Final Report

Pathway to carbon neutral – life cycle analysis in almond orchards

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AL20005

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Pathway to carbon neutral – life cycle analysis in almond orchards (AL20005)

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Public summary

With a growing interest in greenhouse gas emissions reductions, climate risk, carbon disclosure reporting and environmental, social and corporate governance (ESG), Edge was commissioned to conduct a Lifecycle Assessment (LCA) on the Australian almond industry. Working closely with the Almond Board of Australia (ABA), Edge began the project by conducting a Benchmarking Report, comparing domestic and international LCA studies from the almond industry with five other comparable industries. This report found the existing LCA studies conducted on individual Australian and international almond orchards to sit fifth out of the eight industries, comparing Global Warming Potential, land use, water consumption and co-product generation. The most significant insight gained from this report was the similarity in impacts between all industries except the beef industry, which dwarfed the other industries by more than a tenfold in its' GWP impact.

While developing the Benchmarking Report, Edge began connecting with growers and processors within the Australian almond industry and collecting the required data to conduct the Lifecycle Assessment. This process took a number of iterations with the industry members and ABA as the working group refined the data required to accurately capture and represent the industry's impacts. The finalised results were summarised in the LCA Report detailing the scope, methodology, assumptions and GWP results broken down across growers, processors and impact categories. The key findings identified electricity and fertiliser impacts contributing 63% of the total GWP impact for growers and processors, with fertiliser production dominating the impacts for growers and fumigant use dominating the impacts for processors.

Edge then held a mitigation workshop with a group of industry stakeholders to gather insights into which mitigation initiatives were already being practiced, along with the perceptions of other initiatives applied in the industry. This list was refined working closely with ABA and categorised into 'quick wins', 'incremental changes' and 'major projects', catering for industry members at any stage of their carbon reduction journey.

The risks associated with the industry implementing these changes were researched and unpacked in Edge's 'White paper'. This document summarises research and insights gathered from conversations with Climate Active, the Clean Energy Regulator and private carbon project developers, highlighting the key opportunities to enhance the industry's sustainability. This whole process was then summarised into an article for In A Nutshell, helping communicate the findings to the wider industry while positioning ABA as the industry's epicenter of sustainable and strategic leadership. Finally, the resulting initiatives from the mitigation workshop were assessed for modeling and behaviour change considerations, including cost benefits associated to switching from existing practice to the alternatives, and other behaviour change levers. This analysis was aligned to the Action Plan, summarising the opportunities available for the industry to transition towards net zero.

To further enable and inform the industry of their individual impacts and opportunities, Edge has created an interactive LCA tool for public release. This places the LCA results in the hands of each grower and processor, revealing the changing hotspots and opportunity areas as the user modifies their inputs.

Keywords

Almonds; Lifecycle Assessment; growers; processors; net zero; mitigation; behaviour change; action plan

Introduction

The Australian almond industry has experienced significant growth, providing high-quality and nutritious food both domestically and internationally. However, like other sectors in the agricultural and food supply chain, it now faces heightened scrutiny related to environmental, social, and corporate governance (ESG), primarily focused on the reduction of greenhouse gas emissions. Influential factors include increased consumer demand pressuring major retailers, along with investor, legal, and regulatory emphasis on climate risk and carbon disclosure reporting.

On a global scale, the almond industry contends that it can achieve low-carbon, sustainable production. Yet, in an era where regulators intensify their focus on preventing greenwashing, substantiating these claims with regional industry-specific data becomes essential. This necessity is expected to grow as climate disclosure reporting becomes mandatory and international carbon pricing, exemplified by initiatives like the European Union's carbon tariff, gains traction. Accordingly, conducting a comprehensive life cycle assessment (LCA) for the Australian almond industry becomes an imperative. This necessarily considers the entire production process, from on-farm nut collection to transportation, processing, and innovations in orchard management. Beyond environmental considerations, the industry has an opportunity to enhance

awareness of its environmental footprint and explore engagement with the expanding carbon offset market in Australia.

