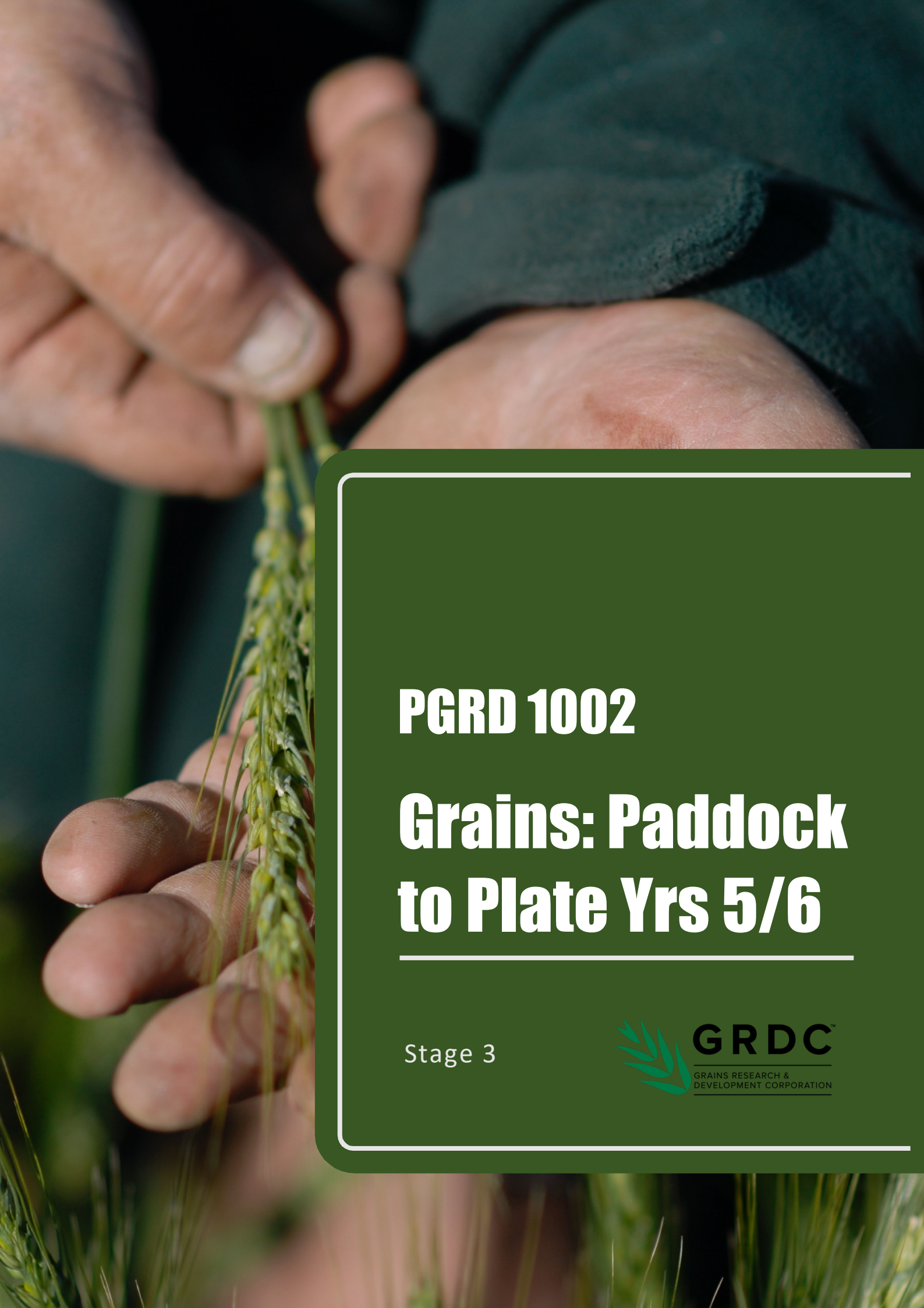


PGRD 1002

Grains: Paddock to Plate Yrs 5/6

Stage 3

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

Instructions for Students

GRAINS: PADDOCK TO PLATE

YEARS 5/6

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

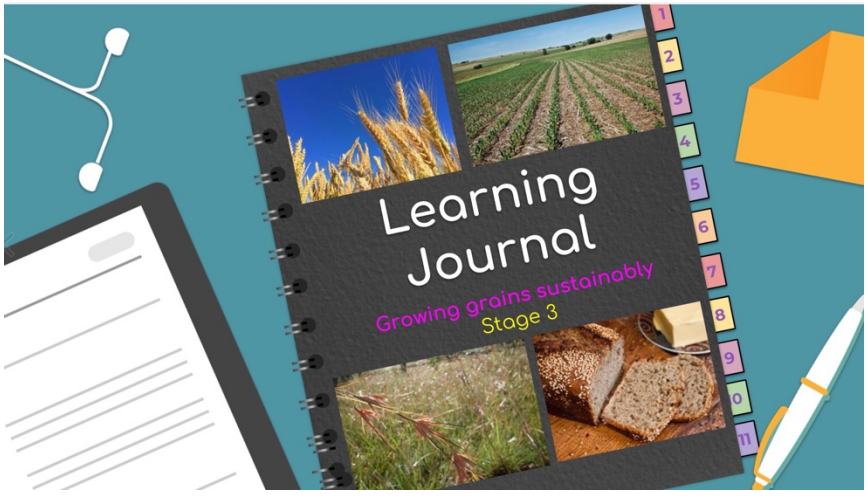
This course will consist of seven online lessons (plus an optional extension lesson). Each lesson will require you to read or view important information.

