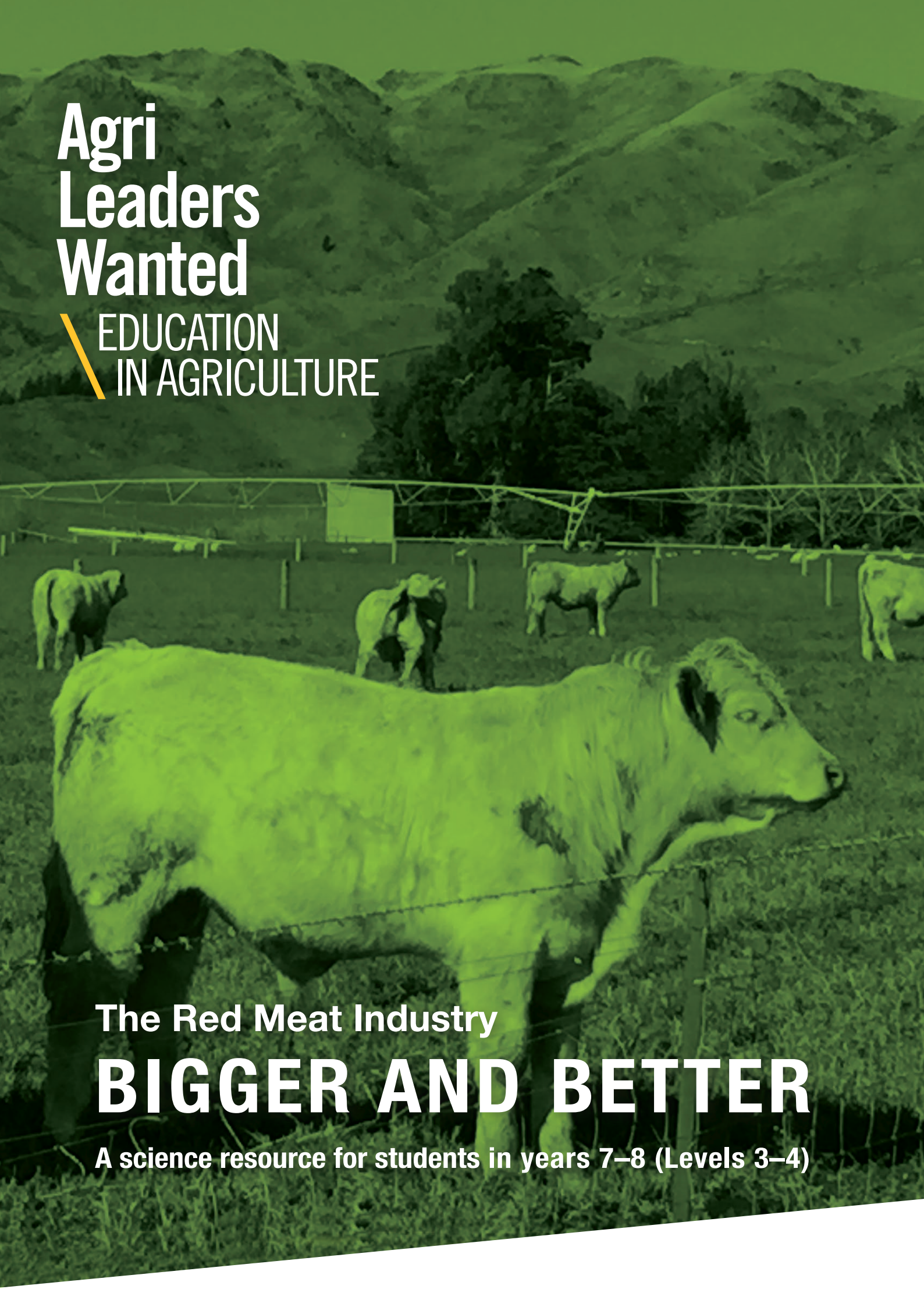


Agri Leaders Wanted

EDUCATION IN AGRICULTURE

The Red Meat Industry

BIGGER AND BETTER

A science resource for students in years 7–8 (Levels 3–4)

Contents

This resource has been funded by the Red Meat Profit Partnership, in conjunction with NZ Young Farmers and CORE Education.

Context

Livestock farming is all about growing grass and processing it through an animal to make money. (400 Plus, p. 2).

Farm facts:

- Sheep and cattle are the most widely farmed animals in New Zealand. 44% of all farms in New Zealand are sheep and/or beef farms.
- In 2016 there were 27.58 million sheep and 3.47 million beef cattle in New Zealand.
- Beef production contributes significantly to the New Zealand economy, with total beef exports worth around $2.8 billion annually.

(Source: Compendium of Farm Facts, 2017).

The farming sector is big business in New Zealand. Agribusiness relies on a wide range of resources and scientific research to produce quality animals that fetch high prices in local, national, and international markets. These markets are highly competitive and New Zealand farmers must make smart use of developments in scientific research to compete.

New Zealand is well suited to growing high quality livestock. Unlike many countries, we have a climate that is ideal for plant and animal growth all year round and livestock live in open fields where they eat grass. New Zealand's isolation from other countries and biosecurity protocols and practices protect animals from contagious diseases. Unfortunately however, this isolation adds considerable costs in transporting our produce to international markets.

Scientific research and technical innovation enhance the knowledge, skills, and processes that increase productivity and efficiency, allowing farmers to breed and raise bigger and better stock. New Zealand has earned a well-deserved reputation for trying out innovative ideas that boost the ongoing development of sheep and beef farming in this country.

This resource supports students in years 7 and 8 to reach the levels 3–4 achievement outcomes of the science curriculum, within the context of sheep and/or beef farming.

