Parliamentary Committees



Impact of climate change on Queensland agricultural production

Report No. 8, 57th Parliament
Health, Environment and Agriculture Committee
May 2024

Health, Environment and Agriculture Committee

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	*Mr Brent Mickelberg MP substituted for Mr Rob Molhoek MP for the period 16 April to 4 June 2024. Mr Sam O'Connor MP was elected Deputy Chair for the period of Mr Molhoek's absence from the committee.

Committee Secretariat	
Telephone	+61 7 3553 6626
Email	heac@parliament.qld.gov.au
Technical Scrutiny Secretariat	+61 7 3553 6601
Committee webpage	www.parliament.qld.gov.au/heac

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All web address references are current at the time of publishing.

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Chair's foreword

This report presents a summary of the Health, Environment and Agriculture Committee's examination of evidence to the former State Development and Regional Industries Committee's (SDRIC) self-referred inquiry into the impact of climate change on agricultural production in Queensland.

I would like to thank the former SDRIC, including the Chair, Mr Chris Whiting MP, for initiating an inquiry into this important issue. The evidence received in the course of the inquiry will be a valuable resource for this committee having recently acquired responsibility for the Agricultural Industry Development, Fisheries and Rural Communities portfolio.

On behalf of the committee, I thank those individuals and organisations who made written submissions and appeared at public hearings before the former committee. I also thank our Parliamentary Service staff and the many organisations that provided briefings to the former committee.

I commend this report to the House.

Aaron Harper MP
Chair

Recommendations

Executive Summary

This report presents a summary of the Health, Environment and Agriculture Committee's (committee) inquiry into the impact of climate change on Queensland agricultural production. The inquiry was instigated by the former State Development and Regional Industries Committee (former SDRIC), and subsequently transferred to this committee. This report presents a summary of the evidence received by the former SDRIC.

In regard to the impact of climate change on Queensland agricultural production stakeholders identified 5 significant future risks:

- biosecurity risks – changes to temperature and rainfall leading to shifts in the extent and distribution of pests and weeds with potential major impacts on productivity, disease management and market access
- disruption to supply chains – rising numbers of floods and cyclones with potential to damage key infrastructure up and down the supply chain
- changing environmental, social and governance expectations – higher costs and potential limits to market access as a result of changing expectations around agricultural producer's climate and emissions responsibilities
- energy transition risks – competition for land and labour as a result of the growth in renewable energy projects
- impacts on human health and rural and First Nation's communities – rising temperatures increasing health and safety risks and limiting access to key native botanicals.

Stakeholders made the following recommendations as to how the Queensland Government can support agricultural producers to become more resilient, and adapt to and mitigate climate risks:

- update and consolidate existing climate information resources
- provide targeted support to agricultural extension officers who are key to building trust regarding climate change amongst the farming community
- support the development of weather index insurance (WII) as a means to provide affordable crop insurance and as an alternative to disaster payments
- review physical and human infrastructure in areas such as biosecurity and transport in preparation for future climate changes
- changes to financial incentives for farmers to better recognise the importance of climate change and to ensure equal treatment between producers of different agricultural commodities
- ensuring policies across government are harmonised to support climate adaptation.

The committee recommended that the Legislative Assembly note the contents of the report.

1 Introduction

1.1 Inquiry terms of reference

On 24 January 2023, the former State Development and Regional Industries Committee (former SDRIC) resolved to conduct an inquiry into the impacts of climate change on Queensland's agricultural production, with the following terms of reference:

(a) the impacts of climate change and climate variability on Queensland agricultural production and the existing and potential future risks of climate change on the sector

(b) opportunities for the Queensland Government to create and support resilience, adaptation and mitigation measures in preparing the agricultural sector for future climate change.

On 13 February 2024, in amending Schedule 6 of the *Standing Rules and Orders of the Legislative Assembly,* the Legislative Assembly transferred the inquiry to the Health, Environment and Agriculture Committee (the committee) for consideration.

1.2 Inquiry process

The former SDRIC conducted several briefings, site visits and public hearings between March and September 2023 (see Appendix A for details) and received 26 submissions to its inquiry (see Appendix B for a list of submitters). While the inquiry examined the impact of climate change on a range of agricultural industries, it did not examine aquaculture.

The committee examined the evidence gathered by the former SDRIC to prepare this report.

1.3 Report

This report presents a summary of the committee's consideration of the inquiry terms of reference and the evidence gathered by the former SDRIC. It discusses key issues raised by witnesses and submitters during the inquiry with a focus on the strategic risks and opportunities posed by climate change to the agricultural sector as a whole. While the report provides brief case studies on the impact of climate change on certain sectors (sugarcane, horticulture, and beef), it does not encompass the breadth of scientific or policy research on the impact of climate change on these commodities or on the industry as a whole.

Recommendation 1

The committee recommends the Legislative Assembly notes the contents of this report.

2 Context

2.1 Agriculture in Queensland

Queensland is one of the most important agricultural producing regions in the world. Despite having a population that is less than 0.1 per cent of the world's population, and accounting for only 1 per cent of the world's total land area, Queensland produces 0.4 per cent of the world's food supply and nearly 1 per cent of the world's agriculture exports.[1]

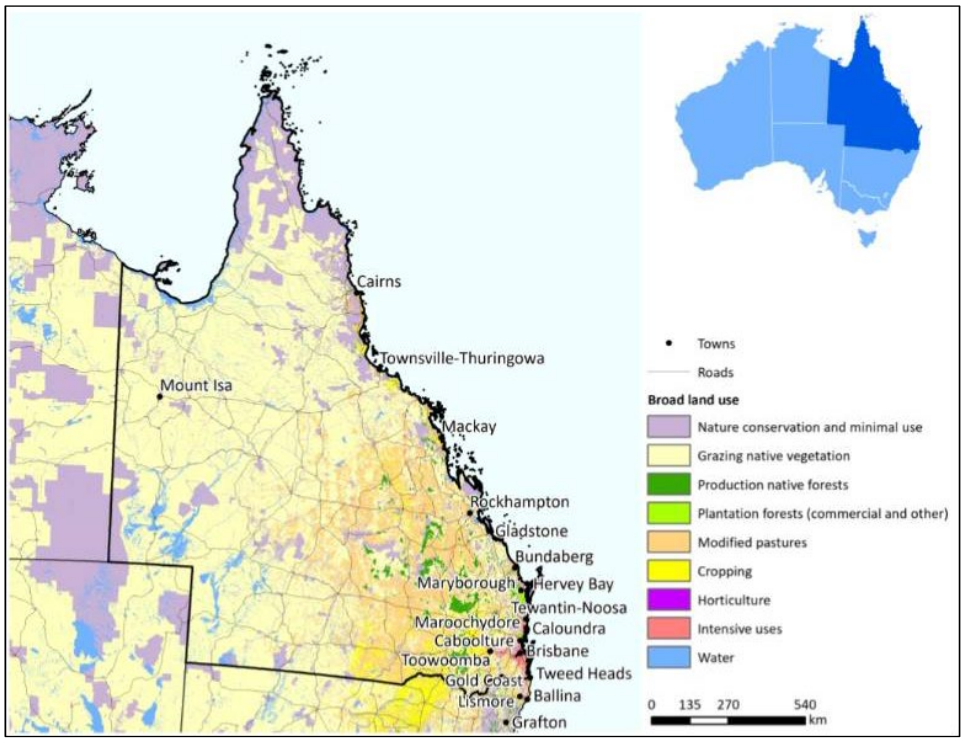
This importance is reflected in the contribution of agriculture to the state's economy. In 2024 the value of Queensland's agricultural commodities is forecast to be $23.67 billion. This is slightly lower than the record estimated value of $24.44 billion in 2022-23, which followed 4 years of sustained

[1] Department of Agriculture and Fisheries (DAF), submission 24, p 3

increases in value from 2019 onwards.[2] Beef, sugar and cotton continue to be Queensland's biggest agricultural industries by value of production, with Queensland producing 95 per cent of Australia's sugarcane and 49 per cent of the nation's cattle herd.[3] Total exports (including fisheries and forestry) amounted to $12.5 billion in financial year 2022-23, an almost 17 per cent increase on the previous year, with the increase in value driven by higher prices and increased volumes.[4] The value of Queensland's agricultural exports have been rising consistently since 2020.[5] Agriculture is also a major employer in the state. Over 58,000 people work in agriculture in Queensland and approximately 363,000 across the supply chain – more than 13 per cent of Queensland's total workforce.[6]

The Queensland Government's *State of the Environment Report 2020* found that 85 per cent of Queensland is suitable for agriculture. Of this land, 9 per cent was deemed highly suitable, 3 per cent was deemed suitable with limitations (i.e. requires irrigation), with the remaining 71 per cent deemed suitable for grazing.[7] Figure 1 shows current agricultural land use in Queensland.