Methodology

STAGE 1 - LIFE CYCLE ASSESSMENT FOR THE ALMOND INDUSTRY

a. Project Inception - At the inception meeting, key team members met with Hort Innovation to review and detail the project plan, scope, deliverables, and project communication. Interaction with the almond industry was deemed essential for project success, necessitating the presentation of a stakeholder engagement/ communication plan. This identified the target audience, including the Almond Board of Australia, major producers (e.g., Select Harvests, CMV Farms), hullers and shellers and processors (e.g., Almondco Australia).

b. Boundary setting and data collection - A key step was setting the boundaries of the LCA. Based on industry understanding, an LCA of raw, inshell, and agreed processed products was undertaken, involving primary data collection across the production and processing chain. Different-sized growers and representatives from various states were engaged to generate assumptions about the industry-wide footprint. Edge developed an RFI template to facilitate data collection.

c. Data review - Edge reviewed the submitted data for completeness and range, identifying outliers. After checking the quality of primary data, any gaps were filled using publicly available information.

d. Undertake the LCA - With all required data and assumptions in place, the team began the assessment, aligning with the Greenhouse Gas Protocol and LCA standards ISO 14040/44. The analysis considered learnings from the Californian almond industry, utilizing LCA databases like AusLCI, Ecoinvent, and Agri Footprint. The LCA accounted for Scope 1 and 2 emissions from various stages of almond production and processing.

e. Benchmarking - Desktop research identified the carbon footprint for almonds globally and for other food products, enabling industry comparison.

f. Summary report - The analysis was presented in a short PowerPoint report, outlining the methodological approach, assumptions, and summary graphics for effective communication.

STAGE 2 - IDENTIFY MITIGATION OPTIONS

a. Mitigation options research - The team conducted desktop research to identify and specify potential mitigation initiatives, drawing on various sources, including industry case studies and Science Based Targets.

b. Mitigation workshop - A three-hour interactive workshop convened with key stakeholders to review initiatives identified through research, prioritize based on effort and impact, and select a short list for further modeling.

c. Mitigation analysis - The selected initiatives were researched in detail and applied to the footprint model. A marginal abatement cost analysis provided a breakdown of anticipated costs per tonne of carbon abated.

d. Carbon mitigation analysis report - A PowerPoint report summarized the footprint analysis, mitigation opportunities, marginal cost analysis, methodology, data comments, and recommendations for achieving carbon neutrality.

STAGE 3 – CARBON MARKET METHODS AND MITIGATING TRANSITION RISK

During this stage, Edge engaged with the Clean Energy Regulator and Climate Active to explore on-farm activities eligible for Australian Carbon Credit Units (ACCU) generation. The team also collated information on transition risk and nature impact accounting, presenting interim findings in a Discussion Paper.

STAGE 4 - COMMUNICATION AND AWARENESS RAISING

To raise awareness, a three-pronged approach was proposed: articulate, co-create, and amplify.

a. Articulate - Insights gathered through stakeholder engagement informed the communication strategy, detailing key

audiences, their states, and desired outcomes.

b. Co-create - A co-creation model involved select stakeholders in reviewing interim communications approaches, resulting in branded templates, infographics, and presentations.

c. Amplify - The final stage aimed to amplify awareness through webinars, articles, editable presentations, and a channel plan for continued engagement.

d. Dynamic LCA tool - A dynamic tool, aligning with the Greenhouse Gas Protocol and LCA standards ISO 14040/44, was delivered for regular updates on industry members' emissions profiles.

Results and discussion

The breakdown of GWP-total is presented below in Figure 1, accounting for an industry-wide average of 1.71 kg CO_2 eq./kg kernel for growers and 0.41 kg CO_2 eq./kg kernel for processors (2.12 kg CO_2 eq./kg kernel total), being consistent with the reported data available in open sources – the Californian industry LCA indicates a GWP value of 2.39 kg CO_2/kg almond kernel*.

As can be seen, the major contributor to GWP-total is GWP-fossil. In most cases, the GWP-biogenic and GWP-land transformation values are very minor (<1%). Electricity (irrigation related) is the most significant contributor to GWP (fossil) values, followed by pest control and fertilisers (breakdown shown page 14).

Biogenic (carbon derived from biomass) and land transformation emissions are highly contextual and require a unique approach, especially in the agricultural context. Land transformation related carbon emissions originate mostly from the clearing of land, leading to a net reduction in the carbon content of agricultural soils because of oxidation, where they are not replaced by an equivalent amount of carbon in woody mass or soil over the same land.

