



ESG Credentials for Australian Pork

This Food Agility CRC project investigated how measuring, managing, and communicating ESG metrics could help to differentiate the Australian pork industry in global markets.

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BEANSTALK



Department of
Primary Industries and
Regional Development



Curtin University

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PROJECT DESCRIPTION

The overarching objective of this project was to equip the Australian pork industry to differentiate itself globally, ensuring readiness for evolving market and regulatory requirements. This objective is achieved through several outcomes, of which the primary one was the development of an Australian-first digital sustainability platform for the pork industry, underpinned by robust research into global ESG benchmarks and technology adoption. This platform is designed to build industry trust and deliver improved welfare and market outcomes for producers by enabling transparent, high-integrity, reporting of key sustainability metrics. Additional project outcomes included assessing the feasibility of launching one of the first carbon-neutral pork brands and benchmarking best-in-class ESG practices and technologies within the sector.

Lean Canvas

Project Name: FA136 – Building a world-class, digitally enabled, platform to enable supply chain sustainability in the pork industry

Completed by: Project team **Project Start:** January 2024 **Project Finish:** September 2025

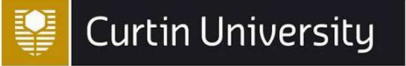
1. End-Users	- Western Australian pork producers -> national and global pork producers - Mid AND Larger producers with mid-large herd/group sizes - Retailers who need to prove and communicate sustainability to customers - Such as Coles, Woolworths, NAB, CBA domestically as well as international distributors and retailers (e.g. Costco) - Consumers and the general public Early-Adopter - Craig Mostyn Group (here after “CMG”) Other value chain beneficiaries - AgVet providers - Animal welfare groups - Financiers such as banks who need to prove their ESG commitments - Regulators (e.g. evidence of an effective system for managing welfare) - Industry quality assurance program (APL)
2. End-User Problem(s)	Providing ESG proof points is increasingly a right-to-play domestically and globally. Retailers, financiers ad regulators are

	increasingly requiring high-integrity evidence of sustainability metrics as a right-to-do-business. • There is currently limited ability of the pork industry to validate ESG claims on a global market, and capture the associated product differentiation benefits and price uplift • Significant productivity and economic losses due to mortality and negative health outcomes of sows (e.g. 30%+ loss p.a.) Today's alternative solutions • Manual ESG data collection and limited ability to communicate progress to key users • Herds' most valuable animals (sows) are replaced in the absence of evidence-based decisions
3. Unique Value Proposition	• Industry-first ability to integrate key welfare data sets to drive significant long term, social licence, value for CMG production systems and the industry • Reduced reputational and regulatory risk in key markets through ability to provide proof points behind claims and show real-time, high integrity data sets to validate sustainability progress • Ability to differentiate products in key export markets • Reduced losses in sows due to early intervention, better treatment outcomes and reduced mortality • More profitable pig production and improved welfare outcomes
4. Our Solution	1. New and existing research into customer-centric sustainability drivers in key markets (US vs Europe vs Asia) to understand the key differences in attitudes and convert this research into unique selling propositions for the Australian Pork industry 2. Utilise leading-edge digital tools (e.g. Power BI, Alteryx and advanced analytics) to build a suite of industry-first, digital, sustainability dashboards with deep dives on key welfare topics (e.g. sow-specific welfare data to form the foundation of reducing the 30%+ replacement rate of Sows, likely involving machine learning or other advanced analytics to identify patterns in key variables that affect sow health and welfare) 3. Research to identify the key opportunities to lower carbon footprint on CMG properties, building on existing emissions benchmarking work 4. Undertake a feasibility analysis of what it would take to launch one of the first carbon neutral pork brands in Australia that isn't offset primarily by purchasing carbon credits, but rather on-farm emissions reductions. 5. Building an industry roadmap to differentiate Australian pork on a global scale

5. Key Results	• # of customers/retailers/financiers who view dashboards as part of negotiations • Improvement on key welfare metrics (e.g. % reduction in Sow Replacement Rate, carbon footprint) • % price uplift in key brands • # or % of reduced sow hospitalisation/ mortality rate in tagged pens • \$ saved in losses by CMG
6. Partners + Team	Partners • CMG • Beanstalk Agtech • Curtin University • Xsights • PIWA • DPIRD Team • Megan Trezona, Michael Garrett, Rob Wilson, Emalyn Loudon, Karen Moore, Elizabeth Jackson, Bruce Mullan, Grant Gilmour, Anwar Sadat Shimul, Yuet Hong Tham, Ming Fung Chua, Lily Tao
7. Pathways to Scale / Impact	• Key dashboards can be made customer-facing in the future to provide proof-points to ESG claims to differentiate both CMG brands and the WA Pork industry globally • Curtin research findings and Beanstalk algorithms and dashboard technology will be documented, scaled to CMG and beyond • PIWA and partners will help facilitate knowledge transfer and adoption
8. Data Sets	To be created in project: • Welfare data- vet data, temperature, weight data etc • XIoT Health Tag data (temperature, movement, location, humidity & others coming soon) • Environmental data – e.g. Carbon baseline, emission intensity etc • CMG People data – e.g. diversity balance, turnover rate • Sow health updates (medication, hospitalisations, mortality)
9. Research Questions	• What are the key ESG metrics/sustainability drivers to track for key markets (US vs Europe vs Asia) based on differences in attitudes • What are the likely uplift scenarios in volume (through product differentiation) and price (through sustainability claims) in key markets? • Can an evidence-based decision-making approach reduce the replacement rate of Sows?