Figure 1: Agricultural land use in Queensland



Source: ABARES, *About my region dashboard*, n.d., https://public.tableau.com/views/AMR_v9_A3L/Dashboard1?:showVizHome=no

2 DAF, *Primary Industries Data*, 12 October 2023, https://www.daf.qld.gov.au/news-media/campaigns/data-farm/primary-industries.

3 DAF, Primary *Industries Data*, 12 October 2023, https://www.daf.qld.gov.au/news-media/campaigns/data-farm/primary-industries.

4 Minister for Agricultural Industry Development and Fisheries and Minister for Rural Communities, 'Latest data shows strong gains in Queensland's agricultural exports', media statement, 15 September 2023, https://statements.qld.gov.au/statements/98692#:~:text=Key%20growth%20commodities%20for%202022,9.83%25%20increase%20in%20export%20volume.

5 DAF, *Primary Industries Data*, 12 October 2023, https://www.daf.qld.gov.au/news-media/campaigns/data-farm/primary-industries.

6 DAF, *Employment and Business Data*, 14 February 2024, https://www.daf.qld.gov.au/news-media/campaigns/data-farm/primary-industries.

7 Queensland Government, *State of the Environment Report 2020*, September 2021, https://www.stateoftheenvironment.des.qld.gov.au/liveability/rural/soil-land-resources-availability-capability.

2.2 Climate change

Climate change is defined by the United Nations Intergovernmental Panel on Climate Change (IPCC) as:

> A change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use.[8]

While Queensland has experienced a high degree of natural climate variability over a long period, changes resulting from increases in greenhouse gases and other changes to atmospheric composition caused by human activities mean that Queensland's climate can no longer be understood only in terms of natural variability.[9]

Average temperatures in Queensland have risen by 1.5˚C since 1910 with summer rainfall increasing over most parts of the state as winter rainfall has declined.[10] The number of days when dangerous bushfire conditions exist have also increased, while the number of severe land-falling cyclones near and south of Cairns has dropped.[11]

It is projected that Queensland's climate will continue to change. The state is expected to continue warming with longer dry periods interrupted by more intense rainfall events.[12] It is anticipated that the frequency of extreme El Niño and La Niña events will also increase.[13] Though efforts to reduce global carbon emissions are ongoing, by mid-century under a high-emissions scenario the climate of Brisbane is projected to be more like Mareeba, the climate of Cairns more like Cooktown, and the climate of Longreach more like Port Headland in Western Australia.[14]

These changes will impact growing conditions in Queensland and around the globe, which will have significant effects on supply and demand for agricultural products.[15]

As the University of Queensland explained in its submission to the inquiry:

> Climate change is and will continue to impact Queensland's agricultural production systems across scales including plants/animals, paddocks, farms, regions, industries, and sectors. Predicted changes in temperature, rainfall, extreme events, and carbon dioxide concentration result in a complex interplay of

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8 IPCC, *Climate Change 2023: Synthesis Report – Contribution of Working Groups I, II and III to the Sixth* Assessment *Report of the Intergovernmental Panel on Climate Change*, p 122.

9 S B Power, *Climate change adaptation to support agriculture in Queensland: A briefing note for the State* Development *and Regional Industries Committee's Inquiry into the impact of climate change on Queensland Agricultural production*, 2023, p 2.

10 Climate Change in Australia, *Queensland's Changing Climate*, 2021, https://www.climatechangeinaustralia.gov.au/en/changing-climate/state-climate-statements/queensland/.

11 Climate Change in Australia, *Queensland's Changing Climate*, 2021, https://www.climatechangeinaustralia.gov.au/en/changing-climate/state-climate-statements/queensland/.

12 Australia Climate Program, *Impacts and adaptation strategies for a variable and changing climate in the Wide Bay* Burnett, https://www.unisq.edu.au/research/environmental-sciences/qdmc-drought.

13 W Cai, 'Increased frequency of extreme La Niña events under greenhouse warming', *Nature Climate Change*, 5(2), January 2015, pp 132-137.

14 Climate Change in Australia, *Queensland's Changing Climate*, 2021, https://www.climatechangeinaustralia.gov.au/en/changing-climate/state-climate-statements/queensland/.

15 Northern Australia Climate Program, *Impacts and adaptation strategies for a variable and changing climate in the Wide Bay Burnett*, https://www.unisq.edu.au/research/environmental-sciences/qdmc-drought.

> factors affecting distribution, yield, health, pests, and disease. There will be some gains, some losses, and a great deal of risk and uncertainty as the sector adapts to the changes.[16]

While incremental adaptation has been successful, a number of studies suggest there is a danger that a short-term approach may lead to maladaptation or that larger opportunities for the sector are missed.[17] Additionally, while adaptation programs form an important part of the state's support for farmers the most recent National Drought Agreement (NDA) annual report notes that, compared to other states and territories, Queensland devotes the lowest proportion of funding to enhancing long-term resilience and preparedness as opposed to in-drought support.[18] However, the state provides the largest proportion of its NDA funding to support rural communities.[19]

3 Impacts of climate change and climate variability on Queensland agricultural production

3.1 Climate change and challenges for agriculture in Queensland

The challenges that Queensland's farmers will face over the coming decades differ significantly based on their location and the type of farming they undertake. Nonetheless some common factors include:

- higher temperatures placing heat stress on workers, animals, and plants
- changes in rainfall (including the trend towards an overall drier climate and more intense rainfall events) leading to a greater reliance on irrigation and increasing risks of run-off and erosion
- more extreme weather events such as increased chance of flooding, longer periods of drought, and heatwaves magnifying drought effects
- changes to natural eco-systems with the potential to increase biosecurity risks, and pest pressures
- harsher fire weather
- sea-level rise causing inundation of low lying coastal land
- reduced reliability of imported products, especially fish meals and fertilizers.

Figure 2 on the following page shows the changes to rainfall during April to October in recent decades relative to the previous century. Shifts in rainfall patterns mean that the northern parts of Queensland now receive more rain while rainfall in areas in the south of the state has been very low. These changes in rainfall combined with increased temperatures, more frequent and intense extreme weather events present challenges, but also opportunities for agriculture.

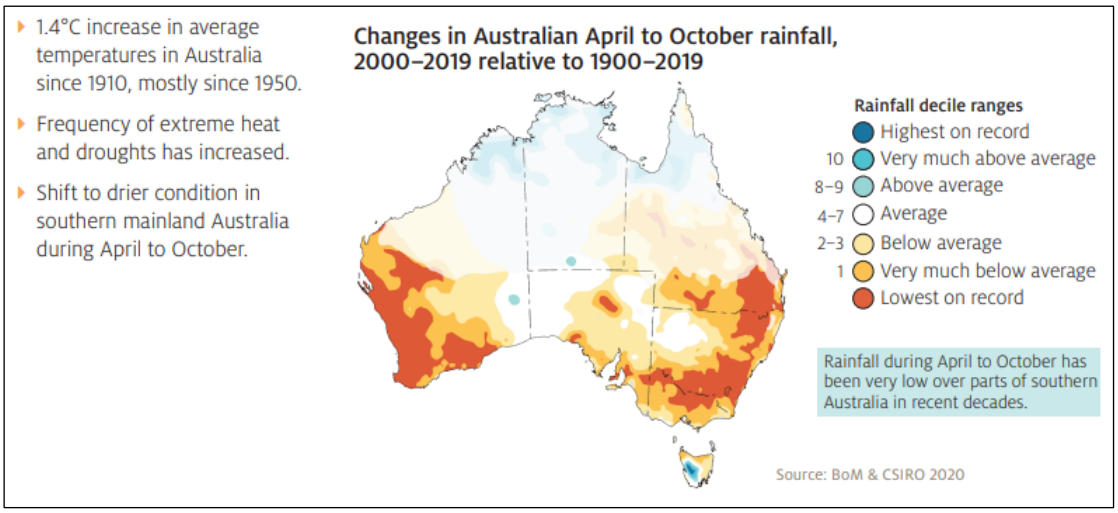
[16] University of Queensland, submission 2, p 2.

