

Save Food Packaging Design Criteria

Packaging solutions
to reduce household
food waste

Industry Insights
Report of PhD insights
and recommendations

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FIGHT FOOD WASTE
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About this project

Matching Packaging Solutions to Household Food Waste Drivers so Consumers Waste Less Food at Home was a four-year PhD research project¹ embedded within the 1.2.1 Save Food Packaging Criteria and Framework research project of the Fight Food Waste Cooperative Research Centre's Reduce Program. The 1.2.1 research project explores packaging opportunities to reduce food waste throughout the food and beverage supply chain. The PhD project provides deeper insight into packaging opportunities specific to reducing household food waste.

This PhD project identified opportunities for specific actors and key decision makers within the food/beverage–packaging industry to implement Save Food Packaging (SFP) solutions more effectively to reduce household food waste. This aligns with a key purpose of the Save Food Packaging Criteria and Framework research project: to provide food manufacturers, brand owners and packaging suppliers with the appropriate tools to minimise food loss and waste through their product–packaging design processes.

This PhD research matched existing SFP solutions to household food waste drivers. The aim was to improve the potential for industry to use existing SFP solutions to reduce food waste.¹ Insights combining industry and consumer factors were generated from literature studies and interviews then published as three open-access, peer-reviewed journal papers. This report summarises key actionable insights from these papers²⁻⁴, presented here for industry to consider.

The report outlines an opportunity for key industry actors, consumers, and researchers to collectively build and exchange insights on how packaging design can affect household food waste. Specifically, food/beverage brands and packaging companies can use these insights to design product–packaging that suits how consumers use specific packaging features and food products. This can increase the chance that product–packaging will effectively meet consumers' needs to reduce household food waste and in turn, build brand loyalty. Such an approach to product–packaging design would also require key packaging decision-makers within industry to prioritise SFP. This presents an opportunity to better understand the supply chain complexities and constraints that industry actors must balance when considering or implementing SFP.

This PhD was funded by the Fight Food Waste Cooperative Research Centre and Australian Government Research Training Program Scholarship. Activities by the Fight Food Waste Cooperative Research Centre support collaborations between industry, researchers and the community, and is funded by the Australian Government's Cooperative Research Centre Program.

The 1.2.1 Save Food Packaging Criteria and Framework project consisted of the Australian Institute of Packaging (AIP) as project leader, RMIT University as research partner, the Save Food Packaging Consortium, other project partners and an extension network. The Save Food Packaging Consortium included ZipForm Packaging, SEE (formerly Sealed Air), Multivac and the Australian Packaging Covenant Organisation (APCO). Project partners included Plantic Technologies, Result Group and Ulma Packaging. The extension network included the Australian Food Cold Chain Council (AFCCC), Australian Food and Grocery Council (AFGC), and Australian Institute of Food Science and Technology (AIFST).



Executive Summary

Household food waste accounts for half of all food wasted globally, bearing significant environmental, economic and social impacts.⁵ In Australia, households generate 2.46 million tonnes of food waste annually, equivalent to A\$2000–2500 worth of food per household.⁶ Reducing food waste is widely seen as a significant way to lower carbon emissions, save money and increase food security – for a more sustainable future. Packaging is one way to reduce household food waste.

How consumers interact with or use packaging can affect food waste. Ideally, packaging should be designed and implemented by key actors in the food/beverage–packaging industry to fit with consumers' needs and food practices. Aligning packaging with consumer behaviour could increase packaging's effectiveness in supporting consumers to reduce household food waste. However, it is currently unclear whether packaging solutions are effectively implemented by industry to support consumers to reduce food waste, with few data for specific products and packaging.

This industry report presents key actionable insights and recommendations from three open-access journal papers²⁻⁴ published during a PhD research study that aimed to improve the potential of Save Food Packaging solutions to reduce household food waste.

The insights and recommendations presented in this report were developed through a research process that considered industry and consumer factors identified from academic literature, industry publications, and interviews with consumer and industry participants. The PhD research identified opportunities for key actors within the food/beverage–packaging industry to implement SFP in ways that can better meet consumers' needs to reduce household food waste. This aligns with a key purpose of the 1.2.1 Save Food Packaging Criteria and Framework research project: to provide food manufacturers, brand owners and packaging suppliers with appropriate tools to minimise food loss and waste through their product packaging design processes.

Matching Packaging Solutions to Household Food Waste Drivers so Consumers Waste Less Food at Home was a four-year PhD research project¹ embedded within the wider 1.2.1 Save Food Packaging Criteria and Framework research project of the Fight Food Waste Cooperative Research Centre's Reduce Program. The 1.2.1 research project explores packaging opportunities to reduce food waste throughout the food and beverage supply chain. The embedded PhD provides deeper insight into packaging opportunities specific to reducing household food waste.

Key insights have been grouped into three categories. They include:

Ensuring that packaging solutions meet consumers' needs to reduce household food waste

1. Opportunity for food/beverage brands and packaging companies to design SFP to focus more on consumers' needs to reduce household food waste across all stages of consumption.
2. Opportunity for food/beverage brands and packaging companies to innovate by developing and implementing packaging that addresses packaging related reasons for household food waste.
3. Opportunity for food/beverage brands and packaging companies to test and tweak product-packaging during the design and development process to suit the contexts in which consumers will use it. By helping consumers minimise household food waste, this is also an opportunity for food/beverage brands to increase sales and brand loyalty.
4. Opportunity for food/beverage brands to proactively gather consumer feedback on existing product packaging.
5. Opportunity for food/beverage brands to clearly communicate SFP functionality to consumers on pack.

Encouraging industry to prioritise SFP to reduce household food waste

1. Opportunity for greater buy-in by key decision makers in food/beverage brands to design and implement packaging to reduce household food waste.
2. Opportunity for key decision makers in food/beverage brands to specify packaging features to reduce household food waste in the product-packaging brief and ensure it is followed through.
3. Opportunity for packaging and machinery companies to develop a wider variety of 'off the shelf' SFP that can integrate into existing production lines.
4. Opportunity for the food/beverage-packaging industry and consumers to better recognise SFP as an important part of designing sustainable packaging.

Foster communication and collaboration between researchers, consumers and industry to design and implement SFP to reduce household food waste

1. Opportunity to recognise the importance of combining contributions by consumers, industry and researchers to build insights into ways to design and implement SFP to reduce household food waste.
2. Opportunity for increased communication and collaboration between researchers, consumers and industry on household food waste and packaging solutions.



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01

Introduction

Household food waste accounts for half of all food wasted globally, bearing significant environmental, economic and social impacts.⁵ In Australia, households generate 2.46 million tonnes of food waste annually, equivalent to A\$2000–2500 worth of food per household.⁶ Reducing food waste is widely seen as a significant way to lower carbon emissions, save money, and increase food security – for a more sustainable future.

The way consumers interact with or use packaging can affect food waste. Ideally, packaging would be designed and implemented by industry to suit consumers' needs and food practices. This could increase the chance that packaging will be effective to support consumers to reduce household food waste. However, it is currently unclear whether the way existing SFP solutions are designed and implemented are effective to support consumers to reduce household food waste, especially at a product and packaging specific level. Moreover, the factors affecting industry implementation of packaging to support consumers to reduce food waste are not clearly understood.

This industry report presents key actionable insights and recommendations from a four-year PhD research study titled *Matching Packaging Solutions to Household Food Waste Drivers so Consumers Waste Less Food at Home*¹. This report is specifically designed to assist industry in doing just as the title suggests, through a succinct set

of guidelines derived from the PhD project. The insights and recommendations presented in this report were initially published as part of three open-access journal papers^{2,3,4}. Weblinks to these papers are provided in the references section for readers to access additional in-depth information, and the academic basis for them, if so required.

The PhD research project is embedded within the 1.2.1 Save Food Packaging Criteria and Framework research project in the Reduce Program of the Fight Food Waste Cooperative Research Centre. The 1.2.1 research project explores packaging opportunities to reduce food waste throughout the food and beverage supply chain. The embedded PhD provides deeper insight into packaging opportunities specific to reducing household food waste.

This PhD research focussed on matching existing Save Food Packaging solutions to household food waste drivers to improve its potential to support consumers to reduce household food waste. In doing so, the research has identified opportunities for industry to implement existing Save Food Packaging solutions more effectively to reduce household food waste. This aligns with a key purpose of the 1.2.1 Save Food Packaging Criteria and Framework research project to provide food manufacturers, brand owners and packaging suppliers with the appropriate tools to minimise food loss and waste through their product packaging design processes.



02

Methodology

The insights and recommendations presented in this report were developed through a three-stage research process that considered industry and consumer factors identified from academic literature, industry publications, and interviews with consumer and industry participants. Ethics approval was granted by the RMIT University College of Design and Social Context Human Ethics Advisory Network.

Each research stage was published as an open-access, peer reviewed paper, referred to as Paper 1², Paper 2³ and Paper 3⁴ respectively. The table presented below shows the bibliographic information for each paper and corresponding research stage. Collectively, these papers help to answer the PhD research question:

How can packaging solutions be better matched to household food waste drivers?



