
Dairy Australia
Primary Industries Education Foundation Australia
Sustainable Dairy: Environmental Sustainability
An educational resource for
Years 9–10
Discover Aussie Dairy

Learning Areas and Australian Curriculum Content

Teacher guide

Design and Technologies

Analyse how people in design and technologies occupations consider ethical, security and sustainability factors to innovate and improve products, services and environments. (AC9TDE10K01).

Analyse the impact of innovation, enterprise and emerging technologies on designed solutions for global preferred futures. (AC9TDE10K02).

Analyse and make judgements on the ethical, secure and sustainable production and marketing of food and fibre enterprises. (AC9TDE10K04).

Analyse needs or opportunities for designing; develop design briefs; and investigate, analyse and select materials, systems, components, tools and equipment to create designed solutions. (AC9TDE10P01).

Apply innovation and enterprise skills to generate, test, iterate and communicate design ideas, processes and solutions, including using digital tools. (AC9TDE10P02).

Lesson Objective

In this lesson, students will be introduced to the Australian dairy industry, gaining an insight into farming practices, the milk supply chain, and the environmental sustainability issues that the industry currently faces. They will compare and contrast the environmental principles outlined in the Australian Agricultural Sustainability Framework (AASF) with the Australian dairy industry's Sustainability Goals. Students will be challenged to think creatively to plan, design, and create an advertising campaign that aims to showcase the strategies being used to meet and achieve these goals by 2030.

Lesson Overview

Activity 1 - Introduction to the Australian Dairy Industry (45 mins)

Activity 2 - Environmental Sustainability on Dairy Farms (30 mins)

Activity 3 - Creative Challenge (60 mins)

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Risk Assessments

Note: Schools are responsible for generating their own risk assessments for activities. Risk assessments should address the potential hazards associated with using dairy products in the classroom, including foodborne illnesses, allergies, slips/falls, and cross-contamination, and propose control measures such as allergy awareness, accident prevention, and hygiene practices to ensure a safe learning environment for students.

ATTRIBUTION, CREDIT & SHARING

This resource was produced by Primary Industries Education Foundation Australia (PIEFA) in collaboration with Dairy Australia. Primary Industries Education Foundation Australia's resources support and facilitate effective teaching and learning about Australia's food and fibre industries. We are grateful for the support of our industry and member organisations for assisting in our research efforts and providing industry-specific information and imagery to benefit the development and accuracy of this educational resource.

Primary Industries Education Foundation Australia

Dairy Australia

Teacher guide

Resources and Equipment

Teacher guide

Activity 1 - Introduction to the Australian Dairy Industry

1 Digital devices
2 **Worksheet 1a - Glossary: Important Dairy Vocabulary**
3 Everything You Need to Know About Dairy (23:24)
4 **Worksheet 1b - Everything You Need to Know About Dairy**

Activity 2 - Environmental Sustainability on Dairy Farms

1 Digital devices
2 Australian Agricultural Sustainability Framework
3 Benefits of Shelterbelts
4 Revegetating Dairy Farms (4:50)
5 Creating Carbon-Neutral Dairy Farms (5:08)
6 Increasing Water Efficiency on Dairy Farms (1:05)
7 Effluent Management on Dairy Farms (0:30)
8 Reducing Food Waste Across the Dairy Supply Chain (2:45)
9 **Worksheet 2a - Environmental Sustainability: Case Studies**

Activity 3 - Creative Challenge

1 **Worksheet 3a - Creative Challenge**
2 How to Build a Storyboard

Additional resources

Background - AASF

Australian Dairy Sustanability Framework

Lesson Guide

Teacher guide

Activity 1 - Introduction to the Australian Dairy Industry

Students will be introduced to key vocabulary and information relevant to Australian dairy production. They will be exposed to industry facts and figures and gain an insight into farming practices, the milk supply chain, and the environmental sustainability issues that the dairy industry currently faces.

a Facilitate a class discussion about the Australian dairy industry, highlighting its importance as the third-largest rural industry in Australia (Department of Agriculture, Fisheries, and Forestry, 2022). Generate a discussion to gauge students' prior knowledge and understanding of the dairy industry and the types of products it produces (for example, milk, cheese, butter, cream, yoghurt, icecream, milk powders).

b Introduce the **'Quick Fire: Facts and Figures'** activity. Read aloud the following questions to the class. Students respond by standing or remaining seated after hearing each question. Provide the answers to generate further discussion. (Answers page 8).

