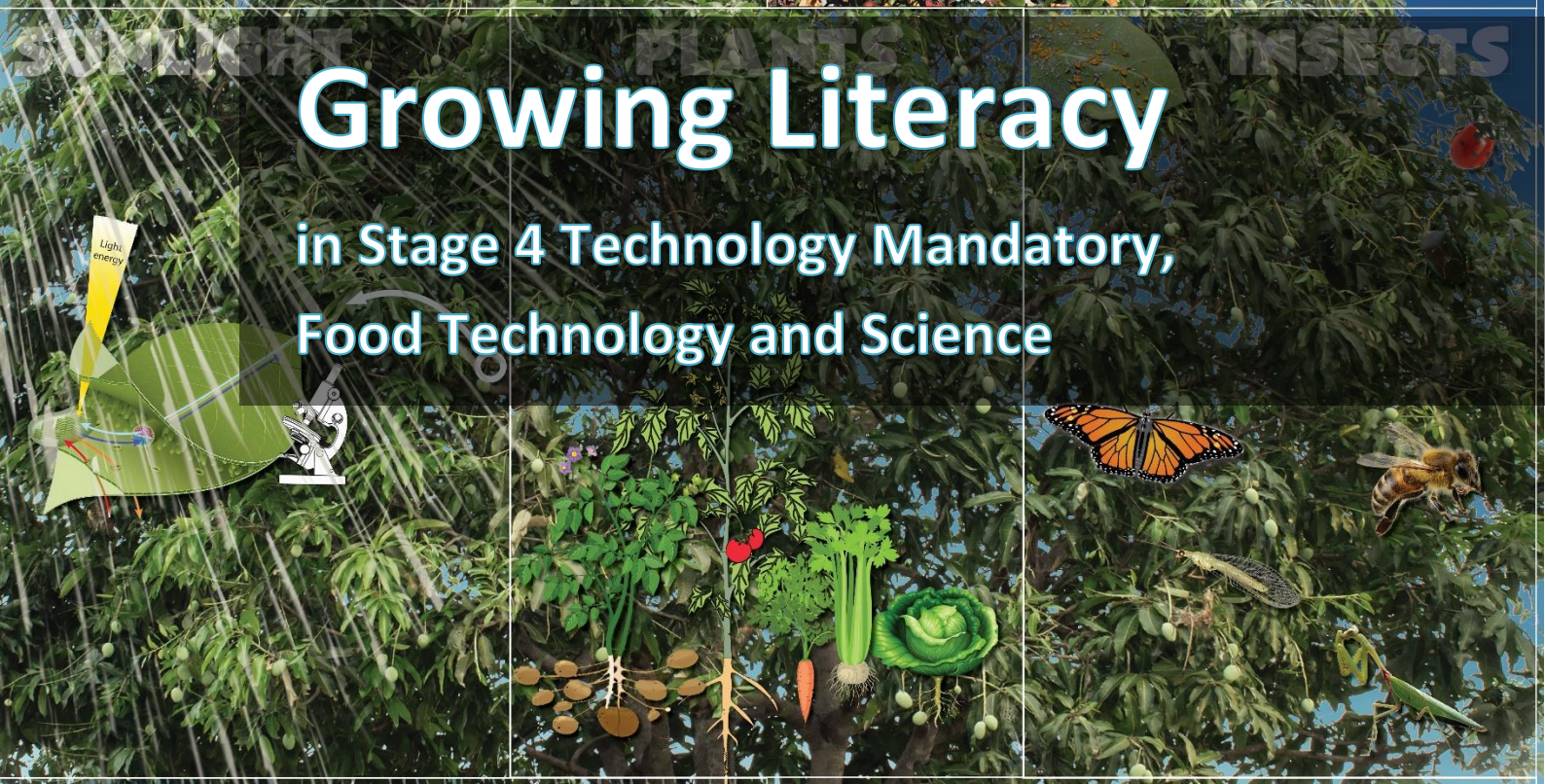
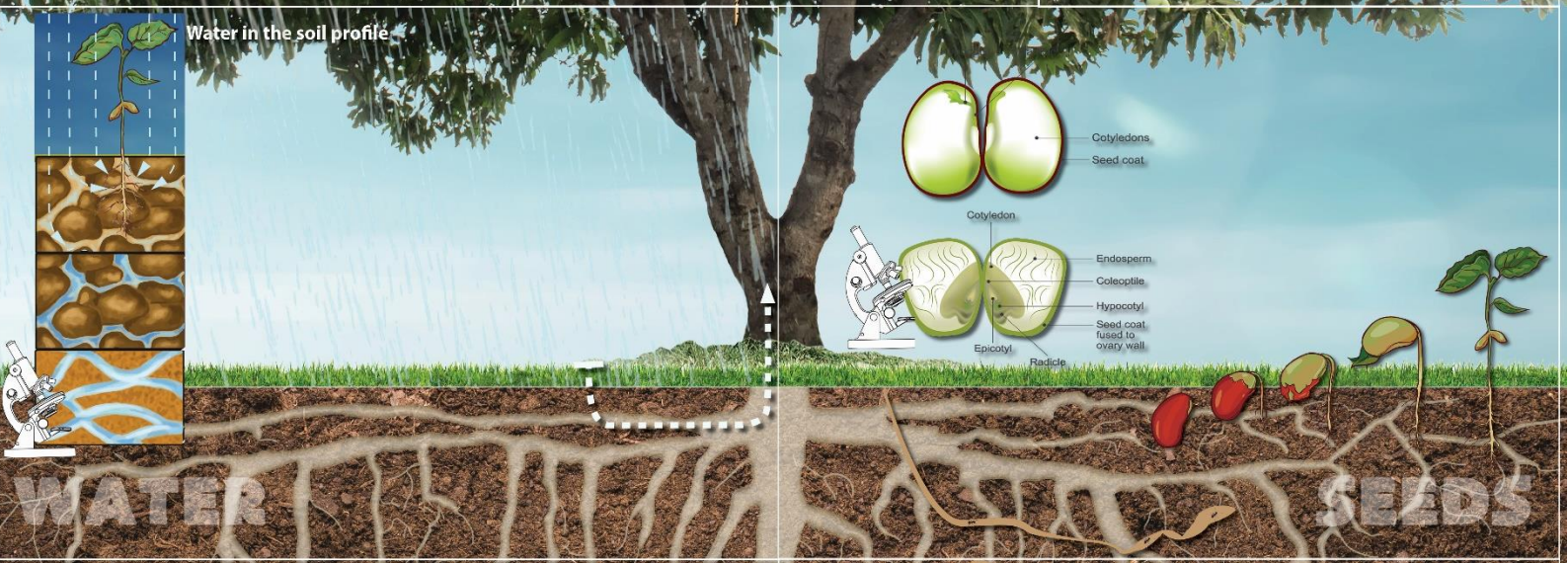
NSW GOVERNMENT
Department of Primary Industries

# Growing Literacy

## in Stage 4 Technology Mandatory, Food Technology and Science









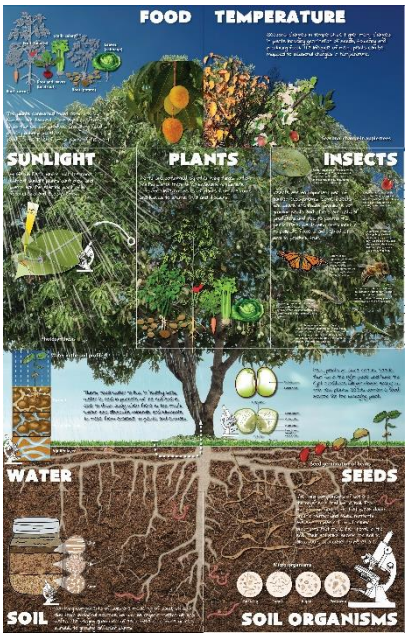
Author: Jo Hathway (Schools Program Officer, NSW DPI)

Editors and Advisors: Michelle Fifield (Education Officer Schools, NSW DPI Orange) and Meg Dunford (Project Officer School programs, NSW DPI Tocal College)

Is it important to know how our food is grown? ..... 3
Soil ..... 4
Soil assessments ..... 5
Colour ..... 5
Soil chemistry ..... 5
Soil structure ..... 6
Organic matter ..... 8
Soil organisms ..... 9
Plants ..... 11
Seeds ..... 16
Water ..... 11
Sunlight ..... 19
Insects ..... 21
Complete a survey of your garden. ..... 24
Observation template ..... 25
Food ..... 26
Fruit and vegetables ..... 26
Temperature ..... 31
NSW Growing regions ..... 31

## Is it important to know how our food is grown?

There are many factors affecting the quality and nutritional value of food - the growing environment is the first part of the story. These activities highlight how the growing environment of food affects food quality and growing efficiency. You will study the factors affecting plant growth from the ground up. Starting with soils and soil organisms, through water, sunlight, seeds, insects and seasonal factors to the point where a plant produces food.