Table 1

Corresponding research stage for each paper and bibliographic information

PhD Research Stage / Paper	Paper Bibliographic Information
PhD Research Stage 1 / Paper 1 ²	Chan, R. B. Y. (2021). A review of packaging-related studies in the context of household food waste: Drivers, solutions and avenues for future research. <i>Packaging Technology and Science</i> , 35(1), pp. 3–51. https://doi.org/10.1002/pts.2611 .
PhD Research Stage 2 / Paper 2 ³	Chan, R. B. Y. (2022). Packaging solutions for household food waste in the context of the food/beverage–packaging industry: A comparative review of empirical literature and industry press releases. <i>Resources, Conservation & Recycling</i> , vol. 185, article no. 106479. https://doi.org/10.1016/j.resconrec.2022.106479 .
PhD Research Stage 3 / Paper 3 ⁴	Chan, R. B. Y. (2023). Drivers of divergent industry and consumer food waste behaviors: The case of reclosable and resealable packaging. <i>Journal of Cleaner Production</i> , vol. 412, article no. 137417. https://doi.org/10.1016/j.jclepro.2023.137417 .

2.1

PhD Research Paper 1: A review of household food waste and packaging research

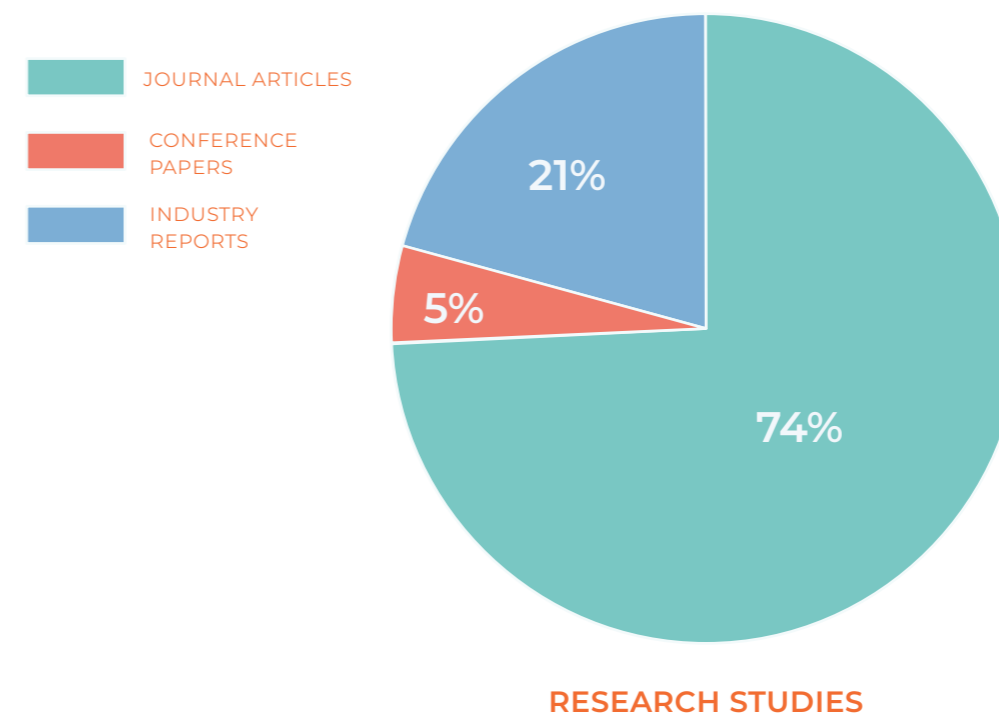
Paper 1 involved a systematised review of academic and industry research literature on packaging related household food waste drivers and solutions. The review included analysis of 43 research studies published globally in English between 2006–2020. The 15-year timespan of this review commences with the initial publication of relevant research studies, for a comprehensive overview of the field. The review identified packaging drivers and solutions for household food waste across 28 food categories, mapped across the packaging functions of communication, convenience, apportionment and protection.

The review highlights specific food categories that relate to specific packaging reasons for household food waste, revealing opportunities for food/beverage brands and packaging companies to develop or tweak packaging design to reduce such waste. These opportunities are detailed in section 3.1 of this report. Refer to Paper 1² for further information on the research method used and detailed results.

The examined academic literature (Figure 1) comprised of 32 journal articles (74%) and 2 conference papers (5%). The examined industry literature comprised of 9 industry reports (21%). Together, this provided a 15-year snapshot of research insights pertaining to packaging related household food waste.

FIGURE 1

Breakdown of the research studies examined in the literature review for Paper 1 (n=43).



2.2

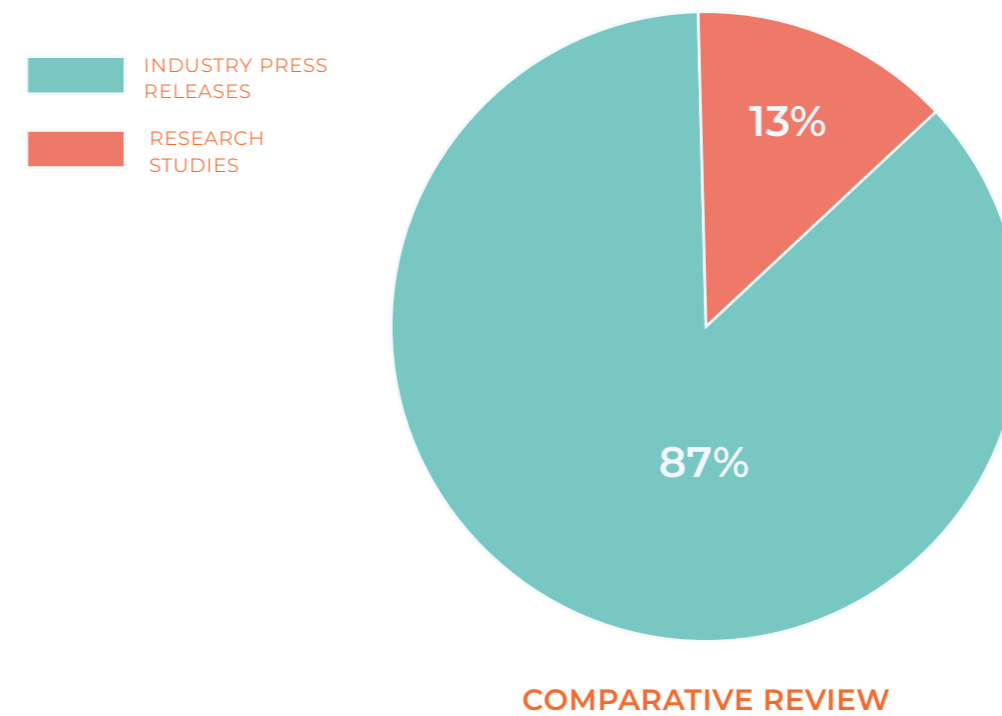
PhD Research Paper 2: A comparison of packaging solutions from research and industry

Paper 2 involved a comparative review of research literature (academic and industry) and press releases from food/beverage–packaging industry magazines to identify SFP solutions for household food waste. The review included 60 research studies and 412 industry press releases published globally in English between the 16-year timespan of 2006–2021. The 16-year timespan of this review covers the initial publication of relevant research studies and reflects available archive access of industry press releases. The review identified differences between the household food waste packaging solutions mentioned in the research literature and those advertised in industry press releases, highlighting opportunities for researchers and industry actors to bridge this gap. These opportunities are detailed in section 3.1 of this report. Refer to Paper 2³ for further information on the method used and detailed results.

Figure 2 shows a breakdown of the publications examined in Paper 2. The research studies (13%, n=60) comprised of 47 journal articles, 2 conference papers, and 11 industry reports. The industry press releases (87% n=412) were gathered from 23 food/beverage and packaging industry magazine platforms. Together, this provided a 16-year snapshot of the key developments within research and industry.

FIGURE 2

Breakdown of the publications examined in the comparative review in Paper 2 (n=472).



2.3

PhD Research Paper 3: An investigation of how industry's packaging decisions can impact household food waste

Paper 3 involved a qualitative study that explored the interplay between industry packaging decisions, consumer–packaging interactions and household food waste. To gather context-specific information, this interplay was explored through the case of reclosable and resealable packaging in relation to consumers' household food storage practices and food waste. This context was chosen due to the link between consumers' food storage practices and household food waste, of which packaging can play a role.^{2,7} There is growing recognition that packaging can play a more central role in helping consumers to optimise food storage and minimise food waste, which is reliant on industry action to design and implement appropriate SFP.⁸⁻¹⁰

The research for this paper⁴ included interviews with industry and consumers. 20 consumer participants were engaged through a context mapping process that included a pre-interview worksheet and semi-structured interviews. Next, 11 food/beverage–packaging industry participants from small and medium enterprises (SMEs) and multinational companies were engaged through semi-structured interviews. Insights from the consumer interviews in relation to consumers' packaging needs informed the interview questions for industry participants.

The data were analysed to identify key factors affecting consumer packaging needs and industry packaging decisions. The analysis also included a systems map of the relative packaging decision-making influence of different actors across the food/beverage–packaging industry by role (e.g. marketing, packaging technologist) and sector (e.g. food/beverage brand, packaging company). This map offers insights into the industry-wide complexities of implementing SFP to reduce household food waste and suggest SFP recommendations accordingly.