	How can the pork industry best assess and adopt emerging technology – what guiding principles and lessons are relevant?
10. Highest Risk Assumptions	- Existing data is made available to the project (e.g. historical sow performance, e.g. replacement rate) - XiOT data is able to accurately capture temperature on Sows - In the short term the security of the dashboards and data will be critical until improvement can be shown - Need to ensure there are clear data governance policies and procedures in place

PROJECT PARTNERS

Partner	Description
Beanstalk AgTech 	Beanstalk is a leading ventures and advisory firm dedicated to driving profitable and sustainable agrifood systems. Bold founders and innovative agribusinesses turn to us for insights, capital and connections. In an uncertain world, we work together to harness technology and meet the challenges of the future. From the field to boardroom, concept to scale, Beanstalk delivers impact to power resilience in agriculture.
Curtin University of Technology 	Curtin is an innovative, global university known for its high-impact research, strong industry partnerships and commitment to preparing you for jobs of the future.
Craig Mostyn Group 	Industry Partner - Craig Mostyn Group is one of Australia's oldest, largest, and most trusted family-owned food and agricultural businesses. With a history tracing back to 1923, Craig Mostyn Group has established itself as the trusted source, consistently delivering high quality produce to local and international markets. We produce fresh pork, beef, lamb, abalone, protein meal and tallow for our food service, retail and wholesale customers domestically and abroad. The CMG vision is to be the trusted source of food for families in Australia and around the world.

WA Department of Primary Industries and Regional Development  Department of Primary Industries and Regional Development GOVERNMENT OF WESTERN AUSTRALIA	The Department of Primary Industries and Regional Development (DPIRD) is the Western Australian government agency responsible for supporting primary industries and regional economies. DPIRD's mandate brings together agriculture, food, fisheries, and regional development under a single framework to ensure coordinated policy, regulation, and research. DPIRD's mission is to grow, protect, innovate. Grow covers the efforts to expand and diversify agriculture, aquaculture, and food industries, alongside broader regional economic development. Protect covers DPIRD's statutory responsibilities to biosecurity, pest and disease control, natural resource stewardship, and fisheries management, ensuring that industry growth does not compromise environmental or community resilience. Innovate reflects DPIRD's role in applied science and technology, using research facilities and field stations to develop and extend new knowledge across crops, livestock, aquaculture, and climate adaptation.
Xsights Digital 	Technology Partner - The Xsights Mission is 'To empower decision making through affordable data collection and insight reporting'. Since incorporation, Xsights has developed scalable 'plug and play' solutions that collect valuable real-time location data on assets using Internet of Things (IoT) devices, offered as a SaaS ('Sensing as a Service') subscription. Xsights is committed to raising awareness for our award winning Xsights IoT Tag (XIoT), for the global agricultural industry, as a scalable solution, for Provenance & Traceability of

	Agrifood, and Health & Wellbeing Monitoring of Livestock. Xsights is also committed to ensuring we continue to establish new partnerships and collaborations, expand our customer base, and secure new funding opportunities to build new markets within the Agri-tech community for the XIoT Tag solution.
Pork Innovation WA 	Pork Innovation WA Inc (PIWA) is a not-for-profit research and development provider led by the WA pork industry. PIWA aims to promote the research, development and extension of science to improve the efficiency, productivity and sustainability of the WA pork industry. It does this through bringing together stakeholders to conduct research projects and disseminate research outcomes and promote the uptake of new technologies.
Food Agility CRC 	Innovation Partner - Food Agility makes innovation easier. We broker, design and deliver innovation programs for the Australian agrifood industry, ensuring maximum impact for investment. We specialise in using data and digital technology to increase profits and improve sustainability. We have a strong track record, with a \$400m+ portfolio that includes discrete, agile research projects through to major initiatives of national and global significance. Our team, board and network of 117 project partners span the agrifood, technology, research and government sectors.

EXECUTIVE SUMMARY

Overview

This report presents the outcomes of the FA136 program—a major, multi-partner research initiative focused on advancing Environmental, Social, and Governance (ESG) capability and decarbonisation within the Australian pork industry. The project developed a pioneering suite of digital sustainability dashboards, conducted a comprehensive feasibility analysis for carbon neutral pork branding and lower footprint production, benchmarked global best practices, reviewed emerging technology for lairage and welfare, and established a roadmap for industry-wide ESG differentiation.

Importance of the Research and Impact

This research was undertaken at a time of rapidly rising expectations for ESG data, climate disclosures, and supply chain transparency in agrifood markets. The evidence base generated is pivotal for ensuring the industry remains competitive, secures continued access to retail and export markets, and builds new market opportunities through sustainability leadership.