Some lessons will require you to complete quizzes based on the information you have learnt. To pass each quiz, a score of at least 80% will be needed to progress to the next lesson. Other lessons will outline hands-on activities, experiments or design tasks that can be completed in the classroom.

In each lesson, you will be asked to reflect on and record your work in the learning journal, a PowerPoint, which you can submit to your teacher at the end of the course.

Save the Learning Journal to Your Computer:

- PowerPoint: LearningJournal-Grains-56.pptx



The learning journal can be used in the following ways. You may choose to:

- Save the PowerPoint document in the Google Drive. The document can be opened and edited at any time in Google Slides. Changes will be saved automatically. At the completion of the online course, you can email your teacher with a link to their learning journal as evidence of work completed.

- Save the PowerPoint document on the computer. The document can be opened, edited, and saved at any time. At the completion of the online course, you can email your teacher with the PowerPoint document attached as evidence of work completed.
- Open the PowerPoint document, download and print the pages. Record learning with hand-written responses. At the completion of the online course, you can submit the hard copy of their work to your teacher as evidence of work completed.

Instructions for Teachers

The table below outlines the content and structure of the course, with links to the NSW and Australian Curriculums.

Lesson	Learning Content	Learning Tasks	NSW Curriculum links	Australian Curriculum links
1	What Are Grains?	LJ* activity 1 Research task	ST3-5LW-T	ACTDEK021
2	Sustainability in Grain Growing	LJ activity 2 Interactive quiz	ST3-5LW-T CCP**: Sustainability	ACTDEK021 CCP: Sustainability
3	Building and Maintaining Soil Health	LJ activity 3 2 x Hands-on tasks	ST3-5LW-T ST2-1WS-S CCP: Sustainability	ACTDEK021 ACSIS086 CCP: Sustainability
4	Managing Water Wisely	LJ activity 4 Hands-on task	ST3-5LW-T ST2-1WS-S CCP: Sustainability	ACTDEK021 ACSIS086 CCP: Sustainability
5	Promoting Biodiversity	LJ activity 5 Interactive quiz	ST3-5LW-T CCP: Sustainability	ACTDEK021 CCP: Sustainability
6	Indigenous Perspectives Part 1	LJ activity 6 Interactive quiz	ST3-5LW-T CCP: Sustainability CCP: ATSI Histories & Cultures	ACTDEK021 CCP: Sustainability CCP: ATSI Histories & Cultures
7	Indigenous Perspectives Part 2	LJ activity 7 Research task	ST3-5LW-T CCP: Sustainability	ACTDEK021 CCP: Sustainability

			CCP: ATSI Histories & Cultures	CCP: ATSI Histories & Cultures
Extension lesson (optional)	Write Your Own Enviro-Story	Writing task	ST3-5LW-T EN3-1A EN3-2A CCP: Sustainability	ACTDEK021 ACELY1704 ACELY1714 CCP: Sustainability

* LJ = Learning Journal **CCP = Cross-curriculum priority

Resources required for the hands-on learning tasks in this course are outlined below:

Lesson 3	Hands-on Learning Task 1: What Type of Soil is at Your Place? • Golf ball sized amount of soil • Small amount of water
Lesson 3	Hands-on Learning Task 2: What's in Our Soil? • Clear bottle, half-filled with water • Soil (1-2 cups) • Funnel
Lesson 4	Hands-on Learning Task: Building Contour Banks • Sand tray/ sand pit/ garden bed • Hand trowel • Watering can

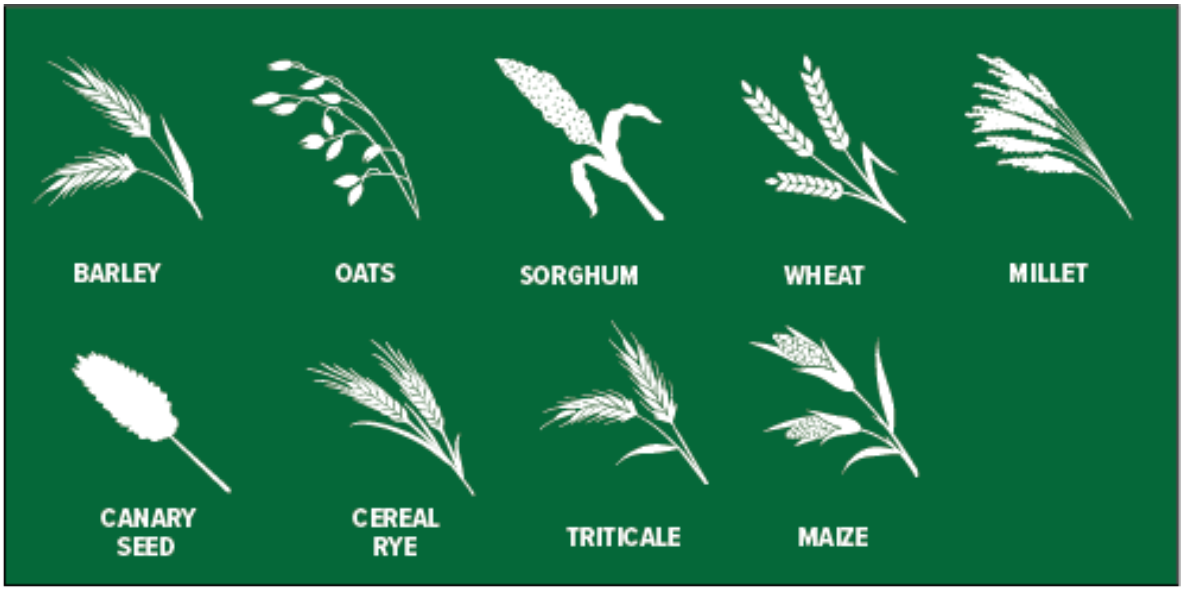
What Are Grains?

