

## Part 2

# Our school environment – getting to know our site

## worksheet 2.1:

### Working with climate

Climate is different to weather. The weather is the condition of the atmosphere at a certain place and a certain time. When we describe the weather, we are describing what is happening in the air. What is the weather like today where you live? Is it hot or cold? Is it cloudy or sunny? Is it wet or dry? Is it windy or still? And what was the weather like yesterday?

The weather is always changing. It changes during the year from one season to another. It also changes daily. The weather in the morning may be different to that in the evening or to that of the day before.

The climate of a place is what the weather is usually like in that place. Different places have different climates. Is the summer usually hot, warm or cool? Is the winter usually warm, cool or cold? Is it usually windy or calm? Does the rain usually fall in summer, in winter or all year round? Is there usually a lot or a little rain?

Every type of plant has a climate in which it grows best. In this worksheet you will learn how to find out about the climate of your area and then to choose plants that grow well in that climate.

In a garden, the climate can change over very short distances giving rise to microclimates. There are different microclimates under trees, on the north and south sides of walls, in exposed places and so on. We can set up microclimates in our garden to grow plants that would not normally survive in our climate. For example, to grow bananas, which need heat and moisture, in the dry and windswept conditions of the Cape Flats.

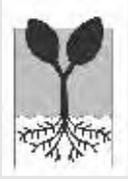
When thinking about climate, the choice of plants to grow mainly depends on the temperature and precipitation.

Temperature: how hot or cold the air is.

Precipitation: the amount and type of water in the air or which falls to the Earth. The different types of precipitation include dew, rain, snow, frost, hail, fog and mist. In South Africa rain is the most important form of precipitation.



## Activity 2.1



Pair work

## Activity 2.1: Think about the climate of your school

- For each row in the table, tick the box which best describes the climate of your school's area.
- Scientists have divided South Africa into six major climatic regions. These are described in the boxes below. Read the boxes and then write down in which climatic region you think your school is situated.

### The climate of my school's area

<b>wind</b>	windy all year <input type="checkbox"/>	windy in summer <input type="checkbox"/>	windy in winter <input type="checkbox"/>	no wind <input type="checkbox"/>
<b>time of rain</b>	rain in summer <input type="checkbox"/>	rain in winter <input type="checkbox"/>	rain all year <input type="checkbox"/>	never rains <input type="checkbox"/>
<b>amount of rain</b>	always plenty of rain to grow crops <input type="checkbox"/>	usually enough rain to grow crops <input type="checkbox"/>	some years there is enough rain to grow crops <input type="checkbox"/>	not enough rain to grow crops <input type="checkbox"/>
<b>winter cold</b>	very cold <input type="checkbox"/>	cold <input type="checkbox"/>	cool <input type="checkbox"/>	warm <input type="checkbox"/>
<b>summer heat</b>	very hot <input type="checkbox"/>	hot <input type="checkbox"/>	warm <input type="checkbox"/>	cool <input type="checkbox"/>

### Fynbos

Fynbos is only found in the winter rainfall areas of the Western and Eastern Cape, nowhere else in the world. Most of the plants in the fynbos are bushes with hard leaves. There are also reeds, which look like grass, that people use for thatching roofs. There were few trees in the fynbos until people began to plant trees from other countries. There is little farming with grazing animals on the fynbos as this veld type is not suitable for grazing.

### Succulent karoo

To the west of the nama karoo is a very dry area with less than 100 mm of winter rain per year. Most of the plants are small bushes with stems and leaves that store a lot of water. This is a sheep farming area.

### Nama karoo

The nama karoo is a hot, dry area although it does rain a bit in summer. Most of the plants in the karoo are small, low bushes. There are also some grasses, especially where the rainfall is higher on the eastern side. The nama karoo is a sheep farming area. Farmers need large areas of land to feed their sheep because the area is too dry to produce much plant growth.

### Forest

Most of the plants in forests are large trees. There are also many plants which grow beneath and on the trees. Forest is found in warm areas with high rainfall which are not burnt. Forest areas are not very useful for grazing animals as there is little grass.