With this understanding you will be able to make better-informed consumer decisions, you will have a better understanding of some food production issues and an insight into the issue of food security.

Let's look at what plants need to grow food.

# Soil

Soils are a complex, invaluable part of sustaining life on Earth. Food production depends on healthy soils. A basic understanding of what soils are made up of, how they vary and how that informs food production is important for all of us.

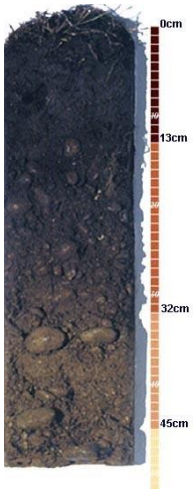
Consider the following images of soil profiles found on Tocal.

### *Windmill paddock profile description*

- 0cm: Dark grey-brown loam. Abundant plant roots, well drained, pH 4.7
- 40cm: Dark grey-brown loam. Plant roots common, worm channel below 22cm, well drained, pH 5.9
- 85cm: Dark grey-brown loam. Lucerne roots at 85-90cm, well drained, pH 6.1


### *View paddock profile description*

- 0cm: A horizon. Dark brown loam. Slight gravel content, plant roots common, good drainage, hard surface soil, large piece of charcoal at 6cm, pH 5.5
- 13cm: B1 horizon. Brown sandy clay loam. Heavy gravel content, plant roots common, good drainage, pH 6.2
- 32cm: B2 horizon. Yellowish brown light medium clay. Heavy gravel content, massive structure, plant roots are few, fair drainage, pH 6.1
- 45cm: C horizon. Rock




How are they different? What makes one more suitable to growing than the other? Consider the soil description and information that is recorded on the side of the profiles – the differences described there give you a hint about what to look for.

.....

.....

.....

.....

Optional: The soils on Tocal have been surveyed and mapped so that farm managers can make informed decisions. This soil map and information about the implications on farm management are available on the Tocal Virtual Farm soils map available at https://Trade.maps.arcgis.com/apps/MapSeries/index.html?appid=52054dd7557c48489

bd4ac0a25aae525 . More information about the Australian Soil Classification system is available on the CSIRO website.

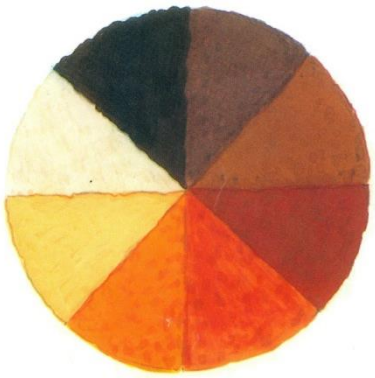
## Soil assessments

### Colour

The first and easiest soil assessment is to look at the colour of the soil. There is a huge variety of soil colours.

Soil scientists use a Munsell Soil Colour chart (https://munsell.com/color-products/color-communications-products/environmental-color-communication/munsell-soil-color-charts/) to help them describe the colour of soil. This helps to ensure consistency between scientists and locations.

This image provides a general guide for most soils you are likely to encounter.



**colour**

Pale colours generally indicate low fertility. Darker colours usually indicate high levels of organic matter. Red colours indicate the presence of oxidised iron (rust) which means the soil is well drained and well structured. White, pale grey and pale green colours may indicate waterlogging. Mottled soil colours may indicate intermittent waterlogging.

Describe the colour of the soil(s) you have:

.....

.....

.....

.....

### Soil chemistry

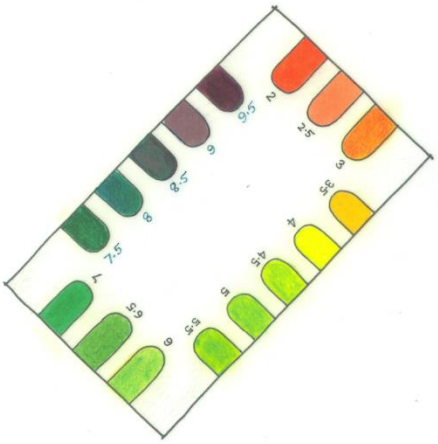
Soil chemistry is a complex area of study. Farmers often have regular soils tests carried out in a soil testing laboratory to see how their management practices are affecting the sustainability of their production enterprise. The soil test results are used to make decisions about fertiliser use to provide minerals which are lacking to optimise plant and animal production on the farm.

#### *pH*

One test that is easily carried out on your soil sample is soil pH. The testing process is quick, the kit comes with easy-to-follow instructions and is a great visual activity for students to do.

# Soil pH

- Soil pH can be easily checked using a simple field pH kit. Test both topsoil and subsoil because they often vary.
- For most agricultural plants, the ideal soil pH range is 6 to 8 on the field kit colour card.
- Above 8, the soil is alkaline and may be deficient in some nutrients.
- Below 6, the soil is acid. Aluminium and manganese toxicity may affect plants. Treatment with lime may be needed.
- Soil pH can indicate the available nutrients in the soil. If a soil is too acid or too alkaline nutrients become unavailable to plants.



Record the pH of your soil samples and predict the impact this will have on plants. If you do not have soil samples discuss the pH in the soil profiles on page 4 – note the change in pH through the profile.

.....

.....

.....

.....

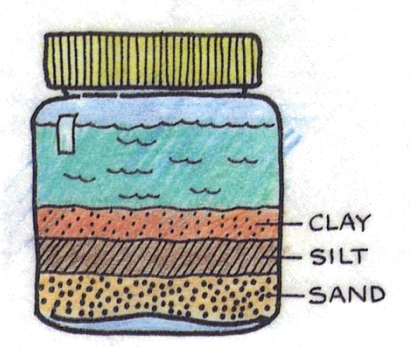
## Soil structure

### *Soil texture*

The relative quantities of different sized particles in soils have an impact on the texture of the soil, affecting its ability to hold water and minerals and its ability to support plant growth. The following two soil assessments determine the texture of the soil.

1. Jar test - In a small jar a sample of soil is mixed with water, the jars are shaken and left in a light location for 24 hours. During this time the sand settles first followed by the silt and finally the clay.

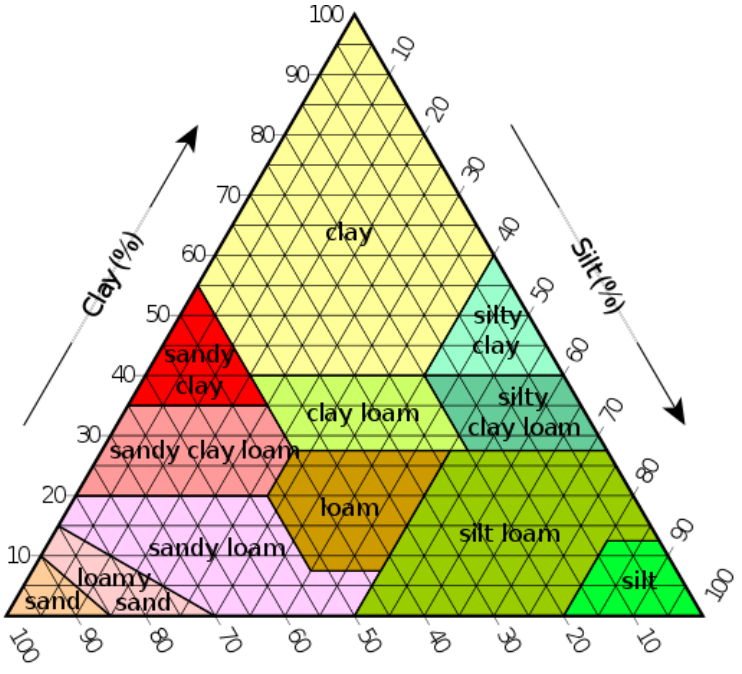
   By measuring the depth of the layers comparing that to the overall depth of the settled soils you are able to calculate the percentages of each.