The primary outcome of the project was to develop a suite of industry leading ESG dashboards. To do this Beanstalk AgTech leveraged the research on sustainability metrics, stakeholder-driven metric prioritisation, and analytics visualisation capability to develop a series of dashboards that enhancing the usefulness and uptake of the dashboards industry-wide. A detailed version has been developed for CMG using real data and this platform now supports ongoing reporting and internal management.

Beneficiaries

The research directly benefits Australian pork producers, industry bodies, exporters, and supply chain partners by equipping them with practical tools and benchmarks for ESG improvement and compliance. Policymakers, retailers, financiers, and consumers will benefit from more credible, transparent information about the sector's performance, enabling informed decisions and supporting market access, investment, and regulatory planning. The broader agri-food sector and innovation partners will draw value from the methodologies, case studies, and collaborative frameworks demonstrated in this program.

Background

Australian pork production faces growing scrutiny and opportunity in the sustainability domain. With new mandatory climate disclosures and stronger demands from global retailers and financiers for robust, auditable ESG metrics, domestic producers must innovate to remain relevant and competitive.

Aims/Objectives

1. Build a world-class digital ESG reporting platform for the pork industry
2. Analyse feasibility of a carbon neutral pork brand, focusing on on-farm emissions reduction and nutrient management
3. Benchmark global best practice in ESG, covering production, welfare, environment, and people, with a pathway to ISO 14001 certification
4. Review global pre-gondola lairage welfare technologies with cost-benefit analysis and recommendations
5. Create a strategic roadmap for sector-wide ESG engagement, innovation, and brand differentiation

Methodology

The work drew on extensive analysis of 19 international frameworks, stakeholder consultation, data gap analysis, qualitative and quantitative benchmarking, scenario modelling, life-cycle assessment, and real-time system deployment through technology partners. Case studies, technical feasibility analysis, and practical implementation guidance were integrated across all outputs.

Key Results and Insights

- Three ESG dashboards developed and tested; real data integration with feedback from company team, and a sanitised version for industry also developed
- Feasibility for carbon neutral branding via operational reductions and insetting, with clear financial models
- A comprehensive guide to decarbonising the pork sector with an in-depth overview of the ESG reporting landscape, key carbon concepts and available solutions
- Benchmarking to identify where pork producers may lag or lead across specific metrics used in ESG dashboard
- Technology reviews delivered a comprehensive overview of potential technology to implement in the lairage to improve animal welfare
- Roadmap synthesised hurdles, early adopter traits, and pathway to engage Australian pork producers to adopt ESG sustainability dashboards

Recommendations

- Prioritise continuous ESG data collection/improvement and broad dashboard adoption
- Emphasise on-farm decarbonisation and insetting in GHG reduction strategies
- Accelerate industry engagement with best practice and technology adoption of ESG Dashboards, leveraging benchmarking insights.

INDUSTRY IMPACT METRICS

The FA136 project is designed to deliver substantial, sector-wide impact for the Australian pork industry, which contributes \$6 billion to GDP annually.

By implementing a digital ESG dashboard tool, the aims to reduce inefficiencies arising from health, compliance, and export limitations. The solution aims to generate an estimated \$24 million per year in economic benefits through improved welfare, productivity, and market access. If the tool is widely adopted by industry, this will support the creation of 45 AgTech jobs to manage the tool and also internal positions to supply data, while boosting digital capability across the supply chain. Adoption of these digital dashboards provides producers and management with timely insights and benchmarking needed to substantiate welfare and sustainability claims for both domestic and key export markets. These improvements promote greater food security, better on-farm practices, enhanced carbon management, and support the industry's long-term global competitiveness.

The lairage technology report provides the industry with evidence-based insights and recommendations on how innovative monitoring and management systems can improve animal welfare, operational efficiency, and product quality in pork supply chains.

The "Lowering Australia's Carbon Footprint" report delivers a practical framework and clear guidance for producers to measure, reduce, and certify greenhouse gas emissions, accelerating the sector's transition to net zero and supporting long-term environmental and market sustainability.



\$6m industry benefits

This technology is projected to generate industry \$6m annually from improved ESG management



\$18m value in market access

Australian Pork producers could gain access to more export markets worth \$18m per year.



Improved ESG decision-making

Management team for pork producers will be able to make better decisions that enhance sustainability outcomes and operational efficiency

IMPACT STATEMENTS

TECHNOLOGY PARTNER

Grant Gilmour, Director, Beanstalk

Lily Tao, Project Leader, Beanstalk

Ming Fung Chua, Associate, Beanstalk

Beanstalk is proud to have led the delivery of major outputs of this project, including an industry-leading ESG dashboard that brings together over 80 metrics from across the business, offering the management team real insight and oversight on its ESG performance. The consultation to create this was detailed, involving reviewing more than 270 sustainability metrics that were discussed with industry experts to make sure what is being measured is not only relevant, but realistic to implement. This tool is more than just a reporting framework, it's designed for regular use, making ESG performance visible and actionable at all levels.

Beanstalk also led the development of the ESG framework, with support from the project team to prioritise from the 270 identified metrics to the final 80. This framework is a first of its kind for producers, setting a new standard for future ESG reporting and decision-making.

