

CLIMATE CHANGE STRATEGY

2020–2025



DAIRY AUSTRALIA'S CLIMATE COMMITMENT

ADAPT. PRESERVE. EMBED. INVEST.

GOALS

OUTCOMES



Adapt

ADAPT Australian dairy farming systems to thrive in a warmer and more unpredictable climate

Dairy businesses successfully adapting to (and continually evolving to meet) future climate challenges



Preserve

PRESERVE our position in the Top 10 globally for low emissions intensity

Australian dairy industry's low carbon footprint recognised internationally, and within the Top 10 globally



Embed

EMBED climate action with the way we look after the environment

Requirements for managing the environment in the face of a changing climate known and being adopted by dairy businesses



Invest

INVEST and actively contribute to keep global warming to below 1.5°

Market and community recognition of the positive contributions of the dairy industry in addressing climate change



CONTENTS

Climate change strategy	2	Priorities for action 2020–2025	14
Dairy businesses committed to the climate	3	Measures of success	15
The problem of climate change	4	Accountability and reporting	16
Australian dairy industry's climate track record	6	Considerations for this strategy	17
Industry context	8	Underpinning assumptions	18
Australian dairy industry climate ecosystem	9	The way forward	19
Strategic alignment of our climate change commitment	10	Research snapshots	20
Value across the dairy ecosystem	12	Glossary	24

DAIRY AUSTRALIA'S CLIMATE CHANGE STRATEGY



PURPOSE

Enabling a climate committed Australian dairy industry with dairy farms that are sustainable, productive and resilient through cost effective and achievable actions



GOALS

ADAPT Australian dairy farming systems to thrive in a warmer and more unpredictable climate

PRESERVE our position in the Top 10 globally for low emissions intensity

EMBED climate action with the way we look after the environment

INVEST and actively contribute to keep global warming to below 1.5°



OUTCOMES

By 2025 the following outcomes will have been met



Adapt

Dairy businesses successfully adapting to (and continually evolving to meet) future climate challenges



Preserve

Australian dairy industry's low carbon footprint recognised internationally, and within the Top 10 globally



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Requirements for managing the environment in the face of a changing climate known and being adopted by dairy businesses



Invest

Market and community recognition of the positive contributions of the dairy industry in addressing climate change

DAIRY BUSINESSES COMMITTED TO THE CLIMATE

Some opportunities already exist for dairy businesses to take action on climate change on their farms. Adapting to physical impacts, reducing emissions and integrating climate action with broader environmental stewardship considerations are all possible now. Further research and development of novel emissions reduction technologies and support for transformational adaptations of farming systems will also be required to ensure the future needs, opportunities and risks of dairy businesses from climate change can be met.

Incremental and transformational adaptations

Adoption of short- and long-term strategies for the adaptation of farming systems to the impacts of climate change, e.g. herd reductions or climate shelters for feedlotting

Increased vegetation on-farm

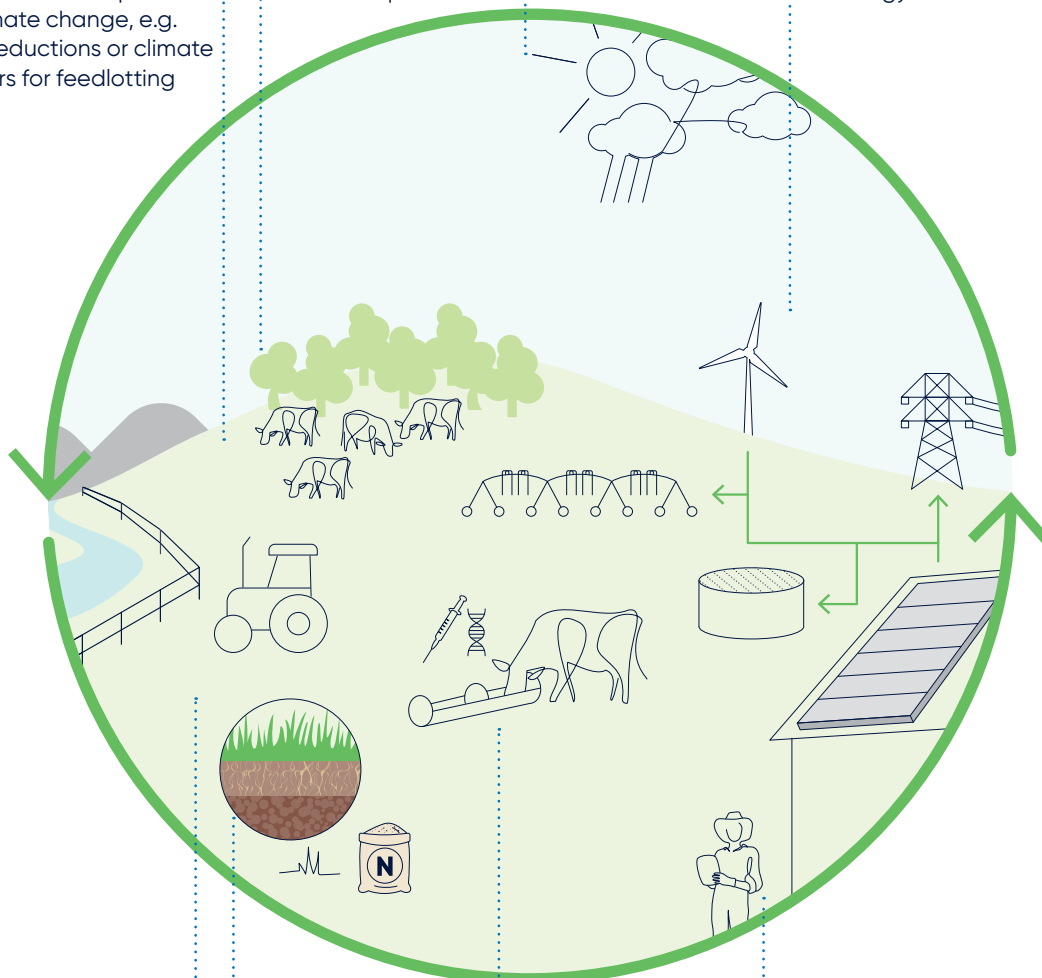
Improve shade and shelter for managing heat stress, as well as carbon sequestration

Extreme events preparedness

Resilience and recovery from storms, fires, floods and drought

Smarter energy use

Reduce energy demand, increase energy efficiency, on-farm renewables/ bioenergy



Future forage alternatives

Establishment of alternative forages in response to changing soil moisture availability and increasing water stress.

Reduced nitrous oxide

New technologies and improved on-farm practices for nitrogen fertiliser use to reduce nitrous oxide losses

Reduced enteric methane

Breeding for low-methane genes, improved rumen function through high quality feed, diets and vaccines

Good business management

Skills and training for climate risk preparedness and adaptation

THE PROBLEM OF CLIMATE CHANGE

Climate change is threatening key resources that support life on earth, with the impacts of global warming already being felt. This has been recognised by governments and industries all around the world.

The science of climate change is clear and the risks to Dairy Australia and the industry are material. Specifically:

- risks to farm profitability
- corporate risks including fiduciary risk for boards and board members
- risks to accessibility to finance and insurance for producers
- risks to community trust for dairy producers and products.

Australia is already the world's driest inhabited continent with the most variable climate. Climate change will exacerbate these conditions.