[17] L Rickards and S M Howden, 'Transformational adaptation: agriculture and climate change', *Crop and Pasture Science*, 63, 2012, pp 240-250.

[18] Department of Agriculture, Water and the Environment (DAWE), *National Drought Agreement: Annual Report 2022-23*, 2023, p 19.

[19] DAWE, *National Drought Agreement: Annual Report 2022-23*, 2023, p 19.

Figure 2: Changes to rainfall patterns



Source: Australian Bureau of Agricultural and Resource Economics and Sciences, 2020, *Analysis of global responses to climate change: opportunities for Australian agricultural producers*

3.1.1 Overall impact on farm profitability

Research undertaken by the Australian Bureau of Agriculture and Resource Economics and Sciences (ABARES) suggests that climate change could have a major impact on farm profits unless further adaptations occur.[20] Relative to the climate between 1950 and 2000, average farm profits could decline by 2 per cent to 32 per cent in the most optimistic climate scenario and by as much as 11 per cent to 50 per cent in the most pessimistic scenario. This research also found that nationally, the biggest impact of climate change on farm profitability is likely to be felt by the northern beef industry due to the often marginal nature of the land on which grazers operate.[21]

The former SDRIC received a private briefing from ABARES on their research into the impact of climate change.

3.1.2 Case Study: Sugarcane

There are mixed views about the effect of increasing atmospheric carbon concentration on sugarcane production. While some studies suggest more atmospheric carbon dioxide will have a neutral or positive effect on yields, other research paints a more complicated picture.[22] An analysis of historical output data has suggested that though increasing levels of atmospheric carbon concentration had a positive effect on production before 1995 this trend has now reversed.[23] There is also disagreement over whether output is likely to be more affected in the north of the state due to higher temperatures or in the south as a result of greater stress on water resources.[24]

Increasing temperatures, especially rising minimum temperatures, may lead to a decline in sugarcane sucrose content. Temperature change may also hasten the maturation of sugarcane, leaving a smaller

[20] N Hughes, M Lu, W Y Soh and K Lawson, 'Modelling the effects of climate change on the profitability of Australian farms', *Climate Change*, 172(12), 2022, p 1.

[21] Hughes et al, 'Modelling the effect of climate change', p 12.

[22] Y Everingham, 'A dual ensemble agroclimate modelling procedure to assess climate change impacts on sugarcane production in Australia', Agricultural Science, August 2015, 6 (19), pp 870-888; Northern Australia Climate Program, *Impacts and adaptation strategies for a variable and changing climate in the Wide Bay Burnett*, https://www.unisq.edu.au/research/environmental-sciences/qdmc-drought.

[23] M Linnenluecke, 'The impact of climate change on the Australian sugarcane industry', *Journal of Cleaner Production*, 2020, p 246.

[24] Linnenluecke, 'The impact of climate change'; S Parks, 'Evaluating the impact of and capacity for adaptation to climate change on sectors in the sugar industry value chain in Australia', *Proceedings of the International Society of Sugar Cane Technologists*, Durban, South Africa, July-August 2007.

window for harvest as well as potentially affecting crop quality.[25] Changed rainfall patterns can also negatively affect both plant growth and sucrose accumulation, disrupt planting, and reduce available harvest time.[26] It is estimated that a 100mm reduction in rainfall will lead to an 8-10 tonnes per hectare reduction in yield year on year.[27]

Consequently, the proposed adaptations the industry could adopt are highly varied and include:

- using varieties with greater tolerance for high temperatures and resistance to pests and disease
- more efficient irrigation techniques and/or supplementary water
- greater use of precision farming techniques
- investigating new regions to plant sugarcane
- using insurance and reinsurance options to offset risk.[28]

3.1.3 Case Study: Beef

Like sugarcane, the precise effect of climate change on the beef industry is hard to determine. Scientists are uncertain about the effect of higher temperatures and carbon dioxide concentration on pastures and thus the diet quality and liveweight gain in cattle.[29] The impact of changes in rainfall are easier to determine and are understood as the most significant threat to the beef industry.[30] As well as drought, producers may be affected by the forecast increase in more intense rainfall events which may impact forage quality.

Producers in Central Queensland report challenges to beef production associated with rising temperatures. Prolonged heatwaves and consistently high temperatures can induce significant heat stress in beef cattle, especially in feedlots. This leads not only to increased animal mortality, but also reduces the time cattle spend grazing and ruminating, resulting in decreased weight. It can also disrupt normal reproductive cycles, reducing overall fertility rates, and contribute to the prevalence of certain diseases and pests, further affecting cattle health and productivity.[31]

While the northern beef industry is projected to be affected less by climate change than southern areas, farm profits could still fall by significant amounts unless climate adaptation strategies are adopted.[32] This is because beef producers are highly vulnerable to relatively small adverse changes in the production and market context.[33]

In response, a range of adaptation measures have been suggested:

- greater use of climate forecasts to aid decision making
- provision of additional water infrastructure
- more prescribed burning to reduce risk of wildfire and control woody thickening

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25 Mackay Conservation Group, submission 1, pp 1-2.

26 Mackay Conservation Group, submission 1, p 2.

27 Bundaberg AG-Food & Fibre Alliance, submission 21, p 2.

28 Northern Australia Climate Program, *Impacts and adaptation strategies for a variable and changing climate in the Wide Bay Burnett*, https://www.unisq.edu.au/research/environmental-sciences/qdmc-drought.

29 Northern Australia Climate Program, *Impacts and adaptation strategies for a variable and changing climate in the Wide Bay Burnett*, https://www.unisq.edu.au/research/environmental-sciences/qdmc-drought.

30 Department of Environment and Heritage Protection, *Queensland Climate Adaptation Strategy: Agriculture Sector Adaptation Plan,* 2017, p 4.

31 Mackay Conservation Group, submission 1, p 2.

32 N Hughes, *Farms are adapting well to climate change, but there's work ahead*, 29 July 2021, https://theconversation.com/farms-are-adapting-well-to-climate-change-but-theres-work-ahead-164860

33 C Stokes, 'Strategies for adapting to climate change', *Proceedings of the Northern Beef Research Conference*, Darwin, November 2011, pp 81-86.

- proactive control of pests and diseases
- selecting different cattle lines with better thermo-regulatory properties
- exploring alternative land use in marginal areas and property diversification.[34]

3.1.4 Case Study: Horticulture

As Queensland Fruit & Vegetable Growers told the inquiry, horticulture 'dances a fine line between nature's bounty and fury'.[35] Climate change is expected to have a major impact on Queensland's horticulture industry due to the temperature sensitive nature of many fruits and vegetables. For example, extended higher temperatures in the Lockyer Valley, has meant the region is less suitable for growing tomatoes than it once was.[36] With horticulture enterprises requiring reliable irrigation supplies, reductions in winter rainfall are expected to have a major effect.[37] Growers will have to meet increased water demand with reduced water supply. At the same time the increased summer rains and frequency of major rainfall events are projected to lead to more fungal problems.[38]

However, not all the effects of climate change on growers are negative. Certain crops may benefit from extra atmospheric carbon dioxide.[39] There is also the possibility that increased minimum temperatures and reduced frost frequency may increase the areas suitable for growing produce like avocados and pineapples.[40] This provides an opportunity for producers of crops that are no longer suitable as a result of climate change to transition to new products. For example, sugarcane producers in the Bundaberg area are increasingly moving to growing avocados and macadamia nuts.[41]

Suggested adaptations include:

- improving risk management strategies
- developing new crop varieties and more efficient irrigation technologies
- better regional and basin-wide water planning
- growing frost-sensitive fruit in regions previously considered unsuitable
- plan for long-term shifts in land use, in particular a likely move of horticultural production towards coastal areas.[42]

4 Existing policies and programs in support of agricultural adaptation

4.1 Australian Government

In October 2021 the Australian Government released the *National Climate Resilience and Adaptation Strategy, 2021-2025* (the Strategy).[43] Its objectives are to drive investment and action through

[34] Northern Australia Climate Program, *Impacts and adaptation strategies for a variable and changing climate in the Wide Bay Burnett*, https://www.unisq.edu.au/research/environmental-sciences/qdmc-drought.