On the carbon neutral front, the detailed feasibility report that Beanstalk developed now gives our industry partner a clear starting point for understanding what decarbonisation really involves and how it can fit with their broader business plans and incentives. This marks an important step forward for the company in planning a practical and informed approach to lowering its carbon footprint. The project has had a real impact by working directly with the project team to turn ESG reporting from a concept into something concrete and useful.

Beanstalk has also released a comprehensive guide for the industry to lower Australian pork's carbon footprint. This guide aims to lift the understanding of key carbon concepts (e.g., LCA, GHG, SBTi, ACCUs), the current sustainability reporting landscape and bringing together an overview of the established and emerging technologies that have the potential to decarbonise on-farm pork production.

RESEARCH PARTNER

Dr Elizabeth Jackson, Associate Professor of Supply Chain Management & Logistics, Curtin University

Dr YH Tham, Lecturer in Accounting, Curtin University

Dr Anwar Sadat Shimul, Senior Lecturer in Marketing, Curtin University

Curtin University is proud to have played a leading role in the FA136 “ESG Credentials for Australian Pork” project, working alongside industry and innovation partners to deliver a transformative step forward for the pork sector. This research aligns with Curtin’s commitment to high-impact, industry-connected research that addresses pressing global challenges in sustainability, food security, and ethical production systems.

Our contribution centred on advancing knowledge in sustainability benchmarking, technology adoption, and supply chain transparency, ensuring that the project outputs were both academically rigorous and industry relevant. Curtin researchers led qualitative inquiries into animal welfare technology adoption and contributed to the development of robust ESG frameworks, helping to translate global standards into practical, actionable tools for Australian producers.

The project’s outcomes—digital ESG dashboards, carbon footprint feasibility studies, benchmarking of best-in-class practices, and strategic roadmaps—demonstrate Curtin’s capability to generate research with real-world impact. These tools will help the pork industry meet growing demands for climate disclosures, welfare transparency, and sustainable supply chain practices, strengthening its competitiveness in both domestic and export markets.

For Curtin, this project reinforces the value of cross-sector collaboration in creating measurable change. By combining academic expertise with industry insights, Curtin has helped build an evidence base that will guide the pork industry’s sustainable transition and position Australian agriculture as a leader in ESG innovation.

END-USER PROFILE

ESG Sustainability Dashboard

End-user Profile: Senior sustainability manager at an integrated pork producer who is responsible for aggregating and communicating ESG data to retailers, financiers, and regulators, as well as informing internal operations and strategic decision-making.

Problem: Pork producers have lacked industry-validated, globally benchmarked mechanisms for collecting, validating, and sharing ESG performance, limiting their readiness for new market expectations, regulatory changes, and consumer demands.

Value of project:

An ESG sustainability dashboard enables sustainability managers to monitor, analyse, and report key environmental, social, and governance metrics in real time, supporting effective performance tracking and decision making. This centralised visibility delivers confidence in compliance, supports stakeholder engagement, and underpins robust communication of sustainability achievements and priorities to boards, investors, and customers.

Lowering Australia Pork's Carbon Footprint – guide to decarbonisation

End-user Profile: Australian pork producer or sustainability manager responsible for farm operations, supply relationships, and compliance with emerging market and regulatory requirements for climate performance. Also useful for broader companies in the supply chain.

Problem: Understanding and applying carbon concepts in pork production can be complex and sometimes confusing, with producers facing challenges in interpreting measurement frameworks, certifications, and emissions reduction strategies. There is a need for clearer guidance and practical information to help stakeholders navigate the rapidly evolving expectations around climate and sustainability in the industry.

Value of project:

The report equips pork producers and industry stakeholders with actionable strategies for decarbonisation, comprehensive explanations of carbon measurement and certification, and decision-making tools for emissions reduction and carbon neutrality claims. This enables practical emissions reductions, enhances access to premium supply chains and capital, protects market access, and positions the sector as a leader in the global transition toward low-footprint, certified sustainable pork.

OBJECTIVES

The objectives of the FA136 project are as follows:

1. **Develop an industry-first suite of digital sustainability dashboards** to enhance management of pig welfare and communicate ESG progress to key stakeholders, including consumers, governments, and financiers, thereby differentiating Australian pork on a global scale. The dashboards leverage leading-edge digital tools (e.g. Power BI, Alteryx, advanced analytics) with deep dives on welfare topics such as sow-specific data, supporting reduction in sow replacement rates exceeding 30%
2. Undertake a **feasibility analysis** for launching one of Australia's first **carbon neutral pork brands**, prioritising on-farm emissions reductions rather than relying on offsetting through purchased credits. Research will focus on evaluating carbon insetting options and advanced nutrient management strategies, building on existing baseline and LCA work.
3. **Benchmark best-in-class ESG practices** from leading global piggeries, specifically addressing production, welfare, environment, and people. Deliverables include development of a roadmap for industry ISO 14001 certification
4. Conduct a **global review of pre-gondola welfare technology** and systems, delivering a cost-benefit analysis with recommendations for adoption and reporting on leading and emerging technology alternatives for the industry.
5. Build a **strategic roadmap** to guide Australia's pork industry in ESG measurement, management, and communication, enabling substantial differentiation in international markets and supporting long-term competitiveness and resilience.

