

Bioenergy Australia Submission - Agriculture and Land Sectoral Plan consultation

Bioenergy Australia (BA) is the national industry association committed to accelerating Australia's bio economy. Our mission is to foster the bioenergy sector to generate jobs, secure investment, maximise the value of local resources, minimise waste and environmental impact, and develop and promote national bioenergy expertise into international markets.

This submission from Bioenergy Australia is on behalf of the Renewable Gas Alliance (RGA), Sustainable Aviation Fuel Alliance of Australia and New Zealand (SAFAANZ) and the Cleaner Fuels Alliance (CFA). These alliances were founded to accelerate the development and deployment of Renewable Liquid Fuels and Biomethane in Australia. Individual members of the alliances will be providing more detailed submissions specific to their business and expertise.

Australia's Bioenergy Roadmap (ARENA, November 2021) outlines how, by the start of the next decade, Australia's bioenergy sector could contribute to around \$10 billion in extra GDP per annum and 26,200 new jobs (predominately regional), reduce emissions by about 9 per cent, divert an extra 6 per cent of waste from landfill, and enhance fuel security. Now is the time to capitalise on these opportunities by strategically aligning the agricultural sector's decarbonisation plan with Australia's broader decarbonisation potential.

We thank the Department of Agriculture, Fisheries and Forestry for the opportunity to provide feedback to the Agriculture and Land Sectoral Plan. We welcome the Department's commitment to developing a decarbonisation plan that will support the agricultural sector play its role as part of the Australian Government's 2050 net zero strategy.

The development of this plan comes at a pivotal time for the agricultural sector where the road towards decarbonisation is not a straight-forward journey as in other sectors of the economy. Many farming practices—such as crop stubble burning and using fuel-powered machinery—are significant contributors to the buildup of greenhouse gases in the atmosphere. As raised in the discussion paper, agriculture, as a sector in the National Greenhouse Account (NGA), made up 16.8 per cent of national greenhouse gas emissions in 2020–21.

We urge the government to be ambitious in the development of this plan as there are significant opportunities available to drive innovation, build capacity and reduce emissions in agriculture. It is well past time that we take advantage of this potential.

Key to realising this potential is the role of the renewable liquid fuels and biomethane industries – industries that will both bolster the agricultural sector and rely on its support.

We provide feedback on the following areas:

- Minimising field burning so that agricultural waste can be utilised for a higher-value purpose (3.2 Cropping and Horticulture)
- Maximising the role of anaerobic digestate use and application (3.2 Cropping and Horticulture)
- Supporting the role of renewable liquid fuels and biomethane in agricultural operations (3.3 Fuel and Energy)
- Leveraging Australia's agricultural might to support industry wide decarbonisation (5 Supporting and enabling change)

Minimising field burning so that agricultural waste can be utilised for a higher-value purpose (3.2 Cropping and Horticulture)

Bioenergy Australia agrees that minimising field burning is a scalable practice that could assist in the decarbonisation of the agriculture sector.

Presently, a substantial amount of cellulosic material generated in agriculture is either burned or left to decompose in fields. According to the Australian Bureau of Statistics (2016-17) [Land Management and Farming in Australia](#), crop stubble and/or trash management practices in Australia comprised removal by cool-moderate burn at approx. 2.1 million ha and removal by hot burn at 1.4 million ha.¹

Crop stubble burn off can emit large amounts of greenhouse gases, contributing to air pollution and exacerbating climate change.² It is estimated that crop residue burning can release 149.24 million tonnes of carbon dioxide (CO₂), over 9 million tonnes of carbon monoxide (CO), 0.25 million tonnes of oxides of sulphur (SOX), 1.28 million tonnes of particulate matter and 0.07 million tonnes of black carbon.³ These impacts can lead to respiratory issues and worsens air quality, posing health risks to nearby communities. Additionally, the release of harmful particulate matter and toxins into the atmosphere can adversely affects soil fertility, biodiversity, and overall ecosystem health, creating a vicious cycle of environmental degradation.⁴

Additionally, stubble burning can limit the potential for Australian communities, farmers or industries to utilise agricultural residues for higher-value purposes, such as converting them into renewable liquid fuels and biomethane using useful bioenergy technologies. The utilisation of low-cost horticultural wastes to produce these value-added product, can also support Australia's clean energy transition.

