Greenhouse Gas Emissions Reduction Options for Western Australian Agriculture

Consultation to inform the Sectoral Emission Reduction Strategies for Agriculture

Have your say and take the survey
Acknowledgement of Country

The Department of Primary Industries and Regional Development (DPIRD) acknowledges the Traditional Custodians of Country, the Aboriginal people of the many lands that we work on and their language groups throughout Western Australia, and recognises their continuing connection to the land and waters. DPIRD respects the continuing culture of Aboriginal people and the contribution they make to the life of our regions and we pay our respects to Elders past, present and emerging.
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Sectoral Emissions Reduction Strategies (SERS)

The Western Australian (WA) Government is committed to building the climate resilience of the agriculture industry. The WA Climate Change Policy underscores this commitment to adapting to climate change and working with all sectors of the economy to achieve net zero emissions by 2050.

Achieving climate resilience requires both adaptation and the mitigation of greenhouse gas (GHG) emissions which accelerate climate change.

The Sectoral Emissions Reduction Strategies (SERS) are a core commitment of the Western Australian Climate Policy. These will provide robust and credible emissions reduction pathways across sectors for the whole of WA. Development of the SERS, announced in December 2021, will involve consultation with industry, business, research institutions and other key stakeholders.

The Department of Primary Industries and Regional Development (DPIRD) is working with industry and producers to develop emissions reduction strategies and solutions for the agriculture sector as part of the Western Australian Government’s transition to net zero emissions.

**Development of the agriculture component of the SERS will drive:**

- Research, development and adoption of low or zero carbon emission production systems.
- Support for agribusinesses along the supply chain to make climate-informed business decisions.
- Integrated actions across government to support inter-related climate action initiatives.
About this document

This document outlines potential actions that could be implemented to achieve WA’s net zero goals for the Agriculture component of SERS.

DPIRD seeks your input on the relevance, value, and adoptability of these actions as it supports the industry reduce emissions and increase carbon sequestration.

DPIRD has developed this document in consultation with industry organisations, researchers, and R&D corporations. It provides information about ways the different sectors can reduce their emissions.

These results, combined with input from experts in the field and prediction modelling, will help DPIRD develop an emissions reduction pathway for WA agriculture.

Agriculture emissions

Agriculture emissions as based on the National Inventory for Greenhouse Gases include methane from ruminants and manure, nitrous oxide from soils and manure and carbon dioxide from the application of lime and urea.

Carbon emissions from pre-farmgate production inputs such as fertilisers and herbicides (Scope 3) and fossil fuel use — diesel for farm vehicles and machinery, irrigation, electricity generation (Scope 2) — all contribute to the agriculture industry’s total carbon account.

The Land Use Land Use Change Forestry (LULUCF) sector covers emissions from activities affecting land use and vegetation cover, including land clearing and regeneration, forest management, plantations, croplands, and grasslands.
LULUCF is both a source of emissions and a means of removing emissions from the atmosphere. It is an important contributor to the State’s overall carbon inventory as well as individual farm businesses wanting to achieve carbon neutrality.

Strong signals from consumers, supply chains, retailers, and the finance and insurance sectors indicate that in the future, lowering on-farm GHG emissions will be expected to maintain market share.

Figure 1: How agricultural production fits across National Greenhouse Gas Inventory sectors
Questions

Consultation using this document, accompanied by an online survey, will address the following questions:

1. Are there key actions that haven’t been captured? If so, what are they?

2. What is the most helpful way to make decision support tools and other information sources available to producers?

3. How could education and training programs be designed and delivered to be most efficient and support the broadest range of producers?

4. Which organisations are best placed to take the lead for implementing these actions?

5. How can government and industry across different states and territories better coordinate and complement investment in low emissions research and development?
Have your say

Online survey results, combined with input from experts in the field and prediction modelling, will help DPIRD develop an emissions reduction pathway for WA agriculture.

The survey will be open until Friday 14 April 2023.

We invite your feedback on options presented in this document through an on-line consultation portal at:

yoursay.dpird.wa.gov.au/climatesurvey

Each section has specific questions.

Take the survey

If you have questions on the SERS process or this document, please email: emissions@dpird.wa.gov.au
Our vision

DPIRD's vision is for WA to have ongoing profitable and resilient primary production, healthy natural environments, and regional communities with net zero emissions by 2050.

This will contribute to improved economic, environmental and social outcomes for farms and farming communities.