Question 1: True or false? The Australian dairy industry employs over 30,000 people.
True (remain seated); False (stand up).

Question 2: How much cheese does the average Australian consume each year?
Less than 10 kg (remain seated); Greater than 10 kg (stand up).

Question 3: How many dairy farms are there in Australia?
Between 400-500 farms (remain seated); Between 4000-5000 farms (stand up).

Question 4: True or false? The majority of milk produced in Australia is consumed in the form of drinking milk. *True (remain seated); False (stand up).*

Question 5: What is the average number of cows on an Australian dairy farm?
Between 200-400 cows (remain seated); Between 500-700 cows (stand up).

c Distribute a copy of **Worksheet 1a - Glossary: Important Dairy Vocabulary** to each student. Students are exposed to important vocabulary relevant to dairy production and sustainable agricultural practices. They are required to match these terms with their correct definition. Students may need to access a digital device to undertake research for completion of this task. (Answers page 8)

d Individually or as a class, view the video Everything You Need to Know About Dairy (23:24). This video provides students with an in-depth look at Australian dairy farming, outlining:

- The history of dairy farming in Australia
- Different breeds of dairy cattle
- How milk is processed into other dairy foods
- How dairy foods get from the farm to our fridges
- The different technologies and processes used to produce dairy
- Sustainability on Australian dairy farms.

e Distribute **Worksheet 1b - Everything You Need to Know About Dairy**. While viewing the video, students record relevant key points under each of the heading's provided. (Answers page 9)

f As a class, discuss the facts, figures, and learnings that have most interested or surprised the students in their introduction to the dairy industry.

Lesson Guide

Teacher guide

Activity 2 - Environmental Sustainability on Dairy Farms

Students will compare and contrast the environmental principles outlined in the Australian Agricultural Sustainability Framework (AASF) with the Australian dairy industry's 2030 Sustainability Goals. They will use an industry case study to analyse a strategy that is currently being implemented within the dairy industry to reduce environmental impact.

a Facilitate a class discussion about the meaning of the term 'environmental sustainability' (the responsible management of natural resources to support the needs of current and future generations).

b Introduce and display the Australian Agricultural Sustainability Framework (AASF), a common set of principles developed by the National Farmers' Federation to prioritise sustainability across agricultural sectors. Examine and discuss the environmental stewardship principles and criteria:

- Greenhouse gases and air: Greenhouse gas emissions are limited to minimise climate change; adverse impacts to air quality are avoided or minimised.
- Soil and landscapes: Soil health and functionality are protected and enhanced; landscape degradation is avoided or minimised.
- Biodiversity: Biodiverse ecological communities are protected and enhanced.
- Water: Water resources are used responsibly and equitably.
- Materials and resources: Finite resources are safeguarded in circular economic systems.

c In addition to the AASF, explain that the Australian dairy industry has developed its own framework to assess and monitor sustainability. The framework outlines four sustainability commitments and 11 goals (aligned to the United Nations Sustainable Development Goals). The environmental sustainability goals include:

Source: 2023 Sustainability Report, Dairy Australia.

Lesson Guide

Teacher guide

d Ask students to compare and contrast the goals in each model. How do the dairy industry goals complement the principles and criteria outlined in the Australian Agricultural Sustainability Framework?

e Distribute **Worksheet 2a - Environmental Sustainability: Case Studies**. Students choose one of the case studies provided, using digital devices to access videos that showcase examples of environmental sustainability within the Australian dairy industry. They describe and analyse the strategy outlined in the case study by answering the questions provided.

f Students partner with a peer to explain the environmental sustainability strategy they have examined and share their findings and analysis.

Activity 3 - Creative Challenge

Students will access data relating to the progress of the dairy industry's environmental sustainability goals. They will plan, design, and create an advertising campaign that aims to showcase the strategies being used to achieve these goals by 2030.

a Individually or as a class, display Dairy Australia's 2023 Sustainability Report. Guide students to access the section of the report examining 'Commitment 4: Reducing Our Environmental Impact' (pages 26-31).

b Assist students to identify data that demonstrates positive achievements in meeting the industry's environmental sustainability goals (Answers page 10).

c Distribute **Worksheet 3a - Creative Challenge**. Students will plan an advertising campaign showcasing the Australian dairy industry's environmentally sustainable practices. They should include data from the Sustainability Report where relevant.

d Allocate time for students to plan, storyboard, and create their advertising campaigns.

e Upon completion, students present their products to the class.

f Optional extension activity: Students analyse data in the 2023 Sustainability Report to identify the industry's sustainability goals that are yet to achieve their progress measures (Answers page 10). Students design and create an advertising campaign aimed at targeting and improving results for one of these goals.