You may also be able to estimate the amount of organic matter as it tends to float on top of the water.

2. Ribbon test - a small handful of soil is gradually mixed with water until a ball is formed. If you cannot form a ball the soil has a high sand content – or you have added too much water. Once a ball is formed it is shaped into a cylindrical shape and pressed over the forefinger with your thumb. When the ribbon breaks the length of the ribbon is measured, the longer the ribbon, the higher the clay content of the soil. If the soil feels gritty you are feeling sand, silky is silt or loam and sticky is clay.

By measuring the percentages of clay, silt and sand, a soil can be classified according to texture triangle. A soil with a high clay content has not enough soil porosity (soil spaces) and can be waterlogged with no aeration. On the other hand, a soil with a high sand content has great aeration but does not hold water. The best soils are loamy soils. https://commons.wikimedia.org/wiki/File:USDA_Soil_Texture.svg




3.

## *Soil stability*

Sometimes soil structure is naturally unstable. There are two potential problems for soil stability – dispersing soil and slaking soil.

Slaking soil means that the soil has poor stability and is prone to erosion. Slaking soils do not have enough organic matter to assist with binding the soil particles together.

Dispersing soils also have poor stability and are prone to erosion but in dispersing soils it is because they have too much sodium attached to the clay particles. They are known as sodic soils. Dispersing soils should not be disturbed - the roots and ground cover will help to stabilise the soil, reducing erosion. Adding gypsum can assist a dispersing soil.

## Organic matter

Organic matter is made from decomposed plant, animal, and microbial matter that were once alive and plays an important role in the healthy soils. Organic matter can be a complex part of managing healthy soils but as general rule of thumb Australian soils are low in organic matter and adding organic matter is beneficial for food and fibre production.

Organic matter effects can be evident in the colour of soil and you may have seen some floating on top of the water if you did the jar test for soil texture. Organic matter can combat many of the issues that face land managers in maintaining soil health by:

- Maintaining soil structure
- Providing food to plants
- Reducing soil erosion
- Retaining soil moisture
- Improving nutrient supply to plants
- Improving soil structure
- Retaining air in the topsoil
- Reducing problems of acid or sodic soils
- Reducing soil diseases, weeds and pests.

Consider the image below and how the litter layer can be used in gardens to improve organic matter content of soils.

### Litter layer

- This layer is found on the surface of the soil.
- It is made up of fresh and decomposed organic material such as leaves and other plant litter.
- The decomposed organic matter gives this layer its dark colour.
- It is usually very fertile because soil organisms feed on the organic matter and release nutrients into the soil.

Record your observations and recommendations for organic matter in your soil.

.....

.....

.....

.....

.....

.....

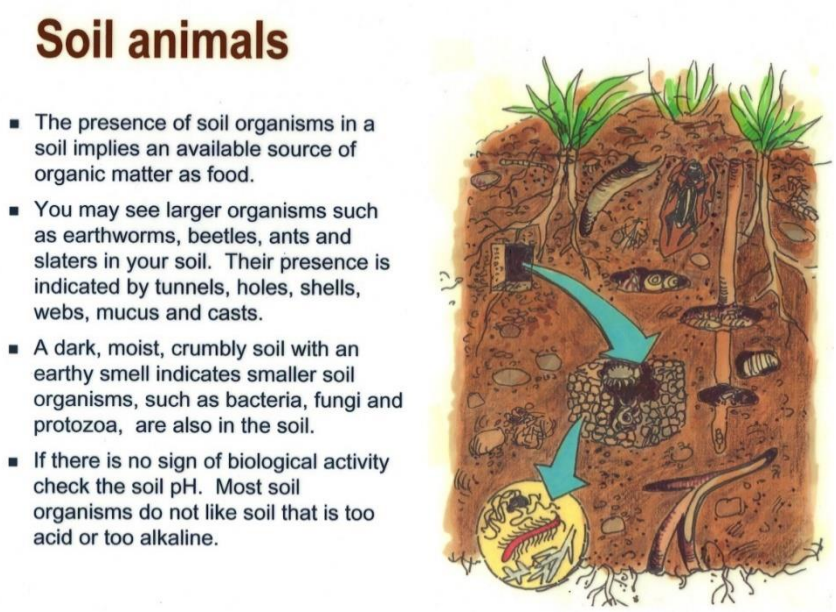
.....

.....

## Soil organisms

Soil organisms play an important role in keeping soils healthy, they decompose organic matter converting it into nutrients that are accessible to plants and they aerate the soil.

They range in size from microscopic bacteria through to insects and earthworms and larger animals that make their home in the soil. Soil organisms have not always been well understood and some past land uses and farming practices have had serious detrimental impacts on soil organisms. Fortunately, soil conditions can be altered to increase the amount of soil organisms.




Watch all or some of the following videos.

**The Soil Food Web**: about the role of decomposers in the food chain. It runs for 7 mins https://www.youtube.com/watch?v=ZcAmpVJgwJI&feature=youtu.be

**Dead Stuff**: the secret ingredient in the food chain. This is a shorter video highlighting the role of 'pond scum' and other decomposers to their role in the food chain. It runs for 3.50 mins. https://www.youtube.com/watch?v=KI7u_pcfAQE

**The Living Soil**: This 360° video is a great immersive introduction to the life in soils. It runs for 3.11 mins and can be watched through the YouTube app. https://www.youtube.com/watch?v=-dhdUoK7s2s

An accurate measure of soil organisms can really only be assessed in a laboratory.

If you do not have access to the site your soil sample was collected use the image above (and included in the appendix) to discuss the role of soil organisms and possible ways to protect them.

If you have access to the site you may be able to observe the activity of some larger soil organisms.

Lay out a shovel full of soil and see if you can find animals or evidence of animals. Look at the soil through a microscope (the soil sample needs to be fresh). The following field trial is used as a way of monitoring activity of soil organisms across growing seasons and from year to year.

### *Cotton strip trial*

This test is only effective for soils in situ. Strips of white cotton or calico approximately 5cm wide and 20cm long are buried in the soil, with one end of the strip left above the soil (so it can be found again). The strips are left in place for about four weeks and when the strips are removed soil organism activity will be evident in the decay of the strip. If there is no decay there is limited soil organism activity.

One of the quirkier of the soil organisms are dung beetles. They play an important role in agriculture. This five-minute video provides a good accessible overview of dung beetles. Why isn't the world covered in poop? - Eleanor Slade and Paul Manning (https://www.youtube.com/watch?v=uSTNyHkde08)

Discuss the role of soil organisms in soil health, use dung beetles as an example:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

