Farming Through History

Science and sustainability
Years 3 – 4

Primary guide stage 2
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 using innovation to meet the challenges of farming on our vast land and variable climate. Farming livestock is a complex process, which involves science at many levels. From managing soil and ground cover and the natural environment to understanding climate and how to best develop and use agricultural areas, there are a myriad of challenges to meet.

In April 1788 there were seven cattle and 29 sheep in Australia – today there are 28 million cattle and around 75 million sheep. In this guide, you’ll read about the history of Australian farming and how cattle and sheep production has developed from the time of the early settlers to the 21st century. You’ll also learn about how the role of the farmer and farming is changing and how modern farmers are using science to deliver more sustainable farming.

### 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.

### Target 100 for a Sustainable Future

Target 100 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. Target 100 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.
Farming through history

In a little more than 200 years, Australian cattle and sheep farming has grown from just a handful of animals to 28 million cattle and around 75 million sheep.

This guide looks at cattle and sheep farming in Australia in a historical context, looking at the influence of farmers in maintaining and growing Australia’s economy and as caretakers of our land. Linking strongly to the literacy and history syllabus, this guide also touches on science outcomes, looking at uses of arid landscapes for example (northern Australia) and how farming, environment and community interact differently in remote and populated parts of Australia. The content covers Science Understanding links in living things and life cycles. As well as Science as a Human Endeavour links in historical knowledge and understanding and historical skills.

How do you know if something is alive?
To decide if something is alive, see if it can do all seven of these processes (they are usually remembered as MRS GREN):

• They can Move by themselves (even plants move).
• They get energy from food via Respiration.
• They are Sensitive to changes in their environment.
• As they get older, they Grow.
• They can Reproduce more of the same living thing.
• They can Excrete the waste they produce.
• They get Nutrition from food for energy and survival.

How can living things be grouped?
To make it easier to study the millions of different living things on Earth, scientists divide them into groups according to their characteristics. Red kangaroos, for example, would be placed in the animal kingdom, as they have multiple cells and consume food for energy (plants also have multiple cells, but they get nutrients and energy through photosynthesis). They are then divided into smaller groups based on other characteristics – kangaroos are vertebrates, as they have internal backbones, and mammals, because they have hair and give birth to live babies.
What is a life cycle?
A life cycle is the different stages that a living thing goes through, from when it is born to when it is able to create new life by giving birth or, in the case of plants, producing seeds. Adult frogs, for example, lay eggs in water, which hatch into tadpoles. As they grow, the tadpoles develop legs and lungs and turn into froglets. They become adult frogs when they finish growing and lose their tails, and can lay eggs to produce more tadpoles. All living things die, so they produce offspring to continue this life cycle.

How do living things depend on each other?
Every living thing on the planet relies on other living things to survive. Plants produce oxygen for animals and rely on fungi and animals for nutrients from the soil, which they convert into energy using sunlight (photosynthesis). In addition to oxygen, humans also rely on plants, and animals as well, for food, clothing and shelter. We even rely on some bacteria to keep us healthy.

How has Australian farming changed over time?
When settlers first arrived in Australia, they adapted their animal breeds and farming methods to suit Australia’s drier climate. Cattle farmers in QLD, where a large portion of Australia’s beef industry is located, crossbred European and Brahman cattle to produce new breeds like Brafords, which could survive in the hot climate. Today, farmers and scientists work together using genetic sciences to breed cattle and sheep that are better suited to a range of Australian environments and will produce more meat.

How has Australian farming stayed the same over time?
Australia’s dry climate has always been a challenge to farmers, even with the introduction of irrigation systems. Different types of farming are concentrated in the areas where they are best suited to the temperatures and annual rainfall. Cattle stations in the north of Australia cover large areas of land and stock animals that are acclimatised to the hot, humid weather – cattle also need to be able to walk large distances for food and water. Cattle farms in the south tend to be smaller because of the higher rainfall and better pastures; sheep, which are also primarily farmed in the south, are usually crossbred to ensure they cope better with their local climate. Sheep can be bred for wool or meat, and sometimes both, depending on the breed.

How can Indigenous Australian knowledge of the land help farmers?
Indigenous Australians developed an excellent knowledge of the land through their long relationship with it; knowledge that can help farmers manage their land today. They understood the seasonal changes and how these affected the environment, gathering food and moving according to these. In some areas, they also used methods that helped them manage the land, like small fires to encourage food plants or those that would attract animals.

Who has played an important role in Australian farming?
Several people played an important role in developing Australia’s farming industries, like ex-convict James Ruse, who started Australia’s first wheat farm at Rose Hill (now Parramatta), and Richard Bower Smith, who invented the stump jump plough. Brothers George and William Chaffey introduced their irrigation system to Mildura, Victoria, in the 1880s and 1890s to overcome the challenge of providing water to farms in Australia’s dry climate. Cattle King, Sir Sidney Kidman, recognised early the potential in the flood plains of the Channel Country in QLD and the importance of being able to rest land for it to recover.
Three months after the First Fleet arrives in Australia, the colony’s livestock includes 7 cattle, 29 sheep, 74 pigs, 18 turkeys, 29 geese and 35 ducks.

1790 Governor Phillip gives ex-convict James Ruse land at Rose Hill (now Parramatta) in New South Wales. This becomes Australia’s first wheat farm.