The activities in this resource enable students to:

- explore the relationship between science and farming
- become aware of science-focussed careers that support farming
- gain knowledge about the main breeds of livestock that contribute to the red meat industry
- identify how science concepts, skills, and knowledge can improve sheep and beef farming practices
- investigate the farming techniques that produce a high quality and quantity of animals
- gain a basic understanding of how genetic science is applied to farming practices
- apply their new knowledge, skills, and capabilities to an authentic context
- present and communicate their acquired knowledge, skills, and science capabilities.

Curriculum links

Achievement objectives

Science: Levels 3–4

Science capabilities

As students work through these activities they will develop and apply these science capabilities:

- gathering and interpreting data
- using evidence
- critiquing evidence
- interpreting representations
- engaging with science.

Nature of Science

Understanding about science

Students will:

- appreciate that science is a way of explaining the world and that science knowledge changes over time
- identify ways in which scientists work together and provide evidence to support their ideas.

Investigating in science

Students will:

- build on prior experiences, working together to share and examine their own and others' knowledge.
- ask questions, find evidence, explore simple models, and carry out appropriate investigations to develop simple explanations.

Communicating in science

Students will begin to use a range of scientific symbols, conventions, and vocabulary.

Participating and contributing

Students will use their growing science knowledge when considering issues of concern to them.

Living World

Life processes

Students will recognise that there are life processes common to all living things and that these occur in different ways.

Evolution

Students will explore how the groups of living things we have in the world have changed over periods of time.

Key understandings

- Genetics is the study of inheritance. Characteristics (or traits) can be inherited and passed from parent to offspring.
- All living things (organisms) contain genetic material called DNA, which controls the life functions of an organism.
- Natural selection is the process through which the conditions in an environment select and control the living things that survive and pass on their successful or useful traits to their progeny.
- Selective breeding is a process through which people select desired genetic traits and manage these so that they are passed on from parents to progeny.
- Farmers use selective breeding techniques to improve the quality and quantity of their livestock and so increase their income.
- The quality and quantity of livestock can be influenced by genetic and non-genetic factors.
- The New Zealand red meat industry is dependent upon a number of different beef and sheep breeds.
- The age of an animal, meat colour, firmness and marbling (IMF) help to predict the quality of the meat.

- Red meat is an important source of protein and iron in human diets.
- Protein is required for growth and repair of bodies.
- Iron is required for oxygen transportation in blood.

Key competencies

As students work through the activities in this resource they will develop and practise the five key competencies outlined in *The New Zealand Curriculum.*

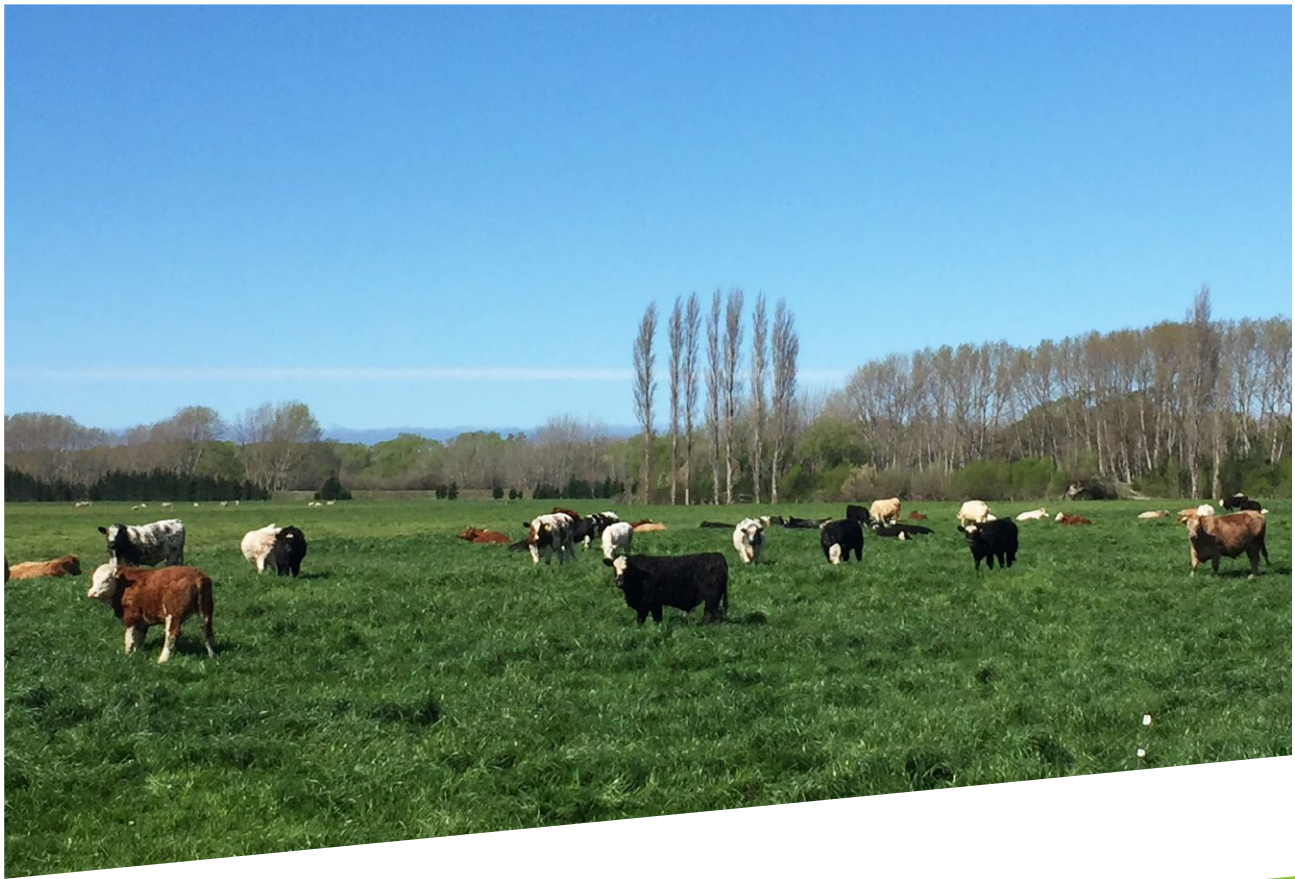
Participating and contributing: Contributing to class discussions, generating questions and ideas that relate science and technology to farming contexts; participating in group tasks, including research and debate

