REFRACTION MEDIA

mla
MEAT & LIVESTOCK AUSTRALIA

Science and sustainability.
Years K – 2

Greener Farms

Primary guide stage 1

Stage 1 – Greener Farming

Australia has long relied on its cattle and sheep industry for our food supply and to benefit our economy. Our farmers have a strong tradition of innovation to meet the challenges of farming on our vast land and variable climate. Keeping animals and the environment healthy is a complex process, which involves science at many levels. From understanding the diseases and parasites that affect cattle and sheep to managing animals in the most positive way and understanding how to best develop farm areas in regards to fencing and feedlots, there are a myriad of challenges to meet.

In this guide, Stage 1 students will learn about the basics that living things need to survive. They'll learn about the food chain and about what happens to get food from farms to our dinner plates. They'll also learn about all the work farmers do to look after their land and all of the living things on it.

The FIVE Es model

This guide employs the 'Five Es' instructional model – a constructivist or inquiry-based approach to learning, in which students build new ideas on top of the information they have acquired through previous experience. Its components are:

Engage Students are asked to make connections between past and present learning experiences and become fully engaged in the topic to be learned.

Explore Students actively explore the concept or topic being taught. It is an informal process where the students should have fun manipulating ideas or equipment and discovering things about the topic.

Explain This is a more formal phase where the theory behind the concept is taught. Terms are defined and explanations given to models and theories.

Elaborate Students develop a deeper understanding of sections of the topic.

Evaluate Teacher and students evaluate what they have learned in each section.

Meat & Livestock Australia for a sustainable future

Meat & Livestock Australia is an initiative by Australian cattle and sheep farmers, along with the broader industry, to deliver more sustainable farming by 2020. It's a commitment to take positive action, both big and small, to continually improve how farmers operate, and improve sustainability in the beef and lamb supply chain. As caretakers of the land, farmers are committed to leaving it in better shape than when they found it by improving efficiency and reducing resources used. Meat & Livestock Australia is also about sharing ideas, celebrating successes and providing a focal point for environmental, social and ethical farming action to ensure we all enjoy a sustainable food supply into the future.

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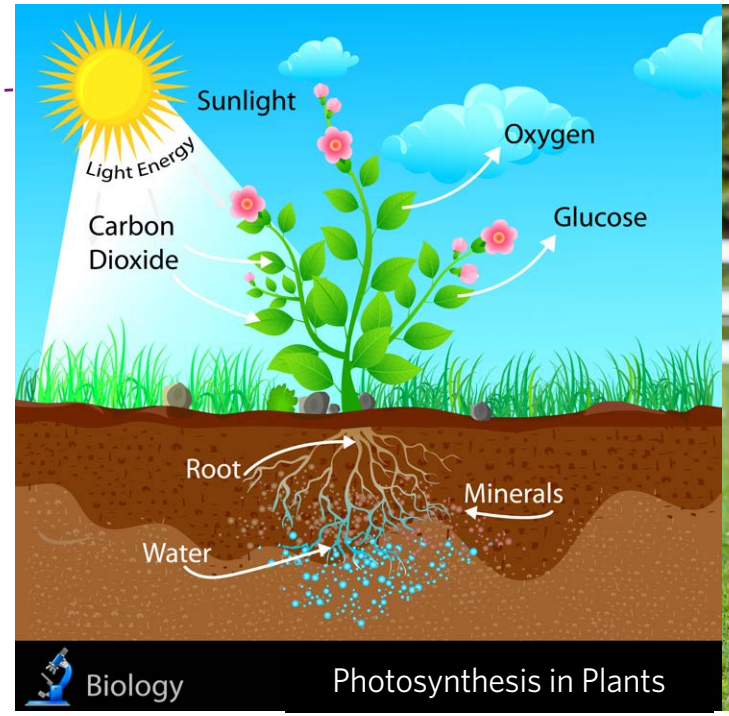
What do living things need to survive?

Living things have needs that must be met for them to survive and live healthy and happy lives. These needs must be met when they live in nature or alongside humans as their pets or farm animals.

Nutrients

First and foremost, all living things, including plants, need something to eat in the form of food. They also need something to drink, such as water.



Water is essential for life as it is required to sustain cells, the building blocks of life. Drought, which is a long period of dry weather, has been a serious challenge in Australia for many farming communities. As a result of drought, there has not always been enough water for cattle and sheep to drink or for the feed that is grown to sustain them nutritionally. When there is enough water, farm animals such as sheep and cattle will graze on what grows on the farmland itself, which is why it is important to keep the land healthy.

Being mammals, calves and lambs take most of their nutrients from their mother's milk.

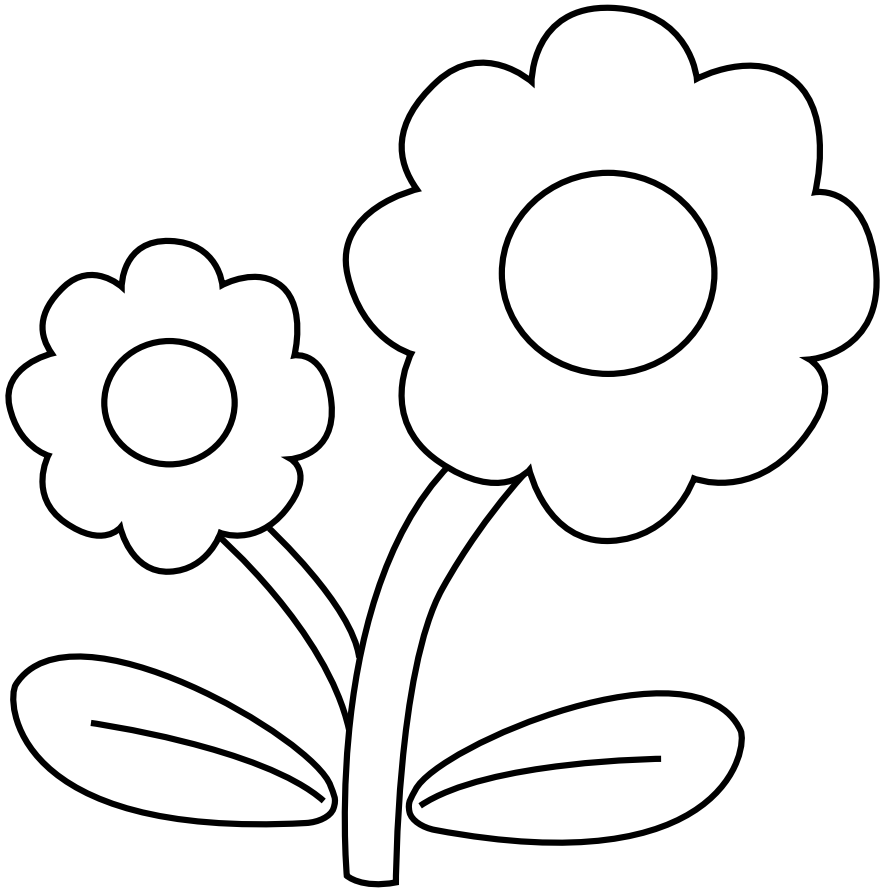
Plants take up nutrients, such as minerals and water, from their roots in the soil to make glucose, or sugars, as a by-product of photosynthesis (the process plants use to create their food and grow). They need access to plenty of sunshine for light energy and carbon dioxide in order to make their own food.

