How can Australia's agriculture sector realise opportunity in a low emissions future?

Farmers for Climate Action

13 September 2021

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Foreword

Climate change is affecting Australia's environment, industries, and communities. The transition to a low emissions global economy presents a range of opportunities to the Australian agricultural sector, where acting early could provide greater competitive advantage for our regional and rural communities.

As stewards of most of Australia's land, farmers play a unique role in the national transition to a low-carbon economy. At the same time, they are the businesspeople most affected by climate change and our potential failure to decrease emissions rapidly.

While the sector will likely continue to produce greenhouse gas emissions in providing high-quality food, fibre and materials to the world, efficient production and effective use of land will allow the sector to act as a key pillar of Australia's decarbonisation pathway. Indeed, it can generate significant additional income through generating valuable carbon credits by storing carbon in soils, vegetation and harnessing traditional burning techniques.

This report outlines a number of technologies, practices and actions that easily reduce greenhouse gas emissions. Taken together, they suggest the Australian agriculture sector could play a significant role in pioneering global climate solutions, and take advantage of future opportunities to increase value and diversify on-farm revenue streams.

The actions outlined in this report build on recent momentum in reducing emissions in the sector while remaining resilient through extreme weather events, fire and droughts. The costs of their development and implementation can be met by sector innovation, peak bodies' support and the establishment of markets and revenue streams for Australia's farmers to meet the demand for climate action across the supply chain.

The Australian Government has a broad portfolio of initiatives related to climate change. This includes the Carbon Farming Initiative (known as the Climate Solutions Fund) and a world first Agriculture Stewardship Package. With further enhancement, it could be well positioned to assist the sector to decouple economic growth from greenhouse gas emissions and take action to build upon its inherent strengths.

In fact, this report notes most of the tools required to achieve a net zero position already exist and require scale through directed support.

As access to international markets begins to be governed both by price and emissions intensity, now is the time for the Australian Government to support the sector's research, development and implementation of next-generation farming practices and technologies.

Increasing demand for our agricultural production across Asian and European markets has been coupled with strong demand for transparency through labelling, branding and disclosure for food that is produced locally, sustainably and ethically. Momentum for the next phase of Australian agriculture can be rallied through strong national policy and targeted investment.

Elizabeth Rose
Partner, Climate Change and Sustainability Services
Brisbane

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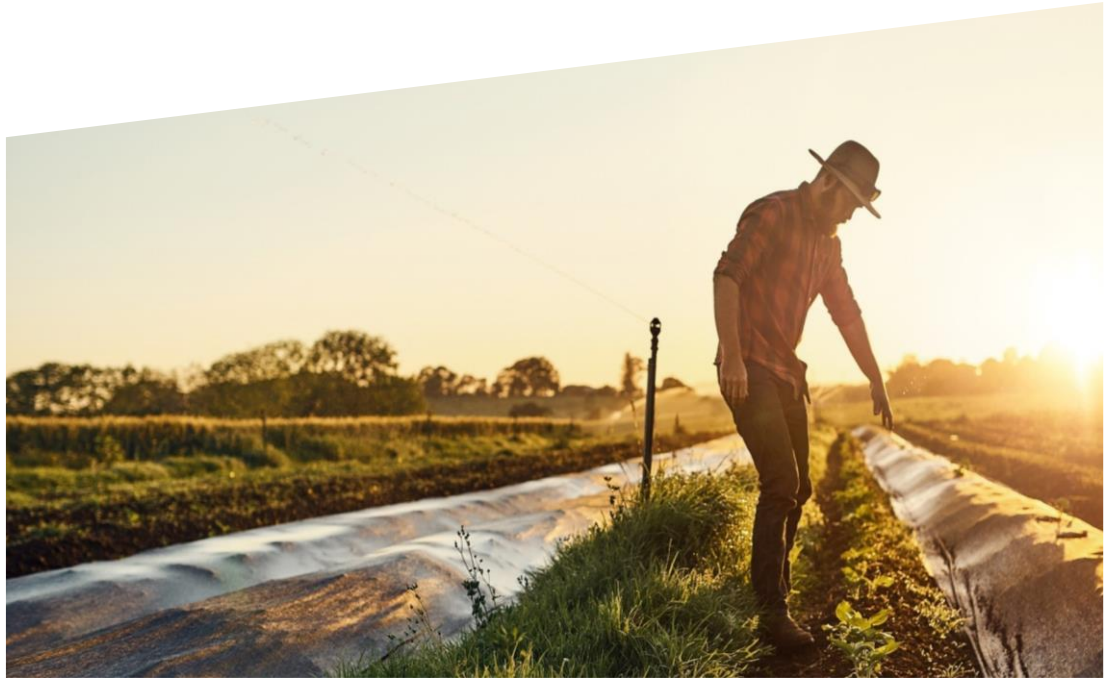


1 Executive Summary

An achievable pathway to a low emissions future

Through the deliberate and coordinated application of high-impact carbon abatement initiatives, we have modelled a pathway to mitigate on-farm emissions from Australian agriculture.

The pathway has been developed to offer an informed, impartial and pragmatic reduction that incorporates differing views and appetites across the sector's stakeholders.

Importantly, it is not the only pathway to abate emissions from the agriculture sector. It charts a conservative approach based on adoption rates, abatement costs, and technological availability without reducing aggregate herd size.

More ambitious pathways are possible, with increased support and benefit. Similarly, the list of included initiatives is not exhaustive. The model excludes emerging solutions, which may be effective with the correct support. Differing combinations of abatement options and uptake may produce different trajectories, magnifying benefit.

Instead, the pathway presented here reflects our understanding of material and sector-acknowledged initiatives that can be practically supported by decision makers.

The pathway is built from the 'ground up' based on government data, best-available literature, and our modelling experience paired with comprehensive stakeholder consultation - including farmers, sector peak bodies and academics.

The pathway modelled is bound by trajectories that are likely to limit global warming to 1.5ºC and 2ºC by 2100 and would see agriculture reach the equivalent of net zero emissions by 2040.*

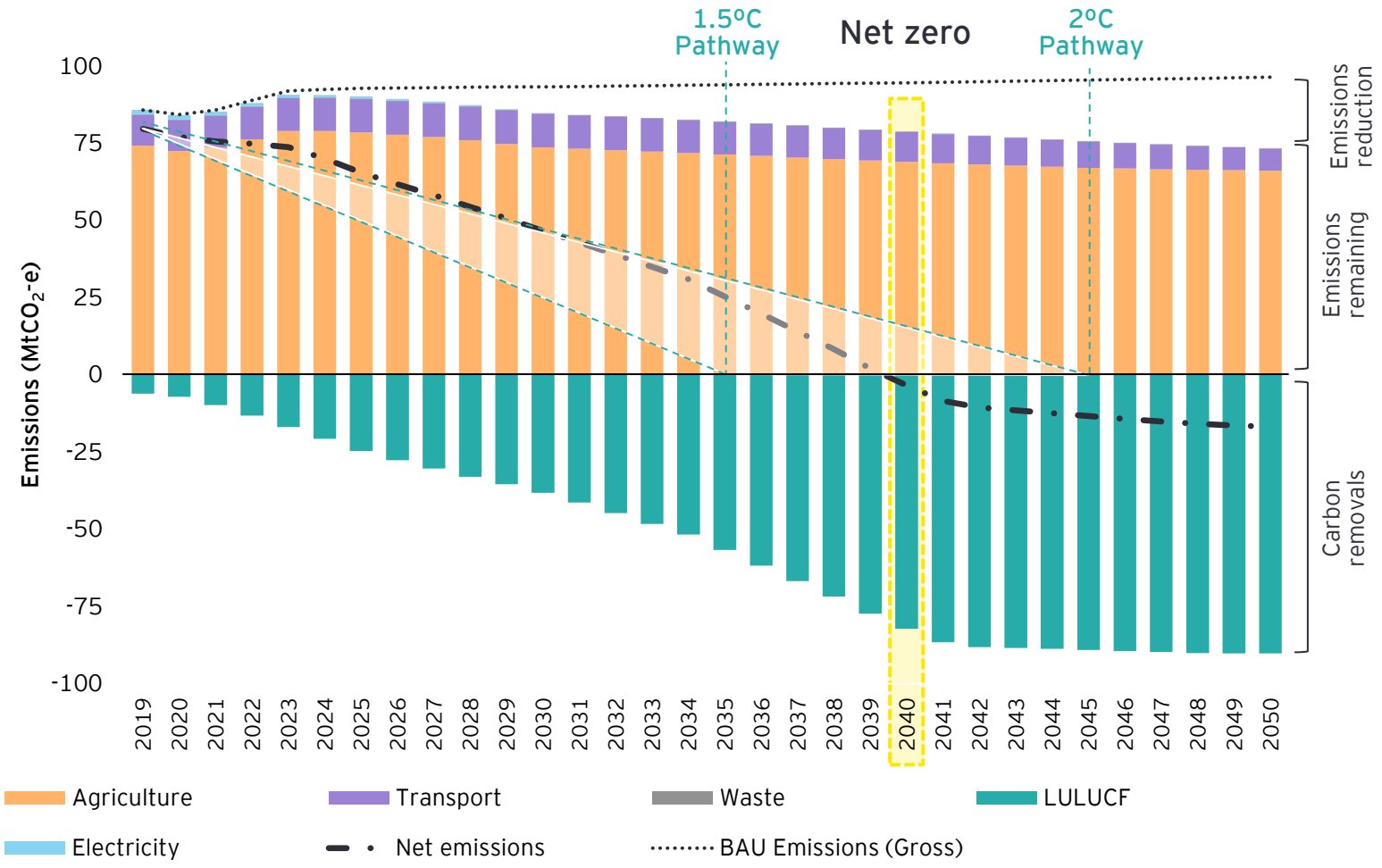


Fig 1. Modelled reduction in Australian agriculture emissions from 2019 to 2050

** 1.5ºC and 2ºC pathways are simplified trajectories based on Australia's agriculture sector's proportional share of emissions reductions to tackle climate change, taking into account GDP and greenhouse gas emissions by country and sector. The purpose of these trajectories is to provide a reference point against the agriculture's net zero pathway and its alignment to limiting global warming by the end of the century.*