Finally, these consumer and industry factors were combined into a diagrammatic model showing how packaging decisions by food/beverage brands can affect household food waste. The role of food/beverage brands was highlighted in the diagrammatic model because they determine the product-packaging that consumers use and consumers associate packaging experiences with the brand, providing a link between industry perspectives of packaging design and consumer packaging experiences.⁴ This research stage identified barriers and opportunities for specific actors within industry to design and implement SFP to reduce house food waste more effectively, detailed in section 3.2 of this report. Refer to Paper 3⁴ for further information on the method used and detailed results.

Profile of consumer participants

Eligible consumer participants for Stage 3 were chosen based on existing research on Australian household profiles that were more likely to waste food, based on household income and number of children (under 15 years-old). Participants were the main food managers for the household, meaning that they usually shopped for food or prepared meals.

The ratio of female (55%) to male (45%) participants (Figure 3) was selected to represent the distribution of household work (including food shopping, management and preparation duties) in Australia, which is typically 2/3 females and 1/3 males.¹¹

Existing research suggests that higher income households in Australia – classified as generating a minimum yearly income of \$100,000 – tend to waste more food^{12, 13}, so participants were recruited accordingly. Approximately 2/3 of the participants generated an income of under \$170k, while 1/3 generated an income of \$170k or over which is significantly higher than the threshold of high-income households (Figure 4).

FIGURE 3

Participants by gender in Paper 3 (n=20).

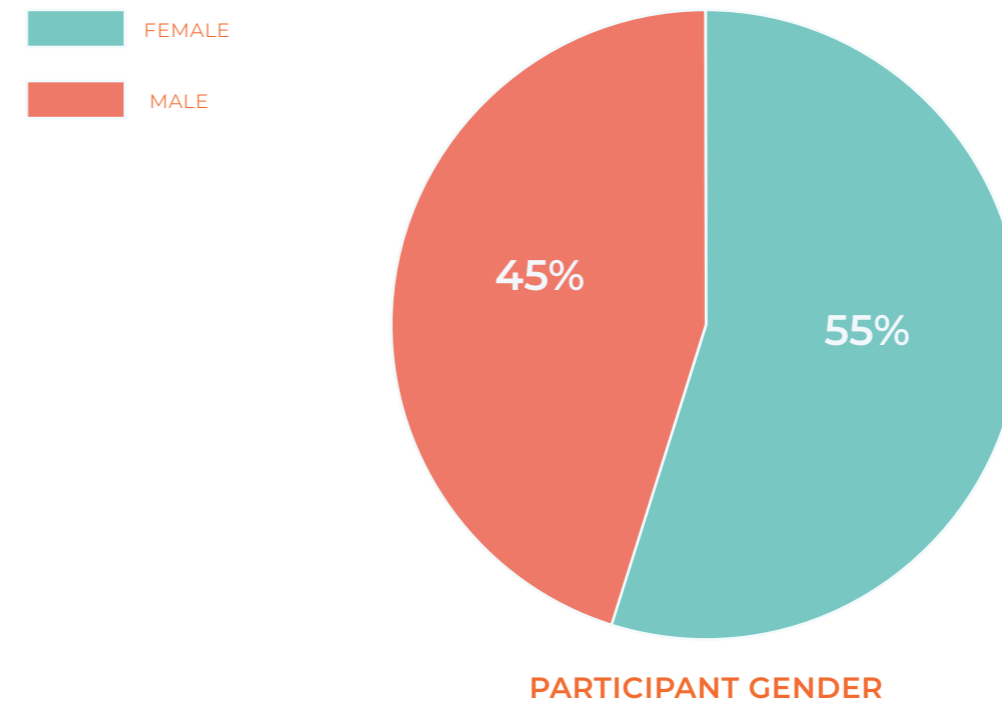
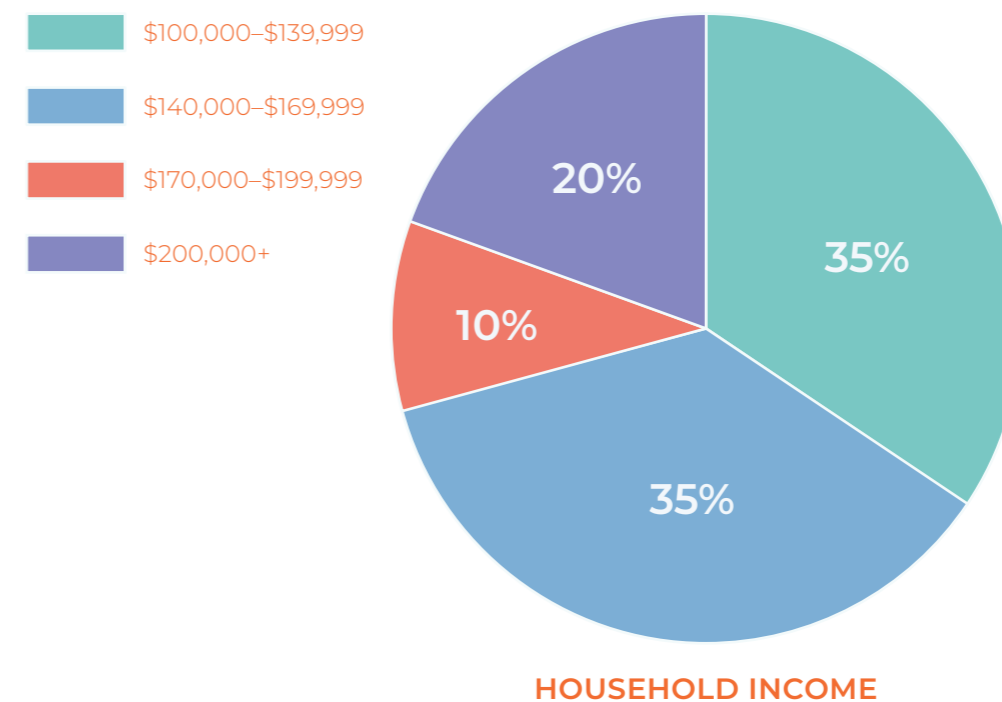


FIGURE 4

Participants by household income in Paper 3 (n=20).

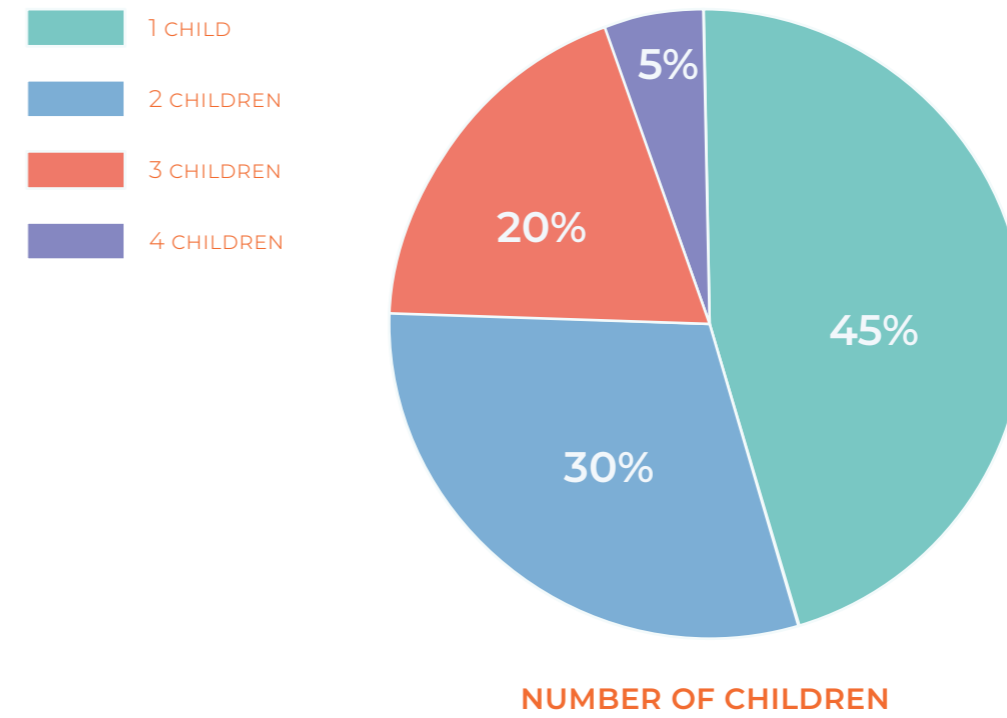


Existing research suggests that households with young children are more likely to waste food than those without.¹² As such, this present research recruited participants from households with at least one child (under 15 years old). Among the consumer participants, 3/4 had up to two children and 1/4 had three or more children (Figure 5).



FIGURE 5

Participants by number of children in household for Paper 3 (n=20).



Profile of industry participants

Of the 11 industry participants (Figure 6), close to 1/2 (46%) were CEO executive level, while marketing and sales roles and packaging technologists both made up just over 1/4 each (27%). This helped to generate insights into decision-making and product-packaging development across multiple levels of organizational hierarchy.

The major sectors that were represented (Figure 7) were packaging manufacturers or suppliers (73%), followed by food/beverage brands (18%) and packaging design consultancies (9%). This helped to generate insights on product-packaging development processes from both client (food/beverage brands) and supplier (packaging design consultancy or manufacturer/supplier) perspectives.

FIGURE 6

Participants per role in organisation in Paper 3 (n=11).