METHODOLOGY

Project output 1: A suite of industry leading dashboards (that could be made publicly available in the future) to build trust in the broader pork industry

The research methodology for the ESG dashboards was highly consultative, comprehensive, and iterative, ensuring that outputs were robust, stakeholder-driven, and aligned with global best practice. The process began with a systematic review and analysis of 19 global sustainability frameworks and reports, from which 290 unique ESG metrics were identified. These metrics were prioritised using a weighting system and sorted into minimum viable product (MVP), Year 1, Year 2, Year 3, and "hero" (most important) metrics through multiple rounds of project team review.

Extensive consultation, including over 20 direct engagements, including with the project team and key CMG stakeholders, was central in shaping the dashboards. Stakeholder input was collected through in-person workshops, detailed metric review sessions, and iterative dashboard testing - with feedback provided at each development phase to refine both the content and the user interface. Specialised feedback from data owners, welfare specialists, and industry leaders was sought to ensure practical alignment and sector relevance, culminating in the identification of the top 10 metrics for the public-facing dashboard.

Additionally, the methodology leveraged advanced digital tools (Power BI) for automated data integration, gap analysis, and benchmarking, enabling industry comparisons and actionable insights.

Project output 2: Detailed feasibility study into launching one of the first carbon neutral pork brands

The research methodology for the "Lowering Australian Pork's Carbon Footprint" report involved a rigorous, multi-stage approach to ensure conceptual clarity and practical relevance for the pork industry.

The process began with a comprehensive literature review of national and international standards, regulatory requirements, and carbon accounting frameworks, which provided a robust policy and analytical foundation. Extensive research was undertaken into carbon insetting options - such as methane capture, wind energy, plantations, and solar - as well as offsetting through carbon credits (including ACCUs), covering both intensive and free-range production systems.

A high-level evaluation of was conducted on existing and emerging technologies manure-to-energy conversion, and alternative feed solutions. The applicability of these strategies was modelled through a hypothetical farm case studies and decarbonisation scenarios, capturing what decrease in carbon footprint is possible. Importantly, the methodology incorporated targeted feedback from experts within the Australian pig industry ensuring sector alignment and practicality of recommended actions. Finally, all insights were synthesised within a structured "Measure, Reduce, Inset, Offset" framework to guide producers stepwise toward carbon neutrality.

Project output 3: Benchmarking best-in class sustainable management practices

Research methodology:

Global standards for reporting sustainability and animal welfare practices were trawled (e.g., GRI, ISO, SDG) to determine 1) how data are gathered for these metrics and 2) how these metrics are reported. National frameworks were also consulted e.g., Australian Agricultural Sustainability Framework, Beef Sustainability Framework, Pork Sustainability Framework. Metrics gleaned from these sources were then ranked by the project team for suitability to the project's objectives who decided upon three broad groups of metrics: protein, planet and people. A sub-set of the project team (the "benchmarking team") was conferred to further develop and refine the sustainability metrics appropriate to CMG. Similar to an action research approach, the refinement process consisted of finding publicly available data for CMG on which to monitor its performance and discussing with the benchmarking team. A trawl of pork industry sustainability sources determined that Danish Crown and SunPork generally yielded the most appropriate data for planet and protein metrics while the Workplace Gender Equality Agency Australia provided helpful data for the people metrics. A total of 64 metrics (20 planet, 26 protein, 18 people metrics) were identified for inclusion in the Year 1 Dashboard but this required further refinement for the efficiencies of reporting purposes. In a third round of consultation, the benchmarking team further refined the list 26 benchmarks (including 12 Hero metrics).

A supplementary report was prepared by consultants, Land Insights, to review CMG's nutrient management practices and compare them to best-in-class practices. The approach to this consisted of auditing existing nine CMG piggeries, production systems, nutrient management and licences. The three types of commonly used pork production systems were used as the reporting framework: conventional piggeries, deep litter/eco-shelter piggeries and rotational outdoor piggeries. Once these data were collected, they were mapped and ranked against best-in-class industry standards published by organisations such as APL and DWER.

In addition to this, consultants (Equii) provided a brief guide specifically about soil nutrient management on outdoor piggeries on WA soil types. This was an expert summary of guidelines issued by APL.

Project output 4: Global review of best-in-class stunning technology (both gondola and pre-gondola systems)

Research methodology:

This study employed a qualitative research approach using semi-structured interviews to gather in-depth insights from industry stakeholders. This research received human research ethics approval from Curtin University's Human Research Ethics Committee (HRE2024-0589). Thirteen interviews were conducted between November 2024 and April 2025 via video conferencing platforms (i.e., MS Teams), after the participants provided a signed consent form. Each interview lasted approximately 45 minutes and followed a standardised protocol focusing on current technology use, implementation experiences, barriers and drivers, and future trends in lairage technology adoption. We conducted 13 interviews with 14 participants (P5 and P6 were interviewed together). Participants were selected through purposive sampling to ensure representation across key stakeholder groups, including academic researchers, industry processors, technology providers, animal welfare organisations, and industry associations. The sample included participants from Australia and other international locations to capture diverse perspectives on lairage technology adoption (see Table 1).