Facilitating Australian farmers to build the industry for the future

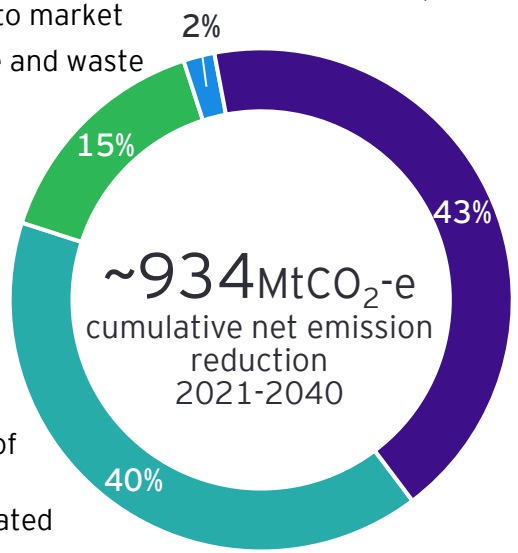
Emissions reduction from on-farm technologies and practices

Methane reduction

- Feed supplements and forages
- Selective breeding
- Vaccination
- Reduced time to market
- Biogas capture and waste management

Transport and electricity

- Transition to electric vehicles on farm
- Adoption of renewable energy on farm



Improved land management

- Cropland carbon sequestration
- Degraded farmland restoration
- Improved pasture management
- Improved grassland management
- Savanna burning
- Stabilised fertilisers

Land use change

- Reforestation of marginal land
- Develop integrated shelterbelts

Income from carbon-related projects[5]	Supporting regional jobs[5]
$34.4bn - $43bn by 2040. Assuming average price of $40 - $50/tonne of carbon dioxide equivalent (tCO_2-e)	**23,350 – 46,700 supported jobs by 2040.** 25 – 50 estimated supported jobs per million tonne of carbon dioxide equivalent ($MtCO_2$-e) abated[3]

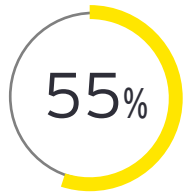
Fig 2. Modelled emission reduction in Australian agriculture from 2019 to 2050. Income calculated using actions in line with current Emissions Reduction Fund requirements.

The Australian agricultural sector fundamentally supports the lives of Australians and our export partners across the globe by producing essential food, fibre and materials.

As a net exporter, the $67 billion-a-year agriculture sector serves as a cornerstone of Australia's economy. It accounts for approximately 1.9% of Australia's value-added GDP and 2.6% of employment in 2019-20[1] with a $100 billion-a-year aspiration by 2030.

> As stewards of the land, farmers play a key role in helping Australia achieve its emissions reduction goals.

Australian agriculture constitutes:



of Australia's land use[1]

of Australia's total emissions[2]

The value of scarce natural resources and high-quality biodiverse land is becoming more recognised in the world's economic system with natural capital being valued and generating income streams. This presents increasing opportunities for farmers to diversify and grow their income from the land through mechanisms such as carbon farming and associated co-benefits.

The actions outlined in this report provide opportunities for farmers to grow their enterprises while helping Australia's fight against climate change by incentivising improvements to the quality and abundance of natural resources.

1 Department of Agriculture, Waster and the Environment (2021) Snapshot of Australian Agriculture 2021. These figures include Fisheries and Forestry which constitute approximately 8% of the overall value.
2 EY modelling using Department of Industry, Science, Energy and Resources (2021) National Inventory Report.
3 Assumption based on Carbon Farming Industry Roadmap by the Carbon Market Institute
4 Australian Bureau of Statistics, Labour Force, Australia, 2019-20
5 Estimated income from carbon-related projects and supported jobs are based on $MtCO_2$-e abated in line with existing methodologies under the Emission Reduction Fund (i.e. 861 $MtCO_2$-e)

How can the Federal government support regional Australia?

Achieving a low emission future, while protecting and enhancing the benefits that the agriculture sector provides, will require a coordinated effort and will ultimately foster the next generation of farmers delivering jobs and economic growth.

Coordinate efforts

Strong leadership, cohesion and coordination across the agriculture sector is crucial for capitalising low emissions opportunities

This includes:

- Guidance to **ensure robust standards and practices are transparent** and fair
- Establishing partnerships across the sector to **accelerate knowledge sharing** and outcomes
- **Cohesion across different industry bodies**, geographies and commodities to align on shared goals
- **Identifying synergies and co-benefits** that exist across the sector
- **Investing in infrastructure** that is core to successful implementation of low emission actions and technologies, such as nation-wide spatial data and the development of next-generation food supplement delivery processes
- **Sharing of cross sectoral knowledge** to generate system wide benefits.

Expand the market

Use the economic system to incentivise and reward actions that reduce emissions while creating jobs and economic growth

This includes:

- **Continuing to develop Emission Reduction Fund (ERF) methodologies** by ensuring affordable implementation and ease of measurement
- **Enable 'method stacking' of ERF methods** on the same farm to deliver synergies in carbon project development and provide an additional revenue stream to farmers
- **Establishing a platform to ensure ease of transaction** and transparent carbon pricing that can be readily linked to international markets
- Ensure the market rewards good management (both historical and future) to **provide an incentive for landowners to embark on these changes**
- Encourage a differentiated market and **provide a premium for projects that achieve additional biodiversity or social co-benefits**.

Invest in innovation

Foster innovation through targeted investment to accelerate the uptake of low emission technologies and practices

This includes:

- **Investing in research and development** to advance emerging solutions and to foster novel climate-sensitive solutions
- **Working with industry** to identify and support leading technologies and practices implemented globally and at home
- **Providing financial incentives for farmers and communities** investing in leading technologies or efficient farm practices
- **Building capability and skills** to assist with on-farm adoption, extension and capacity building
- **Providing landholders and businesses the right information at the right time** about technologies and practices that will deliver the dual benefits of increased productivity and emissions reduction.

Purpose and Context

Purpose of this report

This report outlines pragmatic actions for the Australian agriculture sector to thrive in a low emissions future in line with international expectations of Australia's commitments.

In preparation for the forthcoming UNFCCC Glasgow Climate Change Conference this November, Farmers for Climate Action (FCA) engaged Ernst and Young (EY) to develop a low emissions pathway that could attract broad industry support. FCA plans to use this analysis to show how agriculture can benefit from Australia's whole-of-economy shift towards decarbonisation.

This report provides the strategic vision, potential emission reduction pathway and key economic opportunities for the agriculture sector to support Australia in changing its emissions trajectory. EY undertook a two-pronged approach to build a quantitative model for estimating a balanced emission reduction pathway; a top-down and bottom-up approach based on government and proprietary data sources. Key assumptions and limitations were tested with key sector stakeholders.

This report underpins the key actions for Australian agriculture related to technology, best practices, policy levers and market-based approaches for a successful pathway towards a low emissions economy.

Definition of agriculture for the purposes of the report

The term 'agriculture' is used broadly to refer to both the growing and cultivation of horticultural and other crops (excluding forestry), and the controlled breeding, raising, or farming of animals.

This excludes:

- Aquacultural activities include the controlled breeding, raising or farming of fish, molluscs and crustaceans.
- Forestry and logging activities include growing, maintaining and harvesting forests, as well as gathering forest products.
- Processing/Non-production processes, e.g. abattoirs, dairy refrigeration, freight of goods unless conducted on-site.

The Australian and New Zealand Standard Industrial Classification (ANZSIC), 2006

Benefits across industry

Transitioning the agriculture sector to low emissions has compounding benefits with the potential to unlock additional revenue streams and enhance synergies within agricultural businesses.

Income diversification

The value of Australia's scarce natural resources and high-quality biodiverse land is increasingly recognised as the world's economic system values and brings natural capital onto balance sheets. This will present opportunities for Australian farmers to diversify the incomes they derive from their land through the generation of **Australian Carbon Credit Units (ACCUs) and similar assets.** Other opportunities include using land assets to generate **renewable energy** through wind, solar and hydro electricity.

Not only does this provide the opportunity for farmers to remain resilient in times of drought, it helps with the overall fight against climate change by incentivising improvements in the quality and abundance of natural resources and the availability of renewable energy across the country.

Productivity and market access

A shift to low emissions agriculture will be reliant on next-generation land management practices and will result in healthier ecosystems. Importantly, these practices will sustain high quality and increased agriculture production and **build long-term value across the agricultural supply chain**.

Many of the actions modelled in this report either directly or indirectly enhance quality and quantity of produce with associated financial returns, biodiversity outcomes and grow employment across our regions.

The production and labelling of low emissions meat and grain production will **guarantee access to increasingly demanding international markets and help to differentiate Australian produce**.