1796 John and Elizabeth Macarthur, who established Elizabeth Farm in 1793, buy their first Merino sheep. They send their first bale of wool to England in 1807.

1813 Gregory Blaxland, William Charles Wentworth and William Lawson cross the Blue Mountains to find more farming land.

1878 The discovery of the Great Artesian Basin – which sits under one-fifth of the Australian continent and is believed to hold 65,000 million megalitres of water – means much of arid Australia can become productive grazing land.

1880s and 1890s George Chaffey and his brother William introduce his irrigation system, which he first developed in California, to Mildura in Victoria.

1876 Richard Bowyer Smith displays his invention of the stump-jump plough, which allows farmers to use land containing tree roots and stumps. This opens up the Mallee Country in Victoria and South Australia for farming.

1900 CSIR scientists, led by Arthur Turner, develop a vaccine for black disease, which is considered to be the most serious infectious disease in sheep in Australia at this time.

1930s Arthur Turner and his team develop a vaccine for contagious bovine pleuropneumonia, making it the first cattle disease in Australia that has been eradicated.

1950 The myxoma virus is released to control rabbits, which compete with livestock for food.

1972 The first Belmont Red cattle are released to a cattleman near Rockhampton as part of a program to develop cattle breeds for Australia’s tropical regions. Other breeds have been developed in Australia such as the Braford, which is a cross between Brahman and Hereford. Brafrds are resistant to ticks and can cope well with drought.

2009 All living creatures have a ‘map’ of chemicals in the body that determine what their children will look like. In 2009, scientists discovered the full ‘map’, called a ‘genome’, for cattle. This led to important discoveries for cattle breeders, such as which animals will have the best chance of having healthy calves.
SIR SIDNEY KIDMAN was born in South Australia in 1857. He is now known as Australia’s ‘Cattle King’ because he founded his own company, S. KIDMAN & CO Ltd, in 1899 and helped pioneer the first Australian frozen beef and mutton exports.

After leaving his home in Norwood at age 13, he went to the Barrier Ranges to work with a landless bushman named George Raines, who roamed around the land with his stock in search of good food. While working for Raines, Sidney shared a dugout with an Aboriginal man known as Billy, who taught him tracking and other bushcraft skills.

Over the years Sidney had many jobs, working as a station hand, drover, stockman, bullock team owner and butcher, before going into partnership with his brother Sackville in 1884.

He married Isabel Wright in 1885 and bought his first station in 1886. His plan was to buy a ‘chain’ of stations that would stretch from the Gulf of Carpentaria down to South Australia and move cattle that had been bred in the north of Australia down to his southern properties. Once the cattle were in the south, they could eat the more nutritious feed in abundance in this region before they were sold at market.

Sidney bought a second chain of stations in the 1890s, this time from the Fitzroy River and Victoria River Downs in the north down to Wilpena station near Adelaide.

His two property chains, knowledge of the land and good practice of never having too many animals on his properties helped him cope well with unpredictable rainfall and periodic droughts in central Australia.

During drought periods, he was able to move his cattle to other stations where there was still feed for them. And if there wasn’t enough feed, he was able to sell the cattle at whichever market area had the highest prices.

Sackville died in 1899, but Sidney continued with his plans and eventually all of his properties covered an area nearly as large as Victoria. He retired in 1927 and died in 1935.

S. KIDMAN & CO Ltd is still run by his family and is one of Australia’s largest beef producing companies.
They live a long way from a supermarket, they have to muster cattle using helicopters, and their two children go to primary school over the internet.

given a break from cattle grazing so they can grow back.

“Every three to four years, our main paddock will be totally destocked for a wet season to allow the area to rest and grow,” says Jane. “The holding paddocks (closer to the yards) are more intensely grazed during the mustering season, so these are destocked every wet season.”

They’ve put in more water points for the cattle, which has increased the number of birds, frogs and kangaroos on their property. They use solar energy in their house and for the water pumps at the bores. This means they use far less fuel, which also saves them transporting fuel over huge distances.

Jane thinks that people who work in agriculture in Australia have been very fast to adopt new technology to run their farms and make enough money to continue running them in the future.

“We do what we do because we love the lifestyle and enjoy bringing up our family in a wholesome environment,” Jane says. – Laura Boness
Food brainstorm

1. Think of your favourite type of food and...
   a) State why you like this food.

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   b) Suggest different ways of preparing, cooking or serving this food.

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   c) Identify its main ingredient.

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   d) Think about the nutritional value of the main ingredient – Is it good for you?

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Teacher’s note

Clean empty food packages or unopened tins are good to use, such as; small tins of tuna, corned or roast beef, cheese, milk, breakfast cereal, rice, biscuits, and anything else easily collected. Make sure there are at least a couple of packages or containers with meat protein in order to complete Question 3.
2. Describe where the main ingredient comes from before it arrives at the shop.

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3. Your teacher will provide you with a variety of different food packages. For each one, suggest what the main ingredient is and where it came from.

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4. Which foods contained protein as their main ingredient? Where do most Australians get most of their meat protein? Was this always the case? For example, where did Aboriginal and Torres Straight Islanders traditionally get their protein from?

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______________________________________________________________________________________________________________________________________
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: how the role of the farmer and farming is changing; how living things have lifecycles; how they depend on each other; and how they might be grouped. It is intended that the students make their own discoveries as they work around the stations in the room in any order.

The equipment table below lists the equipment and preparation required for each activity station.