Agricultural biomass production holds immense energy potential due to its extreme versatility and ability to satisfy increasing energy demand. For example, the Race for 2030 [Onsite Anaerobic](#)

¹ [Australian Bureau of Statistics, 'Land Management and Farming in Australia' \(2016-17\)](#)

² [G Saini et. al, 'Stubble burning: Effects on health & environment, regulations and management practices', December 2020.](#)

³ [MVO Nederland, "'From burning to buying: Creating a circular production chain out of left-over crop" residue from Indian farmland', 2019.](#)

⁴ [Developments in stubble retention in cropping systems in southern Australia](#)

[Digestion for Power Generation and Natural Gas/Diesel Displacement Report](#) stated that in Australia, agricultural waste offers the “greatest potential” for biogas expansion and could account for around **86 per cent** of total biogas potential by 2050. Further, the [CSIRO Sustainable Aviation Fuel Roadmap](#) highlighted the potential of agriculture, estimating that Australia has enough feedstock to supply approximately **5 billion litres** of SAF by 2025, being sufficient to satisfy **60 per cent** of local jet fuel demand projected for 2025, growing to **90 per cent** by 2050.

Utilising agricultural residues rather than burning off would also support a circular economy — where waste and pollution are reduced, resources are circulated to their highest value point, and nature is regenerated. By utilising locally produced agricultural residues and waste, valuable by-products such as digestate fertilisers, CO₂, heat, and electricity can create additional income streams, particularly for farmers, while also supporting regional Australia. Through collaboration with different farms, bioenergy production from agricultural residues could generate a variety of job opportunities along the supply chain, from expanded raw material cultivation and collection to transport, storage, and pre-processing, while also serving as a key waste management strategy.

During the last two decades, crop stubble burning has been banned in all European Union (EU) countries under EU regulation 1306/2013. This widespread ban is a primary outcome of the implementation of EU renewable energy policies aimed at increasing the use of biofuel, coupled with air quality concerns and various climate change policies aimed at reducing carbon emissions.⁵

We support the implementation of policy that incentivises farmers to limit crop stubble burning. This proactive step not only reduces direct emissions and aids the agricultural sector in meeting its decarbonisation goals, but also unlocks the potential to utilise agricultural residues for higher-value purposes such as the production of renewable liquid fuels and biomethane.

Maximising the role of anaerobic digestate use and application (3.2 Cropping and Horticulture)

Bioenergy Australia submits that anaerobic digestate plays an essential role in the agriculture sector’s decarbonisation strategy.

Current fertilisers are mostly fossil-fuel based, chemical products and are increasingly expensive. Furthermore, local fertiliser distributors have shown a keen interest in adopting alternative biogenic fertilisers. Anaerobic digestion can provide this alternative, using proven technology that brings significant decarbonisation, economic benefits and waste management advantages for the agricultural sector.

Anaerobic digestion is the controlled biological decomposition of biodegradable materials, such as food waste and animal manure in digester tanks, vessels or covered ponds. Microorganisms naturally break down organic materials, to create biogas, which mainly consists of methane and carbon dioxide. This captured biogenic methane can then be utilised as a renewable energy source.

⁵ [European Parliament and Council 2013. Regulation \(EU\) 1306/2013 of the European parliament and of the council on the financing, management and monitoring of the common agricultural policy](#)

Anaerobic digestion is a ready-to-use technology that supports a circular economy, enabling recovery and use of the embodied energy, nutrient and heat values of organic matter. It facilitates a diversion of large volumes of agro-industrial, domestic and commercial waste and by-products from landfill disposal and reduce the methane emissions this practice creates. We also note that the expansion of biogenic CO₂ utilisation from the horticultural and food processing sectors could also provide significant benefit.

Thus, this process presents an option to use biotechnology to convert a relatively, low- value material into a high- value, reusable material.

We highlight the following benefits to the agricultural sector:

Benefits for the climate

- **Avoiding harmful emissions:** While organic fertilisers can release low or even neutral GHG emissions throughout the production cycle, all organic materials have the potential to release powerful GHGs such as methane and nitrous oxide into the atmosphere, if uncontrolled. Digesting organic materials anaerobically enables the capture and use of GHG emissions that would otherwise be released during decomposition. Anaerobic digestion can help countries achieve GHG emissions reduction targets. The European Biogas Association undertook a report on the Global Potential of Biogas noting that AD has the potential to reduce GHG emissions by 3,290 to 4,360 Mt CO₂ eq., which is equivalent to 10-13% of the world's current greenhouse gas emissions.⁶
- **Substitute for energy intensive synthetic and mineral fertilisers:** In Europe, producing a tonne of mineral fertiliser emits an average of 9.7 tonnes of CO₂ equivalent, harming the environment and extending reliance on imported natural gas. Substituting synthetic and mineral fertilisers with organic digestate fertilisers can drastically reduce emissions.
- **Lower costs:** Digestate can be more competitively priced than mineral and other inorganic fertilisers. Locally produced fertiliser can be produced for local soil types and applications, reducing supply chain costs of transportation and logistics. Farmers with high manure loads can also build their own digester to produce their digestate fertiliser locally saving on transport costs, and potentially selling any surplus to create a new income stream.