Long-term regional resilience

As Australia transitions to a low carbon future, **emerging risks and opportunities will impact sectors to differing extents**. Regional communities are commonly reliant on agriculture as a sector and will be disproportionately vulnerable to the changes that occur as a result of future market forces and international regulatory frameworks.

Investing in our remote and rural communities will improve employment outcomes and allow our farms to be handed to the next generation in better shape than they were found.

The carbon abatement actions that have been modelled in this report and in the **Maranoa Case Study** demonstrate that setting a pathway towards a low emissions future presents opportunities that will drive prosperity in our regional areas.

This results in compounding benefits for farmers and regional areas, particularly those who may be feeling the squeeze of diminishing productivity due to climate risks such as drought and flood, risks that will increase in coming decades.

“Pre-emptive action has a price, yet the cost of inaction will be greater.

Elizabeth Rose

Partner, Climate Change and Sustainability Services

Agriculture's national contribution

Agriculture is an integral element of the Australian economy

The Australian agricultural sector fundamentally supports the lives of Australians and our export partners across the globe by producing essential food, fibre, and materials.

As a net exporter, the $67 billion-a-year agriculture sector[5] serves as a cornerstone of Australia's economy. The sector continues to grow, with production accounting for approximately 1.9% of Australia's value-added GDP and 2.6% of employment (~320,000) in 2020.

It is also a significant source of our national emissions profile and climate risks

The agriculture sector accounted for nearly 15% of emissions in Australia's National Greenhouse Gas Inventory in the year to December 2020. This equates to 72.9 million tonnes of carbon dioxide equivalent ($MtCO_2$-e) emitted from the sector[6].

Greenhouse gas emissions from agriculture include methane, nitrous oxide and carbon dioxide. Methane emissions from livestock constitute the highest source of emissions. At the same time, our agricultural regions are disproportionally impacted by climate risks.

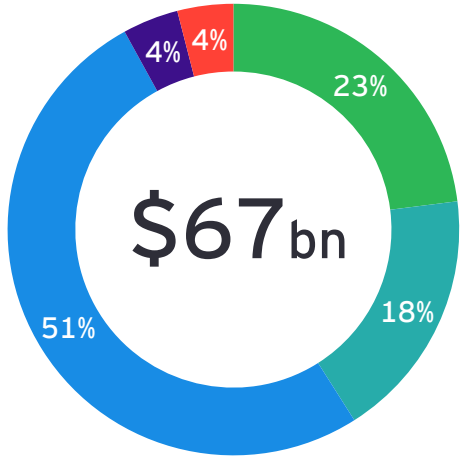


Fig 3. Agriculture, fisheries and forestry value of production, by commodity, 2019–20s

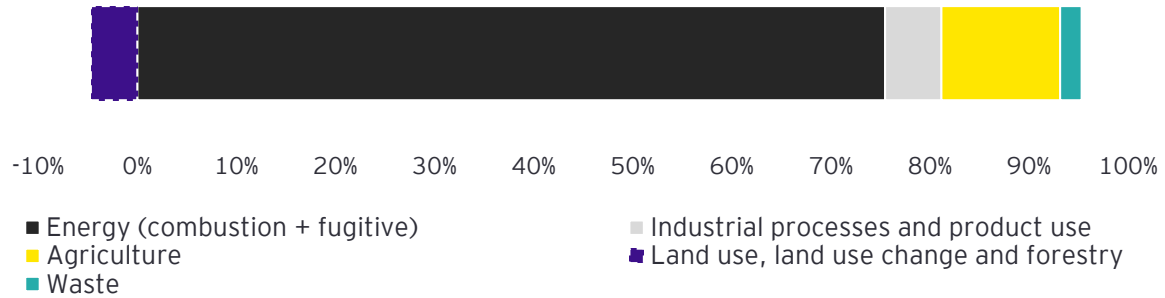


Fig 4. Net greenhouse gas emissions by sector in 2019, Australia ($MtCO_2$-e) [UNFCCC 2021]

[5] Department of Agriculture, Waster and the Environment (2021) Snapshot of Australian Agriculture 2021. These figures include Fisheries and Forestry which constitute approximately 8% of the overall value.
[6] EY modelling using Department of Industry, Science, Energy and Resources (2021) National Inventory Report.

Australian exports may face tariffs from international markets due to decisions made at home

The carbon market in Australia is largely voluntary and driven by the Emissions Reduction Fund. This contrasts with many other countries who have formal and mandated carbon trading schemes.

Australia's voluntary carbon market price has been growing steadily over previous quarters with an auction price of $16 and a spot price of $23 (August 2021[7]). The model that informs the pathway outlined in this report does not incorporate a mandated carbon price, however it is anticipated that the increasing demand for carbon credit units alongside the increasing interest in monetising associated co-benefits (environmental, social or cultural) would accelerate this pathway to a low emissions economy.

Climate change mitigation requires a coordinated global effort. Australia's key trading partners are applying mounting pressure on the Australian Federal Government to play a role in encouraging innovation and driving ambitious climate action.

The European Union has announced the introduction of a Carbon Border Adjustment Mechanism (CBAM) as part of the Green Deal, which imposes additional costs on trades that carry a high carbon footprint and will be active from 2023. It will likely result in Australia paying more to export goods to the EU compared to countries with more adequate climate policies[8]. The initial list of commodities includes iron, steel, aluminium, fertilisers and electricity. The carbon tariff does not currently extend to agriculture; however the agriculture sector should be prepared for the risk that agricultural products are captured under the CBAM. Further action is expected following the recent release of the European Environmental Bureau's net zero agriculture modelling[9].

Despite conflicting views, other importers around the world may impose similar policies in the coming years. Seventy percent of agricultural produce is exported. China is the largest importer of Australian agriculture produce, accounting for $8.9 billion (20%) of exports in 2015. Japan and the United States account for $4.5 billion (10%) and $3.9 billion (9%) respectively [10]. As a country dependant on exporting, this highlights the economic necessity for Australia to make climate policy a priority. This also presents a compelling case for the Australian agriculture sector to accelerate its journey towards low emissions or carbon neutral products and commodities in anticipation of the implementation of these policies.

Australia's economy-wide commitment

The Australian Government has committed to reduce greenhouse gas emissions across the nation at least 26-28 percent below 2005 levels by 2030.

The agriculture sector could play a pivotal role in achieving this economy wide ambition both through reducing emissions and increasing carbon sequestration through land use practices.

[7] RepuTex, "ACCU spot price hits $23/t, new record high", August 2021
[8] Australian Mining, "EU emissions tax threatens Australian exports" July 2021
[9] European Environmental Bureau, EEB pathway for a net-zero agriculture and agriculture-related land emission, 2021
[10] DFAT STARS Database. Based on ABS Cat No 5368.0, June 2017 data; ABS Special Data Service.

National context

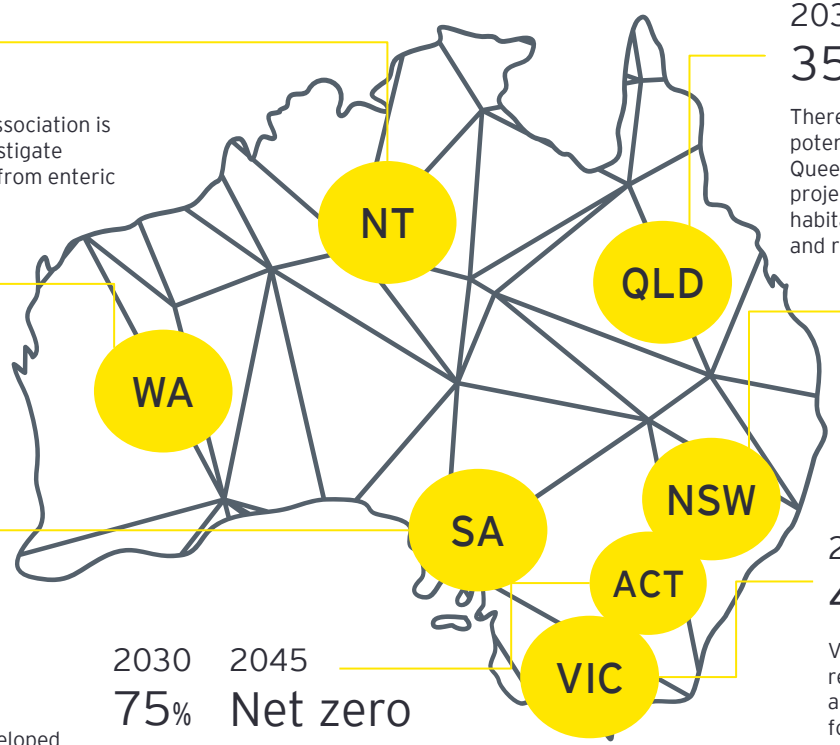
State governments are supporting landowners with land restoration and biodiversity efforts. However, there is need for a coordinated approach among governments to unlock economic and employment opportunities in regional areas.

State governments are taking action. They have introduced climate policies, net zero targets, and initiatives to help with the effort against climate change.

In line with the Federal Government's Emissions Reduction Fund methodologies, the States are supporting farmers to deliver carbon and biodiversity projects that deliver economic, social and environmental value. Support includes policies that support farmers and other landowners with carbon sequestration and biodiversity efforts.

These efforts require further national support to augment the recently announced Agriculture Stewardship Package funding the design and testing of the Carbon + Biodiversity Pilot and the design of the Australian Farm Biodiversity Certification Scheme.

Recent analysis also shows that there are 392 carbon farming projects across Australia, projected to generate $1.9b over 16 years[11].