<table>
<thead>
<tr>
<th>Station no. and activity</th>
<th>Materials list</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Life cycles</td>
<td>Images of animals at different stages of life – provided.</td>
</tr>
<tr>
<td>2. Cattle farming equipment</td>
<td>Images of farming – provided.</td>
</tr>
<tr>
<td>3. Interactions of living things</td>
<td>‘Smart farm science’ poster – provided.</td>
</tr>
<tr>
<td>4. ‘Fun on the farm’ interactive game</td>
<td>Computer to access the website <a href="http://www.mla.com.au/General/Fun-on-the-farm">www.mla.com.au/General/Fun-on-the-farm</a></td>
</tr>
</tbody>
</table>
Station 1

Task

Life cycles

1. Create a lifecycle flowchart for a sheep by cutting out the following images and placing them so that they make a continuous cycle on the circular flowchart provided.
Flowchart
2. Describe how you chose where to place each image. What clues did you use in the images to help you construct this lifecycle flow chart?
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3. A lifecycle flow chart does not show the lifecycle of a single organism, but of the species in general. Does the lifecycle of sheep have a beginning? If so, where could it be? If not, why might it not have a starting or finishing point?
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Station 2

Task Cattle farming equipment

1. Examine the pieces of farming equipment used in cattle farming. Write what you think the farmer uses each piece of equipment for.

   a) Tractor – used for: ______________________________________________________
                                                                                     ______________________________________________________
   b) Pitchfork – used for: ______________________________________________________
                                                                                     ______________________________________________________
   c) Tags – used for: __________________________________________________________
                                                                                     ______________________________________________________
   d) Motorbikes – used for: ____________________________________________________
                                                                                     ______________________________________________________
   e) Helicopters – used for: _________________________________________________
                                                                                     ______________________________________________________
   f) Water pumps – used for: _____________________________________________
                                                                                     ______________________________________________________
   g) GPS – used for: _________________________________________________________
                                                                                     ______________________________________________________
   h) Lasso rope – used for: _________________________________________________
                                                                                     ______________________________________________________

2. If you were a sheep and cattle farmer, which piece of equipment do you think you would find the most useful on your farm and why?
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3. Decide which pieces of equipment are really useful on 21st century cattle farms, and which were used more in the past (i.e. less useful on a modern 21st century cattle farm).
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4. Write the letters next to each piece of farming equipment in the appropriate section of the table below.

<table>
<thead>
<tr>
<th>Used on 21st century cattle farms</th>
<th>Used in the past</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Which piece of equipment do you think is the most useful and has the greatest impact on a modern cattle farm? Why do you think this?

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6. Which piece of equipment do you think is the least useful for modern cattle farmers? Why?

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1. List all the different living things you can see on the poster. You can include ‘plants’ as one thing if you don’t know their individual names, but try to name all the different kinds of animals. Have a good look – there are quite a few!

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2. Now put the animals you listed into different groups. Complete the table to show which animals are: farm animals or livestock (the animals being farmed), wildlife, pests and animals that help farmers do their work.

<table>
<thead>
<tr>
<th>Farm animals</th>
<th>Wildlife</th>
<th>Pests</th>
<th>Animals that help farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>

3. In what ways are people helping animals on the farm?
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4. In what ways are animals helping people on the farm?
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______________________________________________________________________________________________________________________________________
______________________________________________________________________________________________________________________________________
5. What are the farm animals eating and drinking? Where does this food and drink come from?
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6. In what ways are the farmers using the natural environment to promote sustainable farming? Identify some examples from the poster.
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Station 4

Task
‘Fun on the Farm’ interactive game

1. Go to the website www.mla.com.au/General/Fun-on-the-farm

2. For each of the four games, note down:
   a) the aim of the task
   b) the equipment you used to complete the game
   c) the skills you used

<table>
<thead>
<tr>
<th>Game name</th>
<th>Aim of the game</th>
<th>Equipment needed</th>
<th>Skills used</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thirsty cows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weigh station</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mustering the cows</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fence fixer</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. What did you learn about sheep and cattle farming from these games?

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4. Suggest another game that could be designed and added here to help teach students about the jobs farmers have on sheep and cattle farms.

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Future farm resources

Student literacy activities
In this section, we explain the science of farming cattle and sheep by inviting students to read articles and watch videos about relevant issues and applications. This section suggests discussion topics and activities linked to those articles.

Each article/video will have its own literacy and/or numeracy activities, which include:
- Brainstorming
- Glossary
- Comprehension and summary
- Question builder

Stimulus One – A farmer’s story
This short video provides a good insight into the life of a modern-day farmer. From city life to cattle farming – Farmer stories: https://www.youtube.com/watch?v=v_Rleq5koaw&list=PL7a3T42VoqLb_vtOBl7WuUrKvuLwx8Al

Stimulus Two – Sheep and cattle in Australia
This article examines how sheep and cattle breeding has changed in Australia since settlement, and looks at the different breeds that are farmed in Australia and where they came from.

Stimulus three – The role of the Bureau of Statistics
Students examine a graph from the Bureau of Statistics to analyse the growth in population of cattle in Australia from 1900 to 2004.

Source: 2000-01 Agricultural Census data.
Target 100: A farmer’s story

Task
Go to www.youtube.com/user/Target100AUS and watch the video titled ‘From city life to cattle farming – Farmer stories’ (3:18 min).