Growing Grains In Australia

Grains are the edible seeds of specific grasses belonging to the Poaceae (also known as Gramineae) family.

There are many different types of grains that are grown in Australia. The image below shows the grains that are most commonly grown:

Cereals and coarse grains:



Activity 1

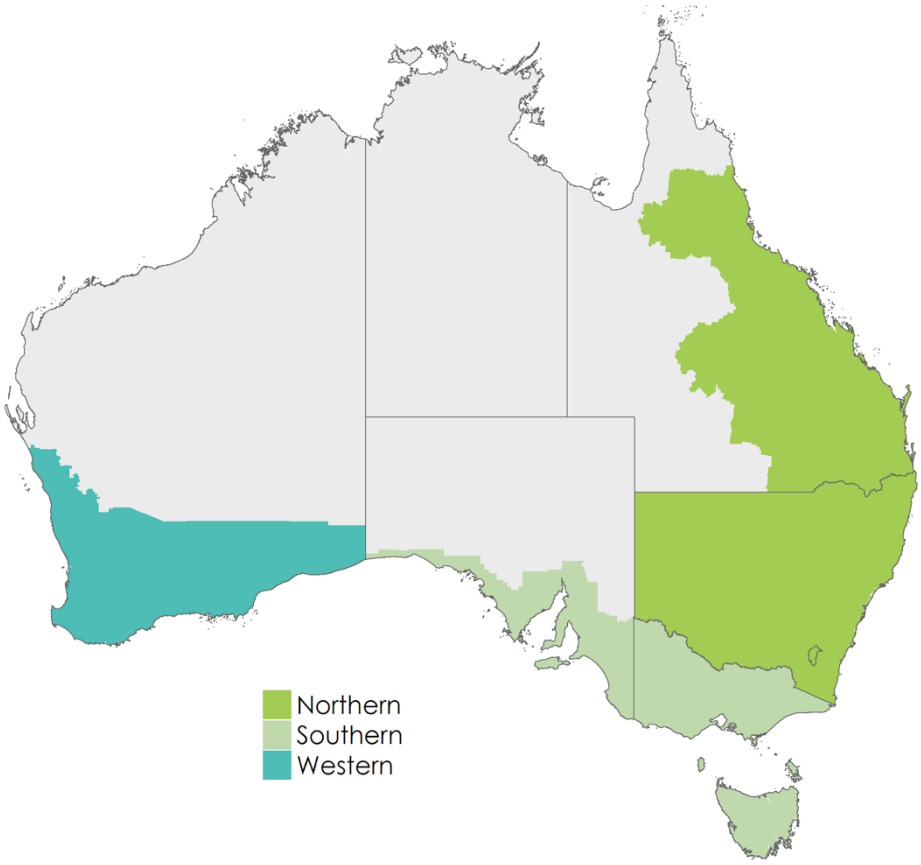
Complete the following questions in your Learning Journal - Activity #1.

There are three main regions in Australia that grow and produce grains for both the domestic (Australian) and international (overseas) markets.

These regions are broadly known as the Northern, Southern and Western grain growing regions, and can be seen on the map on the next page.

1. Answer these questions:

- Which of the grains in the list have you heard about?
- Are there any that you have never heard of?
- Locate the area where you live on this map. Are you in a grain growing region? If so, which one? (Northern, Southern, Western)
- Why do you think these regions are particularly suitable for grain growing? Why are the Central and North-Western regions less suitable?



Source: GRDC grain regions

Grains As A Part Of A Healthy Diet

There are many foods people eat daily that have been made from grains. These foods form an important component of our daily dietary requirements, providing us with fibre, carbohydrates, and protein.

Look at the diagram below from the Australian Guide to Healthy Eating, which outlines the five main food groups and the quantities of each recommended for a healthy, balanced diet.

Activity 2

Complete the following questions in your Learning Journal.

- List as many foods from the grains food group as you can.
- Which foods from the grains food group do you regularly eat?
- Which two food groups is it recommended that we eat the most of?

Turning Grains Into The Food We Eat

The process by which we grow products and turn it into the food we eat is sometimes described as the paddock to plate journey.

Grain growers sow (plant) their crops and look after them as they grow through the following months. Weather conditions, soil nutrition and pest control are important factors to consider during this time.

When the crop is ready, the growers will harvest the grain. It might be sold to food production companies for use in Australia or overseas or used as stock (farm animal) feed. Some grains will need to be milled before they can be sold to the customer (for example, wheat is milled to turn it into flour).

Watch the video Stories about people who produce our food and fibre to gain a better understanding about the paddock to plate journey of grain products. You will meet a grain grower who grows a range of crops on his farm, including wheat, barley, canola and broad beans. You will also learn about the milling process of oats, which turns oat grains into the rolled flakes we use in food products such as breakfast cereals and porridge.

Link: https://www.youtube.com/watch?v=iipJdcpseUs

Research Task

Wheat, barley, and oats are three important grain crops grown in Australia. Choose one of these crops and conduct your own research into the paddock to plate journey of the grain - how does it go from being a plant on a farm to the food on our plates? Use the questions found in Learning Journal (in the PowerPoint) as a guide to your research.