2050
Net zero

The Northern Territory Cattlemen's Association is collaborating with researchers to investigate options to reduce methane emissions from enteric fermentation.

2030 2050
35% Net zero

There are 280 ERF Projects in Queensland with the potential to abate 21.9MtCO_2-e. Further, the Queensland Land Restoration Fund supports projects that improve ecosystems, support habitats, create opportunities for the community and restore the land.

2050
Net zero

The Western Australian Carbon Farming and Land Restoration Program is dedicated to realising agriculture's potential to sequester carbon into the landscape. This program ($15m) funds carbon projects that deliver co-benefits and provide grants for research institutes.

2030 2050
30% Net zero

The NSW Biodiversity Conservation Trust provides a service for biodiversity offsets and sharing knowledge. Additionally, the Adapt Project is all about up-skilling Central West producers to adapt to changes in climate, landscape and markets.

2030 2050
50% Net zero

A carbon offsets program is being developed by the SA Government that leverages carbon markets to fund native vegetation restoration. Additionally, mapping and assessment of the carbon sequestration potential of coastal wetlands and seagrass habitats, soil carbon and valuing the co-benefits of carbon projects.

2030 2045
75% Net zero

The ACT have positioned sustainable agriculture and biodiversity within its Investment Plan to improve both farm productivity and address the threats of climate change.

2030 2050
40% Net zero

Victoria's BushBank program ($77m) is supporting revegetation and restoration of native vegetation across public and private land to improve habitat for biodiversity while increasing carbon sequestration. The Carbon Farming Program ($15m) will help farmers store more carbon in shelterbelt trees and engage in agroforestry

Net zero as of 2015

[11] Carbon Market Institute, QLD, NSW lead charge on $1.9b land sector emission reduction contracts, 2021

Sector context

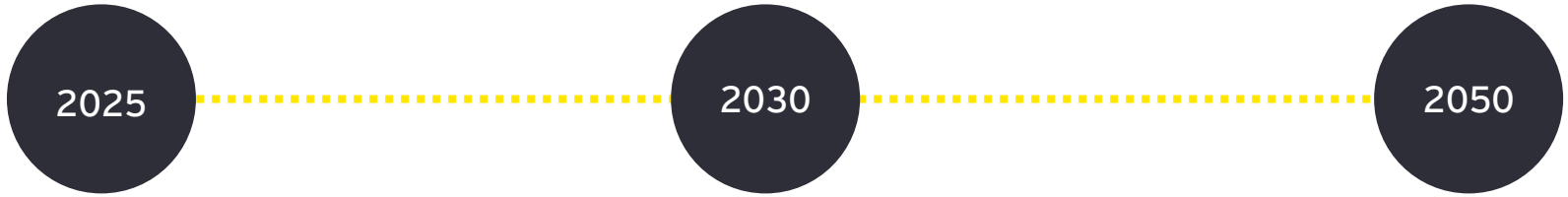
A groundswell of climate action is occurring across the globe with industries, member associations, governments, businesses, investors and individuals becoming increasingly active in responding to climate change.

Climate action is steadily progressing across the Australian agricultural sector, with many industry bodies, representative groups and retailers setting targets and pathways to net zero.

Indeed, the Australian agriculture sector has already made progress in emissions reduction over the past 2 decades. Emissions from grazing and grain cropping industries have fallen by approximately 69 per cent since 1990[12].

The inclusion of the agriculture sector in broader climate policies would allow key industry bodies and sub-industries to work towards a common goal, unlock opportunities in low emissions economy, and set a holistic roadmap that clearly defines actions and roles of key stakeholders.

Farmers for Climate Action advocates for the pivotal role that farmers and the broader agriculture sector play in combating climate change. It aims to accelerate this impact by ensuring farmers are heard by the media, policy makers, businesses throughout supply chains and Australians.



Australian Pork

Australian Pork has set the target to become carbon neutral by 2025[13]

Red Meat Advisory Council

The Red Meat Advisory Council has set a target for the Red Meat industry to be carbon neutral by 2030[14].

Dairy Australia

Dairy Australia has set the target for the dairy industry to achieve a 30% reduction in greenhouse gas (GHG) emission intensity by 2030[15].

National Farmers Federation

The NFF has published a Climate Change Policy, and supports an economy wide aspiration of net zero by 2050[16].

NFF recognises the opportunity for economic resilience, with the intent for coordinated sustainable farming through *ecosystem services* to equal to 5% of farm revenue[16].

[12] Australian Government, Department of Industry, Science, Energy and Resources, Quarterly Update of Australia's National Greenhouse Gas Inventory: June 2020
[13] Commentary from Australian Pork on the coming Australian Pork Industry Sustainability Framework, in relation to Australian Pork Strategic Plan 2020 – 2025
[14] Red Meat Advisory Council, Red Meat 2030 Strategy
[15] Dairy Australia, 2030 Dairy Sustainability Goals and Targets
[16] National Farmers Federation, 2030 Roadmap

3 Technical analysis

Agriculture opportunities in a low emissions economy

The selected initiatives focus on four opportunity areas to mitigate emissions and benefit industry participants:

1 Methane reduction 2 Transport and electricity 3 Land use change 4 Improved land management

Collectively, the four areas above represent a steadily increasing quantity of CO_2-e abated over the next 30 years.

Through a bottom-up approach, EY identified a 'business as usual' (BAU) trajectory to project what an Australian on-farm emissions profile may consist of from 2020 to 2050. This accounted for anticipated changes such as livestock headcounts, historic trends in land uses and the energy transition underway.

This is not the only pathway to reduce emissions from the agriculture sector, but charts a balanced approach based on abatement costs, available technology and adoption rates.

Compared to a BAU trajectory, the model estimates that the Australian agriculture sector can reach net zero emissions by 2040. This includes nearly 40% emission reduction by 2030 and 60% by 2035.

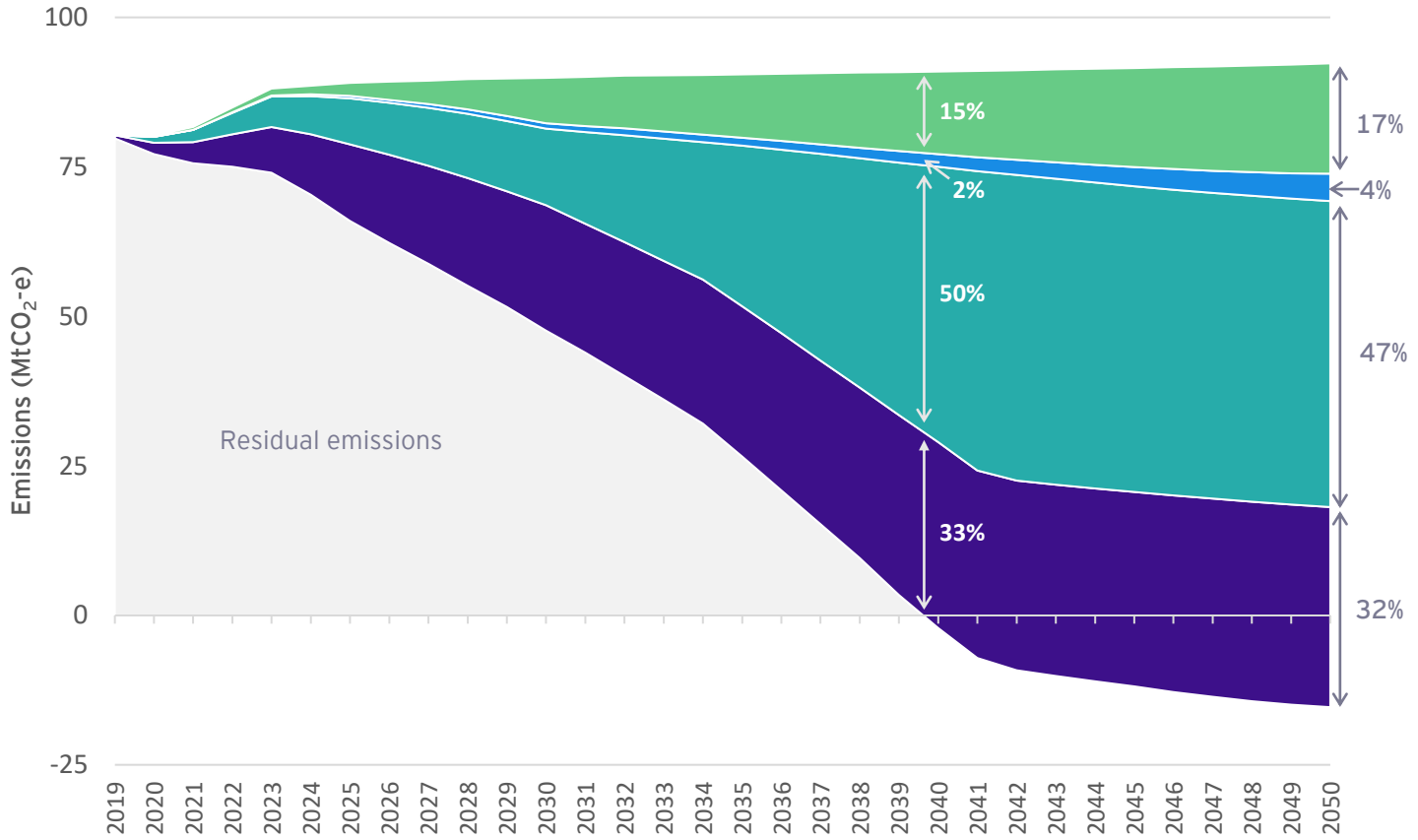


Fig 5. Emissions reduction projection 2019 - 2050

Methane reduction

Reducing methane production from livestock and waste

Enteric methane production in livestock is the highest source of on farm emissions, constituting 71% of Red Meat emissions in 2017[14]. Technologies and solutions to reduce methane production are affective strategies to reduce emissions and increase animal productivity.