Table 1: Overview of interview participant profiles

Participant	Interview date	Stakeholder type	Experience*	Location	Expertise area
P1	1 November 2024	Academic researcher	>31	Australia	Animal welfare science, stunning research
P2	20 November 2024	Academic researcher	21-30	Canada	Meat science, animal welfare, and processing
P3	3 December 2024	Industry processor	21-30	Australia	Vertically integrated pork producer
P4	12 December 2024	Academic researcher	>31	Australia	Technology development, AWISH project
P5	7 February 2025	Industry processor	>31	Australia	Large-scale pork processing facility
P6	7 February 2025	Industry processor	<10	Australia	Large-scale pork processing facility
P7	19 February 2025	Technology provider	21-30	USA	Digital livestock management systems
P8	19 February 2025	Academic researcher	<10	Australia	Animal welfare, abattoir assessment
P9	6 March 2025	Industry processor	21-30	Australia	Biosecurity, animal welfare research
P10	7 March 2025	Animal welfare organisation	11-20	Australia	Welfare technology implementation
P11	11 March 2025	Animal welfare organisation	11-20	Australia	Industry standards, policy advocacy
P12	27 March 2025	Industry association	21-30	Australia	Multi-species processing, industry leadership
P13	11 April 2025	Industry processor	>31	Australia	Regional processing, facility development
P14	17 April 2025	Industry association	11-20	Australia	Research program management, integrity systems

* Years of experience in the current industry/sector

The study employed thematic analysis as the primary methodological approach, supported by NVivo 15 software. Analysis followed the six-phase framework outlined by Braun and Clarke (2006), involving: (1) familiarisation with data through multiple readings of transcripts; (2) systematic line-by-line coding to identify meaningful concepts; (3) searching for themes by grouping related codes; (4) reviewing and refining themes for coherence; (5) defining and naming final themes; and (6) producing the analytical report. The coding process was conducted systematically, with both descriptive and interpretative coding applied to capture explicit and implicit meanings. Five major themes emerged from the analysis: (a) Implemented technology, (b) Drivers for technology implementation, (c) Benefits of technology implementation, (d) Barriers and challenges, and (e) Future trends.

Project output 5: Building an industry roadmap to differentiate Australian pork on a global scale

The research methodology for the industry roadmap centred on a qualitative analysis designed to capture the diversity and readiness of key actors across Australian pork supply chains. This included segmenting industry participants through desktop research, identifying early-adopter archetypes, and mapping key hurdles, blockers, and enablers to ESG implementation and differentiation. Data from these activities were synthesised into actionable insights that underpin the strategic roadmap to uplift adoption of ESG sustainability dashboards.

RESULTS

Project output 1: Industry Leading ESG Dashboards

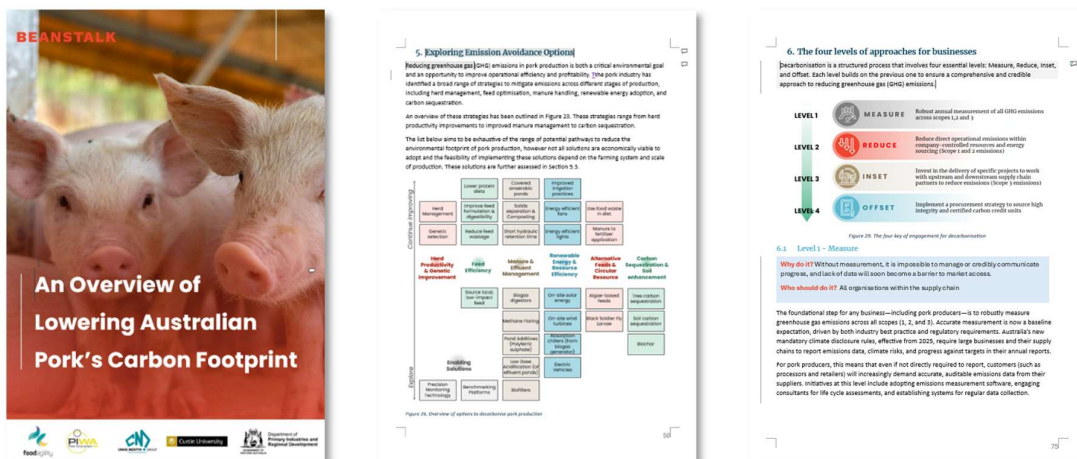
The project delivered a suite of ESG dashboards, each refined through multiple iterations and extensive stakeholder feedback, covering the pillars of Protein, Planet, and People. The dashboards ingest and visualise up to three years of ESG data, with gap analyses performed and data collection plans in place for metrics without data. The system incorporates benchmarks from leading international and domestic peer producers where data is available publicly and integrates with internal data, allowing for robust tracking and actionable insights. Dashboards have been tested and through multiple iterations across 20+ industry and project team stakeholders and is being prepared for internal use by CMG. A sanitised industry dashboard has also been developed to engage with others in the pork industry to provide transparent ESG reporting.