Learning Journal Activity #1

1. Open your learning journal and click on/turn to Lesson 1

2. Answer the 'reflection questions' provided in this lesson.

3. Complete your research task on either wheat, barley, or oats. Use the questions provided in the learning journal to guide your research.

Sustainability in Grain Growing

What Is Sustainable Cropping?

The term 'sustainability' refers to the ability to meet the needs of the present without compromising the ability of future generations to meet their needs.

Sustainability has become an increasingly important issue in grain, oilseeds and pulses farming. Sustainable farming can be viewed from a variety of perspectives:

ENVIRONMENTAL SUSTAINABILITY acknowledges that it is essential to maintain the health and survival of the natural environments in which we farm our grains. Environmental sustainability in agriculture means looking after the land and the natural systems and resources that farms rely on.

Some of the key factors to consider include:

- building and maintaining healthy soil.
- managing water wisely.
- promoting biodiversity.

In this video we hear from a farmer about why environmental sustainability issues are so important to the future of farming: Sustainability in Farming is Critical

ECONOMIC SUSTAINABILITY means that farms are managed in a way that will ensure the owners will continue to make a profit (make more money than they spend) over a long period of time. Farms may not make money every year, especially when faced with challenges such as drought or floods, however a long-term aim of making a profit, with established systems in place to support this goal, is essential to their ongoing operation.

SOCIAL SUSTAINABILITY refers to a variety of factors relating to the people involved in farming.

Such factors may include:

- the physical and mental health of farmers, growers and their families.
- ongoing training and education for farmers and growers.
- equal opportunities for all people to become involved in farming.
- being a member of healthy, supportive communities for farmers and growers.

Lesson 2: Activity 1

Read A Farming Family - The Story of the Hickson family's Farm near Mungindi, NSW.

They grow crops such as wheat, barley, chickpeas, faba beans, lucerne and sorghum. They also farm sheep and cattle.

As you read, take notes on the different environmental, economic, and social factors that the Hickson family are faced with in their quest to ensure their farm remains sustainable. You can record your ideas in learning journal activity 2.

1. Open your learning journal and click on/turn to Lesson 2

2. Record your observations about the different environmental, economic, and social factors that the Hickson family (in the enviro-story: A Farming Family) are faced with in their quest to ensure their farm remains sustainable.

What Can Grain Growers Do to Improve Environmental Sustainability?

As already identified in this lesson, sustainability in farming relates to a variety of factors including the environment, economy and people.

This unit will now take a more in depth look at sustainability from the perspective of the environment. Lessons 3, 4 and 5 will allow you to learn more about some of the practices that grain growers are using to ensure the environmental impact from growing grain is reduced.

Quick Quiz 1

What does the term ‘environmental sustainability’ refer to in relation to farming?

a. Farms are managed in a way that will ensure its owners will continue to make a profit (make more money than they spend) over a long period of time.
b. A variety of factors relating to the people involved in farming, including health, education, equal opportunities and supportive communities.
c. Acknowledgement that it is essential to maintain the health and survival of the natural environments in which we farm.
d. All of the above

What does the term ‘sustainability’ refer to?

a. Ensuring your economic needs are met and you have enough money to continue working.
b. Ensuring you have the ability to meet the needs of the present without compromising the ability of future generations to meet their needs.
c. Ensuring all aspects of the environment remain unchanged forever.
d. Ensuring that the needs of plants and animals are considered more important than the needs of humans.

What does the term ‘economic sustainability’ refer to in relation to farming?

a. Farms are managed in a way that will ensure its owners will continue to make a profit (make more money than they spend) over a long period of time.
b. A variety of factors relating to the people involved in farming, including health, education, equal opportunities and supportive communities.
c. Acknowledgement that it is essential to maintain the health and survival of the natural environments in which we farm.
d. All of the above

Why do the Hickson family diversify (have a range of different farming enterprises) on their property?

a. In case one farming enterprise has a bad year financially.
b. To keep things interesting.
c. Because they couldn’t decide which one they liked best.
d. Because they have so much land.

Read the enviro-story entitled A Farming Family. Which farming enterprises are the Hickson family involved
in?

a. Sheep
b. Cattle
c. Dryland cropping
d. All of the above

Watch the video entitled Sustainability in farming is critical. What does farmer, Ken Baldry, say is one of the key factors for improving biodiversity on farms?

a. Stopping grain production.
b. Conserving water.
c. Stopping pesticide use.
d. Planting more trees for habitat.

What does the term ‘social sustainability’ refer to in relation to farming?

a. Farms are managed in a way that will ensure its owners will continue to make a profit (make more money than they spend) over a long period of time.
b. A variety of factors relating to the people involved in farming, including health, education, equal opportunities and supportive communities.
c. Acknowledgement that it is essential to maintain the health and survival of the natural environments in which we farm.
d. All of the above

Soil Health - Building and Maintaining Soil Health

What Is Soil and Why Is It Important?

Soil is the upper layer of the earth in which plants grow. It is a mixture of minerals, water, air, organic matter, organisms and the decaying remains of plants and animals.

The health of the soil is critical to how well all crops will grow. It provides structural support to the plants as they grow and provides them with the nutrients and water they need for survival.

Read Why do plants need soil to learn more about why looking after our soil is so important.

How Do Grain Growers Look After The Soil on Their Farms?