Activity 1 – Brainstorming

Task
Imagine you are a cattle or sheep farmer. Letting your imagination guide you, write either:

a) a one-page entry in your personal diary, outlining one day of your life – what you did, what happened, and how you felt about it

OR

b) a one-page short story, telling the reader about your life as a farmer – what your work involves, what you enjoy about it, and what you find hard about it.
# Activity 2 – Glossary

Create a glossary. Use the table to define some of the science words and terms in the video.

<table>
<thead>
<tr>
<th>Word/Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poddy herd</td>
<td></td>
</tr>
<tr>
<td>Head of cattle</td>
<td></td>
</tr>
<tr>
<td>Low stress stock handling</td>
<td></td>
</tr>
<tr>
<td>The waters</td>
<td></td>
</tr>
<tr>
<td>Desert grassland</td>
<td></td>
</tr>
<tr>
<td>Erosion control</td>
<td></td>
</tr>
<tr>
<td>Minimal impact</td>
<td></td>
</tr>
<tr>
<td>Sustain</td>
<td></td>
</tr>
</tbody>
</table>
Activity 3 – Summarising

1. Has Jane always been a farmer? Where did she used to live?

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_________________________________________________________________
_________________________________________________________________

2. Does Jane like being a farmer? What does she like the most?

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3. How big is the farm (in acres) and how many cattle live on it?

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4. What does Jane say about wildlife on the farm? Is there more or less of it than when she moved there? Why?

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5. How would you describe how Jane feels about looking after the land?

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6. How is Jane’s life similar or different to the brainstorm you carried out about farming at the beginning of this activity?

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### Activity 4 – Question builder


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

<table>
<thead>
<tr>
<th><strong>Step 1</strong> First word (choose one for each question)</th>
<th><strong>Step 2</strong> Second word (choose one to add to your first word)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What... When... Which... Who... Why... How...</td>
<td>...is/are/do (for a question in the present)</td>
</tr>
<tr>
<td></td>
<td>...did/was (for a question in the past)</td>
</tr>
<tr>
<td></td>
<td>...would/could/can (for a question about possibility)</td>
</tr>
<tr>
<td></td>
<td>...might (for a question about prediction)</td>
</tr>
</tbody>
</table>

**Step 3**
Write your two different questions in the spaces below.

Example question: Why do cattle farmers care about looking after the land they farm on?

Write Question 1 here:

Write Question 2 here:

**Step 4**
Now have a go at answering your own questions, or swap with a friend and answer their questions or suggest some possible answers. You can give your answer in any form you like, e.g. as a PowerPoint presentation, a poem, a report, a letter, or a mind map.
Activity 1 – Brainstorming

How much do you know about the history of sheep and cattle in Australia? Before you read the following article, take this quick True/False quiz to find out.

Are the following statements True (T) or False (F)?

1. _____ The First Fleet arrived in Australia in 1788.

2. _____ As well as sheep and cattle, the First Fleet brought cats to Australia.

3. _____ All of the cattle breeds in Australia originally come from Europe.

4. _____ The first sheep to come to Australia came from South Africa.

5. _____ Meat from older sheep is known as mutton.

6. _____ Cattle are only farmed for their milk.
When the First Fleet arrived in Australia they brought with them cattle and sheep. In April 1788, there were seven cattle and 29 sheep in Australia. Today there are 28 million cattle and around 75 million sheep.

At first, the settlers imported British cattle breeds like Shorthorns and Herefords. Also, at first the settlers imported sheep called fat-tailed sheep. Fat-tailed sheep were hardy and were able to survive in Australia, but their wool was coarse and not very valuable. Soon afterwards they imported Merino sheep. Merino sheep were better suited to Australia’s climate, and their wool was valuable.

Farmers were able to develop their own strains of these sheep breeds. A strain is a group of animals within a breed that share similar characteristics. For example, the Booroola and the Peppin strains within the Merino breed.

Much of Australia’s sheep farming takes place in the south. The south is better suited to lamb production. In the 1790s John Macarthur bred Merinos at Elizabeth Farm in Parramatta, NSW. He wanted to produce sheep with fine wool to export to other countries. He chose to breed purebred Merinos as they produced better wool.

A number of Merino strains have since been developed in Australia. In 1861, the Peppin brothers established a sheep farm in the Riverina in NSW. The Peppin brothers took 200 of their best ewes and crossed them with a French Merino ram called Emperor. The lambs that were born grew up to produce lots of wool. They called this new strain the Peppin Merino.

In the 1950s, Jack and Dick Seears of Booroola near Cooma in NSW, wanted to produce a strain that gave birth to lots of lambs. They chose ewes that gave birth to multiple lambs and bred them. This produced the Booroola Merino strain. Today
all Booroola Merinos have multiple births.

Today, Australian farmers breed sheep more for their meat than their wool. They produce 6% of the world’s lamb and mutton.

The British cattle breeds that were originally imported did well in southern Australia as they were well-suited to the climate and conditions. Farmers also developed their own cattle breeds and in 1905, in the upper Murray River Valley in NSW, a Black Aberdeen Angus bull bred with a Shorthorn cow. The grey calves that were produced were the beginning of a new breed called the Murray Grey. This is now known as crossbreeding.

In tropical North Queensland, there were problems with drought, heat and ticks, and the British cattle breeds did not do so well. Farmers used crossbreeding to produce cattle more suitable to the climate. Crossbreeding in the north produced the Braford and the Droughtmaster. Farmers crossed the Indian Brahman cattle with the British Shorthorns and Herefords to produce the Braford. Like the Brahman, the Braford and the Droughtmaster are more resilient to drought and ticks than the British breeds.

