

## Dairy farming – planning pathways

This interactive diagram provides a selection of pathways that allow for different approaches and starting points using resources about dairy farming and climate change in New Zealand.



This interactive diagram provides a selection of pathways that allow for different approaches and starting points using resources about dairy farming and the impacts of climate change in New Zealand. The aim is to assist educators with their planning of lessons and units of work by providing options that cover multiple science concepts. The article [Dairy farming and climate change – a context for learning](#) provides links to the New Zealand Curriculum.

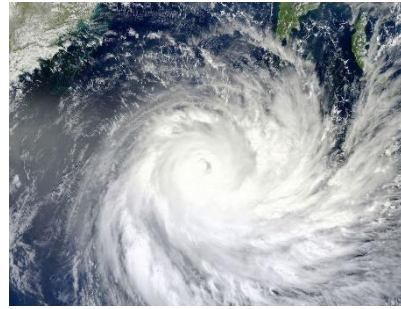
### Transcript

- [Climate change](#)
- [History of dairy farming in New Zealand](#)
- [For younger learners](#)
- [Environmental factors](#)
- [Dairy farming as a context for learning](#)
- [Dairy research development and innovations](#)
- [Ruminant digestion](#)
- [Te ao Māori perspectives](#)
- [Pasture and soil](#)

## Climate change

Since 1990, New Zealand’s agricultural greenhouse gas emissions have grown by about 1% each year. Intensified farming has led to added emissions of nitrous oxide and methane in particular.

Climate change – as a wicked problem – can form a rich real-life context for developing students’ thinking, visioning and problem-solving skills, action competence and an array of key competencies.



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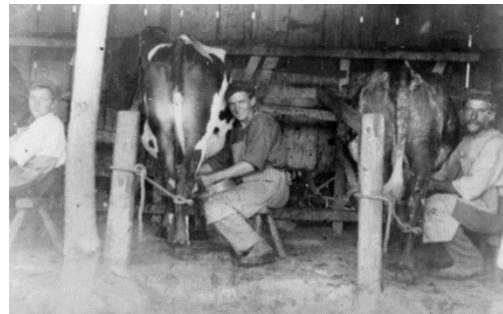
Focusing on one main issue – the science and innovations of reducing dairy sector greenhouse emissions – can provide an opportunity for students to develop a deeper understanding.

- [The primary sector and climate change](#) – article
- [Climate change – implications for dairy farming](#) – article
- [Dairy innovations – targeting climate change](#) – article
- [Measuring greenhouse gas emissions](#) – article
- [Farming and environmental pollution](#) – article
- [Inhibiting nitrous oxide emissions](#) – article
- [Climate change – a wicked problem for classroom inquiry](#) – PLD
- [Climate change, science and controversy](#) – PLD
- [Climate change – challenging conversations](#) – PLD

## History of dairy farming in New Zealand

Dairy farming has changed significantly over the centuries from hand milking to machine milking. The size of farms and the expectations on farmers have also changed with time.

There is no doubt that agricultural intensification can come at a cost to the environment. However, we need to balance this cost with the importance of food production. As the Earth’s population grows, so does the need for farmers and others to produce more food.



*Image Courtesy of Te Aroha and District Museum.*

- [Dairy farming – key terms](#) – article
- [New Zealand dairy farming – timeline](#) – article
- [Farming development and changing landscapes](#) – article
- [Farming and the environment – timeline](#) – article

## For younger learners

One aspect of DairyNZ’s education and extension programme is supporting our youngest learners to engage with and learn about dairy farming in New Zealand. There are opportunities for cross-curricular learning.

Rosie’s World is a safe, fun site designed to entertain kids and help them learn about dairying.



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These Rosie's World links provide some engaging resources pitched especially for younger learners.

- [All about cows](#)
- [How a cow works](#)
- [Science and dairy farming](#)
- [Ngāi Tahu dairy farming](#)
- [Working on a dairy farm](#)

## Environmental factors

The environmental concerns associated with farming are often the subject of media reports and emotive debate. It is the role of scientists to provide reliable information and data concerning farm practices and potential environmental impacts.

Provide an opportunity for students to dive deeper into the information and make sense of the complexities within it. Scaffold their understanding of concepts such as nutrient cycling and interdependence as well as exploring socio-scientific aspects.



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- [Dairy farming and the nitrogen cycle](#) – article
- [The nitrogen cycle and dairy farming](#) – interactive
- [Exploring ethical issues related to farming and environmental pollution](#) – activity
- [Denitrification beds – a creative approach](#) – article
- [Dairy farming solutions](#) – article
- [Farm management practices](#) – article
- [Liming paddocks](#) – activity
- [The Vision is Clear](#) has a series of stories on how farmers and community groups are working to clean up New Zealand waterways.

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## Dairy farming as a context for learning

Learning on the farm creates opportunities for students to experience practical learning as well as reinforcing knowledge.

Learning about farming in an urban classroom provides opportunities to explore an industry that is embedded in New Zealand innovation and history.



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Agriculture has a diverse curriculum including economic, historical, social and cultural influences on primary production and the interrelationships of science, technology, society and the environment.

These resources will provide some tools to support teachers exploring aspects of dairy farming in the classroom:



## Dairy farming – planning pathways

- [Dairy farming and climate change – a context for learning](#) – PLD
- [Dairy farming – key terms](#) – article
- [Farming and environmental issues](#) – activity
- [Futures thinking toolkit](#) – activity
- [Ethics thinking toolkit](#) – activity
- [Ethical thinking in science](#) – PLD
- [Investigating the possible environmental impacts of run-off from silage](#) – teacher case study

## Dairy research development and innovations

The industry recognises the crucial role it plays in protecting the environment. Research and innovation is vital to ensuring the industry continues to improve practices and minimise impacts on the environment while producing an important product – milk.