Benefits for farming

- Digestate as a fertiliser can contain all macronutrients and micronutrients necessary for modern farming. Higher humus content in soil can improve moisture and carbon retention, improving soil fertility, productivity and resilience.
- Global reserves of phosphate are declining. Digestate offers the opportunity to recycle this valuable nutrient from organic waste streams. Organic fertilisers also release more slowly providing nutrients to plants for up to three years (European Biogas Association, Digestate Factsheet, 2019), with a lower risk of leaching into water than mineral fertilisers.

⁶ [European Biogas Association, 'Anaerobic digestion has the potential to reduce global GHG emissions with 10-13%', July 2019.](#)

- Digestate is a safer fertiliser than raw organic material because it has fewer animal and plant pathogens due to the microbial conditions in the digester and after thermal treatment of digestate (where necessary)
- By implementing break or control cropping techniques, there's potential for farmers to use the biomass created through the AD process to offset production costs.
- It can reduce the spread of invasive weeds.

Benefits for the economy and employment

Anaerobic digestion incorporates proven technology, and employs skilled plant constructors, operators and service providers. It offers the possibility of thousands of jobs in regional areas. Regional job creation is, in part, driving anaerobic digestion policy in other countries, for example Denmark, Germany and UK, and would be no less an important political and economic consideration in Australia, too.⁷

Maximising the use and application of anaerobic digestate presents a pivotal strategy for decarbonising the agricultural sector. It embodies a comprehensive strategy that simultaneously addresses emissions reduction, supports resources and fosters economic development—a holistic approach essential for a sustainable and resilient agricultural future.

Supporting the role of renewable liquid fuels and biomethane in agricultural operations (3.3 Fuel and Energy)

As a hard-to-abate sector, agriculture will continue to rely on liquid fuels and gas in the medium to long-term.

The lifespan for legacy infrastructure, vehicles and machinery used within agriculture sectors, can be approximately 15-20 years and upgrading this equipment is both time-consuming and expensive. This means that today's fuel and gas reliant technologies, will continue to be used throughout the medium to long term. Thus, the agriculture sector will require solution to decarbonise their existing technologies.

Drop-in and blended replacement fuels, like renewable diesel, bioethanol and biodiesel are straightforward solutions. These renewable liquid fuels burn in combustion engines, just like traditional petrol or diesel fuels but are cleaner and release fewer emissions. Renewable liquid fuels can be chemically identical to their fossil equivalent and can be used as direct replacements, without requiring significant changes to existing agricultural/farming technologies, infrastructure or vehicles. These fuels are cost-effective, readily deployable and have convenient storage and handling properties.

The renewable liquid fuel industry has demonstrated strong market readiness, with Australia's international peers already taking advantage of the immense benefits it offers. Notably, Australia is already exporting 60 per cent of the canola from Western Australia to Europe to be converted into biofuels, thanks to the incentives for bioenergy production and use in the EU.

⁷ [GHD & Bioenergy Australia, 'Fertile Ground: The role of digestate in Australia's circular economy', April 2022](#)

Furthermore, some agricultural operators cannot fully electrify their heating, refining and reforming processes, and therefore biomethane presents as the only genuine solution for emissions reduction for gas dependent processes. Biomethane is ready for immediate deployment and can be seamlessly integrated into existing gas grids and transmission infrastructure without requiring significant infrastructure upgrades. Notably, production technologies, including anaerobic digestion, are being actively developed in Australia, highlighting the immediate scalability and use of biomethane production. Biomethane is an internationally mature technology and operating at scale. This technology, including grid injection, is driving down emissions globally with 57PJ p.a. produced in the United States, 45PJ p.a. produced in Europe in 2019 and 140 PJ p.a. in Brazil.⁸ The global biomethane industry is also anticipated to generate \$5.5 billion by 2032, having achieved a value of \$3.1 billion in 2022.

Hydrogen and electrification are not currently economically feasible or practicable (noting the remoteness and limited infrastructure in regional Australia) to support all of these operations. When these technologies do develop, they may not be available in time to help Australia achieve its net zero targets.