15%
Proportion of cumulative abatement up to 2040

12.9
$MtCO_2$-e
Annual abatement in 2040

$45.7
Weighted average cost per tCO_2-e abated in 2040

Example initiatives

- CSIRO scientists have developed a cost-effective seaweed feed additive called FutureFeed, which uses a variety of Australian seaweed that significantly reduces their methane emissions and has potential to increase livestock productivity.
- The New Zealand Agricultural Greenhouse Gas Research Centre is currently developing a prototype vaccine that aims to reduce methane emissions from both cattle and sheep by at least 20%.

Included actions

Action	Description
Feed supplements and forages to reduce production of methane in beef cattle, dairy cattle and sheep	Research has been dedicated to discovering how different feed supplements can reduce enteric methane production in livestock with algae and 3-Nitrooxypropanol (3-NOP) showing promising results.
Selective breeding for methane reduction in sheep, beef cattle and dairy cattle	Genetic variability is known to influence methane emission rates in livestock. Research conducted has demonstrated that methane emissions has a moderate heritability in both cattle and sheep. [15]
Anti-methane vaccine for dairy, beef cattle and sheep	Vaccines to mitigate methane emissions in livestock have been advancing in development over the last decade. The vaccine introduces anti-bodies into the cow's saliva which is then transferred to the rumen to bind with methanogens to prevent the production of methane.
Biogas capture from dairy cattle, feedlot cattle and pig effluent	The capture of methane from manure systems to reduce emissions. Once captured, methane fuel can be burnt to be destroyed or to produce energy.
Increase proportion of beef cattle in feedlots and reduce time to market	Increasing the number of cattle finished in feedlots reduces lifetime emissions per animal and proportionately fewer animals producing methane. This is achieved through reducing the age of animal at slaughter and increasing weight at slaughter.

[17] Meat & Livestock Australia, Carbon Neutral by 2030 Roadmap
[18] University of Southern Queensland in collaboration with John Black Consulting; A marginal abatement cost analysis of practice options related to the NLMP program, 2015

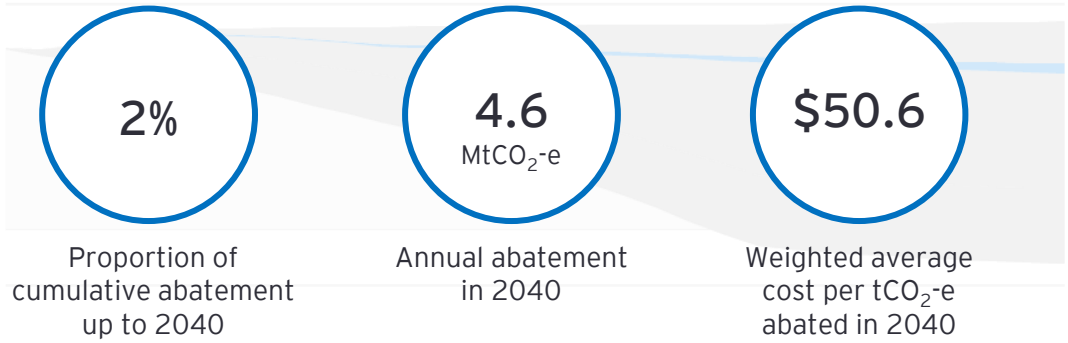
Transport and electricity

A transition to renewable on-farm electricity consumption and electric vehicles

There is an abundance of renewable power across Australia's vast agricultural landscapes, and we have included the adoption of renewable energy to power the sector.

The transition to electric vehicles (EVs) is also underway. Although the Australian public has been cautious to embrace them, EV's offer significant financial, operational, and emissions opportunities on farm. This is particularly true of tractors and heavy farm vehicles – historically reliant on burning diesel. While current options are maturing, we anticipate strong and material growth as certain tipping points are reached – as we are witnessing in the commercial vehicle market today.

Combined, their abatement potential is limited by overall consumption volumes and an energy market that is already rapidly decarbonising.



Included actions

Action	Description
Transition to EVs (Tractors, heavy vehicles, light vehicles)	Gradual replacement of internal combustion engine vehicles with electric vehicles. Modelling is based on AEMO's *Distributed Energy Resources and Electric Vehicle Forecasts and includes National Energy Market grid carbon intensity*.
Adoption of renewable energy on farms	Increased uptake of solar or wind energy to replace grid consumption, and a shift to renewable energy Power Purchase Agreements.

Example initiatives

- Adoption of electric tractors and heavy vehicles in Californian vineyards such as Wente Vineyards in Southern California.
- The introduction of solar heating systems to power energy intensive tunnels and greenhouses at Summit Naturals Organic Farm

While hydrogen presents a significant opportunity for the transport sector, the model does not include hydrogen technology for on-farm activities. This is due to limited available quantitative data related to on-farm practices and the relative low share of emissions from transport within the farmgate.

Land use change

Reforesting and integrating blended marginal farmlands for multi-layered benefit

There is an opportunity to magnify the carbon capture, utilisation, and value of agricultural land by deliberately changing the flora it hosts. Doing so leverages the land's powerful capacity to act as a carbon 'sink'.

The pathway models two actions that can be taken up at farmers discretion in a way that is most synergistic with current operations. The first is the introduction of biodiverse forestry on low productivity marginal farmlands. The second involves strategic and recognised integration (or 'stacking') of appropriate reforestation on existing productive land.

Both methods can create positive outcomes for farmers. Recognising associated co-benefits can incentivise the uptake of the abatement options, and improve financial outcomes and resilience for agricultural communities. Physical on-farm benefits (e.g. livestock health and productivity improvements and more climate-resilient and biodiverse landscapes) can be complimented by targeted financial/market based recognition of value-add such as through the ERF.

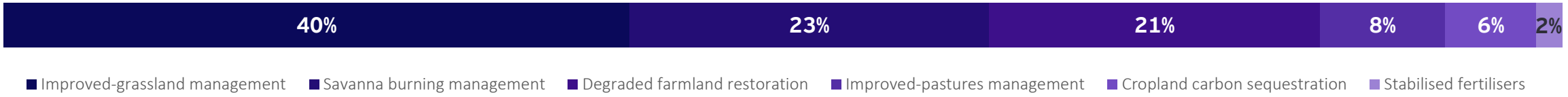
Included actions

Action	Description
Reforestation of marginal land *~3.9 Mha by 2040 (0.9% of total farmland)*	Human-induced regeneration and planting of environmental forests on less productive, marginal land. These forests may consist of mixed native species and are not intended for harvest. They will likely improve the quality of land and water supply while providing biodiversity outcomes and shelter for livestock.
Develop integrated shelterbelts *~1.9 Mha by 2040 (0.4% of total farmland)*	Strategic and selective reforestation of small tree stands/forests on productive land for wind breaks, shade and erosion protection on waterways. These targeted plantings will help reduce soil moisture loss improving yields and can provide shelter for livestock in certain orientations.

Example initiatives

- The Western Farm Trees project reforested permanent plantings of native tree species on land that was predominately for agricultural use. It resulted in ~25,400 ACCU credits, worth approximately $530k today.
- The partnership between Greening Australia and Woodside on the Cowcher property saw 15,000 hectares of previously-cleared, marginal agricultural land planted with 80 native plant species.

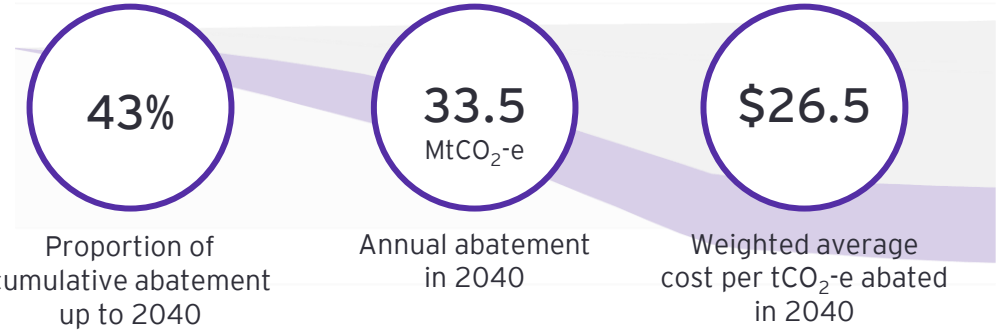
Improved land management



Enhancing the way we manage agricultural land

The Australian agricultural sector has a tremendous opportunity to sequester carbon through the rich land that it manages. This will not be new information for many in the sector. Rotational grazing, cover crops and the introduction of perennial grasses will be familiar to many. Rather, our modelling incorporates the accelerated uptake of such land management practices.

In turn, this can build resilience of agricultural communities, contribute to national emission targets and compound the benefit of other abatement options through reduced emissions from livestock.