Growth

Living things use the water and nutrients they take in from the environment in order to grow. Plants grow roots, shoots, leaves, seeds and flowers, some of which can be eaten by us as well as by the animals on a farm. Animals use water and nutrients to grow larger and produce more meat, which is profitable for the farmer.

Reproduction

Once organisms are fully grown, they reproduce to continue their species. Plants produce flowers that make seeds, which germinate to produce new plants. Sheep and cattle are bred by farmers once they are old enough to have offspring. Farmers breed together animals with favourable characteristics, such as good milk production and calm disposition, and hope that these characteristics are passed on to their offspring.



Other needs

In extreme weather conditions, animals need somewhere to shelter. They also need to stay free of disease and to be able to live their lives in a low-stress environment. Animals need space in their environment to move around and interact with each other.

Features of living things

Living things have a variety of external features, known as adaptations, which help them survive in their environment. It is important to be able to observe and describe these features to help understand why an animal behaves in a certain way. Scientists and cattle and sheep farmers can then use this information to provide the best possible care for plants and animals, so they can grow up strong and healthy, and produce healthy offspring.

How do living things use their environment to help them survive?

Living things live in places where their needs are best met. Plants grow best where there is plenty of water, sunshine and good quality soil. Animals such as sheep and cattle will move around a paddock looking for food, water and shelter from the weather, such as shade from the Sun. Young animals will stay close to their mothers for food and protection.

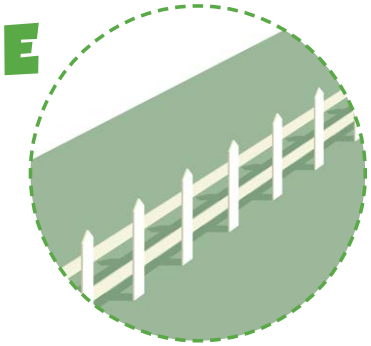
Hannah is a farmer. What does Hannah do? Match the phrases (1–5) with the photos (A–E).

1. Cares for animals _____
2. Plants trees _____
3. Provides water for the animals _____
4. Puts up fences _____
5. Uses horses on the farm _____

A

B

E



D

C

From farm to fork

This image shows one kind of dinner eaten by people around Australia.

Engage: The food chain

This image shows the different categories of food we must eat each day for good health.

1. Tick the categories of food in the image above that are found on the dinner plate on page 9.

2. Do you grow any food at your house? What do you grow? Make a drawing of something you could eat growing in either your garden, a school garden or a relative's garden.

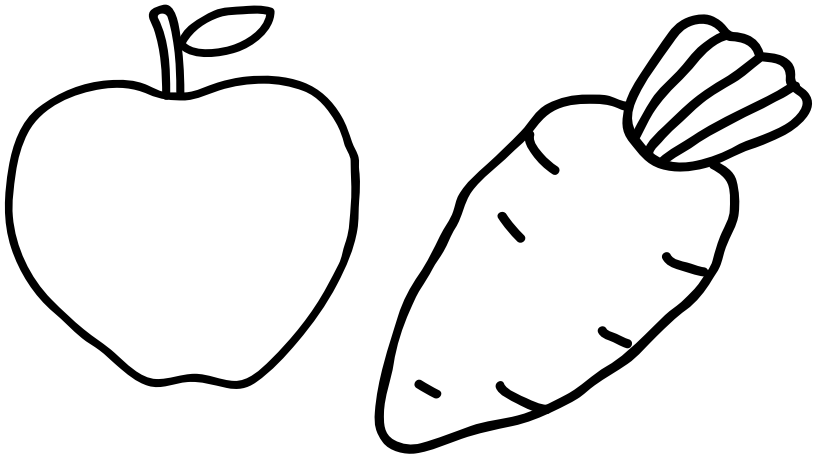
3. Lots of people help to get our food to the dinner table. Can you think who they might be? Here are some questions to help you think:

a) Who grew the food?

b) Who helped get the food to the shop?

c) Who helped to prepare or package the food?

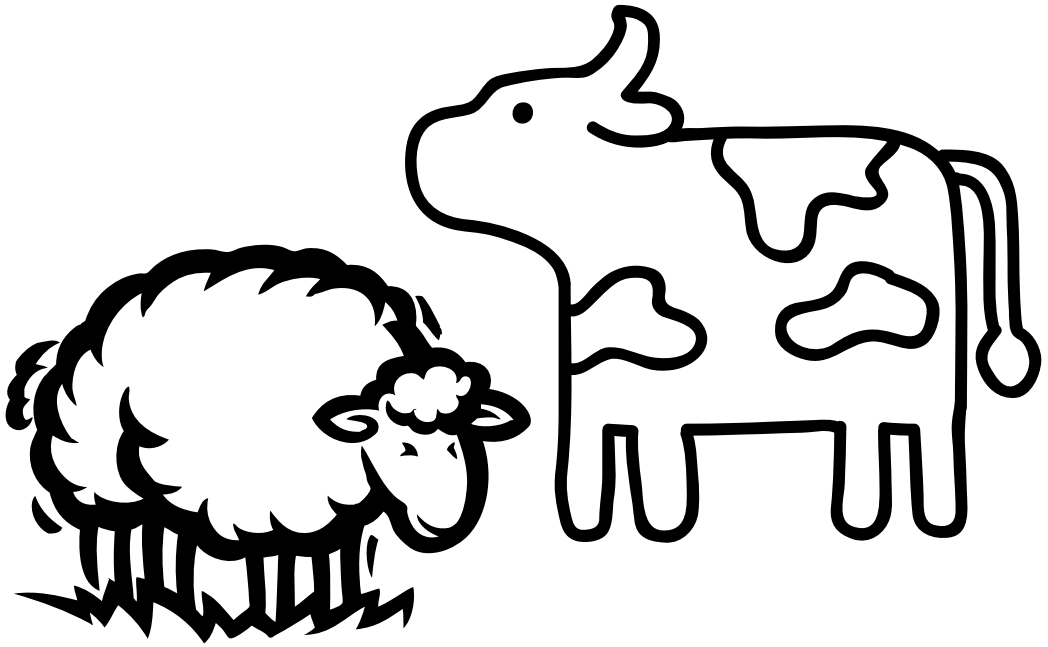
d) Who sold or gave it to you?



Engage: The food chain

4. How did the steak get to the dinner plate above? Write the numbers 1–6 next to each image to show the correct order in which these things happened.

5. What questions did you think about when carrying out these activities? Write down one question you have about farming and food.



Teacher's information

The aim of the Explore section is for the students to investigate some of the ideas around the farming of sheep and cattle, such as what the animals might need in order to stay healthy and how they might have similar needs. It is intended that the students make their own discoveries as they complete the four different stations in the room.