In 1956, near Rockhampton in QLD, the CSIRO developed the Belmont Red. The Belmont Red is one half Africander, one quarter Hereford and one quarter Shorthorn, and has characteristics from all three types of cattle. Like the Africander, it can tolerate heat and it is more resistant to ticks. It also has a calm temperament and is easy to handle like the Hereford, and it can adjust to new conditions like the Shorthorn.

Today, Australia produces 4% of the world’s beef. Farmers and scientists use computer databases to help them breed better cattle and sheep. These databases record information about the cattle and sheep, and can be used to predict the likelihood of characteristics being passed on – this is called genetics. The system for cattle is called Breedplan. The system sheep is called Lambplan.
# Activity 2 – Glossary
Create a glossary. Use the table to define any science words that are related to this article.

<table>
<thead>
<tr>
<th>Word/Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strain</td>
<td></td>
</tr>
<tr>
<td>Characteristic</td>
<td></td>
</tr>
<tr>
<td>Climate</td>
<td></td>
</tr>
<tr>
<td>Crossbreed</td>
<td></td>
</tr>
<tr>
<td>Multiple births</td>
<td></td>
</tr>
<tr>
<td>Adaptable</td>
<td></td>
</tr>
</tbody>
</table>
### Activity 3 – Summarising

1. Imagine you’re a cattle farmer in North Queensland. Which characteristics would you look for when choosing a cattle breed? Rank the characteristics in order of importance. (1 = most important; 5 = least important).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resistance to ticks</td>
<td></td>
</tr>
<tr>
<td>Colour</td>
<td></td>
</tr>
<tr>
<td>Milk production</td>
<td></td>
</tr>
<tr>
<td>Grow to adult quickly</td>
<td></td>
</tr>
<tr>
<td>Adaptable</td>
<td></td>
</tr>
</tbody>
</table>

2. Compare your rankings with a partner.
   a) Which characteristic did your partner choose as most important?

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________

   b) Why do you think they chose this characteristic? Refer to the table below to help you explain.

   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
   ________________________________________________________________
<table>
<thead>
<tr>
<th>Type of sheep</th>
<th>Characteristics</th>
</tr>
</thead>
</table>
| Booroola Merino              | • ewes have multiple births  
                               • small in size  
                               • lambs develop slowly  
                               • excellent wool quality |
| First cross                   | • ewes produce lots of milk  
                               • caring, protective mothers  
                               • large in size  
                               • lambs grow quickly  
                               • good quality wool |
| Border Leicester              | • ewes produce good milk  
                               • excellent mothers  
                               • large in size  
                               • docile  
                               • lambs grow quickly  
                               • quality meat |

3. Which breed would you choose for the following situations? Explain your choices.

**a)** If you wanted to farm sheep for wool.

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

**b)** If you wanted to farm sheep for meat.

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

**c)** If you wanted a sheep you could farm for meat and wool.

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

4. In your own words, explain why farmers and scientists use crossbreeding.

________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________
________________________________________________________________

**Farming Through History**
## Activity 4 – Question builder


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

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>First word</td>
<td>Second word</td>
</tr>
<tr>
<td>(choose one for each question)</td>
<td>(choose one to add to your first word)</td>
</tr>
<tr>
<td>What...</td>
<td>...is/are/do (for a question in the present)</td>
</tr>
<tr>
<td>When...</td>
<td>...did/was (for a question in the past)</td>
</tr>
<tr>
<td>Which...</td>
<td>...would/could/can (for a question about possibility)</td>
</tr>
<tr>
<td>Who...</td>
<td>...might (for a question about prediction)</td>
</tr>
<tr>
<td>Why...</td>
<td>How...</td>
</tr>
</tbody>
</table>

**Step 3**

Write your two different questions in the spaces below:

Example question: How do we know that certain foods contain protein; is there a scientific test?

Write Question 1 here:

Write Question 2 here:

**Step 4**

Now have a go at answering your own questions, or swap with a friend and answer their questions or suggest some possible answers. You can give your answer in any form you like, e.g. as a PowerPoint presentation, a poem, a report, a letter, or a mind map.
The cattle country
Over time, Australia's herd has grown from just a few animals to many millions.

Farmers use data from the Australian Government’s Bureau of Statistics to help them on their farms.
This graph shows the number of beef cattle in Australia from 1900 to 2004.

Title: ____________________________________________

2004 level estimated by the Australian Bureau of Agricultural and Resource Economics (ABARE)
Source: ABS Agricultural Censuses and Surveys: ABARE
Activity 1 – Brainstorming

If you were a farmer, what kinds of facts and figures would you like to have access to?

1. Make a class list of all the data that you think would be useful to a farmer on a day-to-day basis. For example, what would you like to know about the climate, or how your stock might be valued at the market?

__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________

2. Once a class list has been made, write ideas about the way farmers could access and then use the different pieces of information in their jobs.

__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
__________________________________________________________________________________________________________________________________________________________________
Activity 2 — Glossary
Creating a glossary. Use the table to define some science words/terms included in the article.