Renewable liquid fuels and biomethane also offer opportunities for on-site energy production on farms. This can reduce reliance on centralised energy grids and contribute to greater energy independence and security for agricultural operations.

As renewable liquid fuels and biomethane support existing technologies within agriculture and can be seamlessly integrated without the need for expensive upgrading, they offer a cost-effective, immediate and viable long-term solution to significantly reducing carbon emissions within the agriculture sector.

Leveraging Australia's agricultural might to support industry wide decarbonisation (5 Supporting and enabling change)

The renewable liquid fuels and biomethane industries are essential pieces of Australia's decarbonisation strategy and will be essential to replacing traditional fossil fuels used within major hard to abate sectors including aviation, defence, marine, heavy haulage, mining, construction, manufacturing and agriculture.

Bioenergy Australia is heavily engaged with these hard-to-abate sectors and has partnered with some of Australia's largest fuel and gas users in advocating for the development of Australia's renewable liquid fuel and biomethane industries. Throughout our engagement, it's evident that there's a substantial demand for these renewable resources. Yet, the development of our domestic renewable liquid fuel and biomethane industries requires a significant supply of feedstock – Australia's agriculture sector can support this.

The importance of Australia's agricultural feedstock cannot be overstated, representing an estimated **41 percent, or 1066PJ per annum**, of the nation's bioenergy resource potential by 2030. It is crucial to leverage our desirable feedstock position by collaborating with agricultural leaders to utilise locally

⁸ [American Gas Foundation, 2019. European Commission, 2017](#)

grown feedstocks and locally produced wastes into higher value purposes such as renewable liquid fuels and biomethane.

By doing so, agriculture can bolster these industries that have significant decarbonisation potential.

Renewable liquid fuels can be produced from a variety of feedstocks including agricultural residues such as rendered animal fats, tallow, straw, cotton trash, sugarcane bagass, forestry and urban waste streams. It can also use purpose-grown crops such as sugarcane, oilseeds, grass, woody biomass or algae.

The below Figure 1 from the CSIRO SAF Roadmap highlights that each state and territory has its own feedstock advantages. Australia's diverse and abundant feedstock resources offer an opportunity to produce renewable liquid fuels locally, reducing our reliance on imports, where 90% of liquid fuels are presently sourced for Australia. The development of both thermal and biological conversion processes could also ensure maximum utility of agricultural waste, noting Australia has the opportunity to develop its own sovereign capability around these processes.

Thus, a local renewable liquid fuels industry can generate new sovereign capability, sustainability, and economic opportunities.

Figure 1. [Feedstock advantages of Australian states](#)



The renewable liquid fuels potential was highlighted in the [Transitioning Australia's Liquid Fuel Sector: The Role of Renewable Fuels Report](#) which stated that **45 per cent** of the nation's total energy use is from liquid fuels. Therefore, it will be near impossible to decarbonise Australia's economy without the urgent development and deployment of renewable liquid fuels, especially within hard-to-abate sectors like agriculture. The report indicating the following potentials:

- Replacing just 6 per cent of petrol with bioethanol, based on targets, would be the equivalent of taking 730,000 vehicles off the road.
- Replacing 2 per cent of diesel with biodiesel or renewable diesel, based on current targets, would be the equivalent of taking 29,000 rigid trucks off the road.
- Replacing 10 per cent of jet fuel with Sustainable Aviation Fuel, based on airline targets, could be the equivalent of around 220 million less kms flown annually by a Boeing 747.

These potentials can be realised by leveraging our agriculture might into producing these renewable liquid fuels.

Producing renewable liquid fuels domestically from Australian feedstocks will also support Australia's long-term sovereign refining capability and help mitigate the risk of supply disruptions. This is a cross-cutting opportunity that will assist in the decarbonisation of various sectors including industry, transport, energy and the built environment.

However, despite this potential, Australian-produced feedstocks are being locked into long-term supply contracts for export internationally, undermining feedstock use by Australian refiners and operators, resulting in Australia missing out on the economic and sustainability benefits of domestic production. As a result, Australia risks becoming a net importer of a renewable fuel derived from feedstock grown on its soil, and abundantly.