Social, biophysical and economic modelling indicates climate change has negatively impacted dairy productivity by 0.6–0.9 per cent per year since 2000,¹ and is a major cause of productivity gains being zero in the past decade.² The main threats to Australian dairy businesses will come from continued increase in climate variability and extreme events.³

Dairy farmers in Australia are already experiencing increased variability and shifts in pasture growth patterns, reduced rainfall, heat impacts on milk production and increased incidence of extreme events, such as floods, droughts and bushfires. The cumulative effects of climate change-induced productivity decline will have flow-on impacts on competitiveness and profitability.

**SUSTAINABLE
DEVELOPMENT
GOALS**



UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

13 Take urgent action to combat climate change and its impacts

With rising greenhouse gas emissions, climate change is occurring at rates much faster than anticipated and its effects are clearly felt worldwide. While there are positive steps in terms of the climate finance flows and the development of nationally determined contributions, far more ambitious plans and accelerated action are needed on mitigation and adaptation. Access to finance and strengthened capacities need to be scaled up at a much faster rate, particularly for least developed countries and small island developing states.

The Australian Government is committed to its role in meeting global efforts towards addressing climate change through its signing of the United Nations Sustainable Development Goals (UN SDGs) encompassing Climate Action⁴ and the Paris Agreement⁵ regarding global warming.

1 Dairy Businesses for Future Climates – National findings (2016) and Murray Dairy results (to be released 2020). dairyclimatetoolkit.com.au/adapting-to-climate-change/adapting-the-dairy-industry

2 Australian Dairy Plan (2020) Measurement of profitability on Australian dairy farms – Historical trends and future targets – Appendix F. dairyplan.com.au/key-documents

3 Hennessey et al (2016) Climate change impacts on Australian dairy regions. CSIRO Oceans and Atmosphere, Melbourne, Australia. dairyclimatetoolkit.com.au/~/_/media/climatetoolkit/reports/csiro-report-on-climate-change-impacts-for-aus-dairy-regions-final-approv.pdf?la=en

4 UN SDG 13: Take urgent action to combat climate change and its impacts. sustainabledevelopment.un.org/sdg13

5 Australia has committed to the global Paris Agreement to pursue efforts to keep global warming below 1.5°C above pre-industrial levels within this century, signing in 2016 along with 175 other member states. The Paris Agreement is part of the UN Framework on Climate Change, which includes the annual Conference of the Parties (COP), Kyoto Protocol and Paris Agreement unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement



Most recently, the Federal and State Agriculture Ministers have agreed on a national cross-sector approach to climate change,⁶ while Meat and Livestock Australia (MLA) has committed to a carbon neutral red meat industry by 2030.⁷ In addition, banks and investors are increasingly looking towards measures of climate resilience, including valuing on-farm natural capital, before making decisions to invest and insure.

These international, domestic and market signals will have implications for the Australian dairy sector. Our strong track record of excellence in RD&E (outlined in the following pages) will provide the foundations for our climate change response.

The management of climate change and climate risk has been a consideration in many of Dairy Australia's programs for some time. In fact, the majority of investment in productivity gains in dairy farming systems over the past decade has been a material contributor to combating climate change. However, there is now a clear case for a renewed and stronger focus across the industry requiring resources, effort and partnerships.

The signals for more urgent action are from markets (and consumers) demanding more action, farmers demanding more information on how to respond to biophysical impacts, banks and other investors seeking opportunities to partner with industries on the solutions, and governments making commitments around carbon on behalf of national economies of which dairy is a sector.

Climate change is a systemic threat with no single solution. For the Australian dairy industry there will be opportunities and challenges at all levels – national (industry/sector level), regional (region-specific impact and response), supply chain (manufacturing/processing) and on-farm (enterprise/farm level). There is an opportunity to better connect all these levels to ensure a coordinated dairy industry-wide approach to climate action going forward.

⁶ AGMIN commitment and Work Plan agreed 25 October 2019 agriculture.gov.au/ag-farm-food/climatechange/climate/national-approach-agriculture

⁷ MLA CN30 initiative sustainableaustralianbeef.com.au/managing-climate-change-risk. MLA's role will be to work with industry and government to invest in activities to support industry on its path to CN30.

AUSTRALIAN DAIRY INDUSTRY'S CLIMATE TRACK RECORD

Adaptation in action

Dairy farmers have already seen the impacts of climate change on their business and many are making changes that are assisting them to adapt to climate variability.

Adaptation refers to the process of adjustment to actual or expected climate and its effects. Adaptation seeks to moderate harm or exploit beneficial opportunities and can come in many forms. The first step to widespread adaptation is to increase understanding of the potential impacts and then proactively identify strategies for dealing with the impacts within each business's unique operating context

Some adaptation steps that dairy farmers are taking include:

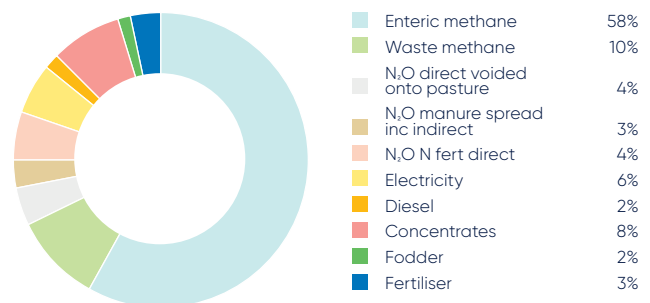
- Managing heat stress – increasing stock shade and shelter for extreme conditions
- Managing water security – upgrading on-farm water infrastructure, water saving and recycling in the dairy shed
- Changing feed base – maximising tonnes of fodder for every megalitre of water (irrigation or rainfall), changing from perennial to annual feed base, and/or storing additional fodder to buffer against periods of low water allocation/high water prices
- Climate risk assessment – accessing long-range weather forecasts.

The Australian dairy industry has leveraged its natural strength of a pasture-based system; however low input, pasture-based systems are no longer competitive in some regions. The dairy industry's reliance on pasture as its competitive advantage is under pressure from increased rainfall variability and shifts in pasture growth patterns which are being compounded by reduced water availability and/or price.

Scientific information on its own is unlikely to be useful in decision-making for adaptation. Neither is a traditional risk matrix approach due to the high levels of uncertainty associated with climate change (policy and physical). Recommended approaches are scenario modelling or 'iterative management'. Building knowledge and confidence in this area will be vital component of this strategy.

Dairy's low carbon footprint

The Australian Dairy industry accounts for 10 per cent of agricultural greenhouse gas (GHG) emissions, or about 2 per cent of total national emissions (pre- and post-farmgate). On-farm is the predominant source of emissions across the dairy supply chain, with the largest source of emissions coming from methane from enteric fermentation (56 per cent of on-farm emissions). Livestock industries are under increasing scrutiny for methane emissions.



Source: Christie, K. 2020. Analysis of dairy farm greenhouse gas emissions data (DairyBase).

These GHG emissions represent an inefficiency in dairy systems. The loss of methane and nitrous oxide gases into the atmosphere means that energy and nitrogen that could be directed towards production are being lost. Some level of emissions is expected, but there are many opportunities within a typical dairy system to reduce greenhouse gases and achieve efficiency and profitability gains. Technical options to reduce emissions include feed supplements and feed management, grazing land and manure management, health management and improved animal husbandry practices.

As one of its environmental commitments within the Sustainability Framework, the industry has agreed to reducing 30 per cent emissions intensity across the whole industry by 2030 (from a baseline of 2015). The critical term here is **emissions intensity**, which is a measure of the GHG emissions per unit of output.

The emissions intensity of dairy in 2015 was 1.03kg carbon dioxide equivalent per kg of fat and protein corrected milk (CO₂-e/kg FPCM).¹ This carbon footprint is low by global standards (when compared to FAO average of 2.4 CO₂-e/kg FPCM).²

The 2030 target is thus 0.70 kg CO₂-e/FPCM. When set in 2013, this target was compatible with the emerging science-based methodology and responded to the increasing pressure from consumers and large multinational food processing companies around carbon emission intensity of various foods.