There are many ways that grain growers look after the health of their soil. Some of these include:

No-Till Farming

Tilling is the process of digging up the soil before planting seeds. To preserve soil moisture, over 90% of Australian grain growers are choosing to no longer till their soil before planting their seeds every year. Instead, these growers choose to use a no-till method and plant directly over the plant stubble left over from previous crops. There are several reasons that grain growers might choose no-till practices:

- The soil structure remains intact, meaning it is not as easily blown away by strong winds or washed away by heavy rains. This reduces the chance of erosion.
- Microorganisms, fungi, and bacteria in the soil are left undisturbed and can feed off the soil's organic matter. They are very important for the soil's health.
- Evaporation processes are slowed down, which means the soil can hold more moisture for a longer period. This is very important for the crop, which relies on soil moisture to grow.

Reducing Pesticide Use and Providing Habitat For 'Beneficials'

Pests can be a real problem for grain growers. Insects or mice can damage or destroy plants and can sometimes eat entire crops! Pesticides (chemicals that kill or repel pests) might be used on farms to ensure this doesn't happen.

If pesticides are overused, they can cause a problem to the health of the soil. Ways they may do this include:

- Reducing the abundance and diversity of organisms in the soil needed for a healthy ecosystem
- Impacting on other animals and birds that help maintain the structure and fertility of the soil
- Contaminating the water and the air in and around the soil.

In the story Pest Troubles, Robert and Cooper's crops are being impacted by problem insects. Read about the ways in which they try to solve this problem while also protecting the health of the soil and their environment.

https://www.envirostories.com.au/wp-content/uploads/pdf/2014028PestTroubles.pdf

Cover Crops

Cover crops can be planted in a paddock once the grain crop has been harvested. Cover crops are planted to cover the soil, specifically for the purpose of protecting it and keeping it healthy. However, cover crops require a lot of soil moisture, making it difficult to grow cover crops in drier regions.

Rotating Crops

Many grain growers choose to rotate the crops that they grow in a paddock as a way of ensuring the soil remains healthy. Rather than growing the same crop in the same place year after year, different crops are rotated over a period of time. This ensures different nutrients are being put into the soil throughout the year, which improves the structure and the fertility of the soil.

For example, growing a pulse crop such as chickpeas, lentils or beans after growing cereals can help boost soil nitrogen and improve soil biology. Pulses have symbiotic relationships with some nitrogen-fixing bacteria that help the plant absorb nitrogen from the air and store it in the soil. This means that farmers do not have to buy as much fertiliser for the next cereal crop while they make money from selling their chickpeas or beans.

Precision Agriculture

One of the biggest ways in which farmers have been able to reduce the use of fertiliser and to increase their crop yields has been by integrating high-tech features into their farm machinery. Farmers measure how much grain comes off each area of the paddock using monitors in the harvesters, and then calculate how much fertiliser needs to be replaced in each area at planting in the following year. The tractors steer themselves using GPS and adjust the fertiliser and seed rates on the go to precisely place the correct amount on each area of the paddock. Have a look at this short video that explains how precision agriculture works:

https://education.abc.net.au/home#!/media/524433/feeding-soils-to-grow-hungry-crops

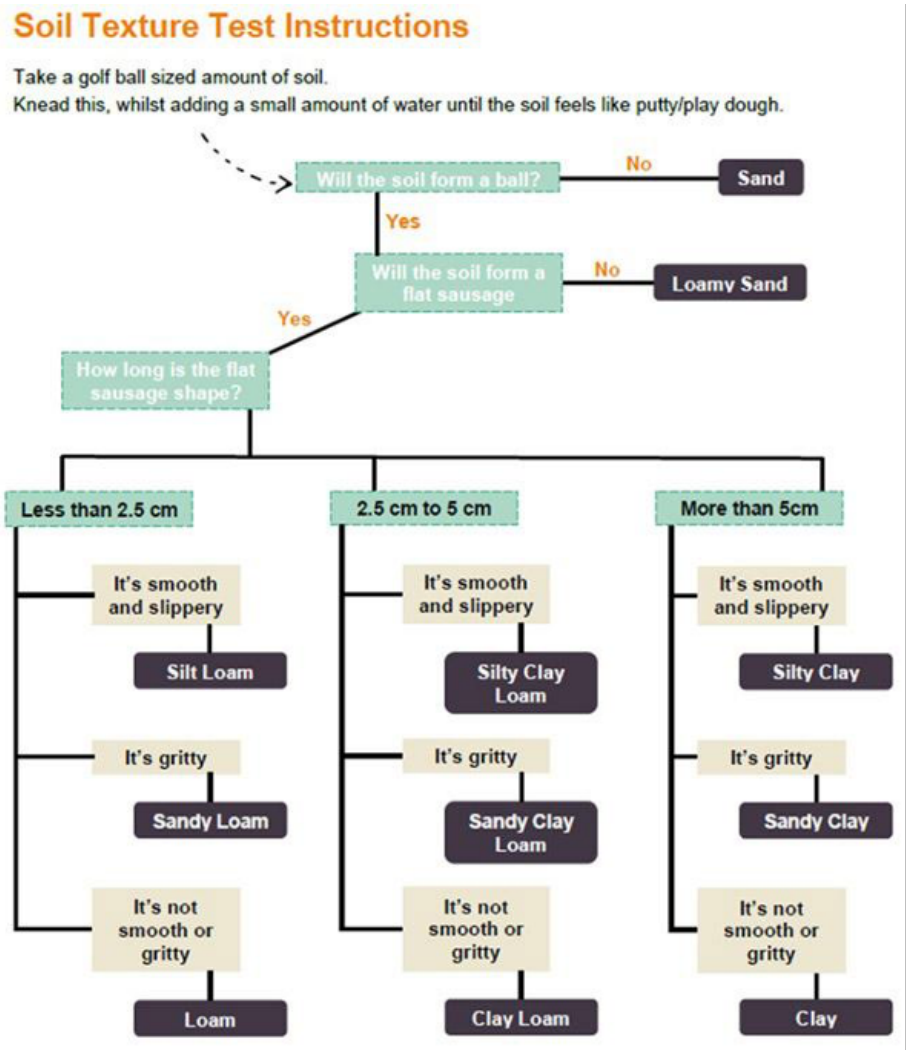
These are just a few examples of the sustainable farming methods grain growers might use in order to build and maintain the health of their soil.