### Savanna

The savanna is often called the bushveld. Low trees and grass together make up the savanna. Savanna is found in warm areas that have summer rainfall and dry winters. The savanna is suitable for cattle and goats. The wild animals of Africa, such as elephants, buck, rhino, zebra and giraffes, were found in large numbers in the savanna.

### Grassland

Most of the plants in grasslands are grasses. There are few trees or bushes. True grassland is found in cool areas which get from 700 to 400 mm of rain per year. There are also grasslands in the warm high rainfall areas on the east of the country which could be savanna or forests. Fire, caused by people and lightning, keeps these grasslands cleared of trees and bushes. The grasslands are the best areas for farming grazing animals like sheep and cows.

# Temperature

When people talk about the temperature of a place, they mean the temperature of the air of that place. In South Africa, we measure temperature in degrees Centigrade. We shorten this to °C. Water boils at 100°C. Water freezes into ice at 0°C.

When the temperature falls to 0°C the water on and in the leaves also freezes. This is called frost. Areas where the temperature falls below 0°C in winter are called temperate or frost areas. In some areas the temperature never falls below 0°C. These areas are called tropical or frost-free areas.

## Tropical and temperate plants

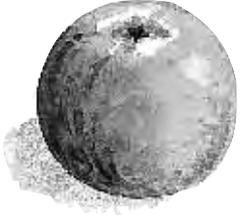
Tropical plants grow in tropical areas, and frost usually damages or kills them. Temperate plants usually can grow in frost areas. Plants that are not damaged by frost are also called hardy plants or frost-resistant plants. Many temperate plants need cold winters to flower and produce fruit well.

Knowing whether to plant temperate or tropical plants on your land is especially important when you grow perennials such as trees, shrubs and vines. If you live in a frost-free area, and you plant temperate perennials, they may not flower and produce fruit well because the winters are not cold enough. If you live in a frost area, and you plant tropical perennials, they will probably be damaged by the frost.

The table below lists some common tropical and temperate fruit trees and vines. Appendix 1 also shows whether the 140 plants listed are damaged by frost. A star (\*) in the 'frost-resistant' column means that the plant is not damaged by frost. The remainder of the plants, that is, those with no star in the 'frost-resistant' column, are damaged by frost.

**Table 2.1: Tropical and temperate fruit trees and vines**

Tropical fruit trees and vines (damaged by frost)	Temperate fruit trees and vines (not damaged by frost)
avocado banana cashew nut coffee custard apple (cherimoya) granadilla grapefruit guava lemon litchi macadamia nut mango mulberry naartjie orange oyster nut paw-paw tree tomato	almond apple apricot blackberry fig grape kiwi fruit nectarine peach pear pecan nut plum pomegranate raspberry



## Which perennials can you grow?

Before you choose which perennial plants to grow, you must know whether your area gets frost or not. You can easily tell whether an area gets frost by looking at the trees growing in the area:

- ☞ If there are tropical trees such as mango, avocado or guava, then the area is frost-free. In terms of temperature, you can grow most tropical trees.
- ☞ If there are temperate fruit trees such as peaches, apples or apricots, then there is probably frost in winter. In terms of temperature, you can grow most temperate trees.

## Cool and warm season plants

Most crop and vegetable plants are annuals as they grow for only one season. We can group annual plants as either cool season plants or warm season plants.

Cool season plants grow better in winter in most places in South Africa. They can grow well in summer if the summer of a place is cool. Some cool season plants are damaged by frost, others are not. Warm season plants grow better in summer in most places in South Africa. They can grow well in winter if the winter of a place is warm. Most warm season plants are damaged or killed by frost.

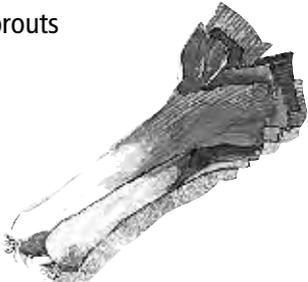
## Which annuals can you grow?