Example initiatives

- Facilitation of further carbon farming, such as the Australian Farm Biodiversity Stewardship Pilot
- Support for savanna fire management such as the Central Cape York Regional Savanna Fire Project
- Maintaining a suitable level of ground cover and introducing diversified grass species to enhance soil carbon sequestration such as Binginbar farm in NSW

Included actions

Action	Description
Cropland carbon sequestration *~1.1 Mha by 2040 (0.3% of total farmland)*	Increase soil carbon in cropland through sustainable management practices. This includes reducing bare fallow, utilising cover crops cover in combination with soil conditioners such as clay delving or organic materials and improved crop varieties.
Degraded farmland restoration *~7.2 Mha by 2040 (1.7% of total farmland)*	Restore degraded farmland, including degraded cropland, degraded improved-pastures, and degraded natural grassland to productive farmland. This improves land quality and carbon sequestration through reducing salinity, acidification and erosion. This can be achieved by enabling revegetation, applying lime, improving fertility via nutrient application, and applying organic substrates.
Improved pastures/ grassland management *~54.4 Mha by 2040 (12.8% of total farmland)*	Increase soil carbon and land productivity in natural grassland and improved pastures through sustainable management practices. This includes embedding agriculture practices that sequester carbon such as rotational grazing, fire management and the introduction of perennial grasses with higher productivity or greater sequestration through deep roots. Improved pastures and grassland also drives a reduction in emissions from livestock.
Savanna fire management *~45 Mha by 2040 (10.5% of total farmland)*	An indigenous fire management technique where low intensity burning occurs on agricultural land in Australia's savanna landscapes in the early dry season. This reduces the frequency and severity of emissions from high-intensity bushfires in the late dry season. Low intensity fires consume less dead organic matter which enables more carbon to remain stored in the landscape.
Stabilised Fertilisers	The use of stabilised fertilisers on productive land to reduce the direct release of nitrous oxide resulting in lowered emissions and productivity gain.

Neglecting to act will reduce farm production and impact farmers' livelihoods

Although climate change can represent a financial opportunity for farmers through abatement, it also represents an immense risk. The climate is changing as a direct result of human generated emissions. As mean global temperatures rise, so do the risks of chronic and acute climate impacts, including drought, heat waves, bushfires, floods and storms.

Farmers and their livelihoods are deeply connected to the natural environment, and therefore particularly vulnerable to these changes. The risk is increasing with each tonne of carbon dioxide emitted into the atmosphere.

The current science suggests that delaying action may also increase the risk of missing economic opportunities, as well as negative cost implications across a number of aspects of the economy (e.g. health, insurance, production costs)[19].

Economic analysis demonstrates that the impact of climate change could cost between 3% and 8% of annual global Gross Domestic Product (GDP) depending on how delayed the action is - as a result of lost productive capacity, increased health costs and the impact of natural disasters intensified by climate change.[20] If applied to Australia's current agricultural output of $67b, the quantum annual los from climate events could be of +$5b annually.

If acting in the best interests of the agricultural sector, and the economy more broadly, decision makers are compelled to facilitate reductions in emissions.

[19] Kahn, M. E. et al. (2019) 'Long-Term Macroeconomic Effects of Climate Change: A Cross-Country Analysis', National Bureau of Economic Research.
[20] Nixon, J. 2019, 'The economic impact of global warming: an Oxford Economics White Paper', Oxford Economics, London.

What next? Harness the opportunities and manage the risks

Significant value lies beyond net zero

In the technical pathway modelled for this report, cumulative total abatement in the decade from 2041-2050 is greater than the cumulative total abatement between now and achieving net zero in 2040. The faster the Australian agriculture industry shifts towards low emissions production, the sooner carbon credits in excess of the sector's emissions are generated. This race to net zero will allow all excess credits to assist other Australian sectors to decarbonise a will be a pure increase in aggregate sector profit.

The carbon offset surplus past net zero is a value bank. The speed at which the industry can achieve net zero will help determine the value that farmers can access. This is particularly true when viewed in light of escalating price for carbon offsets around the world.

As alluded to earlier in the report, this is not the only pathway and these trajectories are malleable. They are driven by decisions. Investment and successful market structure can help achieve the options modelled here or additional 'blue sky' opportunities to assist farmers sooner.

Value for farmers will be magnified through carbon market enhancements

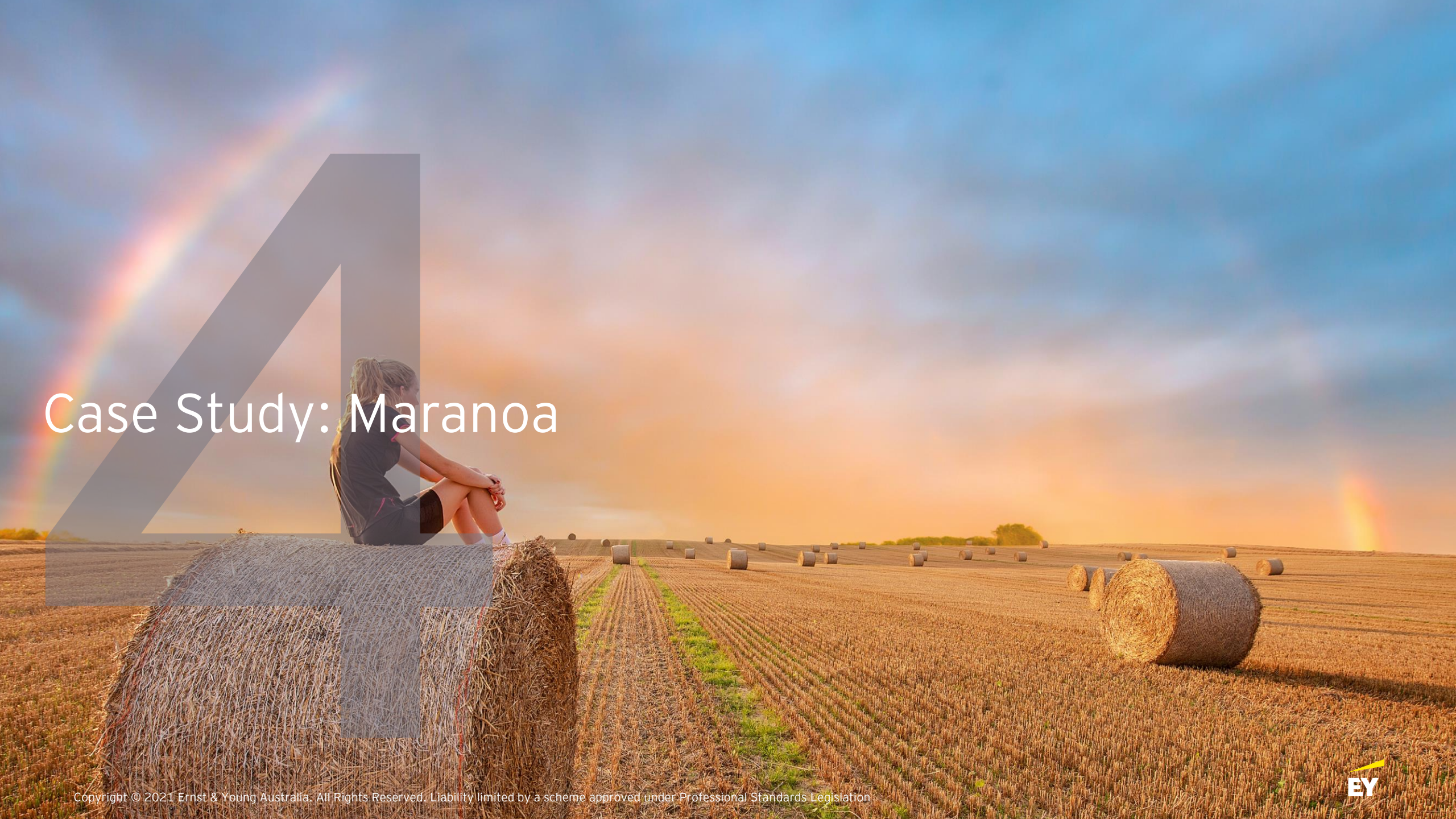
This report was not authored to provide recommendations on how leverage carbon markets to create opportunities for farmers. However, the Federal Government will need to make specific decisions, in consultation with the agriculture sector, about how to leverage market mechanisms to realise the value in abated carbon for farmers. To date, this has been achieved through ACCUs and the Climate Solutions Fund/ERF.

The market may be further impacted by broader, nation wide political decisions relating to the future of the Safeguard Baseline, International Protocols or new approaches to meet national decarbonisation targets. Decision making must consider the allocation and use of carbon offsets.