Thinking: Exploring scientific innovations, their implications, and their effects on farming practices; considering how scientific knowledge changes farming practices; understanding the specialist knowledge and skills required for scientific research

Using language, symbols, and texts: Learning subject-specific vocabulary; learning scientific concepts; reading and making sense of texts that have been written for a specific audience – producers in the red meat industry

Relating to others: Working collaboratively to develop understandings about concepts and ideas and about the relationships between natural science phenomena, scientific developments, and sheep and beef farming

Managing self: Showing initiative, meeting commitments made to the group, contributing to class or group research projects.



Background notes for teachers

This resource provides an authentic context for students to explore the complementary relationship between science and farming. They will discover how scientific research is used to increase sheep and beef productivity, to produce larger animals, and to produce higher quality meat.

The activities in the resource introduce scientific knowledge and illustrate how science concepts, skills, and knowledge relate to improving farming practices. A glossary of context-specific terms is included.

The context of a New Zealand sheep and/or beef farm allows students to:

- explore the application of key scientific concepts to a real-life context
- develop critical thinking skills as they investigate how science has improved farming practices and made farming more productive
- learn a range of skills and concepts within the context of a farm visit.

New Zealand Young Farmers territory managers can help schools to arrange a farm visit. Where this is not possible for a school, they can arrange for a class to email or skype a farmer to discuss aspects of the learning activities. Alternatively, a farmer can be invited to a school as a guest speaker. NZYF territory managers can be contacted on 0800 6993 4636 or emailed at info@youngfarmers.co.nz.

Key concepts

- New Zealand is economically dependent on the sheep and beef cattle industry.
- Investigations into sheep and beef cattle farming provide authentic contexts for students to become scientifically literate, providing opportunities to develop their science capabilities.
- Scientific developments such as genetics and pasture management have contributed considerably to advances in the production of high quality sheep and beef farm animals.
- New Zealand has a reputation for pioneering innovative scientific and technological solutions to problems. These in turn have increased productivity and contributed to the national economy.

The structure of this resource

This resource provides a range of activities for students to explore the role science plays in the sheep and beef cattle farming industry. Not all the activities need to be completed to investigate the relationship between the red meat industry and aspects of science. Students have a range of experiences, connections, and prior knowledge and teachers can take these into consideration when they choose to use or adapt the content in this resource to meet the needs of their students.

Learning will be enhanced when students are able to apply their knowledge, skills, and capabilities by visiting a sheep or beef farm. When this is not possible, consider inviting experts such as scientists, farmers, or others involved in the production processes to visit the class. Alternatively you could arrange a virtual field trip or make contact with a farmer through video conferencing (using Skype or Google Hangouts).

Students can demonstrate their learning through formative and summative assessment tasks that relate to this curriculum area. They can demonstrate their ability to relate their learning in science to a sheep or beef cattle context by presenting their observations and investigations in written or visual formats. They can share their learning with a range of audiences, including their classmates, their families and whānau, or farm industry experts they have worked with. Their presentations can be used to assess the skills and knowledge acquired during their investigations against the science achievement objectives.

Module1: Introduction to the science in farming

Achievement objectives

- Living World: Life processes – Students will recognise that there are life processes common to all living things and that these occur in different ways.
- Nature of Science: Understanding about science; Investigating in science

Sheep and beef cattle farms provide many opportunities for students to explore science in action. This introduction will allow students to consider some aspects of science that relate to improving farming outcomes, so that they can later recognise, apply, and explore the contributions science can make to improving agribusiness.

Activities

Setting the scene

Have students view a video about farming in New Zealand. Suggested videos include:

- Country Calendar. Raising the Steaks – Kakahu Angus [23 mins]
- Hyundai Country Calendar. Episode 25, 6 Aug, 2017, Bull Market TVNZ OnDemand [23.05 mins]
- TVNZ's Rural Delivery Show. Lake Farm Beef [8.29 mins]

Have students focus on how the video relates science to the red meat industry. As they view they can take notes about the information in the video that is related to science. Students can work in small groups to collate their ideas and contribute them to a whole-class summary.

Specific questions

Bull Market video: Why is the production of bigger and better bulls important to the red meat industry? What is meant by "bigger and better" in this context

Lake Farm Beef video: What breeds of cattle does this farm rear? How does the farmer ensure the high quality and quantity of his stock?

Agriscience

Have students explore this interactive programme to discover more about the role of science in agriculture.

Question generator

Guide the class to generate a bank of questions that can be used to focus student inquiry, a class visit to a sheep or beef farm, or an interview with an expert.

Some examples:

What types of meat do New Zealanders or people of other cultures eat?

What animals do these types of meat come from?

How important is meat production to the New Zealand economy?

What risks can affect animals bred for the red meat industry?

What industries are involved in producing, processing, and transporting meat to a consumer's table?