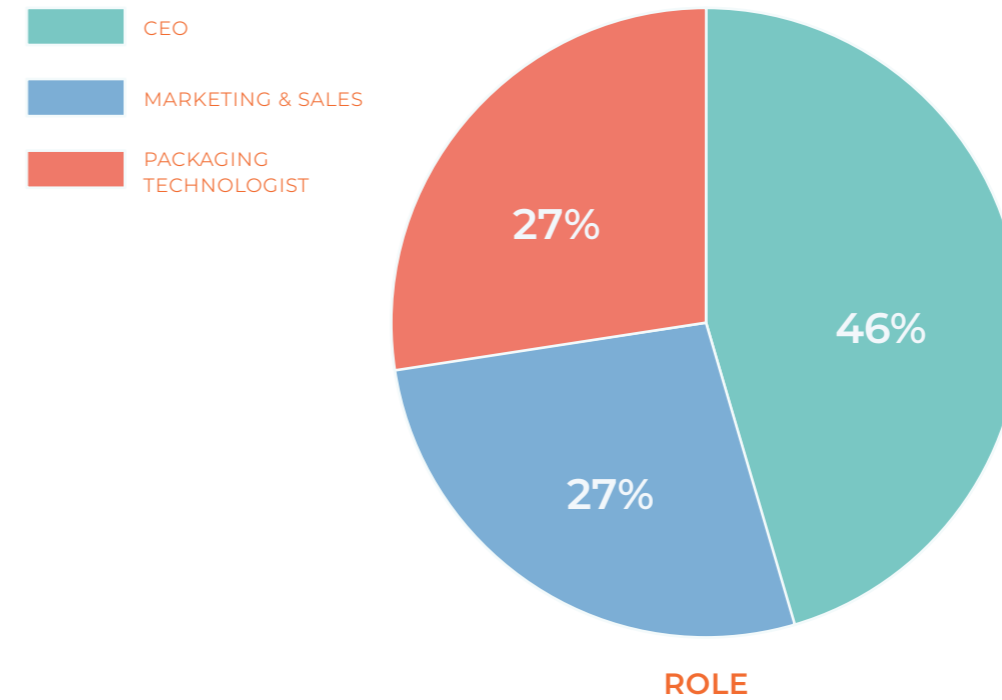
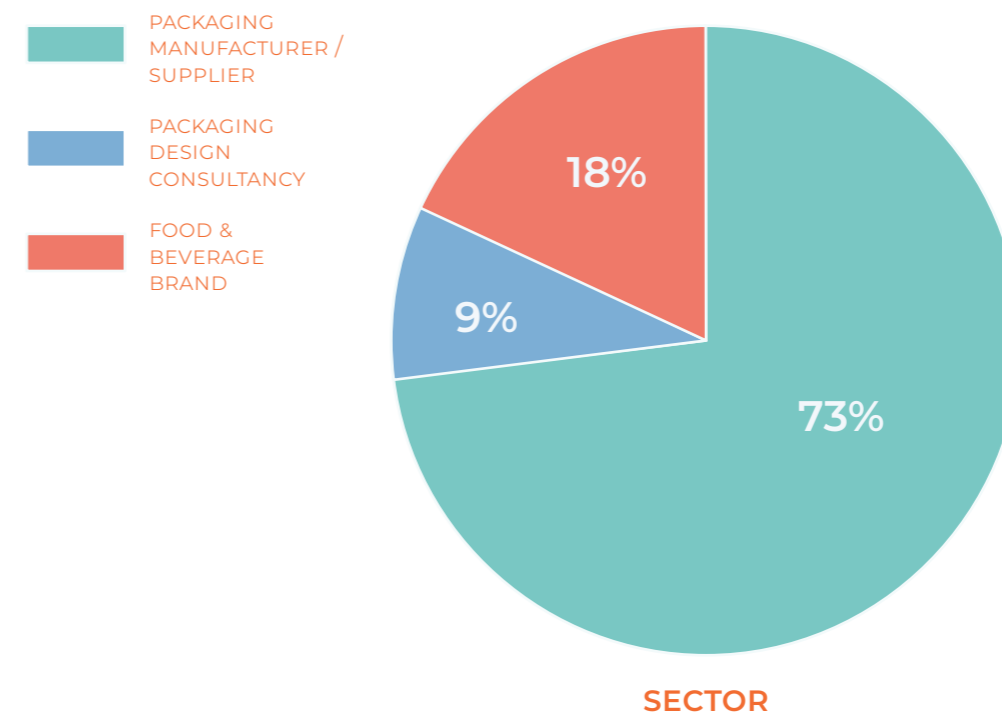


FIGURE 7

Participants per sector in organisation in Paper 3 (n=11).

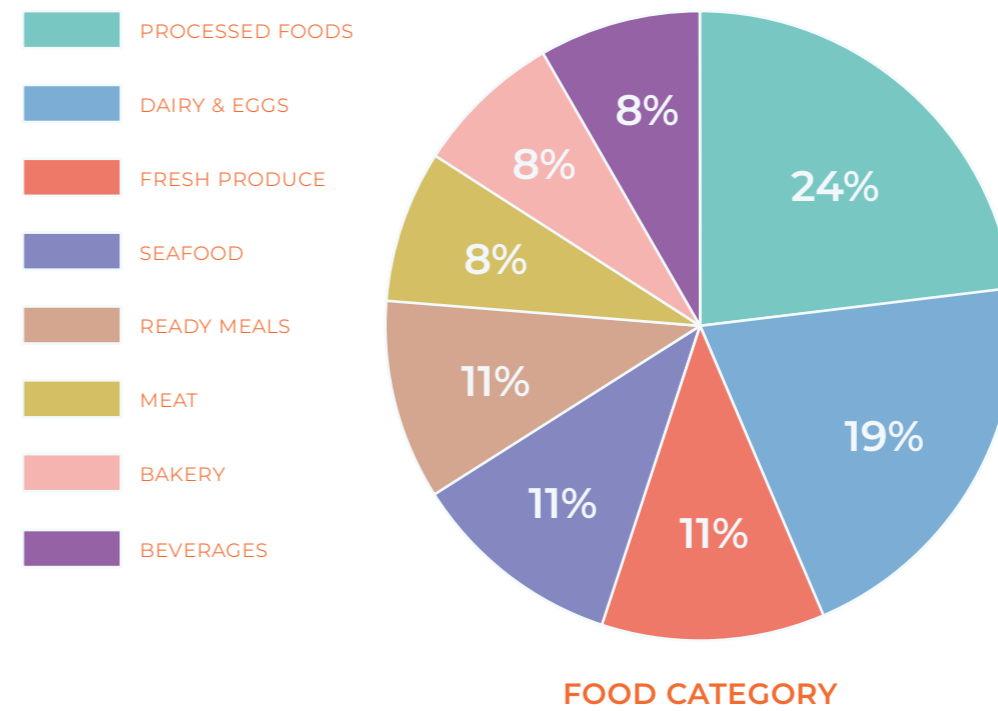




Each industry participant (Figure 8) identified the product categories they predominantly worked with. The most represented categories were processed foods and dairy and eggs (collectively at 43%). There was medium representation from fresh produce, seafood, and ready meals (collectively at 33%); and low representation from meat, bakery and beverages (collectively at 24%).

FIGURE 8

Participants per food category expertise in Paper 3 (n=11).





03

Insights &
Discussion

This section summarises the key insights that emerged from the three research stages detailed in section 2 of this report, with links to the relevant research papers²⁻⁴ in which these insights were originally published. While the research papers present both academic and industry relevant insights, this report focusses on industry relevant insights to guide businesses on action for effective SFP.

The insights in this industry report have been divided into three key themes or factors (Figure 9):

1. Ensuring that packaging solutions meet consumers' needs to reduce household food waste.
2. Encouraging industry to prioritise SFP to reduce household food waste.
3. Fostering increased communication and collaboration between researchers, consumers and industry to design and implement SFP to reduce household food waste.

We propose these themes or factors are important for industry to keep in mind because when they are interconnected, they represent an ideal environment conducive to designing and implementing SFP to reduce household food waste effectively.

FIGURE 9

Key factors that create an environment conducive to designing and implementing SFP to effectively reduce household food waste.



3.1

Effective packaging solutions to reduce household food waste

The most marketed SFP solutions for household food waste by industry are unaligned to the most mentioned packaging reasons for household food waste

Packaging can drive or reduce household food waste depending on the features it contains and whether these features meet consumers' needs through the different stages of consumption. This section presents packaging reasons for household food waste as opportunities for the food/beverage and packaging industry to innovate and develop solutions. This section also highlights the importance of industry personnel engaging consumers for product-packaging feedback to better understand how the way consumers perceive and use packaging can affect household food waste. The suggestions presented in this section can help industry to design and implement SFP solutions that are more attuned to consumers' needs and more likely to minimise household food waste.