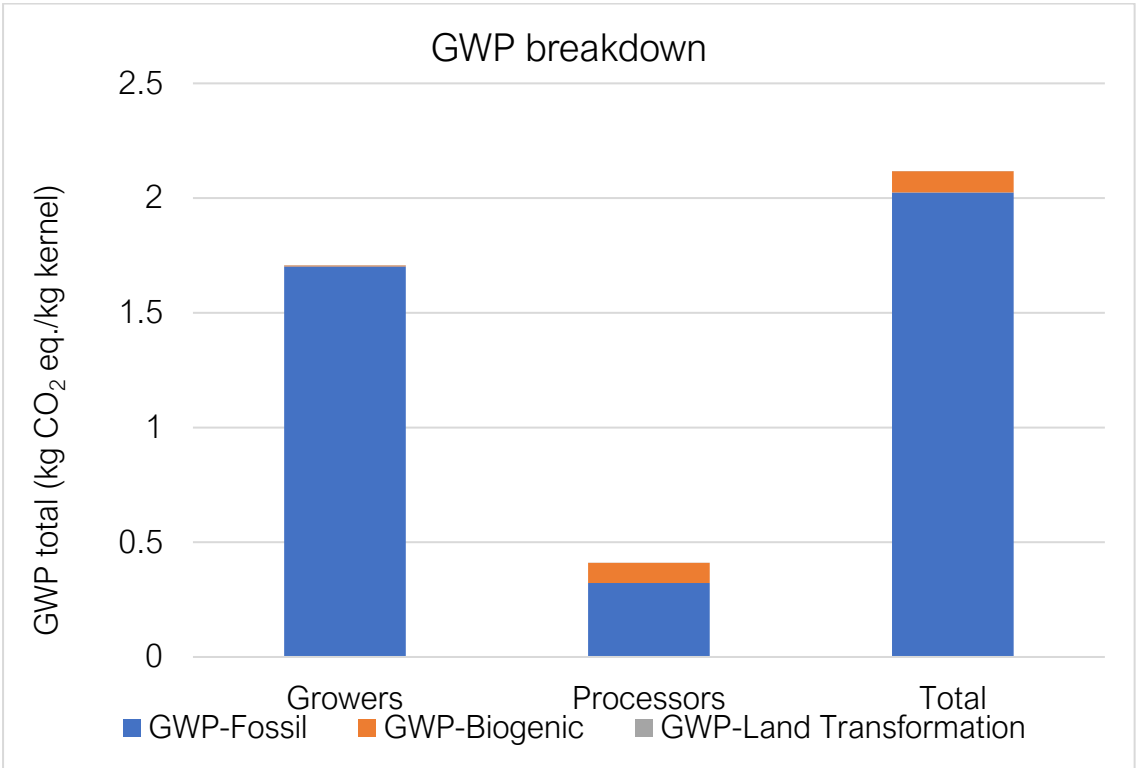

Figure 1. Breakdown of GWP-total.

Figure 2 below highlights how electricity contributes the highest GWP impact overall (26%). However, fertiliser production and use contribute most (37%) when combined as the same source. Pest management contributes 15% to the total GWP and fumigants 8%. Addressing these key hotspot areas covers 86% of the industry's GWP impact.