What does science contribute to red meat production and processing?

Name some of the scientific careers available in the primary industries.

Allow students to add to these questions at any stage during this study. These questions could also form a basis for some of Agriscience Explorers activities in Module 4. Questions could be recorded digitally using an app such as Padlet set up by the teacher.

The building blocks of genetics

Students can create a mindmap or concept map to show their understanding of the relationships between

- a cell
- a chromosome
- DNA
- a gene
- a genome.

They can present their thinking in graphic form using the app Mindmup, Padlet with connections, Thinglink, Google drawings or on posters.

Have students investigate the number of pairs of chromosomes each cell of a:

- human
- sheep
- cow
- gorse bush.

They can then devise interesting ways to present this information.

Which one is which?

Provide students with 8–10 images of sheep or cattle breeds used for meat production. Using these, they can create a sorting key (dichotomous key) to be used to identify the main breeds of sheep and cattle that New Zealand farmers breed for the red meat industry. There may be an opportunity to try their key out during a farm visit. Afterwards they can consider any changes that are needed to improve it.

Extension activity

Students can research some of the newer or less common breeds of livestock used in New Zealand for meat production and explain why farmers are interested in these breeds.

Life processes

Students can revise their prior knowledge of the life processes (remind them of the acronym, MRS GREN) by producing a graphic representation of each life process as it relates to sheep or cattle.

Resources

- Genetics for Kids. This site contains a range of short videos and other resources. The first video, Genetics: What are Genes? [4.25 mins] is a great place to start.
- Beef+Lamb New Zealand. Compendium of Farm Facts – 2017
- New Zealand Sheep Breeders Association. Sheep Breeds
- *The Rural*, 19 Nov., 2013. Sheep breeds in New Zealand
- *The Rural*, 14 Nov., 2013. Cattle breeds in New Zealand
- *The Rural*, 14 July, 2015. What are the best beefies for the farm?
- Bioscience for the Future: Discovering DNA – The recipe for life
- BBC BiteSize Science. MRS GREN
- Science Learning Hub. Characteristics of living things
- education.com. Science Project – Dichotomous Key
- Beef+Lamb New Zealand. Beef + Lamb NZ [1 min.]
- Beef+Lamb New Zealand. New Season Outlook 2016–17
- Ministry of Primary Industries. Science and technology in the primary industries [3.22 mins]
- Te Ara The Encyclopedia of New Zealand. Sheep farming; Beef farming
- Agrication – Farm Visits [2.24 mins]

Module 2: Breeding bigger and better animals

Achievement objectives

- Living World: Life processes – Students will recognise that there are life processes common to all living things and that these occur in different ways.
  Evolution – Students will explore how groups of living things we have in the world have changed over time.
- Nature of Science: Investigating in science; Communicating in science

"Farming is all about getting the balance right between feeding and breeding!"
(S. Holland, farmer, Hemingford Stud)

The genetic traits of an animal and what it eats both help to determine the quality and quantity of meat it produces. This in turn determines a farmer's income. When farmers grow more livestock of a high quality that show desirable traits they are considered to be successful. Animal breeding techniques that utilise the science of genetics help farmers to produce bigger livestock of a higher quality. Some farmers specialise in breeding rams or bulls whose semen is used to improve farmers' stock lines worldwide.

These activities allow students to explore in more detail the science of breeding (genetics) and how it relates to the red meat industry.

Activities

What does "bigger and better" mean?

The terms "bigger" and "better" applied to livestock and farming may mean different things to different people. As a class, students can discuss these terms and collate their ideas and opinions before deciding on a collective definition. Have them gather the perspectives of a range of people, including a farmer and a scientist, as well as their family, whānau, and people in other occupations. They can compare the definitions they have gathered with the class definition and consider whether they need to modify or extend this. Have the students record this process in a table.

<table>
<tr><td colspan="3">Focus question: What do the terms "bigger and better" mean when applied to livestock?</td></tr>
<tr><td>My understanding of "bigger and better"</td><td>Class definition of "bigger and better"</td><td>Other people's understandings of "bigger and better"</td></tr>
<tr><td rowspan="4">I think "bigger and better" means ...</td><td rowspan="4">Our class think that ""bigger and better" means …

After collecting other people's ideas we now think …</td><td>A farmer's point of view is …</td></tr>
<tr><td>A scientist's point of view is …</td></tr>
<tr><td>My mother thinks …</td></tr>
<tr><td>The school bus driver says …</td></tr>
</table>

Environmental impact

To what extent do factors in an animal's environment affect its growth rate, reproductive abilities, and meat quality?

Factors to consider could include:

- the animal's health (parasites and pathogens)
- type of forage and feed (fodder, haylage, baleage, silage, pasture, grain, pellets)
- mineral supplements, such as copper, selenium, zinc, and iodine in food
- soil types and quality
- climatic conditions
- type of landscape (flat, hilly, dry)
- the numbers (density) of animals in paddocks (stocking ratios).

Group the students and allocate each group member (or have them choose) an environmental factor that affects animals' growth. Students exploring similar factors can then work collaboratively to research the science that explains how that factor affects growth. Each student can then share their findings with their original group, becoming the group "expert" for their specific topic.

The life cycle of a farm animal

All living things grow and reproduce. Have students construct a timeline or a concept map for a named breed of sheep or beef cattle to show the ages and stages it goes through from birth to death. Encourage them to use the appropriate farming vocabulary that indicates the age, stage, and gender of the animal (bobby calf, bull, calf, cow, dam, ewe, ewe-lamb, heifer, hogget, lamb, maternal sire, mutton, ram, ram-lamb, steer, terminal sire, two-tooth, weaner, wether).