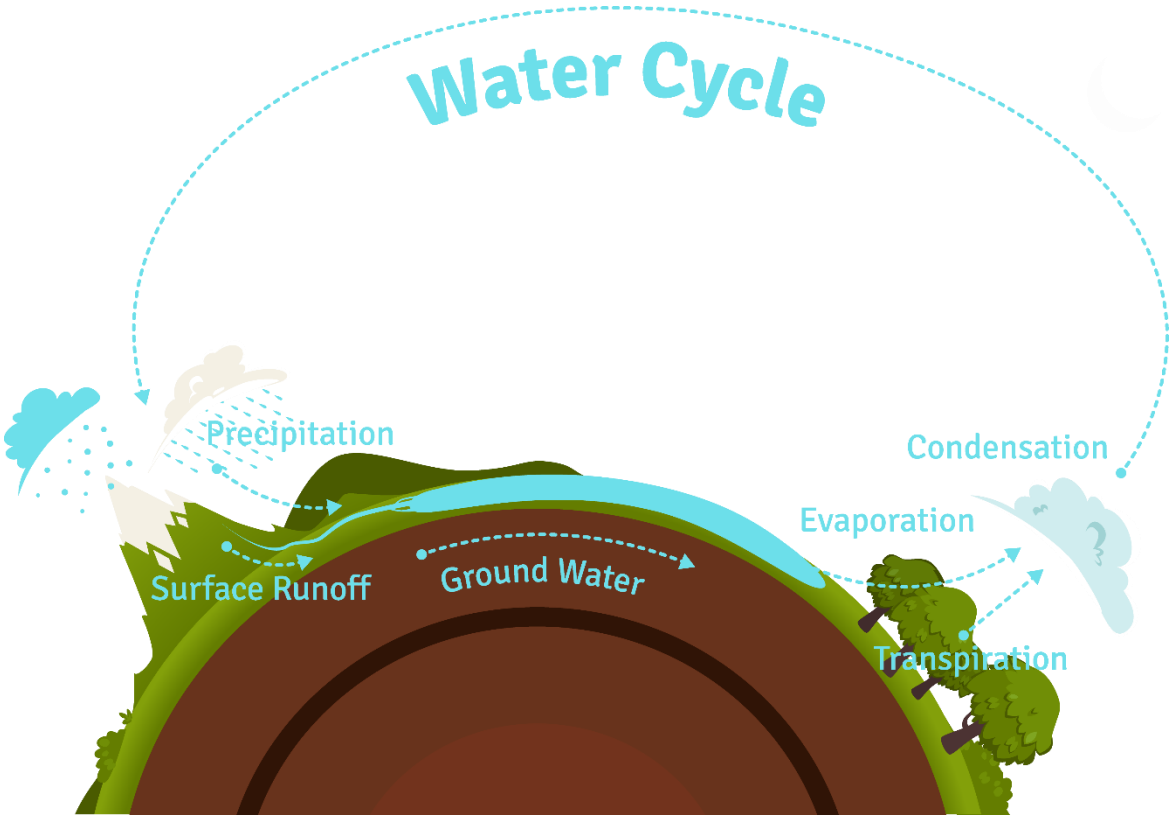
.....

.....

## Water

Water is perhaps the world's most precious resource. There is a limited amount of water in the world, we don't lose it and we can't make any more!

The water cycle demonstrates how this works at a global scale.




The water cycle can be modelled using a Bunsen burner, beaker with water and a cover. As the water reaches boiling point observe the steam rising from the water. If you place a cover over the steam it will accumulate on the cover and when the droplet size is big enough it will drop back into the beaker.

Write a report on the experiment.

Introduction (what is the aim of the experiment?) .....

.....

.....

.....

.....

.....

Diagram of the set-up (include labels)

Method (how was the experiment set up?) .....

.....

.....

.....

.....

.....

.....

Results (what did you observe?) .....

.....

.....

.....

.....

.....

.....

.....

Conclusion (how does this apply to growing plants?) .....

.....

.....

.....

.....

.....

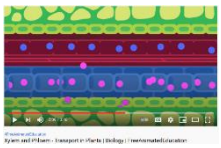
.....

Plants require water for:

- Germination of seeds
- Transpiration (heat control, similar to people sweating)
- Photosynthesis (production of energy for growing) and
- Structure (full, hydrated cells help to hold stems up).

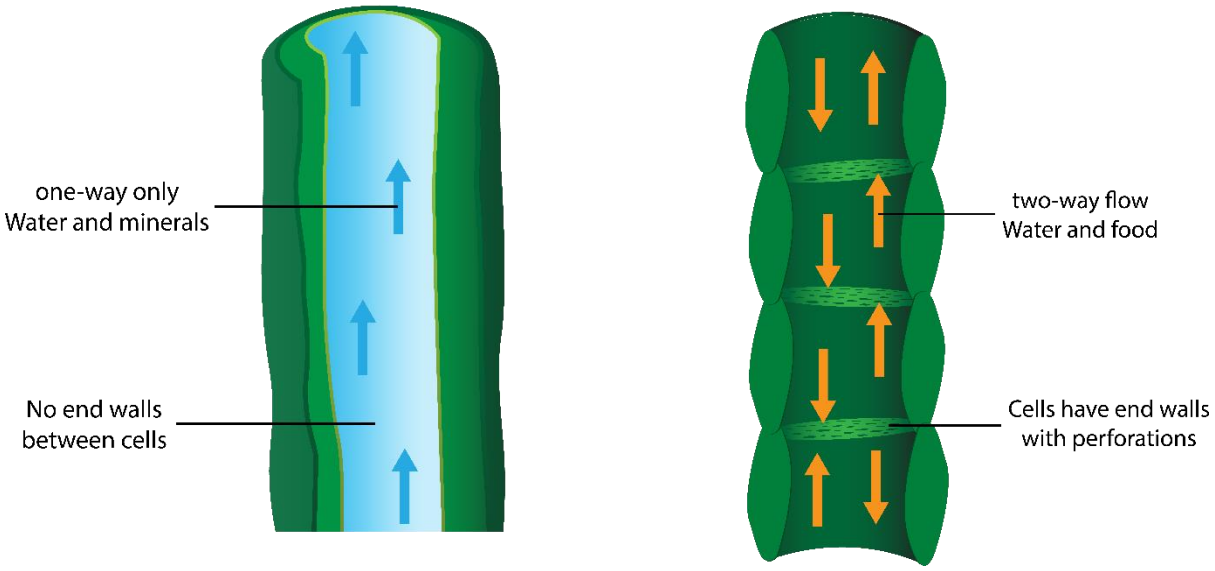
Germination and photosynthesis will be considered in more detail in later sessions.

The **structure** of a plant is supported by water as it is transported through the plant. This video explains the structures of plants and cells that are involved in moving water around a plant. Plant structure – xylem and phloem https://youtu.be/DhyYtT1K844



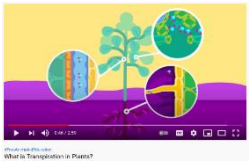
Label which vessel is xylem and which is phloem.

..... .....

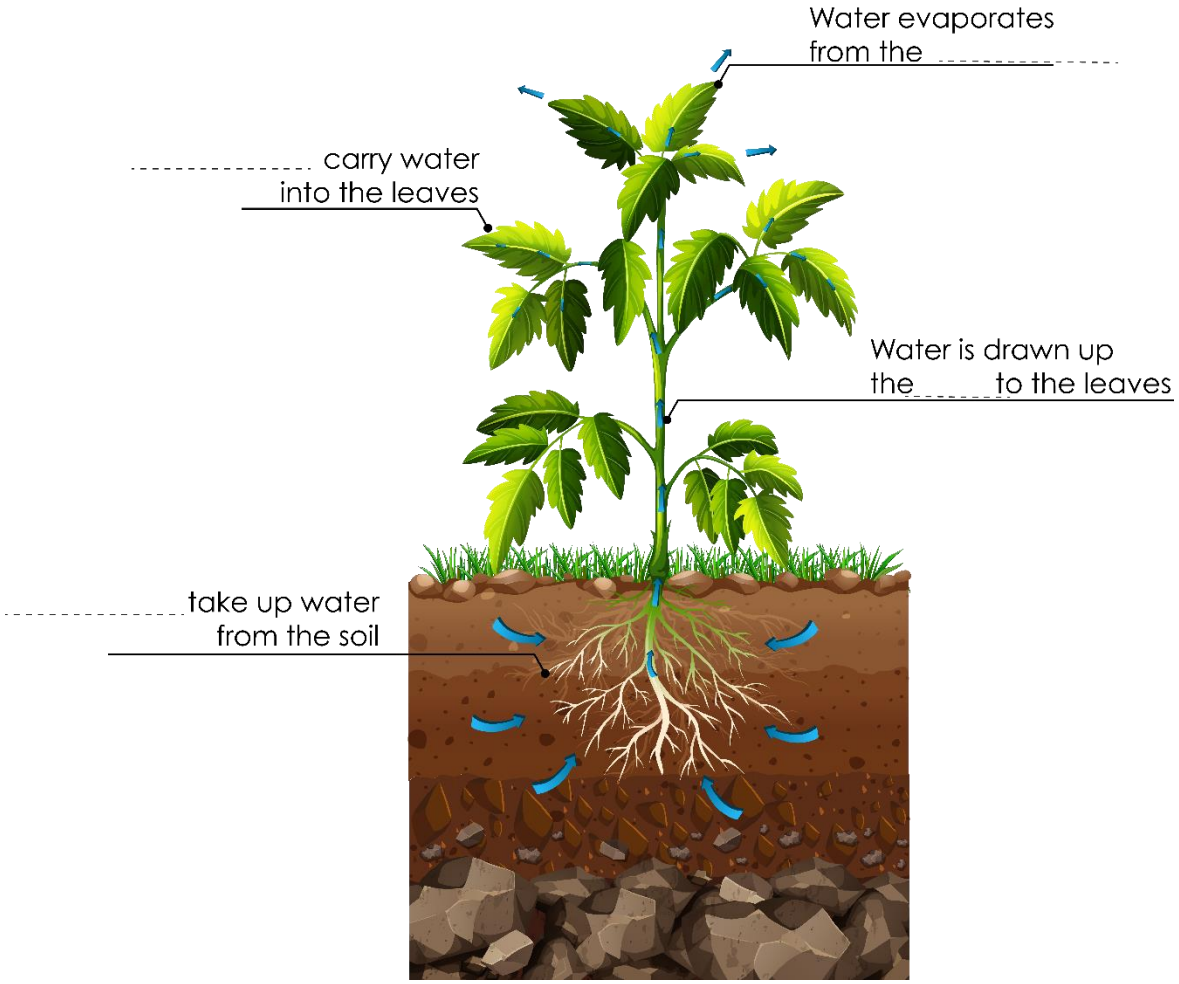


**Transpiration** is the process of plants losing water through leaf surfaces, it is part of the complex process of plants producing energy and growing.