[35] Queensland Fruit & Vegetable Growers, public hearing, Brisbane, 11 September 2023, p 31.

[36] Department of Environment and Heritage Protection, *Queensland Climate Adaptation Strategy: Agriculture Sector Adaptation Plan*, 2017, p 8.

[37] B Taylor, 'Horticulture and climate change in the East Coast Cluster: Impacts & Opportunities', CSIRO, May 2015, p 4.

[38] B Taylor, 'Horticulture and climate change', p 4.

[39] B Taylor, 'Horticulture and climate change', p 3.

[40] Northern Australia Climate Program, *Impacts and adaptation strategies for a variable and changing climate in the Wide Bay Burnett*, https://www.unisq.edu.au/research/environmental-sciences/qdmc-drought.

[41] University of Queensland, submission 2, p 2.

[42] Northern Australia Climate Program, *Impacts and adaptation strategies for a variable and changing climate in the Wide Bay Burnett*, https://www.unisq.edu.au/research/environmental-sciences/qdmc-drought.

[43] DAWE, *National Climate Resilience and Adaptation Strategy, 2021-2025*, 2021.

collaboration, improve climate information and services, and assess progress and improve over time. The National Adaptation Policy Office is tasked with implementing the Strategy. The Strategy is focused on supporting Australian farmers, fishers, foresters, and local communities to be active stewards of the environment. Two funding packages are particularly relevant to this aim.

4.1.1 Agriculture and Biodiversity Stewardship Package

Developed in conjunction with the Australian National University, the National Farmers' Federation and Natural Resource Management (NRM) organisations, the Agriculture and Biodiversity Stewardship Package is designed to encourage private investment in biodiversity and sustainability opportunities. A number of pilots have been set up to test mechanisms for rewarding landholders for increasing plantings, supporting biodiversity, and improving existing native vegetation on privately owned land. Locations for these pilots in Queensland include the Burnett Mary region and the Fitzroy Basin.[44]

A National Stewardship Trading Platform has also been created. This online marketplace has been designed to help farmers generate income from selling environmental services. It includes tools to plan environmental projects (such as sequestering carbon) and connect landholders with potential buyers of carbon and biodiversity outcomes.[45]

4.1.2 Future Drought Fund

The Future Drought Fund (FDF) provides $100 million per year for drought resilience measures and supports a variety of programs including: Climate Services for Agriculture (an online climate information platform), Drought Resilience Self-Assessment Tool (combines farmer supplied information with climate projections), Farm Business Resilience (provides advice on resilience measures), and Regional Drought Resilience Planning (supporting community led resilience planning).[46]

There are also a wide range of grants supported by the FDF including grants for innovation, adaption, and support for drought resistant landscapes, soils, and commercialisation initiatives. Additional programs exist to support communities to prepare for droughts.[47]

Funding decisions are guided by the principles of the Drought Resilience Funding Plan and are designed to align with the National Drought Agreement (NDA). Signed between the Australian Government and the states and territories the NDA was designed to align state and federal programs and provide more long-term funding for resilience activities as opposed to support in exceptional circumstances.[48] The NDA was introduced in December 2018 and runs until June 2024.

In June 2023, the Productivity Commission released the finding of its inquiry into the workings of the FDF. This found that the FDF is establishing a solid foundation for building drought resilience but that a stronger focus on activities that generate lasting public benefit was needed.[49] The Productivity Commission also determined that, while drought should remain its focus, the FDF should explicitly recognise climate change resilience to ensure that appropriate programs to address a broad range of

[44] Department of Agriculture, Fisheries and Forestry, *Agriculture Biodiversity Stewardship Package*, 22 May 2023, https://www.agriculture.gov.au/agriculture-land/farm-food-drought/natural-resources/landcare/sustaining-future-australian-farming

[45] National Stewardship Trading Platform, *About*, https://agsteward.com.au/about

[46] Department of Agriculture, Fisheries and Forestry, *Future Drought Fund*, 7 May 2024 https://www.agriculture.gov.au/agriculture-land/farm-food-drought/drought/future-drought-fund

[47] Department of Agriculture, Fisheries and Forestry, *Future Drought Fund*, 7 May 2024 https://www.agriculture.gov.au/agriculture-land/farm-food-drought/drought/future-drought-fund

[48] DAWE, *National Drought Agreement: Annual Report 2020-21*, 2022, p 3.

[49] Productivity Commission, *Overview – Inquiry report – Review of Part 3 of the Future Drought Fund Act*, September 2023, p 6.

climate risks are within its remit.[50] On 7 May 2024, the Prime Minister, Hon Anthony Albanese MP, announced changes to FDF in line with the recommendations of the Productivity Commission and committed to a $519.1 million investment over 8 years into the FDF.[51]

4.2 Queensland Government

The Queensland Government has commissioned a number of reports into climate adaptation in the agriculture sector. For example, *Climate Q* (2009) which reviewed existing climate change strategies and highlighted the need for more research into water management, drought, biosecurity, and the threat of pests to farmers.[52]

More recently the Queensland Government produced its own climate adaptation plan *Pathways to a climate reliant Queensland: Queensland Climate Adaptation Strategy, 2017-30* (2017).[53] This included an agricultural sector plan, the Agriculture Sector Adaptation Plan (Ag SAP). Ag SAP was produced by the Queensland Farmers Federation (QFF) in partnership with AgForce (representing rural producers) and GrowCom (representing fruit, vegetable, and nut growers). The Ag SAP noted existing adaptation processes applied by Queensland farmers while also highlighting:

- the need for climate risk management to be fully incorporated into better management practices
- a lack of awareness among the farming community about existing climate information and tools
- the limited climate information available to support decision making at the farm level
- inadequate availability and affordability of crop insurance products for farmers
- insufficient focus on industry research and development programs on climate risk and adaptation and difficulties in knowledge transfer.[54]

4.2.1 Drought and Climate Adaptation Program

The issues raised in the Ag SAP and the NDA informed the Queensland Government's Drought and Climate Adaptation Program. Announced in 2016 with 5 years of funding from 2017-18, the program brings together academics, government agencies, and peak bodies to produce research and tools designed to aid farmers' decision making about droughts and climate change.[55]

The program has supported a variety of activities, including:

- the Farm Business Resilience Program – supporting farmers to develop their own resilience plan (which is necessary to apply for drought assistance grants and loans)
- the Northern Australian Climate Program – a partnership between the Queensland Government, the Meat and Livestock Australia Donor Company and the University of Southern Queensland to improve forecasting across northern Australia
- GrazingFutures Livestock Business Resilience – a project in partnership with FutureBeef to provide workshops, training, and insights specific to the grazing industry
- the Queensland Drought Mitigation Centre – a program led by the University of Southern Queensland to provide enhanced climate models and seasonal forecasts

[50] Productivity Commission, *Overview – Inquiry report – Review of Part 3 of the Future Drought Fund Act*, September 2023, p 6.

[51] Department of Agriculture, Fisheries and Forestry, *Future Drought Fund*, 7 May 2024, https://www.agriculture.gov.au/agriculture-land/farm-food-drought/drought/future-drought-fund.

[52] Department of Environment and Resource Management, *Climate Q towards a Greener Queensland*, 2009.