Shifting to low emissions while protecting and enhancing agriculture's benefits will require a coordinated effort between government, businesses and land owners

Theme	Description	Potential roles to achieve a low emissions future for the agriculture sector			Abatement Potential by 2040
		Government	Business	Land Owners	
Methane reduction	Enteric methane production in livestock is the highest source of on farm emissions, constituting 71% of red meat emissions in 2017. Technologies to reduce methane production are effective strategies to reduce emissions and increase animal productivity.	▸ Invest in Research and Development solutions to accelerate emerging solutions and de-risk private investment. ▸ Extend knowledge to landowners and business to increase adoption and enable innovation.	▸ Provide extension services to increase ease of implementation. Research and development to propel innovation.	▸ Understand methane output from management systems and assess emissions as assets and liabilities within their farming business.	142 $MtCO_2$-e
Transport	Transition of on farm light vehicles, heavy vehicles and tractors to be powered by electricity.	▸ Provide tax incentives to encourage landowner to switch to electric vehicles (e.g. 150% depreciation allowance).	▸ To provide convenient charging stations in rural areas and access to affordable and reliable vehicles.	▸ Take pride in demonstrating commitment to environment.	18 $MtCO_2$-e
Electricity	Generate solar and/or wind energy on farms to decrease consumption from national energy market in states where there is a reliance on non-renewable energy sources.	▸ Provide a structure on grid input and fair electricity pricing. ▸ Provide tax incentives.	▸ Provide renewable energy projects that are an appropriate scale for on farm needs.	▸ Look for synergies that exist with other aspects of the business and take a long-term view by investing capital to reduce annual costs.	1 $MtCO_2$-e
Land use change	Integration of strategic and selective reforestation accompanying other land use to increase carbon sequestration.	▸ Educate landowners on the financial costs and benefits of transition and the required break-even carbon price. ▸ Encourage a differentiated market to incentivise ACCU quality by incorporating and rewarding projects that achieve additional environmental benefits.	▸ Provide skilled advice and project management to support the implementation of on ground works including advice on tree species and strategic planting to deliver additional environmental and/or production benefit ▸ Financiers can offer innovative products that align the revenue derived from carbon projects and the costs incurred.	▸ Look for synergistic reasons to conduct these activities and strategically design shelterbelts for maximum production and biodiversity benefit ▸ Strategically select tree species and use methods such as mixed native species planting to enhance other environmental co-benefits such as biodiversity ▸ Engage with third parties who may wish to support with tree planting efforts (including universities for research)	375 $MtCO_2$-e
Improved land management	Improve and restore land through sustainable land management practices. Increase soil carbon and biodiversity in cropland, natural grassland and improved pastures resulting in healthier land and increased productivity.	▸ Continue development of ERF methodologies that incentivise adoption of these practices by ensuring affordable implementation and ease of measurement. ▸ Transparent carbon pricing to reward good management (both historical and future) and to provide an incentive for landowners to embark on these changes.	▸ Provide skilled advice and project management to support the implementation of on ground works.	▸ Understand how land management practices store carbon and the synergies that exist with other aspects of the business, including increased productivity.	398 $MtCO_2$-e

Case Study: Maranoa



Maranoa Case Study

Current State | 2020

** Economic benefits from international carbon markets have not been included in this analysis.*

Current state of the Maranoa Electorate in Southern Queensland (2020):

72,989,659 Hectares

151,026 Residents

67,000+ Jobs

$24.3bn Economic output

The Maranoa Electorate in Southern Queensland is known for mining and agriculture which produce 18% ($4.4 million) and 16% ($3.8 million) of total economic output respectively, as shown in Figure 6. [15] The agriculture sector is the largest employer accounting for nearly 13,000 jobs (19%) while the mining sector contributes over 2,700 jobs (4%). [15]

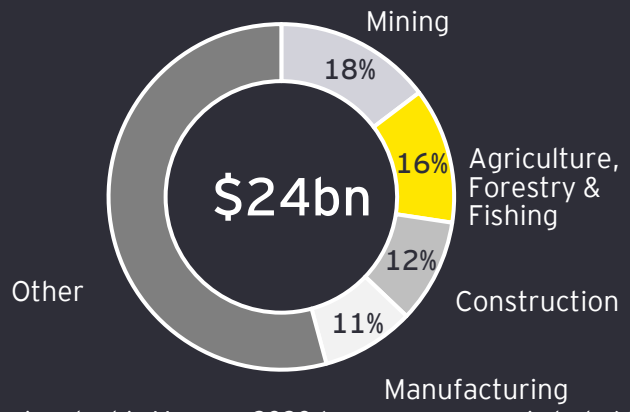


Fig 6. Economic output in Maranoa 2020 (gross revenue per industry) [15]

The Maranoa electorate emitted 12.7 $MtCO_2$-e in the 2019 calendar year. Agriculture accounted for 58% (7.4 $MtCO_2$-e) of emissions which can be attributed to the comparatively large land area and relatively low population.

Climate-related risks are likely to affect the main industry sectors in Maranoa, including agriculture, mining, electricity, gas and water, and construction (see Figure 7). Physical climate-related risks will have a significant impact on the agriculture sector though changing climactic conditions, increased temperatures, heat stress, droughts and flooding. Transition risks are likely to have a significant impact on regional communities such as Maranoa due to a reliance on fossil fuels and mining activities. Transitions risks may include constrained carbon and energy policies, consumer preferences, and technology.

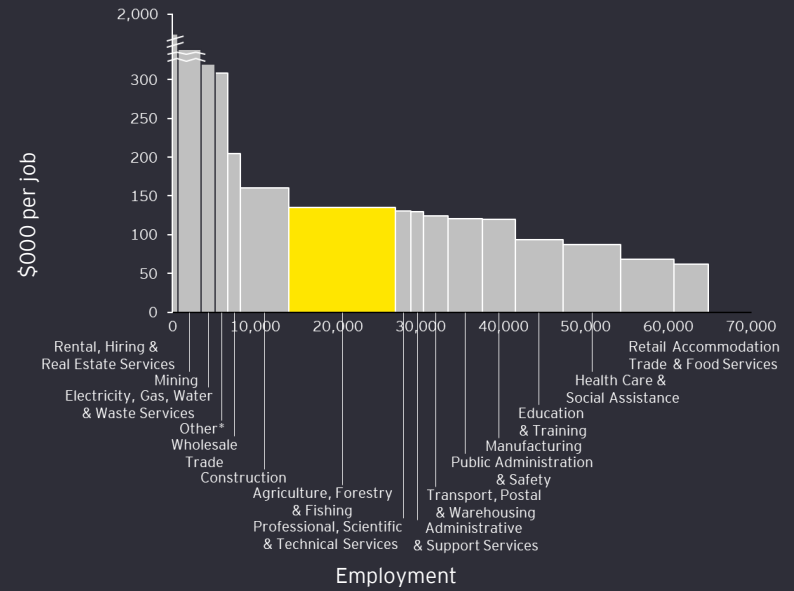


Fig 7. Employment and gross value added (GVA) in Maranoa [16]

Regional economies such as Maranoa will be disproportionately affected by these risks compared to urban regions due to the lack of alternative employment opportunities or industries.

While a low emissions economy would lessen the risk exposure to climate-related risks it would also present significant opportunities for agriculture through additional revenue streams and supporting jobs. In the national context, one of the most significant opportunities is carbon farming, through the Emission Reduction Fund, which rewards landowners for implementing sustainable land management practices. However, there are broader opportunities for the agriculture sector to play a key role in international carbon markets.*

[15] REMPLAN Maranoa Economy data 2020
[16] Australian Bureau of Statistics

Maranoa Case Study

58-71m
additional ACCUs generated

$2-2.4bn
additional revenue

14-17k
supported jobs

Potential Future | 2021 - 2030

The Maranoa Electorate has the potential to grow significantly over the next 10 years through carbon farming.

** Refer to Appendix for detailed assumptions and limitations.*

Adequate policy settings and market-based approaches will be necessary to minimise adverse impacts on the agriculture sector and support of other primary industries. Carbon farming projects can support the agriculture sector through the delivery of social, economic, cultural and environmental outcomes. These may include creating additional revenue streams, adopting new technology, leveraging traditional knowledge, retaining populations through supporting local employment, and protecting and restoring natural capital.

Maranoa, and Queensland more broadly, is well positioned to seize the upside of carbon farming with 278 ERF projects already registered. [17] Grazing native vegetation is by far the largest land use type in Maranoa, covering ~62 million hectares (85% of Maranoa).[18] Dryland cropping makes up an additional ~2 million hectares (~3% of Maranoa).[18]

ERF Projects registered across QLD

of ERF contracted to Maranoa electorate

of Maranoa is used for grazing native vegetation

Various management practices can be implemented on land that is used for grazing native vegetation and dryland cropping to reduce emissions and/or sequester more carbon. These include:

- Improved grassland management (23% of ACCUs)
- Reduced time to market – beef cattle (2% of ACCUs)
- Degraded farmland restoration (12% of ACCUs)
- Feed Supplements (5% of ACCUs)
- Reforestation of marginal land (35% of ACCUs)
- Integration of shelterbelts (23% of ACCUs)
- Cropland carbon sequestration (0.1% of ACCUs)

EY has modelled the potential economic benefit that could result from a conservative uptake of these land management practices and subsequent recognition by the ERF over a 10 year period. The majority of these practices are already recognised in the ERF but there may be some additional eligibility considerations.

Maranoa could generate between 58 - 71 million ACCUs over a 10 year period, resulting in an additional $2 – 2.4 billion of revenue and supporting 14-17,000 direct jobs in the Maranoa region*.

Importantly, improvements to the health of the land itself can be achieved through the methods required to create ACCUs. This builds the value of natural capital for farmers and thereby prosperity of the business.

This positive reinforcement means that farmers can also expect additional production benefits and subsequent profit gains along with a number of other environmental, social and economic co-benefits.

Flow on effects from this economic stimulus have an estimated consumption effect of $290 million over a 10 year period.