Expand SFP considerations for household food waste beyond shelf life extension

The research presented in Paper 2³ suggests that packaging companies are focussing on SFP solutions to reduce food waste through the food/beverage supply chain and also marketing these packaging solutions as useful to reduce household food waste.^{3, 10} This industry focus on designing product-packaging around supply chain distribution instead of how consumers interact with packaging is indicative of industry priorities.^{4, 10} The versatility of SFP solutions is necessary given the many roles that packaging is expected to

fulfil across the supply chain. However, the most marketed SFP solutions for household food waste by industry are unaligned to the most mentioned packaging reasons for household food waste, so it is unclear how useful consumers will find these solutions in practice.³

Packaging solutions that can extend food/beverage shelf life through the supply chain are the most marketed by packaging companies, but the effectiveness of these solutions depends on the product packaging remaining sealed. This constraint limits the save food benefits consumers can reap from packaging to the early pre-opening storage stage of food consumption, which is inadequate if SFP is to be specifically effective to reduce household food waste. Existing research shows that packaging-related food waste is generated at all stages of consumer food consumption, including after packaging is opened.^{2, 14} Consumer inability to reseal a package for food storage is connected to household food waste^{2, 4, 14}, yet resealable and easy-to-store packaging are relatively less marketed by packaging companies³. Beyond issues of perceived food quality and safety that arise from suboptimal storage, transferring food out of a package can lead to consumers losing access to on-pack product information that can assist with portioning and cooking – all of which can affect household food waste.⁴ To improve packaging's potential to

reduce household food waste effectively, there is an opportunity for industry (i.e. packaging technologists within food/beverage brands, those that manage them, and packaging companies) to market and implement SFP to focus more on consumers' specific needs across all stages of food consumption.^{3, 15}

Food/beverage brands can conduct product-packaging trials to verify whether consumers recognise implemented SFP features, how consumers interact with these features, and whether consumers benefit from using these features.^{4, 15} The Fight Food Waste CRC conducted an assessment of how packaging features and SFP solutions or strategies are understood and used by consumers; the related industry report¹⁴ is a resource that industry can consult during product-packaging design. Paper 1² also presents packaging reasons associated with household food waste, summarised in the next subsection as another resource that industry can consult.

Design and implement packaging to address reasons for household food waste

Packaging can be a valuable tool to support consumers to reduce household food waste. It is important that packaging is designed and implemented thoughtfully with consideration for consumers' needs across all stages of consumption because otherwise, packaging can

Opportunity for industry to implement resealable packaging solutions for frozen vegetables, pasta, rice and biscuits

contribute to food waste. The academic literature documents a variety of packaging-related reasons for household food waste, presenting innovation opportunities for food/beverage and packaging companies to develop packaging solutions in response.² Companies that take this opportunity can distinguish themselves from competitors through product-packaging solutions that directly addresses research-documented reasons for household food waste.


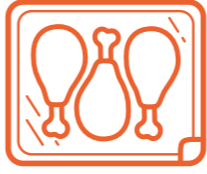

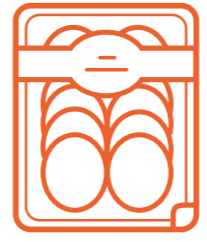
To improve the effectiveness of SFP to reduce household food waste, there is a clear opportunity for food/beverage brands and packaging companies to design and implement packaging to address specific reasons why consumers waste food. This includes considerations for packaging format, features, and use context. The following table presents packaging-related reasons for household food waste by food category, intended as a resource that food/beverage brands and packaging companies can use to review their own packaging solutions and action iterative amendments or changes where necessary.


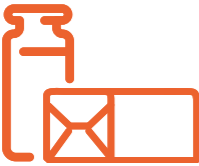

The table below is an adaptation of Table 2 in Paper 1² and integrates research insights from Paper 3⁴. Please refer to these papers for additional detail on the packaging materials and formats of specific product-packaging associated with household food waste and corresponding SFP suggestions.




Table 2



Packaging reasons for household food waste, sorted by food category. Adapted from Chan 2022². *Additional insights from Chan 2023⁴ denoted by an asterisk.







Reasons why packaged food is wasted in households	
 Fruit	<ul style="list-style-type: none"> • Package contained more product than needed. • Purchased multiple packages or a larger package for cost savings. • Overpurchased due to difficulty estimating suitable portion sizes. • Did not like the food. • Did not want to eat leftovers. • Spoiled after the packaging was removed for storage. • Unsure if suitable to freeze due to quality and safety concerns. • Purchased with specific plans to use but was busy or changed plans. • Forgot to use. • Felt the product was kept for too long or not fresh enough. • Purchased a new package and the old package sat uneaten. • Passed the 'best before' date. • Unconfident to rely on sensory judgement of whether product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 Vegetables	<ul style="list-style-type: none"> • Package contained more product than needed. • Purchased multiple packages or a larger package for cost savings. • Overpurchased due to difficulty estimating suitable portion sizes. • Did not like the food. • Did not want to eat leftovers. • Difficultly or inability to reclose or reseal the package. • Product spilled out of the opened package. • Product stored at an inadequately low temperature. • Unsure if suitable to freeze due to quality and safety concerns. • Spoiled after the packaging was removed for storage. • Felt the food was kept for too long or no longer fresh enough. • Purchased a new package and the old package sat uneaten. • Passed the 'best before' date. • Unconfident to rely on sensory judgement of whether product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.

Reasons why packaged food is wasted in households	
 Fresh Meat Red meat (i.e. beef) and white meat (i.e. pork) but excluding poultry	<ul style="list-style-type: none"> • Package contained more product than needed. • Purchased multiple packages or a larger package for cost savings. • Overpurchased or prepared excess due to a difficulty estimating suitable portion sizes. • Did not want to eat leftovers. • Unsure whether the product can be frozen due to quality and safety concerns. • Spoiled after the packaging was removed to use the product. • Felt the package was kept open for too long or not fresh enough. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether product past the 'best before' or 'use by' date is safe to eat. • Spoiled in the package before the product was fully used.
 Poultry	<ul style="list-style-type: none"> • Package contained more product than needed. • Overpurchased or prepared excess due to a difficulty estimating suitable portion sizes. • Felt the package was kept open for too long or not fresh enough. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 Fish / Seafood Fresh and processed	<ul style="list-style-type: none"> • Package contained more product than needed. • Purchased multiple packages or a larger package for cost savings due to promotions, which exceeded the amount needed. • Difficult to fully remove the product from the package. • Did not like the food. • Passed the 'best before' or 'use by' date. • Confused at the meaning of the 'best before' or 'use by' date label. • Unconfident to rely on sensory judgement of product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 Charcuterie Cured or processed deli meats (i.e. sausages, ham)	<ul style="list-style-type: none"> • Package contained more product than needed. • Purchased multiple packages or a larger package for cost savings. • Overpurchased or prepared excess due to a difficulty estimating suitable portion sizes. • Did not like the food. • Difficultly or inability to reclose or reseal the package. • Unsure how to use the product. • Passed the 'best before' or 'use by' date. • Confused at the meaning of the 'best before' or 'use by' date label. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.

Reasons why packaged food is wasted in households	
 <p>Eggs</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Purchased multiple packages, beyond the amount needed. • Did not like the food. • Felt the product was kept for too long or not fresh enough. • Passed the 'best before' or 'use by' date. • Confused at the meaning of the 'best before' or 'use by' date label. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 <p>Butter & Cream Was 'Dairy – general' in Paper 1</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Purchased or prepared more than needed due to difficulty estimating suitable portion sizes. • Did not like the food. • Bad or broken package. • Difficulty or inability to reclose or reseal the package. • Product spilled out of the opened package. • Unsure if the product is best stored in the fridge or on the bench top • Difficult to fully remove the product from the package. • Forgot to use. • Felt was the package was opened for too long or not fresh enough. • Purchased a new package and the old package sat uneaten. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 <p>Milk</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Overpurchased or prepared excess needed due to a difficulty estimating suitable portion sizes. • Purchased multiple packages or a larger package for cost savings due to promotions, which exceeded their needs. • Product spilled out of the fully filled screw cap carton pack when breaking the seal and pouring for the first time. • Product spilled out from the cardboard carton due to bent corners. • Did not like the food. • Felt was the package was opened for too long or not fresh enough. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.

Reasons why packaged food is wasted in households	
 <p>Yoghurt & Fermented Milk Products</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Difficulty or inability to reclose or reseal the package. • Product spilled out of the opened package • Difficult to fully remove the product from the package. • Confused at the meaning of the 'best before' or 'use by' date label. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 <p>Cheese</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Overpurchased or prepared excess due to a difficulty estimating suitable portion sizes. • Did not want to eat leftovers. • Difficulty or inability to reclose or reseal the package. • Dried out. • Improper storage temperature. • Forgot to use. • Confused at the meaning of the 'best before' or 'use by' date label. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 <p>Cereals, Grains, Flour</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Did not want to eat leftovers. • Packaging damaged due to being difficult to open. • Difficulty or inability to reclose or reseal the package.* • Product spilled out of the opened package. • Difficult to fully remove the product from the package. • Unsure how to use the product. • Forgot to use. • Confused at the meaning of the 'best before' or 'use by' date label. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.