<table>
<thead>
<tr>
<th>Word</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data</td>
<td></td>
</tr>
<tr>
<td>Statistics</td>
<td></td>
</tr>
<tr>
<td>Graph</td>
<td></td>
</tr>
</tbody>
</table>

Activity 3 — Summarising
1. Write a title for the graph on page 33 on the line provided next to the word ‘Title’. Don’t forget to look at the information on the two axes to help you give the graph an appropriate title.

2. In what year did Australia produce the most beef cattle?

________________________________________________________________

3. In what year did Australia produce the least beef cattle?

________________________________________________________________

4. Add to the graph by drawing in the number of beef cattle for 2014 (28 million beef cattle).

5. Is there a general pattern or trend to the shape of the graph? How would you describe the shape of this graph to someone who has not seen it before?

________________________________________________________________

________________________________________________________________

________________________________________________________________

6. One of the reasons there was a decline in beef herd to 19.4 million in the 1980s was drought. Could drought affect the beef cattle herd size again in the future? Why/Why not?

________________________________________________________________

________________________________________________________________

________________________________________________________________
**Activity 4 –**

**Question builder**


Use the Question Builder below to help create two of your own questions related to the use of data and statistics on sheep and cattle farms. Each question should start with a word from Step 1 and a second word from Step 2.

---

<table>
<thead>
<tr>
<th><strong>The four-step question builder</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong></td>
</tr>
<tr>
<td>First word</td>
</tr>
<tr>
<td>(choose one for each question)</td>
</tr>
<tr>
<td>What...</td>
</tr>
<tr>
<td>When...</td>
</tr>
<tr>
<td>Which...</td>
</tr>
<tr>
<td>Who...</td>
</tr>
<tr>
<td>Why...</td>
</tr>
</tbody>
</table>

**Step 3**

Write your two different questions in the spaces below:

Example questions: **How might** cattle and sheep farmers continue to feed the same or more people if the climate changes too much? **What do** farmers do if there hasn’t been a lot of rain and therefore not a lot of grass for their animals to eat?

Write Question 1 here:

Write Question 2 here:

**Step 4**

Now have a go at answering your own questions, or swap with a friend and answer their questions or suggest some possible answers. You can give your answer in any form you like, e.g. as a PowerPoint presentation, a poem, a report, a letter, or a mind map.
Activity 5 – Bringing it all together

1. What did you enjoy learning about the most?
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

2. List the two most interesting things about sheep and cattle farming that you have learnt about from doing these activities
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________
   __________________________________________________________

3. Draw a picture to summarise what you have learnt about sheep and cattle farming.
# The Science Matrix

<table>
<thead>
<tr>
<th>Description</th>
<th>Activity Suggestions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scientific Procedure</strong></td>
<td>Hands-on activities that follow the scientific method. Includes experiments and surveys. Great for kinaesthetic and logical learners, as well as budding scientists.</td>
</tr>
<tr>
<td><strong>Science Philosophy</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Being Creative With Science</strong></td>
<td>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.</td>
</tr>
<tr>
<td><strong>Science Time Travel</strong></td>
<td>Here we consider scientific and technological development as a linear process by looking back in time or travelling creatively into the future.</td>
</tr>
<tr>
<td><strong>‘Me’ The Scientist</strong></td>
<td>Personalising the science experience in order to engage students more deeply.</td>
</tr>
</tbody>
</table>

1. A healthy farm contains a range of living things from plants to microscopic bacteria to fungi. Analyse some specimens and have a think about whether or not they are alive. See Activity 1.

2. Could local farmers benefit from incorporating local indigenous knowledge into their daily routines to help manage their land? Research ways Aboriginal and Torres Straight Islander people care for the land and decide whether their knowledge should be consulted in order to improve the success of the farm. You can have a class debate to discuss the question.

3. Imagine you are a TV personality interviewing one of the young farming champions (see [http://www.art4agriculture.com.au/yfc/yfc2014.html](http://www.art4agriculture.com.au/yfc/yfc2014.html)). Read their profiles and/or blogs and use the information they have uploaded to create questions and then answers to those questions. Perform your interview with the young farming champion as a role play for the rest of the class.

4. Find out about Australia’s very first farmers. Choose a famous farmer (e.g. James Ruse) and write a newspaper story about them, telling the reader who they were and what they did. Alternatively, you could put a scrapbook together showing the life and times of your chosen farmer. [http://museumvictoria.com.au/collections/items/782763/negative-australia-s-first-farmer-1949](http://museumvictoria.com.au/collections/items/782763/negative-australia-s-first-farmer-1949)

5. Could you be a Beef Champion? To find out have a go at answering some of the questions that appeared on the Beef farming and by-products worksheet. Some of the questions you can answer from what you have remembered in this unit of work, and the rest you will have to research. See Activity 2.
Activity 1
Teacher's notes

1. Before the activity a discussion about what is alive will be needed to prime the students and give them the tools to carry out the activity. There are plenty of useful examples of how to use MRS GREN (each letter representing one of the 7 characteristics of living things) to introduce the concept of being alive.

2. The specimens can be set up around the room for the students to examine. It is okay to place the tick on the line between alive and dead if students are unsure which category the specimen is in. The important thing is that they think about what it is to be alive rather than get the 'right' answer, as most of the specimens have been chosen due to being difficult to tell.

