PROJECT SUMMARY *'The opportunities for Australia's packaging and processing machinery sector to tackle food waste'* Project

KEY POINTS

- The food packaging and processing machinery (PPM) sector is already investing in new infrastructure for efficient packaging and processing and is playing an important role in making the food supply chain less wasteful.
- Companies in the PPM sector have a positive attitude towards food loss and waste (FLW) reduction in the sector. Some existing innovations have already focussed on food waste reduction with direct and indirect impact on food waste in the food supply chain. While not 'in control' of any part of the food supply chain, this study shows that the packaging and processing machinery sector can play an important role in further reducing FLW in the larger food system.
- There is room to build on existing sustainability strategies to implement broader circular strategies in the industry and develop circular leadership. Leadership may focus on building collaboration and starting initiatives that cross organisational boundaries and form a bridge between the PPM sector and the food supply chain. In addition, leaders need to be technology minded across a range of platforms such as the Internet of Things (IoT), neural networks, and blockchain, as these technologies hold promise.
- Government policy is a force for good, currently registering in the middle of challenges or impediments to action, behind 'customer willingness to pay', 'labour costs', 'difficulty of measuring food waste and impact of improvements', and 'customer demand'. Policy, therefore, sits as a missed opportunity to further food waste reduction, with a clear need to liaise with government and develop pathways to accelerate current food waste reduction activities.
- The capabilities and ecosystem of the PPM sector are broad and deep but also only indirectly connected to the food supply chain. To leverage those capabilities the following two strategies could be applied:
  - First, there is an opportunity to develop more in-depth food waste reduction capabilities in the packaging and processing area where the industry has core strengths. By building a full understanding of the needs of clients in that part of the food supply chain, innovation development and adoption could be accelerated.
  - Second, by further integrating PPM capabilities that are adjacent to packaging and processing, the industry could broaden its offerings and become more aligned with integrated whole-of-chain solutions.

THE CHALLENGE

Prior to this project, there was a limited coordinated understanding of exactly how the PPM sector can promote their existing technologies to the food sector and to realise new opportunities to reduce and/or transform FLW.

THE OPPORTUNITY

By consolidating knowledge on the ways that Australian packaging and processing machinery can have an impact towards reducing and transforming food wastage, has provided equipment manufacturers with improved knowledge and understanding of the food waste challenges. This, in turn, develops opportunities for the sector by promoting new ideas, improved machinery designs and features to combat food waste.

OUR RESEARCH

The Fight Food Waste CRC supported a partnership with the APPMA and RMIT University to conduct a one-year (during 2020 and 2021) study, to further understand the opportunities for packaging and

The Fight Food Waste Cooperative Research Centre is funded through the Australian Government's CRC Program administered by the Department of Science, Industry and Resources.

processing machinery to tackle food waste. This project used technological and market analysis, industry surveys and interviews and literature analysis to identify trends, opportunities, and threats to packaging and processing machinery firms operating in the food sector tackling the food waste issue.

Baseline Literature Review

The baseline review utilised keyword combinations, informed by an analysis that mapped the focus of organisations in APPMA's membership base, to search academic databases for both academic literature and grey literature (industry reports) regarding existing research about packaging, machinery, and other technologies that have an impact on food loss and waste (FLW), and that are currently used or being developed for use in the food supply chain.

Figure 1 below shows the spread of papers across different parts of the food supply chain. This shows that the literature identified is focused largely on a whole food system approach, but that packaging and processing and manufacturing technologies are also a strong focus.

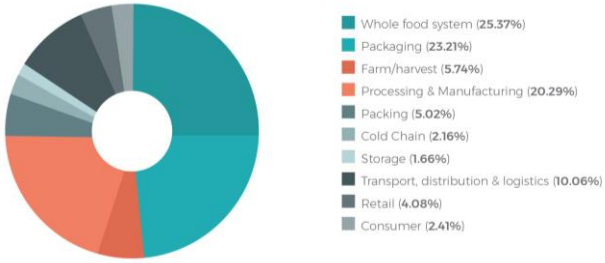

Figure 1. Percentage of papers that address different parts of the food supply chain

Sector Landscape Study

A Sector Landscape Study was conducted among companies in the Australian PPM sector regarding their role in the food waste challenge facing Australia and the rest of the world. The study used an online survey to elicit 27 usable responses (conducted in the second half of 2020). The survey was followed up with five interviews in the first quarter of 2021. All happening during the particularly significant interruptions of the COVID-19 pandemic.