Reasons why packaged food is wasted in households	
 <p>Pasta, Rice, Noodles</p>	<ul style="list-style-type: none"> • Overpurchased or prepared extra due to a difficulty estimating suitable portion sizes. • Packaging damaged due to being difficult to open. • Difficulty or inability to reclose or reseal the package.* • Product spilled out of the opened package. • Felt the package was opened for too long. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 <p>Nuts, Legumes, Seeds</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Difficulty or inability to reclose or reseal the package.* • Product spilled out of the opened package. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before the product was fully used.
 <p>Breads & Baked Goods</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Overpurchased due to a difficulty estimating suitable portion sizes. • Did not like the food. • Did not want to eat leftovers. • Difficulty or inability to reclose or reseal the package. • Forgot to use. • Product showed signs of freezer burn. • Felt the package was kept open for too long or not fresh enough. • Purchased a new package and the old package sat uneaten. • Passed the 'best before' or 'use by' date. • Confused at the meaning of the 'best before' or 'use by' date label. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before product was fully used.
 <p>Biscuits & Snacks</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Difficulty or inability to reclose or reseal the package. • Passed the 'best before' label. • Spoiled in the package before product was fully used.
 <p>Dips</p>	<ul style="list-style-type: none"> • Felt the package was kept open for too long or not fresh enough. • Passed the 'best before' or 'use by' date label. • Spoiled in the package before product was fully used.

Reasons why packaged food is wasted in households	
 <p>Salad</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Did not like the food. • Felt the package was kept open for too long or not fresh enough. • Purchased a new package and the old package sat uneaten. • Passed the 'best before' or 'use by' date. • Confused at the meaning of the 'best before' or 'use by' date label. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before product was fully used.
 <p>Ready Meals</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Difficult to fully remove the product from the package. • Did not like the food. • Did not want to eat leftovers. • Felt the package was kept open for too long or not fresh enough. • Purchased a new package and the old package sat uneaten. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date label is safe to eat. • Spoiled in the package before product was fully used.
 <p>Sweets & Desserts</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Felt the package kept open for too long or not fresh enough. • Passed the 'best before' or 'use by' date. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before product was fully used.
 <p>Sauces, Condiments, Spreads</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Product spilled out of the opened package. • Difficult to fully remove the product from the package. • Did not like the food. • Felt the package was kept open for too long or not fresh enough. • Passed the 'best before' or 'use by' date label. • Spoiled in the package before product was fully used.
 <p>Herbs & Spices</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Unsure how to use the product. • Spoiled in the package before product was fully used.
 <p>Oils, Fats, Vinegar</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Unsure how to use the product. • Difficult to fully remove the product from the package. • Passed the 'best before' or 'use by' date. • Spoiled in the package before product was fully used.

Reasons why packaged food is wasted in households	
 <p>Canned Food</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Product spilled out due to the package being hard to open. • Unsure how to properly store after opening. • Felt the package was kept open for too long or not fresh enough. • Passed the 'best before' or 'use by' date. • Spoiled in the package before product was fully used.
 <p>Pickles & Preserves</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Difficult to fully remove the product from the package. • Felt the package was kept open for too long or not fresh enough. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Passed the 'best before' or 'use by' date. • Spoiled in the package before product was fully used.
 <p>Frozen Foods</p>	<ul style="list-style-type: none"> • Package contained more product than needed. • Overpurchased due to a difficulty estimating suitable portion sizes. • Product spilled out of the opened package.* • Did not like the food. • Product showed signs of freezer burn. • Felt was the product was kept for too long or not fresh enough. • Unsure how long the food product lasts in the freezer. • Passed the 'best before' or 'use by' date. • Confused at the meaning of the 'best before' or 'use by' date label. • Unconfident to rely on sensory judgement of whether the product past the 'best before' date is safe to eat. • Spoiled in the package before product was fully used.
 <p>Beverages</p>	<ul style="list-style-type: none"> • Product spilled out from the carton due to bent corners. • Felt the package was kept open for too long or not fresh enough. • Passed the 'best before' or 'use by' date. • Spoiled in the package before product was fully used.

According to the research presented in Paper 1², food safety doubts implicated by date labels and overly large pack sizes are among the most mentioned packaging related reasons for household food waste across all food categories. There is an opportunity for industry to give more consideration to how date labels can affect household food waste. There is also an opportunity for industry to design appropriately apportioned packs to suit different consumer appetites, household sizes and food-use contexts. The Fight Food Waste CRC National Date Labelling and Storage Advice research project is a coordinated step to do just this.¹⁶

Drawing from the research presented in Paper 3⁴, there is an opportunity for food/beverage brands and packaging companies to implement a greater number of resealable packaging solutions for frozen vegetables, pasta, rice and biscuits. This would support consumers to store these foods in the original pack and maintain freshness. Storing food in the original pack can also better enable consumers to retain access to key product information (i.e. portions sizes, cooking instructions, ingredients list) and therefore minimise household food waste.⁴

Test and tweak product-packaging to suit how consumers will use it

Consumers often interact with product-packaging as part of their daily food routines. As such, industry should ideally design packaging with features to support consumers to minimise food waste as they go about these routines.⁴ Understanding and targeting specific reasons² why food is wasted in households is a key starting point during the product-packaging design process and can act as a compass. Next it is important to verify the effectiveness of the product-packaging to minimise household food waste through direct consumer testing.^{4, 10} This is necessary as the assumptions used by industry during the initial stages of packaging design may not align with the way consumers actually use packaging. There is an opportunity for packaging technologists to play a larger role in product-packaging testing processes to gather context-specific insights into how consumers use food and packaging, and whether consumers are aware of and consider the save food features helpful. The insights generated from such testing can be used to tweak packaging, increasing the chance that the packaging will be effective to support consumers to minimise household food waste.

Industry insider knowledge can lead to misplaced assumptions on what consumers understand and need

Industry personnel are technically also consumers, so some industry interviewees (from the research presented in Paper 3⁴) question the necessity of routine direct consumer testing during the product-packaging design process to understand how consumers use packaging.⁴ The cognitive aspects of the design process can be better communicated to industry, specifically, to raise awareness that industry insider knowledge can lead to misplaced assumptions on what consumers understand and need when using packaging.^{4, 17} This helps to highlight the value of consumer testing, particularly in-home testing, to provide context specific insights on how consumers use packaging and the effects on food waste.

A wider issue to address is that key decision-makers in food/beverage brands (e.g. marketers, managers and executive level personnel) are not considering food waste when conducting product-packaging tests with consumers.^{4, 15} Consumer tests are routinely led by marketers with a focus on visual appeal and branding, prioritising product sales to maintain the brand's core business viability.⁴ It is therefore important for industry to more highly prioritise implementing SFP for packaging to effectively support consumers to reduce household food waste – see section 3.2 for the relevant insights and discussion.

Consumers purchase alternative brands with different product-packaging that better meets their needs

Proactively gather consumer feedback on existing product packaging

Consumer satisfaction of product-packaging forms part of how consumers perceive food/beverage brands. A portion of consumer interviewees (from the research reported in Paper 3⁴) said that they have negative perceptions of food/beverage brands due to poor experiences with specific product-packaging. This includes packaging that rips when first opened and is hard to adequately reseal to maintain freshness, contributing to food waste.⁴ However, food/beverage brands may not be aware when consumers have difficulties or dissatisfaction with specific product-packaging unless consumers choose to inform them. Rather, consumers say that they opt to avoid repeat purchase of these products where possible, choosing to purchase alternative brands with different product-packaging that better meets their needs.^{4, 18} As such, there is a clear opportunity for food/beverage brands to proactively gather packaging feedback from consumers in the context of usability and household food waste.^{4, 10} This would provide food/beverage brands an opportunity to tweak packaging, helping to maintain or even increase consumer satisfaction of product-packaging and minimise household food waste.

Support consumers to identify save food packaging features and benefits on pack

The effectiveness of industry action to develop and apply SFP solutions to minimise household food waste is partially affected by consumer ability to recognise and understand the functionality of these SFP solutions. A combination of clearly communicating SFP solutions on-pack and through a food/beverage brand's marketing channels can assist in this regard, essential to encourage consumers to use and therefore benefit from SFP.^{10, 18}

Consumers read on pack messaging and are influenced by them, such as messages that communicate how for SFP can extend the shelf life of food, make it easier to store, and identify relevant product information including portion sizes.^{4, 18} Consumers are also willing to pay a premium for such SFP, dependent on on-pack communication that convinces consumers on the benefits of these solutions for specific foods.^{4, 18} The Fight Food Waste CRC conducted an assessment on consumer acceptance of SFP designs for different foods; the related industry report¹⁸ is a resource that industry can consult during product-packaging design. When food/beverage brands make it easier for consumers to identify features in product-

When consumers identify features in product-packaging that suits their needs, this can provide brands a competitive advantage

packaging that suits their needs, this can provide brands a competitive advantage by nudging consumers toward using this product-packaging.^{1,4}

Beyond on-pack communication of SFP features to consumers, there is also an opportunity for food/beverage brands to educate consumers about packaging's role in reducing food waste. This can be actioned through a brand's marketing channels, i.e. social media, retailer magazines. This communication is also an opportunity to introduce to consumers the different SFP features present in their product-packaging and the potential benefits these features can bring consumers.^{1, 10, 18} Altogether, communicating the SFP features of specific product-packaging both on-pack and through a brand's marketing channels can encourage consumer re-purchases and brand loyalty.