Selective breeding

Farmers breed selectively to produce animals with desirable traits to meet particular needs or markets. People have been doing this since animals were first domesticated thousands of years ago. Our growing knowledge of DNA and genes has developed the science of genetics, which underpins selective breeding programmes.

Have the students imagine that they are a sheep or a beef cattle farmer. They can consider the types of traits they would select to improve their livestock. They may choose to focus on increasing the numbers of livestock born in each season, the quality and quantity of the meat produced by their animals, or the hardiness of their animals.

Students can then choose to investigate one genetics-based breeding technique that is used to improve livestock on a farm. Examples could include:

- the choice of crossbreeds showing hybrid vigour
- estimated breeding values (EBVs)
- artificial insemination (AI)
- embryo transplants (ET)
- purchasing desirable breeding stock
- the use of eIDs to identify individual animals and their stored data.

Have the students link the scientific research that informs each method to its purpose. Their investigations can be presented as reports, newspaper articles, posters, infographics, or digital presentations, such as Thinklink, Google Drawing, PowerPoint slides, Tellagami, or videos.

Solutions to the dairy farm problem

Problem: Bobby calves do not produce milk so they are of little value to the dairy farmer. They are not economically productive for a dairy farm.

Solutions:

- Bobby calves are sold at a few days old and slaughtered for meat.
- Farmers artificially inseminate their herd with sexed semen that contains only X chromosomes and so produce only female calves.
- Farmers introduce beef genes into the herd so that bobby calves can be grown to produce meat.

Students can discuss the problem and carry out an investigation into each of these solutions. They may come up with alternative solutions. They can record the outcomes of their investigations on a PMI chart.

Problem: Bobby calves are of little value in the dairy industry.				
Describe details of each solution – How does it work?	Scientific research involved	Positives – the advantages of this solution	Negatives – the disadvantages of this solution	Interesting aspects of this solution

Resources

- Beef+Lamb New Zealand. Buying rams soon?
- Beef+Lamb New Zealand Genetics. Spot the Genetic Differences
- The Omega Lamb Project
- Te Ara The Encyclopaedia of New Zealand. Beef breeding; Sheep farming; Beef farming
- Beef+Lamb New Zealand. Guide To New Zealand Cattle Farming
- Sheep 201. A Beginner's Guide to Raising Sheep
- Beef+Lamb New Zealand. 400 Plus – A guide to improved lamb growth for farmers and advisors
- *The Rural* 28 Sep., 2016. Increase in use of dairy beef genetics puts more money in farmers' back pockets
- Beef+Lamb New Zealand. Dairy Beef Integration – an interview on Rural Delivery [6.55 mins]
- Rural Delivery programme, Episode 14, 10 June, 2017. The Mt Linton Genetics Programme TVNZ OnDemand [22.48 mins]
- Beef+Lamb New Zealand. Taking production to the next level – Sheep farming [1.38 mins]
- PGG Wrightson's Stud Tour. Waikaka Genetics Farm – Beef and sheep breeding [25.46 mins]
- Mt Linton Station. Mount Linton Genetics – Hill farming, sheep breeding [24.04 mins]
- Radio New Zealand podcast. Do ewe baa English? Farming Ile de France sheep in North Canterbury [9.18 mins]
- Beef+Lamb New Zealand Genetics. Meat eating quality and adding value [18.29 mins]
- Ministry of Primary Industries. Meet Cather – Director of the Photon Factory and Primary Industry – Using lasers to sex cattle semen [2.12 mins]
- Auckland company boasts cutting edge cattle breeding technology [2.06 mins] (video and newspaper article)
- Sexed Semen: History and Potential
- Radio New Zealand. New tool to test sheep meat quality; NZ scientists map sheep genes
- National Sheep Improvement Program. What are EBVs?

Module 3: What's meat?

Achievement objectives

- Nature of Science: Understanding about science; Investigating in science; Communicating in science
- Science capabilities: Gathering and interpreting data; Using evidence; Engaging with science

Meat is an important part of many people's diets. These activities allow students to investigate the importance of this food source.

Activities

How is meat produced?

Students could produce an infographic to illustrate the processes involved in converting sunlight (solar energy) into sheep or beef meat (chemical potential energy) and into protein within human body (also chemical potential energy). They could present their infographics to other classes.

A source of iron

Red meat is a key source of iron, which is an essential mineral in our diet. Have students record and compare the iron content of different foods. They can also investigate why iron is important for health.

Keeping meat safe

All food, including meat, is subject to decomposition. Decomposing food is a major health risk. Have students, in small groups, investigate these key questions:

What causes meat to go off?

What could happen when we eat meat that is "off"?

What can we do to ensure meat is safe to eat after a period of time.

How can red meat be preserved?

How does freezing, drying, or canning preserve meat?

How did Māori and other traditional cultures preserve meat?

What are the rules and regulations for the safe handling and processing of red meat?

Practical investigation: Digesting meat

Cooks use marinades to tenderise meat. This is partial digestion. In groups, students can carry out a practical investigation into different ways to speed up this process. They can use a range of fruits, such as kiwifruit, to compare digestion rates. Other substances, such as soda drinks can also be used for this process. Students could also experiment to find out whether it is easier to digest raw or cooked meat.

Extension activity

Students can investigate why herbivores, (especially ruminants) such as sheep and cows, need to eat constantly and have large, multiple stomachs to digest their food, whereas carnivores eat once or twice a week and have small, single stomachs similar to humans.