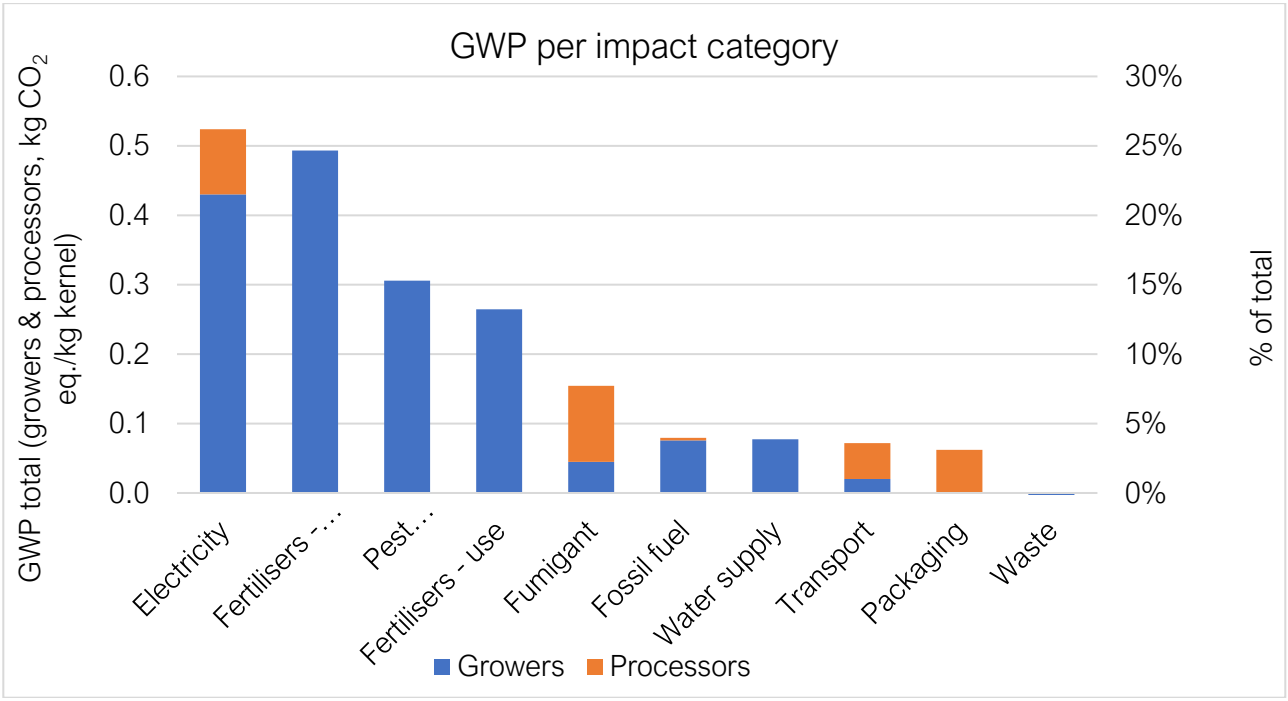

Figure 2. GWP per impact category.

Figure 3 below highlights how 87% of GWP impacts in the growing stage are associated with fertiliser production, electricity use, pest management and fertiliser use. The water supply impact accounts for impacts associated to externally sourced water only. Impacts from water sourced from natural reserves (private diversion and/ or ground water) are captured in electricity and fossil fuel categories. Average irrigated water use is 3.29 m^3/ kg kernel (both natural reserves and externally sourced), significantly below the reported California data available in open sources*.

The fumigant category refers to fumigants used on stockpiles applied on farm. While five growers apply fumigants, only one uses sulfuryl fluoride which contributes 99.9% of this impact category. Transport refers to truck transport between grower and processing facilities only. It does not include distribution of products from processing facilities. Waste data was mostly unavailable due to limited records. Data that was provided has a small impact compared to other areas.

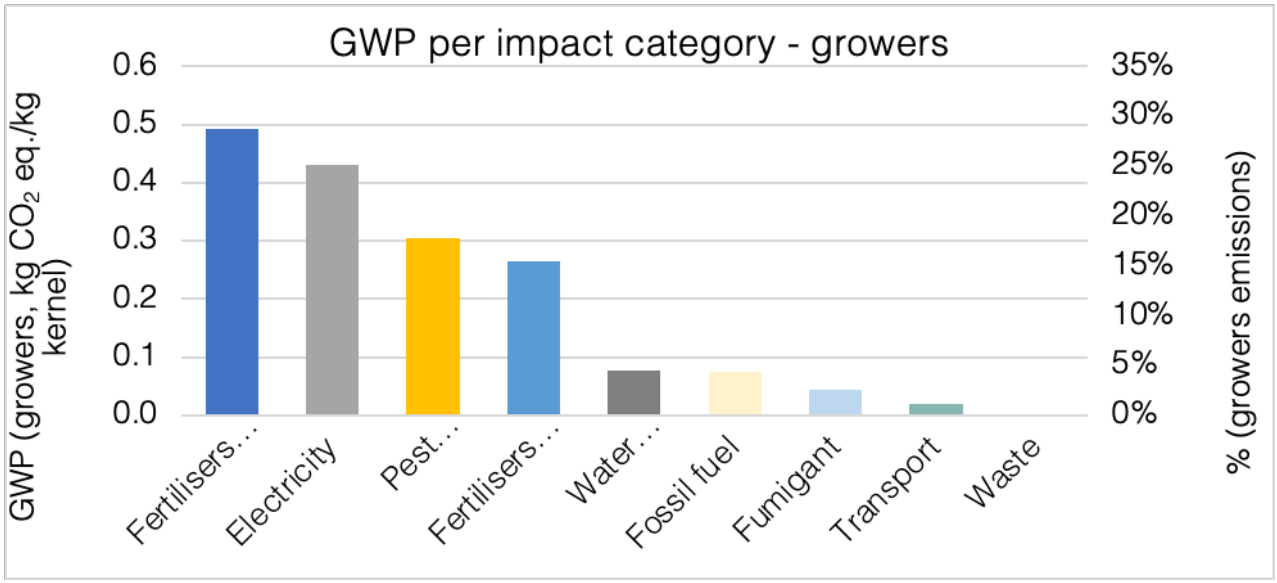

Figure 3. GWP per impact category, growers.