Before you can choose which crops or vegetables to grow, you must know what the temperature of your area is usually like in summer and in winter. In most areas of South Africa, you can grow warm season crops and vegetables in summer and cool season crops and vegetables in winter. If you want to grow cool season crops in summer, or warm season crops in winter, look at the types of plants other farmers in your area are growing:

- ☞ If they are growing cool season plants such as cabbages, spinach or wheat in summer, then your area probably has cool summers and cold winters. In terms of temperature, you can grow most cool season annuals in summer.
- ☞ If they are growing warm season plants such as tomatoes, melons or cucumbers in winter, then your area probably has warm winters and hot summers. In terms of temperature, you can grow most warm season annuals in winter.

The tables below lists some cool season and warm season crops and vegetables.

**Table 2.2: Cool and warm season vegetables**

Cool season vegetables (not damaged by frost)	Cool season vegetables (damaged by frost)	Warm season vegetables
asparagus broadbeans broccoli brussel sprouts cabbage chives garlic leek onion parsley radish turnip 	beetroot carrot cauliflower celery lettuce parsnip potato pea spinach 	amadumbe (coco yam) beans chile (hot pepper) cucumber eggplant marrow melon okra pumpkin squash sweetcorn sweet peppers 
		sweet potato tomato watermelon

**Table 2.3: Cool and warm season crops**

Cool season crops (not damaged by frost)	Cool season crops (damaged by frost)	Warm season crops	
barley broadbeans oats rye sugarbeet wheat	peas potato tobacco 	bambara groundnut cassava cowpeas lentils millet sesame sugarcane tobacco	beans cotton groundnut maize rice sorghum sunflower yam

**Activity 2.2**



**Pair work**

**Choose which plants are suited to the temperatures of your area**

- Walk around your school area and look at the plants which are growing there. Take this worksheet and a pencil with you.
- Write the names of the plants you see into the table below. Mainly look for food plants. Speak to people if you are not sure what plants there are. Use any language to name the plants.

Season of the year: \_\_\_\_\_ Area where I looked for plants: \_\_\_\_\_

**Fruit trees** I saw:

**Vegetables** I saw:

**Crops** I saw:

- Once back at school, tick the correct answers to the questions below by comparing the information you wrote down in Step 2 with the plant lists in Tables 2.1, 2.2 and 2.3.
  - What time of year is it now?  
Summer/Winter
  - Which trees grow well in the temperature of your area?  
Tropical trees /Temperate trees
  - Which vegetables grow well in summer in your area?  
Cool season vegetables /Warm season vegetables/ I do not know as it is winter now
  - Which vegetables grow well in winter in your area?  
Any cool season vegetables /Cool season vegetables not damaged by frost / Warm season vegetables / I do not know as it is summer now
  - Which crops grow well in summer in your area?  
Cool season crops / Warm season crops/I do not know as it is winter now
  - Which crops grow well in winter in your area?  
Any cool season crops /Cool season crops not damaged by frost/ Warm season crops / I do not know as it is summer now

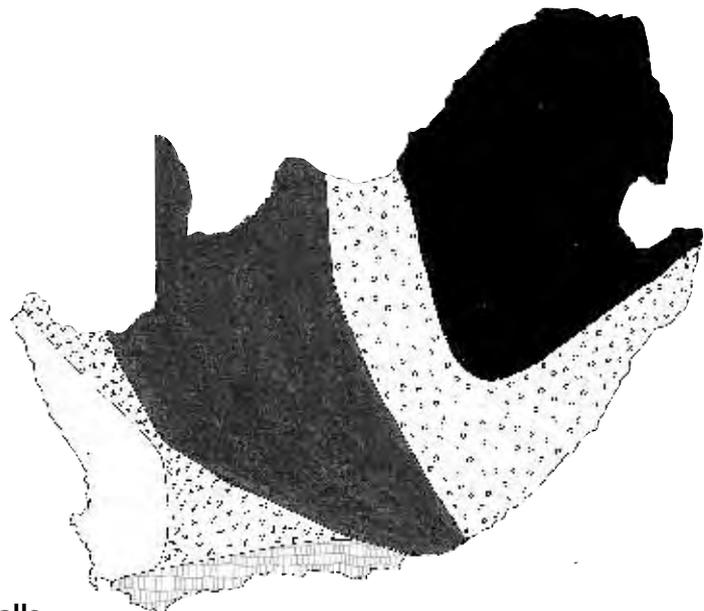
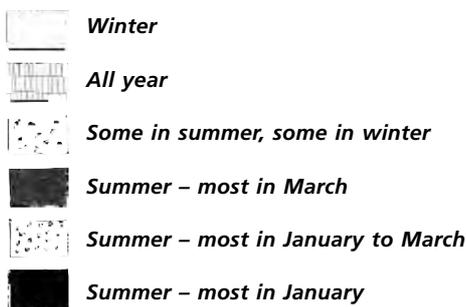
# Rainfall