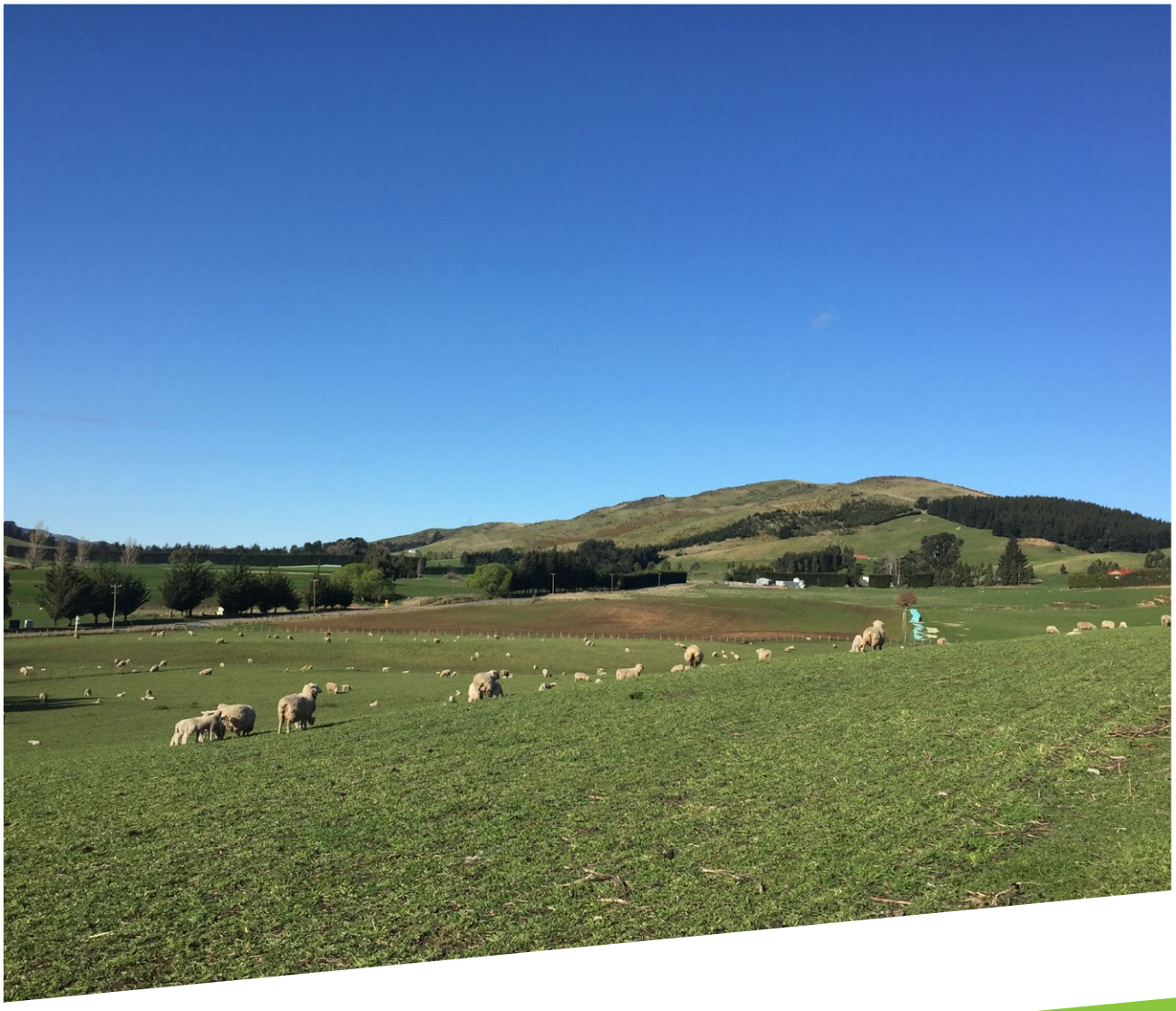
Resources

- Beef and Lamb New Zealand. Nutrition
- Beef and Lamb NZ Advertising Campaigns. Stairway to Heaven [0.44 mins] or the fuller Australian version [1.30 mins]
- Te Ara The Encyclopedia of New Zealand. Kai Māori
- New Zealand Nutrition Foundation. Iron
- *Stuff*, 12 Dec., 2016. Why iron is such an important part of your diet
- TVNZ Rural Delivery Programme, 29 July, 2017, Episode 21. Some diagnostic and processing tools for the meat industry at Carne Technologies from 14.32 to 22.43 [8.11 mins] TVNZ OnDemand
- Beef and Lamb New Zealand. Body condition scoring is a game changer [1.21 mins]
- Beef and Lamb New Zealand. Practical demonstration in the yards: Body condition scoring demo [4.13 mins]
- Ohio Beef Council. How Does Beef Reach Your Plate? Students can investigate the similarities and differences to beef farming in New Zealand [6.49 mins]
- Beef and Lamb New Zealand Genetics. Meat quality – A global view [16.15 mins]
- Beef and Lamb New Zealand Genetics. Meat eating quality and adding value [18.29 mins]
- Science Learning Hub. Fruit enzymes tenderise meat – Notes and an activity sheet for experiments with fruits tenderising meat
- Food Science Australia. Reprinted Nov., 2006 Sheep meat eating quality
- Radio New Zealand. New tool to test sheep meat quality; NZ scientists map sheep genes
- Beef and Lamb New Zealand. Beef and Lamb New Zealand Reference Guide

Module 4: Agriscience explorers

Achievement objectives

- Living World: Life processes – Students will recognise that there are life processes common to all living things and that these occur in different ways.
- Evolution – Students will explore how groups of living things have changed over long periods of time.
- Nature of Science: Understanding about science; Investigating in science, Communicating in science; Participating and contributing
- Science capabilities: Gathering and interpreting data; Using evidence; Critiquing evidence; Interpreting representations; Engaging with science



Activities

Have students choose 6–8 of these tasks and work on them either individually or in groups. They can be incorporated into a farm visit but do not have to be. Adapt the number and range of activities to meet student and class needs.