FAT AND PROTEIN CORRECTED MILK (FPCM)

FPCM is milk corrected for its fat and protein content to a standard of 4.0 per cent fat and 3.3 per cent protein. This is a standard used for comparing milk with different fat and protein contents. It is a means of evaluating milk production of different dairy animals and breeds on a common basis.

Key points

- The Australian dairy industry contributes ~2 per cent to the nation's GHG emissions
- The broader agriculture sector, including dairy, faces the dual challenge of increasing food production while reducing emissions
- It is important for dairy businesses to first understand their emissions (i.e. footprint) to pinpoint the most effective options for reductions
- Methane and nitrous oxide are the major on-farm emissions on most dairy farms
- Herd, feed and soil-based strategies can reduce emissions on some dairy farms
- Following current best practice minimises emissions
- Well managed farms and productive farms will significantly reduce the emissions intensity over current average farms. To achieve emissions reductions beyond that will require significant changes to their farming or feeding system and the commercialisation of new technologies for on-farm use
- Business planning, skills and strategies will become increasingly important for effective management of the impacts of climate change on dairy businesses. Short-, medium- and long-term strategies will be required.

¹ Christie, K. 2019. Review of the 2015–16 Dairy Farm Monitor Project data for GHG emissions assessment, Dairy Australia – Milestone 3 report.

² FAO. 2010. Greenhouse Gas Emissions from the Dairy Sector. [fao.org/3/k7930e/k7930e00.pdf](https://www.fao.org/3/k7930e/k7930e00.pdf). Note even though this dataset is 2010 it is demonstrative of global average.



INDUSTRY CONTEXT

The Australian dairy industry makes a crucial contribution to the economy, being the fourth largest rural industry in Australia. There are dairy farms located in all states in Australia and the majority of milk production takes place in the south-east corner of the country. It is one of the few remaining major manufacturing industries in Australia and makes a vital contribution to rural and regional economies. In recent years, rising input costs combined with unprecedented volatility has undermined profitability.



29%

of milk production is exported

MAJOR EXPORT MARKETS tonnes

244,460 t
Greater China

73,984 t
Singapore

86,269 t
Japan

61,858 t
Malaysia

51,843 t
Indonesia

VALUE OF FARMGATE PRODUCTION

\$4.8 billion



AVERAGE ANNUAL MILK PRODUCTION PER COW

6,170
litres

TOTAL ANNUAL MILK PRODUCTION

8,776
million litres



4th

Dairy is Australia's fourth largest rural industry



43,500

Dairy industry workforce



ANNUAL PER CAPITA CONSUMPTION

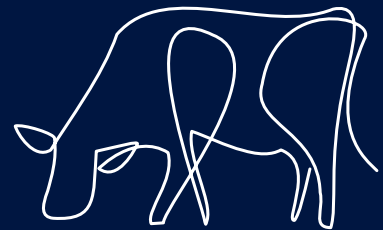
97 litres
milk

13.6 kg
cheese



AVERAGE HERD SIZE

279
cows

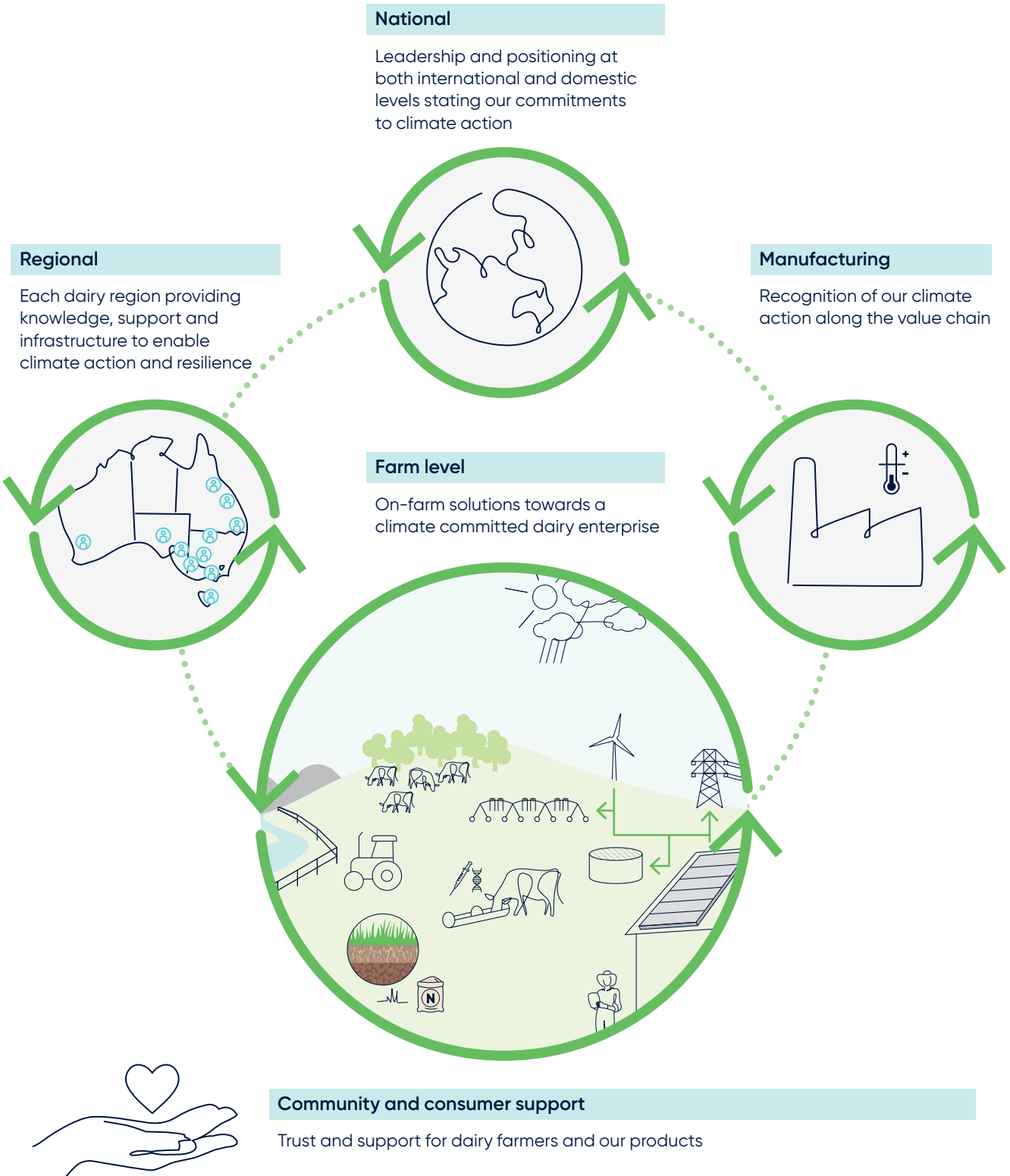


AUSTRALIAN DAIRY HERD

1.41 million
COWS

AUSTRALIAN DAIRY INDUSTRY CLIMATE ECOSYSTEM

Climate change is a systemic threat with no single solution. For the Australian dairy industry there will be opportunities and challenges at all scales across the dairy value chain – from on-farm through to industry level. Promoting knowledge and connection across the dairy ecosystem will be vital for embedding climate action going forward.