When thinking about climate, the choice of plants to grow mainly depends on the temperature and the rainfall. We have looked at temperature, we will now look at rainfall.

All plants need water to live. This water usually comes from rain unless the plants are irrigated or growing close to a source of water such as a river or stream. Plants differ in the amount of water that they need to grow well:

- ☞ Plants which need a lot of water to grow well are called water-loving plants. Water-loving plants usually come from high rainfall areas.
- ☞ Plants which can grow with less water are called drought-tolerant plants because they can continue to grow if little rain falls. Some drought-tolerant-plants do not grow well in high rainfall areas because they get diseases in wet weather.

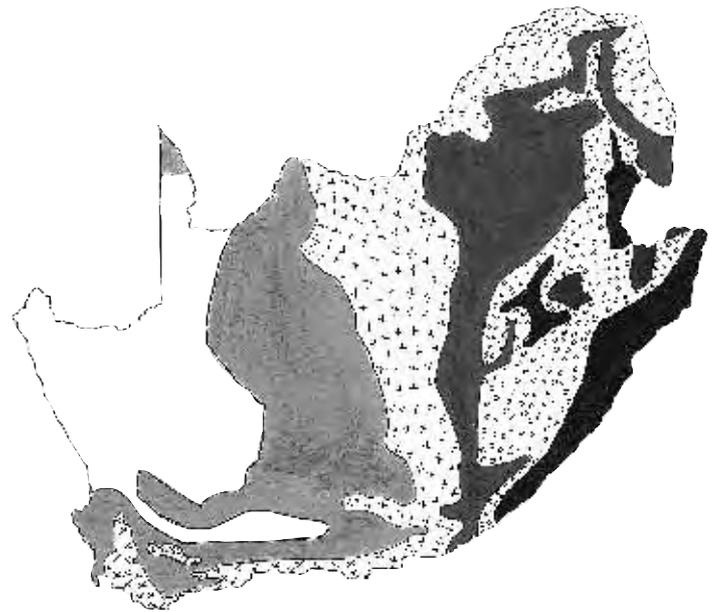
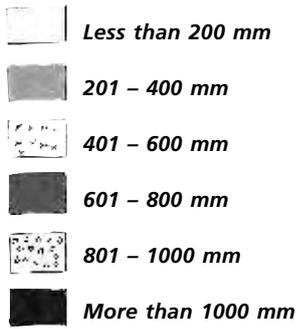
The two maps below give information about rainfall in South Africa. Map 1 shows the seasons of the year when the rain usually falls. Map 2 shows the average annual rainfall. This is the amount of rain that usually falls in one year. The amount of rain that falls is measured in millimetres. We shorten this to mm.



Map 1: The season of the year when rain usually falls

To find out the rainfall of your area, find your area on Map 2. To help you find where your area is on the rainfall map, look at Map 3. Map 3 shows where different places are in South Africa. If the name of your area is not on the map, look for the closest big town or city. Now look for the same point on Map 2. Compare the shading at this point of the map with the shading in the key to find out the rainfall of your area.

Once you know the rainfall of your area, you can find out which plants grow well with that rainfall. Very few crop plants grow with less than 400 mm rainfall per year. Map 2 shows that nearly half of the land in South Africa does not get enough rain to grow crops without irrigation.