Watch this video, and use the information to label the diagram
https://youtu.be/5jJLfwTkGe8



# TRANSPIRATION




Write a description of how transpiration contributes to plant growth.

.....

.....

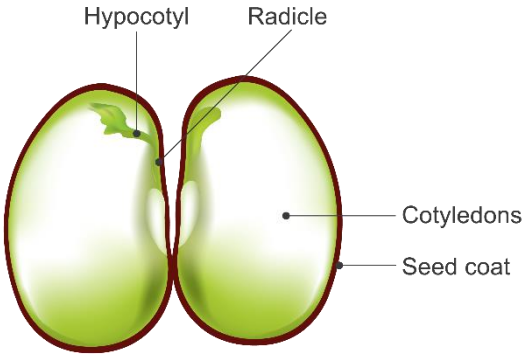
.....

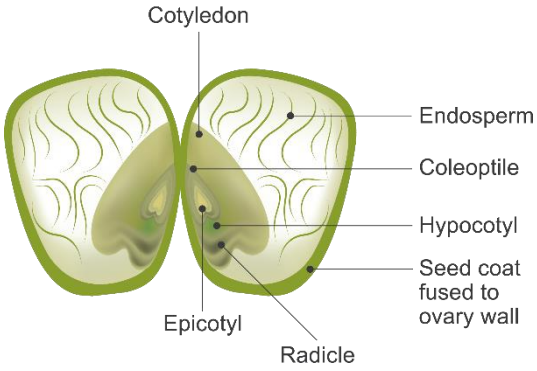
.....

## Seeds

Seeds contain everything they need to give a plant a good start. In the diagrams below of a dicotyledon above and a monocotyledon below) you will see:

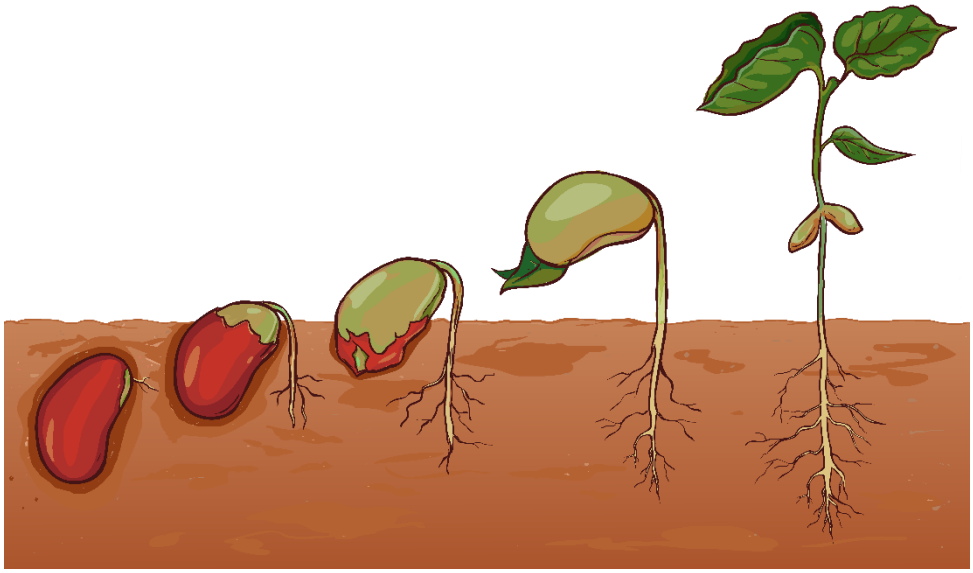
- Seed coat: the outer layer that provides protection to the plant in its earliest stages of development,
- Cotyledons or Endosperm: the food for the developing plant,
- Radicle: will form the primary root of the plant,
- The hypocotyl, epicotyl and the coleoptile are structures that will form the stem and leaf after germination.




When a plant starts to emerge from a seed it is called germination. Germinations occurs when the seeds have the right conditions. The ideal conditions for germination depend on the type of seed. All seeds have specific temperature requirements (for most seeds this is somewhere between 25 and 30°C), water requirements and oxygen requirements. More information about how these factors influence seed germination is available on this webpage: https://www.biologydiscussion.com/seed/germination/factors-affecting-seed-germination-external-and-internal-factors/15758

Germination of a bean seed (dicotyledon) looks like this. Note the rupturing of the seed coat, establishment of the primary root (radicle) and emergence of the early leaves (hypocotyl and cotyledons).



In agriculture a high percentage of seed germination can affect the success of a crop. Farmers need to ensure the right conditions for germination to determine the right time to plant and which seeds to sow. This means planting the right seeds, at the right time of year, with the right

equipment. A lot of research and development goes into providing advice to farmers about the conditions required by different plants to ensure an optimal harvest and into breeding plant varieties for different environmental conditions.

Based on the information provided in this table, plan a planting and harvest schedule for a farm that receives the example temperatures and rainfall. Note: these are example figures for the purpose of this exercise, planning for planting and harvest is a much more complex process than this.

| **Crop/Plant** | **Planting season** | **Planting depth** | **Time to harvest** | **Harvesting method / equipment** |
|---|---|---|---|---|
| Wheat | Autumn | 35 to 50 mm | 7 months | Combine harvester |
| Corn / maize | Spring | 50 to 75 mm | 3 months | Combine harvester or field chopper for silage |
| Pumpkin | Late winter | 30 -70 mm | 5 months | Harvested by hand |
| | | | | |
| | | | | |

Calendar of operations.

| | **Summer** | | **Autumn** | | | **Winter** | | | **Spring** | | | **Summer** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Crop** | **Jan** | **Feb** | **Mar** | **Apr** | **May** | **Jun** | **Jul** | **Aug** | **Sep** | **Oct** | **Nov** | **Dec** |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |

Key: Planting ☐ Growing ☐ Harvest ☐

Annual plants such as cereal grasses complete their full life cycle within a year. A lot of plants used in horticulture however are perennial plants. The life cycle of perennial plants (germination, growth, seed production and death) spans more than two years, with more than one season to produce food. Some perennial species such as fruit trees can live, grow and keep producing for over 100 years.

For perennial plants the rate of germination (percentage of seeds that germinate) is not as big an issue as in cropping industries. It is important that these plants that are nurtured to produce high quality fruit that meet market demands. In horticulture a lot of research and development is involved in selecting, planting and harvesting plants that produce fruit that Australian (and international) consumers prefer.

This web page provides an overview of the difference between grafted trees and trees grown from seed. https://deepgreenpermaculture.com/2017/02/16/the-difference-between-seedling-grafted-and-cutting-grown-fruit-trees/ .