[53] L Knudsen and J Muller, *Agriculture Sector Adaptation Plan*, 2017.

[54] L Knudsen and J Muller, *Agriculture Sector Adaptation Plan*, 2017.

[55] Queensland Government, *The Drought and Climate Adaptation Program*, https://www.longpaddock.qld.gov.au/dcap/.

- reports into improving agricultural crop insurance products.[56]

Linked to the Drought and Climate Adaptation Program, the 2021-22 Budget announced that programs that did not encourage preparedness would be phased out and replaced with programs that encouraged resilience,[57] including:

- Farm Business Resilience Program preparedness workshops
- Drought Preparedness Grants of up to $50,000 for on-farm capital investments
- a suite of concessional loans to help producers prepare for, manage and respond to drought.

Critically, access to these new programs is no longer contingent on an area being 'drought declared'.[58]

4.2.2 Other Queensland Government policies and programs that support climate change adaptation and mitigation

The Queensland Government supports agricultural producers to adapt to a changing climate through a range of other policies and programs. These include:

- Land Restoration Fund – funding to support individual carbon farming projects as well as wider research to increase participation and reduce barriers to carbon farming in Queensland
- Queensland Low Emissions Agriculture Roadmap 2022-32 – a pathway to help agribusiness to lower their emissions (developed in partnership with QFF and AgForce Queensland)
- The Long Paddock – a long-running online resource providing climate information to the grazing, cropping and horticulture industry
- Disaster Recovery Funding Arrangements – programs including Disaster Assistance Loans of up to $250,000 to eligible primary producers and freight subsidies of up to $5000
- Queensland Future Climate Science Program – a collaboration between the Department of Environment, Science and Innovation and the University of Queensland to deliver downscaled high-resolution climate projections
- Queensland Biosecurity Strategy – raising awareness about biosecurity risk, threats and opportunities and coordinating state and national programs
- development and completion of a range of water infrastructure projects and the review and publication of new water management plans under the *Water Act 2000*
- provision of research, development and extension activities through Agri-Science Queensland, including collaborations with 175 different organisations in Australia and 31 overseas.[59]

5 Existing and potential future risks of climate change on Queensland's agricultural sector

The former SDRIC's inquiry received 26 submissions and heard from witnesses at a public hearing in Brisbane on 11 September 2023. Many of these submissions related to the impact of climate change on individual commodities and specific local areas. The section below summarises the wider strategic threats and opportunities for the agricultural sector identified by submitters and witnesses.

[56] Queensland Government, *The Drought and Climate Adaptation Program*, https://www.longpaddock.qld.gov.au/dcap/.

[57] DAF, submission 24, p 5.

[58] DAF, submission 24, p 5.

[59] DAF, submission 24, pp 4-9.

5.1 Biosecurity risks

The impact of climate change on biosecurity was frequently referenced by submitters to the inquiry.[60] As the Commonwealth Science and Industrial Research Organisation (CSIRO) explained:

> Pests, weeds, and diseases ("agri-pests") already have a significant impact on Queensland's agriculture (Knudsen and Muller 2017). A changing climate will influence the distribution and behaviour of pests, weeds, and diseases affecting agricultural productivity and sustainability. Increased temperatures and changes in rainfall could have multiple impacts on agri-pests including changing the geographical suitability of both exotic and already established agri-pests as well as changing the population dynamics and size.[61]

The impact of climate driven changes to biosecurity could include reduced productivity, increased cost of disease management, and changes to market access both internationally and regionally. There is also the risk that existing means to manage agri-pests (e.g. sprays) may be less effective at higher temperatures and/or that plants may be less tolerant to these measures.[62] However, the CSIRO also noted that there is the possibility that areas which were once affected by particular agri-pests may no longer be due to climate change.[63]

In addition to the effect of climate change on agricultural production, Safe Food Production Queensland identified increased risks for food distributors and processors. For example, crops and food may become contaminated as a result of flooding, and warmer temperatures may encourage the proliferation of pathogens such as salmonella in food processing facilities.[64]

5.2 Disruption of local, regional and export supply chains

Agricultural producers are often reliant on long and complex supply chains to provide critical inputs for production and to bring goods to market. A number of submitters to the inquiry highlighted ways in which climate change could have a profound impact on these supply chains.[65]

Many of the risks identified by submitters involved the potential for climate change to lead to more natural disasters. For example, the CSIRO highlighted the potential for floods and high rainfall events to impact road and rail infrastructure as well as storage and retail facilities.[66] Disruption to transport infrastructure could impact the delivery of key inputs (e.g. fertilizer) as well as exports.[67]

Other submitters raised the prospect of climate change impacting production of agricultural commodities which are themselves key inputs for others within the agricultural sector. For example, Australian Pork Limited, explained that while the pork industry itself is less directly exposed to climate change risk, it relies on the grains industry for stock feed, which is more likely to be affected by climate change, which will have flow on effects for pig producers.[68] Similarly, the Mackay Conservation Group, noted that for sugarcane, reduced output can affect not only the local sugar supply but also other industries that rely on molasses, a byproduct of sugar production.[69]

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60 See for example, submissions 8, 10, 11, 15, 17, 22, 27, 25.

61 CSIRO, submission 10, p 18.

62 CSIRO, submission 10, p 18.

63 Submission 10, p 18.

64 Safe Food Production Queensland, submission 15, p 2.

65 See for example, submission 1, 3, 10, 17.

66 CSIRO, submission 10, p 19.

67 CSIRO, submission 10, p 19.

68 Australian Pork Limited, submission 17, p 4.

69 MacKay Conservation Group, submission 1, p 4.

Submitters stressed how climate change could have a major impact on food security and food supply. For example, disruption to one industry, such as beef, could potentially have a cascading effect on the supply of other foodstuffs as consumers seek substitutes.[70]

Professor Neal Menzies of Griffith University, explained how Queensland's supply chain infrastructure, such as key roads and silos, may need to be altered to reflect changes to where crops are grown and when they are harvested. As an example, Professor Menzies cited changes to wheat production noting how:

> We will probably see a lot less winter wheat grown in Queensland. We will probably see a lot more summer crops such as sorghum grown. Then we need to start to think about what are the logistics of dealing with that change. At the moment a large portion of our crop is harvested at the end of winter and another portion of our crop is harvested at the end of summer. If you start to see the largest proportion of your crop harvested in one season, then the logistics change…Do we need additional silos? Do we need to schedule additional trains or upgrade roads in order to have more transport taking grain out through a more limited part of the year?[71]

5.3 Changing environmental, social and governance expectations

The desire to reduce greenhouse gas emissions is changing the expectations and demands of consumers, retailers, and regulators in Australia and overseas. Changing environmental, social and governance (ESG) expectations create additional challenges to Queensland producers. As Healthy Land & Water explained in their submission:

> [while] Trading partners and sources of capital and finance are increasingly expecting companies and products to meet global environmental, social and governance principles…ESG guidelines have no national, or global, set of standards and are instead open to interpretation by individual businesses; currently there are more than 30 different industry ESG models operating in Australia.[72]

Queensland Fruit & Vegetable Growers noted that Queensland farmers are often obliged to follow other countries sustainability standards should they wish to export.[73] These rules and requirements may be problematic for Queensland farmers when they do not adequately reflect local conditions. As Australian Pork Limited stated, 'one of the biggest risks is that in the rush to respond to climate change, bigger countries like Europe and the USA dictate the terms that Australia must produce under, without consideration for our unique operating environment'.[74]

Alongside concerns about whether standards set in other nations are relevant to Australian conditions, the question of who in the supply chain pays the cost of ESG measures was raised by Queensland Fruit & Vegetable Growers who told the committee:

> ESG is the world's biggest team sport we are playing at the moment. It is about the links in the supply chain. Our biggest fear is that the grower is always at the bottom. As a primary producer, being primary means one, so we are always at the bottom. Our biggest concern is that, in all of these climate change and emissions, it is really easy to pass it [costs] down and not so easy to pass it [costs] back up.[75]

[70] MacKay Conservation Group, submission 1, p 4; CSIRO, submission 10, p 27; Safe Food Production Queensland, submission 15, pp 2-3.