3. The value in the activity comes out during the class discussion once the students have finished categorising the specimens. To start the discussion, students can be invited to share the specimens they had difficulty classifying as dead or alive by explaining why they had difficulty. Here are a few notes to push the student thinking further and encourage their own questions around whether something is alive and its interactions with other living things.
### Specimen Comment for teacher

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Comment for teacher</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Piece of fruit</td>
<td>Some questions to consider here are: Was the fruit alive while it was on the tree? – why or why not? At what point does the fruit die? How does a fruit help a plant reproduce and create more plants?</td>
</tr>
<tr>
<td>2. Yoghurt</td>
<td>The best tubs of yoghurt to use here will have ‘live culture’ or ‘contains live bacteria’ written on the side as some students will pick up on this and use it in their response. This can stimulate a discussion about microorganisms that are too small to see without a microscope but still have an important role to play in day-to-day life and in particular on farms, such as helping to provide nutrients to the soils to promote rich pasture, causing disease that might affect the herds and flocks.</td>
</tr>
<tr>
<td>3. Seeds</td>
<td>Radish seeds are a good example to use here. The idea of dormancy can be introduced here. Questions can include: What needs to be added to the seed to be able to give it life? If the seed is not alive, is it dead? Could we test it in any way to see if it is dead?</td>
</tr>
<tr>
<td>4. Soil</td>
<td>This one is important for farmers. The soil must be looked after to promote good nutrient content and active microorganisms that can recycle nitrogen for plant use. Students will probably say the soil is dead, but this is a good opportunity to remind them that it contains plenty of living organisms that are necessary for healthy soil.</td>
</tr>
<tr>
<td>5. Fungus</td>
<td>If you cannot find some fungus growing on bark then a photo can be used. An edible mushroom is fine, but it won’t be as effective to push the students to think about the role of recycling matter in an ecosystem. Students can say that the fungus is growing as it feeds off the dead log. They can then be led to think about why farmers might leave dead trees on their properties.</td>
</tr>
<tr>
<td>6. Cork</td>
<td>Students here can be reminded that cork comes from the bark of trees and any living matter can be recycled back into the farming ecosystem.</td>
</tr>
<tr>
<td>7. Leaves</td>
<td>Green and brown leaves can be used for comparison. This one can be paired with the fruit specimen. Were the leaves alive while they were on the tree? - why or why not? At what point does a leaf die? What is leaf litter? – can leaf litter provide a habitat for other living things? How can leaf litter help make the soil underneath more healthy?</td>
</tr>
<tr>
<td>8. Garlic sprouting</td>
<td>A clove of garlic can be suspended by a toothpick with the flat section facing down in some water. After a few days some roots will appear and then some shoots – students will probably recognise this as the plant being alive. Do shoots and roots always mean something is alive? What provides the energy and nutrients for the roots and shoots to grow?</td>
</tr>
</tbody>
</table>
**Activity 1**  
**Is it alive?**

**Background information**  
Sustainable farms contain a variety of living things, but not all of them are obvious or easy to recognise. In this activity you will examine a variety of specimens and decide whether or not they are alive. Before you start you should have a clear idea of what to look for when recognising whether something is alive.

**Aim:** To identify signs of life in a variety of specimens.

**What you need:**
- magnifying glass
- nine specimen of living and non-living organisms including a piece of fruit, yoghurt, seeds, soil, fungus, cork, garlic.

**What to do:**
1. Move around the room and examine the specimens labelled 1–9 with a magnifying glass.
2. Decide if each specimen is alive (a product of a living thing), dead (once living and now dead), or is non-living (has never lived).
3. Record your findings in the table below. Put a tick in the correct category for each specimen.
4. Comment on your findings. Are there any exceptions?
### Results:

<table>
<thead>
<tr>
<th>Specimen</th>
<th>Alive</th>
<th>Dead</th>
<th>Product of living thing</th>
<th>Non-living</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Piece of fruit</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Yoghurt</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Seeds</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Fungus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Cork</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Leaves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Garlic sprouting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion:

1. How did you decide which specimens were alive, dead or not living?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

2. Which specimen(s) did you have trouble categorising and why?

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

3. When might recognising and understanding ALL the living things on a property help a sheep and cattle farmer run a more sustainable farm? Think of one example and write it here. Then share your idea with the rest of the class.

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________

Summarise your results:

_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
_________________________________________________________________
Activity 2
Beef farming and by-products worksheet

By completing these activities, students will be able to apply the knowledge they have learnt during this unit of work, as well as apply their research skills to put together responses for information not yet covered in this unit.

Question 1 – Answers

a)
**Question 2 – Answers**

a) A by-product is a secondary product that is made when something else is the primary product.

b)  

<table>
<thead>
<tr>
<th>Name of beef cattle by-product</th>
<th>Use of beef cattle by-product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Example: Floor wax</td>
<td>To polish the floor</td>
</tr>
<tr>
<td>2.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td></td>
</tr>
</tbody>
</table>

Note: Students responses will vary depending on their research. The following website can be used to check their examples:  
### Question 3 – Answers

**a)** Jumbled words.

<table>
<thead>
<tr>
<th>Word</th>
<th>Correct Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>klanf</td>
<td>flank</td>
</tr>
<tr>
<td>hecke</td>
<td>cheek</td>
</tr>
<tr>
<td>kucch</td>
<td>chuck</td>
</tr>
<tr>
<td>uprm</td>
<td>rump</td>
</tr>
<tr>
<td>itrks</td>
<td>skirt</td>
</tr>
<tr>
<td>insh</td>
<td>shin</td>
</tr>
<tr>
<td>kisterb</td>
<td>brisket</td>
</tr>
<tr>
<td>pto ieds</td>
<td>top side</td>
</tr>
<tr>
<td>npiostilr</td>
<td>striploin</td>
</tr>
</tbody>
</table>
Activity 2
Beef farming and by-products worksheet

Question 1
Complete the word search and then use the words to complete the cloze passage below.

a) Can you find all the words?

