data, such as:<br>• Pests<br>• Diseases<br>• Agro-chemicals (usage, applications and stockholding)<br>• Crops (yields)<br>• Stock controls<br>• Economic indicators<br>• Maintenance information. | | |
| The correct methods to apply data collection. | | |
| How & why we should collect data accurately? | | |
| Required reporting formats. | | |
| Identifying, noting and reporting on basic deviances in data. | | |

# Session 3 Use and Maintain Data Collection Equipment

*After completing this session, you will be able to:*
**SO 3: Use and maintain data collection equipment correctly.**

**In this session we are going to examine the following concepts:**

- Using and maintaining data collection equipment correctly.
- Recording tools: Pen and paper; Voice recorders; Electronic tools (e.g. GIS); Pin boards; Colour codes.
- How to use them, store, repair and clean different types of recording tools.

## 3.1 Data Collection Equipment

There are various basic tools and pieces of equipment that will assist the person who is completing data collection tasks. Let's look at some examples of these recording tools and what they are specifically used for:

| Tool / Equipment | What it is used for | How to store, repair and clean |
|---|---|---|
| **Pen and paper** | All recording, graphs, plotting and written information. | Filing and storage of all material and equipment should be in a secure and structured place. |
| **Voice recorders** | Digital voice recorders let you record memos, meetings, and phone conversations, as well as any information that you might want to store for data compilation. | Unlike tape recorders, Voice recordings are stored in.wma,.wav, and other formats. You can listen to the files on the recorder itself or transfer them to your Personal Computer for playback, archiving, and sending to others as e-mail attachments. Depending on the recording device, you can even use voice recognition software to transcribe your recordings into text, though the results can be spotty. |
| **Electronic tools** | These include equipment such as: Tensiometers, Oscilloscopes, Global Positioning systems, Bar-codes scanners, computers and many more. | Each piece of electronic equipment has a very specific and scientific function and should be stored, repaired and cleaned as prescribe by the manufacturer.<br>We will look at their uses in more detail at higher level of this learning. |

| Tool / Equipment | What it is used for | How to store, repair and clean |
|---|---|---|
| **GIS** | *"In the strictest sense, a GIS is a computer system capable of assembling, storing, manipulating, and displaying geographically referenced information, i.e. data identified according to their locations. Practitioners also regard the total GIS as including operating personnel and the data that go into the system."* | |
| **Pin boards** | Drawn up and framed on a backing board, it can be covered in glass or clear plastic, or be attached to a **pin board**. Use felt-tipped pens to **record** details (often in different colours) | |


| Concept (SO 3) | I understand this concept | Questions that I still would like to ask |
|---|---|---|
| Using and maintaining data collection equipment correctly. | | |
| Recording tools:<br>• pen and paper<br>• voice recorders<br>• electronic tools<br>• pin boards<br>• colour codes. | | |
| How to use them, store, repair and clean different types of recording tools? | | |

## My Notes ...

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# Session 4 Health & Safety Measures Applicable to Data Collection

*After completing this session, you will be able to:*
**SO 4: Apply health and safety measures applicable to the collection method and equipment.**

**In this session we are going to examine the following concepts:**

- Important health and safety measures for collection methods and equipment.
- Health and safety measures required for the safe collection of data.
- Appropriate protective garments and tools to be used during data collection.
- Applicable hygiene standards to maintain throughout the process of data collection.

When compiling agricultural data and collecting the information that is required, it is important to remember that whilst the final reporting is often in written format, the early collection stages require physical work and health, safety and hygiene requirements should be adhered to at all costs.

## 4.1 Health and Safety Measures Required for the Safe Collection of Data

### Protective Clothing and Gear

It is important to remember that some of the sampling chemicals might require the workers to wear respiratory gear and safety clothing. In this section, we will look at the manner in which protective gear and clothing must be maintained and how it is correctly utilised.

### Maintenance of Equipment and Gear

All protective clothing and safety equipment must be in good condition at all times. Before protective clothing is utilised, the user must ensure that:

- All items are free of holes and tears to prevent penetration of the chemical onto undergarments or onto the skin.
- All items have been washed properly after previous use.
- All buttons, zippers or other fastenings are working well.
- Elastic used in clothing and facemasks are not perished or stretched out.

Cartridges for respirators must be replaced on a regular basis in line with the manufacturer's specification.

Where it is found that protective clothing is torn, or has perished in some way, it must be replaced.

## Utilisation of Equipment and Gear

The use of protective clothing must be strictly enforced at all times. Each individual should have his or her own protective clothing and equipment that fits well and is properly maintained.

Safety precautions do not end when the sampling application is complete. All equipment has to be cleaned, maintained and stored in good condition in preparation for future use.

Operators should change out of working clothes and bathe once spraying is complete. Work clothes should be washed.

## Personnel Regulations, Communication with Workers and Non-authorised Workers

All workers must be fully trained in workplace safety regulations and these regulations should be enforced at all times. The regulations must include:

- Regulations regarding the conduct of personnel when handling samples and chemicals, being:
  - No smoking, drinking or eating is allowed in the vicinity of where chemicals are mixed, applied or stored.
  - No person that is under the influence of alcohol or other drugs is allowed to handle chemicals for whatever purpose under any circumstances.
  - Safety regulations regarding the use of chemical application equipment.
  - Regulations regarding proper utilisation of protective clothing and equipment.
  - Regulations on how to handle chemicals safely.
  - Prescriptive regulations on how chemical spills, leakages and other emergencies should be handled.
- Instructions concerning the chemical to be used, the concentration to be used, the area to be sampled and type of sample coverage required must be given in writing on a daily basis and signed by the supervisor.
- In the interest of safety, under no circumstances are any non-authorised workers allowed to handle or be associated with handling or application of chemicals.

## Soil and Water Contamination

Care should be taken when compiling data so that spray drift does not contaminate water sources, such as dams, streams, springs, etc, as this might contaminate samples and distort the data.

Filling points where chemicals are mixed and spray machine tanks filled should be situated at least 50m from any water source, including boreholes, and have a suitable drainage system, such as a French drain, that can safely drain away spilt chemicals and excess water.

## Climatic Conditions

The supervisor should take cognisance of the expected weather conditions for the day of the planned sampling application, using various media that are available, such as radio, television, websites, etc. This will assist in the planning for resource allocation for the following day. If rain is expected, delay the planned sampling until such time as the weather clears

## Designated Areas

Adequate signage (approved by the authorities) that is easily observable should be placed in locations designated for a specific purpose. These signs must give a bold, concise message such as:

- Danger.
- No Entry.
- No smoking.
- No drinking and eating.
- Fire-extinguisher location.
- First Aid Equipment location.
- Emergency Exit.

These signs are either informative in nature or give a clear instruction in a manner that is understandable to all irrespective of their language.

Chemicals should only be mixed in areas designated for the purpose, such as at filling points. These areas should be clearly marked and unauthorised personnel should not be allowed into these areas while chemicals are being handled.


Please complete practical activity **4.1** in your workbook

**My Notes ...**

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| Concept (SO 4) | I understand this concept | Questions that I still would like to ask |
|---|---|---|
| Important health and safety measures for collection methods and equipment. | | |
| Health and safety measures required for the safe collection of data. | | |
| Appropriate protective garments and tools to be used during data collection. | | |
| Applicable hygiene standards to maintain throughout the process of data collection. | | |

**My Notes ...**

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# Terms & Conditions



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