[71] N Menzies, public briefing, Brisbane, 31 May 2023, p 3.

[72] Healthy Land & Water, submission 8, p 5.

[73] Queensland Fruit & Vegetable Growers, public hearing, Brisbane, 11 September 2023.

[74] Australian Pork Limited, submission 17, p 6.

[75] Queensland Fruit & Vegetable Growers, public hearing, Brisbane, 11 September 2023, p 34.

5.4 Energy transition risks

Linked to risks over changing ESG expectations and costs were concerns raised by some submitters about the way in which the wider energy transition away from fossil fuels might impact agricultural production. Risks identified by witnesses and submitters to the inquiry included:

- competition for land and labour related to renewable energy projects[76]
- potential impact of carbon sequestration schemes on soil productivity[77]
- limits to the availability of land for food production as a result of increased tree planting[78]
- availability and price of key agricultural inputs that continue to be made from fossil fuels, e.g. CO^2 used in abattoirs.[79]

5.5 Impacts on human health and rural and First Nations communities

Other risks identified by submitters included:

- occupational health and safety risks to agriculture workers through exposure to heat and potentially degraded air quality (if higher levels of agro-chemicals are used in response to increased biosecurity risk)[80]
- increased economic precarity for migrant workers who may be impacted by reduced number of workdays caused by unseasonable weather[81]
- impact on native botanicals and bush foods with economic and cultural impacts.[82]

6 Opportunities for the Queensland Government to create and support resilience, adaptation and mitigation measures

Stakeholders consistently stated how agricultural producers are already adapting to climate change and are well placed to continue doing so. As Professor Neal Menzies, Griffith University, stated:

> I have a strong view that the agriculture sector will change in response to climate change, but it is not that they are looking at climate change saying, 'We need to change.' They are changing because at each year, at each increment, they are saying, 'What is the best way that we can run our business?' Climate change will drive change in the agricultural community. They are stunningly good at looking at options and making their businesses efficient and productive. I think we can trust them into the future to remain stunningly good at doing that.[83]

At the same time, witnesses and submitters stressed the danger of maladaptation to climate change. This includes adaptations, such as increasing nitrogen use on soils or more intensive irrigation systems, which while effective, may contribute to worsening climate or environmental outcomes.[84]

The Department of Agriculture and Fisheries (DAF) and other Queensland Government departments were commended by stakeholders for supporting climate adaptation by working with farmers and

[76] University of Queensland, submission 2, p 5; The Next Economy, submission 7, p 3.

[77] B Mackey, public briefing, Brisbane 31 May 2023, p 2.

[78] B Mackey, public briefing, Brisbane 31 May 2023, p 2.

[79] Australian Pork Limited, submission 17, p 6.

[80] The Next Economy, submission 7, pp 3-4.

[81] K Barry, submission 5, p 2.

[82] The Next Economy, submission 7, p 4.

[83] N Menzies, public briefing, Brisbane 31 May 2023, pp 2-3.

[84] University of Queensland, submission 2, p 4; The Next Economy, submission 7, p 3; CSIRO, submission 10, p 32.

local communities and adopting a collaborative approach.[85] Nonetheless, submitters noted a number of areas in which the Queensland Government could support farmers and rural communities to better adapt to climate change.

6.1 Ensuring access to useful resources

A number of stakeholders noted the high-quality resources supported or produced by the Queensland Government.[86] These include the Queensland Agriculture Sector Adaptation Plan, the Low Emissions Agriculture Road Map, The Long Paddock, and the Queensland Alliance for Agriculture and Food Innovation (QAAFI). The QAAFI is a government supported research centre at the University of Queensland which has become the number 2 agricultural research institute in the world.[87]

To continue to improve the quality of information available to researchers and farmers, submitters suggested the following:

- update the Queensland Agriculture Sector Adaptation Plan to account for developments since 2018 and implement the recommendation that subsections within agriculture (e.g. sugarcane, broadacre farming, and grazing) develop individual adaptation plans[88]
- support research to link remote sensing data (e.g. in grain silos) with predictive tools for climate, to support logistics firms better anticipate and respond to demand[89]
- support research to analyse the costs and benefits of shared climate risk management and climate adaptation across the supply chain, analysing questions such as supply chain stability, distribution of profits and losses across partners, and food security[90]
- undertake specific research into climate change and sown pastures and legumes in southern coastal Queensland,[91] soil nutrition,[92] and regenerative farming methods[93]
- ensure researchers continue to engage with other states and federal agencies, such as *Climate Services for Agriculture*, to ensure compatibility and to minimise duplication[94]
- produce a database describing projects undertaken in Queensland to address climate change and climate variability to identify gaps and reduce duplication[95]
- promote and consolidate the variety of data and decision support tools currently available.[96]

Professor Scott Power, University of Southern Queensland, suggested that the Queensland Government support the creation of a major new climate science initiative for the state on a similar model to that adopted by the Victorian Climate Water and Climate Initiative – a partnership between the Victorian Department of Energy, Environment and Climate Action, the Bureau of Meteorology and the CSIRO.[97] This would help to 'improve understanding of the character, cause and predictability of observed multidecadal climate change in Queensland [and] clarify what will happen to climate

85 B Mackey, public briefing, Brisbane 31 May 2023, p 13.

86 S Power, public briefing, Brisbane 31 May 2023, p 5; AgForce Queensland, public hearing, Brisbane, 11 September 2023, p 24; N Menzies, public briefing, Brisbane, 31 May 2023, pp 3, 10.

87 N Menzies, public briefing, Brisbane, 31 May 2023, p 10.

88 S Power, public briefing, Brisbane 31 May 2023, p 5.

89 N Menzies, public briefing, Brisbane, 31 May 2023, p 9.

90 Queensland Fruit & Vegetable Growers, submission 20, p 5.

91 Healthy Land & Water, public hearing, Brisbane, 11 September 2023, p 11.

92 QFF, submission 21, p 12.

93 The Next Economy, public hearing, Brisbane, 11 September 2023, p 16.

94 CSIRO, submission 10, p 22.

95 S Power, public briefing, Brisbane, 31 May 2023, p 6.

96 CSIRO, submission 10, p 20; Queensland Fruity and Vegetable Growers, submission 20, p 4.

97 S Power, public briefing, Brisbane, 31 May 2023, p 14.

variability in Queensland over coming decades'.[98] According to Professor Power, such a project would also help restore Queensland to the position of national leadership on research into agriculture and climate change which it held previously.[99]

6.2 Information dissemination and extension officers

In addition to improving information resources available to farmers, stakeholders consistently highlighted the important role of extension officers in assisting adaptation to climate change. Extension officers advise farmers, agricultural businesses and rural producers on the production, processing and distribution of farm products. In Queensland, extension officers are employed by DAF, Natural Resource Management (NRM) groups, and private companies.

Submitters provided 3 reasons why extension officers play such an important role in aiding farmers to adapt to climate change.

First, while there are tools to help farmers manage seasonal and long-term climate patterns (e.g. The Long Paddock) they often require support for farmers to interpret and apply the data. For example, CSIRO explained that 'adoption is not a simple 'roll out' of technology, but a more complicated interplay of farmers/technology/advisors over time and in different forums (industry groups, one-on-one, on farm demonstrations)'.[100] Second, as AgForce Queensland explained, farmers are busy - 'in agriculture you are the CEO and you end up being the help desk on everything from IT to biosecurity and managing the plant in between' - and as such cannot always devote the time needed to research what are often complex products and solutions.[101] Finally, there is an issue of culture and risk. As Farmers for Climate Action noted at the public hearing:

> One thing I will say as a grazier farmer is that in our industry we are all very conservative. We like to watch and make sure things are working before we take the leap. I think a big part of extension is picking the early innovators and making champions out of them, showing the greater grazing community and agriculture community that it does work. Once it is seen that it is working, people will then jump in.[102]

As a result, as AgForce described, work undertaken by extension officers such as organising farm walks and information sessions is necessary to expand the reach of adaptive solutions from the 20 per cent of farmers who are 'out there innovating and well ahead of the game' to the farmers that remain.[103] Healthy Land & Water, the NRM group responsible for South East Queensland, provided evidence of this extension work in action. Ninety-six per cent of the landholders who attended their Climate Adaptation workshops identified climate adaptation strategies they might implement and 91 per cent indicated that their participation had led to increased resilience of their enterprise and natural assets to deal with climate change.[104] Healthy Land & Water also explained that the demand for extension services was growing constantly because of the rapid rate at which agricultural properties were changing hands, and the changing demographics of the agricultural industry. [105]

Submitters made a number of suggestions for how the Queensland Government could better support the work of extension officers. These included:

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98 UniSQ Centre for Apply Climate Sciences, *Climate change adaptation to support agriculture in Queensland, Technical Report No. 1*, June 2023.