STRATEGIC ALIGNMENT OF OUR CLIMATE CHANGE COMMITMENT

Alignment with Australian Dairy Plan themes

In light of recent challenging conditions, the industry has been working towards defining a new plan for the dairy industry. The Australian Dairy Plan (ADP) aims to lift profitability across the supply chain, rebuild the confidence of dairy businesses in the industry's future and unite the industry by working together to address key challenges. The ADP also recognises that there are some well-regarded and fundamental activities that the industry must continue to implement to sustain long-term growth.

This Climate Change Strategy responds to a number of sections in the ADP, including Commitment 4 (We will intensify the focus on farm business skills to improve profitability and better manage risk) and the need to pursue sustainability as a fundamentally important strength of the dairy industry.

AUSTRALIAN DAIRY PLAN (ADP)

The Australian Dairy Plan is a bold new industry led plan to deliver increased profitability, confidence and unity across the industry. It is a joint initiative of Australian Dairy Farmers, Australian Dairy Products Federation, Dairy Australia and Gardiner Dairy Foundation, with its development led by Independent Chair, John Brumby AO.

It sets a clear industry direction for the next five years and beyond to deliver increased profitability, business confidence and unity across the industry.

The plan was published on 28 September 2020.

For more visit dairyplan.com.au

Alignment with Australian Dairy Sustainability Framework

The world-class Australian Dairy Sustainability Framework established in 2012 shows how the industry is working to respond to the challenges of animal welfare, environmental impact and climate change in order to sustain the trust and support of the community and consumers.

The Framework outlines the industry's commitment to creating a vibrant industry that produces nutritious, safe, quality food while providing best care for our animals and being good stewards of the environment. A target of Goal 10 of the framework is to reduce GHG emissions intensity by 30 per cent across the whole industry by 2030 (from a baseline of 2015). A target of Goal 8 is that 80 per cent of dairy farms manage a proportion of their land for conservation and biodiversity by 2020. Planting trees on farms to sequester carbon will assist in offsetting on-farm GHG emissions, and reduce the emissions intensity of milk production. Trees will also contribute to increased conservation and biodiversity, and help achieve these two Sustainability Framework targets.

This strategy will deliver underpinning scientific evidence that enable the Sustainability Framework to consider the feasibility of more aggressive targets towards climate action across the industry.

DAIRY SUSTAINABILITY FRAMEWORK COMMITMENT 4 REDUCING ENVIRONMENTAL IMPACT

Goal 10 of the Dairy Sustainability Framework sets a target of reducing greenhouse gas emissions intensity across the dairy industry by 30 per cent by 2030. The dairy industry wants to be part of the solution to ensure we play our role in meeting the challenges of climate change.

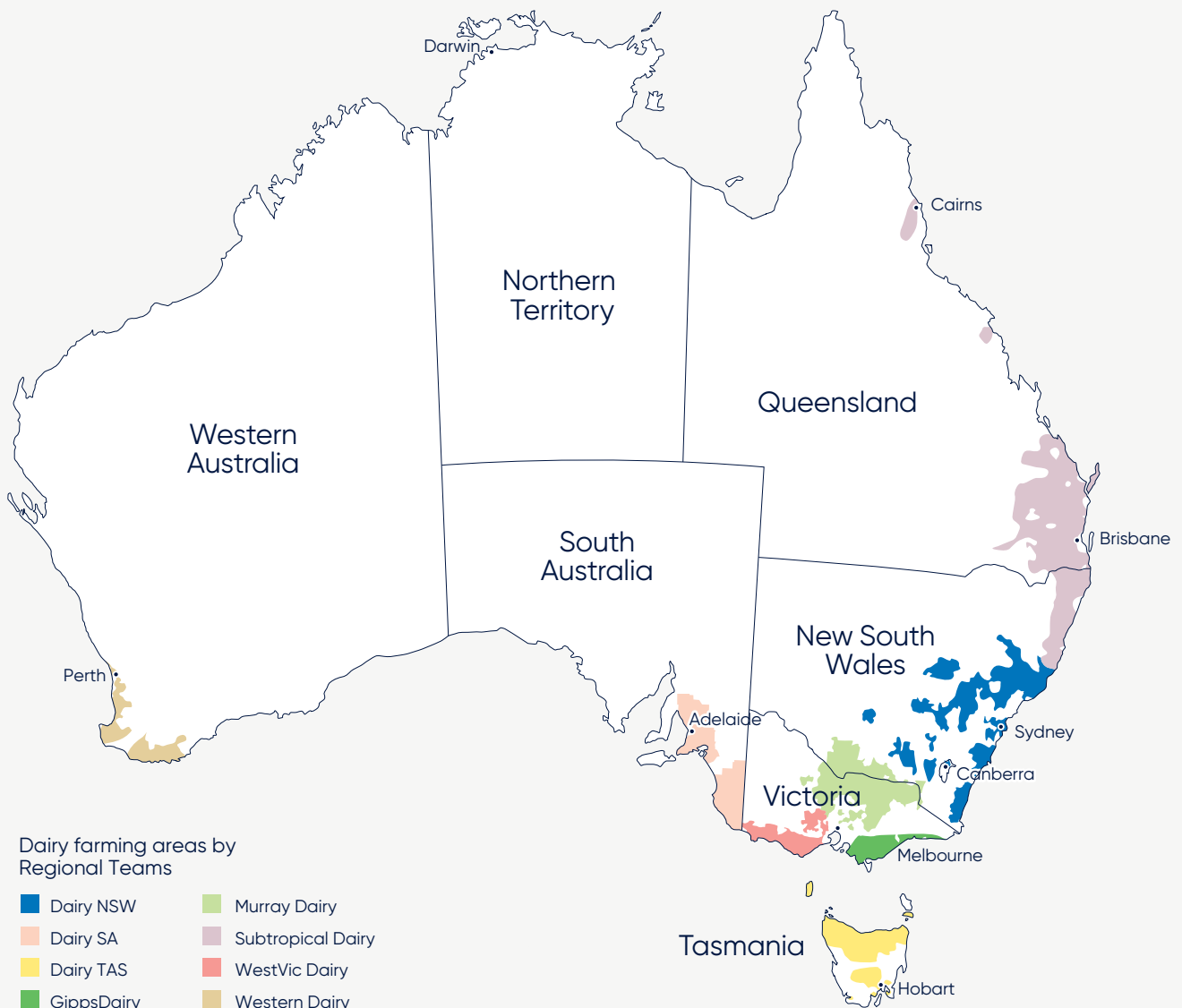
Alignment within and across Dairy Australia's RDE efforts

National climate action will also need to be integrated with existing RD&E efforts – across relevant research portfolios (breeding, feedbase, productivity, water), existing industry groups (regions, manufacturing, policy), emerging market trends/demands, and evolving government policies.

In the absence of a single solution to this complex problem, Dairy Australia needs to display clear and consistent leadership in identifying ways to incorporate climate change risk and adaptation measures into our programs (and our wider operations) in order to support our levy payers into a carbon-constrained and increasingly volatile future.

While Dairy Australia is the national service delivery organisation, the delivery of the strategy will also be regionally focused. Dairy Australia has eight regional teams with their own local management, linkages and delivery infrastructures. Each region will need to be supported to identify its unique issues and solutions in responding to climate change.

The eight dairy regions are Subtropical (Queensland and NSW far north coast), NSW, Murray (Northern Victoria and the Riverina), Gippsland, Western Victoria, Tasmania, South Australia and Western Australia.



VALUE ACROSS THE DAIRY ECOSYSTEM

The Australian dairy industry has a track record of demonstrating adaptation and investing in RD&E to address climate change. Without certainty and clear value propositions many businesses have been reluctant to accelerate their investment. This strategy will provide

all industry stakeholders with a clear vision and pathway towards realising our positive contribution to the climate. The value of this approach at all levels of the dairy value chain has been described below.