Figure 4 below shows fumigation as the highest impact (34%) out of all impact categories for processors, followed by electricity. All three processors use fumigants, yet as with growers, only one processor applies sulfuryl fluoride, contributing 99.9% of this impact category. As with growers, fumigation impacts can almost be eliminated through application of lower impact fumigants, and electricity impacts can be reduced with renewable sources such as solar pumps and solar panels.

Packaging and transport involve packing and transporting almond kernel via truck or ship to customer destinations in Australia or overseas. These impacts are included to account for Scope 3 emissions related to the processing facilities. Waste related impacts were insignificant compared to other categories.

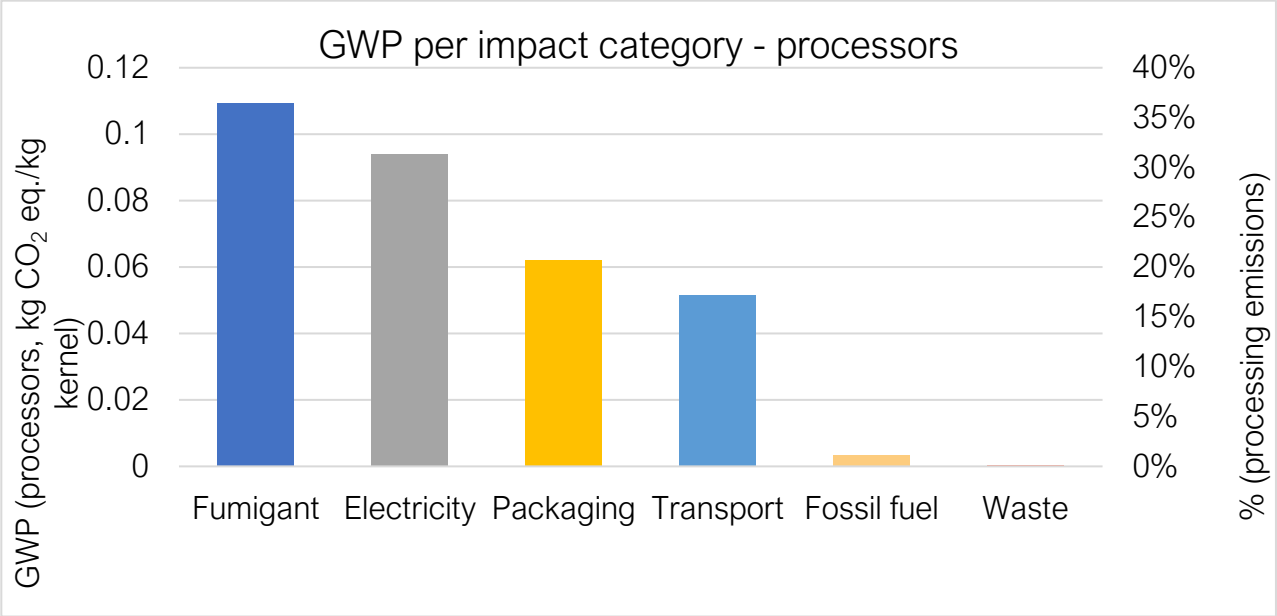

Figure 4. GWP per impact category, processors.

The average GWP value at the growing stage is 1.71 kg CO_2 eq./kg kernel being consistent with open-source literature on almond production globally. The average GWP contribution from processors is 0.41 kg CO_2 eq./kg kernel. This accounts for 19.3% of the net GWP of almond production, resulting in a total of
2.12 kg CO_2 eq.

The major contributing factors to the footprint are synthetic nitrogen-based fertiliser production and use, electricity use, pest control chemicals production and their use (energy use and other equipment emissions), and fumigation, accounting for 86% of the industry's total GWP impact. There appears to be considerable mitigation options available to the industry as a result, which will be explored in future work.
The impact of water use is captured in the 'water supply' category for growers sourcing irrigation water externally, and within the 'electricity' category for growers drawing from natural reserves. These are highly seasonable variables which can have a significant impact on the total footprint. For this reason, annual collection of this data is valuable.