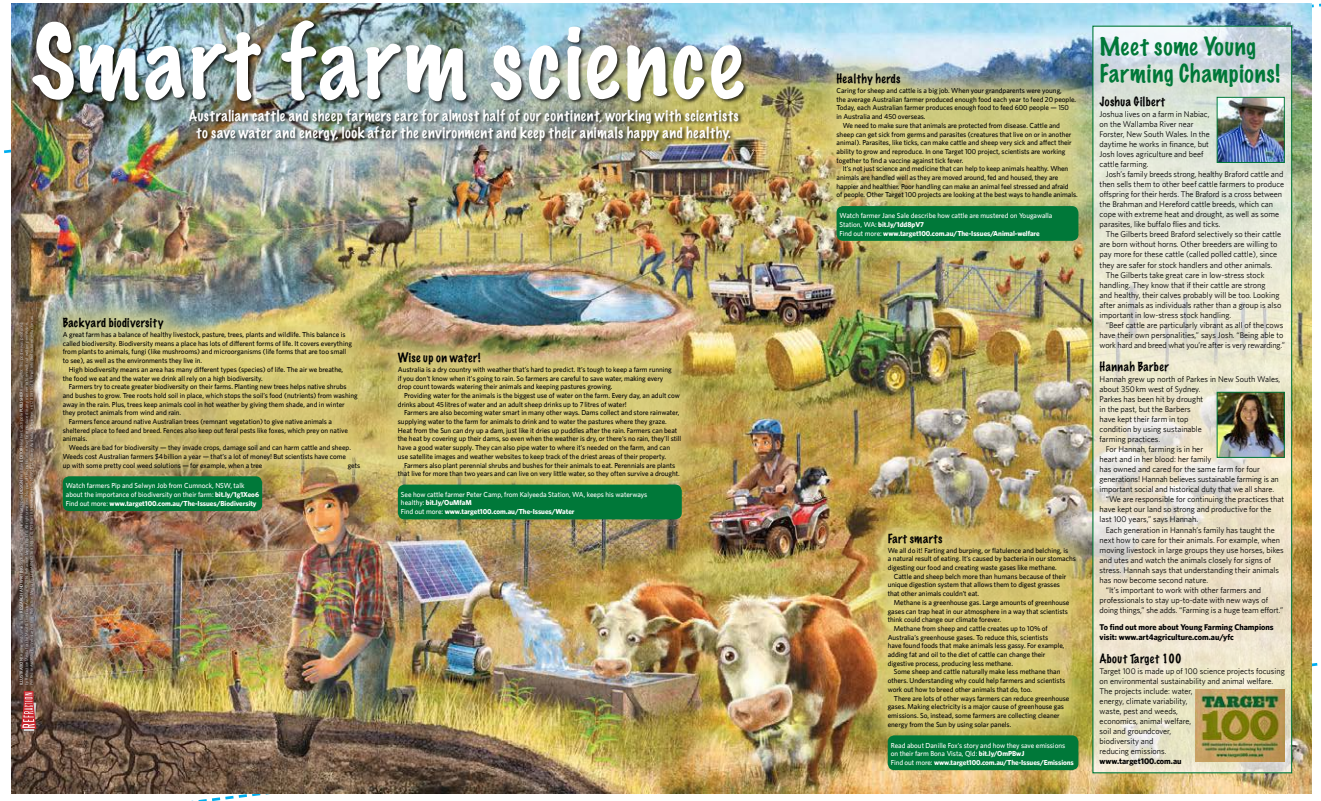
Station number and activity
1. Can you identify all the living things?
2. Similarities and differences
3. Where do cows and sheep live?
4. Good farm/bad farm

Station 1

Task

Identifying the living things on a farm

1. Examine the ‘Smart farm science’ poster, free to download from: ***goodmeat.com.au/education***



Smart farm science

Australian cattle and sheep farmers care for almost half of our continent, working with scientists to save water and energy, look after the environment and keep their animals happy and healthy.

Backyard biodiversity

A great farm has a balance of healthy livestock, pasture, trees, plants and wildlife. This balance is called biodiversity. Biodiversity means a place has lots of different forms of life. It covers everything from plants to animals, fungi (like mushrooms) and microorganisms (life forms that are too small to see), as well as the environments they live in.

High biodiversity means an area has many different types (species) of life. The air we breathe, the food we eat and the water we drink all rely on a high biodiversity.

Farmers try to create greater biodiversity on their farms. Planting new trees helps native shrubs and bushes to grow. Tree roots hold soil in place, which stops the soil's food (nutrients) from washing away in the rain. Plus, trees keep animals cool in hot weather by giving them shade, and in winter they protect animals from wind and rain.

Farmers fence around native Australian trees (remnant vegetation) to give native animals a sheltered place to feed and breed. Fences also keep out feral pests like foxes, which prey on native animals.

Weeds are bad for biodiversity — they invade crops, damage soil and can harm cattle and sheep. Weeds cost Australian farmers $4 billion a year — that's a lot of money! But scientists have come gets up with some pretty cool weed solutions — for example, when a tree

Watch farmers Pip and Selwyn Job from Cunnock, NSW, talk about the importance of biodiversity on their farm: **bit.ly/1gTXeo6**
Find out more: **www.target100.com.au/The-Issues/Biodiversity**

Wise up on water!

Australia is a dry country with weather that's hard to predict. It's tough to keep a farm running if you don't know when it's going to rain. So farmers are careful to save water, making every drop count towards watering their animals and keeping pastures growing.

Providing water for the animals is the biggest use of water on the farm. Every day, an adult cow drinks about 45 litres of water and an adult sheep drinks up to 7 litres of water!

Farmers are also becoming water smart in many other ways. Dams collect and store rainwater, supplying water to the farm for animals to drink and to water the pastures where they graze. Heat from the Sun can dry up a dam, just like it dries up puddles after the rain. Farmers can beat the heat by covering up their dams, so even when the weather is dry, or there's no rain, they'll still have a good water supply. They can also pipe water to where it's needed on the farm, and can use satellite images and weather websites to keep track of the driest areas of their property.

Farmers also plant perennial shrubs and bushes for their animals to eat. Perennials are plants that live for more than two years and can live on very little water, so they often survive a drought.

See how cattle farmer Peter Camp, from Kalyeeda Station, WA, keeps his waterways healthy: **bit.ly/OuMIaM**
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Healthy herds

Caring for sheep and cattle is a big job. When your grandparents were young, the average Australian farmer produced enough food each year to feed 20 people. Today, each Australian farmer produces enough food to feed 600 people — 150 in Australia and 450 overseas.

We need to make sure that animals are protected from disease. Cattle and sheep can get sick from germs and parasites (creatures that live on or in another animal). Parasites, like ticks, can make cattle and sheep very sick and affect their ability to grow and reproduce. In one Target 100 project, scientists are working together to find a vaccine against tick fever.

It's not just science and medicine that can help to keep animals healthy. When animals are handled well as they are moved around, fed and housed, they are happier and healthier. Poor handling can make an animal feel stressed and afraid of people. Other Target 100 projects are looking at the best ways to handle animals.

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Fart smarts

We all do it! Farting and burping, or flatulence and belching, is a natural result of eating. It's caused by bacteria in our stomachs digesting our food and creating waste gases like methane.

Cattle and sheep belch more than humans because of their unique digestion system that allows them to digest grasses that other animals couldn't eat.

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Methane from sheep and cattle creates up to 10% of Australia's greenhouse gases. To reduce this, scientists have found foods that make animals less gassy. For example, adding fat and oil to the diet of cattle can change their digestive process, producing less methane.

Some sheep and cattle naturally make less methane than others. Understanding why could help farmers and scientists work out how to breed other animals that do, too.

There are lots of other ways farmers can reduce greenhouse gases. Making electricity is a major cause of greenhouse gas emissions. So, instead, some farmers are collecting cleaner energy from the Sun by using solar panels.

Read about Danille Fox's story and how they save emissions on their farm Bora Vista, Qld: **bit.ly/OmPBwJ**
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Meet some Young Farming Champions!

Joshua Gilbert

Joshua lives on a farm in Nabiac, on the Wallamba River near Forster, New South Wales. In the daytime he works in finance, but Josh loves agriculture and beef cattle farming.