Demonstrating the value of this strategy at each level of industry and value chain

Members across the dairy value chain			
Work areas	Dairy industry bodies	Manufacturers and wider value chain	Farm/enterprise level
<p>Adaptation and resilience Recognising that global warming is now an accepted trend in all Australian climates, with investment to proactively identify solutions that support adaptation and resilience across the industry</p>	<ul style="list-style-type: none"> Lead the transition to resilient dairy farming systems that can anticipate and adapt to climate change, increasing climate variability and the availability of key resources 	<ul style="list-style-type: none"> Help provide the best chance of maintaining milk production into the future 	<ul style="list-style-type: none"> Unique adaptation challenges will be supported with dedicated investment Focus on adaptation and resilience of farming systems to the impacts of climate change
<p>Rapid transition and mitigation Reflecting the growing urgency for the majority of Australian dairy farms and supply chains to make a positive contribution to the climate in order to limit global warming to 1.5°C</p>	<ul style="list-style-type: none"> Drive the feasibility of GHG mitigation opportunities with minimal impact on dairy farm and manufacturing profitability Wider opportunities to collaborate and leverage funding towards our goals 	<ul style="list-style-type: none"> Common goals towards reducing GHG emissions from dairy value chain will help unlock new investment opportunities 	<ul style="list-style-type: none"> Confidence and lower risk profile against future carbon and energy policies Cost-effective and actionable opportunities to reduce GHG will be available to meet market requirements
<p>Environmental stewardship Integrating climate action with environmental stewardship of our natural resources</p>	<ul style="list-style-type: none"> Industry reinforcing its commitments to existing 'clean and green' goals that relate to climate change 	<ul style="list-style-type: none"> Work with industry to develop common indicators for reporting on environmental stewardship 	<ul style="list-style-type: none"> Clarity on requirements for environmental stewardship in the face of a changing climate A vehicle to demonstrate on-farm environmental stewardship and climate action
<p>Leadership and empowerment Demonstrating our commitment to global efforts towards limiting global warming to 1.5°C through leadership, investing in innovations and enabling best practice</p>	<ul style="list-style-type: none"> Demonstrate to community and markets that we take the issue of climate change seriously Certainty of industry position A vehicle to demonstrate leadership and build confidence of measured approach to climate change 	<ul style="list-style-type: none"> Opportunity to tell markets and consumers how industry is addressing the issue Certainty of industry position for investment in action at supply chain and with suppliers 	<ul style="list-style-type: none"> Knowledge that long-term goals have been established to help farmers better manage their land, assets and business

Service providers	Government/NGOs/investors	Customers/communities
<ul style="list-style-type: none"> • Build adaptation capacity and resilience across service providers 	<ul style="list-style-type: none"> • Opportunity to work with industry to develop practical activities, policies and incentives to embed climate risk planning, adaptation and resilience into farming and manufacturing systems 	<ul style="list-style-type: none"> • Re-enforce the positive contribution of dairy to local communities and their ongoing resilience
<ul style="list-style-type: none"> • Opportunities to innovate to a climate committed dairy industry 	<ul style="list-style-type: none"> • Clear industry position on need for reducing GHG emissions 	<ul style="list-style-type: none"> • Meet consumer expectations for the urgent need for climate action across all sectors of the economy
<ul style="list-style-type: none"> • Opportunity to work with dairy industry to respond to RDE gaps and needs related to both environmental stewardship and ongoing climate resilience 	<ul style="list-style-type: none"> • Opportunity to align natural capital approaches with climate risk and on-farm environmental sustainability needs 	<ul style="list-style-type: none"> • Meet 'clean and green' expectations
<ul style="list-style-type: none"> • Certainty of industry position to help with client offerings and new business opportunities to meet industry goals • Clear opportunity to work on efforts to educate and embed those goals into existing programs 	<ul style="list-style-type: none"> • The opportunity to work with industry to build confidence, adaptation and resilience across the industry • The opportunity to work on new incentives for adaptation and adoption of emissions reduction actions 	<ul style="list-style-type: none"> • Cement dairy as a key sustainable source of nutrition • Meet consumer expectations for climate action across all sectors of the economy



PRIORITIES FOR ACTION 2020–2025

The positive contribution of the dairy industry to climate will be realised through the following priority areas and actions.



Adapt

Australian dairy farming systems to thrive in a warmer and more unpredictable climate

What we know

- Global warming is increasingly impacting on dairy farming in Australia
- Incremental adaptations may no longer be enough to ensure viable dairy businesses in some regions
- There is no single solution (adaptation) that farming businesses can implement to meet the challenge of climate change. And scientific information on its own is unlikely to be useful in decision-making for adaptation.
- Building knowledge and confidence for decision-making in uncertainty will be key
- Short-, medium- and long-term adaptation strategies will be required

What we can do

- Lead the transition towards agile dairy businesses that can anticipate and adapt to climate change, increasing climate variability and the availability of key resources (water, feed, grains, etc)
- Proactively engage and co-design with dairy businesses to support their unique adaptation challenges
- Deliver high quality climate information and iterative management approaches to inform decision-making in uncertainty
- Support development of climate risk management skills across dairy farmers, service providers and wider value chain



Preserve

Our position in the Top 10 globally for low emissions intensity

- The Australian dairy industry's carbon footprint in 2015 was 1.03 CO₂e-/kg FPCM (lower than the UN Food and Agriculture Organisation average of 2.4 CO₂e-/kg FPCM). Methane is ~56 per cent of a dairy's emissions profile
- Livestock industries (inc dairy) are under increasing scrutiny for methane emissions
- Some level of emissions is expected from any activity, but there are existing opportunities within a typical dairy system to reduce GHG emissions and achieve efficiency gains
- To achieve significant emissions reductions will require changes to farming or feeding systems, as well as the development of new technologies

- Drive the rapid adoption of feasible and cost-effective emissions reduction and carbon sequestration (storage and capture) activities
- Invest in R&D to identify and commercialise novel emissions reduction opportunities
- Improve the availability of incentives for dairy businesses to participate in carbon markets
- Decrease the cost and improve the feasibility of measurement and accountability of greenhouse gas emissions in dairy



Embed

Climate action with the way we look after the environment

- Markets (and consumers) are demanding more action from industries in addressing global warming, along with broader environmental issues, such as biodiversity
- GHG emissions represent an inefficiency in dairy systems, whereby energy and nitrogen that could be directed towards production are being lost. Trade-offs are inevitable when practice change is being adopted. Consequently any climate action needs to be embedded across the system/environment in which dairy businesses' operate
- Global warming will also impact on the natural resources that dairy farming relies on. For example, reduced water in storages, increased water quality issues and water availability are all impacted by reduced rainfall

- Engage with the value chain to develop environmental stewardship and climate risk solutions
- Improve integration of practical activities, policies and incentives to embed climate risk planning, adaptation and mitigation into farming and manufacturing systems
- Identify appropriate indicators and develop monitoring, evaluation and reporting needs to track progress
- Provide evidence of value and impact of industry action to community and government



Invest

Actively contribute to keep global warming to below 1.5°

- The management of climate change and climate risk has been a consideration in many of Dairy Australia's programs for some time. However, there is now a clear case for a renewed and coordinated approach across the industry requiring resources, focus and partnerships.
- Incremental (BAU) adaptation strategies and some emissions reduction opportunities exist. However, to ensure our industry have the skills, flexibility and strategies in place for managing the continuing evolution of the impacts of climate change and to actively contribute to global targets, Dairy Australia needs to drive and leverage industry investment in RD&E

- Drive broader industry commitment (including the underpinning culture) towards 1.5°C goals
- Identify key interventions and research gaps that will be required to meet this challenge
- Partner with governments, researchers and businesses to address the current technological challenges of a climate committed dairy farm/enterprise
- Deliver on immediate research, development and extension needs
- Ensure climate change considerations are embedding in Dairy Australia's decision making processes and approaches

MEASURES OF SUCCESS

Our goal is to enable the Australian dairy industry to make a **positive contribution to the climate**. This will be realised through cost effective and achievable actions that ensure sustainable, productive and resilient dairy farms.