Agriscience Explorers		
Wild Card Choose and explain an aspect of farming practice that has been influenced by scientific research.	How do farmers measure the quality of the meat they produce? What are the desirable qualities of meat that farmers breed into their livestock?	What does the nitrogen cycle have to do with producing bigger and better livestock?
Design an infomercial encouraging others to eat more red meat.	Investigate one of the questions from in the Module 1 Question Generator.	Which genetic characteristics of sheep and cattle are dominant and which are recessive? Use this information to create a genetic profile.
Investigate the role of farmers as kaitiaki – caretakers of the environment.	Interview a farmer about the key tasks they need to carry out to ensure they produce high quality livestock.	As a scientist you have been asked for some advice by a farmer about using EBV or the SIL index. What would to tell them?
Profile a scientist or a research organisation involved in improving the red meat industry.	Investigate less common or rare breeds or cross breeds of sheep or beef cattle.	Write a pepeha for a local sheep or beef cattle farm.
Create a game to teach others about key vocabulary in the science of selective breeding.	Design a pamphlet or poster to alert people to the risks of a pathogen that could affect the health of sheep or cattle or design a pamphlet advising farmers how to manage these risks.	Match photos of different cuts of meat to an anatomy diagram of a sheep or cow. Extension - match these cuts to a diagram of human anatomy.

Module 5: Making the learning visible

Activities

Case study

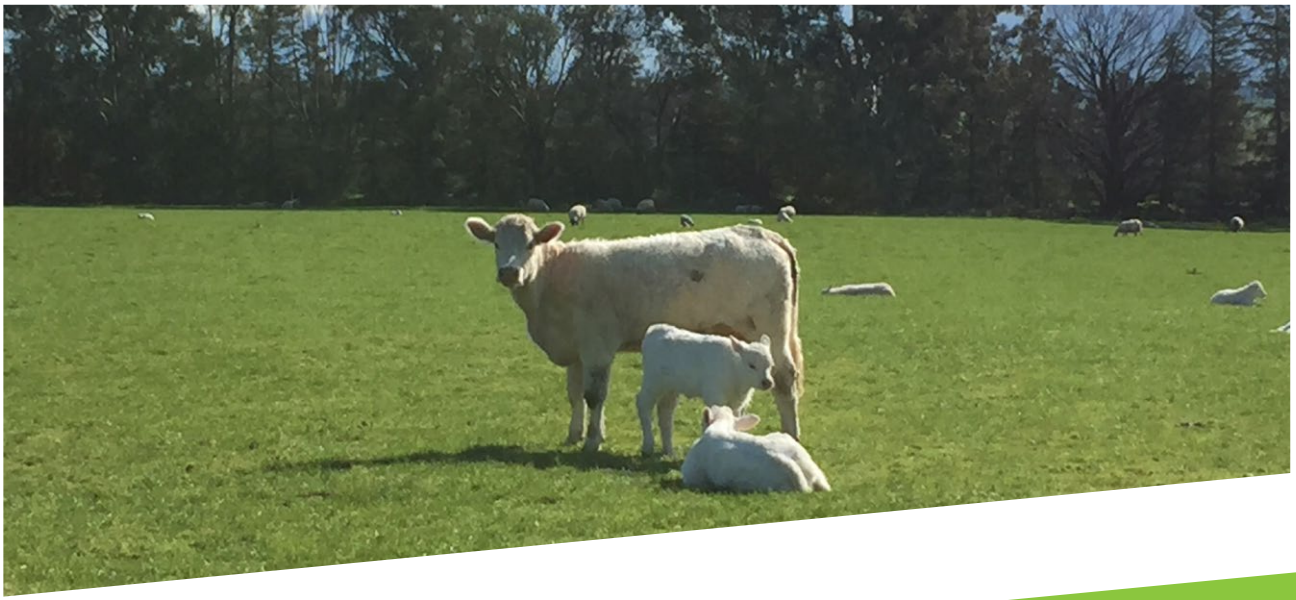
Canterbury Farming, June 2017 includes an article, “The Genetics of Charolais”. Charolais are a cattle breed being bred as stud animals and for the meat industry on Hemingford Stud near Culverden in North Canterbury. This farm also breeds Texel sheep. Have students refer to this article to list the farming practices used to improve the quality and quantity of stock at Hemingford Stud. Students can then research the science that informs these practices. (Note to teachers: You may want to print off the relevant parts of the article to remove the advertising).

Q & A

Students can discuss and reflect on answers they found to their initial questions through observations on a farm, talking to experts, viewing videos, listening to podcasts or through their own research. Focus their discussion on the contribution of scientific research to the production of bigger and better livestock. They could use Padlet, Google Slides, Powerpoint, or other digital or non-digital means to share their questions and answers with others and to make their learning visible.

Show and tell exhibition

Have students prepare a presentation or exhibition of their learning during these activities. Ensure students focus their presentations on examples of science improving and supporting the red meat industry. They can work individually or in groups and their learning can be presented in digital or print formats, tailored to a chosen audience.