Outputs

Table 1. Output summary

Output	Description	Detail
LCA Benchmarking Report	The benchmarking report summarises the global warming potential (GWP), land use, water consumption and co-product generations per commodity per kg of product. Oat grain, wine, dairy, cotton, pistachio and beef were chosen as well as other almond LCA's due to their similar cultivation and water consumption requirements.	Overall, beef shows an order of magnitude higher impacts for GWP and land use compared to the rest. Cotton production also showed a high land use (considering the land use data that was provided within the LCA's), leaving the remaining commodities and impact categories within a similar comparison band. Almond production was found to place fourth, behind oat grain, wine and dairy, respectively.
Stakeholder Engagement Plan	The plan sets out an engagement pathway with the key stakeholder group during the implementation of the project.	The overall framework follows an inform, consult, involve, collaborate and empower approach. An engagement schedule is prepared from the presentation of LCA findings, behavior change workshop, mitigation anaylsis report, industry benchmarking tool/ calculator and final report summarising all project deliverables.
Almond LCA Report	The almond LCA report provides an LCA of almond production in Australia, capturing impacts from growers and processors focusing mainly on GWP value per kg almond kernel produced.	Overall, a net GWP between 1.74 - 2.24 kg CO2 eq./kg kernel was calculated across large and small growers and processors throughout the Sunraysia, Riverland and Riverina regions. Focusing on pre-processing GWP average values lie between 1.4 - 1.9 kg CO2 eq./ kg kernel which is consistent with open-source literature.
Mitigation Action Plan Report	Prioritised shortlist of candidate mitigation options for the industry to explore according to the LCA hotspots.	Taking into account cost, variability between orchards and the differences in sustainability maturity between all growers and processors in Australia, an action plan identified nine priority initiatives for the industry to consider in pursuing a low carbon position. These varied between quick and simple fixes (switching fertilisers and transition irrigation to solar power), step changes in orchard management for longer term impact (cover planting, switching fumigants, nitrogen efficiencies and repurposing of offcuts) and major projects for the industry to progress (biochar, biofertilizers and widescale renewables). Each priority area is stepped out, detailing its impact on emissions, costs and feasibility and risks and considerations. The action plan therefore provides a range of options in a user-friendly and relatable way.
LCA Presentation	LCA Presentation for ABA to provide to industry representatives, growers and processors.	This presentation details the project's LCA method and outputs in a clearly communicable format which can be used by ABA to engage industry on the topic.

In A Nutshell article	Article written to be published in In A Nutshell to help garner attention and interest in the study and its initiatives.	An article articulating the broad scope of sustainability issues for the almond industry, highlighting the role ABA and Hort have played in understanding emissions as a key issue of focus. The article reflects on the results of the LCA, differentiates between the various scopes of emissions as they relate to the almond industry, and identifying the hotspots discovered through the LCA of nitrogen based fertiliser, electricity and water use, pest and disease control and chemical use, and fumigation use.

White Paper	White paper written to explore the key risks for the industry transitioning towards increased sustainability, according to insights from leading industry bodies in carbon markets.	A longer form discussion paper which considers the broad range of sustainability risks and opportunities for the almond industry.
		
		The paper identifies that the Industry has several key sustainability risks that need to be managed to ensure long-term viability which include:
		• Pollination
		• Access to water
		• Financial viability
		• Climate variability
		• Transition risks
		  o Market appetite for low-carbon products
		  o Access into low-carbon markets
		  o Consumer sentiment
		
		The paper suggests there are a number of opportunities available that can reduce the Industry's environmental impacts, and through desktop research and the LCA conducted as part of this project, identified three key areas that can reduce the direct environmental impacts while having a beneficial or neutral impact on operations. These are:
		• Shifting to low-emission nutrients and fertilisers
		• Shifting to renewable energy sources
		• Further develop the potential valorisation or reuse of by-products.
		
		Further to this, embracing regenerative farming practices and carbon-reducing activities were recognised for their ability to contribute to building a resilient industry.

Channel Plan	A plan designed for ABA helping identify what actions and approaches to take	A high-level document identifying the primary communication channels to engage the

	across their key channels (e.g., website, social media, etc).	industry's key audiences on these key topics, and in doing so demonstrate to the audiences ABA's and Hort Innovation's activities and requests for industry support. The key channels identified were the website, social media, the quarterly e-magazine, e-newsletter, industry events; leveraging targeted stakeholder engagement, cross promotional opportunities and ongoing monitoring and evaluation to measure progress that can be communicated back to the industry.
LCA Tool	"Industry benchmarking tool" for industry members to input their businesses variables and understand their environmental impacts.	An Excel-based Tool which provides growers and processors with the ability to measure their individual carbon footprints utilizing the same method applied for the industry as a whole.