Adapt

Australian dairy farming systems to thrive in a warmer and more unpredictable climate

Outcome

Dairy businesses successfully adapting to (and continually evolving to meet) future climate challenges

Success indicators

- 1a** 75 per cent of dairy farmers have the right information and capabilities to thrive in an increasingly volatile climate (DA Strategy - Outcome 4.A.)
- 1b** Climate change adaptation plans developed for all key dairy regions, implementation underway and regional measures of success being realised
- 1c** 20 per cent of dairy farms using at least one new extreme event forecasting product to aid adaptation and business decision making
- 1d** Four summer active species to have gene editing work undertaken to improve nutritional value
- 1e** New strategies for utilising forage and concentrate supplementation during hot weather developed and 20 per cent of farms adopting these new strategies



Preserve

Pathways for as many dairy farms as possible, as quickly as possible, to be carbon neutral developed and adopted

Industry on track to meet emissions reduction targets by 2030

- 2a** 80 per cent of dairy farm businesses have access to and adopted up to three new commercial solutions for reducing on farm emissions (DA Strategy - Outcome 4.C.)
- 2b** 30 per cent of industry understand their carbon footprint (DA Strategy - Outcome 4.C.)
- 2c** 85 per cent of Dairy farm businesses generating renewable energy (DA Strategy - Outcome 4.C.)
- 2d** Demonstrable progress towards industry target of 30 per cent reduction in GHG emissions intensity by 2030 - based on 2015/16 level of 1.0 kg CO₂ e/kg FPCM (Dairy Sustainability Framework alignment)
- 2e** 20 per cent of dairy farmers can objectively assess the value of their participation in sequestration and offset markets



Embed

Policies and programs in place to remove barriers to sustainable on-farm solutions to environmental stewardship and climate risk

Demonstrated uptake of solutions to environmental stewardship and climate risk by dairy businesses

- 3a** 50 per cent of dairy farmers are meeting more than 80 per cent of on-farm indicators for addressing environmental stewardship and climate risk
- 3b** 80 per cent of dairy farmers are aware of relevant 'co-benefits' of reducing nitrogen loss and improved manure management
- 3c** 30 per cent of dairy farmers have completed the new soil health and climate module and have built their knowledge of how soil health will change under future climate scenarios



Invest

Industry committed and working constructively towards 1.5°C goals

Industry commitments regularly reviewed with the mind to accelerating the contribution of the Australian dairy industry towards global and domestic greenhouse gas emissions reduction targets

- 4a** Industry and government stakeholders value work of Dairy Australia to inform climate change (and related energy/water) policy discussions (rating 8 out of 10) (DA Strategy - Outcome 5.B)
- 4b** 75 per cent of consumers agree dairy farmers do a good job of caring for the environment (and the climate) (DA Strategy - Outcome 3.A, related to Dairy Matters Environmental Consumer Campaign)
- 4c** At least \$5 million of private investment in Australia directed at climate change action relevant for the dairy industry in the 2020 to 2025 period
- 4d** All climate change-related industry targets and priorities can be demonstrated to be underpinned by latest science and policy considerations
- 4e** Climate change considerations in Dairy Australia investment decisions have been successfully embedded across the organisation and can be demonstrated



ACCOUNTABILITY AND REPORTING

Tracking against the 2025 Measures of Success will be ongoing, with both internal and external reporting.

Formal external reporting on progress towards our success indicators will be three-fold, via:

- The release of two Special Impact Reports – Dairy Australia's Climate Change Strategy in years three and five of the strategy
- Annual reporting of all RD&E investments via Dairy Australia's Annual Reports and
- Annual progress reports against the relevant Dairy Sustainability Framework industry targets.

An internal cross-functional committee will be established to oversee the embedding of this strategy across Dairy Australia's business units and evaluation of progress. Membership of this committee will be drawn from each of DA's business units, as well as additional subject matter expertise, as needed. The objective of this group will be to:

- Oversee the direction and actions of the strategy
- Embed climate change into organisational culture
- Keep an active stocktake of current and forward projects/programs contributing to the strategy
- Celebrate successes and allow for new insights to be communicated across disciplines and business units
- Evaluate progress towards the success indicators and approve the external progress reports.

CONSIDERATIONS FOR THIS STRATEGY

Meeting the challenge of climate change, together

We are currently living through unprecedented times of change (technological, society, economic and climate). Bold action to address climate change is required at an industry level in order to provide leadership, demonstrate our commitment towards global and domestic targets and ensure the Australian Dairy industry is future ready.

There is no single solution to this topic

Climate change is a systemic threat to natural processes and presents a material risk to businesses that rely on those natural assets. The dairy industry is not alone in responding to the need for greater and more urgent action on climate change. Collaboration with jurisdictions and other sectors across agriculture will be vital component of delivering this strategy.

Accessible and timely information is needed for decision makers

Directors of organisations at all levels of the industry have a duty to consider climate risk like any other material risk. A report on fiduciary duties¹ notes that the risk has to only be foreseeable, not probable, for directors to have a responsibility to act. Companies, organisations and enterprises at all levels of the industry will need to have access to information in order to determine their risks and appropriate level of response to both physical and transitional climate impacts.

Need to provide solutions to dairy farmers so that they are future ready

The centre of the climate change issue for the Australian dairy industry is the issue of dealing with more highly variable climates and extreme events. Managing climate variability is therefore about vulnerability of systems, degree of risk, ability to adapt, information and support needed to adapt and increasing confidence/resilience.

Tools, resources, opportunities and support will be required to enable dairy businesses to make informed decisions in response to climate change.

Any solution needs to be cost effective and actionable across the value chain

First and foremost, this strategy is driven by the need to better manage changing farm systems and profitability/sustainability of dairy farm enterprises into the future. Uncertainty will always exist in decision making. Consequently, this strategy will need to improve understanding of probability and risk and how to make decisions under increasing uncertainty across all levels of the value chain.

¹ Future Business Council – Fiduciary Duties and Climate Change futurebusinesscouncil.com/fiduciary-duties-and-climate-change



UNDERPINNING ASSUMPTIONS

The success of this Strategy will be underpinned by the following assumptions:

- Dairy farmers will want to make a positive contribution to the climate, especially actions that limit global temperature rise to 1.5 degrees Celsius above pre-industrial levels.
- Dairy farmers will want to meet consumer and societal expectations for the dairy industry to accelerate the transition to more sustainable and climate committed food production systems and diets.
- Australian dairy farmers cannot avoid responsibility because they have a comparatively low carbon footprint when compared to many of our international competitors. Cost effective and achievable actions are needed to make further contributions to reduce greenhouse gas emissions and operate toward carbon neutral farms.
- Investment will need to target solutions that enable dairy farms and dairy supply chains to achieve industry targets that are set out in the Sustainability Framework. Targets for 2030 are under review and are likely to be more aggressive than the current target to reduce emissions intensity by 30 per cent by 2030.
- Unlocking greater opportunities for collaboration will be critical for success on both a domestic and global scale, especially for developing solutions. A more aggressive target set by industry will be important for attracting investment partners.
- Australia is a relatively small dairy market, but also a valuable and stable market for new product development and investment in businesses. It is a priority to make Australia a favourable destination to fast-track the development of existing and emerging technologies that enable an accelerated transition to a low carbon future.
- There is likely to be political pressure to focus investment on a cross-commodity basis. Dairy Australia will need to actively engage in this process and will be best placed to do so when it has a clear set of priority investments and can more effectively describe impacts of investments on the dairy sector.