Answers

Answer

Activity 1 - Introduction to the Australian Dairy Industry

b) Quick Fire: Facts and figures

1 The statement is true (seated students are correct). There are 33,500 people in the Australian dairy industry workforce.

2 The amount of cheese consumed by the average Australian each year is greater than 10 kg (standing students are correct). The annual consumption of cheese per capita is 15 kg.

3 There are 4,163 dairy farms in Australia (standing students are correct).

4 The statement is false (standing students are correct). 43% of the milk produced in Australia is consumed as a cheese product, while only 30% is consumed as drinking milk.

5 The average herd size on an Australian dairy farm is 305 cows (seated students are correct).

(The Australian Dairy Industry in Focus 2023, Dairy Australia, 2023).

Worksheet 1a - Glossary: Important Dairy Vocabulary

Pasture: Land that is covered with grass and other low plants suitable for grazing animals. A variety of crops are planted and maintained by dairy farmers to ensure their cows have a balanced grazing diet.

Ruminant: An even-toed, hoofed mammal that has more than one stomach compartment. They are herbivorous, grazing animals that can bring up food from their stomach and chew it again, sometimes referred to as 'chewing the cud'.

Greenhouse gases: Gases in the atmosphere that trap heat. These can be emitted (released) in dairy farming and other forms of agriculture as well as other sectors including energy and transport.

Rotary: A large, automated platform located in milking sheds. Cows walk onto the raised platform and stand in designated areas where feed is provided. As the cows feed, the platform rotates and the milking apparatus is attached.

Effluent: Liquid waste from the dairy milking shed containing manure, urine, and the shed wash-down water. If it is managed correctly, it can be a valuable resource for dairy farmers.

Calcium: A mineral needed by our bodies to carry out many important functions. It is particularly important for building and maintaining strong, healthy bones and teeth. Dairy products are one of the best sources of this mineral.

Pasteurisation: A sterilisation process that milk goes through once it has been taken to the processing plant. It is designed to kill any harmful bacteria in order to ensure it is safe for consumption.

Renewable energy: Energy that is derived from natural sources that can be replenished at a higher rate than they are consumed. Sunlight and wind are two examples of such energy sources.

Whey: The name given to the watery liquid remaining after milk has been curdled and strained. It is a by-product of the cheese-making process, during which the milk solids are separated from the liquids.

Curd: The solid substance formed during the cheese-making process. When pasteurised milk is heated, an enzyme called rennet is added to make the milk set into what looks like jelly.

Answers

Answer

Worksheet 1b - Everything You Need to Know About Dairy

Key points recorded by students may vary. Suggested responses include:

History of dairy farming: Nine dairy cows were originally brought to Australia in 1788. Within 12 years, these numbers grew to over 1000 dairy cows. There are two types of dairy farms - family farms and commercial farms. Over 90% of Australian dairy farms are family-run businesses.

Where dairy farms are located in Australia: 80% of milk production occurs in the high rainfall regions of Australia's southern and eastern coastlines (cows like cool to warm temperatures). The Murray-Darling Basin is also used for dairy production. Irrigation is used to substitute high rainfall.

Breeds of dairy cows: There are 7 breeds of dairy cows in Australia. The most common breeds in Australia are Holsteins, Jerseys, and Aussie Reds. A herd is made up of four different groups of cattle (cows, heifers, bulls, calves).

How and when cows make milk: A cow produces milk after her first calf is born. Farmers then milk the cows to get milk for us too. Cows are milked twice a day (morning and night). Each cow is milked for 10 months of the year and then given a two month break.

What cows eat to produce milk: Cows eat fresh pasture, hay, silage, and grains. They can eat up to 20 kg of food and drink up to 100 L of water each day. Cows are ruminants with four stomach compartments. Food passes through the four compartments before the nutrients are absorbed by the cow. Some nutrients are transferred to the udder where milk is made and stored. The milk is squeezed from the udder's four teats. It takes cows 50-70 hours to transform food into milk.

How dairy farmers care for their cows: Cows are milked because their udders get very full and heavy. Cows are kept happy and relaxed and follow familiar, safe routines. Cows are identified with ID tags so that detailed records can be kept on each cow, including health and medical needs. They receive regular veterinary treatments when required. Thorough cleaning and hygiene practices are implemented in milking sheds.