Lesson 3: Hands-on Task - Investigating Soil

Task 1 - What Type of Soil Is at Your Place?

There are many different types of soil. Grain growers need to have a good understanding of all the different types of soil on their farm. Knowing the type of soil you have can inform decisions about plant choice, use of water and the possible need to add nutrients. Use the instructions on the simple flowchart below to have a go at identifying the type of soil in your school / backyard.

1. Watch the following video for more background information:
    a. https://education.abc.net.au/
2. Describe your findings in Learning Journal Activity #3.



Source: RHS Campaign for School Gardening

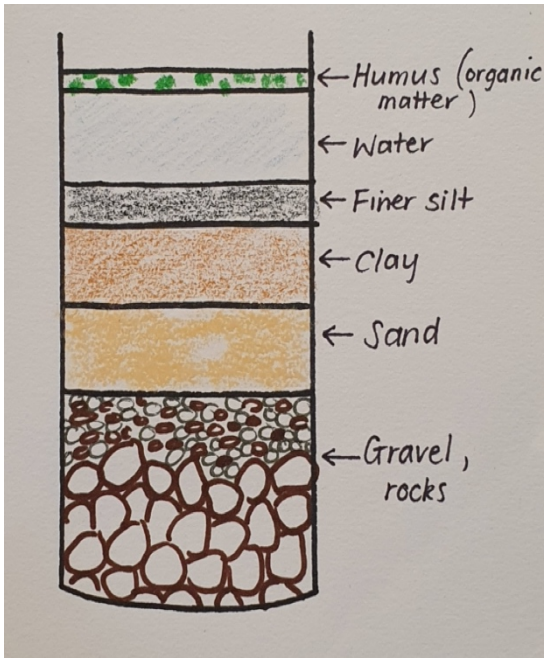
Task 2: What's in Our Soil?

Our soil is made up of a range of particles which all play a special role in helping plants to grow. It can be hard to distinguish between all these particles when they are mixed. This simple experiment will allow you to separate the particles to get a better understanding of what is in our soil.

Equipment	Method
• Clear bottle, half-filled with water • Soil (1-2 cups) • Funnel	1. Place the funnel in the top of the bottle 2. Pour soil through the funnel so it mixes with the water inside 3. Shake the bottle so that soil and water are mixed well 4. Leave the bottle overnight 5. Look at the bottle the following day to discover the different matter within your soil

Over time, the heavier particles will sink to the bottom of the bottle and the lighter particles will float above, allowing you to see the layers of soil (sand & gravel, clay, finer silt, and humus).

1. In learning journal activity #3, research and record information about the role that each of the layers of soil plays in helping plants to grow.



Learning Journal Activity #3

1. Open your learning journal and click on/turn to Lesson 3

2. Record your findings from Hands-on Task 1.

3. Using the Internet, research the role that each of the layers of soil plays in helping plants to grow to complete Hands-on Task 2.

Managing Water Wisely

Why Is It Important to Manage Water Wisely?

Water is arguably the most valuable natural resource on our planet as it is essential to the survival of all living things.

As with all plants, regular watering is critical for a healthy grain crop to grow. In Australia we have been experiencing increasingly hotter and drier conditions for longer periods of time.

These weather patterns have meant that grain growers have needed to consider the important issue of water sustainability. Growers have addressed this issue in several ways, including by reducing water use and catching and storing as much rainwater as possible in their soil by increasing the capacity of the soil to hold water, for example through no-till farming.

Capturing and Storing Water in the Soil

One of the big risks with growing grain crops is that farmers never know when it will rain and whether they will get enough rain for the crops to survive.

Because of this, farmers work hard to ensure their soils can hold as much water as possible by improving the soil structure. Growing grains is tough during a drought, but farmers are still managing to harvest crops.

Watch this video to learn about it.

https://www.abc.net.au/news/2019-11-27/farmers-managing-in-drought/11739648?nw=0

Getting Better Results From Less Water

Drought-Tolerant Crops

Australian scientists are working hard to breed new grain varieties that require less water and can grow in drier weather conditions. These are what we call 'drought-tolerant' crops. Over the past 30 years, thanks to the hard work of plant breeders and more water-efficient ways of farming such as no-till farming, Australia farmers have become twice as water efficient.

This photo shows trial crops planted by the Grains Research and Development Corporation to test the growth of new grain varieties. Australian growers grow and export the grain that works with their regional conditions and that consumers in Australia and overseas like to eat.

Speeding Up The Development of Better Crops

The life cycle of crops is being sped up to develop new varieties so Australian farmers can minimise the effects of drought and climate change. The technique is designed to fast-track more robust crops to meet the food demands of a growing world population.

Read the following article & watch the video:

- https://www.abc.net.au/news/
- https://youtu.be/Ea-1rHCg9b4

Learning Journal Activity #4

1. Open your learning journal.

2. Answer the Lesson 4 questions about the video on speed breeding. You may also need to use the web to find answers.

3. Save your journal.

Promoting Biodiversity in Farming

What Is Biodiversity?