Map 2: The amount of rain that usually falls in one year

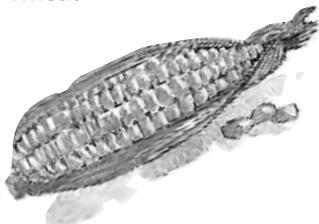


Map 3: The places in South Africa

Table 2.4 lists the plants which grow well in each area with more than 400 mm rainfall per year. Some plants are listed in more than one of the columns. These plants will produce a harvest in lower rainfall areas, but will produce better in higher rainfall areas. Plants which are not on the higher rainfall list get diseases if the air is too wet or if they get too much water. There are many vegetables which are not on these lists. This is because most vegetables need irrigation to grow well.

Appendix 1 also shows whether the 140 plants listed are drought-tolerant or water-loving. A star (\*) in the 'drought-resistant' column means that the plant can grow in lower rainfall areas without regular irrigation. The remainder of the plants, that is, those with no star in the 'drought-tolerant' column, require higher rainfall.

**Table 2.4: Plants that grow well in each rainfall area**

401-600 mm rainfall	601-800 mm rainfall	801-1 000 mm rainfall	more than 1 000 mm rainfall
barley cashew nut cassava cowpeas mango potato pumpkin rye sorghum sunflower watermelon wheat 	barley beans cashew nut cassava cowpeas cotton groundnuts guava sorghum maize mango mulberry oats potato pumpkin rye soyabeans sweet potatoes sweetcorn sunflower watermelon wheat 	apricot apple avocado beans cashew nut cassava citrus cowpeas cotton groundnuts guava litchi maize mulberry nectarine oats paw-paw peach pear peas plum potato sorghum soyabeans sunflower sweet potatoes sweetcorn tobacco	apricot apple avocado banana cashew nut citrus coco yam guava litchi maize macadamia nut mulberry nectarine peach pear plum rice sugarcane sweet potatoes 

### Activity 2.3



Pair work

### Choose which plants are suited to the rainfall of your school's area

1. Find the average annual rainfall in your school's area with the use of Maps 2 and 3 in the way described above.
2. List the plants which are best suited to the rainfall of your school area by looking at the plants in Table 2.4 above.
3. Look at Map 1. During which part of the year does the rain usually fall in your area?
4. Which plants are suited to both the amount of rainfall and the season of the rainfall in your area? To help you answer this question, look at your answers to Activity 2.2 and Tables 2.1, 2.2 and 2.3. For example, if you have winter rainfall, you will probably need to choose temperate trees and vines and cool season crops and vegetables.
5. Which plants are suited to both the amount of rainfall, the season of the rainfall and the temperature of your area? To help you answer this question, look again at your answers to Activity 2.2 and Tables 2.1, 2.2 and 2.3.

# Microclimates

In fenced gardens and on farms where the land is not flat, the climate can change over very short distances. The climate changes with the direction the slopes or the fences face: North, South, East or West. North-facing slopes and fences are usually hotter and drier than south-facing slopes and fences. This is because the sun shines directly onto north-facing areas, while south-facing areas are in shadow for a part of the day, especially in winter. West-facing areas have afternoon sun while east-facing areas have morning sun. West-facing areas are usually hotter and drier than east-facing areas, but not as hot as north-facing areas.

Low-lying areas and river valleys usually have hot days and cold nights. This is because cold air sinks down into low-lying areas at night. Low-lying areas may have frost in winter while the upper slopes are frost-free.

You can grow plants which are suited to each of the different climates. For example, in north-facing areas, you could grow more drought-tolerant, warm season plants such as sorghum and mangoes. In south-facing areas you could grow more water-loving, cool season plants such as potatoes and peaches.

## Activity 2.4



Pair work

### Bring it all together

In Activity 2.3, you selected plants that were suited to the rainfall and temperature of your school area. Look around your school garden for any microclimates that could extend your choice of plants. Describe what you see in the table below. The first row has been completed as an example.