Outcomes

Table 2. Outcome summary

Outcome	Alignment to fund outcome, strategy and KPI	Description	Evidence
Providing a platform for cohesion among the working group of growers, facilitating an easier transition towards potential End-Of-Project outcomes	Outcomes 1, strategy 8 and associated KPIs Outcome 4, strategy 3 and the 2nd KPI		• Edge facilitated a Mitigation Workshop which brought together a spectrum of industry members to discuss and work through a number of exercises. • Edge also presented at the Almond Industry's R&D forum in Robinvale, delivering the results to the 100+ group of industry members. Edge worked very closely with each grower and processor involved during the data gathering stage, ensuring the process was simple and efficient. • Individual reports were then sent to each participant, helping facilitate the comprehension and transition for each member.
Building trusting relationships with growers throughout the project, helping gain valuable insights into almond farming and assisting in the communication of potential recommendations to change practices			As above, Edge was in constant communication with growers and processors during the data collection stage. A number of these members then joined in the workshop, and then were present at the R&D forum to connect with in person.
Improve understanding of the emissions associated with the almond industry		The LCA report clearly reveals the emissions profile of the almond industry and the LCA Tool helps the industry understand these emissions per property. The Communications Plan helps steer ABA towards publishing the information for maximum uptake.	Feedback provided from ABA on the tool. Feedback from the LCA presentation at the almond R&D Forum. Ongoing engagement with growers and processors, who demonstrated increased understanding of the nuances associated with the industry's carbon footprinting exercise.
Identify ways that the industry can progressively reduce its emissions.		The Mitigation Action Plan clearly details the key mitigation initiatives available to help address	Feedback from ABA and industry confirmed the identified emissions reduction initiatives to be relevant to, and capable of implementing

		the industry's main emission hotspots. The risks associated with this transition are researched and provided in the White Paper document on carbon markets.	for, the Australian almond industry. These are described in the Action Plan in a format that is easily understandable for the industry and accessible for ease of industry adoption.
Understand the risks posed to the industry by the transition to a low carbon economy.		These risks are unpacked in the White Paper	The White Paper addressed the variety of risks presenting to the Australian almond industry, presenting both the current challenges but also the opportunities for leadership in the carbon market.

Monitoring and evaluation

Table 3. Key Evaluation Questions

Key Evaluation Question	Project performance	Continuous improvement opportunities
To what extent has the project achieved its expected outcomes?	The project has fully achieved the outcomes stated above, especially the latter outcomes involving the industry's understanding of its emissions, ways to reduce them and risks associated to the transitions.	
How relevant was the project to the needs of intended beneficiaries?	The project directly addresses the impacts, mitigation options and action plan for growers and processors, broken down by category, with all assumptions clearly stated.	The project illustrated somewhat divergent needs of project participants, depending on the size and sophistication of their operations. In future, consider separating the two groups to ensure project outcomes are appropriate for all stakeholders.
How well have intended beneficiaries been engaged in the project?	The growers and processors have been continuously engaged throughout the entirety of the project. Edge has reached out directly during the data collection stage, and worked with ABA who represents their industry members. Members were also directly engaged at the Mitigation Workshop and the R&D Forum event. Each grower and processor was also sent an individual report, comparing their site's impact versus the average.	
To what extent were engagement processes appropriate to the target audience/s of the project?	Each engagement was directly beneficial and appropriate to the growers and processors.	Time in various workshops was limited. Pre-reading materials ensures only relevant information is discussed in

		workshops and stakeholders feel like their time is used efficiently.
What efforts did the project make to improve efficiency?	Request For Information (RFI) sheets were created before reaching out to growers and processors, ensuring each member was providing the same information. When questions would arise regarding data collection, Edge would address the relevant members all at once via email, while keeping identities anonymous.	

Recommendations

This project provides a clear assessment of the key topics of focus for the Australian almond industry in transitioning to a low carbon future in order to maintain market access, avoid consumer scrutiny and ultimately support farmer objectives.

It is recommended that ABA and Hort Innovation continue in their support of the broader industry's comprehension of the carbon markets, leveraging the work conducted through this project to instill and awareness and appreciation for the primary challenges and opportunities associated with understanding the role of carbon in almond production.