3.2

Industry to prioritise save food packaging to reduce household food waste

Different views and needs across industry can affect whether chosen solutions are appropriate or effective to reduce household food waste

SFP solutions that are suitable for reducing household food waste in theory cannot reduce food waste in practice unless industry personnel including key packaging decision makers are willing to prioritise implementing them. It is therefore important for SFP solutions to be developed and implemented in consideration of the views of different people within the food/beverage-packaging industry, and how the decision-making influence of different industry players can shape product-packaging design. External influences including consumer demand and government legislation can also affect whether the industry prioritises implementing SFP to reduce household food waste.

The food/beverage-packaging industry is made up of a range of companies that perform various roles across the supply chain to produce packaged food/beverage products ready for sale to consumers. These roles include packaging design and implementation, packaging manufacture, food/beverage manufacturing, package filling, and consumer testing and marketing. Given the variety of these roles, it is unsurprising that the industry stakeholders who perform these roles each have different views and needs when it comes to packaging. These different views and needs across the various food/beverage-packaging industry sectors and roles can affect whether SFP solutions are implemented, and whether the chosen

solutions are appropriate or effective to support consumers to reduce household food waste.⁴

This section presents the key factors that affect the willingness or ability of different stakeholders in the food/beverage and packaging industry to prioritise implementing SFP. The section also presents suggestions to help encourage increased industry action to implement SFP to support consumers to reduce household food waste.

Encourage greater buy-in by key decision makers to reduce household food waste through packaging

The research presented in Paper 3⁴ suggests that executive level personnel at packaging companies and packaging technologists within food/beverage brands appear eager to implement packaging solutions to support consumers to reduce household food waste.^{4†} This is positive, as the packaging expertise of these stakeholders highlight their value in helping to implement suitable packaging solutions to reduce household food waste. However, these specific stakeholders are rarely the key decision makers during the

Enable packaging technologists within food/beverage brands and packaging companies to implement SFP more readily

product-packaging design process within food/beverage brands. Rather, they are often tasked by key decision makers within food beverage brands (i.e. executive level personnel and marketers) to deliver a product-packaging design brief that does not specify reducing household food waste, limiting their actions to implement SFP features into product-packaging to reduce household food waste. Given the top-down approach to decision-making within food/beverage brands and the client-supplier relationship between food beverage brands and packaging companies, implementing SFP to reduce household food waste requires buy-in by key decision makers within food beverage brands. This would enable other staff within the product-packaging design process – including packaging technologists within food/beverage brands and packaging companies – to implement SFP more readily. In reality, this may require a shift in organisational strategy, often defined and/or managed by such decision-makers.

Understanding and addressing barriers that hinder the willingness of key decision makers within food/beverage brands to implement SFP is important to encourage buy-in. At the basic level, key decision-makers within food/beverage brands – including executive level personnel and marketers – perceive that implementing to help consumers reduce household food waste competes with their core business priorities of selling food/beverages.

[†]As mentioned in Section 2.1, the PhD research distinguishes between the relative decision-making influence of people in different roles across specific sectors of the food/beverage-packaging industry. As such, the insights presented here had a different emphasis to the research in the wider 1.2.1 project, which groups actors by role across the industry as a whole.

There is an opportunity for a greater industry-wide effort to engage key decision makers within food/beverage brands on the potential business benefits of implementing packaging solutions to reduce household food waste, including encouraging repeat purchases and building brand loyalty.^{4, 10, 15, 19} An econometric study by WRAP reported that approximately 50% of the money saved by consumers purchasing less food from reducing food waste is spent again in retail stores, often on higher-value foods – called 'trading up'.²⁰ There is also the potential for food/beverage brands and retailers to sell higher margin goods which require less volume to make the same profit. Overall, this supports a business case for food/beverage brands to support consumers to reduce food waste.^{1, 19}

Communicating the business benefits of SFP through case studies and training materials could help to address concerns over the costs of implementing SFP and the returns on investment, as these concerns are key barriers to the adoption of SFP design by food/beverage brands.^{4, 10, 19} Encouraging greater buy-in by key decision makers in food/beverage brands could lead to increased industry-wide action to implement SFP to support consumers to reduce household food waste. Simultaneously, there is an opportunity for food/beverage retailers and government to coordinate food waste reduction campaigns

Case studies of the benefits of SFP could encourage greater 'buy in' from key decision-makers

to increase consumer awareness on food waste and motivation to reduce it¹⁹, important to support consumer purchase and use of SFP as a way to minimise household food waste. See section 3.3 for a discussion on the role of communication and collaboration to reduce food waste.

Specify reducing household food waste in the packaging brief and follow it through

The PhD research suggests that food/beverage brands rarely specify SFP features to reduce household food waste as part of product packaging design briefs.⁴ As a design brief dictates what features or key aspect the packaging will meet, there is a clear opportunity for food/beverage companies to specify reducing household food waste on a greater number of product-packaging design briefs. Ideally, this would assist stakeholders within food/beverage brands to appropriately prioritise and budget for SFP features. This may require adjustments at a strategic level by executives and decision-makers. Presenting case studies of the benefits SFP could also encourage greater 'buy in' or practical support from key decision-makers in the product-packaging design process (including marketers and executive level personnel within food/beverage brands) to more frequently specify SFP features to reduce household food waste.^{4, 15} However, specifying SFP as part of the product design brief is only a start. Insights by the 1.2.1 research project suggests that

Depending on the manufacturing set-up or specific machines used, off-the-shelf packaging can mean limited options that are suitable to meet consumers' needs to reduce household food waste

SFP considerations during the early stages of the product-packaging design process are not always carried out during the later stages.¹⁵ This highlights an opportunity for further research to identify additional barriers within the product-packaging design process that prevent SFP features from being implemented¹⁵, especially in the context of household food waste.

Develop more 'off the shelf' save food packaging for existing production lines

The research suggests that food/beverage brands view using off-the-shelf packaging as a more favourable option that developing packaging 'from scratch' due to budget constraints for research and development and a preference to minimise capital expenses.^{4, 15} Off the shelf packaging is used for the confidence that it can readily integrate into existing manufacturing lines and reduce project lead times. However, depending on the manufacturing set-up or specific machines used, off-the-shelf packaging can mean limited options that are suitable to meet consumers' needs to reduce household food waste.¹ There is an opportunity for packaging companies and machinery companies to develop a greater number of 'off-the-shelf' SFP suitable for commonly used machinery on existing production lines.^{1, 21} This would provide food/beverage brands a variety of SFP options aligned to both production and consumer needs, increasing the chance that SFP can reduce household food waste.⁴

Packaging has a role to play in increasing the sustainability of the food and beverage supply and consumption chain

The Fight Food Waste CRC conducted an assessment on the opportunities and barriers for Australia's packaging and processing machinery sector to tackle food waste; the related industry report²¹ is a resource that industry can consult during product-packaging design.

Emphasise save food packaging's role in a sustainable food system

In recent years, conversations on packaging sustainability has increased within the food/beverage-packaging industry, consumers, researchers and government.^{2, 3} This conversation has primarily focussed on the long-term physical polluting impacts of packaging, resulting in a focus on lightweighting, recyclability, compostability, and other ways to increase the 'material sustainability' of packaging. This is reflected in the 2025 National Packaging Targets established in 2018 and made mandatory in 2023 as part of legislation to reduce waste.²² Consumers are increasingly aware about the 'material sustainability' impacts of packaging but less so about the environmental impacts of wasting food. This lack of awareness can impede industry action to implement SFP.²³ Within this context, the food/beverage-packaging industry has reported trade-offs between achieving the 2025 National Packaging Targets and the 2030 target to reduce food waste by half.^{4, 10, 15} As the conversation on packaging sustainability continues, there is an opportunity for researchers and industry bodies

(including the AIP) to continue emphasising to industry and consumers that packaging has a role to play in increasing the sustainability of the food and beverage supply and consumption chain. Ideally, designing packaging to increase material sustainability should not come at the expense of increased food waste if this means greater overall environmental impacts according to many life cycle assessment (LCA) studies²⁴⁻²⁷. Industry training sessions on LCA of product-packaging can help in this regard. Consumer educational campaigns can also play a role to encourage greater acceptance and use of SFP, important to ensure SFP is effective to reduce household food waste.

3.3

Communication and collaboration on packaging to reduce food waste

Sections 3.1 and 3.2 of this report have communicated the importance of ensuring that:

- SFP is designed to meet consumers' needs to reduce house food waste.
- Industry prioritises designing and implementing SFP to reduce household food waste.

Both aspects are crucial to increase the chance that SFP is effective to support consumers to reduce household food waste. The insights presented in relation to these aspects were drawn from research with consumers and industry. Consumers have communicated reasons why they waste food and how packaging can play a role for better or for worse. Researchers have presented this information in the form of reports and journal articles along with recommendations, as first steps toward developing appropriate packaging solutions. Industry have communicated the barriers associated with implementing SFP to reduce household food waste. Together, these insights build a holistic picture of opportunities for SFP to reduce household food waste.

Foster consumer, industry and researcher inter communication and collaboration

Key information needed to start addressing the barriers associated with the design and implementation of SFP to reduce household food waste effectively is present, but not currently put to full use. This is supported by a disconnect between the insights researchers have recommended based on consumer research on household food waste and the action the food/beverage-packaging industry are taking to reduce food waste through packaging – also known in this research as a ‘research–practice’ gap.³ It is hoped that the insights and recommendations presented in this report can help to reduce this disconnect. There is an opportunity for increased communication and collaboration between researchers, consumers and industry on matters pertaining to household food waste and suitable packaging solutions.^{1, 19} This would help to put the suggestions presented in this report into practice.