Microclimate	Suitable plants	Season / Perennial	Reason for choice of plant
North-facing garden wall	Tomatoes	Winter	Full sun, warm, protected from frost

# Part 3

# Protecting the garden

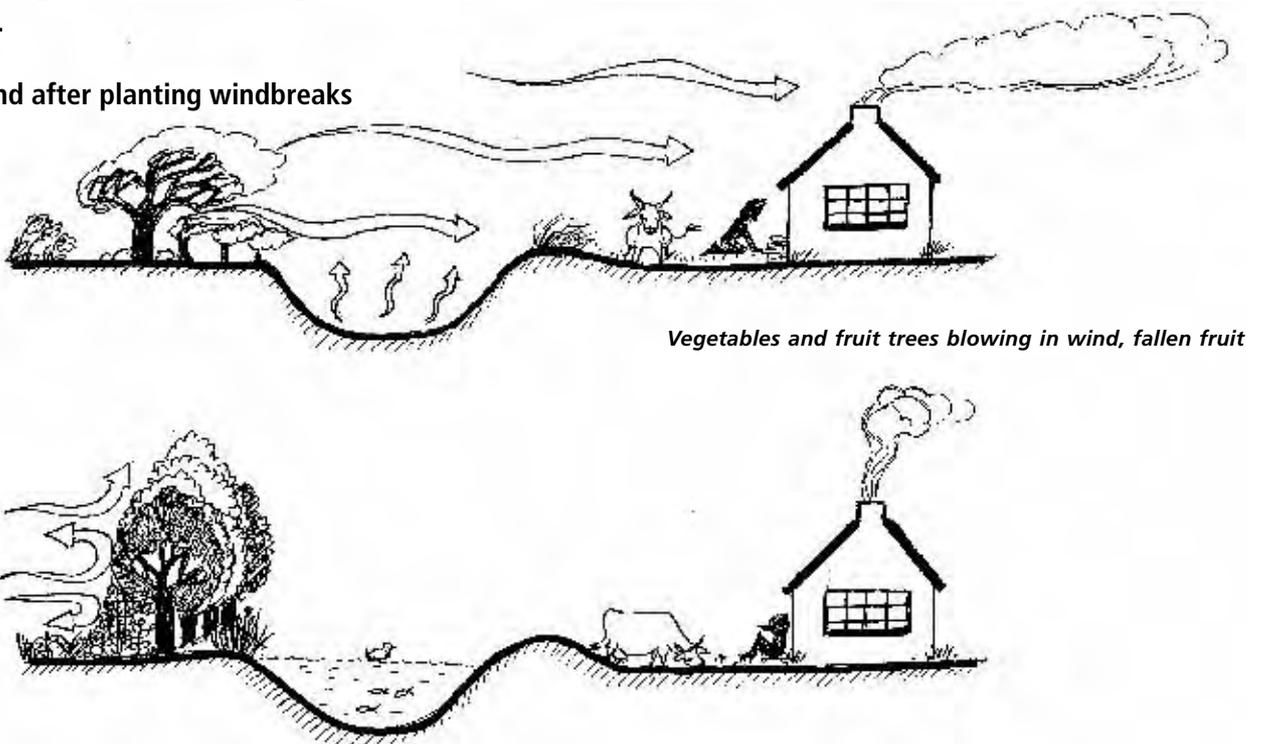
## worksheet 3.1

### Wind protection

Wind is moving air. Wind can damage plants by breaking their stems or blowing off their flowers and fruits. Strong, hot, dry winds can dry out plants and even burn them.

Windbreaks are essential in windy areas such as the Western Cape. They are also useful in very dry areas, where the winds dry plants out badly. Windbreaks usually consist of hardy trees and shrubs. Shrubs are generally shorter than trees, and have several stems, rather than a single trunk. Planting windbreaks is the first thing to do when establishing a garden.

Before and after planting windbreaks



The first step is to choose the best position for a windbreak. To do this we need to know the directions of the prevailing winds. A prevailing wind is a wind that usually blows at a certain time of the year. In Cape Town there are two prevailing winds: an uncomfortable summer wind from the south-east, called the southeaster, and a stormy winter wind from the north-east, called the north easterly wind. As you can see from these examples, winds are named after the direction from which they blow.

There are many simple instruments for showing the wind direction. The wind-sock and wind-vane shown in the diagrams are two examples. Wind-socks are used at airports to show pilots the wind direction as they land or take off their planes. Wind-vanes are usually seen on top of high buildings such as churches.

answers as you go along. Let them complete the written work for homework and then take it in.