**Activity 2**
Beef farming and by-products worksheet

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Complete the word search and then use the words to complete the cloze passage below.

a) Can you find all the words?

**BREEDPLAN**
DIFFERENT
HEREFORD
MILLION
SOAP

**CANDLES**
DROUGHT
MEAT
MURRAY GREY
TICKS

**CROSSBREEDING**
FOUR PER CENT
MILK
SHORTHORN
TOOTHPASTE

**MEAT**
**MILK**

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Beef farming and by-products worksheet

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**Activity 2**
Beef farming and by-products worksheet

**Question 1**
Complete the word search and then use the words to complete the cloze passage below.

a) Can you find all the words?

**BREEDPLAN**
DIFFERENT
HEREFORD
MILLION
SOAP

**CANDLES**
DROUGHT
MEAT
MURRAY GREY
TICKS

**CROSSBREEDING**
FOUR PER CENT
MILK
SHORTHORN
TOOTHPASTE

**MEAT**
**MILK**

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**Activity 2**
Beef farming and by-products worksheet

**Question 1**
Complete the word search and then use the words to complete the cloze passage below.

a) Can you find all the words?
Question 1
Fill in the gaps in the sentences with words from the word search.

1. There are many ________ types of cattle.
2. Cattle are farmed for their ________, ________, and by products.
3. By products of cattle include ________, ________, and ________.
4. Today Australia produces ________ of the world’s beef.
5. There are 28 ________ cattle in Australia.
6 There are many different breeds of cattle, including ________, ________, and ________.
7. Farmers can make their own cattle breeds by ________. This is when one type of cow is bred with another. The system farmers use to do this is called ________.
8. Some cattle are more resistant to problems than others. Some problems farmers might have with cattle are ________, and ________.

Question 2
Beef cattle provide us with more than meat to eat. There are many different by-products of beef farming.

a) What is a ‘by-product’?

____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________
____________________________________________________________________________________

b) Research as many different by-products we use from cattle as you can. List the by-products here and then outline their use. Can you list 10 different by-products of beef cattle?
**Activity 2**

2014 Landmark Beef Championship

**Pre Event Worksheet**

<table>
<thead>
<tr>
<th>Name of beef cattle by-product</th>
<th>Use of beef cattle by-product</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
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<tr>
<td>2.</td>
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<td>3.</td>
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<td>4.</td>
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<td>9.</td>
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<tr>
<td>10.</td>
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</tbody>
</table>

**Elaborate**

- Check your responses with your teacher and then add up the number of correct by-products.
  
  My total number of by-products researched: _________________________________

- How well did you do? Use the table below to award yourself a ribbon!

<table>
<thead>
<tr>
<th>Less than 3 by-products</th>
<th>Beef farming encouragement award</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 to 6 by-products</td>
<td>Third place Beef Farming Champion</td>
</tr>
<tr>
<td>7 to 9 by-products</td>
<td>Runner up Beef Farming Champion</td>
</tr>
<tr>
<td>10 or more by-products</td>
<td>Beef Farming Champion</td>
</tr>
<tr>
<td>identified</td>
<td></td>
</tr>
</tbody>
</table>
**Question 3**

There are many different cuts of meat that come from a single animal. Complete the word jumble of the different cuts of beef and then carry out some research to find out where they come from on the cow.

**a)** The following words are different cuts of meat. Use this list to help you un-jumble the words below.

<table>
<thead>
<tr>
<th>brisket</th>
<th>cheek</th>
<th>chuck</th>
<th>flank</th>
<th>rump</th>
<th>shin</th>
<th>skirt</th>
<th>sirloin</th>
<th>top side</th>
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</tbody>
</table>
b) Write the cuts of meat on the shapes drawn on the cow below.
Section 1 –
Draw your own poster

Draw your own poster about sheep and cattle farming to show what you have learnt during this unit of work.
Section 3 – Crossword

Across
3. Rounding up the cattle or sheep.
6. How many head of cattle does Australia produce each year?
7. Australia is one of the driest places on earth, which means it often experiences this.
8. The First Fleet brought these.
9. When soil is moved or washed away from its original site.

Down
1. Different types of sheep and cattle with different characteristics.
2. Breed of sheep well suited to the Australian climate.
4. Farmers use what from databases to help them run their farms?
6. Farmers now prefer to handle their stock with less of this.
## Section 4 – Individual unit review

<table>
<thead>
<tr>
<th><strong>Learning summary</strong></th>
<th><strong>Your philosophy</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Write five dotpoints of things that you learnt about sheep and cattle farming that you didn’t know before you started.</td>
<td>Describe your overall thoughts about cattle and sheep farming after completing this unit. Has this unit of work changed your thinking about cattle and sheep farming? Are you more interested in learning about cattle and sheep farming after studying it at school?</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>More questions</strong></th>
<th><strong>What do you think?</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Write three questions that you still have about sheep and cattle farming or anything else related to this unit of study.</td>
<td>Which activities did you find helped you learn the easiest? Why?</td>
</tr>
</tbody>
</table>