An environment that is rich with biodiversity supports the growth and survival of a variety of living things, including crops. These living things may include plants, animals, and microorganisms. It is essential to have a diverse range of life as all species have an important role to play in keeping their ecosystem healthy and productive.

This BTN story explores the importance of biodiversity and ways in which scientists are working to promote and protect it.

https://www.abc.net.au/btn/classroom/biodiversity-year/10537298

Why Is Biodiversity Important on Farms?

Biodiversity is sadly under increasing threat throughout the world due to the damage that has been done to natural habitats as the human population continues to grow.

More than 40% of the Earth's surface is used for agriculture, which places a large share of responsibility for protecting biodiversity in farmer's hands (Food and Agriculture Organization of the United Nations).

In this video, the CSIRO speak about why biodiversity is so important to the ongoing success of Australian grain, pulse & oilseed growers.

Watch: Australia's Biodiversity

Many growers believe that promoting biodiversity can bring a range of benefits to farms. Creating habitats that support various forms of life on farms can also help improve soil health, reduce erosion, enhance natural pest control and improve waterways.

Biodiversity Case Studies

Learn more about ways in which Australian farmers are promoting biodiversity on their farms by investigating the following case study.

Case Study: The Cameron Family

'Yallock' is owned by the Geddes family. It is located on the picturesque Four Mile Lane, 27 km north east of Holbrook, NSW. The word 'Yallock' means 'land of many springs'. At 'Yallock', the Geddes' farm sheep and crops. Find out more by reading their envirostory.

https://www.envirostories.com.au/wp-content/uploads/pdf/2019003Yallock.pdf

Learning Journal Activity #5

1. Open your learning journal and click on/turn to Lesson 5.
2. Answer the questions provided in response to the case study from this lesson.

Quick Quiz 2

What does the term ‘biodiversity’ refer to?

a. The growth and survival of a variety of living things.
b. The study of living things.
c. The growth and survival of a living thing.
d. The conservation and management of water.

According to the BTN story about Biodiversity Year, how many new species are being discovered every year?

a. 2,000
b. 10,000
c. 18,000
d. 32,000

What reason does the BTN story give regarding why the plants and animal species found in Australia are so
unique?

a. We have more plants and animal species than any other country.
b. We have more endangered species than any other country.
c. We have many species that don’t exist anywhere else on Earth.
d. We protect all our plant and animal species

According to the Food and Agriculture Organisation of the United Nations, what percentage of the Earth’s surface is used for agriculture?

a. 20%
b. 40%
c. 60%
d. 80%

How can promoting biodiversity benefit farming properties?

a. Improve soil health and reduce erosion
b. Enhance natural pest control
c. Improve waterways
d. All of the above

In the Case Study, who do the Geddes family work with to conserve and protect biodiversity of their property, ‘Yallock’?

a. Holbrook Landcare
b. Australian Conservation Foundation
c. Bush Heritage Australia
d. Worldwide Fund for Nature

Indigenous Perspectives

Grains from Native Grasses

Indigenous Australians have used grains for tens of thousands of years, particularly the use of seeds from native grasses that were ground for the purpose of baking. Some Aboriginal nations relied on native grasses for grain production. These nations actively managed grasslands using cultural burning and harvested, stored and ground grains for flat bread making.

There are many different native grains which have potential for development as crops across Australia. These grains include kangaroo grass, mitchell grass, bluegrass, native millet, warrego grass, and signal grass amongst others as well as some non-grass species such as lomandra seeds and pigweed seed.

The World's First Bakers

Many history books will tell you that the first people to discover that grinding grass seeds into flour to then bake into bread were the Egyptians. There is evidence that this was happening in Egypt somewhere between 12,000 - 17,000 years ago. Recent archaeological discoveries in Australia, however, suggest that this information is no longer accurate. It is now believed that Indigenous Australians were grinding native grass seeds for the purpose of making bread as far back as 65,000 years ago!

Why is this Relevant for Grain Growers Today?

When white settlers first arrived in Australia, they wanted to bring with them the agricultural knowledge and practices that they had used in England. The First Fleet brought several types of grain with them, not knowing which would grow successfully in the 'new country'.

The first harvests of these grains were not as successful as expected because they were not suited to the Australian climate or soils. The failure of these crops meant that the new colony very nearly starved in the first few years. New varieties of wheat have been developed since then to be able to survive hardier conditions and, as discussed in Lesson 1, wheat is now Australia's most commonly grown crop.

Are there lessons that we could learn from the fact that grains were already being harvested in Australia for 65,000 years before wheat and other modern grain crops were introduced? Could lessons in sustainability be learnt from investigating how native grass seeds could be commercially grown and harvested?

Indigenous Perspectives

What Is The Scientific Research Saying?

Scientific research in agriculture is very important. Scientists research the nutritional content of potential cropping foods such as the native grains. They also research the climates and soils that are best for growing these grains and how to harvest the crops at the best times and in the best ways.

Dr Angela Pattison from the University of Sydney's Institute of Agriculture is undertaking research into native grains and is working with the Aboriginal communities of NSW to develop these grasses for commercial use. The researchers are using Gamilaraay language words for these grains.

Dhunbarrbila = Lots of edible grain/seed in one place (similar to English 'grain crop'). Comes from dhunbarr (grass seed ready for grinding), which possibly comes from dhun (tail or hanging thing, as most native grain heads do when full of seed)

Dhuwarr = Bread made from native grains.

It is important to include Aboriginal communities in the research and give credit to the knowledge that has been handed down from generation to generation. Aboriginal people hold knowledge about native grasses and grains despite loss of knowledge caused by colonisation. Being involved allows knowledge to be rebuilt and community building through the management and healing of Country.

