Kai Commitment
BUSINESSES LEADING FOOD WASTE REDUCTION

Food Waste Drivers Across the Bread Supply Chain Map Resources

RESOURCE 1: Definitions

The following expands on definitions used in the Kai Commitment Food Waste Drivers Across the Bread Supply Chain Map.

Own Drivers Definitions

Logistics

Driver	Evidence/examples/description	Impact
Delivery delays	Whether direct or via a depot, delays can reduce shelf life by 1–2 days. Issues such as road closures, flooding, and inter-island ferry problems exacerbate this. Despite manufacturing on both the North and South Islands, long delays can strand stock – leading to waste.	Minor
Temperature / humidity control	In summer, temperature and humidity can cause bread to go mouldy early or cause weevil infestations in flour.	Minor
Human error / behaviour / staff training issues	Human errors in logistics – such as forklift operations, missed picks, and product damage – contribute to material waste. Some suggested root causes of this include staff shortages and temporary staff, leading to training gaps for manual tasks.	Minor

Packaging and handling issues	Handling issues are often related to human error / behaviour / staff training issues (e.g. staff mishandling and product spills). Packaging issues include new cardboard bread tags coming loose more often – causing bread bags to open.	Minor

Milling

Driver	Evidence/examples/description	Impact
Varying wheat quality	Wheat quality can be significantly impacted by various environmental factors, including drought and flooding or deterioration during transit. This reduces the value that can be extracted and lowers flour yield. Imported surplus or discarded wheat must be buried due to MPI biosecurity requirements and is therefore not able to be recovered.	Moderate
Human error / behaviours / staff training issues	Human error and behavioural issues (e.g. lack of care/ accountability) can cause grain and flour spillages. High staff turnover and training gaps contribute to these issues. Spillages can be reworked, but at a cost.	Minor
Storage issues	Weevils may spread if wheat is not stored properly. The presence of weevils leads to the disposal of wheat.	Minor

Manufacturing

Driver	Evidence/examples/description	Impact
Human error / behaviours / staff training issues	Minor human errors in bakeries cause significant impacts such as ingredient spillages, uncorrected leaks, improper ingredient weighing, and machine calibration errors. High staff	Major

	turnover, incomplete training, complex SOPs, language barriers, and a lack of numeracy skills contribute to these issues.	
Machinery inefficiencies	Older, unreliable machinery can cause waste due to breakdowns or mechanical issues, ruining batches of bread. Manufacturers use PLC and SCADA systems, but outdated equipment can lead to sub-optimal control.	Moderate
Packaging and handling issues	Racks of loaves are stacked by machines and humans. At the end of packing lines, high racks of loaves can topple due to equipment issues or operator error – causing bread damage. Packaging is generally reliable but tags (particularly cardboard ones)/closures can sometimes fail, causing bags to open and bread to spill out during distribution.	Moderate
Inventory control	Poor inventory management – such as overstocking ingredients to handle unexpected orders – can lead to waste.	Minor

Wholesale

Driver	Evidence/examples/description	Impact
Poor forecasting / inventory management	The lead time for ordering bread is often a few days, making it difficult for wholesalers to respond to changes in demand from food service providers quickly. This can result in stock going out of date.	Moderate
Delivery delays	Food service companies and their clients expect very fresh bread. Any delivery delays can reduce shelf life, causing the bread to become stale or even mouldy.	Minor

Retail

Driver	Evidence/examples/description	Impact
Poor inventory management	Forecasting for own-brand and externally supplied bread is challenging. Forecasting can be hampered by a lack of visibility of stock going in and out. The interface between ordering projections and suppliers affects accuracy. Manual decisions by store managers often lead to over-ordering and excess inventory.	Minor
Packaging and handling issues	Packaging issues can occur with bread spillages, particularly due to bag tags coming loose (particularly cardboard tags). Stocking shelves to full capacity can also sometimes lead to products being squashed or the tags coming undone, contributing to further waste.	Minor
Vendor placing waste in skips	Some smaller vendors have been placing bread waste in store skip bins – leading to landfill disposal instead of being used for human food, animal feed, or compost. This practice, though not allowed, occurs when skip bins are left unlocked.	Minor