Josh's family breeds strong, healthy Braford cattle and then sells them to other beef cattle farmers to produce offspring for their herds. The Braford is a cross between the Brahman and Hereford cattle breeds, which can cope with extreme heat and drought, as well as some parasites, like buffalo flies and ticks.

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The Gilberts take great care in low-stress stock handling. They know that if their cattle are strong and healthy, their calves probably will be too. Looking after animals as individuals rather than a group is also important in low-stress stock handling.

"Beef cattle are particularly vibrant as all of the cows have their own personalities," says Josh. "Being able to work hard and breed what you're after is very rewarding."

Hannah Barber

Hannah grew up north of Parkes in New South Wales, about 350 km west of Sydney. Parkes has been hit by drought in the past, but the Barbers have kept their farm in top condition by using sustainable farming practices.

For Hannah, farming is in her heart and in her blood: her family has owned and cared for the same farm for four generations! Hannah believes sustainable farming is an important social and historical duty that we all share.

"We are responsible for continuing the practices that have kept our land so strong and productive for the last 100 years," says Hannah.

Each generation in Hannah's family has taught the next how to care for their animals. For example, when moving livestock in large groups they use horses, bikes and utes and watch the animals closely for signs of stress. Hannah says that understanding their animals has now become second nature.

"It's important to work with other farmers and professionals to stay up-to-date with new ways of doing things," she adds. "Farming is a huge team effort."

To find out more about Young Farming Champions visit: www.art4agriculture.com.au/yfc

About Target 100

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www.target100.com.au

TARGET 100

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2. Make a list of all the different kinds of living things, e.g. cow, person, tree.

3. How many of these living things can you see on the poster? List the living things you can see next to your answers in Question 2.

4. How many different living things are there? Add up the number of different living things you have and write it here:

_____

_____

5. Which living thing is there the most of?

_____

_____

6. Which living thing is there the least of?

_____

_____

Station 2

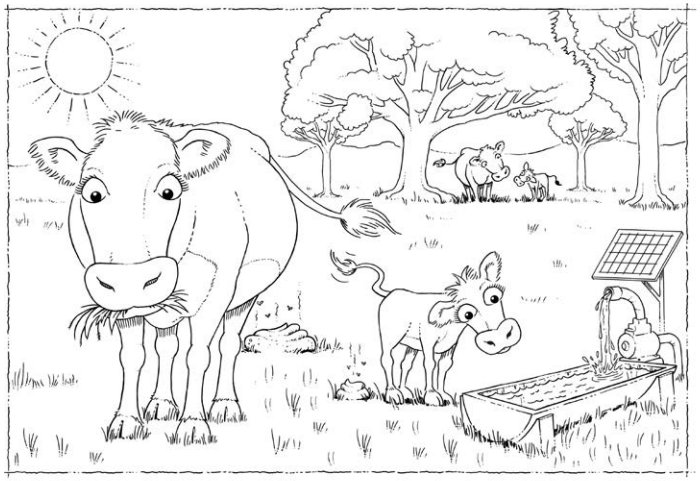
Task

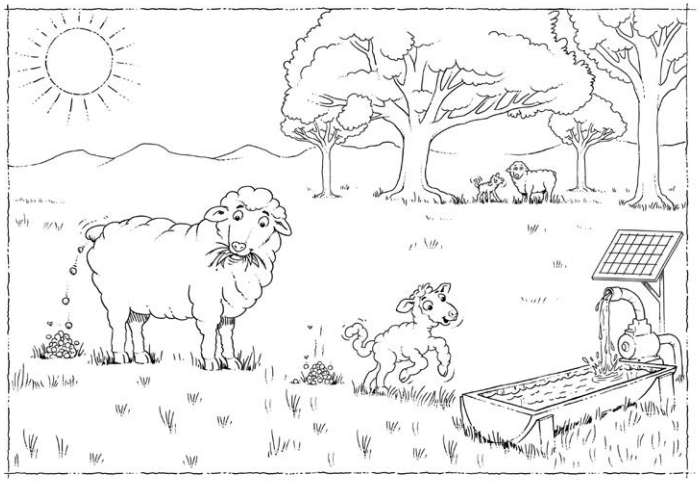
Similarities and differences

1. Compare the images of a sheep and a cow. Circle the similarities – for example, they both have two eyes.

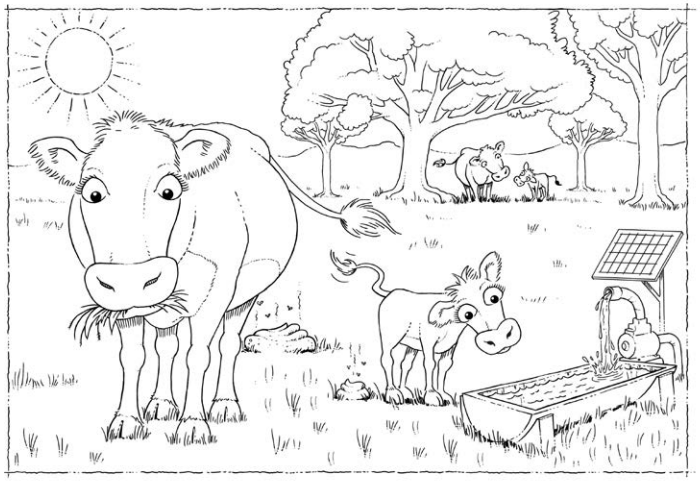
2. Finish this sentence:

The sheep and cow are similar because…

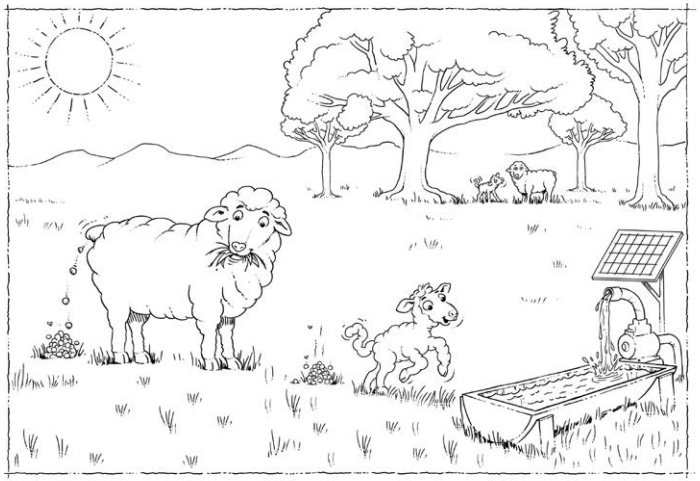




3. Compare the images of a sheep and a cow.
What are the differences between them?
Place a cross on all the things that are different
– for example, the mother cow has a long tail.



4. Finish this sentence:
The sheep and cow are different because…



Station 3

Task

Where do cattle and sheep live?