Of those surveyed, the majority of their operations (43%) took place in Victoria, with 21% in New South Wales, 18% in Queensland, 9% in South Australia. The average number of full-time equivalent (FTE) employees employed, in Australia, in the organisations surveyed was about 40 - with 25% of the sample having 40 FTE or more.

The division into smaller and larger companies provides a useful analysis, with smaller companies seeming to play a role across the food supply chain, whereas larger companies seemed to be more focused on and located in the centre of the chain with a strategic focus on manufacturing (i.e., packaging and processing - see Figure 2).

Figure 2. Strategic focus in smaller vs larger companies

OUTCOMES

The baseline review identified five clusters of machinery and technologies, with a link to either food waste or loss. Those being (1) Processing (2) Packaging (3) Distribution and transport (4) Waste management and (5) Industry 4.0/digital transformation.

Key insights from the review of technologies

- A whole-of-supply-chain approach, that places specific technologies within the broader context of their use and seeks to integrate them with other process improvements, will ensure the technology works successfully and does not conflict with other stages of the process, including factors such as incompatibility or bottlenecking.
- There is limited research that provides evidence that economic goals and sustainability goals are connected in the studies in the sample. Most literature identifies the potential for sustainability impact only.

The Fight Food Waste Cooperative Research Centre is funded through the Australian Government's CRC Program administered by the Department of Science, Industry and Resources.

- The implementation process regarding packaging and processing technologies is recognised as important. Proper planning and feasibility analyses of technology upgrades will enable a strategic, harmonious, and cost-efficient approach to technology implementation, in contrast to acting based on the novelty or value posed by one improvement.
- Communication between stakeholders throughout the supply chain further enhances the benefits supplied by a strategic approach, ensuring that implemented technologies are adopted and managed towards target outcomes.

Key insights from the Australian PPM Sector

- Awareness about the need to reduce food waste was high amongst the PPM companies surveyed. Three-quarters of those surveyed either recognised that there lies both the need to reduce and there are positive opportunities from measuring the impact of their technologies on food waste. 70% of companies stated they have been successful in reducing food waste directly or indirectly themselves, with a range of projects having been embarked on, such as: washing and re-using packaging, top sealed products, equilibrium modified atmosphere packaging (eMAP), recyclability, efficiency of raw material use and packaging optimisation, and automation.
- Sustainability is an important component of the innovation efforts in the sector, with 80% agreeing that their innovation efforts target sustainability, and most firms noting they are seeing momentum, profitability, and a customer focus on sustainability.
- The PPM industry has a broad array of potential capabilities and capacities available to tackle the FLW problem, especially through the triple helix of industry, governments, and academia, though only a minority of firms (16.8%) thought that the right policies and incentives are in place for the industry to effectively reduce food waste.
- The variety of food waste reduction strategies and technologies already implemented by survey respondents included: manufacturing cleaning, energy, handling, system integration, packaging technologies, shelf-life extension, and recycling and sustainability efforts.
- Blockchain was viewed as the emerging technology likely to be the most impactful in reducing food waste, though only a small number of firms were knowledgeable about this technological approach having an impact. Whereas the Internet of Things (IoT) was seen as both impactful and had broad industry awareness.
- The 'packaging' and 'consumption' stages of the supply chain have the greatest opportunity for food waste reduction over the next five years (Figure 3).

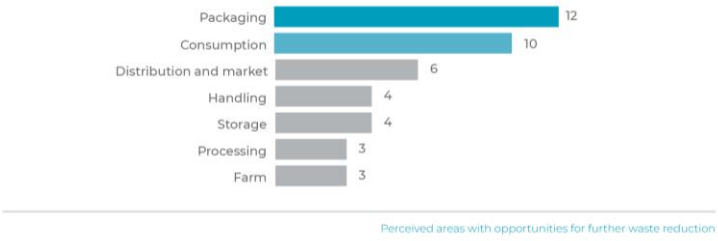

Figure 3. Sector opportunities in next five years for further food waste reduction

- Vital food waste reduction capabilities to develop:
  - (1) taking a whole-of-chain approach i.e. including the household and optimising control and cleaning in the other steps of the supply chain
  - (2) using packaging in a way that reduces waste and extends shelf life
  - (3) regulatory support, and
  - (4) changing retail practices.
- There are a range of regulatory ideas and opportunities that can have a positive effect on innovation and food waste reduction in the PPM sector. The most vital regulatory changes required cover: economic incentives, customer education, enforcement, cosmetic standards, recycling system improvement, the supply chain and other areas (such as automation).