Food Service

Driver	Evidence/examples/description	Impact
Fluctuating patronage	Expected numbers for meals fluctuate daily – leading to difficulties in predicting demand, planning, and ordering – resulting in waste. Factors such as weather, holidays, local events, and patient conditions in hospitals affect meal requirements. E.g. Event ordering is often done days in advance based on forecasts, while hospital ordering is typically done the day before, making meal planning unreliable and generating waste.	Major
Lack of food waste monitoring	Participants noted that being unaware of food waste is a major driver of food waste generating behaviours. The lack of existing processes to measure food waste by weight and financial value contributes to this. Most professional food service companies use manual or semi-automated systems to track food waste daily by category, keeping the issue visible to chefs. However, food waste disposal systems such as sink macerators and digesters hide the waste, making it less apparent.	Major

Staff behaviour and communication issues	Poor communication between front-of-house and kitchen staff, as well as between sales teams and site staff, leads to issues with updating customer numbers and preferences. This is often due to poor training or operating procedures, and a lack of staff objectives and incentives to reduce waste.	Moderate
Portion management	Plate waste can result from staff over-portioning, often due to inadequate training or serving tools. Customers may also take more than needed from buffets.	Moderate
Storage / inventory management	Bread waste can occur due to poor stock rotation, or inappropriate storage of stock. E.g., lack of freezing capacity can result in molding bread.	Minor
Lack of internal upcycling opportunity	The inability to produce food items that are not on the menu prevents food service businesses from using up food that has not been utilised.	Minor

Supply Chain Drivers / Business-to-Business Drivers

Driver	Supply Chain Stage	Description	Impact
Contractual agreements between manufacturers and retailers	Manufacturing, Retail	Confidential contractual terms between businesses driven by negotiated business models.	Major and moderate
Contractual agreements between food service and clients	Food service	Confidential contractual terms between businesses driven by negotiated business models.	Major
Consumer expectation of freshness	Manufacturers, Retail, Food service, Household	Consumer expectations that fresh bread is best.	Moderate (retailer/ manufacturer) Minor (retail and household)

Forecasting	Manufacturers, Retail, Food service	Lead-time for ordering bread is often a few days, which means that wholesalers cannot always respond quickly to changes in demand from the food service providers. This can lead to stock going out of date.	Moderate
Limitations of client premises	Food service	Food service often operates on client sites where they don't have operational control over waste options or necessary storage requirements for surplus.	Moderate
Storage and distribution issues	Logistics, Milling, Manufacturing	Large manufacturers rely on millers to maintain flour supply, avoiding shortfalls. Yeast and grains arrive via tankers and sacks. Smaller manufacturers face packaging damage, causing flour waste, which mills don't manage.	Minor
Supplies arriving out of spec	Milling, Manufacturing	Minor milling and blending errors can lead to rejected flour or manufacturers rejecting flour or baked bread.	Minor
Delivery delays	Logistics (whole chain)	Delays reduce shelf life by 1–2 days, worsened by road closures or ferry disruptions, which strand stock. Even with bakeries on both the North and South islands, long delays can cause bread waste.	Minor
Merchandising delays	Manufacturing, Retail	Bread delivered overnight may sit before merchandising/shelving, shortening shelf life, especially in warm weather. The gap between delivery and in-store merchandising reduces bread shelf life or freshness at a consumer's home.	Minor
Consumer expectation of availability / choice	Manufacturing, Retail, Household	The practice of stores is to keep shelves fully stocked to meet consumer expectations, and to be available for online shopping, often exceeds the demand, creating waste.	Minor
Temperature & humidity issues	Whole chain	In summer, heat and humidity can speed up mould growth, even with proper storage.	Minor
Packaging & handling issues	Whole chain	A range of issues, including thinner bags and cardboard tags becoming loose, increase bread spillage.	Minor
Competitor specials and promotions	Manufacturing, Retail	Promoting a particular brand or type of bread can reduce the demand for alternatives, impacting the forecasting by bakeries and can generating waste.	Minor
Risk of supply chain breakdown	Manufacturing, Retail, Food service	Sites receive regular deliveries (approximately three times per week) eliminating the need to over-order. However, many sites store excess stock as a precaution against supplier breakdowns and potential shortages, which can lead to waste.	Minor

Portion & packaging decisions	Manufacturing, Retail, Household	Standard loaf sizes may not suit smaller households or those with limited knowledge of correct storage, leading to waste. Household preference for fresh bread also increases waste if standard loaf size is not eaten before it loses its freshness.	Minor
Consumer communications on label / awareness	Manufacturing, Households	A general lack of public understanding regarding the difference between 'best before' and 'use by' dates can drive waste. Additionally, insufficient guidance from manufacturers on how to best store products or use items that are not at their peak can contribute to this issue.	Minor

RESOURCE 2: Best Practice Solutions by Supply Chain Stage

The following are best-practice-based solutions to food waste, categorised by supply chain stage.