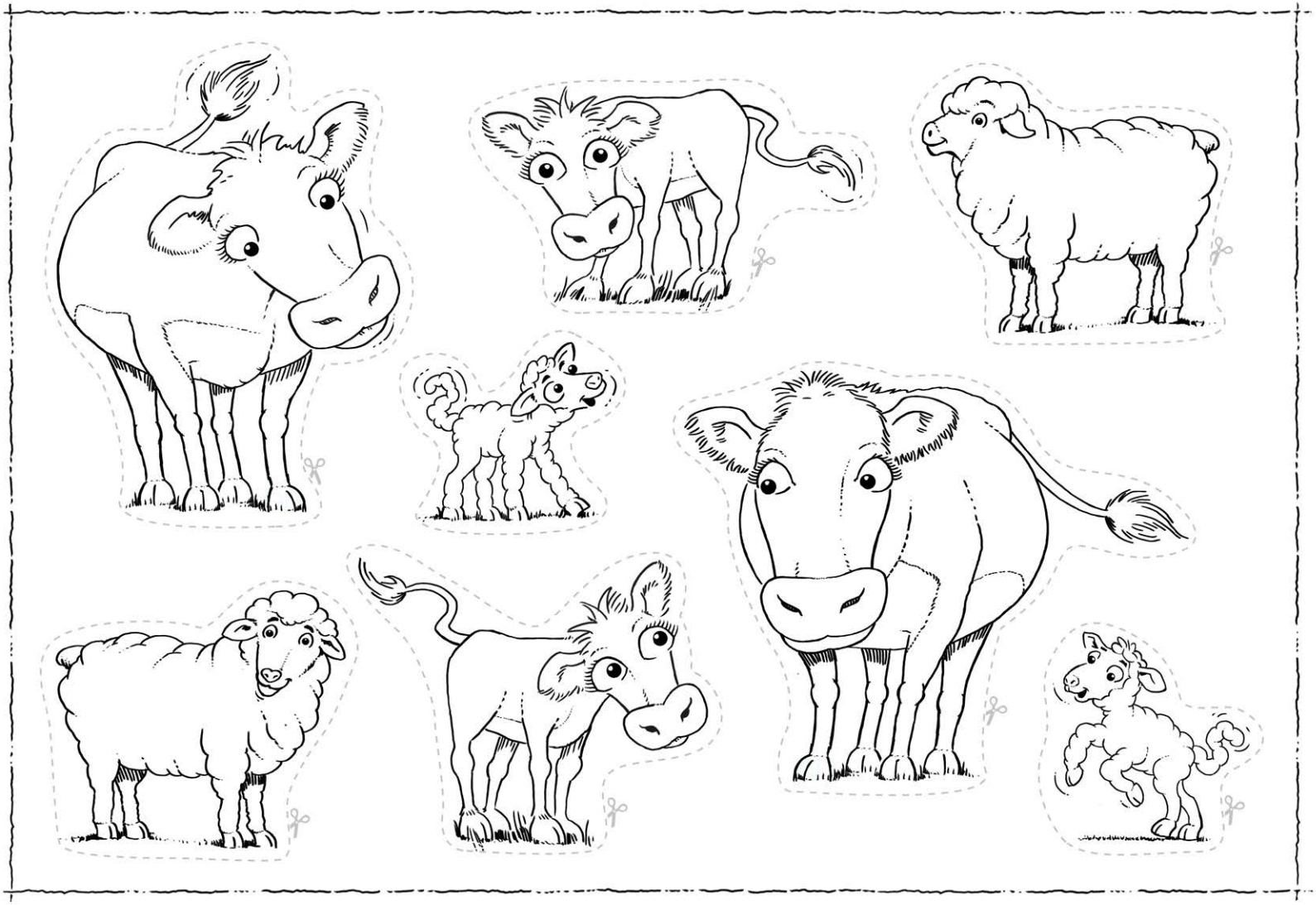
Here is a picture of a farm taken from a helicopter.

1. Tick the names of the things you can see in the image.

- ❑ Trees
- ❑ Fence
- ❑ House
- ❑ Truck
- ❑ Barn
- ❑ Cattle
- ❑ Road
- ❑ Watering hole
- ❑ People