Example industry dashboard pages

Project output 2: Feasibility Study for Carbon Neutral Pork & Carbon Footprint Report

A detailed study analysed the pathways, investment, and brand impact of launching a carbon neutral pork brand, using both actual carbon footprint and LCA estimates for CMG. Analysis was conducted including a financial model on the financial impact of launching a carbon neutral pork brand.



Example pages from 'Lowering Australian Pork's Carbon Footprint' report

A Detailed Report entitled 'An Overview of Lowering Australian Pork's Carbon Footprint' also was developed for industry. This expanded study delivers practical decision-making frameworks, feasibility assessments for carbon insetting and nutrient management, and clear scenarios for both intensive and free-range pork production. Results include a sector-wide guide on key carbon concepts and the current ESG landscape, with overview of solutions that could be used for avoiding emissions.

Project output 3: Benchmarking Best-in-Class Sustainable Management

Global benchmarking compiled and compared ESG and nutrient management practices. This includes benchmarks on emissions, welfare, feed sources, and more, contextualised for Australian operations. The findings have informed both the dashboards and a roadmap for ISO 14001 certification, providing clarity on feasible best-practice adoption and industry leadership opportunities. The result of the iterative data collection process is presented in Table 2 whereby 12 Hero metrics were prioritised with project working team were used to enrich the ESG dashboard.

Table 2: Final benchmarks and data sources of 12 Hero metrics

	Hero metric	Description	Data source
Protein	Industry accreditation farming scheme	Number of farms accreditations	SunPork
	Industry accreditation processing scheme	Number of accreditation processing scheme	SunPork
	Exotic disease (FMD/ASF) free	Exotic disease (FMD/ASF) free	APL 2023 Baseline Report
	Locally sourced feed %	Percentage of pig feed that is sourced locally	Wiedemann et al. (2024)
People	Gender pay gap	Gender pay gap (%) - WGEA ag vs whole census for benchmark	Workplace Gender Equality Agency Australia
	Leadership gender diversity	Leadership gender diversity – managers by gender, % male vs female	Workplace Gender Equality Agency Australia
	Food or other awards	Benchmark number of food or other awards won	SunPork
	Product recalls	Number of product recall annually	Smithfield Foods
	Total lost time injury or illness frequency	Total lost time injury and illness frequency - frequency per hours worked	SafeWork Australia
Planet	Emissions intensity (per kg of pork)	1. Measure Scope 1, 2 and 3 GHG reduction emission intensity based on kg CO ₂ -e/kg output using baseline year. 2. Using 2020 APL baseline GHG emissions 3.3kgCO ₂ /kg LW produced, from LCA of 44% of production	1. Danish Crown 2023/2204 annual report 2. APL 2023 Baseline Report
	Water consumption per output (on farm / processing)	Measure of water consumption intensity per production output (m3 per tonnes output)	1. Danish Crown 2023-24 annual report 2. Maple Leaf 2023 sustainability report
	Locally sourced feed	Locally sourced feed - % of local cereal/protein sources	Wiedemann et al. (2024)

The nutrient management work yielded a number of outcomes for the three pork production types studied: Free-Range Outdoor Rotational Piggery, Eco-shelters/Deep Litter, and Intensive/Conventional systems. This work mapped and ranked these production systems against best-in-class industry standards published by organisations such as APL and DWER.

In addition to this, consultants (Equii) provided a brief guide specifically about soil nutrient management on outdoor piggeries on WA soil types. This was an expert summary of guidelines issued by APL.

The review of nutrient management related to soils offered the following framework as a best practice guide:

- Parameterise and characterise soil types
- Measure soil properties
- Monitor soil nutrient levels
- Nutrient budgeting including stocking rates
- Manure management
- Alter soil properties
- Record keeping.

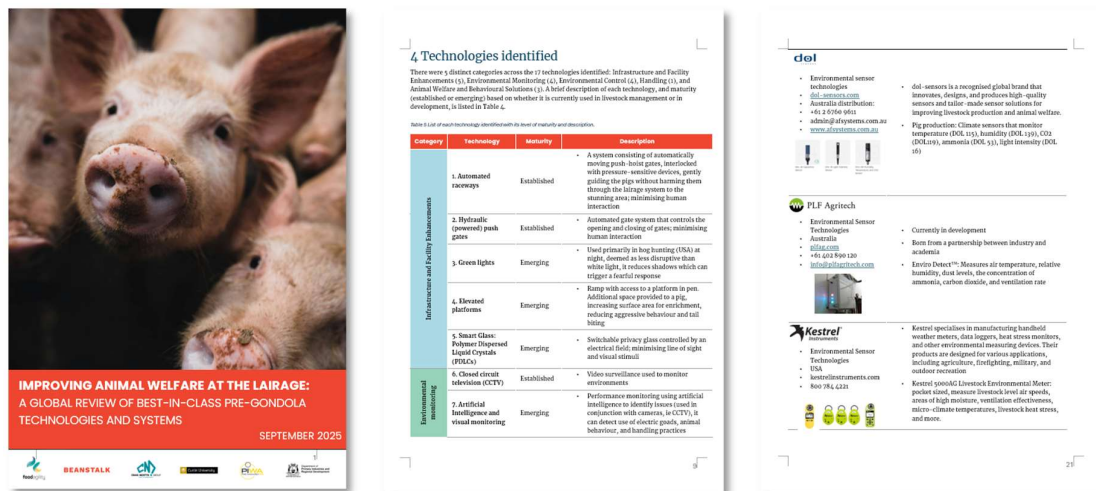
Project output 4: Global Review of Lairage Technology