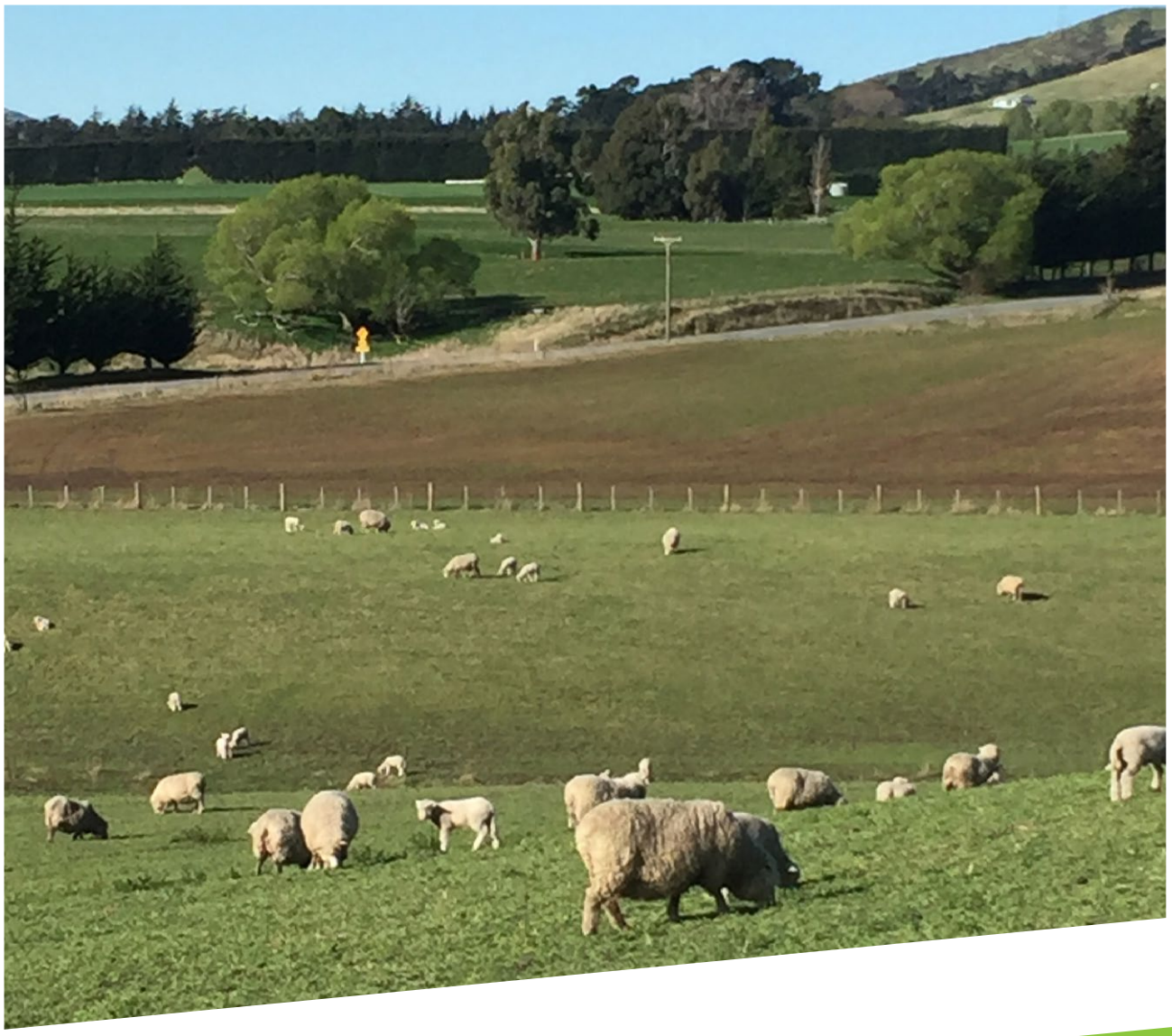


Assessment

Determine the science capabilities, achievement objectives, and key competencies you wish to assess against and choose the indicators you will focus on. You can then design assessment tasks, which may be based on activities completed from this resource, and construct your assessment rubric.

Example of assessment tasks:

- Students present a documentary video explaining why it is important that farmers have an understanding of genetics.
- Students explain a particular farming practice that produces bigger and better livestock.
- Students design a game to teach others about the role of science in New Zealand's agribusiness.
- Students create an information infographic about the role of iron in our diet and the part red meat plays as a source of iron.



Glossary

A.I.	Artificial insemination. The deliberate introduction of semen into a female animal to induce a pregnancy
culling	Removing or segregating animals from breeding stock to remove undesirable traits
dichotomous key	A tool that allows the user to determine the identity of items in the natural world
EBV	Estimated breeding value. A prediction of an animal's genetic merits in a range of different characteristics
eID	Electronic identity tags, usually attached to an animal's ear. These can be read by electronic devices and link to a digital database of information. They are sometimes called RFID – radio frequency identity tags.
E.T.	Embryo transplant – the transplant of an embryo into a surrogate dam
hybrid vigour	The improved characteristics of animals with parents of different breeds
genetics	The study of heredity – how genes, traits or characteristics are passed on from one generation to another
IMF	Intramuscular fat, also known as marbling This is small pockets of fat found inside muscle fibres in meat.
MRS GREN	An acronym for the seven characteristics of all living things – movement, respiration, sensitivity, growth, reproduction, excretion, nutrition
marbling	Small pockets of fat contained within muscle fibres of meat This is also known as intramuscular fat (IMF).
maternal sire	A male breeding animal (bull or ram), whose purpose is to produce offspring for breeding purposes.
progeny	Offspring
S.I.L. index	Sheep Improvement Limited is a New Zealand database that assigns the genetic value of a ram for particular traits.
terminal sire	A male breeding animal (bull or ram) that is bred with different breeds to produce crossbred progeny with hybrid vigour
traits	Characteristics