[17] Clean Energy Regulator, Emissions Reduction Fund Register 2021
[18] Australians Bureau of Agricultural and Resource Economics and Sciences

Appendices

A1: Business as usual modelling assumptions

BAU modelling limitations

Sector	Modelling Limitations
Agriculture	EY has not predicted future climatic conditions and assumes a return to average seasonal conditions in line with national projections in the near term. In the medium to long term, worsening climatic conditions are assumed resulting in loss of agricultural productivity. There is significant uncertainty around the impacts of climate change on this sector.
LULUCF	EY has not predicted future climatic conditions and assumes a return to average seasonal conditions in line with national projections. There is significant uncertainty around the climate and its impact on this sector. EY has modelled average net GHG emissions for this sector out to 2050, which does not accurately reflect the cyclical nature of LULUCF activity and associated GHG emissions
Waste	On-farm agricultural waste trends have been held broadly in-line with national waste projections. Mitigation actions for waste were not modelled based on relative emission proportions for baseline emissions.
Electricity	GHG emissions from electricity exports and imports have not been factored into the projections due to the nascent nature of this industry.
Transport	The potential impact of hydrogen fuel has not been estimated in the business-as-usual as this is a new initiative.
General	The emissions modelling in this report may differ under different growth assumptions. Total greenhouse gas emissions have been expressed on GHG equivalents based on emissions inventories of carbon dioxide, nitrous oxide and methane. The model does not included embodied (Scope 3) emissions.

BAU modelling key data sources

Sector	Data sources
Agriculture	▪ National Greenhouse Gas Inventory reports ▪ State and Territory Greenhouse Gas Inventories 1990-2019 ▪ Department of Industry, Science, Energy and Resources - Australia's emissions projections 2020 ▪ Department of Agriculture: Agriculture and trade data ▪ Dept of Agriculture: ABARES Insights: Analysis of global responses to climate change - opportunities for Australian agricultural producers ▪ CSIRO's Pathways to carbon neutrality for the Australian red meat sector ▪ CSIRO's Future Feed analysis ▪ ClimateWorks' Food and land use transition reporting and national Decarbonisation Futures report.
LULUCF	▪ State and Territory Greenhouse Gas Inventories 1990-2019 ▪ Department of Industry, Science, Energy and Resources - Australia's emissions projections 2020
Waste	▪ State and Territory Greenhouse Gas Inventories 1990-2019 ▪ Department of Industry, Science, Energy and Resources - Australia's emissions projections 2020
Electricity	▪ State and Territory Greenhouse Gas Inventories 1990-2019 ▪ Department of Industry, Science, Energy and Resources - Australia's emissions projections 2020 ▪ AEMO grid forecasts and electric vehicle modelling
Transport	▪ State and Territory Greenhouse Gas Inventories 1990-2019 ▪ Department of Industry, Science, Energy and Resources - Australia's emissions projections 2020 ▪ AEMO grid forecast and electric vehicle modelling
General	▪ REMPLAN economic data (regional and national datasets) 2021 ▪ ABS datasets

A2: Shortlisted technologies and practices

Shortlisted abatement actions

Area	Technology or practice	Cumulative abatement (2019 to 2050) [$MtCO_2$-e]	Indicative marginal abatement cost (AUD/tCO_2-e)	Source
Methane reduction	Feed Supplements and Forages - Beef Cattle (Feedlot)	63.4	$56.5	Meat & Livestock Australia (2015). A marginal abatement cost analysis of practice options related to the NLMP program.
Methane reduction	Feed Supplements and Forages - Other Cattle	31.5	$188.0	Meat & Livestock Australia (2015). A marginal abatement cost analysis of practice options related to the NLMP program.
Methane reduction	Feed Supplements and Forages - Sheep	41.3	$121.0	Meat & Livestock Australia (2015). A marginal abatement cost analysis of practice options related to the NLMP program.
Methane reduction	Selective Breeding	41.4	-$0.03	Energetics (2019). Queensland agriculture and land use marginal abatement cost curve.
Methane reduction	Anti-methane vaccine	57.9	$17.0	ClimateWorks (2010). Low carbon growth plan for Australia.
Methane reduction	Biogas capture from effluent	0.03	-$250.0	Energetics (2019). Queensland agriculture and land use marginal abatement cost curve.
Methane reduction	Reduce time to market - Beef Cattle	53.7	Nil	Meat & Livestock Australia (2021). Greenhouse gas mitigation potential of the Australian red meat production and processing sectors.
Transport	Transition to EV's - Tractors	15.5	$113.0	EY estimate (2021).

A2: Shortlisted technologies and practices

Shortlisted abatement actions

Area	Technology or practice	Cumulative abatement (2019 to 2050) [$MtCO_2$-e]	Indicative marginal abatement cost (AUD/tCO_2-e)	Source
Transport	Transition to EV's - Heavy vehicles	22.8	$222.0	Ibrahim, N.; Kennedy, C. A (2016). Methodology for Constructing Marginal Abatement Cost Curves for Climate Action in Cities.
Transport	Transition to EV's - Light vehicles	1.0	$4.0	Energetics (2016). Modelling and analysis of Australia's abatement opportunities.
Electricity	Adoption of renewable energy on farms	13.6	-$42.0	Energetics (2019). Queensland agriculture and land use marginal abatement cost curve.
Land use change	Reforestation of marginal land	522.3	$26.0	ClimateWorks (2010). Low carbon growth plan for Australia.
Land use change	Develop integrated shelterbelts	363.2	$27.0	ClimateWorks (2010). Low carbon growth plan for Australia.
Improved land management	Cropland carbon sequestration	43.7	$25.0	ClimateWorks (2010). Low carbon growth plan for Australia.
Improved land management	Degraded farmland restoration	160.3	$85.0	ClimateWorks (2010). Low carbon growth plan for Australia.
Improved land management	Stabilised fertilisers	19.3	$37.0	Energetics (2019). Queensland agriculture and land use marginal abatement cost curve.

A2: Shortlisted technologies and practices

Shortlisted abatement actions

Area	Technology or practice	Cumulative abatement (2019 to 2050) [$MtCO_2$-e]	Indicative marginal abatement cost (AUD/tCO_2-e)	Source
Improved land management	Improved-pastures management	60.7	$5.0	ClimateWorks (2010). Low carbon growth plan for Australia.
Improved land management	Improved-grassland management	303.5	$12.0	ClimateWorks (2010). Low carbon growth plan for Australia.
Improved land management	Savanna burning management	149.3	$5.0	Meat & Livestock Australia (2021). Greenhouse gas mitigation potential of the Australian red meat production and processing sectors.

A3: Pathway forecast assumptions

Shortlisted abatement actions

Area	Technology or practice	Start year and end year	Adoption rate in 2050	Percentage emissions reduction when applied
Methane reduction	Feed Supplements and Forages - Beef Cattle (Feedlot)	2025 - 2050	90%	90%
Methane reduction	Feed Supplements and Forages - Other Cattle	2024 - 2050	20%	30%
Methane reduction	Feed Supplements and Forages - Sheep	2025 - 2050	20%	80%
Methane reduction	Selective Breeding	2021 - 2050	40%	8% - 16%
Methane reduction	Anti-methane vaccine	2028 - 2050	40%	20%
Methane reduction	Biogas capture from effluent	2022 - 2050	0.5%	6% - 50%
Methane reduction	Reduce time to market - Beef Cattle	2020 - 2030	6%	10%
Transport	Transition to EV's - Tractors	2020 – 2050	60%	Variable over time - partially dependent on grid decarbonisation

A3: Pathway forecast assumptions

Shortlisted abatement actions

Area	Technology or practice	Start year and end year	Adoption rate in 2050	Percentage emissions reduction when applied
Transport	Transition to EV's - Heavy vehicles	2020 – 2050	60%	Variable over time - partially dependent on grid decarbonisation
Transport	Transition to EV's - Light vehicles	2020 - 2050	96%	Variable over time - partially dependent on grid decarbonisation
Electricity	Adoption of renewable energy on farms	2022 - 2040	22%	100%
Land use change	Reforestation of marginal land	2020 - 2050	1% (of total Agricultural land)	100% + sink
Land use change	Develop integrated shelterbelts	2020 - 2050	0.5% (of total Agricultural land)	100% + sink
Improved land management	Cropland carbon sequestration	2019 - 2050	0.3% (of total Agricultural land)	100% + sink
Improved land management	Degraded farmland restoration	2019 - 2050	1.8% (of total Agricultural land)	100% + sink
Methane reduction	Stabilised fertilisers	2020 - 2050	100%	60%

A3: Pathway forecast assumptions

Shortlisted abatement actions

Area	Technology or practice	Start year and end year	Adoption rate in 2050	Percentage emissions reduction when applied
Improved land management	Improved-pastures management	2019 - 2050	2.3% (of total Agricultural land)	100% + sink
Improved land management	Improved-grassland management	2019 - 2050	11.6% (of total Agricultural land)	100% + sink
Improved land management	Savanna burning management	2020 - 2050	0.8% (of total Agricultural land)	100% + sink

Assumptions made on Maranoa case study

Through the modelling, EY assumed that:

- Every tCO_2-e abated is recognised in existing and potential ERF methodologies.
- The average carbon price (2021-30) is $34/ACCU.
- The same action adoption rate and percentage of land use that were assumed in the Australian agriculture pathway, are representative of Maranoa. Further detailed analysis is required to reduce limitations and provide a more accurate estimation based on biophysical capacity of the land.
- A ±10% error margin was applied to the adoption rate.
- Some ERF methods may not generate ACCUs immediately and may take a few years to be established.
- Economic output from ACCUs will differ from the economic output from traditional agricultural produce. For this reason, economic impacts and additional jobs associated with a supply chain effects are excluded.
- A conservative estimate of 25 jobs per $MtCO_2$-e abated was applied to calculate supported jobs.
- A consumption multiplier effect of 0.133 was applied based on the assumption that additional revenue in the hands of farmers would stimulate spending and economic activity in the Maranoa region.