The Australian pork processing industry stands at a critical juncture where technology adoption in lairage facilities has evolved from optional enhancement to essential infrastructure. This qualitative inquiry based on interviews 14 pork industry professionals demonstrates that welfare-enhancing technologies deliver measurable benefits across multiple dimensions: improved animal welfare, enhanced meat quality, operational efficiency, and social licence maintenance. While implementation barriers persist, particularly regarding cost and technical complexity, the convergence of regulatory requirements, market demands, and technological advancement creates compelling drivers for continued innovation adoption. The industry's future success depends on strategic technology implementation that balances welfare outcomes with economic viability, supported by collaborative approaches that ensure equitable access to innovations across all facility scales. A summary of the findings is provided in Figure 1.

Figure 1: An illustrative summary of the research themes and findings



A comprehensive global assessment evaluated both lairage technology, focusing on the impact for animal welfare, feasibility, and cost for adoption in the Australian context. The study includes a high-level cost-benefit analysis for retrofitting abattoirs, technical due diligence on selected priority technologies, and an industry-ready report outlining supplier details and risk assessments for implementation. This report is designed to give Australian pork processors clear information on emerging and established lairage technologies, along with a high-level assessment of each technology's impact on animal welfare, feasibility of implementation, and relevant supplier examples.



Example pages from 'Improving Animal Welfare at the Lairage: A global review of best-in class pre-gondola technologies and systems'

Project output 5: Industry Roadmap for Global Differentiation

A strategic roadmap has been developed through segmentation and gap analysis, mapping the industry's state of ESG maturity and outlining archetypes for early adopters. The roadmap serves as a decision-support tool for commercial adoption, highlighting hurdles and recommendations for scaling ESG dashboards and practices across the sector. Conversations with the leading industry body (APL) are ongoing to share the findings of this project with broader industry.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

- The project successfully built a comprehensive suite of ESG dashboards in the pork Industry, detailed decarbonisation strategies, and the analysis of advanced lairage technologies to drive measurable improvements in animal welfare, operational efficiency, environmental performance, and global market competitiveness for the Australian pork industry.
- Collaboration among producers, processors, technology providers, and researchers underpinned the effective translation of research into practical, scalable solutions for decarbonisation, welfare management, and ESG reporting.
- These innovations, particularly the digital ESG dashboard will position Australian pork to meet higher regulatory, retailer, and consumer expectations and secure premium market access domestically and internationally.

Recommendations

- Scale up the deployment and routine use of digital ESG dashboards across the pork supply chain to enable timely decision making, transparent reporting, and benchmarking against global standards.
- Prioritise industry collaboration and funding models that support both large and small operators to decarbonise their operations, including exploration of insetting program
- Engage with government and market partners to further harmonise ESG and welfare standards, providing a strong foundation for ongoing differentiation and value creation within Australian pork.

NEXT STEPS

Next Steps and Suggested Actions

1. Industry-wide Dashboard Deployment, Training, and Commercialisation

Advance the commoditisation and dissemination of the ESG dashboard as an industry-standard product. Roll out the dashboard through coordinated campaigns targeting both early adopters and major supply chain partners, complemented by practical training and support resources. Work in collaboration with industry partners to ensure that producers and stakeholders can access and benefit from ESG insights and benchmarking tools. This approach will drive consistency in sustainability measurement, facilitate sector-wide improvement, and position the dashboard as a foundational asset in Australian pork's sustainability journey

2. Collaboration with Industry Bodies and Knowledge Sharing

Strengthen partnerships with key industry bodies, such as Australian Pork Limited (APL), to disseminate research insights, benchmark performance, and align future projects with industry-wide objectives. Contribute to workshops, publications, and data-sharing agreements to maximise sector impact, avoid duplication of effort, and ensure the continuous evolution of best practice across the Australian pork value chain.

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PUBLICATIONS LIST

Tao, L., Chua, M. F., (2025). *An overview of lowering Australian Pork's Carbon Footprint*. Food Agility CRC

Jackson, E.L., Shimul, A. S., (2025). *Technology adoption in pig lairages: Enhancing animal welfare through innovation*. Food Agility CRC

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ACRONYMS & ABBREVIATIONS

ESG	Environmental, Social, and Governance
GHG	Greenhouse Gas
LCA	Life Cycle Assessment
CO₂e	Carbon Dioxide Equivalent
ISO	International Organization for Standardization (e.g., ISO 14001 environmental management standard)
ACCU	Australian Carbon Credit Unit
SBTi	Science Based Targets initiative

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ESG Credentials for Australian Pork

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