Record a summary of the information in the video:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

## Sunlight

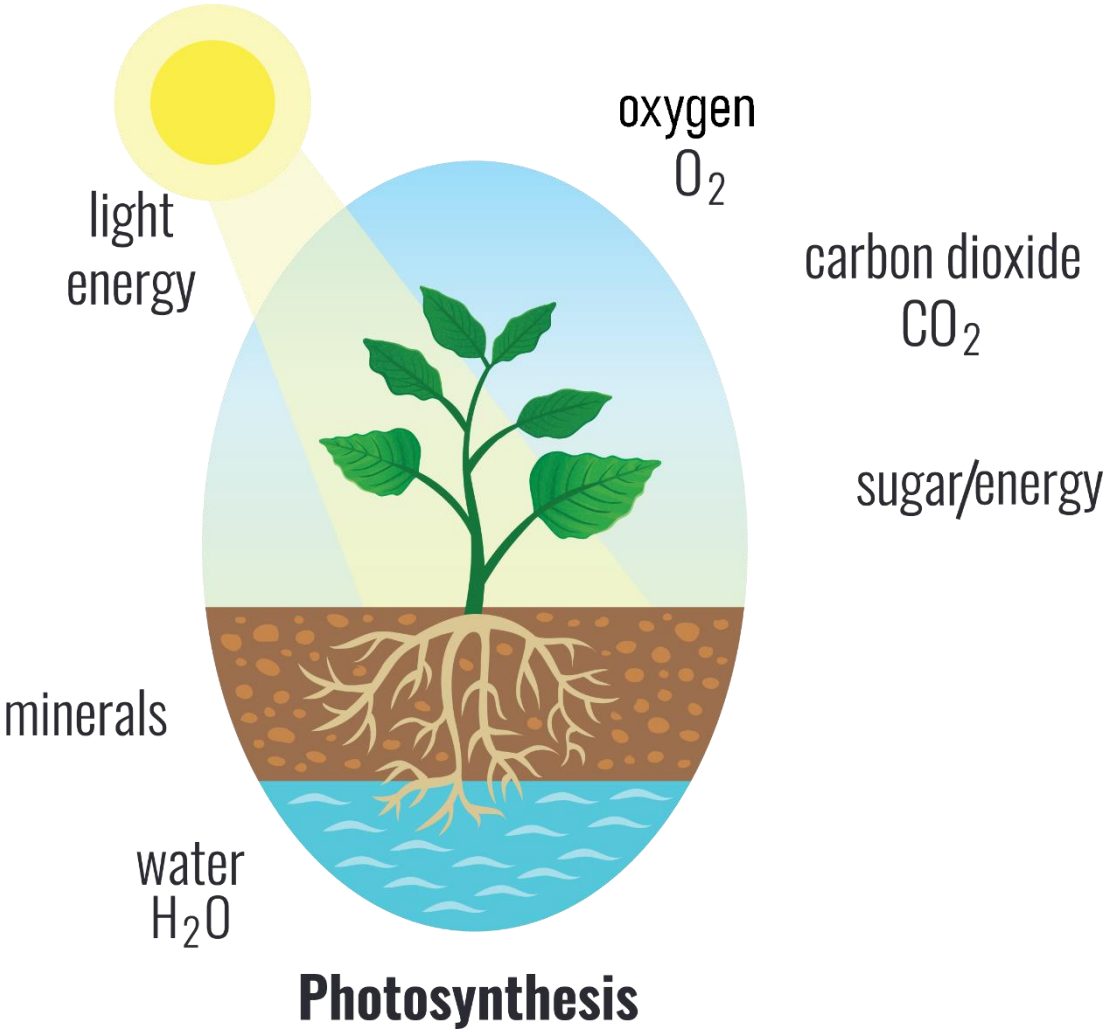
Plants make energy from sunlight that they absorb through their leaves. The process is called photosynthesis. The water that plants take up through their roots is used along with carbon dioxide from the air and minerals from the soil to make energy for the plant to grow.

Complete this expression of photosynthesis:

_____ + _____ -> (in the presence of _____) -> glucose/sugar (energy) plus water

In the process of making energy, plants release oxygen into the air. We need oxygen to survive, so the more plants are making energy, the more oxygen there is for us!

Add arrows to this diagram to show how plants use sunlight to make energy.



Research how farmers ensure plants grown in greenhouses and in hydroponics glasshouses receive sufficient sunlight?

.....

.....

.....

.....

.....

.....

.....

.....

Photosynthesis can be modelled and observed in a number of ways:

1. Place a plastic bag over a limb on a tree outside and tape it up so that there is no gas exchange. After a couple of days you will see water in the bottom of the bag. This water is released during photosynthesis and pools at the bottom of the bag due to condensation.
2. Submerge a plant part (leaf or small branch) in water. After a couple of hours bubbles around the edge of the leaf will form, the bubbles are oxygen produced during photosynthesis.
3. Observe a plant in a terrarium- over time if not opened the plant will produce its own water, carbon dioxide, oxygen etc with only external input being sunlight.

Run one of these and record a summary of your observations here:

.....

.....

.....

.....

.....

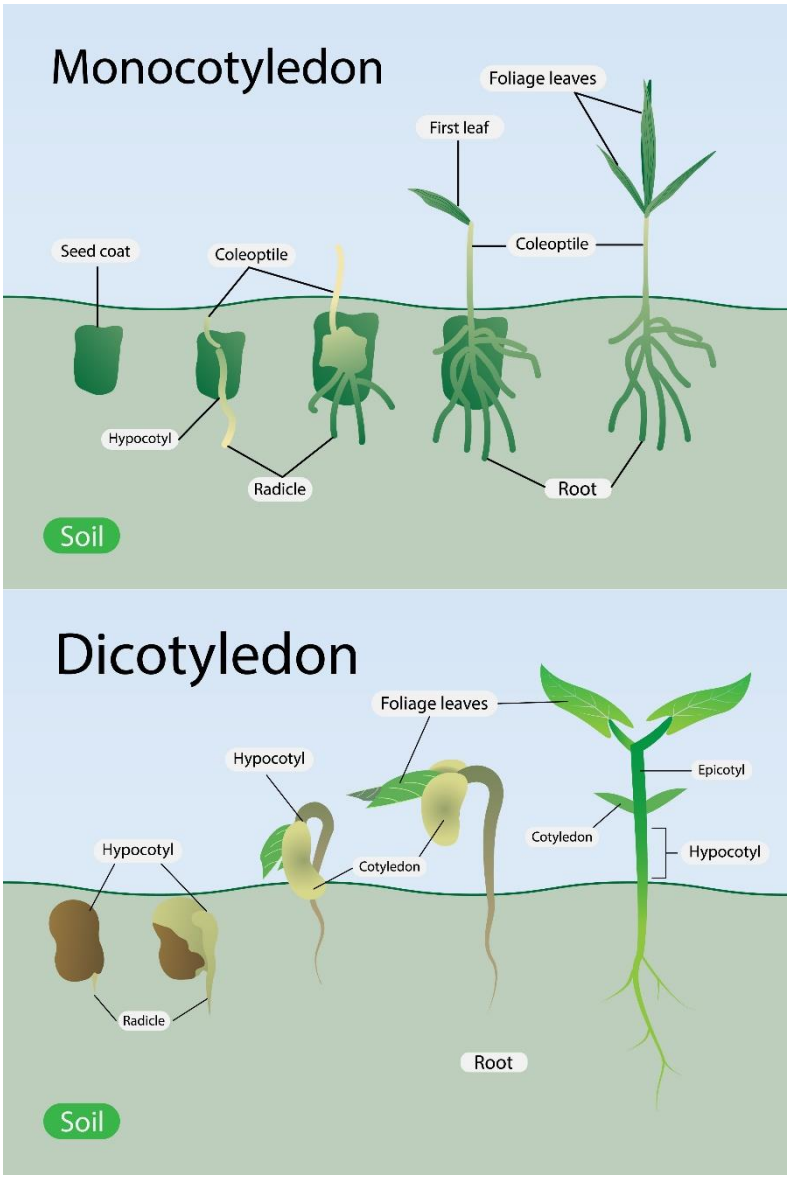
.....

## Plants

Food is consumed from different parts of plants. We harvest the fruit of some plants, the seeds of others, flowers, roots of others and some we use the stem.

The part of the plant that we use and the plant's life cycle determine how and when a plant can be grown. Certain plants are better suited to some climatic regions and soil types and others require particular equipment which may mean that farmers are limited in their ability to grow that plant.

Angiosperms or 'true flowering plants' include more than 955 of all plants. Most agricultural and food crop species are angiosperms. Angiosperms are divided into monocotyledons and dicotyledons.