Running a dairy farm: Milking usually takes place each day at 5:30 am and 4:00 pm. Aside from milking, dairy farmers are also involved in multiple on-farm jobs, including feeding and breeding management, planting crops, making hay, fixing machinery, pasture and water management, bookkeeping, and administration tasks.

Caring for the environment: The main environmental sustainability issues on dairy farms include soil management, protecting waterways and bushland, conserving water, and adapting to a changing climate. Some management practices include effluent reuse, planting trees, stock management, planting of perennial pastures, generating and using renewable energy, and investigating ways to reduce greenhouse gas emissions.

How milk is processed: Milk is transported by tankers from the dairy farm to a nearby processing plant. Milk is tested before being pasteurised to kill harmful bacteria. It is then homogenised to separate the cream from the milk to give it a smooth, consistent texture. It is packaged in cartons or bottles.

How cheese and yoghurt are made: Starter culture and rennet (enzyme) are added to milk. The milk sets into a jelly-like substance called curd. The curd is heated, stirred, and separated from the whey. The curd sticks together to form a block of cheese. Cheese is stored to mature for 2-12 months before being sold.

Milk and live bacterial cultures are combined to make yoghurt. Milk is separated, pasteurised, blended, homogenised, and then cooked and cooled. Extra flavours and fruit can be added before packaging.

The importance of eating dairy foods: Dairy foods provide calcium, which helps to grow strong bones and teeth. They also provide eight other essential nutrients, including protein and zinc. The Australian Dietary Guidelines recommend 1-3 servings of dairy food every day, depending on your age and gender.

Answers

Answer

Activity 2 - Environmental Sustainability on Dairy Farms

Worksheet 2a - Environmental Sustainability: Case Studies

Student responses will vary based on chosen case study.

Activity 3 - Creative Challenge

b Examples of positive environmental sustainability achievements (2023 Sustainability Report), may include:

- Increased number of dairy farmers with natural waterways fenced off from livestock (83%).
- Increased number of dairy farms using renewable energy (89%).
- Increased number of dairy farmers implementing a soil and nutrient management plan (59%).
- Increased number of dairy farmers recycling water from dairy sheds (80%).
- Increased number of dairy farms implementing water security risk management plans (59%).
- Increased number of dairy farmers implementing practices to reduce greenhouse gases (96%).

f Examples of industry sustainability goals that are yet to achieve their progress measures (2023 Sustainability Report), may include:

- Goal 8.4: 100% of farmers have and implement a documented biodiversity action plan (only 14% recorded in 2023).
- Goal 9.4: 100% of farmers monitoring water consumption (only 43% recorded in 2023).
- Goal 11.2: 100% of silage wrap recycled (for farm).

Worksheet 3a - Creative Challenge

Student responses will vary depending on the chosen designs.

The importance of eating dairy foods: Dairy foods provide calcium, which helps to grow strong bones and teeth. They also provide eight other essential nutrients, including protein and zinc. The Australian Dietary Guidelines recommend 1-3 servings of dairy food every day, depending on your age and gender.

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Worksheet 1a

Glossary: Important Dairy Vocabulary

Activity

Match the word on the left with its definition on the right. The definitions are jumbled. You can complete this task on your own or in pairs. If necessary, conduct research to assist with the completion of this task.

A large, automated platform located in milking sheds. Cows walk onto the raised platform and stand in designated areas where feed is provided. As the cows feed, the platform rotates and the milking apparatus is attached.

Liquid waste from the dairy milking shed containing manure, urine, and the shed wash-down water. If it is managed correctly, it can be a valuable resource for dairy farmers.

Land that is covered with grass and other low plants suitable for grazing animals. A variety of crops are planted and maintained by dairy farmers to ensure their cows have a balanced grazing diet.

An even-toed, hoofed mammal that has more than one stomach compartment. They are herbivorous, grazing animals that can bring up food from their stomach and chew it again, sometimes referred to as 'chewing the cud'.

Gases in the atmosphere that trap heat. These can be emitted (released) in dairy farming and other forms of agriculture as well as other sectors including energy and transport.

Worksheet 1a

Glossary: Important Dairy Vocabulary

Activity

Match the word on the left with its definition on the right. The definitions are jumbled. You can complete this task on your own or in pairs. If necessary, conduct research to assist with the completion of this task.