**Economic impacts**

- Continued access to key markets and attracting a premium for ‘carbon positive’ products.
- Maintain and enhance access to markets for WA primary produce.
- Development of new and expanding ag tech industries in WA.

**Environmental impacts**

- Lower carbon emissions from agricultural production reducing WA’s overall contribution to global warming.
- Improved health of the production system environment through improved soil health, increased biodiversity, improved water and nutrient use efficiency and reduced chemical use.

**Social impacts**

- Sustainable regional communities through the continued viability of agricultural businesses and the associated employment and other social benefits.
- Enhanced innovation and human capital resources for the WA primary industries sector.
- Greater food security in the face of climate change.
Building on government and industry actions

The SERS will build on current industry and government strategies to take us towards net zero.

Industry commitments:

- **Chicken** (Australian Chicken Meat Federation) – [Environmental Footprint](#)
- **Dairy** (Dairy Australia) – [Dairy Australia Climate Change Strategy](#)
- **Eggs** (Australian Eggs) – [Australian Eggs Sustainability Framework](#)
- **Grains** (Grains Research Development Corporation) – [Grains Industry Carbon Targets](#)
- **Horticulture** (Hort Innovation) – [Horticulture Sustainability Framework](#)
- **Pork** (Australian Pork Limited) – [Sustainability Framework](#)
- **Red Meat** (Meat & Livestock Australia) – [Carbon Neutral by 2030](#)
- **Wine** (Wine Australia) – [Wine Australia Emissions Reduction Roadmap](#)
- **Wool** (Australian Wool Innovation) – [Wool industry approach to reducing emissions](#)

Government commitments:

- The Minister for Climate Action is leading the development of the sectoral emissions reduction strategies, a core commitment of the Western Australian Climate Policy.
- WA State Government has committed to net zero by 2050 and an interim target of 80% reduction in emissions from State Government operations and entities by 2030¹.
- Australian Federal Government has committed to net zero by 2050 and an interim target of 43% reduction by 2030².

¹ [WA Emissions Targets](#)
² [Australia legislates emission reduction targets](#)
Potential actions to deliver the agricultural component of SERS

To drive progress towards achieving our vision for net zero agriculture, actions across four focus areas have been identified:

1. Extensive livestock emissions
2. Intensive livestock and horticulture emissions
3. Cropping emissions
4. On farm carbon opportunities

WA agriculture is a mosaic of enterprises and production systems: many farm enterprises have a multitude of production systems on the one farm.

Although this document is divided into four production types there are interrelationships between them. For example, grains contribute livestock feed sources – both on and off farm; manure and waste from intensive agriculture is used by broadscale enterprises.
Extensive livestock emissions

Potential actions under this area focus on technologies and pathways to reduce methane emissions from the red meat, dairy, and wool production sectors.

Our goals

1. Reducing net emissions of WA’s livestock production to zero by 2050 while maintaining a productive and profitable livestock industry.

2. Increasing productivity and lowering the GHG emissions intensity of livestock production in kg CO$_2$e-/kg of product

3. WA becoming more efficient than our leading global competitors through feed efficiency, turn-off systems and production in the short term.
How do we get there?

• Make best use of new pasture forage systems, different grazing systems and feed additives to reduce emissions across the year.

• Permanently reducing animal emissions through breeding and genetic technology.

• Improve pasture production to reduce reliance on supplementary feed and lifting legume content to reduce the emissions from fertiliser application.

• Lowering the GHG emissions intensity of livestock production in kg CO₂e-/kg of product and becoming more efficient than our leading global competitors through feed efficiency, turn-off systems and production.

**Figure 2: Relative drivers of emissions for the cattle and sheep industries.**

*Source DPIRD*
Figure 2: Relative drivers of emissions for the cattle and sheep industries (cont.)
Source DPIRD
How we can work together

Led by industry and government:

• Benchmark the GHG intensity of the major livestock commodities in a global context.

• Develop a platform for producers to access information and decision support tools for low emissions practices and technologies, including GHG calculators.

• Determine WA focussed methane contributions for forages, grazing and pastoral systems.

• Invest in and support commercialisation and adoption of novel forages and dietary supplements that reduce methane production in the red meat, wool and dairy industries.

• Improve skills and knowledge through adoption programs for producers and agriculture service providers on low emission production systems and transition planning.

• Support the development and adoption of best practice manure management in dairies and feedlots through better data, systems and incentives.