99 S Power, public briefing, Brisbane, 31 May 2023, p 6.

100 CSIRO, submission 10, p 25.

101 AgForce Queensland, public briefing, Brisbane, 11 September 2023, p 23

102 Farmers for Climate Action, public briefing, Brisbane, 11 September 2023, p 18.

103 AgForce Queensland, public briefing, Brisbane, 11 September 2023, p 24.

104 Healthy Land & Water, submission 8, p 6.

105 Healthy Land & Water, public briefing, Brisbane, 11 September 2023, p 12.

- investment in DAF extension officers to increase professional capacity in agricultural science and its relationship to climate change[106]
- recruiting more staff with soil conservation and management skills – which is especially important as industry extension support is often geared towards the sale of chemicals[107]
- longer-term funding for extension officers through NRM organisations to allow them to build up relationships with farmers[108]
- more work to inform landholders about available tools and incentives, such as the Renewable Energy Toolkit developed by the QFF and the Queensland Department of Energy and Public Works[109]
- greater collaboration with regional NRM and industry extension and adaption staff to enable experienced and local trusted advisors to be directly involved in the delivery of Queensland Government programs[110]
- more integration between Queensland Government programs and policies – e.g. ensuring funding packages, such as the Natural Resources Recovery Program, are integrated with water and land use planning decisions[111]
- funding support for peer-to-peer learning, such as the Climate Mate program organised via the Northern Australia Climate Program.[112]

6.3 Insurance

Several submitters referenced the role that adequate and affordable insurance products could play in helping farmers adapt to climate change and the way the Queensland Government could support this.[113]

Willis Towers Watson explained that at present the overwhelming majority of Queensland farmers remain uninsured and are heavily exposed to climate risk (e.g. weather volatility and natural disasters) as the traditional insurance product – known as multi-peril crop insurance (MPCI) – is considered prohibitively expensive. Instead, farmers often rely on disaster grants and loans provided by the Queensland and Commonwealth Governments. This has the effect of crowding out the private insurance sector as well as placing a considerable burden on the taxpayer.[114]

An alternative to MPCI is known as parametric or weather index insurance (WII). Instead of paying out only after a loss, WII policies focus on key weather risks of concern (e.g. drought, excess rainfall) and can be more affordable and settle simply and promptly based on weather data.[115] For example, a vegetable grower might take out a WII policy against the risk of excess heat; irrespective of loss to his/her crop the WII policy would payout if the temperature in the growers' local area went above a certain level (as observed by independent weather stations/satellite data).

[106] P Grace, submission 18, p 3; S Power, public briefing, Brisbane, 31 May 2023, p 67.

[107] Healthy Land & Water, submission 8, p 6; P Grace, submission 18, p 2

[108] Healthy Land & Water, public briefing, Brisbane, 11 September 2023, p 9.

[109] Farmers for Climate Action, submission 9, p 4.

[110] Healthy Land & Water, submission 8, p 6.

[111] Healthy Land & Water, submission 8, pp 6-7.

[112] B Mackey, public briefing, Brisbane, 31 May 2023, p 15.

[113] QFF, submission 21, p 12; Healthy Land & Water, submission 8, p 5; AgForce Queensland, submission 11, p 7.

[114] Willis Towers Watson, submission 2, p 2.

[115] Willis Towers Watson, submission 2, p 2.

While WII insurance has been used quite extensively overseas, including in the USA, its uptake in Australia has been relatively limited.[116] Willis Towers Watson, the University of Southern Queensland, the QFF and CSIRO are engaged in ongoing research to support its development.[117]

To support the uptake of WII, submitters to the inquiry suggested that the Queensland Government:

- support the development of alternatives to MPCI through investment in research and development and capacity building[118]
- invest in data and weather station infrastructure critical to the development of WII insurance products, such as on farm weather stations
- collaborate with insurance companies to organise workshops to help improve farmers' awareness of WII[119]
- provide the initial capital to support a Discretionary Mutual Fund to provide farmers with lower cost crop insurance[120]
- consider partial subsidies or tax concessions for insurance products that can lower the need for Extraordinary Disaster Assistance Recovery Grants.[121]

6.4 Infrastructure to support adaptation

In its submission to the inquiry the CSIRO stated that:

> To date, considerable adaptation work has occurred at the farm level. Less common, but equally essential adaption processes, are needed at the regional, industry and whole of supply-chain level with adjustments needed to be made across processing, transport and marketing.[122]

In line with this, submitters and witnesses proposed a range of measures broadly related to infrastructure that the Queensland Government might undertake to better support adaptation. These included:

- transport infrastructure – reviewing existing physical transport infrastructure (e.g. location and quality of roads and silos) to ensure that it is fit for purpose in light of climate driven changes to cropping and harvesting patterns[123]
- biosecurity infrastructure – reopening of regional laboratories and investment in data systems to support sharing across human, agricultural, environmental, and marine health sectors to identify and manage emerging biosecurity risks[124]
- water infrastructure – repairing dams and removing irrigation bottlenecks as well as a wider review of Queensland's approach to water storage[125]
- critical national infrastructure – support for domestic production of key agricultural inputs (e.g. fertilizer).[126]

[116] Willis Towers Watson, public hearing, Brisbane, 11 September 2023, p 2.

[117] Willis Towers Watson, submission 2, p 2.

[118] Willis Towers Watson, submission 2, p 3.

[119] University of Southern Queensland – Business School, submission 4, p 3.

[120] Willis Towers Watson, submission 2, p 3.

[121] Queensland Fruit & Vegetable Growers, submission 20, p 5; Willis Towers Watson, submission 2, p 3.

[122] CSIRO, submission 10, p 24.

[123] N Menzies, public briefing, Brisbane, 31 May 2023, p 3.

[124] QFF, submission 21, p 7; CSIRO, submission 10, p 27.

[125] Bundaberg Ag-Food & Fibre Alliance, submission 21, p 4; QFF, submission 21, p 8.

[126] QFF, submission 22, p 6.

6.5 Direct support and incentives for agricultural producers

Healthy Land & Water submitted that 'change is expensive and agricultural businesses may need assistance to transition, diversify or adapt to meet environmental credentials'.[127] This was a position which was shared by a number of submitters to the inquiry who suggested, in particular, that more grants and incentives be offered to farmers and grazers to adopt low emissions technology.[128]

At the same time, AgForce Queensland, sought to emphasize that farmers did not want 'handouts' or 'social security' and that investment should be based on helping to make farmers more 'self-reliant'.[129] Examples of this included the proposal by the CSIRO that support be given to upskill farmers and/or attract skilled workers to make best use of improvements in agricultural technology.[130]

In relation to existing funding packages and schemes, submitters made the following suggestions that:

- the Farm Business Resilience Program be expanded to include a specific climate adaptation focus – as has been indicated will be the case following the Prime Minister's announcement on the FDF[131]
- the Queensland Rural and Industry Development Authority support following disasters be broadened to provide more support for farmers who have diversified and now have significant off-farm income (as in the case of the new Rural Landholder Recovery Grant Scheme)[132]
- horticulturalists receive drought relief funding for seedling/new tree stock as well as land preparation (to deliver consistency between how horticulturists and graziers are treated in regard to drought funding).[133]

6.6 Harmonising policies

Submitters emphasised the importance of a consistent and harmonized regulatory environment so that farmers are able to make long-term investment decisions.[134] This is because, as AgForce Queensland explained, 'investment pathways for us are often 20 or 30 years—there are multigenerational businesses—but if the regulation keeps changing then it is very difficult to continue to develop your business in the way that you originally planned'.[135]

To that end, stakeholders made the following recommendations:

- renewable energy – delivering benefits between the agriculture and renewable energy sectors, such as ensuring that transport designed for renewables has a legacy application for agriculture and that rural communities benefit directly from transmissions projects.[136] AgForce Queensland also stressed the importance of preserving prime agricultural land in the face of pressures from renewable energy projects, while Australian Pork Limited argued that older low emissions

[127] Healthy Land & Water, submission 8, p 7.