Examples of monocots include:

- Banana
- Coconut
- Garlic
- Maize / Corn
- Pineapple
- Rice

Examples of dicots include:

- Tomato
- Strawberry
- Mango
- Beans
- Apple trees
- Lentils
- Avocado

Research the following plants and record which part/s of the plant we commonly consume and how it grows. Remember the parts of a plant include stem, leaf, fruit, roots and seeds and the type of plant could include trees, bushes and grasses. Record some others of your choice.

| **Food** | **Type of plant** (monocot or dicot, tree, grass, shrub etc) | **Part of the plant consumed** |
|---|---|---|
| Apple | | |
| Celery | | |
| Beetroot | | |
| Strawberry | | |
| Spinach | | |
| | | |
| | | |
| | | |

There is a variety of ways that farmers increase yield. Research each of the following and describe how each innovation helps to ensure crop yield (think about the growing needs of the plants):

Irrigation

.....

.....

Greenhouses

.....

.....

Fertiliser

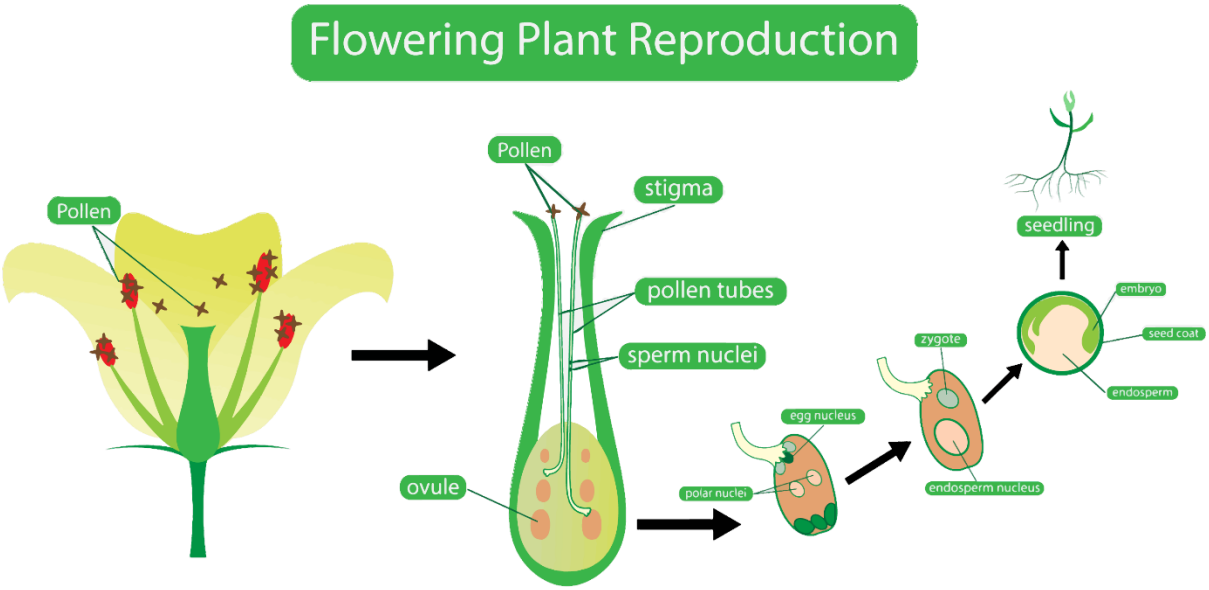
.....

## Insects

The life cycle of different insects means the role they fulfil in the garden varies. For example:

- insects that lay their eggs underground aerate the soil as they burrow, roots and seeds need oxygen to perform their function within the soil, keeping the soil aerated also encourages water infiltration,
- insects that feed on organic matter in the soil help to break this down and make the nutrients available to plants,
- insects that feed on other insects help to keep the population of those insects in control, including insects that can be detrimental to plants and crops,
- insects that require pollen and nectar from flowers pollinate flowers as they move from flower to flower, without pollination many plants would not produce fruit.

Pollination is a form of sexual reproduction. Fruit and seeds form as part of plant reproduction as shown in this diagram.




The roles described above are beneficial roles. A relationship between species that benefits both species is called symbiotic. Relationships between species can also be detrimental to one or both species.

An important part of gardening and farming is controlling the population of detrimental insects – or pests. In agriculture the practice of encouraging beneficial species is part of integrated pest management (IPM). Find out more about IPM online, including the work of the NSW DPI at https://www.dpi.nsw.gov.au/search?query=ipm.

Describe IPM and how it could be applied in your garden:

.....

.....

.....

.....

.....

.....

.....

Limiting the movement of pests species into Australian and between growing regions is part of biosecurity and is a major focus of government departments including the NSW Department of Primary Industries. The top 20 least wanted pests at listed on the Australian Government  Department of Agriculture, Water and Environment's website https://www.agriculture.gov.au/pests-diseases-weeds/plant.

## Complete a survey of your garden.

To be comprehensive a survey will need to be completed at different times of the day and ensuring that you observe different parts of the plant ie check under leaves, and along the stem as well as on flowers and leaves. Some insects will work mostly along the surface of the soil so check there as well. Use the template on the next page to record your observations.

Are there plenty of beneficial insects present? Research ways to encourage beneficial insects and make a plan for your garden.

.....

.....

.....

.....

.....

.....

## Observation template

Name: _____ Date: _____

Location name, features and description _____

Describe the area (ie plants, buildings, water nearby, shelter or shade etc) or draw a map

.....

.....

.....

.....

.....

.....

.....

Time of day _____ Weather _____

| Type of insect | Number observed | What were they doing? |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

Observation record number_____of _____

Next observation planned: _____

# Food

## Fruit and vegetables

The difference between fruit and vegetables is a botanical one. Fruit only grows on flowering plants. This make sense when you know that a fruit is the reproductive part of a plant that contains seeds – or seedpod - seeds are the method of reproduction. Vegetables are all other edible parts of a plant. Zucchini and tomatoes are technically fruit.

List some of the fruit and vegetables that you eat – you might need to reconsider your understanding of fruit and vegetables.

| Fruit | Vegetables |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |
| | |

View this video to work out if you are right.
https://youtu.be/a6nKRTG-L4k

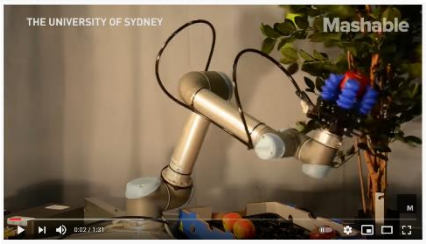

The role of farmers in agriculture and horticulture is to maximise the sustainable production of plants. Remember our global goal is to increase food production by around 70% in order to be able to feed the anticipated world population of 9.1 billion people by 2050. Science, technology and innovation are helping us to achieve this goal.

Watch these videos about innovations in agriculture and answer the following questions for five of the crops shown in the videos.

Hydroponic tomatoes in Victoria
https://youtu.be/5Fq6PQl7fr8

Growing Tomatoes Indoors With 94% Less Water And No Soil

Robotic Farming of the Future
https://youtu.be/NO8PmqEI0cc



Robotic Farming of the Future

The Future of Farming
https://youtu.be/Qmla9NLFBvU
Note: plant innovations 0.00 – 04.37, animals 04.37 – 08.51, industry innovations eg genetic modification 08.51-12.00.


The Future of Farming

**Product grown**: .....

What time of year is it naturally in season: .....

What limitations are experienced by farmers in outdoor, natural growing situations?

.....

.....

How do the innovation/s in the videos improve sustainability of production?

.....

.....

.....

**Product grown**: .....

What time of year is it naturally in season: .....

What limitations are experienced by farmers in outdoor, natural growing situations?

.....

.....

.....

How do the innovation/s in the videos improve sustainability of production?

.....

.....

.....

.....

.....

---

**Product grown**: .....

What time of year is it naturally in season: .....

What limitations are experienced by farmers in outdoor, natural growing situations?

.....

.....

.....

How do the innovation/s in the videos improve sustainability of production?

.....

.....

.....

.....

---

**Product grown**: .....

What time of year is it naturally in season: .....

What limitations are experienced by farmers in outdoor, natural growing situations?

.....

.....

.....

How do the innovation/s in the videos improve sustainability of production?

.....

.....

.....

.....

.....

---

**Product grown**: .....

What time of year is it naturally in season: .....

What limitations are experienced by farmers in outdoor, natural growing situations?