• Investigate and raise awareness of First Nations rangelands management techniques that can be incorporated into grazing management systems.

• Develop policies and frameworks that support the further development of livestock industries and regions with a low emissions future.

What you can do now

• Undertake an enterprise level GHG footprint analysis using carbon calculators to understand your baseline and actions to reduce emissions.

• Adopt manure management practices and greater herd or flock efficiency for an incremental reduction in GHG emissions.

• Assess pasture density and composition and improve where needed.

• Maintain awareness of emerging domestic and export market trends relating to product marketability and enterprise sustainability credentials to inform business decisions.

• Assess pasture density and composition and improve where needed.
Intensive livestock and horticulture emissions

Potential actions under this area focus on technologies and pathways to reduce emissions from the pork, poultry, egg, and horticulture sectors.

Our goals

1. Reducing net emissions of WA’s intensive production to zero by 2050 while maintaining production and profitability of the sector.

2. Increasing profitability while lowering the GHG emissions intensity of production in kg CO₂e/kg of product and be more efficient than our leading eastern states and global competitors in the short term.
How do we get there?

- 100% of waste converted for use as an energy source (e.g., biomethane) or compost to support more sustainable, lower input production.
- Maximise use of renewable energy (electricity and fuel) on farm and in packaging/storage facilities.
- Make best use of local grain and pasture systems to reduce feed emissions in the meat and egg sectors.

![Waste/Manure Management](image)

![Electricity](image)

**Figure 3: Relative impact of drivers of emissions for horticulture (avocados, DPIRD analysis, Vegetables (Maraseni et al (2010)) and the pork, poultry (Wiedemann 2017, 2018) and egg sectors.**

*Source DPIRD*
Figure 3: Relative impact of drivers of emissions for horticulture (avocados, DPIRD analysis, Vegetables (Maraseni et al (2010)) and the pork, poultry (Wiedemann 2017, 2018) and egg sectors (cont.).

Source DPIRD
How we can work together

Led by industry and government:

- Develop comprehensive waste strategies to meet the needs of producers.
- Determine energy needs for both fuel and electricity use and the adoption of renewable fuels.
- Develop alternative cost effective/low emission/local source feeds to imported soybean meal and other higher emission feed sources.
- Support research and demonstration projects for new and improved nitrogen fertiliser sources, including slow-release fertilisers, and the role of legumes in rotations and intercropping with a view to increasing adoption and improving cost efficiencies.
- Support research and demonstration projects for precision irrigation and nutrition, including the use of soil and plant sensors, with a view to optimizing energy usage and fertiliser application.
- Improve skills and knowledge through education and training programs for producers and agriculture service providers on low emission production systems and transition planning.
- Undertake a detailed review of the emissions footprint of free-range systems and conventional systems.

What you can do now

- Undertake an enterprise level GHG footprint analysis using available calculators to establish an understanding of your baseline and areas of emissions reduction focus.
- Adopt fertiliser, energy and manure management practices that can lead to an incremental reduction in GHG emissions.
- Maintain awareness of emerging domestic and export market trends and policy signals relating to product marketability and enterprise sustainability credentials to inform business decisions.
Cropping emissions

Potential actions focus on efficient use of fertilisers and crop rotations, the management of residue, and reducing fossil fuel use. An associated action is to support development of low or no emissions fertilisers.

Our goals

1. Reducing net emissions of WA’s crop and grains production to zero by 2050 while building the profitability of the grains industry.

2. Lowering the GHG emissions intensity of cropping and grain commodities in kg CO₂e/kg of production and be more efficient than our leading global competitors.
How do we get there?

• Undertake soil testing and mapping to develop strategies for improvement.
• Highly targeted fertiliser applications with variable rates and timing in accordance with soil types to increase productivity (reduce emissions intensity).
• Lower fertiliser requirements per unit of production through genetic improvement of crops.
• Decrease fertiliser application through new techniques, technologies and improved soil quality initiatives.
• Increase productivity on some of the land to allow less viable land to be converted from cropping to pasture or vegetation, reducing total fertiliser inputs and increasing carbon stocks.
• Increase legumes in rotations of both crop and pasture phases.
• Establish extensive living cover crops over summer.
• Reduce fossil fuel and machinery use and increase use of technologies.
• Use alternative fuels such as renewable diesel and electrical.
• Have at least 90% of cropping production land managed at industry best practice.
Wheat (0.3t CO₂e-/t)