2. Cut out the animals and place them on the farm on page 21 where you think they should be.

3. Choose one of the animals from Question 2 and write why you put it at that place on the farm.

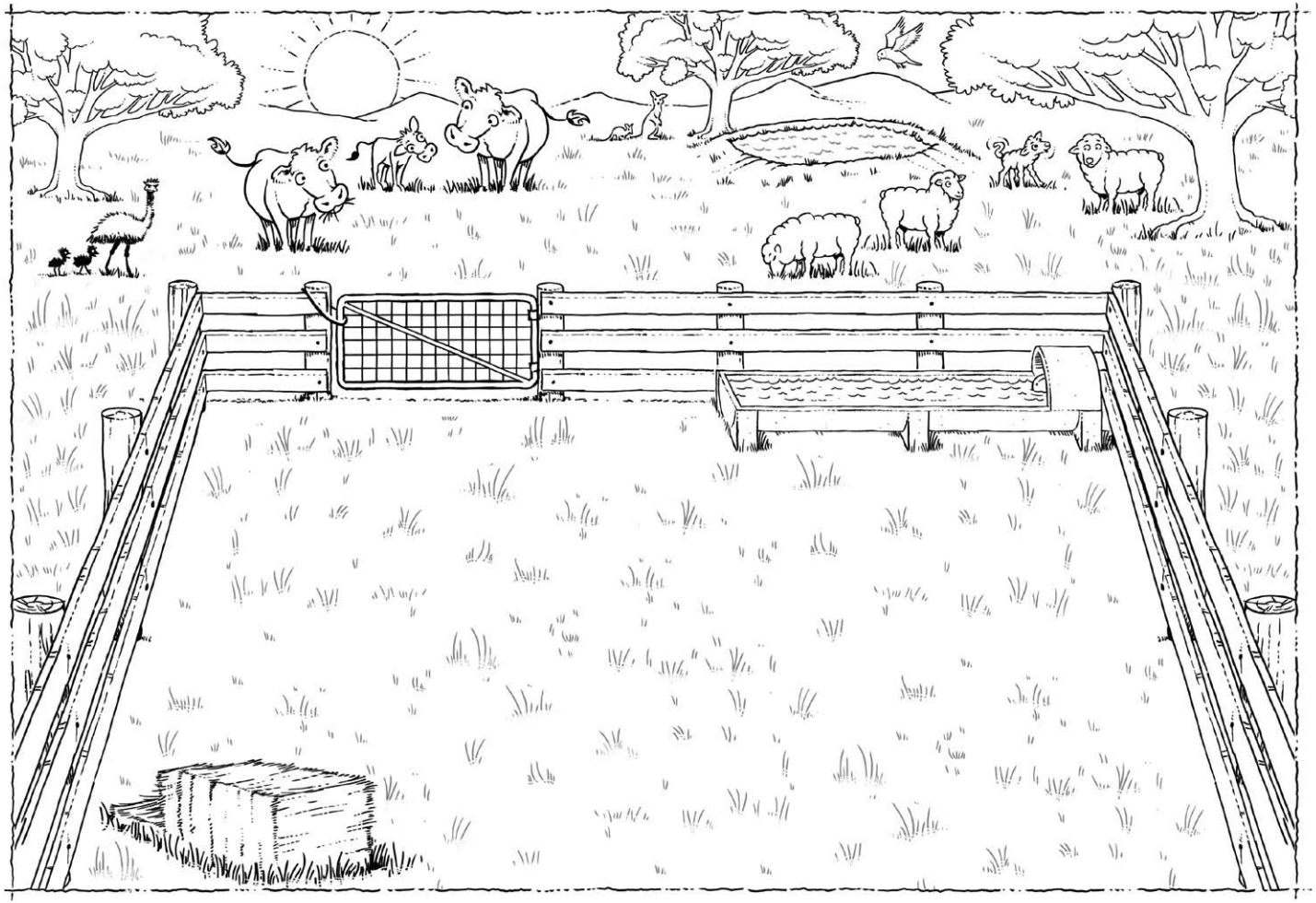


Station 4

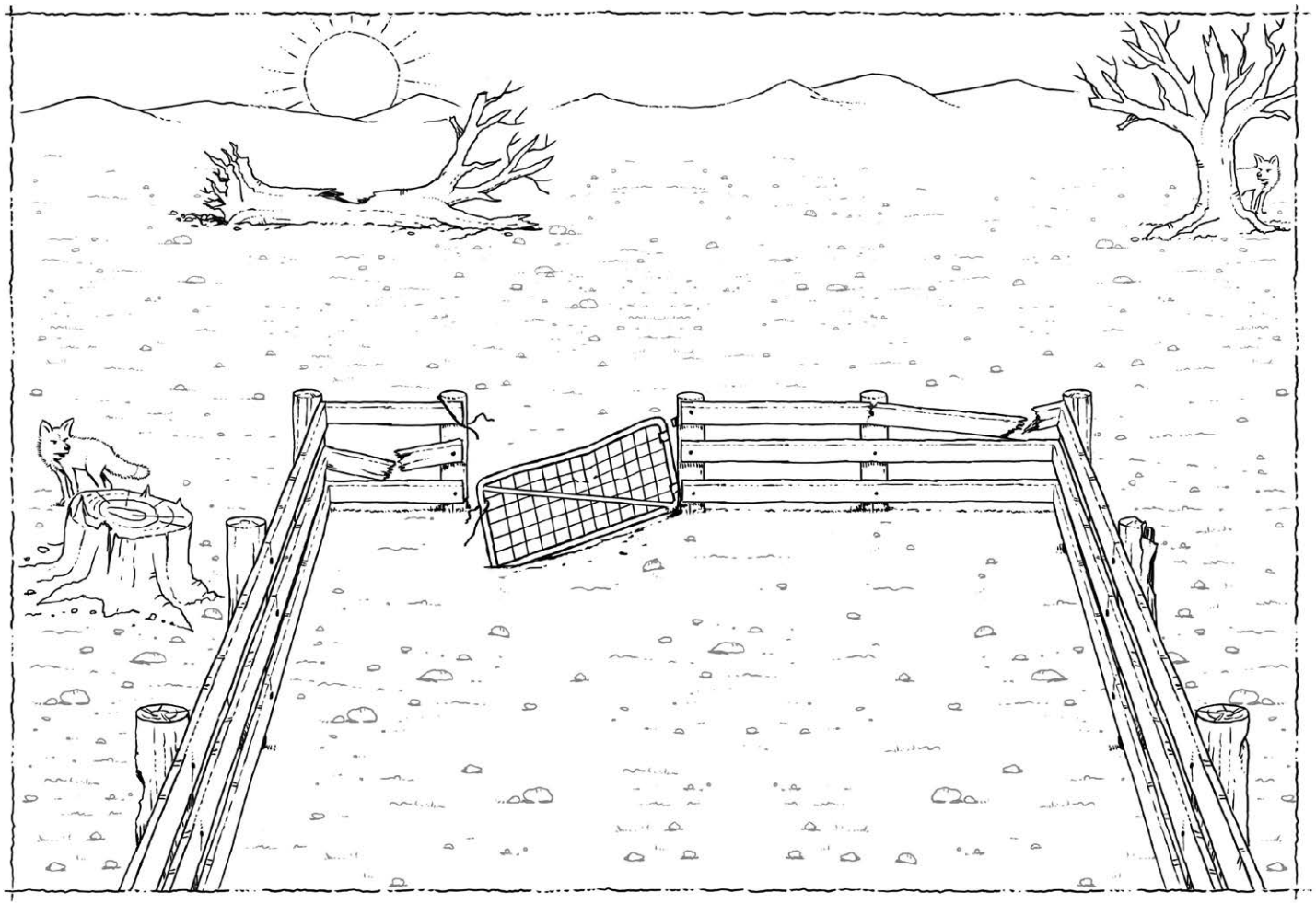
Task

Good farm/bad farm

Farm 1



Farm 2



1. Which farm is the good farm?

2. What are all the things that make the good farm better?

3. What makes the bad farm not as good?

_____

_____

_____

4. The farmer needs to fix a few things, starting with the gate. Use a ruler to measure the length of the gate on the good farm and write it here: _____

5. If the farmer can't fix the gate on the bad farm, which of the following gates could be used to replace it? Circle the gate that is the correct length.

6. What else should the farmer fix on the bad farm? Draw a few things to improve the bad farm.

Student literacy activities

In this section, the science of farming cattle and sheep is explained by getting students to read articles and watch videos about relevant aspects of farming.

Each stimulus material contains:

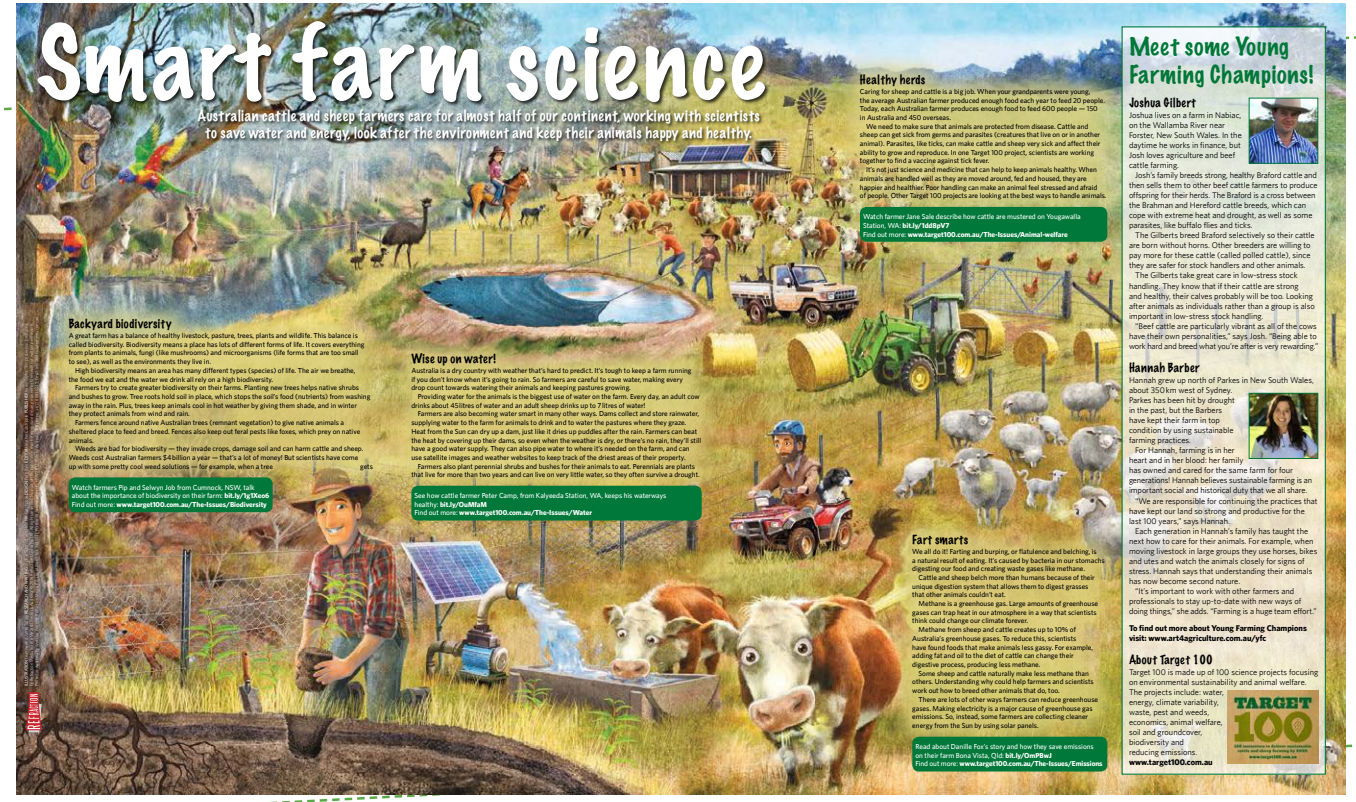
- A brainstorm activity.
- Literacy activities.
- Numeracy activities.