It is recommended that Hort Innovation / ABA act on the recommendations of the Communications Plan in developing a unique, strategic platform with which the industry can take the action recommended by the Mitigation Action Plan.

This would include but is not limited to:

- An industry-wide roll out of the LCA Tool
- A strategic campaign to increase industry awareness of the study, highlighting the opportunities available to industry from understanding and leveraging the materials produced
- Ongoing communications with industry members to maintain the momentum created through the project lifetime; supporting individual use of the LCA tool, opportunities to share and reflect on findings, shared learnings between large commercial growers and smaller family farms.

Nine priority initiatives make up the action plan for reducing carbon emissions in the almond industry.

You can choose to take up one or more of these initiatives as your contribution to carbon emissions reduction for the industry.

To make it easier for you to review and self-select your next steps, we've put these into three categories:

Quick and simple: make the switch and get results in a single season

- Switching fertilisers: delivering the same soil nutrients with less product
- Solar-powered irrigation: replacing pumps to save on electricity

Next level: a step change in orchard management for longer term impact

- Cover planting to boost nitrogen: reducing fertiliser and water use
- Switching fumigants: making the change to a lower emissions alternative
- Understanding nitrogen needs: targeting efficient fertiliser application
- Returning offcuts to orchards: putting wood and prunings to better use

Advanced: major projects to lock in future benefits for business and carbon emissions

- Biochar production: turning orchard offcuts into fertiliser
- Biofertilisers: a long-term solution for soil health and crop nutrients
- Renewable energy: onsite or through the energy grid

According to our modelling, three priority initiatives were found to deliver the greatest reduction in carbon emissions:

- **Biochar production:** turning orchard offcuts into fertiliser
- **Solar-powered irrigation:** replacing pumps to save on electricity
- **Switching fumigants:** making the change to a lower emissions alternative

Key considerations

Update nutrient management plans prior to introducing **biochar** and **biofertilisers** to avoid excessive use of key nutrients and minerals.

Extra benefits

Beyond a reduced carbon footprint, almond growers can expect additional benefits from the following initiatives:

- Improvements to soil structure, microbial activity and nutrient cycling can be achieved from **cover planting to boost nitrogen** and **returning offcuts to orchards** as mulch and compost.
- Moving to **solar-powered irrigation** creates an opportunity to redesign irrigation systems to improve water efficiency and water retention in soils.

References

Bartzas G., Vamvuka D., Komnitsas K. 2017. Comparative life cycle assessment of pistachio, almond and apple production.

Kendall A., Marvinney E., Brodt S., Zhu W. 2015. Life cycle-based assessment of energy use and greenhouse gas emissions in almond production, part 1.

Marvinney E., Kendall A. 2021. A scalable and spatiotemporally resolved agricultural life cycle assessment of California almonds.

Roer A., Korsaeth A., Henrikson T., Michelson O., Stromman A. 2012. The influence of system boundaries on life cycle assessment of grain production in central southeast Norway.

Viana L.R. et al. 2023. Life Cycle Assessment of Oat Flake Production with Two End-of-Life Options for Agro-Industrial Residue Management.

Benedetto G. 2013. The environmental impact of a Sardinian wine by partial Life cycle Assessment

Amienyo D., Camilleri C., Azapagic A. 2014. Environmental impacts of consumption of Australian red wine in the UK.

Berton M. et al. 2021. Environmental impacts of milk production and processing in the Eastern Alps: A “cradle-to-dairy gate” LCA approach.

Gollnow S. et al. 2010. Carbon footprint of milk production from dairy cows in Australia.

Hedayati M., Brock P., Nachimutha G., Schwenke G. 2019. Farm-level strategies to reduce the life cycle greenhouse gas emissions of cotton production: An Australian perspective.

Shah P., Bansal A., Kumar Singh R. 2018. Life cycle assessment of organic, BCI and conventional cotton: A comparative study of cotton cultivation practices in India.

Bartzas G., Vamvuka D., Komnitsas K. 2017. Comparative life cycle assessment of pistachio, almond and apple production.

Marvinney E., Kendall A., Brodt S. 2014. A comparative assessment of greenhouse gas emissions in California almond, pistachio, and walnut production.

Asem-Hiablie S., Battagliese T., Stackhouse-Lawson K., Rotz A. 2018. A life cycle assessment of the environmental impacts of a beef system in the USA.

Wiedemann S.G., et al. 2015. Australian Beef Industry 35-year environmental impact trends analysis.

Intellectual property

No project IP or commercialisation to report

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