- [Dairy innovations – targeting climate change](#) – article
- [Plantain research](#) – article
- [Investigating robotic milking](#) – article
- [Design a robotic milking system](#) – activity
- [Dairy farming solutions](#) – activity
- [Fighting acne with milk proteins](#) – article
- [New Zealand milk powder’s chemical signature](#) – article



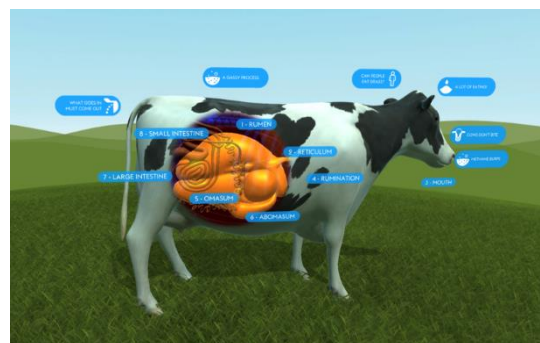
[Regenerative agriculture](#), © Ravensdown

## Ruminant digestion

Ruminants are mammals with specialised digestive systems that use fermentation processes to gain nutrients from plant material. Cattle, sheep, horses, deer, goats and camels are all ruminants.

Each part of the digestive system from the mouth to the intestine has a part to play in the breakdown of plant material.

The adaptation that sets ruminants apart from other animals is their complex multi-chambered stomach comprising the rumen, omasum, reticulum and abomasum.



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- [Ruminant digestion](#) – article
- [Ruminant digestion](#) – interactive
- [Explore a cow’s digestive system](#) – activity
- [Label a cow’s digestive passage](#) – interactive

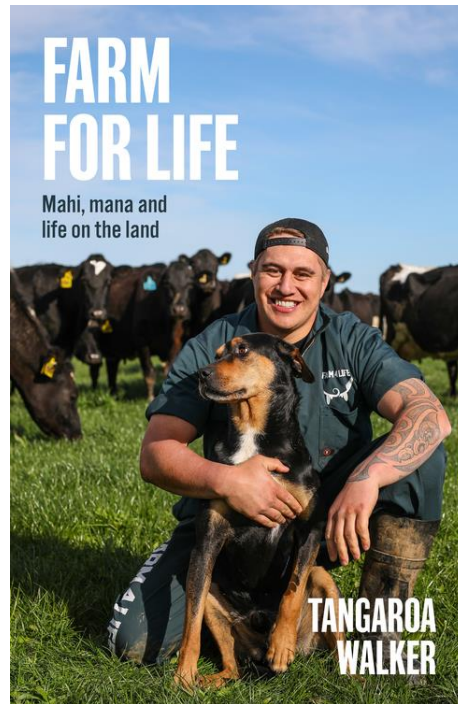
*“Cows are an amazing species, turning something that a human could never eat into something that is really, really nutritious and allows them to produce a lot of milk and grow babies.”*

Have a look at DairyNZ’s [FeedRight resources](#) for a more in-depth look at ruminant digestion.

## Te ao Māori perspectives

The dairy industry recognises the crucial role it plays in improving and protecting water quality and mitigating greenhouse gas emissions. As stewards of the land, [many farmers are working to protect, restore and enhance the environment](#), an approach that aligns with [kaitiakitanga](#) – guardianship and care for the environment. Other perspectives to consider are the roles of [mātauranga Māori](#) and [whakapapa](#) (interconnections).

Image: Cover of [Farm for Life](#), by farmer and dairy farming advocate Tangaroa Walker (Ranginui/Pukenga). Tangaroa was the winner of the inaugural Young Māori Farmer of the Year Ahuwhenua Trophy in 2012. His goal is to educate people – especially young Māori – about opportunities that exist in agriculture. Tangaroa runs the online video learning platform [Farm 4 Life!](#)



© Penguin Books New Zealand.

## Pasture and soil

Soil – it's much more than dirt. Soil keeps us alive. Without soil, we would be hungry, thirsty, naked, homeless and breathless.

It is important in science to not only build students' knowledge and understanding of science but to support them to make connections between science concepts and the world around them. Soil and pasture is an ideal context for this as it links to many other aspects of science as well as global and local issues such as growing food and farming practices.



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- [Pasture plants](#) – article
- [Common pasture plant species](#) – interactive
- [Observing pasture composition](#) – activity
- [Measuring pasture mass](#) – activity
- [Soil, farming and science – introduction](#) – article
- [Managing nutrients](#) – article
- [What makes up soil?](#) – activity
- [The role of clover](#) – article
- [The terrestrial nitrogen cycle](#) – article
- [Nutrient pollution](#) – activity
- [Water and nutrient leaching](#) – activity

*"The students thought 'dirt' was pretty boring until their eyes were opened to 'soil' and what lies beneath the ground. They were fascinated to discover roots, glass, worms and clay. What made a huge impact on them was how important soil is to us and the world in which we live."*

Teacher

## Acknowledgement

This resource has been produced with the support of DairyNZ.



### DairyNZ

DairyNZ is the industry organisation that represents all New Zealand dairy farmers. DairyNZ supports farmers through investing in research, resource development, extension and advocacy to ensure sustainable dairy farming and food production.