LOGISTICS	Drivers & Solutions	B2B Collaboration Opportunities
	Delivery delays: Real-time GPS tracking, flexible distribution hubs.	**Temperature / humidity**: Supply chain-wide climate control monitoring.
	Temperature / humidity: Automated environmental sensors with real-time alerts.	**Storage / distribution / packaging / delivery**: Collaborate on industry logistics challenges.
	Human error / staff training: Automate processes, standardise training and SOPs, multilingual training tools, gamification, and incentives for waste reduction.	

	Packaging / handling: Strengthen bread bags and securing mechanisms for transit.	
	General: Measure waste, monitor waste hotspots, foster continuous improvement culture with targets & KPIs (where appropriate).	
	Diversion from landfill: Investigate best waste disposal destinations to reduce environmental/climate impact of food waste (e.g. anaerobic digestion, composting).	
MILLING	**Drivers & Solutions**	**B2B Collaboration opportunities**
	Varying wheat quality: Use real-time grain-quality sensors, redirect off-spec wheat to value-added processing.	**Storage / distribution / packaging**: Consult on supply requirements and design stronger packaging formats.
	Human error / staff training: Automate processes, standardise training and SOPs, multilingual training tools, visual aids, gamification, and incentives for waste reduction.	**Supplies arriving out of spec**: Implement stricter quality checks and collaborate on the causes of rejections from the supply chain.
	Storage issues (weevils): Environmental monitoring and pest detection in silos.	
	General: Measure waste, monitor waste hotspots, foster continuous improvement culture with targets & KPIs (where appropriate).	
	Diversion from landfill: Investigate best waste disposal destinations to reduce environmental/climate impact of food waste (e.g. anaerobic digestion, composting).	
MANUFACTURING	**Drivers & Solutions**	**B2B Collaboration opportunities**
	Human error / staff training: Automate processes, standardise training and SOPs, multilingual training tools, gamification and incentives for waste reduction.	**Contractual agreements**: Build the case for alternative, lower waste arrangements, use data and global best practice options, include waste reduction in supply meetings.

	Machinery inefficiencies: Allocate time to conduct routine maintenance programme for equipment to prevent breakdowns and batch losses. Invest in/support pilot interventions, equipment or technology upgrades.	**Competitor promotions**: Enhanced forecasting across SKUs taking into account competitor promotional activities.
	Packaging/handling: Improve design of tags to reduce failure rate. Automated sensors for rack stacking.	**Forecasting**: Integrated information sharing, technology-enabled platforms.
	Inventory control: Demand-driven ordering, digital inventory platforms.	**Storage/distribution**: Partner with millers on packaging improvements.
	General: Measure waste, monitor waste hotspots, and implement continuous improvement culture with targets and KPIs (where appropriate). Use data insights to justify investment in improvements (e.g. forecasting technology, process improvement expertise, equipment).	**Delivery delays**: Collaborate on common industry logistics challenges.
	Diversion from landfill: Strengthen food rescue and animal feed initiatives and investigate upcycling partnerships. Investigate best waste disposal destinations to reduce environmental / climate impact of food waste (e.g. anaerobic digestion, composting).	**Merchandising delays**: Coordinated and more efficient delivery-to-shelving schedules.
		Consumer behaviours: Flexible loaf sizes, resealable packaging, shelf-life extension, consumer engagement on correct use of date labelling, storage advice, reuse of products.
		Temperature/humidity: Supply chain-wide climate control monitoring with alerts.
		Supply chain breakdown: Localised backup supply options.
WHOLESALE	**Drivers & Solutions**	**B2B Collaboration opportunities**