This is a real and immediate threat with Australian feedstocks already being exporting, notably:

- Approximately, two-thirds of Australia's canola oilseed exports are to the EU, largely for biodiesel production, thanks to the incentives for bioenergy production and use in the EU.⁹
- Australia exports 85 per cent of the ~4m tonnes of sugar produced annually from the 30 m tonnes of cane produced, making Australia the [world's second largest](#) exporter of sugar after Brazil. This sugar could be diverted to make ethanol or SAF, as could the [>10m tonnes](#) of dry residual material.
- Australia is already exporting around 72 per cent of the total value of its agricultural, fisheries and forestry production.¹⁰
- There has been over a 30,000 per cent increase in the export of used cooking oil from Australia to the USA from 2020 to 2022.

Furthermore, Australia's vast amounts of feedstock can also play a crucial role in generating biomethane. Biomethane can be produced from agriculture residues, livestock manure, landfills, organic fraction of MSW, FOGO and wastewater sludge. The EU is the largest producer of biomethane, and it is expected that about 50 per cent of the biomethane production in 2030 will come from agricultural waste, including manure and residues.¹¹ Using waste and residues as feedstocks also avoids the land-use issues associated with energy crops.

⁹ [United States Department of Agriculture: Foreign Agricultural Service, 'Biofuels Annual' December 2022](#)

¹⁰ [Snapshot of Australian Agriculture 2023 - DAFF](#)

¹¹ [Biomethane production potentials in the EU \(2022\), prepared by Guidehouse Netherlands B.V. for Gas for Climate](#)

Biomethane can support energy system resilience, maintain existing consumer energy choice and minimise community disruption, as well as enabling least cost decarbonisation for the energy sector. In fact, biomethane can already be blended with natural gas into the existing gas infrastructure providing optionality and enabling least cost emissions reductions for gas users for whom it may not be possible or affordable to electrify, including industrial and vulnerable residential consumers. Biomethane is less expensive than renewable hydrogen in the short-to-medium term and is interchangeable with natural gas without the need to upgrade gas infrastructure or end use appliances and can be scaled quickly.

Australian agriculture is key to decarbonising our nation's gas sector with The Race for 2030 [Onsite Anaerobic Digestion for Power Generation and Natural Gas/Diesel Displacement Report](#) noting agricultural waste could account for **319 PJ/yr** of the overall biogas potential of **371 PJ/yr** in 2050, and landfills, wastewater sludge, livestock manure, and FOGO accounting for the remaining **52 PJ/yr**. This biogas has the possibility of supplying up to 6.2 per cent of Australia's total energy consumption or replace 22.5 per cent of the nation's current fossil gas usage.

There are also emerging solutions and innovations in agriculture that will enable Australian farmers to meet the rapidly rising demand for renewable feedstocks while improving their productivity and sustainability. Advances in plant science, crop management and rotation changes, along with clearly defined sustainability standards and certification systems will enable increased crop-based feedstock production that supports food and fuel security. Australia has natural resources and an agricultural sector with the capabilities and sustainability to meet the growing demand for renewable feedstocks while minimising or avoiding land use change.

Harnessing Australian agricultural feedstock to produce renewable liquid fuels and biomethane also creates vast economic opportunities for the agricultural sector. The Australia's Bioenergy Roadmap (ARENA, November 2021) has stated that **\$10 billion** in GDP per annum could be added to the economy over the next decade with the development of a mature bioenergy sector, along with **26,200 new jobs**, predominantly in regional Australia.¹²

As noted above, utilising locally produced agricultural residues and waste not only can produce highly valued renewable liquid fuels and biomethane but also valuable by-products (such as digestate fertilisers, CO₂, heat, and electricity) which can add significant economic opportunities to farmers and regional Australian communities.

We support the development of a renewable industry that adds value to feedstock that would otherwise be left to decay in fields, burnt off, or exported to international markets, thus, failing to secure this value domestically. It's well past time we capitalise on the strengths of our agricultural sector to secure our domestic benefit.

¹² [Australia's Bioenergy Roadmap, ARENA, 2021](#)

Synergy between the agriculture sector and our renewable industries represents a key piece of the puzzle when it comes to emissions reduction in Australia. Australia's clean energy transition is reliant on the agricultural feedstock potential being realised.

The agriculture sector's ambition to play a leading role in Australia's clean energy transition is clear. However, industry cannot tackle this task alone. It is imperative government create policy frameworks that encourage investment, innovation and deployment in the initiatives mentioned, so that these opportunities can be fully realised, just as they are being realised in Europe and North America. Given our vast agricultural might, our refining capabilities and our renowned ingenuity, Australian agriculture has the opportunity to be a global decarbonisation leader. It is there for the taking.

Thank you for taking the time to consider our submission. [REDACTED]

[REDACTED]

Sincerely,

[REDACTED]

Shahana McKenzie
CEO Bioenergy Australia