Activity 1 – Brainstorming

Task

Do you have a pet, or know anyone who has a pet? How do you, or the person you know, look after this pet? Draw a picture of a pet owner looking after their pet.

Activity 2 – Farmers look after their animals, too



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About Target 100

Target 100 is made up of 100 science projects focusing on environmental sustainability and animal welfare. The projects include: water, energy, climate variability, waste, pest and weeds, economics, animal welfare, soil and groundcover, biodiversity and reducing emissions.

www.target100.com.au

TARGET 100

Farmers look after their animals just as pet owners look after their pets. Farm animals need food, water and a safe place to live. Farmers don't want their animals to get sick so they use science and medicine to help keep them healthy. As well as looking after their animals, farmers look after the land that the animals graze on (pasture). Good farmers also look after native trees, plants and wildlife. This keeps the land healthy.

Explain – Stimulus One

1. How do farmers look after their animals? Circle all the examples on the poster where animals are being looked after.

2. Complete this sentence: Looking after pets and farm animals is the same because…

3. Complete this sentence: Looking after pets and farm animals is different because…

Activity 1 – Brainstorming

Make a list of all the words you can think of that are related to cattle and sheep farming.

Activity 2 – Word wall

1. Write the following words out on pieces of coloured card and attach them to one of the classroom walls.

farmer cattle sheep scientist
living pastures grazing weather
nutrients sustainable water feed
livestock beef lamb

2. Write any extra words from your brainstorm on cards and add them to the word wall.

3. Write the following words in alphabetical order:

sheep beef lamb pastures scientist

Young farming champion – Casey Dahl

CASEY AND HER BROTHER GREW UP on a cattle property near Baralaba in Central Queensland. A cattle property is a large farm where cattle are raised. Casey's family has worked on the farm for more than 100 years. They know a lot about raising beef cattle.

Casey wanted to learn more about farming so she went to university to study agriculture (farming). She is working on a science project to help farmers breed better cattle.

Me with one of our many poddy calves when I was growing up, and my brother and I helping out with the fencing.

Casey's family has had to overcome lots of challenges in the last 100 years, including droughts, floods and fire. Her family has survived as cattle farmers because they respect and care for the land.

Casey and her brother know that keeping a healthy environment is important for the future. Here she tells us how they do this.

Choosing the right cattle breed

We breed Brahman and Droughtmaster cattle. They are suited to Queensland's hot weather.

Brahman and Droughtmaster cattle are more resistant to ticks than other cattle. A tick is a small animal that can live on cattle and make them very sick. If we had other types of cattle we would have to use more chemicals to stop them getting ticks.

Number of cattle

If you have too many cattle they can overgraze the land. Overgrazing is when too many plants are eaten and the pasture becomes damaged.

Feed

We make sure we have enough stock feed (grain or hay) for our cattle. This means they can survive a drought.

Getting dirty working at university.

Casey working on her science project.

Water

We have dams on our properties to supply water. We fence them off to create ecosystems for many plant and animal species. We also have two creek systems running through our properties. These provide water for stock as well as adding to the incredible natural beauty of the land.

At home with some of my Brahman cattle.

We remove weeds from the creek systems to return them to their native state.

Natural woodlands

We have also kept large areas of natural woodlands. This provides habitat for native animals. We are often able to hear the koalas from our house just on dusk.

Activity 1 – Brainstorming

What do you think you would like and not like about living on a cattle property? Write or draw your thoughts in the boxes below.

What I would **LIKE** about living on a cattle property…	What I would **NOT** like about living on a cattle property…

Activity 2

1. What challenges has Casey's family overcome in the last 100 years?

2. Why is it important not to have too many cattle on the property?

3. How does Casey's family take care of the water supply on the farm?

Activity 3 – question builder

Adapted from: Langrehr, John (2002). 'Question Time for the Gifted.' Gifted. July, 124, 12–14.

Use the Question Builder below to help create two of your own questions related to farming in Australia. Each question should start with a word from Step 1 and a second word from Step 2.

The four-step question builder	
Step 1 **First word** (choose one for each question)	**Step 2** **Second word** (choose one to add to your first word)
What… When… Which… Who… Why… How…	…is/are/do (for a question in the **present**) …did/was (for a question in the **past**) …would/could/can (for a question about **possibility**) …might (for a question about **prediction**)

Step 3

Write your two different questions in the spaces below.

Example question: **How** many cattle can a single farmer look after?

Write Question 1 here:

Write Question 2 here:

Step 4

Now have a go at answering your own questions or swap with a friend.

You can present your responses in any format you wish – for example, as a presentation, a poem, a report, a letter or a mind map.

The Science Matrix

	Description	Activity Suggestions
Scientific procedure	Hands-on activities that follow scientific method. Includes experiments and surveys. Great for kinesthetic and logical learners, as well as budding scientists.	Students carry out an exploration of living things in their own habitat such as the school grounds, a local park or their own back garden. See Activity 1 – Exploring a local habitat.
Science philosophy	Thinking about science and its role in society. Includes discussion of ethical issues, debates and hypothetical situations. An important part of science in the 21st century.	Ask students to bring in from home any books, magazines, songs, toys, games or other things they can find that are about food and/or farming, for a classroom 'show and tell' discussion. Students can explain why they chose this item, what they learnt from it, what they found most interesting, what they liked, and what they disliked.
Being creative with science	For all those imaginative students with a creative flair. Great for visual and musical learners and those who like to be innovative with the written word.	**1.** Students design the layout of their own farms so that plants, sheep and cattle can be looked after. Where will the animals live? How will their needs be met? **2.** Students build a place for cattle or sheep to live (e.g. barn, paddock, pen) in a box that has the things it needs to survive (e.g. bedding, food, water, other animals).
Science time travel	Here we consider scientific and technological development as a linear process by looking back in time or travelling creatively into the future.	Students act out a timeline of events from the farm to consumer – for example, cattle farmer gets up early to feed the cows; truck driver drives the meat to the shop; shopkeeper sells the meat to customers, and so on.
'Me' the scientist	Personalising the science experience in order to engage students more deeply.	**1.** Students write captions/guidelines for new farmers on how to look after their animals. See Activity 2 – how do farmers look after sheep and cattle? **2.** Students imagine they are farmers. Write a short diary entry (a day in the life of a farmer) and draw a picture showing what the farmer might look like.

Activity 1 – exploring a local habitat

Aim: To investigate the living things in an area and how those living things help each other survive.

Results: Make a drawing of the area you are studying showing all the different living things. Label as many of the living things as you can.