	Poor forecasting/inventory: AI-based demand forecasts, data sharing for better lead times.	**Temperature/humidity**: Supply chain-wide climate control monitoring with alerts.
	Delivery delays: Integrated tracking systems for fresh food delivery prioritisation.	**Packaging/handling**: Communicate to manufacturers on recurring damage/spillage issues.
	General: Measure waste, monitor waste hotspots, implement continuous improvement culture with targets and KPIs (where appropriate). Invest in/support pilot interventions. Create internal champions who motivate and organise staff engagement activities.	
	Diversion from landfill: Strengthen food rescue and animal feed initiatives and investigate upcycling partnerships. Investigate best waste disposal destinations to reduce environmental/climate impact of food waste (e.g. anaerobic digestion, composting).	
RETAIL	**Drivers & Solutions**	**B2B Collaboration opportunities**
	Poor inventory management: Collaboration with merchandisers from supply chain partners on sales stats and shelf level analytics for accurate reordering. Use centralised dark stores in urban areas for stock management.	**Contractual agreements:** Collaborate with supply chain partners on drivers of waste due to B2B arrangements, processing and practices.
	Packaging/handing: Upgrade packaging, limit shelf overfilling.	**Consumer expectations**: Education on cost savings to motivate customers to waste less. Raise awareness of correct use of date labels and other information at POS (e.g. storage, reuse) packaging innovations, promote quality over freshness, pilot stock level variations.

	Vendor placing waste in skips: Lock waste bins, monitor with sensors/cameras.	**Forecasting**: Integrated information sharing platforms.
	General: Measure waste, monitor waste hotspots, implement continuous improvement culture (Set targets, KPIs, track progress, and share visual data reporting with teams). Provide regular staff training and support pilot interventions. Create internal champions who motivate and organise staff engagement activities.	**Delivery/merchandising delays**: Coordinated schedules, industry logistics collaboration.
	Diversion from landfill: Strengthen food rescue and animal feed initiatives and investigate upcycling partnerships. Investigate best waste disposal destinations to reduce environmental/climate impact of food waste (e.g. anaerobic digestion, composting)	**Temperature/humidity**: Supply chain-wide climate control monitoring with alerts.
		Promotional activity: Collaborate with manufacturing to mitigate waste caused by competitor promotions (within competition laws).
		Supply chain breakdown: Localised backup supply options.
FOOD SERVICE	**Drivers & Solutions**	**B2B Collaboration opportunities**
	Fluctuating patronage: Dynamic demand planning with event/weather/historical data.	**Contractual agreements**: Collaborate with supply chain partners on drivers of waste due to B2B arrangements, processing and practices.
	Lack of monitoring: Smart waste tracking tools (camera bins, scales) for kitchen waste. Measure customer waste, monitor waste hotspots, implement continuous improvement culture with targets and KPIs for waste reduction, and invest in/support pilot interventions.	**Consumer expectations**: Engage customers on reduced.

	Staff behaviour/communication: Mobile kitchen apps, automate processes, standardise training and SOPs, multilingual training tools, gamification and incentives for reduction, including shared waste reduction targets.	**Client premises limitations**: Collaborate to improve storage at venues and waste diversion infrastructure options.
	Portion management: Standardised serving tools and training. Smaller plate size and single serves.	**Forecasting**: Integrated information sharing platforms.
	Storage/inventory: automated alerts and technology enabled inventory management.	**Temperature/humidity**: Supply chain-wide climate control monitoring with alerts.
	Lack of internal upcycling: Reuse within recipe design, staff incentives for innovation and waste reduction through chef specials etc.	**Supply chain breakdown**: Localised backup supply options.
	Diversion from landfill: Strengthen food rescue and animal feed initiatives and investigate upcycling partnerships. Investigate best waste disposal destinations to reduce environmental/climate impact of food waste (e.g. anaerobic digestion, composting). Emission-tracking software to calculate emissions factors and communicate impact to customers.	

Case Studies

- **End Food Waste: Australia Bakery Sector Action Plan** incorporates the following case studies on food waste reduction:
  - **Goodman Fielder –** equipment upgrade
  - **Humble –** introducing waste sorting and increasing diversion options
  - **Phillipa's –** SKU/range reduction
  - **Bob & Pete's –** Awareness and reporting
- **Cranswick,** measuring food waste and incorporating best practice
- **BBF UK & Europe** – incorporating Quality Assessment Critical Control Point
- **Kellogg's** – collaboration with supply chain partners to develop post-harvest loss reduction practices