The solid substance formed during the cheese making process. When pasteurised milk is heated, an enzyme called rennet is added to make the milk set into what looks like jelly.

The name given to the watery liquid remaining after milk has been curdled and strained. It is a by-product of the cheese making process, during which the milk solids are separated from the liquids.

A mineral needed by our bodies to carry out many important functions. It is particularly important for building and maintaining strong, healthy bones and teeth. Dairy products are one of the best sources of this mineral.

A sterilisation process that milk goes through once it has been taken to the processing plant. It is designed to kill any harmful bacteria in order to ensure it is safe for consumption.

Energy that is derived from natural sources that can be replenished at a higher rate than they are consumed. Sunlight and wind are two examples of such energy sources.

Worksheet 1b

Everything You Need to Know About Dairy

Watch Everything You Need to Know About Dairy (23:24). Summarise key points under each of the headings below.

History of dairy farming	Where dairy farms are located in Australia	How and when cows make milk

Worksheet 1b

Everything You Need to Know About Dairy

Breeds of dairy cows	What cows eat to produce milk

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Worksheet 1b

Everything You Need to Know About Dairy

How dairy farmers care for their cows	Caring for the environment	How cheese and yoghurt are made

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Worksheet 1b

Everything You Need to Know About Dairy

Running a dairy farm	How milk is processed	The importance of eating dairy foods

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Worksheet 2a

Environmental Sustainability: Case Studies

Activity

Investigate a strategy used by the Australian dairy industry to manage natural resources sustainably. Choose one of the case studies below. Analyse the strategy demonstrated in the case study by answering the questions on page 2 (**Worksheet 2a - Page 2 of 2)**.

[Benefits of Shelterbelts](youtube.com/watch?v=FachZtZ-LCQ) (3:38)

youtube.com/watch?v=FachZtZ-LCQ

[Revegetating Dairy Farms](youtube.com/watch?v=icyGa1S0JN8) (4:50)

youtube.com/watch?v=icyGa1S0JN8

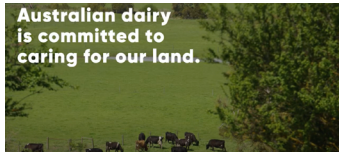
[Creating Carbon-neutral Dairy Farms](youtube.com/watch?v=elt0DseN5w8) (5:08)

youtube.com/watch?v=elt0DseN5w8

[Increasing Water Efficiency on Dairy Farms](youtube.com/watch?v=GT5lzZ3o5so) (1:05)

youtube.com/watch?v=GT5lzZ3o5so

[Effluent Management on Dairy Farms](youtube.com/watch?v=Em9-rK2gLo8ms) (0:30)



youtube.com/watch?v=Em9-rK2gLo8ms

[Reducing Food Waste Across the Dairy Supply Chain](youtube.com/watch?v=Z_S6VwRjZaY) (2:45)

youtube.com/watch?v=Z_S6VwRjZaY

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Worksheet 2a

Environmental Sustainability: Case Studies

Activity

a Title of chosen case study: _____

b Describe how the strategy outlined in this case study aims to reduce environmental impact.

_____

_____

_____

_____

_____

c Which environmental stewardship principles (Australian Agricultural Sustainability Framework) are addressed in this case study?

	Greenhouse gases and air		Waste
	Soil and landscapes		Materials and resources
	Bioiversity		

d Which Dairy Australia 2030 Sustainability Goals are addressed in this case study?

_____

_____

_____

_____

_____

e Identify possible strengths or limitations in the widespread application of this strategy across the Australian dairy industry.

_____

_____

_____

_____

_____

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Worksheet 3a

Creative Challenge

Activity

Design task

Design an advertising campaign showcasing environmentally sustainable practices from the Australian dairy industry.

1 Brainstorm sustainability practices that could be showcased.

2 Consider the message of the campaign. What are the core ideas you are trying to communicate?

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Worksheet 3a

Creative Challenge

Activity

3 Consider the audience for your campaign. How will you capture their attention?

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4 Consider the form your campaign may take. Examples may include:

Short videos

Posters

Brochures

Social media posts

5 What resources and/or information will you require in order to create your chosen product?

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Worksheet 3a

Creative Challenge

Activity

6 A storyboard canva.com/learn/how-to-build-a-storyboard/ is a graphic representation of a project used to plan and communicate ideas. It consists of a series of panels, with images and accompanying titles/captions. Use the space below to create a storyboard of your advertising campaign.

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