[128] AgForce Queensland, public briefing, Brisbane, 11 September 2023, p 24; The Next Economy, submission 7, p 7; JCU Agriculture Technology and Adoption Centre, submission 12, p 4; Troy and Lisa Jensen, submission 13, p 1.

[129] AgForce Queensland, submission 11, p 6.

[130] CSIRO, submission 10, p 18; JCU Agriculture Technology and Adoption Centre, submission 12, p 4.

[131] Queensland Fruit & Vegetable Growers, submission 20, p 5.

[132] Healthy Land & Water, *Response to questions taken on notice at the hearing on 11 September 2023*, 15 September 2023, pp 1-2.

[133] Queensland Fruit & Vegetable Growers, public hearing, Brisbane, 11 September 2023, p 33.

[134] Australian Pork Limited, submission 17, 7; AgForce, public hearing, Brisbane, 11 September 2023, p 23.

[135] AgForce Queensland, public briefing, Brisbane, 11 September 2023, p 23.

[136] AgForce Queensland, public briefing, Brisbane, 11 September 2023, p 27; Farmers for Climate Action, submission 9, p 3.

technology (e.g. anerobic digesters to produce bio-gas) receive similar treatment to new and emerging technology.[137]

- carbon farming – ensuring that that carbon accounting standards are comparable for Australian and overseas schemes[138]
- land use – ensuring that future land use planning takes into account climate trends to protect to protect the best agricultural land in the higher rainfall regions from fragmentation and to prevent the breakup of larger farms into smaller ones[139]
- vegetation management – continued work to harmonise the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) and the *Vegetation Management Act 1999*[140]
- Indigenous policy – development of policy that impacts upon Indigenous peoples be based on the principle of Free Prior and Informed Consent, empowering Aboriginal and Torres Strait Islander peoples to play a primary role in adapting to and mitigating climate change.[141]

Committee comment

Evidence before the committee demonstrates the resilience of Queensland farmers who continue to adapt to climate change. This is supported by Queensland Government efforts to support leading research into climate change and agriculture through initiatives such as QAAFI, and providing farmers with useful resources to interpret and apply research findings.

It is clear that stakeholders within the agricultural supply chain must remain responsive to the challenges posed by climate change. With insufficient adaptation, the risks facing Queensland agricultural producers may have broader impacts on Queensland's food security. The committee notes that while adaptations have been successful, stakeholders must also work collaboratively to ensure that any future solutions to climate related changes do not have adverse effects on the environment.

The committee thanks stakeholders to the inquiry for their recommendations about how the Queensland Government can better support agricultural producers to adapt to the challenges of climate change. While Queensland has high-quality information resources for climate change and adaptation by the sector, it is essential that these are continually updated. It is also clear that extension officers play a pivotal role in supporting farmers to implement solutions to climate related changes, and that the government must ensure these officers are appropriately trained and resourced to assist farmers. Evidence also highlights the need to ensure the consistency of the regulatory environment to support farmers in making long-term investment decisions.

Thanks also to the former SDRIC for its work on this inquiry and to submitters and participants of that committee's public briefings and public hearings.

[137] AgForce Queensland, submission 11, p 5.

[138] Farmers for Climate Action, public briefing, Brisbane, 11 September 2023, p 18.

[139] Healthy Land and Water, submission 8, p 8.

[140] AgForce Queensland, public briefing, Brisbane, 11 September 2023, p 23.

[141] Cape York Institute, submission 23, p 7.

Appendix A – Site visits, briefings and hearings held by the former State and Development and Regional Industries Committee

Most of the former SDRIC's engagements for the inquiry consisted of private briefings and site visits in 2023:

- Private briefing with the Australian Bureau of Agricultural and Resource Economics and Sciences on 21 March
- Private briefing and site visit at Queensland University of Technology on 21 March
- Site visit to the Redlands and Queensland Crop Development Facility on 22 March
- Site visit with Yirriganydji Land and Sea Rangers to the Jack Barnes Bicentennial Mangrove Boardwalk on 12 May
- Private briefing and site visit at the Cairns Institute/James Cook University on 12 May
- Private briefing and site visit at the University of Queensland on 31 May
- Private briefing from Bureau of Meteorology on 1 June
- Private briefing from National Farmers' Federation, Australian Pork, and Agricultural Innovation Australia on 1 June
- Private briefing from CSIRO on 1 June.

The former SDRIC also held three public proceedings in 2023:

- Public briefing on 31 May with the following witnesses –

  Griffith University
  - Professor Brendan Mackey
  - Professor Neal Menzies

  University of Southern Queensland
  - Professor Scott Power, Centre for Applied Science
  - Russell Mehmet

- Public briefing on 10 July with the following witnesses –

  Department of Agriculture and Fisheries
  - Elton Miller, Acting Deputy Director-General, Agriculture
  - Dr Rachel Chay, Chief Biosecurity Officer, Biosecurity Queensland
  - Dr Wayne Hall, Executive Director, Agri-Science Queensland
  - Lynne Turner, General Manager, Horticulture and Forestry Science

  Department of Environment and Science
  - Alex Graham, Executive Director, Landscapes, Water and Natural Capital
  - Gobind Kalsi, Director, Climate Change Strategy and Accountability, Climate Action and Sustainable Planning, Environment and Heritage Policy and Programs, Environment and Heritage Policy and Programs
  - David Putland, Principal Scientist, Climate, Biodiversity and Information, Science

- Public hearing on 11 September with the following witnesses –

  Willis Towers Watson
  - Russell Mehmet, Account Director - Risk and Broking

  Healthy Land & Water Queensland
  - Stephen Robertson, Chairman
  - Julie McLellan, Chief Executive Officer
  - Bruce Lord, Principal Scientist, Sustainable Agriculture

The Next Economy

- Jacqui Bell, Program Director - Land Sector, Resilience and Adaption

Farmers for Climate Action

- Georgia Webster, Interim Chief Executive Officer and General Manager
- Angus Emmott, Queensland Representative

AgForce Queensland

- Georgie Somerset, General President, AgForce Queensland Board
- Michael Guerin, Chief Executive Officer
- Sam Forzisi, Policy Director

Australian Pork Limited

- Margo Andrae, Chief Executive Officer
- Tanya Pittard, General Manager, Policy and Industry Relations

Queensland Fruit & Vegetable Growers

- Rachel Chambers, Chief Executive Officer

Appendix B – Submitters to former State Development and Regional Industries Committee inquiry

Sub #	Submitter
1	Mackay Conservation Group
2	Willis Towers Watson (WTW)
3	The University of Queensland
4	University of Southern Queensland, School of Business
5	Dr Kaya Barry
6	Nicola Thomas
7	The Next Economy
8	Healthy Land & Water
9	Farmers for Climate Action
10	CSIRO
11	AgForce Queensland
12	JCU Agriculture Technology and Adoption Centre
13	Troy and Lisa Jensen
14	University of the Sunshine Coast
15	Safe Food Production Queensland
16	University of Southern Queensland, Research & Innovation
17	Australian Pork Limited and Pork Queensland Inc.
18	Professor Peter Grace
19	Wilderness Society
20	Queensland Fruit and Vegetable Growers
21	Bundaberg Ag-Food & Fibre Alliance
22	Queensland Farmers' Federation
23	Cape York Institute
24	Department of Agriculture and Fisheries on behalf of the Queensland Government
25	AgriFutures Australia
26	Confidential