THE WAY FORWARD

A successful strategy to realise the positive contribution dairy can make towards climate change must be underpinned by RD&E to enable systemic adaptation and identify priority gaps for improving knowledge, skills, attitudes and adoption.

Foundational RD&E has been completed, with advice on climate impacts by region (CSIRO report), review of emissions reduction opportunities (marginal abatement cost curve, soil carbon report) and farming system adaptation options analysis (Dairy Businesses for Future Climates) available and critically informing future direction. Development and extension activities have delivered tools such as the Dairy Carbon Calculator, Cool Cows heat alert service and Dairy Climate Toolkit website.

The work that Dairy Australia has invested in to-date places us in a good position to understand the challenges and identify the gaps in knowledge.

The alignment of this strategy with Dairy Plan and the Australian Dairy Sustainability Framework will ensure the objective of enabling a climate committed dairy industry will be embedded, well supported and realised.

This strategy will be implemented over five years, 2020–2025, with a basis of funding from farmer levies and Federal Government, leveraged through other opportunities as they are identified.

Contact us

The strategy will build on foundational work completed by Dairy Australia and its partners who will seek to collaborate domestically and internationally to deliver on its objectives.

Opportunities to partner in the implementation of this strategy are welcomed. Contact Dairy Australia directly to discuss.



RESEARCH SNAPSHOTS

Dairy Businesses for Future Climates

The Dairy Businesses for Future Climates project was established in 2012 to model and answer the question: 'How are our current dairy businesses vulnerable to a 2040 climate?' Economic and biophysical modelling of four different dairy farm systems across central Gippsland, Victoria; the Fleurieu Peninsula, South Australia; north west Tasmania; and Murray Dairy was undertaken.

By modelling real base farms in different regions and testing three development options at each site the researchers were able to forecast what would be likely to have a reduction in profit. While it is difficult to compare development options across regions because they are specific to location, some general trends were evident:

- The growing season for pastures will shift under 2040 climate change scenarios creating feed challenges.
- Year to year climate variability will continue to be a challenge to dairy farm businesses.
- In order to minimise the potential impacts of climate variability, dairy farmers will need to continue to improve their management skills and continue to adapt their farm systems to manage future climate risks.

dairyclimatetoolkit.com.au/adapting-to-climate-change/adapting-the-dairy-industry

RESEARCH AT A GLANCE

Climate variability will continue to be a challenge to dairy farm businesses

Dairy farm managers will need to continue to adapt their farm systems to manage risks. Dairy farm managers will also need to measure and manage efficiencies within the system to remain profitable

Skilled farm managers and service sector are essential to the future success of the dairy industry, and training and skill support for farmers to manage future climate challenges will be required

The profitability of the case study farm and all three other options investigated were negatively affected by the 2040 climate change scenarios that were modelled

The changed climate scenarios will alter the growth and utilisation of pastures and forage crops, creating feed challenges and suggesting more irrigation water will be required and/or requiring dairy farmers to get more out of every ML applied

Milk price has a substantial impact on business performance in addition to climate, as milk payment systems may alter the attractiveness and returns of different production systems

DairyBio and DairyFeedbase – future proofing dairy farms

Dairy Australia, Agriculture Victoria and the Gardiner Dairy Foundation are driving transformational bioscience and applied research programs, focused on delivering 'future proofing' innovation to Australian dairy farms. These programs - DairyBio and DairyFeedbase – also collaborate with domestic and international partners to achieve world's best research on climate, 'right-to-farm' and profitability outcomes.

DairyBio animal has delivered the world's first Heat Tolerance ABV, a Feed Efficiency ABV and will continue to deliver options for farmers to select for climate proof and environmentally friendly cows. DairyBio forage has developed an F1 Hybrid ryegrass that can deliver up to 20-30 per cent greater yield and 1-2MJ more of ME using the same amount of water and nitrogen inputs. They are currently developing grasses to suit the climates that our key dairy areas will be facing in the future via 2020 dairy impacts modelling through the CSIRO and Agriculture Victoria, which models out to 2100.

DairyFeedbase is developing step-change strategies at a herd and individual cow level to maintain production for our changing climate, including heat reduction strategies, feeding strategies and forage utilisation strategies.

dairybio.com.au and dairyfeedbase.com.au



Dairy Carbon Calculator

The Australian dairy industry is committed to a 30 per cent reduction in GHG emissions intensity across the dairy supply chain based on 2015 levels. To compare farms producing differing amounts of milk, emissions intensity is calculated by dividing total emissions by the amount of fat and protein corrected milk (FPCM; standard of 4.0 per cent fat and 3.3 per cent protein).

To track industry progress, Dairy Australia has developed a GHG accounting tool linked to DairyBase called the Australian Dairy Carbon Calculator. This tool provides a breakdown of emissions sources and potential abatement strategies.

Measuring actual emissions on farm is expensive and the Australian Dairy Carbon Calculator is an internationally recognised tool that can be used to estimate on farm emissions. It can also be used to estimate the impact of changes in management practices on emissions.

dairybase.com.au/tools-and-resources/australian-dairy-carbon-calculator

Original Excel version of the GHG Abatement Tool here (for non-DairyBase users) dairyingfortomorrow.com.au/tools-and-guidelines/dairy-greenhouse-gas-abatement-calculator

Marginal Abatement Cost Curve

In 2019 a comprehensive desktop research review was undertaken to identify key emissions reduction opportunities for the industry. The review summarised information in relation to mitigation potential, adoption rates (including sequencing considerations) and economic assumptions, collated from various sources on emission reduction opportunities for both the on-farm and manufacturing segments of the industry.

The marginal cost of abatement (\$/tonne CO₂-e abated) was calculated – quantified by dividing the net present value (NPV) of each opportunity by the total GHG emissions abated over the lifetime of the project and all opportunities levelised.

The results were presented as a Marginal Abatement Cost Curve for the dairy industry, which provides a roadmap for emissions reduction to 2030. This work was used to inform the development of this strategy and is currently being translated into a suite of information for dairy farmers to access.

Carbon emissions report

Inputs

Report

Strategy

Refresh data
 Download Spreadsheet
 Open in DairyBase

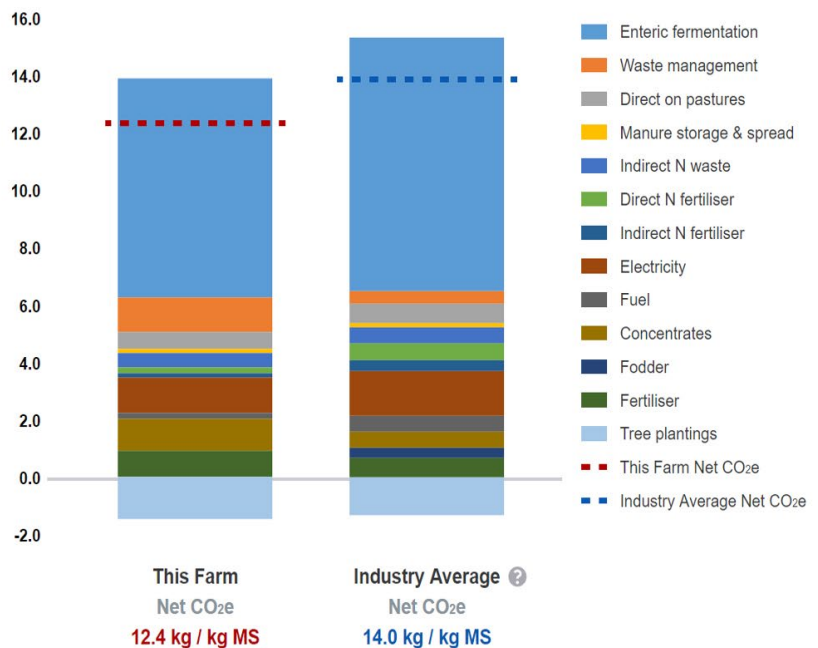
DBCC Comparison 1

16/17 — DA0001

Carbon Emissions Report

DairyBase Farm Id	DA0001
State	Victoria
DFMP Region	Gippsland
Financial Year	16/17
Dataset Name	DBCC Comparison 1
Description	