.....

.....

.....

How do the innovation/s in the videos improve sustainability of production?

.....

.....

.....

.....

---

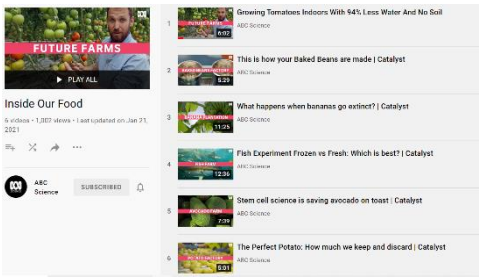
Consider your school ag plot or garden. Design a way to improve the efficiency of the garden and write a pitch for your Principal. If you don't have an ag plot or garden in your school, pitch the idea to develop one including how it can contribute to school learning and events.

Watch these videos for ideas.

Can we create the "perfect" farm? - Brent Loken
https://youtu.be/xFqecEtdGZ0

Can we create the "perfect" farm? - Brent Loken

Inside our Food series on ABC Science channel
https://youtube.com/playlist?list=PLJI8aSIWm2aCNo_4aA3MCaEDW0xmTOY6-




Record your ideas:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

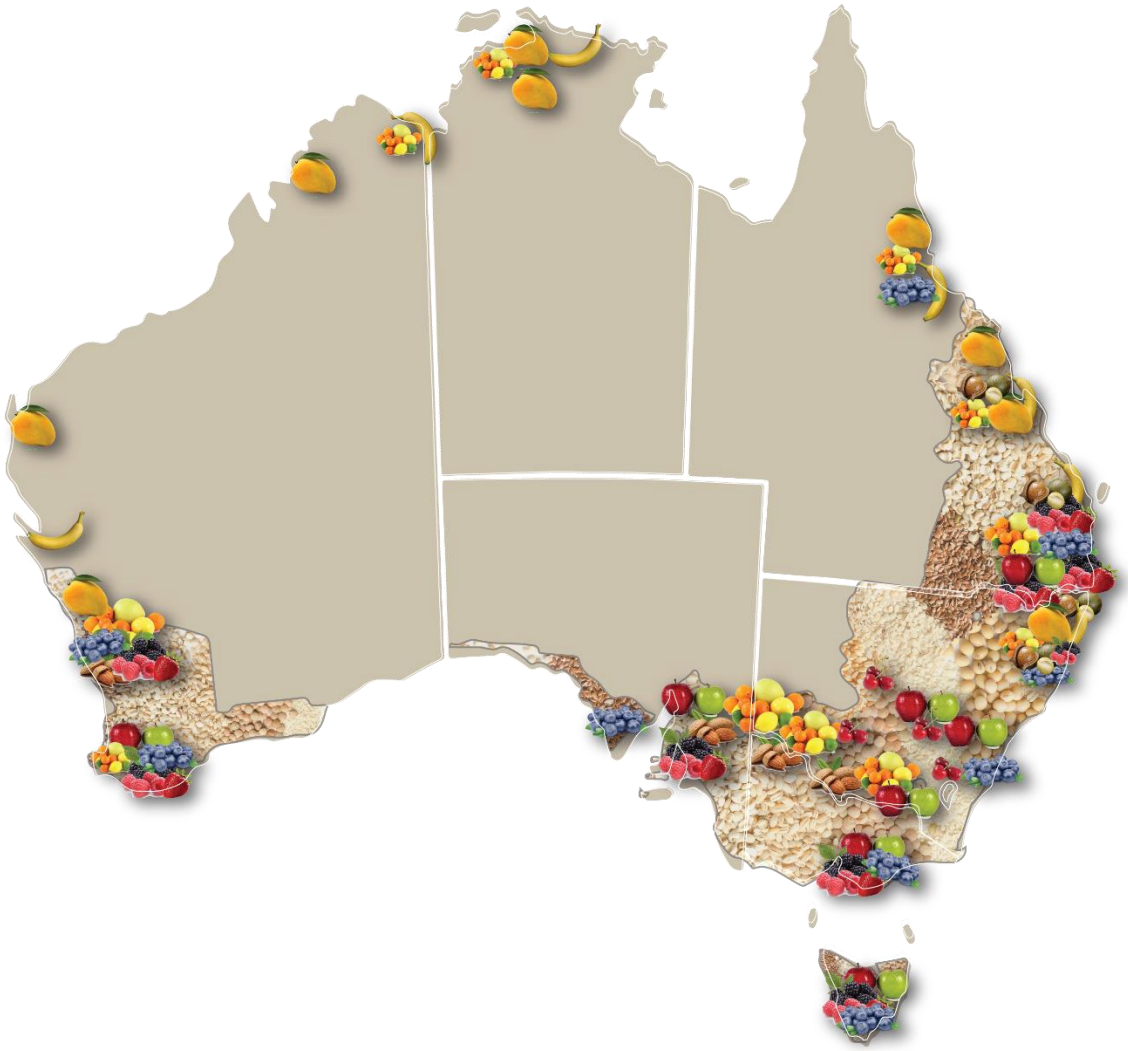
# Temperature

## NSW Growing regions

Plants grow best in particular climates and soils and the goal of agriculture and horticulture is for highly productive, sustainable and efficient production. Weather and climate vary around the state and around Australia, so do soils and rainfall. So it makes sense that there are areas that are suited to broad scale cropping of pulses and cereals and others that are suited to producing fruit and vegetables, and other areas that are not suited to growing food.

Food is grown around NSW (as well as Australia and the World) in regions that are best suited to the conditions required by the plant or animal. To maintain food availability around the world and at different times of the year food is exported to other countries and we import foods from about the world.

The map below gives a general indication of the major growing regions in Australia for a range of fruits, vegetable and grains (information sourced from industry websites listed below).



Research at least four of the fruits, vegetables or grains from the map and identify what factors of the growing region make it suitable to producing that product. Consider the factors of the growing environment you have studied in previous lessons and the image of Australia – showing vegetation - to guide your response.

Your research should also include technology that helps producers in meeting market demand outside of natural growing seasons and adapting to changing weather conditions. This could be being addressed either on the productions side or the storage and consumer side of the supply chain.

The following links will assist your research, or choose product of your own interest.

Apples https://www.aussieapples.com.au/about/#majorgrowingregions

Citrus https://citrusaustralia.com.au/growers-industry

Bananas https://australianbananas.com.au/Pages/all-about-bananas/the-banana-story

Berries https://berries.net.au/

Cherries https://www.cherrygrowers.org.au/nsw/

Grains https://grdc.com.au/about/our-industry/growing-regions

Macadamias https://www.australianmacadamias.org/industry/about/about-the-macadamia-industry

Almonds https://australianalmonds.com.au/almond-story/?v=6cc98ba2045f

Mangoes https://mangoes.net.au/about-australian-mangoes/where-do-my-mangoes-come-from/

Vegetables https://ausveg.com.au/resources/economics-statistics/veggie-stats/

**Product / fruit / vegetable / grain**: .....

Where is it grown in NSW? .....

What sort of plant does it grow on? .....

What type of soil does the plant prefer? .....

.....

Does the plant have specific water requirements? .....

.....

.....

What are the climatic features of the region that make it suitable for growing this product?

.....

.....

.....

How is technology changing availability of this product? .....

.....

.....

---

**Product / fruit / vegetable / grain**: .....

Where is it grown in NSW? .....

What sort of plant does it grow on? .....

What type of soil does the plant prefer? .....

.....

Does the plant have specific water requirements? .....

.....

.....

What are the climatic features of the region that make it suitable for growing this product?

.....

.....

.....

How is technology changing availability of this product? .....

.....

.....

---

**Product / fruit / vegetable / grain**: .....

Where is it grown in NSW? .....

What sort of plant does it grow on? .....

What type of soil does the plant prefer? .....

.....

Does the plant have specific water requirements? .....

.....

.....

What are the climatic features of the region that make it suitable for growing this product?

.....

.....

.....

How is technology changing availability of this product? .....

.....

.....

**Product / fruit / vegetable / grain**: .....

Where is it grown in NSW? .....

What sort of plant does it grow on? .....

Does the plant have specific water requirements? .....

.....

.....

What are the climatic features of the region that make it suitable for growing this product?

.....

.....

.....

How is technology changing availability of this product? .....

.....

.....