Discussion questions:

1. How have humans cared for the living things in this habitat?

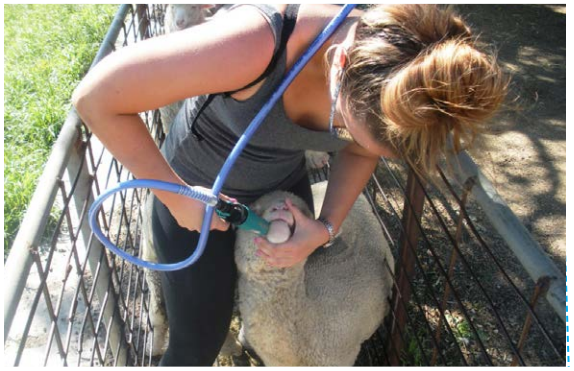
2. Choose one of the living things from your drawing and describe how it gets what it needs from its environment. For example, where does it get its food or water? Does it need shelter or sunlight?

Conclusion:

What have you learnt while carrying out this activity?

Activity 2 – how do farmers look after sheep and cattle?

Write captions for each of the photos. Your captions should describe how the farmer is looking after the animals.



Caption 1:

Caption 2:

Caption 3:

Section 1 – word jumble

Can you un-jumble the words about sheep and cattle farming?

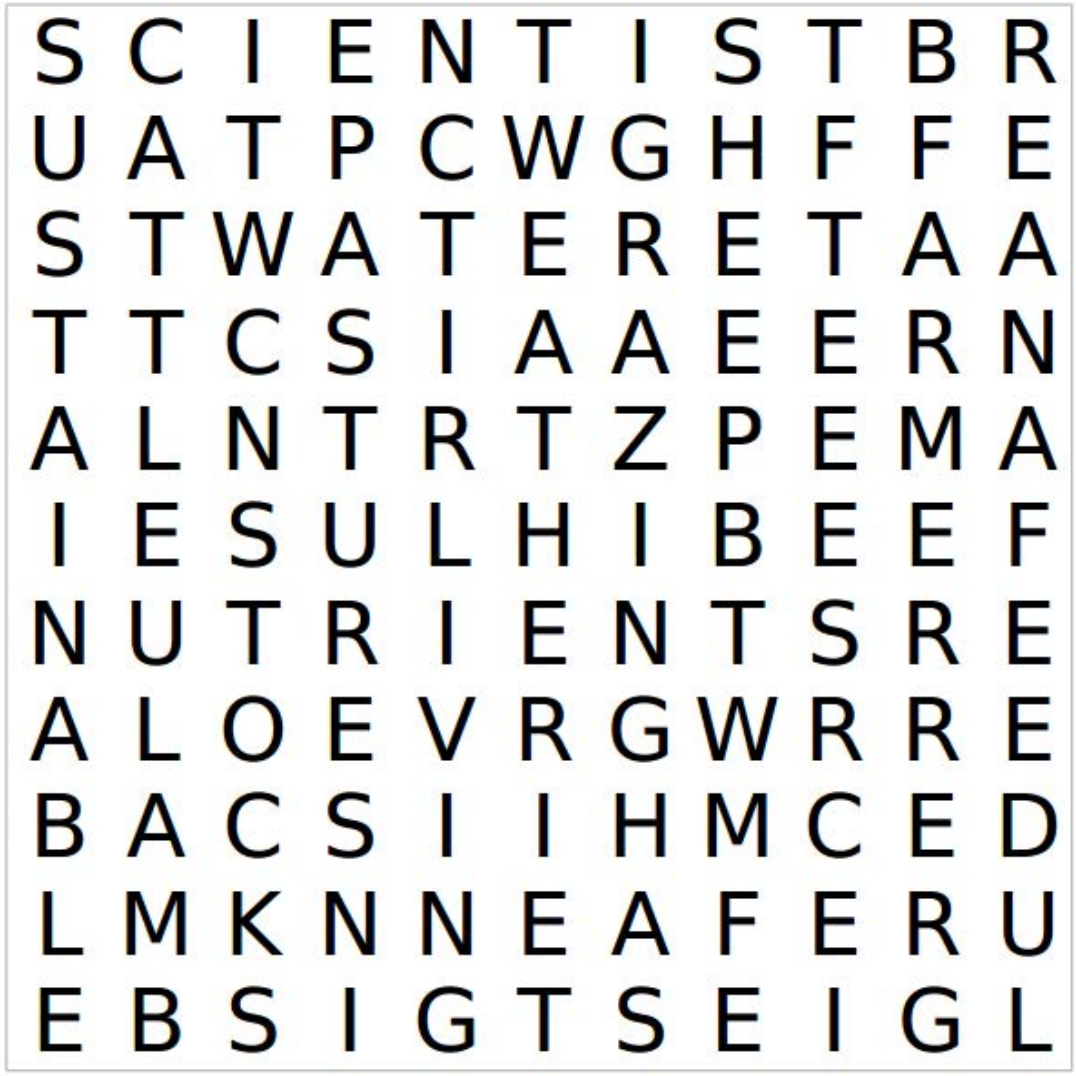
1. FEEB ___ ___ ___ ___

2. MARREF ___ ___ ___ ___ ___ ___

3. ATTLEC ___ ___ ___ ___ ___ ___

4. PEHES ___ ___ ___ ___ ___

5. ZINGRAG ___ ___ ___ ___ ___ ___ ___



S C I E N T I S T B R
U A T P C W G H F F E
S T W A T E R E T A A
T T C S I A A E E R N
A L N T R T Z P E M A
I E S U L H I B E E F
N U T R I E N T S R E
A L O E V R G W R R E
B A C S I I H M C E D
L M K N N E A F E R U
E B S I G T S E I G L

Section 2 – find a word

BEEF
CATTLE
FARMER
FEED
GRAZING
LAMB
LIVING
NUTRIENTS
PASTURES
SCIENTIST
SHEEP
STOCK
SUSTAINABLE
WEATHER
WATER

Section 2 – who/what am I?

1. Who am I?

a. I might not live on a farm but I can live near one.

b. I am not native to Australia.

c. Farmers consider me a pest because I may snatch lambs from their mothers.

I am a(n) _____

2. What am I?

a. I am green.

b. My growth depends on the weather.

c. Sheep and cattle graze on me.

I am a(n) _____

3. Who am I?

a. I do work on the farm and also in the laboratory.

b. I work with farmers to help understand how all the living things interact.

c. In my work I conduct experiments to find answers to questions.

I am a(n) _____

Section 3 – match the image with the sentence

Match each sentence (1-4) with the image (A-D) that describes it.

1. Shady trees provide protection for animals from the heat of the sun.

2. Animals need fresh drinking water to stay healthy.

3. Farmers protect the native animals that live on their farms.

4. Fencing is used to keep farm animals in and pest animals out.

Section 4 – review of the word wall

1. Ask a few students to suggest five or six words from the word wall. Record them on the board.

2. Each student must pick two words and draw a picture to show how the two things they chose interact on a farm.

Section 5 – individual unit review

What about you?	Drawing
Describe your favourite activity during this unit of study.	Create an image that summarises this unit of study for you.
Learning summary	**More questions?**
Write two dot points of things that you learnt about cattle and sheep farming.	Write three questions that you still have about cattle and sheep farming or anything else related to this unit of study.

Answers

Activity 1

1. beef **2.** farmer **3.** cattle
4. sheep **5.** grazing

Activity 3

1. fox **2.** pasture **3.** scientist

Activity 2