GHG emissions intensity	kg CO ₂ e / kg FPCM	0.89
	kg CO ₂ e / kg MS	12.4



Climate change impacts on dairy regions

Climate change and variability are already impacting on profitability in dairy, but the extent of impacts can differ across the eight dairy regions and production systems.

This table is a summary of the 2016 CSIRO report commissioned by DA to predicted impact of climate change on dairy farming regions out to 2040.

Climate change will increase the variability of temperature and rain patterns. In addition, a whole range of extreme events, such as floods, droughts and heat waves and associated risks such as price volatility, pests and diseases become more likely.

Adaptation of farming systems to climate variability is a high priority for the industry as adaptation directly impacts farm practices, productivity, and business profitability.

Further detailed examination of climate changes by region have recently been developed by Bureau of Meteorology. Those climate guides provide more tailored regional information for farmers and can be freely accessed here: bom.gov.au/climate/climate-guides

dairyclimatetoolkit.com.au/adapting-to-climate-change/understanding-climate-impacts

	Gippsland	Murray Dairy	WestVic	DairyTas	DairySA	Dairy NSW	Subtropical Dairy	Western Dairy
Temperature increase	1–1.7°	1.2–1.8°	1–1.6°	0.5–1.5°	1–1.6°	1.2–2°	1–2°	1–1.7°
Season of greatest warming	Summer	Summer	Summer	Summer/autumn	Summer	Summer	Spring	Summer
% decrease in rainfall (range)	-3 (-10 to +5)	-3 (-10 to +5)	-5 (-15 to +3)	-5 (-15 to +0)	-5 (-17 to +3)	0	-5	-15 (-22 to -7)
Variability of rainfall	Winter, spring decrease	Winter, spring decrease	Autumn, winter, spring decrease	Spring, summer decrease	Winter, spring decrease	Little change	All seasons decrease (south)	All seasons decrease (esp spring)
% time in drought (historical)	45 (33)	46 (33)	55 (38)	53 (33)	50 (40)	38 (35)	43 (35)	62 (45)
% soil moisture decline	-8 to -2	-7 to -1	-5 to -1	-6 to -1	-5 - 0	-7 to 2	-5 to -1	-7 to 0

GLOSSARY

Item	Description
Adaptation/adapt	The process of adjustment to actual or expected climate change and its effects.
Bioenergy	Energy that is derived from biological sources, such as plant matter or animal waste.
Carbon calculator	A tool/resource that calculates the approximate amount of carbon dioxide emissions produced by a business/enterprise. The output is often presented as a 'carbon footprint' and/or an action plan that identifies what that business could do to reduce its greenhouse gas emissions.
Carbon dioxide equivalent	A common metric used for comparing the climate effects of different gases, as compared to one metric ton of carbon dioxide (CO ₂). Represented as CO ₂ equivalent or CO ₂ -e.
Carbon footprint	The total greenhouse gas (GHG) emissions caused by an individual, entity or product. Represented as carbon dioxide equivalent (CO ₂ -e).
Carbon neutral	Having or resulting in no net addition of greenhouse gas emissions to the atmosphere. This could be as a result of reduced GHG emissions or the offsetting of emissions.
Carbon sequestration	The process where carbon dioxide is removed from the atmosphere and stored in organic stocks (e.g. soils and trees).
Climate change	The long-term alteration of temperature and typical weather patterns in a place. It is caused by the rise in concentrations of GHG emissions in the atmosphere. Typically averaged over a period of 30 years.
Climate change scenarios	Projections of future GHG emissions used by analysts to assess future vulnerability to climate change. Scenarios typically combine model outputs with observed climate data to describe a reasonable or probable description of a future state of the world.
Climate variability	Changes in rainfall, temperature and extreme events (floods, droughts and heat waves) that can be actual or projected for a certain time period (season, year, decade, etc).
Emissions intensity	A unit measure of emissions that allows for comparison of farms producing differing amounts of milk. Emissions intensity is calculated by dividing total emissions by the amount of fat and protein corrected milk (FPCM; standard of 4.0% fat and 3.3% protein).
Enteric	Relating to or originating in the digestive system. Enteric fermentation is a natural part of a ruminant's digestive process.
Fiduciary climate risk	The recognition that climate change is a relevant risk factor that must be considered by directors / executives of organisations/trusts (fiduciary). Company directors have a fiduciary responsibility to understand, assess and act upon climate risk.
Global warming	Describes the recent increase in the world's temperature that is caused by the increase in GHG emissions in the atmosphere.
Greenhouse gas (GHG)	A gas that can capture and retain heat from sunlight thus warming the atmosphere.
GWP*	Global Warming Potential (GWP) is the heat absorbed by any GHG in the atmosphere, as a multiple of the heat that would be absorbed by the same mass of carbon dioxide (CO ₂). GWP* is a metric developed to better describe this relationship of short-lived gases, such as methane, to long-lived gases, like CO ₂ .
Heat tolerance ABV	The heat tolerance Australian Breeding Value (ABV) allows farmers to identify animals with greater ability to tolerate hot, humid conditions with less impact on milk production.
Marginal cost of abatement	A economic measure (\$/tonne CO ₂ -e abated) quantified by dividing the net present value (NPV) of each emissions reduction opportunity by the total GHG emissions abated over the lifetime of the project and all opportunities levelised.
Methane (CH₄)	A colourless, odorless GHG produced under anaerobic conditions, such as the normal digestive processes in many animals, including ruminants (enteric methane). Methane is a short-lived gas, as after 10 years it is broken down in a process called hydroxyl oxidation into CO ₂ .
Mitigation	Actions to limit the magnitude or rate of global warming. In other words actions that either reduce GHG emissions from a source or actions that offset/sequester emissions.
Natural capital	Another term for the stock of renewable and non-renewable resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people.
Nitrogen (N)	A colorless, odorless, gas that makes up 78 percent of the atmosphere (by volume). It is a major part of chlorophyll and the green colour of plants. It is used to make ammonia, nitric acid and fertilizers.
Nitrous oxide (N₂O)	A potent GHG with about 300 times the heat trapping power of CO ₂ . It is emitted naturally from the microbial processes in the soil, however, the majority of N ₂ O emissions comes from human activity, including agriculture.
Paris Agreement	An agreement within the United Nations Framework Convention on Climate Change, dealing with GHG emissions mitigation, adaptation and finance, signed by 196 parties in 2016.
Sequester	To hide or take out of circulation and deposit in a sink.
Transformational adaptation	A long-term response to climate change. Often categorised by actions that are adopted at much larger scale, that are truly new to a particular region or resource system, and that transform places and shift locations.





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ISBN 978-1-925347-67-8 (print), 978-1-925347-79-1 (online)