### **Answers to questions**

1. a) Permaculture has improved life at School B by providing: shade, food, improved water supplies, firewood, food for animals, building materials and herbs, ways of earning money, a beautiful school environment, a living laboratory.  
b) This list will probably be similar to that of Question 1a, though there may be a few improvements that are particular to your school.  
c) These problems can include lack of fencing, space, tools, seeds, fertilisers, etc. There are no right or wrong answers to this question. The aim is to get learners into thinking of themselves as problem solvers.
2. Changing problems into solutions can include planting living fences from thorny plants; using organic matter and compost for soil fertility, making tools or bringing from home or using tillage methods that do not need tools; collecting seeds from fruit that has been eaten; etc.

### **Curriculum links**

#### **Outcomes**

CO 1: Identify and solve problems and make decisions using critical and creative thinking.

## **Part 2: Our school environment – getting to know our site**

The Curriculum links and Assessment suggestions are given for all the activities in this part after the individual activity descriptions. Take in the written work for assessment once all four activities have been completed. Assess the work individually, so each learner should have his or her own copy of the work.

### **worksheet 2.1 Working with climate**

#### **Activity 2.1 Think about the climate of your school**

##### **Pair work**

This is an elicitation activity to find out what learner's already know about their local climate. Encourage discussion. There are no right or wrong answers to these questions. You can walk around and listen to the discussions and correct any misconceptions that you notice.

Instruct the learners to either copy the table into their exercise books for completion or to complete the table on the worksheet.

### **worksheet 2.2 Temperature**

#### **Activity 2.2 Choose which plants are suited to the temperatures of your area**

##### **Pair work**

To do this activity, learners need to make observations while they walk around the school area. You can give them school time to do this or expect them to do it for homework. The activity can alternatively be done at home if the homes of most learners are in a similar climatic area to the school.

Before they begin the activity, instruct the learners to either copy the table into their exercise books for completion or to complete the table on the worksheet. Similarly, they can answer Question 3 on the worksheet, or they can write their choice of answers in their exercise books.

Learners need to answer Question 3 according to the fruit trees, vegetables and crops that they saw.

## **worksheet 2.3 Rainfall**

### **Activity 2.3 Choose which plants are suited to the rainfall of your school's area**

#### **Pair work**

Instruct the learners to work in pairs to follow the steps of this activity. They find the answers with use of the maps and the tables in Worksheet 2.3. They should write their answers in their exercise books.

## **worksheet 2.4 Microclimates**

### **Activity 2.4 Bring it all together**

#### **Pair work**

Again instruct learners to work in pairs to complete the table. Learners can EITHER copy the table into their exercise books for completion OR complete the table on the worksheet.

#### **Curriculum Links**

##### **Core knowledge and content**

NS Planet Earth and Beyond

- Weather may change from day to day. Weather can be described by measurable quantities such as temperature and precipitation.
- Other changes take longer to occur. An example of this type of medium-term change is annual seasonal changes which may be described in terms of changes in rainfall, average wind direction, length of day or night and average maximum and minimum temperatures.

SS Geography

Grade 4: Mapwork – map symbols and key; map of South Africa showing provinces.

Grade 5: Climatic regions of South Africa and their temperature and rainfall. Mapwork – cross-referencing information on different maps.

#### **Outcomes**

NS LO2: Learners know, interpret and apply scientific knowledge.

SS Geog LO1: Learners use enquiry skills to investigate geographical and environmental concepts and processes.

#### **Assessment**

Assess the written work from all four activities together.

## **Part 3: Protecting the garden**

### **worksheet 3.1 Wind protection**

#### **Activity 3.1 Find the prevailing wind directions at your school**

##### **Class work**

##### **Each group will need**

straw, cardboard, drawing pin or ribbon, bottle, stick or knitting needle, sand, a compass if available

Marking the cardinal directions is a good activity for an afternoon club as it takes some time to do and does not require a full class of learners. Ask learners to suggest ways to mark the cardinal points of the compass in a permanent way.