Good communication between consumers and food/beverage brands or retailers is important for the full value of SFP to be realised. Consumer ability to benefit from SFP depends on a willingness by food/beverage brands to invest in SFP, which in turn partially depends on consumers demonstrating willingness to purchase. Moreover, consumer willingness to purchase SFP relies on consumers being convinced that they will benefit

Potential to develop greater understanding and common ground

from SFP and being able to identify this SFP. Food/beverage retailers and brands can play a key role to communicate this information to consumers. There is therefore an opportunity for food/beverage brands and retailers to coordinate ways to communicate relevant information to consumers. Food/beverage retailers could focus on the benefits of reducing food waste, priming consumers to receive information on how SFP can help. Taking a broader view, there is also an opportunity for government to simultaneously support a consumer campaign on reducing household food waste; Stop Food Waste Australia (in association with the Fight Food Waste CRC) is working toward a national behaviour change campaign as a coordinated step to do this.²⁸ While the challenge of achieving such coordinated communication and collaboration is acknowledged, in the United Kingdom a success in doing so has played a part in significantly reducing household food waste in ways that have benefited food/beverage brands, retailers, consumers and even local governments.¹⁹ Synergy in communication and collaboration between consumers, food/beverage brands, retailers, and government in promoting and adopting SFP can pave the way for a more sustainable future with significantly reduced food waste.

To effectively reduce household food waste through SFP, it is important for food beverage brands to listen to consumers' packaging needs and demonstrate a willingness to act upon them. Given the many functions that packaging needs to fulfil across the food and beverage supply and consumption chain, it remains a challenge for industry actors to design and implement packaging that aligns with both industry and consumer views and needs.⁴ Researchers can play a mediating role by gathering and combining insights from consumers and industry to communicate practical opportunities to reduce food waste through packaging, as demonstrated by the research presented in this industry report. When researchers, consumers and industry come together, there is a potential to develop greater understanding and common ground. This connection is beneficial in that it can generate holistic and syncretic insights to drive forward SFP innovations.





04

Recommendations

Ensure that packaging solutions meet consumers' needs to reduce household food waste

1. Opportunity for the food/beverage-packaging industry to design save food packaging to focus more on consumers' needs to reduce household food waste across all stages of consumption

There is an opportunity for the food/beverage-packaging industry – specifically food/beverage brands and packaging companies – to design SFP to focus more on consumers' specific needs to reduce household food waste across all consumption stages. This includes an opportunity to consider SFP solutions in addition to shelf-life-extension. Industry's focus on shelf-life-extension is understandable given the wider supply chain benefits¹⁰, but can overshadow the benefits of other SFP solutions which can more adequately address the many different reasons for household food waste⁴.

2. Opportunity for food/beverage brands and packaging companies to innovate by developing and implementing packaging that addresses packaging reasons for household food waste

The academic literature documents a variety of packaging-related reasons for household food waste, presenting innovation opportunities for food/beverage brands and packaging companies to develop packaging solutions in response.² Companies that take this opportunity can distinguish themselves from competitors through product-packaging solutions that directly addresses research-documented reasons for household food waste.

3. **Opportunity for packaging personnel to test and tweak packaging during the design and development process to suit the contexts in which consumers will use it**

It is important to verify the effectiveness of product-packaging to minimise household food waste through direct consumer testing. In-home testing is a valuable tool to help food/beverage brands and packaging companies gather context specific insights into how consumers use food and packaging, and whether consumers are aware of and consider the save food features helpful. These insights can be used to tweak packaging, increasing the chance that the packaging will be effective to support consumers to minimise household food waste. In turn, this is an opportunity for food/beverage brands to increase sales and loyalty.

4. **Opportunity for food/beverage brands to proactively gather consumer feedback on existing product packaging**

Consumer satisfaction of product-packaging forms part of how consumers perceive food/beverage brands. However, food/beverage brands may not be aware when consumers have difficulties or dissatisfaction with specific product-packaging unless consumers choose to inform them.¹⁰ Rather, consumers may choose to purchase from another brand which offers product-packaging that better meets their needs.⁴ There is a clear opportunity for food/beverage brands to proactively gather packaging feedback from consumers. This would provide food/beverage brands an opportunity to tweak packaging to help maintain or increase consumer satisfaction and minimise household food waste.

5. **Opportunity for clear on pack communication of save food packaging functionality**

When SFP solutions are applied, it is important that consumers can recognise these solutions and understand what role they can play in reducing household food waste. Clear on-pack messaging of SFP solutions by food/beverage brands and packaging companies can assist in this regard. Beyond supporting consumers to identify and benefit from packaging that suits their needs to reduce food waste, these on-pack messages can provide food/beverage brands a competitive advantage.



Encourage industry to prioritise save food packaging to reduce household food waste

1. **Opportunity for greater buy-in by food/beverage brands to design and implement packaging to reduce household food waste**

There is an opportunity for greater buy-in by key packaging decision-makers in industry to design and implement packaging to reduce household food waste. In particular, this includes marketers and executive level personnel within food/beverage brands given their role in determining what features are presenting in packaging.⁴ Highlighting the potential business benefits of implementing SFP solutions to reduce household food waste to these decision-makers could help to overcome their perceptions that it competes with core business priorities. This may require a strategic shift. Nevertheless, top-down support would enable packaging companies and packaging technologists within food/beverage brands to act more readily to implement SFP.

2. **Opportunity to specify packaging features to reduce household food waste in the product-packaging brief and ensure follow through.**

The research suggests that food/beverage brands rarely specify packaging features to reduce household food waste as part of product packaging design briefs.⁴ A design brief dictates what features or key aspect the packaging will meet, so there is a clear opportunity for food/beverage brands to specify reducing household food waste on a greater number of product-packaging design briefs. This would assist stakeholders within food/beverage brands to appropriately prioritise and budget for SFP features. Encouraging greater 'buy in' or practical support from key decision-makers within food/beverage brands is also important to ensure that what is specified is followed through.^{4, 15} Again, reoriented strategy may play a role.

3. **Opportunity for packaging and machinery companies to develop a wider variety of 'off the shelf' save food packaging that can integrate into existing production lines**

Food/beverage brands often view using off-the-shelf packaging as a more favourable option than developing packaging 'from scratch' to minimise research and development expenses and capital expenses.^{4, 15} However, choosing off-the-shelf packaging that readily integrates into existing manufacturing lines can mean limited options that meet consumers' needs to reduce household food waste. There is an opportunity for packaging companies and machinery companies to develop and market a greater number of 'off-the-shelf' SFP suitable for existing production lines.²¹ This would provide food/beverage brands a variety of SFP options aligned to both production and consumer needs.

4. **Opportunity for the food/beverage–packaging industry and consumers to better recognise save food packaging as an important part of designing sustainable packaging**

Industry has reported a greater focus on the 2025 National Packaging Targets than the 2030 target to reduce food waste by half.^{4, 10, 15} This is likely due to a mix of consumer pressure and government legislation to reduce packaging waste.⁴ Consumers are increasingly aware about the ‘material sustainability’ impacts of packaging but less so about the environmental impacts of wasting food, impeding industry action to implement SFP.¹⁴ There is an opportunity for consumer campaigns and industry training materials to continue emphasizing the important role packaging plays in the sustainability of the food/beverage supply and consumption chain.

Foster increased communication and collaboration between researchers, consumers and industry to design and implement save food packaging to reduce household food waste

1. **Opportunity to recognise the importance of combining contributions by consumers, industry and researchers to build insights into ways to design and implement save food packaging to reduce household food waste**

To increase the chance that SFP is effective to support consumers to reduce household food waste, it is important that (1) SFP is designed to meet consumers’ needs to reduce house food waste, and (2) industry prioritises designing and implementing SFP to reduce household food waste. The recommendations provided so far have suggested practical ways to help achieve this and have been drawn from research with consumers and the food/beverage–packaging industry. The contributions from consumers, the food/beverage–packaging industry and researchers are valuable. The contributions are even more valuable when combined as what emerges is a holistic picture of what opportunities there are for the future of SFP to reduce household food waste.

2. Opportunity for increased communication and collaboration between researchers, consumers and industry on household food waste and packaging solutions

To help drive momentum to put the suggestions presented in this report into practice, there is an opportunity for increased communication and collaboration between researchers, consumers and industry on matters pertaining to household food waste and suitable packaging solutions. Food/ beverage retailers and brands could coordinate to communicate to consumers the benefits of reducing food waste and packaging's role to assist. A willingness to listen and act upon consumer's packaging needs is also important. This would help to drive consumer demand for SFP and in turn, encourage increased industry-wide investment in SFP. Given the many functions that packaging needs to fulfil across the food and beverage supply and consumption chain, it remains a challenge to design and implement packaging that aligns to both industry and consumer views and needs – researchers can play a mediating role. When researchers, consumers and industry come together, there is a potential for greater understanding and holistic insights that can be used to drive forward innovations for SFP.



A close-up photograph of a person's hand holding a brown cardboard box. The hand is wearing a light green long-sleeved shirt with a black elastic cuff. The background is a blurred green plant with large, pointed leaves. The lighting is soft and natural.

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