The Fight Food Waste Cooperative Research Centre is funded through the Australian Government's CRC Program administered by the Department of Science, Industry and Resources.

IMPACT

The PPM sector touches all stages of the food supply chain, but the core lies in manufacturing. Lean manufacturing is one of the key scenario interventions recommended by the FIAL Feasibility Study, in 2021, with a modelled FLW reduction of 578.5 thousand tonnes, over the 10 years to 2030, of FLW in Australia by improving resource efficiency in manufacturing e.g., through new equipment, process changes or the adoption of 'lean manufacturing. This is equated to a benefit to the economy of $1,887 per tonne of avoided waste and an emissions reduction of 1,296K tonnes of carbon dioxide equivalent.

Well-implemented changes in the sector could have an impact of some 5-10% improvement in the efficiency of the supply chain, leading to similar reduction in the amount of FLW tonnage and the equivalent reduction in CO2 emissions, as well as the amount of food rescued. The majority of the firms in the PPM sector surveyed think that profits and food waste reduction go hand in hand. Sales and profit increases could be in the millions at the sector level.

Given that there are 134 member companies in the APPMA, the creation of a better ecosystem is estimated to lead to FTE 100++ circular economy jobs in the sector.

By delivering a case study, related to the research, to cohorts of the Executive Master of Business Administration (Executive MBA or EMBA) program at RMIT University, the project has delivered industry training to over 110 EMBA course participants. Furthermore, through the promotion of project findings via the APPMA industry outlets Machinery Matters and AUSPACK (now known as APPEX) in May 2022, with the reports made available through both mediums, an estimated 10,000 FTE have been reached ensuring that the knowledge and education elements of the project have been far-reaching.

NEXT STEPS

The findings will continue to be utilised to keep our members and the broader Processing and Packaging sector informed and supportive of the FFWCRC objectives and projects with regular updates to be provided in newsletters, on the website and via social media.

The FFWCRC will also be present at APPEX (Australasian Processing and Packaging Expo) scheduled for March 2024 with the opportunity available to

- Promote the progress to date re the delivery of FFWCRC targets
- Follow up with members and exhibitors re the findings of the report,
- further engage exhibitors, other business partners and visitors to explore new initiatives and projects.

PROJECT TEAM

Mark Leenders (RMIT)
Karli Verghese (RMIT)
Allister Hill (RMIT)
Sophie Langley (RMIT)
Gordon Young (RMIT)
Emma Coy (RMIT)
Sam Lodge (RMIT)
Peter Mulherin (RMIT)

PROJECT REPORTS/PUBLICATIONS

Fight Food Waste CRC. (2020). *Opportunities for Australia's packaging & processing machinery sector*. FFW CRC Document 2020/013

Langley, S., Hill, A., Lodge, S., Young, G., Mulherin, P., Verghese, K., & Leenders, M. (2020). *Opportunities for packaging and processing machinery and technologies to tackle food waste: Baseline Review Insights*. FFW CRC Document 2020/029

Leenders, M., Verghese, K., Hill, A., Langley, S., Young, G., Coy, E., Lodge, S., & Mulherin, P. (2021). *Opportunities and Barriers for the Australian Packaging and Processing Machinery Sector to Tackle Food Waste: Sector Landscape Study*. FFW CRC Document 2021/010

PKN Packaging News. (2021, 24 August). New Australian study: Machinery sector's role in tackling food waste. *PKN Packaging News:*

The Fight Food Waste Cooperative Research Centre is funded through the Australian Government's CRC Program administered by the Department of Science, Industry and Resources.

Machinery Matters. https://www.packagingnews.com.au/latest/new-australian-study-machinery-sector-s-role-in-tackling-food-waste

PKN Packaging News. (2022, 19 May). [Video]. *In AUSPACK FILES: Mark Leenders, Professor of Business at RMIT, on reducing food waste.* https://www.youtube.com/live/wJNnFejGO-8

Robinson, W. (2020, 23 November). Report: How machinery and technology can help fight food waste. *PKN Packaging News: Machinery Matters*. https://www.packagingnews.com.au/manufacturing-today/report-how-machinery-and-technology-can-help-fight-food-waste

PROJECT WEBPAGE

https://fightfoodwastecrc.com.au/project/the-opportunities-for-australias-packaging-and-processing-machinery-sector-to-tackle-food-waste/

The Fight Food Waste Cooperative Research Centre is funded through the Australian Government's CRC Program administered by the Department of Science, Industry and Resources.