- Fuel: 10%
- Fertiliser and lime (applied): 50%
- Crop residue: 15%
- Fertiliser (embedded emissions): 13%

Canola (0.6t CO₂e-/t)

- Fuel: 12%
- Fertiliser and lime (applied): 27%
- Crop residue: 14%
- Fertiliser (embedded emissions): 29%

Figure 4: Relative impact of drivers of emissions for grains.
How we can work together

Led by industry and government:

- Develop a platform for producers to access information and build new decision support tools, including GHG calculators, for WA practices and low emissions technologies.
- Improve the information available for decision support tools, including soil data, crop rotations and inputs.
- Invest in research and demonstration projects for enhancing and managing soil quality to minimise fertiliser use.
- Support research and demonstration projects for slow-release nitrogen fertilisers with a view to increasing adoption and improving cost efficiencies.
- Invest in research on nutrient use efficiency (nitrogen, phosphorous, potassium) of grain and pasture crops.
- Develop robust systems for summer cover crops.
- Quantify the benefits and contributions of re-engineering the soil profile at depth.
- Improve skills and knowledge through education and training programs for producers and agriculture service providers on low emission production systems and transition planning.
- Invest in development of feedstock options to produce advanced biofuels such as renewable diesel.
- Develop enterprise-level nitrogen baselines and provide scientifically supported advice on the application of low emission fertiliser practices and naturally derived nitrogen.

What you can do now

- Undertake an enterprise level GHG footprint analysis using carbon calculators to understand your baseline and actions to reduce emissions.
- Use nitrogen calculators or advisors to develop an enterprise-level plan for nitrogen management.
- Maintain awareness of new fertiliser options and their efficacy and cost effectiveness in reducing GHG emissions from cropping activity.
- Use soil assessment tools to develop an enterprise-level plan to increase soil carbon and soil biology to improve productivity.
On-farm carbon opportunities

Potential actions focus on carbon sequestration, building healthy productive soils and taking advantage of the growing market for biofuels.

Our goals

1. To maximise the level of carbon sequestered across the landscape to provide co-benefits to the land holder and the state.
2. To support the uptake of carbon farming and production of biofuel for WA.
Relative impact of LULUCF in WA

Reducing GHG emissions through avoidance, offsetting carbon emissions, and insetting (use of nature-based solutions such as reforestation, agroforestry, renewable energy and regenerative agriculture on farm) will be important contributors to reaching net zero.

The information below shows the relative impact on total emissions by a range of activities. Positive numbers indicate increased emissions. Negative numbers indicate reduced emissions. (Measured in Gigagrams of CO$_2$ e-. (1 Gg = 1,000t))

Source: National Inventory, 2020
How do we get there?

• Increase participation in carbon farming on agricultural and pastoral lands.
• Improve productivity of crops and pastures through increased knowledge of soil structure and cation exchange capacity and potential to increase soil carbon.
• Quality crop and pasture lands are managed for productivity with a focus on revegetation/environmental plantings on less productive agricultural land to increase carbon storage.
• Integration of plantings for biofuels and bioenergy in farming systems, enhancing agricultural productivity and providing renewable energy for the aviation, agriculture and transport sectors.
• Set targets on the amount and quality of native vegetation on private land, such as shires in the South West Agricultural Region having at least 10% native vegetation on private land.
• Have at least 80% of pastoral land in good to very good condition (score 1-2 pasture condition and 0-2 soil erosion).
• Utilise the traditional knowledge and skills of First Nations people to enable impactful land restoration activities and business development.

How we can work together

*Led by industry and government:*

• Improve information available for decision support tools, including soil data and multi-species sequestration rates across soil types, climate zones and farm systems.
• Provide farmer-friendly information about carbon farming and train agronomists and professional service providers to understand the opportunities and risks.
• Increase soil carbon and revegetate less productive or non-arable lands for carbon insetting\(^3\) and offsetting.
• Understand soil carbon variation and cycling across agro-climatic zones.
• Support development of the WA bioenergy industry to supply advanced biofuels through investment.
• Increase the capacity of local nurseries to supply biodiverse, endemic seed and seedlings, and bioenergy crops.

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\(^3\) Insetting – use of nature-based solutions on farm: reforestation, agroforestry, renewable energy and regenerative agriculture.
Greenhouse Gas Emissions Reduction Options for WA
Resources

2020 Emissions Baseline Report for the Agriculture Sector in Western Australia

WA Climate Policy 2022
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