The researchers have found that almost all native grasses have higher mineral, vitamin, protein, and good fat content than wheat. This means they are very nutritionally good for you and are worth researching further.

Here is a table showing some of the positive and negative impacts of growing dhunbarr as an agricultural crop that the university team has discovered.

Research discoveries	Impact
Dhunbarrbila take longer to produce first crop than wheat and rye	Farmers may not want to plant a new crop that they cannot get a harvest from immediately.
Dhunbarrbila crops do not require new seed to be sewn (planted) every year	This means that the soil does not get disturbed by planting and will save farmers money in the long run.
Dhunbarrbila use less water, less fertiliser, and less pesticides than wheat.	This reduces cost to the farmer.
Dhunbarrbila are more drought tolerant	Farmers are less likely to lose crops
Dhunbarrbila cannot tolerate herbicides	Farmers will have to develop more labour-intensive weeding practices, and this could be more expensive. Weeds need to be removed because they can interfere with clean harvesting.
Dhunbarrbila heads do not ripen all at one time like wheat.	This means more than one harvesting period over the season and could be more expensive to farmers.

Dhunbarrbila crops may remove more carbon from the air than ordinary grain crops	This means native grains may be better for dealing with climate change gasses in the atmosphere than ordinary grains.
Immature seed is mixed with mature seed at harvest.	This adds to the cost of processing to remove the immature seeds.
Multiple Dhunbarrbila can be grown in the same paddock together	Farmers will have to develop more labour-intensive weeding practices, and this could be more expensive. Weeds need to be removed because they can interfere with clean harvesting. Diversity is increased.
Maybe able to be grown in areas where wheat cannot be grown	This allows land to be developed and revived for agriculture that may have been damaged by past unhelpful agricultural practices.
Dhunbarrbila are harder than wheat	This means the native grains may be harder to mill or need different milling methods than wheat which may then require expensive new machinery. They will also absorb more water during cooking than wheat.

How Are Native Grains Currently Being Used and What Is Their Future?

Native grains produce dark breads with strong earthy flavours. They can be used as bread by themselves as a dense gluten free bread or can be used with around 15% wheat to make a springy bread. Other options being explored by researchers for use of dhunbarr include kibble, rolled grains, as a rice substitute, puffed grain, for oil or protein extraction, in sauces, as a coffee substitute, and to make beer. The ability to investigate these and other food options is hampered by the lack of raw product with which to experiment.

The stories and traditions associated with dhunbarrbila and the role of Aboriginal people in developing these foods should be considered when discussing new food products. Aboriginal-run businesses are already operating on small scales e.g., Black Duck Foods on Yuin country. Different communities may have different reasons for wanting to explore dhunbarr enterprise; some will value community/culture over commercial profit, others will want both.

These two articles show how dhunbarrbila is being used commercially, on a small scale and maybe developed further in the future. Currently there are very few businesses selling the dhunbarr (seed) or duhwarr (bread) as it is not in large scale production and quite expensive.

- Read this article

How Are Native Grains Being Used Today?

Breads and baked goods made from native grains are not yet being mass-produced or sold in shops, as there is more research being done on how best grow these grains commercially and to use the grain in modern recipes.

The University of Sydney has undertaken a project called Indigenous Grasslands for Grain (read more), in which researchers and scientists have been working with Indigenous people to learn more about how best to grow and harvest native grasses such as mitchell grass, purslane and native millet.

Some bakers are beginning to experiment with making products from native grains such as kangaroo grass.

Read this article from the Sydney Morning Herald to learn more about how people are trialling the use of these grains in bread products.

Research Task

Kangaroo grass is an example of a native grass which may be able to be part of our food production systems. Conduct research on this grass to learn more about it. Use the questions in learning journal activity #7 to guide your research.

Learning Journal Activity 6/7

1. Open your learning journal and click on/turn to Lessons 6 & 7
2. Answer the reflection questions.
3. Complete your research task on kangaroo grass. Use the questions provided in the learning journal to guide your research.

Extension Activity (Optional)

Write Your Own 'Enviro-story'

Throughout this unit, we have learnt about many ways that grain growers are promoting and using sustainable farming methods on their properties. We have also investigated the possibilities presented by learning from Indigenous knowledge and the use of native grains.

In various lessons, our learning was supported by reading 'enviro-stories' that have been written and illustrated by primary aged students about issues from their local area. The stories focus on an environmental issue faced by the story's characters and the ways in which these characters solve their issue.

You can visit the Enviro-stories website to browse the library and read more stories that have been written by kids, for kids.

https://www.envirostories.com.au/books/

Extension Task

Have a go at writing your own enviro-story based on one of the issues and sustainable solutions that we have investigated throughout this unit. You may need to conduct further research into the issue and the sustainable solution to help you gain more information.

Topics you might choose from include:

Environmental issues:	Sustainable solutions:
Poor soil health Erosion Lack of biodiversity Lack of water	No-till farming Providing habitat for 'beneficial' insects Rotating crops Planting cover crops Drip irrigation Capturing water using contour banks Planting drought tolerant grain crops Planting and using native grains

Use the 'Enviro-story planning guide' below to help you plan your story.

Talk to your teacher about the best way to present your enviro-story. You might choose to write and illustrate it by hand, or type it and include digital images.

When your enviro-story is complete, share it with your teacher and your peers!

Enviro-story planning guide

Story characters:

Type of grain crop grown by characters:

Environmental issue faced by characters on their property:

Sustainable farming solution used to solve the problem: