Dairy Australia

Delivering on the Dairy Food Waste Action Plan

Wrap up report

Contents

Acknowledgements

This project is funded by Sustainability Victoria.

Dairy Australia commissioned RM Consulting Group (RMCG) to support the development of this report.

Acknowledgment of Country

We acknowledge the Traditional Owners of the Country that we work on throughout Australia and recognise their continuing connection to land, waters and culture. We pay our respects to their Elders past and present, and we acknowledge emerging leaders. Moreover, we express gratitude for the knowledge and insight that Traditional Owners and other Aboriginal and Torres Strait Islander people contribute to our shared work in Australia.

We pay respects to all Aboriginal and Torres Strait Islander communities. We recognise that Australia was founded on the genocide and dispossession of First Nations people and acknowledge that sovereignty was not ceded in this country. We embrace the spirit of reconciliation, working towards self-determination, equity of outcomes, and an equal voice for Australia's First People.

ADPF GARDINER FOUNDATION END FOOD WASTE AUSTRALIA

Executive summary

Background

The Dairy Sector Food Waste Action Plan serves as the dairy industry's response to the Australian Government's goal of halving food waste by 2030.

The action plan increases transparency of food waste along the dairy supply chain and assists decision making to promote efficiency, profitability and sustainability. It also presents a pathway for cross-industry collaboration to improve the environmental footprint of the Australian dairy industry.

The action plan identified 10 key actions to reduce food waste, reduce environmental impacts and reduce costs across the dairy supply chain. Two immediate actions were identified for Dairy Australia and its industry partners to begin advancing food waste reduction efforts, which primarily focus on the manufacturing/processing sector as the largest contributor to dairy food waste in the supply chain. They are:

- **Action 1:** Monitor dairy food waste across the supply chain and establish an industry working group.
- **Action 2:** Implement practices that prevent process wastes.

Dairy Australia and its industry partners have progressed key elements of Actions 1 and 2 in the manufacturing supply chain area, including:

- Development of a raw milk equivalence calculator
- Second round of data collection for the Dairy Food Waste Account
- On-site food waste assessments, and implementation plans which addressed both site-specific and cross-manufacturing root causes
- Establishment of an Industry Food Waste Working Group.

Key findings

Raw milk equivalence calculator

- The calculator can be used as a standardised benchmarking tool to highlight the amount of dairy food waste and its raw milk equivalence for different dairy food waste categories.
- Quality, site-specific data will improve the accuracy of the calculator.

Dairy Food Waste account updates

- The Australian dairy industry reduced the total amount of dairy food waste in 2022/23, but the estimated wholesale market value of dairy food waste increased.
- Robust and accurate data across the supply chain (particularly food service/households and food rescue) will better inform the estimated tonnage and value of wasted dairy food.

Site waste assessments

- Ten dairy manufacturing sites were assessed, covering production of milk, cheese, frozen desserts, powders and butter. Common challenges were found across the sites however the sample size is not representative of the whole dairy sector.
- Common root causes for dairy food waste were identified across the manufacturing sector.
- Dairy manufacturers generally showed a good culture of continuous improvement, particularly if they employed dedicated staff in this area.

Industry Food Waste working group

- Three productive meetings were held to support the implementation of the action plan.
- The meetings provided an opportunity to sense-check the findings of activities undertaken, provide feedback and drive discussions on industry opportunities to address barriers and challenges to food waste.

Section 1

Introduction

About the Dairy Sector Food Waste Action Plan

In June 2023, Dairy Australia – in partnership with the Australian Dairy Products Federation and End Food Waste Australia with support from the Dairy Manufacturers Sustainability Council and Sustainability Victoria – launched the Dairy Sector Food Waste Action Plan. It serves as the dairy industry's response to the Australian Government's goal of halving food waste by 2030.

The development of the action plan produced unique insights into where, what, and how much food waste is occurring in the dairy industry. Food waste from the dairy supply chain was previously identified as one of the six highest Australian food waste sources. In 2020/21, Australia produced 8,858 million litres of milk and the action plan identified 0.71 million tonnes of actual dairy food was generated across the supply chain. The manufacturing/processing sector was identified as the biggest contributor to food waste with key waste categories including:

- By-products from cheese production (e.g. whey)
- Process wastes associated with dairy product manufacturing
- Disposal of off-specification/out-of-date finished product to landfill.

The action plan increases transparency of food waste along the dairy supply chain and assists decision making to promote efficiency, profitability and sustainability. It also presents a pathway for cross-industry collaboration to improve the environmental footprint of the Australian dairy industry.

The action plan assessed and recommended commercial and practical food waste reduction opportunities across the dairy supply chain and identified 10 key actions to reduce food waste, reduce environmental impacts and reduce costs.

Priority actions include:

- Implementing efficient mechanisms and systems to monitor, report and manage dairy food wastes within and across sites
- Conducting site-specific assessments that identify the amount of dairy food waste across categories, their root causes and potential solutions
- Investing in research and development and technical solutions for dairy manufacturing sites
- Partnering with food rescue organisations
- Promoting sustainable packaging solutions
- Educating consumers through product labelling and storage advice – behaviour changes across the supply chain.

Collectively and collaboratively, the action plan sets the Australian dairy industry up for success.

This report

Following the development of the action plan, two immediate actions (Actions 1 and 2) were identified for Dairy Australia and its industry partners to begin advancing food waste reduction efforts in the dairy industry. Both actions primarily focus on the manufacturing/processing sector due to the volumes of dairy food waste produced at this stage of the supply chain, and the opportunity to identify and implement solutions that will maximise value and reduce dairy food waste.

- **Action 1** is to monitor dairy food waste across the supply chain and establish an industry working group. This action aims on monitoring dairy food waste through ongoing data collection and expanding the Dairy Food Waste Account which will help to drive and track progress against the dairy industry's food waste reduction initiatives. A key component of the action is the development of a standardised food waste monitoring tool, the raw milk equivalence calculator. This tool addresses the challenge of comparing diverse waste types, such as whey, cheese, and milk, by providing a metric based on the milk input required for each waste type.
- **Action 2** is to implement practices that prevent process wastes by undertaking site-specific food waste assessments to identify sources of food waste at manufacturing sites and provide recommendations.

This report examines how Dairy Australia, and its industry partners have progressed key elements of Actions 1 and 2 in the manufacturing sector. It discusses the drivers, approach, key findings and next steps for four activities including:

- Development of a Raw Milk Equivalence calculator (Action 1)
- Second round of data collection for the Dairy Food Waste Account (Action 1)
- On-site food waste assessments, and implementation plans for site-specific and cross-sector root causes (Action 2)
- Establishment of an Industry Food Waste Working Group (Action 1).

Section 2

Raw Milk Equivalence calculator

Action 1

Monitor dairy food waste across the supply chain and establish industry working group.

Activity:
Develop a milk equivalence calculator that can convert all forms of dairy products and their ingredients into a common metric (raw milk equivalents).

Delivery partner:
Process Partners

Drivers

The Australian dairy industry currently produces a significant amount of food waste across the supply chain. As the manufacturing sector produces a range of dairy products across businesses and sites, the industry requires a common metric for estimating food loss that is consistent across the supply chain, and one that can deal with the complex make-up of the varying dairy products, as comparing different waste types like whey, cheese, and milk by weight alone is not accurate.

To address this issue, a Raw Milk Equivalence calculator was developed to allow manufacturers in the dairy supply chain to compare dairy food waste streams using a standardised metric on an annual basis. The calculator provides a guide on the amount of raw milk lost for each dairy food waste type, enabling robust comparisons across different products and more effective prioritisation of key waste hotspots and potential practice change.

Ultimately, the calculator aims to be a practical tool that can enable sites to undertake internal and external benchmarking to reduce the loss of raw and finished product and continue working up the dairy food waste hierarchy. As the calculator evolves, its accuracy and scope will improve. However, the figures generated by the Raw Milk Equivalence calculator are considered a point-in-time estimate and are expected to be refined over time.

Approach

The calculator uses dairy food waste data collected by a dairy manufacturer. This data is categorised into the following food waste groups which use predefined product compositions (outlined in further detail below):

- Dairy products (milk, cheese, fresh products, frozen products, powders)
- Dairy by-products (whey, mother liquor, lactose concentrate)
- Wastewater treatment losses (e.g. dissolved air flotation (DAF) sludge, and biochemical oxygen demand (BOD)/chemical oxygen demand (COD) values of the wastewater)
- Other products which fall outside of the above categories, including finished products (packaged and unpackaged) and unfinished products (unpackaged, intermediates and raw). The user must define the product composition for items in this category.

The original intent of the calculator was to undertake mass balance calculations for each site, thereby estimating the resultant dairy losses. However, the food waste data collected thus far from the dairy manufacturing sites lacks the level of detail required to enable the mass balance approach to work consistently. The complex nature of many of the dairy products and their components further adds to the complexity.

Given the current data limitation, the approach taken to create the calculator was to break down different dairy products into four core components: protein, fat, lactose and total solids. To estimate the 'raw milk equivalence' values for each food waste product type, the user selects a component (protein, casein, whey protein, fat, lactose, milk solids-not-fat (MSNF) or total solids) to calculate the volume of milk required to produce this component in the dairy waste product. The calculator includes a recommended default setting for the dairy equivalence for each product, based on the most significant component that best reflects the raw milk input required for each product's production. An example being casein as the recommended component to calculate the raw milk equivalence in hard and soft cheese. Casein proteins are the primary basis for these cheese structures, and thus casein content reflects the milk input most accurately. However, an alternative component can also be selected for each product type if required.

The raw milk equivalence value is based on typical raw milk compositions for Australia. The calculator also makes component assumptions for products including milk, flavoured milk, cream, hard cheese, soft cheese, desserts, ice-cream and nutritional powders, in addition to waste conversion factors.

Example data was used to test and validate the calculator. The calculator has been reviewed by an independent dairy expert in the Netherlands to ensure accuracy and credibility. Additionally, the reviewer is preparing a report outlining future improvements to enhance the calculator's quality and functionality.

The calculator is presented as a Microsoft Excel tool with instructions and explanations that can be used by each site to further investigate their potential milk losses and opportunities for improvement.

Key findings

Data collection challenges

The Raw Milk Equivalence calculator mapped the major dairy food waste categories.

The calculated raw milk equivalence is an estimation only as it was challenging to receive quality, accurate data from dairy manufacturers across each site's activities and as a result, the calculator includes a range of assumptions and estimations. Each manufacturing site has different levels of sophistication and priorities regarding dairy food waste, in addition to resourcing and mode of data collection.

Site-specific data on typical yields (e.g. how many litres of product is produced per litre of milk) would be valuable, particularly to inform benchmarking. In addition, for wastewater data, pre-treatment wastewater data rather than post-treatment data provides more accurate results. The outputs of the calculator will improve with more detailed and robust data collection, particularly the site-specific yield information which is likely already being collected and recorded by each site.

There is also an opportunity for Dairy Australia to continue working with manufacturers to understand how a mass balance approach could be taken to measure the amount of raw milk lost for each dairy food waste type.

Benchmarking potential

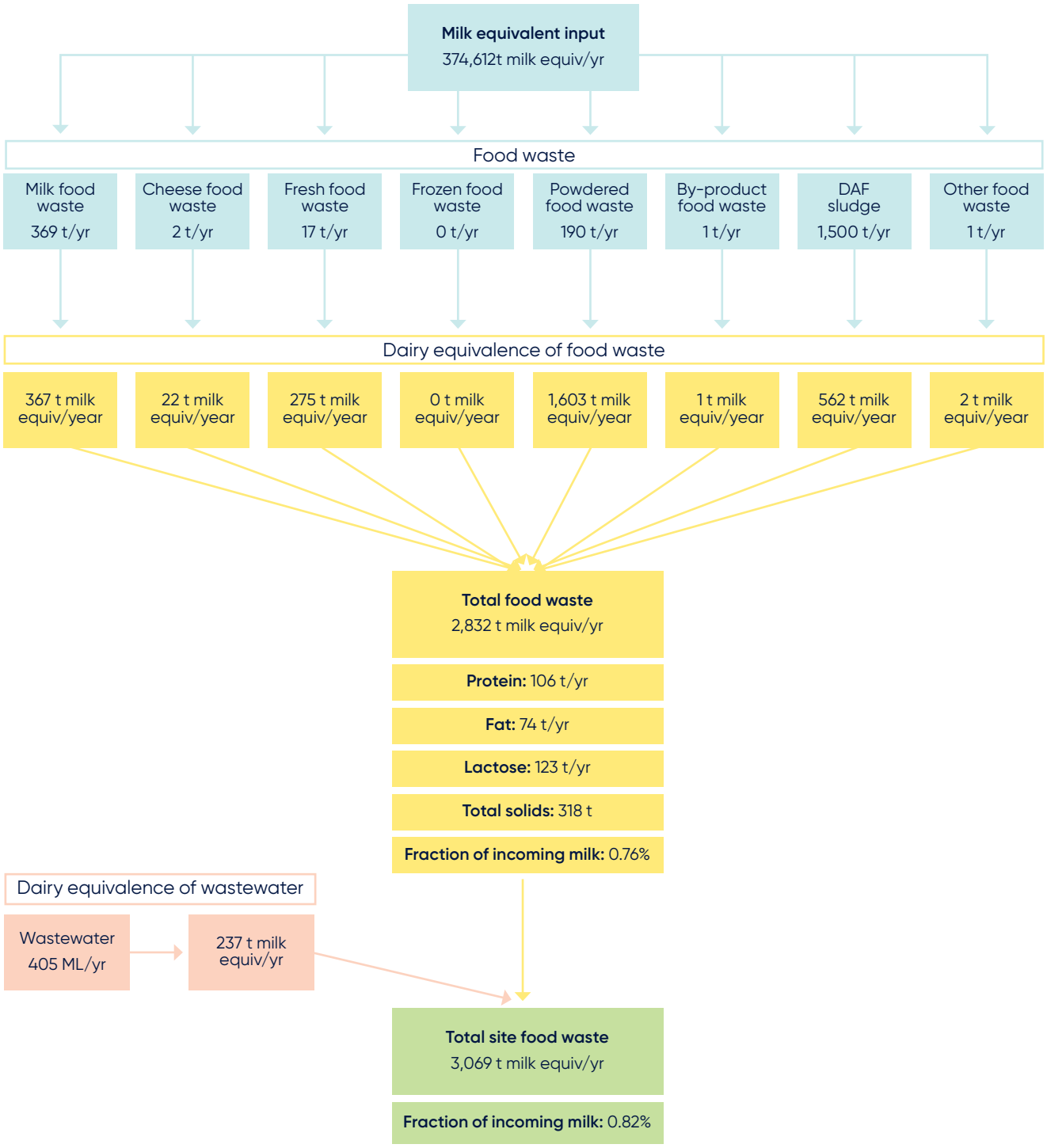
The Raw Milk Equivalence calculator produces a flow chart summarising the annual total dairy food waste per site (Figure 1 on page 6). This illustrates the site's milk equivalent input, its contribution to dairy food waste across each group (e.g. milk, cheese, by-products), and the resulting milk equivalent of food waste and wastewater.

The calculator takes a strong first step towards unravelling the complexities of converting forms of dairy products into a common metric. Importantly, it can be used as a standardised benchmarking tool at both an individual site and from a business-wide perspective across the supply chain.

At the site level, the calculator can highlight the amount of dairy food waste and its milk equivalence being generated across different categories and inform decision making about which areas to prioritise and address to limit waste. At a higher level, the total estimated dairy food waste and its milk equivalence produced per site can be used to benchmark the performance of different sites within one business, or the performance of similar business across the industry. It is noted however that improved data collection across the sites is required before the outputs of the calculator can be used confidently amongst different sites and across businesses. This is predominantly associated with the 'yield' issue discussed above and therefore, the accuracy of comparison between sites.

Therefore, there is significant potential to increase industry confidence in the Raw Milk Equivalence calculator and its estimations using stronger and more accurate, site-specific data.

Figure 1 Example food waste summary from the Raw Milk Equivalence calculator



Next steps

The Raw Milk Equivalence calculator will be made available on the Dairy Australia website in early 2025. There is potential for the Industry Food Waste Working Group to drive and help refine the calculator, thereby improving the industry's knowledge on dairy manufacturing food loss and the potential for improvement.

Section 3

Dairy Food Waste Account updates

Action 1

Monitor dairy food waste across the supply chain and establish industry working group.

Activity:
Monitoring is to occur at least every second year using a standardised monitoring template to support the ease of data collection, consistent reporting across the supply chain, and monitoring the progress and impact of industry actions over time.

Delivery partner:
Rawtec

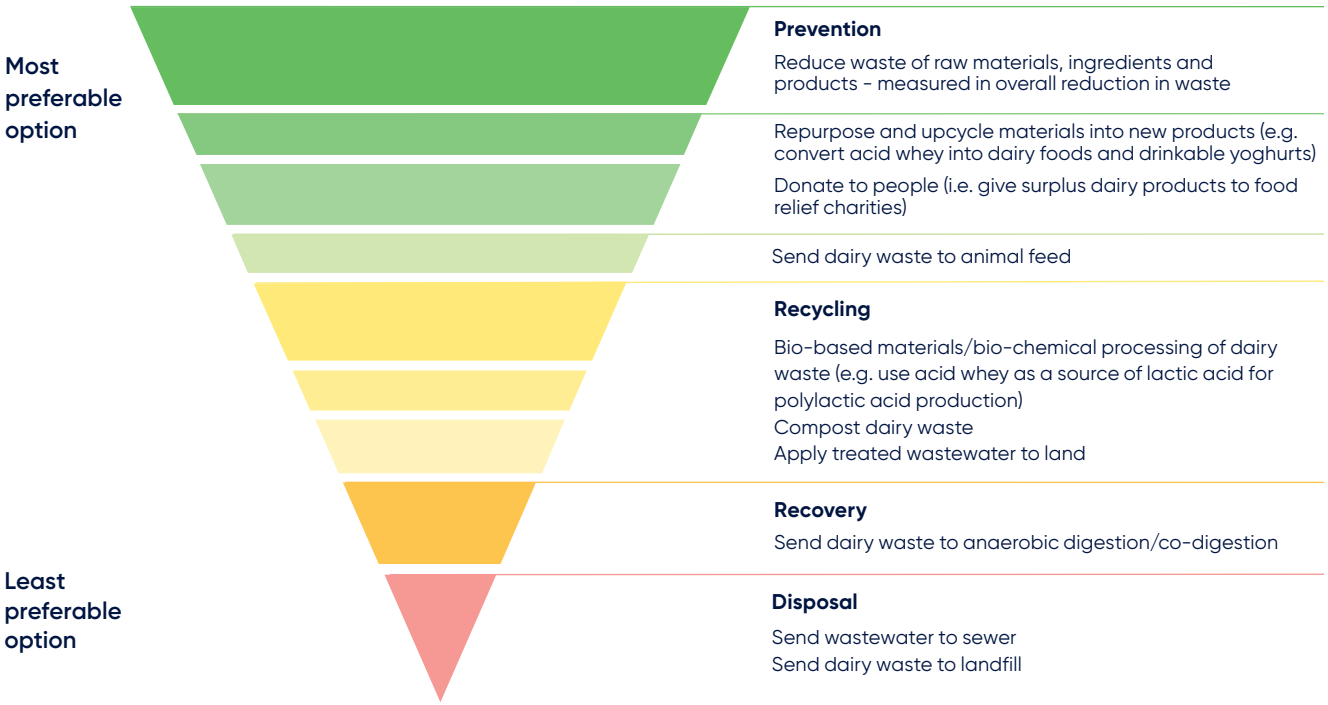
Drivers

The Dairy Food Waste Account was developed to estimate food loss and waste across the dairy supply chain. Using multiple data sources, it provides the richest data set of dairy food waste information available to the Australian dairy industry.

The account identifies the dairy food waste hotspots and the impact that can be achieved by either eliminating the dairy food waste from occurring or moving its management further up the dairy food waste hierarchy (Figure 2).

A second round of data collection was conducted for financial year (FY) 2022/23 to track industry progress against the established baseline from FY 2020/21.

Figure 2 Dairy food waste hierarchy



Approach

First round of data collection

The Dairy Food Waste Account was initially developed using data from the 2020/21 financial year on dairy food waste across the supply chain, including farms, manufacturers, retail/distribution and food service/households.

The original data was collected using a detailed data survey and follow-up consultation with dairy manufacturers, retailers and food rescue organisations. Pre-farm gate milk loss data for dairy farms was provided by Dairy Australia, while dairy food waste estimates for food service and households were developed using secondary sources (e.g. the National Food Waste Baseline, surveys, previous audits). Existing data held by Dairy Australia on whey production volumes by Melbourne's small- to medium-sized speciality cheese and yoghurt production businesses was also used to build the account.

For the manufacturing sector, a data survey was developed to collect the following information:

- Incoming volumes of raw milk
- Outgoing products (e.g. milk, cheese, yoghurt, cream, ice cream, powders, etc.)
- By-products (e.g. whey)
- Volumes of wastewater disposed to sewer
- Food waste volumes avoided or managed through various methods including food waste prevention, recycling, recovery and disposal
- Current dairy food waste management costs.

Second round of data collection

In 2024, the account was updated using 2022/23 data from Dairy Australia and dairy manufacturers. Similar data collection to that of 2020/21 was undertaken, however, additional data was sourced from Australia's major retailers, which was extrapolated to account for the entire retail segment. No new data was available for the food service/household category with dairy waste estimates for this category remaining the same for both data collection events.

It is estimated that 86% of Australia's total milk volume is captured in the updated account using 2022/23 data, compared with 80% in 2020/21.

Participants were generally willing to provide information, however navigating time pressures and competing priorities was an ongoing challenge and as a result, data from some larger dairy businesses was not included in the 2022/23 update and may influence the frozen product category more than the other products. Although additional and more detailed data collection was attempted with the small- to medium-sized manufacturing businesses, no additional data of note was collected and the data for this section of the supply chain remains relatively unchanged.

Key findings

Dairy food waste hierarchy progress

Of the 612,200 tonnes of dairy food waste identified in 2022/23, the Australian dairy industry prevented 295,300 tonnes (33%) going to waste. This is an increase from 213,300 of a total 728,100 tonnes (23%) in 2020/21

There was a slight decrease in the amount of dairy food waste being recycled from 278,600 tonnes (30%) to 201,300 tonnes (22%), potentially due to the increase in prevention of dairy food waste. In addition, 13,600 tonnes of dairy food waste was recovered (down from 18,500 tonnes) while 384,100 tonnes was disposed (down from 428,800).

The amount of potential dairy food waste produced by farmers increased to 10,400 tonnes (up from 6,600 tonnes), which may be attributed to improved data granularity in the current Dairy Food Waste Account compared to previous years.

Due to the large number of dairy farms spread across Australia, obtaining precise data on milk loss from individual farms is challenging. The Dairy Food Waste Account uses data from dairy manufacturers to estimate farm-level milk loss and extrapolate this to the total milk production. In 2021/22, on-farm milk loss data was sourced from just one manufacturer, while in 2022/23 it included data from two manufacturers. As more data points are incorporated, the accuracy and reliability of the on-farm milk loss estimates will continue to improve.

In addition, the manufacturing sector reduced its potential food waste from 736,800 tonnes to 694,300 tonnes. Potential dairy food waste for the retail/distribution sector increased to 13,200 tonnes (up from 8,400 tonnes), primarily due to the additional data sourced from Australia's major retailers which refined estimations.

Dairy food waste by sector

It is estimated that significant volumes of dairy food waste continue to be generated at the manufacturing stage of the supply chain (approximately 77% of total dairy food waste). This is followed by food service (11%) and households (10%), while farms and retail/distribution represent 1% respectively.

The farm dairy food loss data recognises the significant work done by the dairy industry to keep farm milk losses low. However, the retail/distribution and household estimates are likely to be underestimated due to limited data, and the difficulty in estimating dairy food loss due to behavioural practices such as milk, yoghurt and dairy desserts being disposed down the sink.

Dairy food waste by product type

Similar to 2020/21, cheese, milk and fresh dairy products were the main food waste streams for the Australian dairy industry. While cheese contributes a significant proportion to dairy food waste, this is reduced when excluding by-products (e.g. whey) which are mainly an unavoidable 'material' produced during manufacturing.

Of the total 328,100 tonnes of actual dairy food waste by stream (excluding by-products) in 2022/23, milk represented 190,200 tonnes (58%), followed by fresh dairy (80,500 tonnes or 25%) and cheese (41,400 tonnes or 13%). Frozen products, powders and other/mixed products represented between 5,100-5,600 tonnes (2%) respectively.

The amount of dairy food waste for milk and frozen products decreased considerably in comparison to 2020/21 (around 22,000 tonnes respectively), while fresh dairy decreased by approximately 1,400 tonnes and other/mixed products decreased by 1,700 tonnes. Powders increased by approximately 1,700 tonnes and cheese reported similar amounts to 2020/21.

Figure 3 Summary of the destination of potential dairy food waste for all sectors considering the dairy food waste hierarchy

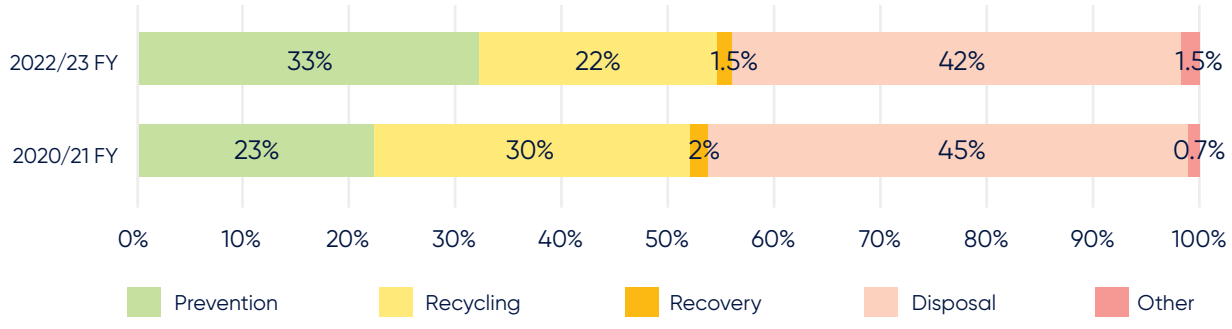
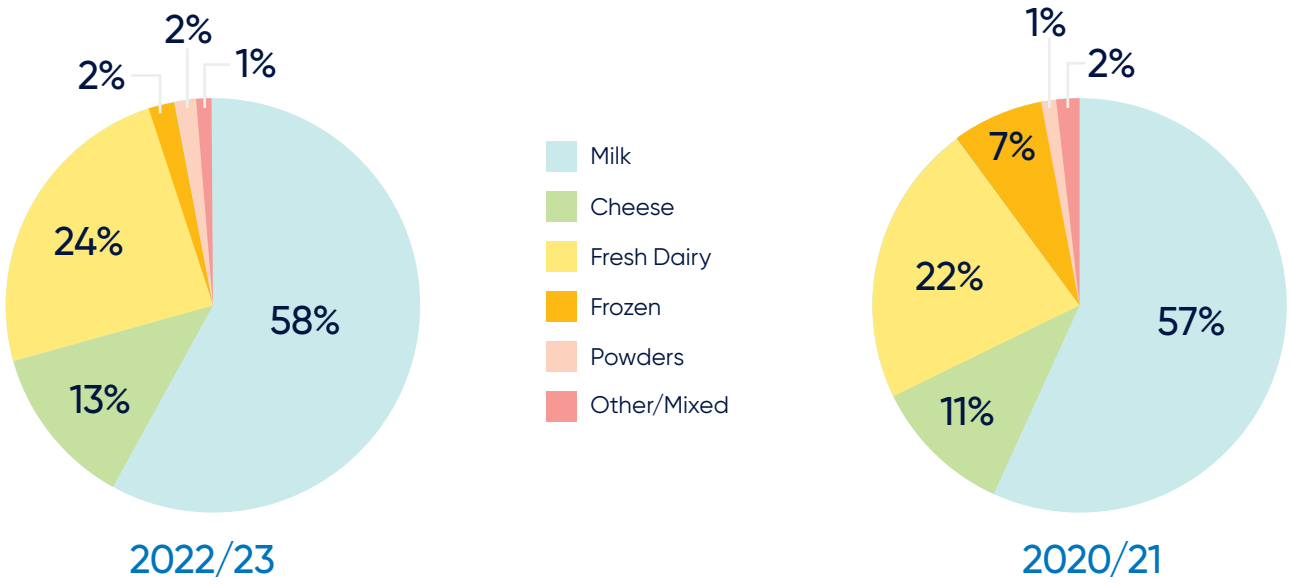


Figure 4 Actual dairy food waste by product type, excluding by-products – Australia wide tonnes in 2022/23 (left) and 2020/21 (right).



Trends and insights

The Dairy Food Waste Account identified that the industry is losing both raw product and finished product to dairy food waste. Importantly, while the industry reduced the total amount of dairy food waste in 2022/23, the **estimated wholesale market value of dairy food waste increased** to $844.4 million (up from $690.2 million in 2020/21). This is largely driven by the increase in the market value of finished products per unit compared with 2020/21, in addition to the cost of milk and processing. It is therefore essential for the supply chain to continue maximising the value of raw dairy products.

While the second round of data collection for the Dairy Food Waste Account captured a slightly higher proportion of total milk volume produced in Australia, it is crucial to **continue receiving robust and accurate data** across the supply chain to better inform the industry on both the tonnage and value of wasted dairy food.

This is particularly prevalent for the **food service** and **household** categories, as well as retail/distribution in respect to **food rescue** and separating volumes of scheduled donations and ad hoc donations of dairy food waste products to avoid disposal. Supply chain organisations need to conduct a root cause analysis at their sites to better understand where they may be generating waste and how they can prevent losses.

While some categories or product streams represented a smaller percentage of total dairy food waste tonnage, these figures can still equate to **significant volumes in practice**, making it critical for manufacturers and other supply chain members to refine their processes and look for opportunities to innovate.

Next steps

Dairy Australia and its stakeholders should continue to promote the value of the Dairy Food Waste Account across the industry, and the improved insights that can be gained through stronger and more specific data collection, as previously mentioned.

As the account provides the means for the industry to track its progress against the Dairy Sector Food Waste Action Plan and Australia's broader goal of halving food waste by 2030, it therefore requires ongoing investment and support.

Section 4

Site waste assessments

Action 2

Implement practices that prevent process wastes.

Activity:
Implement value stream mapping and detailed root cause analysis to determine why dairy food loss is occurring.

Delivery partner:
End Food Waste Australia

Drivers

Dairy manufacturers have differing levels of knowledge regarding their overall yield, total dairy food waste produced on a site and its impact. Depending on their scale and complexity, some businesses have data and resourcing to support their understanding of the main sources of food waste in their site operations, while others do not.

On-site assessments allow dairy manufacturers to gain a clear understanding of the milk and/or dairy product losses they are generating, highlight significant waste hotspots and initiate a root cause analysis to uncover why the waste is occurring. Using this knowledge, the manufacturers can implement informed, targeted and effective systems to drive change.

Approach

Between July and October 2024, End Food Waste Australia completed site food waste assessments utilising Australian Food Pact methodology at 10 dairy sites across Victoria, New South Wales and Queensland. The sites produced a range of dairy products including white milk, flavoured milk and cream (three sites); cheese (three sites); ice cream (two sites); powders (four sites); butter (two sites); and other dairy-based desserts (one site).

The site assessment involved three stages:

1. **Pre-meeting** which examined existing manufacturer data on areas to be addressed during the site assessment, including overall yield, dairy products produced, manufacturing processes, and any known food waste hotspots and the root causes for these losses.
2. **Site assessment and debrief** with cross-functional dairy manufacturer staff, ranging from general management, production/operation, continuous improvement, engineering and quality assurance to supply chain logistics and sustainability.
3. **Written report and wrap-up session** which included priority actions for the manufacturers to focus on and detailed observations and recommendations for the site. The wrap-up session allowed time for discussion on the findings.

The site assessments were conducted over 1 day and provided an opportunity to specifically focus on dairy food waste, rather than assessing multiple aspects of a site concurrently.

The manufacturers were also invited to participate in an implementation plan workshop to address the findings and recommendations of the assessment. The implementation plan would explore some of the root causes identified in the site waste assessment, focusing on those where solutions may provide the greatest impact on reducing food waste, and where solutions were likely to be most feasible for the manufacturer. The workshops aimed to explore the challenges and potential solutions.

It was intended that five of the ten sites which had participated in site assessments, would participate in implementation plan workshops. However, due to manufacturer time and availability constraints, two site-specific implementation plan workshops were conducted, and an additional three implementation plan were produced on hotspots relevant across the dairy manufacturing sector, with general guidance on solving common food waste challenges for further investigation.

"The assessment was very good, it got the team together and forced us to discuss waste that many know is happening but just don't have the resource or capability to drive solutions. This assessment allowed us to rank our waste streams and prioritise."

– Dairy manufacturer after completing a site assessment

Key findings

Best practice insights

The site assessments showed there was generally a good culture of continuous improvement in the dairy manufacturing sector, although this finding may be skewed as the assessments were voluntary and more likely to be taken up by businesses looking to improve their processes further and reduce waste.

General good manufacturing practices identified during the site assessments to limit waste included:

- Using turbidity meters to automate product changeovers and clean in place (CIP) chemicals, where possible and feasible
- Collaborating with equipment manufacturers to optimise separators/clarifier discharge
- Reclaiming curd fines and keeping curd knives sharp
- Reworking butter churn residuals, noting consideration of potential microbial issues.

The participating manufacturers provided good, high-level data for the assessments. Most sites had a reasonably clear overview of the overall yield as a percentage of production; however, Australia's food waste target is absolute, and manufacturers still need to keep in mind that even low waste percentages relate to a high amount of absolute food waste. Most sites could benefit from more discreet and detailed data on the exact contributions to waste percentages to identify the main processes requiring change.

While manufacturers understandably focus on raw material costs associated with dairy food waste, it is important to consider all relevant costs for food waste including procurement, production, storage/holding and waste disposal. Using the metric of potential profit lost can assist in progressing dairy food waste interventions.

Each dairy manufacturer had its own approach to best practice, but generally a site performed more strongly if it employed staff dedicated to continuous improvement. There is an opportunity for a business case to be conducted at each site to identify the return on investment for employing staff dedicated to continuous improvement.

Food waste hotspots

The site assessments highlighted some common root causes for dairy food waste across the manufacturing sector and potential solutions, which are discussed below. However, it should be noted that these may not be relevant to every business in the industry. It is crucial for individual site assessments to be undertaken to identify the primary root causes specific to a manufacturer or site.

Balancing production and customer requirements

Stock keeping unit (SKU) proliferation paired with acceptance of orders below minimum batch size, minimum-life-on-receipt (MLOR) and end-of-life restrictions was found to be an interlinked issue. For example, many businesses had a high number of SKUs (e.g. flavoured milks), but customer orders did not always meet the minimum batch size for production. To maintain shelf space in the market, businesses would produce the order at minimum batch size and hope to sell the remaining stock before expiry or minimum-life-on-receipt (MLOR). One site quoted at least $100,000 in annual losses from too-small batch sizes.

Consumer and customer demand for seasonal products also contributes to this issue.

Suggested actions are discussed further in the dairy sector implementation plan (see 'Next steps').

Product change-overs

Sites producing a high number of SKUs to satisfy internal sales policies or external demand, were found to have high frequency cleaning and suffer inefficiencies in their sales and operations planning. High frequency cleaning leads to waste of product, CIP chemicals and water. Only some sites showed best practice of sensor-controlled discharge of cleaning water and in other sites it was completed manually. One medium-sized manufacturer estimated 165,000L losses from change-overs per year.

Suggested actions:

- Improved sales and operations planning, including renegotiation with key customers.
- Improved use of available sensor-controlled technologies.

Restrictions on donating branded products

MLOR was a prevalent challenge for short shelf-life products, but compounding this issue was the fact that manufacturers are often restricted in how they are allowed to use branded products past MLOR.

Several sites reported that they were of the understanding that they could not donate contract manufactured private label products to food rescue organisations. Particularly private label products had to be disposed of in a manner with no risk of brand damage. This often led to disposal to landfill or secure burial as removing labelling of branded packaging was often not feasible.

Suggested action:

- Investigate existing restrictions on donating products, determine any contractual obligations and re-negotiate with the customer.

New product development factory trials

The development of new products requires factory trials, and the finished products are usually wasted. One manufacturer reported that standard new products only required one trial of 5000L, which could not be marketed, while an internal policy required three successful factory trials of 5000L for core products, with the trial product destined for waste.

There is potential to limit new product development factory trials to R&D pilot plants designed for the food industry. These scaled-down facilities mimic the production of a large-scale factory, allowing manufacturers to develop and test new products.

The benefits of this approach include gathering sufficient data throughout the development process to inform decisions, cost-effective and timely testing of new products using commercial-grade materials and equipment, testing of smaller-quantity products and reduced food waste.

As an example, the CSIRO has developed two R&D pilot plant facilities in Victoria and Queensland which allow food companies to access innovative technologies, enhance their competitiveness through the development of new products and reduce their risk in the commercialisation of new products and technologies.

A R&D pilot plant that can be used between multiple dairy manufacturers would help the industry to reduce its food waste during new product developments by limiting duplication, while increasing efficiency, cost-effectiveness and value to the industry as a whole. However, there may be difficulties in achieving this due to different manufacturer requirements and locations. Regardless, it is an innovative potential solution that could warrant further investigation.

Suggested actions:

- Investigate avenues for planned consumption of trial product (human or animal)
- Determine business case and advantages of pilot plants
- Internal negotiation on new product commercial trial policies to reduce number of successful trials required.

Tanker incomplete emptying

Several sites reported 50-150L of milk being lost with each tanker unloading because the drivers either did not take sufficient time to unload and/or did not burst-rinse, in addition to infrastructure limitations. One site quoted residual milk losses of between $60,000-120,000 per annum while another site reported approximately 55,000L of losses.

Suggested actions are discussed further in the dairy sector implementation plan (see 'Next steps').

Underutilisation of stockfeed arrangements

During the site assessments, some manufacturers shared that their existing arrangements to send dairy food waste to stockfeed had ceased for different reasons. Diverting dairy waste to stockfeed where safe to do so, represents an opportunity for cost reduction and food waste prevention.

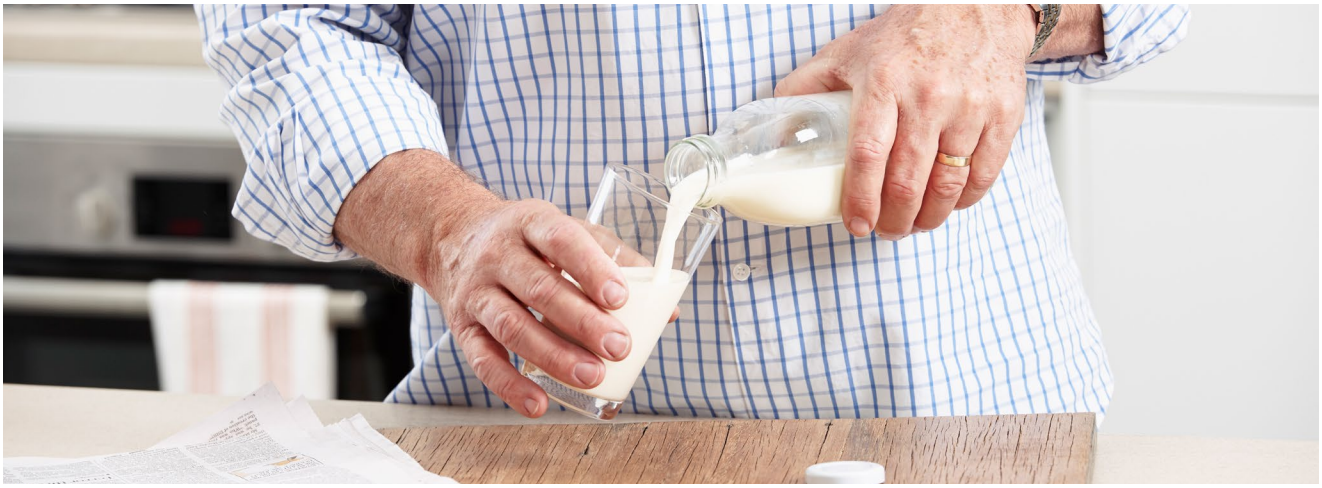
Suggested actions are discussed further in the dairy sector implementation plan (see 'Next steps').

Customer rework restrictions

Some manufacturers identified that food safety certification from customers prohibited rework, which could lead to disposal of product if the site did not have the capacity to hold the product until an alternatively branded product was made, or there was no other avenue of use.

Suggested actions:

- Quantify waste from this issue, contributing factors and barriers to any lacking stockfeed arrangements, where otherwise safe to divert.
- Industry to collaborate with customers to reassess risk from rework and develop solutions.



Next steps

Implementation plans

Three dairy sector implementation plans were developed on common dairy waste hotspots observed during the site assessments. The plans offer suggested solutions to mitigate waste for industry consideration, with the aim to start discussions and actions within organisations to solve operational challenges and improve efficiencies.

The implementation plans focus on:

- Residual loss during milk tanker unloading
- SKU and operational challenges – issues with SKU proliferation, minimum order quantity (MOQ) and MLOR
- Underutilisation of stockfeed arrangements.

The implementation plans can be found in Appendix B, C and D. Each implementation plan defines the issue, root causes and contributing factors, and includes a list of actions (short-term and long-term) and stakeholders to be considered in the discussions. Suggested solutions for each of the three dairy waste hotspots are summarised below.

Tanker unloading

The implementation plan emphasises a collaborative effort between dairy processors, tanker drivers and logistics companies to:

- Estimate milk losses to establish a baseline, calculate losses and track the effectiveness of interventions
- Partner with logistics providers to implement standardised unloading procedures, training programs and communication channels
- Upgrade milk receival infrastructure to facilitate complete emptying, such as ensuring compatibility of burst-rinse configuration between tanker bay and tanker.

SKU and operational challenges

The implementation plan suggests a collaborative and data-driven approach to address the identified issues of SKU proliferation, acceptance of orders below minimum batch size, MLOR requirements and disposal agreements for private label products, including:

- Systematically measuring waste from the abovementioned hotspots and calculating all relevant costs including raw materials, labour and waste disposal fees
- Reviewing and improving forecasting, planning, ordering, and Sales & Operation Planning (S&OP) processes to minimise production excesses
- Developing joint business plans with private label customers that address MOQ, MLOR, and disposal challenges, aligning incentives and reducing waste.

Underutilisation of stockfeed arrangements

The implementation plan on stockfeed arrangements summarises the general regulations on feed for ruminants and pigs with a particular focus on restricted animal materials for feedstock. It is not intended as legal advice and it is recommended to discuss changes with local, relevant authorities before implementations. Suggested actions are:

- To quantify the opportunity of sending current waste streams to stockfeed
- Strengthen relationships with livestock farmers and feedstock manufacturers, ensuring alternative channels if arrangements with one partner ceases
- Embed responsibilities for stockfeed arrangements in the position descriptions of internal staff.

By addressing these challenges, dairy manufacturers could limit waste disposal costs and reduce their environmental footprint.

Section 5

Industry food waste working group

Action 1

Monitor dairy food waste across the supply chain and establish industry working group.

Activity:
Form a collaborative group of key stakeholders that focuses on addressing dairy food waste with the goal to guide and synchronize industry efforts, share best practices, and develop innovative solutions for waste reduction.

Delivery partner:
End Food Waste Australia

Drivers

Actions 1 and 2 of the Dairy Sector Food Waste Action Plan require industry leadership to spearhead comprehensive, systemic solutions that integrate industry best practices.

To achieve this, Dairy Australia is working collaboratively with its Project Partners: Australian Dairy Product Federation, End Food Waste Australia and the Gardiner Foundation, with funding from Sustainability Victoria. The establishment of an Industry Food Waste Working Group aims to bring together a collaborative group of key stakeholders and experts to guide and synchronise industry efforts to address dairy food waste, share best practices and develop innovative solutions for waste reduction.

Approach

In 2024, an Industry Food Waste Working Group comprising 16 key stakeholders and experts in the Australian dairy industry was formed to focus on addressing dairy food waste. Membership was open to all Dairy Manufacturers Sustainability Council members and Project Partners and includes larger dairy businesses as well as small-to-medium enterprises.

The working group was facilitated by End Food Waste Australia and aimed to:

- Discuss and share knowledge of data monitoring and collection best practice
- Draw on aggregated results of the data collected through the waste measurement surveys to guide and synchronise industry efforts
- Develop action plans to work on innovative solutions for waste reduction
- Have a positive influence on food waste reduction across all parts of the food value chain.

The working group met in August, October and December 2024.

Key findings

The working group has held productive meetings to support the implementation of the action plan.

Working group meetings involved delivery partner updates on key activities from Actions 1 and 2 including the raw milk equivalence calculator, second round of data collection for the Dairy Food Waste Account and site waste assessments. The meetings provided an opportunity for working group members to sense-check the findings, share feedback and drive discussions on industry opportunities to address barriers and challenges.

Discussions highlighted that it is essential for the Australian dairy industry to provide robust and detailed data across the supply chain to increase the accuracy of findings, trends and ensure the industry is capitalising on all opportunities to move up the waste hierarchy and maximise Australia's high quality milk products.

Main causes of dairy food waste

As the site waste assessments represented a small portion of the dairy manufacturing industry, working group members were invited to prioritise the identified hotspots relevant to their business to progress industry-wide change.

Working group members identified new product development trials, minimum batch sizes, other end-of-life food donation restrictions, customer MLOR and a lack of waste to stockfeed arrangements as the top five causes of dairy food waste for their businesses.

It was recommended that dairy manufacturers adopt the best management practices highlighted during the site waste assessments if appropriate for their facility.

Specific food waste prevention strategies were discussed with dairy manufacturer representatives during the working group meetings and are outlined in further details below.

Dairy food waste prevention opportunities

Dairy food waste to stockfeed

Data from the Dairy Food Waste Account showed that absolute tonnes of dairy food waste going to stockfeed increased in 2022/23, however during the site assessments, several manufacturers reported that since that time, stockfeed arrangements were only informally handled and, in some cases, had halted completely due to a range of minor challenges.

While this feedback may not be representative of the entire industry, dairy manufacturers in the working group were reminded to confirm their arrangements on sending food waste to stockfeed.

Working group members flagged that import permits are required if Australian dairy food waste includes imported ingredients, which presents a time-consuming and expensive barrier to dairy manufacturers sending food waste to stockfeed. Some producers requiring stockfeed are also unable to recycle the packaging from dairy food waste and it is sent to landfill.

There is an opportunity for the industry to work together to develop a national database of producers requiring stockfeed that are willing and able to receive various dairy by-products, as this can support easy identification of disposal options.

Customer re-work restrictions

The site assessments identified that some customers restrict the potential for contracted products to be re-worked or sent to food rescue. Working group members suggested that addressing issues relating to customers re-work clauses should occur across the entire retail sector.

Affordable de-packaging

Working group members suggested that further investigation was required into the viability of regional de-packaging facilities for all food products, or potentially subsidising transport costs.

Established facilities are usually located in metropolitan areas, making it cost-prohibitive for regionally based manufacturers to use these services. In addition, it is a competitive market with only a few options available.

Some solutions were presented at the December 2024 working group meeting, including a cost analysis of sending packaged product to be re-purposed into animal feed versus sending to landfill, including the carbon comparison, and an example showing a carbon benefit for re-purposing packaged product.

Next steps

Following the December 2024 meeting, attendees voted that the Industry Food Waste Working Group should continue and that data for the Dairy Food Waste Account should continue to be collected every two years. A range of larger dairy manufacturer representatives attended the working group meeting and indicated that they found the discussions to be helpful in addition to the findings from the account.

It was noted that to continue these activities, additional funding may need to be sought.

Section 6

Conclusion

Summary

Significant progress has been made towards Actions 1 and 2 of the Dairy Sector Food Waste Action Plan.

For Action 1, monitoring of dairy food waste across the supply chain has improved, particularly for dairy manufacturing/processing as the largest contributing sector. This was achieved through the development of a raw milk equivalence calculator and updates to the Dairy Food Waste Account. A collaborative Industry Food Waste Working Group was also established to guide and synchronise industry efforts to address dairy food waste, share best practices and develop innovative solutions for waste reduction.

For Action 2, practices to prevent process wastes included conducting on-site food waste assessments with dairy manufacturers in addition to developing implementation plans which addressed both site-specific and cross-manufacturing root causes.

Across all activities, it was clear that the ongoing collection of quality, detailed data across the dairy supply chain is crucial to increase the accuracy of findings, trends and ensure the industry is capitalising on all opportunities to move up the waste hierarchy and maximise Australia's high quality milk products. The collaboration of Dairy Australia, its Project Partners and delivery partners also demonstrates what can be achieved when the dairy industry works together towards a common goal.

It is critical to continue this momentum to ensure the dairy industry plays its part in helping Australia to halve its food waste by 2030.

Key findings

Raw Milk Equivalence calculator

The Raw Milk Equivalence calculator is a practical tool which categorises dairy food waste data into predefined product compositions using a Microsoft Excel spreadsheet. It allows dairy manufacturers to measure the amount of raw milk lost for each major dairy food waste type, enabling internal and external benchmarking across different products and more effective prioritisation of key waste hotspots.

Due to limitations in access to quality, site-specific data, the calculator provides an estimation only. As the calculator evolves, its accuracy and scope will improve.

Dairy Food Waste Account updates

The Dairy Food Waste Account was updated in 2024 with additional data sourced from Australia's major retailers. As a result, it was estimated that 86% of Australia's total milk volume was captured in the updated account using 2022/23 data, compared with 80% in 2020/21. Collecting robust data from dairy businesses of all sizes across the supply chain in addition to the food service/household category and food rescue is essential to improve the accuracy of the account.

The Australian dairy industry prevented 33% (295,300 tonnes) of dairy food going to waste in 2022/23, up from 23% (213,300 tonnes) in 2021/22. However, the estimated wholesale market value of dairy food waste increased to $844.4 million (up from $690.2 million in 2020/21), largely driven by the increase in the market value of finished products per unit compared with 2020/21, in addition to the cost of milk and processing. It is therefore essential for the supply chain to continue maximising the value of raw dairy products.

Site waste assessments

On-site food waste assessments were conducted at ten dairy sites across Victoria, New South Wales and Queensland which captured the major dairy food waste categories. The manufacturers were also invited to participate in an implementation plan workshop to explore a specific root cause identified in the site waste assessment. Due to manufacturer time and availability constraints, two site-specific implementation plan workshops were conducted, and an additional three dairy sector implementation plans were produced to provide the sector with general guidance on solving common food waste challenges.

Dairy manufacturers generally showed a good culture of continuous improvement, particularly if they employed dedicated staff in this area. Common root causes for dairy food waste were identified across the manufacturing sector, however these are not relevant to every business in the industry.

Industry Food Waste Working Group

In 2024, an Industry Food Waste Working Group comprising 16 key stakeholders and experts in the Australian dairy industry was formed to focus on addressing dairy food waste. Membership was open to all Dairy Manufacturers Sustainability Council members and Dairy Australia Project Partners, and included larger dairy businesses as well as small-to-medium enterprises.

The working group held three productive meetings in 2024 to support the implementation of the action plan by sense-checking the findings of current activities, providing feedback and driving discussions on industry opportunities to address barriers and challenges to food waste.

Following feedback from attendees, particularly larger dairy manufacturer representatives, it was recommended that the Industry Food Waste Working Group should continue and that data for the Dairy Food Waste Account should continue to be collected every two years.

Appendix A

2022/23 dairy food waste summary report

1. Background

Dairy Australia, in partnership with the Australian Dairy Products Federation and End Food Waste Australia and Sustainability Victoria, released the Dairy Sector Food Waste Action Plan in 2023 to support the dairy industry's public commitment to halving food waste by 2030.

The Action Plan was underpinned by data across the dairy value chain. The baseline Dairy Food Waste Account brought together data from financial year (FY) 2020/21 to outline the scale of dairy food waste across the dairy supply chain, including:

- On Farm
- Manufacturers
- Retail/distribution
- Food Service
- Households

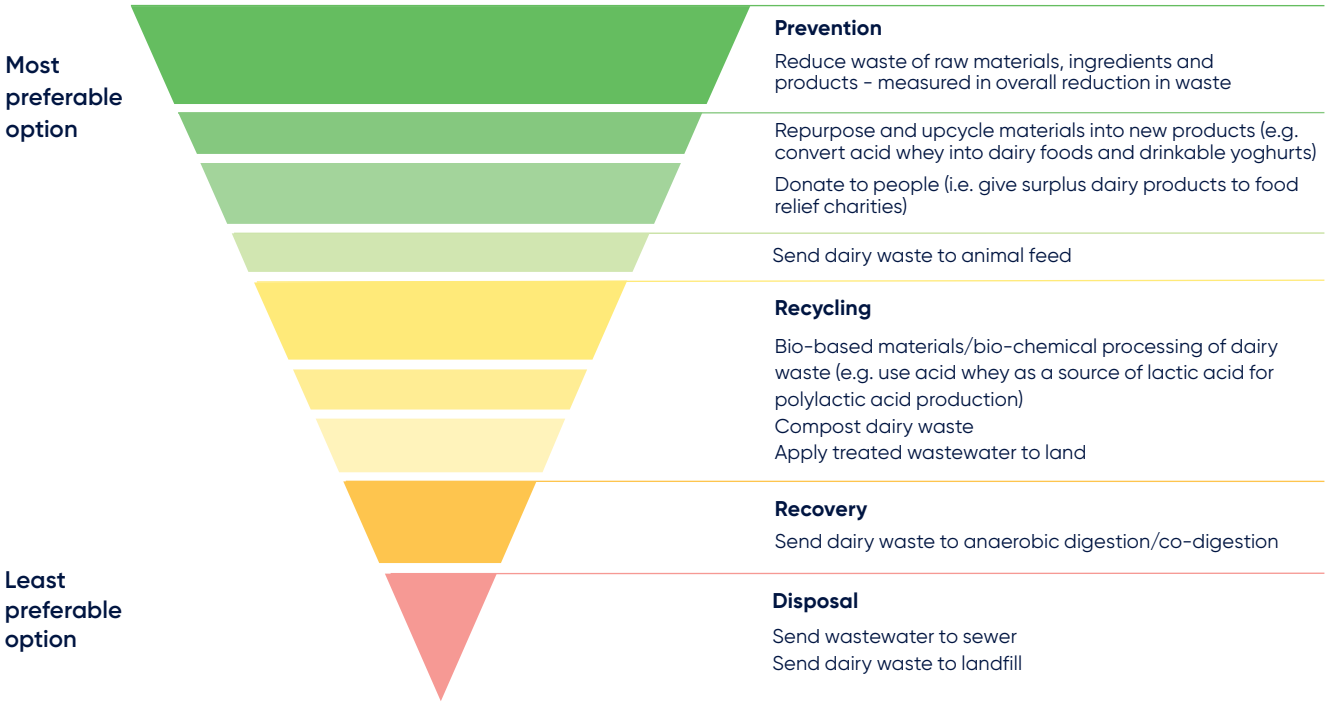
The Action Plan identified that ongoing data collection, and an update of the Waste Account will help monitor the industry's progress over time. Dairy Australia re-engaged Rawtec to repeat the data gathering and analysis to update the Food Waste Account for FY 2022/23.

This report compares the FY 2020/21 Waste Account and FY 2022/23 Waste Account to explore the main changes.

1.1 Dairy food waste hierarchy

The dairy food waste hierarchy outlines the priority actions to manage waste that minimise environmental impact. Items higher up the hierarchy are the preferred options and actions like disposal should be avoided where possible.

Figure 5 Dairy food waste hierarchy



1.2. Defining dairy food waste

The Waste Account refers to two types of dairy food waste:

- Potential dairy food waste – includes all dairy waste regardless of its destination in the dairy food waste hierarchy and indicates the total amount of dairy products lost in the value chain.
- Actual dairy food waste – only includes dairy waste that is sent to recycling, recovery or disposal destinations. It does not include dairy waste that is repurposed/upcycled into new human food products, donated for human consumption or become animal feed.

The difference between potential and actual dairy food waste is considered 'avoided dairy food waste'.

2. Headline Waste Account results

2.1. Headline numbers

In FY 2022/23 an estimated 612,200 tonnes of actual dairy food waste was generated (907,500 of potential dairy food waste, with 295,300 avoided by sending it to destinations up the waste hierarchy).

Comparing the headline numbers between FY 2020/21 and FY 2022/23 Waste Account reveals a:

- slight decrease in potential dairy food waste (5%)
- increase in avoided dairy food waste (38%)
- reduction in actual dairy food waste (16%)

The changes in the specific sectors below are explored in this report.

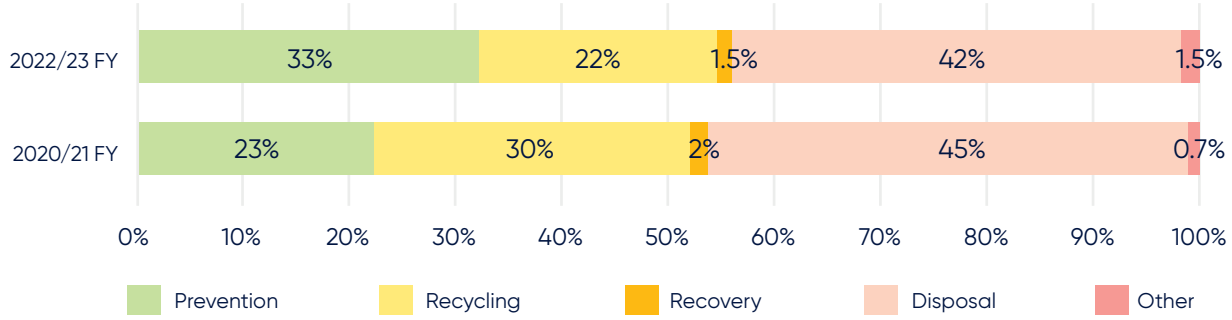
Table 1 Summary of the headline numbers for FY 2020/2021 and FY 2022/2023

	FY 2020/21	FY 2022/23	Change
	tonnes	tonnes	tonnes
On Farm	6,600	10,400	↑ 3,800
Manufacturers	736,800	694,300	↓ 42,500
Retail/Distribution	8,400	13,200	↑ 4,800
Food service	103,400	103,400	-
Households	86,200	86,200	-
Total potential dairy food waste	**941,400**	**907,500**	**↓ 33,900**
Avoided dairy food waste	**213,300**	**295,300**	**↑ 82,000**
Total actual dairy food waste	**728,100**	**612,200**	**↓ 115,900**

2.2. Dairy food waste by destination

The destination of dairy food waste according to the waste hierarchy shows a similar level of dairy products being sent to disposal and noticeable changes in the proportion to prevention and recycling (Figure 6). The variance is influenced largely by the changes in the manufacturer's pathways, outlined further below.

Figure 6 Destination of potential dairy food waste for all sectors



2.3. Raw milk equivalent tonnes of dairy food waste | All sectors

Comparing dairy food waste side-by-side on a tonnes basis does not consider that some products have a higher input of raw milk compared to others (e.g. cheese requires more milk inputs than ice cream). Converting dairy food waste to raw milk equivalent tonnes helps to show different dairy products on the same basis of the amount of raw milk required in their manufacture which can help to identify priority areas to reduce food waste (Table 2).

The raw milk equivalent conversion factors (and associated calculator) have been developed by Dairy Australia as part of the delivery of the Action Plan, to facilitate a common comparison across industry. The accuracy and coverage of these raw milk equivalent factors will evolve over time; therefore the raw milk equivalent figures presented are a point-in-time indication only and likely to change as the calculator is refined.

Table 2 Summary of raw milk equivalent tonnes of actual dairy food waste for all sectors

	FY 2020/21	FY 2020/21 excl. byproducts	FY 2022/23	FY 2022/23 excl. byproducts
	Raw milk equivalent tonnes		Raw milk equivalent tonnes	
Milk	179,100	179,100	170,100	170,100
Cheese	507,000	341,400	536,200	313,900
Fresh Dairy	508,200	486,800	513,100	451,700
Frozen	28,700	28,700	13,700	13,700
Powders	114,400	14,300	127,300	27,700
Other/Mixed	3,900	3,900	3,100	3,100
Total	**1,341,300**	**1,054,200**	**1,363,500**	**980,200**
Proportion of total milk production	**15%**	**12%**	**16%**	**12%**

2.4. Market value of dairy food waste - finished products

Estimating the wholesale market value of finished dairy products that become food waste provides an indication of the economic loss across the value chain.[1]

These estimates include finished products at the manufacturing, retail/distribution, food service and household stages of the value chain and do not include the value of raw milk loss from farms.

The FY 2022/23 values are compared against the original FY 2020/21 values and the original values were adjusted to the 2022/23 pricing to compare their relativity (Table 3). It reveals:

- Food service and households remain the source of the largest loss of value.
- Retail/distribution increased from the previous, but this is consistent with the greater level of reporting (See section 5 for detail on the increase).
- Manufacturing increased due to the increase in proportion of finished products becoming food waste compared to the previous year.

Overall, despite total dairy food waste reducing slightly in FY 2022/23, the wholesale value increased from FY 2020/21 when compared on the same basis. This reflects an increase in the proportion of finished products becoming food waste in FY 2022/23 (38%) compared to FY 2020/21 (31%).

Table 3 Estimated wholesale market value of finished products becoming dairy food waste

	FY 2020/21		FY 2022/23
	2020/21 wholesale pricing	Updated to 2022/23 wholesale pricing	2022/23 wholesale pricing
Manufacturing	$123 million	$138 million	$167 million
Retail/Distribution	$12 million	$14 million	$44 million
Food service	$250 million	$287 million	$287 million
Households	$305 million	$346 million	$346 million
Total	**$690 million**	**$786 million**	**$844 million**

3. On farm milk loss

Gathering precise data on milk loss on farms is difficult to achieve due to the large number of dairy farms spread across Australia and varying levels of data recording. Estimating on-farm milk loss for the Dairy Food Waste Account is based on a methodology of using data from dairy manufacturers tracking milk loss from farms within their supply networks and extrapolating to the total milk production.

In FY 2020/2021, on-farm milk loss data was sourced from just one manufacturer and their milk pool share and then extrapolating this to estimate overall on-farm milk loss.

In FY 2022/2023 two manufacturers provided data and the increase in on-farm milk loss may be attributed to this greater data granularity. As more data points are incorporated, the accuracy and reliability of the on-farm milk loss estimates will continue to improve.

Total Australian milk production in FY 2022/23 was 8,129 ML, compared to 8,756 ML in FY 2020/21. Despite this reduction, the estimated volume of on farm milk loss increased (Table 4).

1. Calculating the wholesale market value is based on information provided by Dairy Australia and supplemented by the survey data.

Table 4 National milk production and estimated on-farm milk losses

	FY 2020/21	FY 2022/23
Total milk production	8,756 ML	8,129 ML
Estimated milk losses	6 ML	10 ML
Milk production minus losses	**8,750 ML**	**8,119 ML**

3.1. Data limitations and data methodology

For the purposes of attributing a destination for the Waste Account all on-farm milk losses have been allocated to composting (The FY 2020/21 Waste Account was updated to be consistent). It is highly likely that a proportion of this milk is sent to animal feed, but a conservative approach has been taken due to the data limitations on actual destinations.

4. Manufacturers

The FY 2022/23 round of data capture and analysis achieved a higher coverage of the manufacturing sector, based on the reported incoming milk as a proportion of production minus on farm losses (Table 5).

Table 5 Summary of data coverage for manufacturers

Data coverage metric	FY 2020/21	FY 2022/23
Reported incoming milk as proportion of production minus on farm losses	80%	86%
No. of large manufacturing sites providing data	45 sites	51 sites
No. SMEs captured	67 sites	65 sites

4.1. Potential dairy food waste by product type

In FY 2022/23, potential dairy food waste showed a slight reduction from FY 2020/21 (Table 6). However, it is too soon to determine whether this decrease of dairy food waste reflects a positive trend that can be attributed to improved performance, a natural fluctuation in the data, or potential issues with data quality.

With only two years of data, the project team infers that the observed variation in the volume of reported dairy waste is primarily influenced by differences in reporting practices rather than reflecting a definitive trend in waste generation. This is particularly noticeable in the frozen dairy category, where certain key sites did not provide data for the FY 2022/23 reporting period.

The absence of responses from these sites likely contributed to the reduced volumes recorded in this category, emphasizing the importance of consistent and comprehensive data collection in future years. As the dataset grows and reporting becomes more standardized, it will be possible to better distinguish between actual trends in waste reduction and variations caused by reporting discrepancies.

Table 6 Summary of potential dairy food waste for manufacturers, including byproducts

	FY 2020/21	FY 2022/23
	tonnes	tonnes
Milk	101,900	85,100
Cheese	451,600	421,200
Fresh Dairy	97,300	110,300
Frozen	28,800	3,100
Powders	53,700	71,500
Other/Mixed	3,900	3,100
Total	**737,200**	**694,300**

4.2. Raw milk equivalent tonnes of dairy food waste

Converting dairy food waste to raw milk equivalent tonnes helps to show different dairy products on the same basis of the amount of raw milk required in their manufacture which can help to identify priorities for manufacturers to reduce food waste (Table 7).

Table 7 Summary of raw milk equivalent tonnes of actual dairy food waste for manufacturers

	FY 2020/21	FY 2020/21 excl. byproducts	FY 2022/23	FY 2022/23 excl. byproducts
	Raw milk equivalent tonnes		Raw milk equivalent tonnes	
Milk	61,400	61,400	48,500	48,500
Cheese	276,800	111,200	295,100	72,800
Fresh Dairy	120,600	99,200	117,400	56,000
Frozen	28,700	28,700	2,700	2,700
Powders	114,400	14,300	127,200	27,600
Other/Mixed	3,900	3,900	3,100	3,100
Total	**605,800**	**318,700**	**594,000**	**210,700**
Proportion of total milk production	**7%**	**4%**	**7%**	**3%**

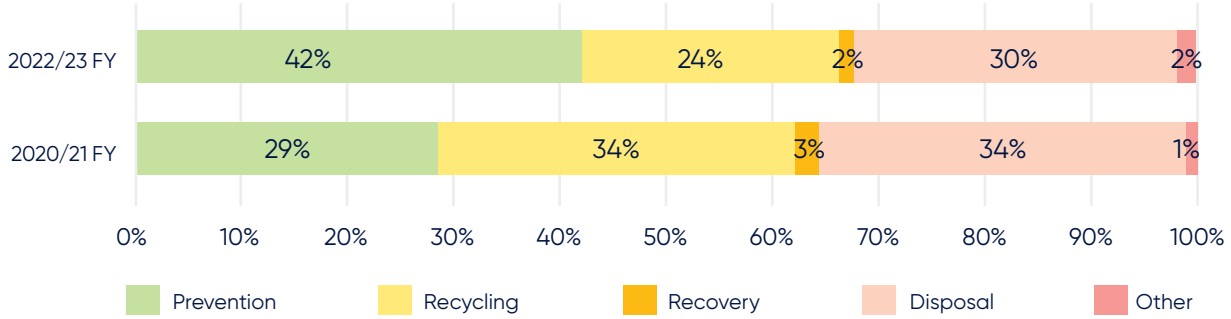
4.3. Destination of dairy food waste

Total potential food waste reduced and the destination of how it was managed also changed (Figure 7):

- There was an increase in prevention due to an increase in material to animal feed.
- Recycling dropped due to a reduction in material applied to land.
- Recovery and other management methods remained consistent and a small destination overall.
- The proportion of disposal remained similar.

Actual dairy food waste reduced to 58%, compared to 72% of total potential dairy food waste in FY 2020/21.

Figure 7 Destination of potential dairy food waste | Manufacturers



4.4. Disposal costs of dairy food waste

Managing dairy food waste comes at a cost to manufacturers. The FY 2022/23 values are compared against the original FY 2020/21 values and the original values adjusted to the 2022/23 pricing to compare their relativity (Table 8).

The reduction in volumes of (potential) dairy food waste and changes in disposal pathways (e.g. less to sewer which is very high cost) has reduced the total cost of managing or disposing of this material by approximately $221 million in today's terms.

Table 8 Estimated disposal costs of dairy food waste

	FY 2020/21		FY 2022/23
	2020/21 management/ disposal costs	Updated to 2022/23 management/disposal costs	2022/23 disposal costs
Prevention	$10 million	$12 million	$16 million
Recycling	$20 million	$22 million	$17 million
Recovery	$3 million	$3 million	$0.8 million
Disposal	$826 million	$930 million	$710 million
Total	**$859 million**	**$967 million**	**$746 million**

The methodology for calculating management and disposal costs remained consistent with FY 2020/21 (although the figures have been revised that reflect other changes to the Waste Account), with an adjustment for CPI. Actual costs reported from manufacturers were not directly used due to variability but helped inform the values adopted.

4.5. Causes of food waste

The FY 2022/23 survey asked manufacturers to identify the cause of their dairy food waste using a pre-defined drop-down menu of options.

Among the responses, byproducts, such as whey, represented the largest proportion (Table 9). These byproducts are largely unavoidable when producing primary dairy products (e.g. cheese, yogurt) and whether they are considered food waste depends on how individual sites manage them.

Facilities with effective systems in place may repurpose or utilize byproducts, reducing waste, while others may not have the infrastructure or capability to do so.

When byproducts are excluded, the primary contributor to dairy food waste shifts to equipment inefficiency, highlighting areas where improvements in technology and operational practices could have a meaningful impact on waste reduction.

Table 9 Summary of the causes of food waste, based on survey responses (or interpretation by project team)

Cause of food waste	**Proportion**	**Proportion** excl. byproducts
	%	%
Byproduct	73%	
Equipment inefficiency	13%	49%
Product changeover	4%	16%
Out of specification products	4%	14%
Product storage issues	2%	7%
CIP inefficiency	2%	6%
Start-up/shutdown of equipment	1%	5%
Equipment failure	1%	3%
Resource and capital allocation	<0.5%	1%
Other (specify in Column N)	<0.5%	<0.5%
Human error	<0.5%	<0.5%
Forecasting/planning issue	<0.5%	<0.5%
Unknown	<0.5%	<0.5%
Awareness and training	<0.5%	<0.5%
Product testing	<0.5%	<0.5%
Packaging issues	<0.5%	<0.5%

4.6. Data limitations and data methodology

The survey data does have limitations, including:

- Some sites that reported previously did not report in FY 2022/23 and this can have significant impacts (e.g. there is a large difference in frozen dairy food waste in FY 2022/23).
- Not all volumes of dairy food waste are necessarily reported by a site (and it is difficult to determine the proportion that is).
- The accuracy of how data is measured can vary.
- Data cleansing to achieve consistency relies on a range of interpretations, assumptions and reallocation of data.

The FY 2022/23 Waste Account included some changes to the methodology of how data is analysed and reported:

- New raw milk equivalent conversion factors were developed. These were also retrospectively applied to the FY 2020/21 Waste Account to allow a comparison between the two data sets. The accuracy and coverage of these raw milk equivalent factors will evolve over time; therefore the raw milk equivalent figures presented are a point-in-time indication only and likely to change as the calculator is refined.
- The FY 2020/21 captured a high proportion (97%) of cheese production, so the reported dairy food waste was not adjusted to consider proportion of reported incoming milk. The FY 2022/23 data did not capture the same proportion of cheese production; therefore the reported dairy food waste was adjusted along the lines of the proportion of reported incoming milk.
- Changes to the calculation of wastewater data were made to both Waste Accounts:
  - For sites that reported both DAF sludge and dairy waste products to sewer, the lower of the two values was excluded from the analysis.
  - For sites that reported wastewater only (no DAF sludge or dairy product to sewer) and provided Chemical Oxygen Demand (COD) levels, the proportion of dairy food waste according to the UK WRAP methodology was calculated
  - Sites that did not provide any wastewater data (including COD) were not estimated.

5. Retail/distribution

Estimates of dairy food waste from retail and distribution are higher in FY 2022/23 compared to the FY 2020/21 Waste Account (Table 10). This is largely due to more accurate data being provided by the retail sector.

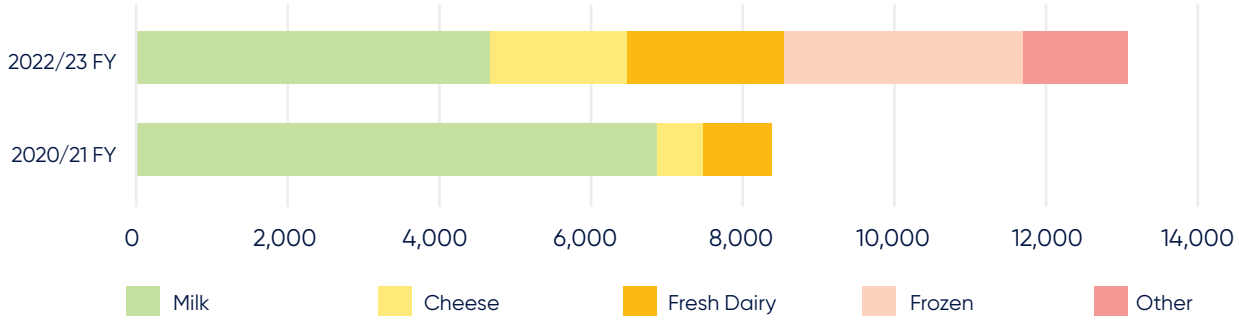
The data provided was analysed and then extrapolated based on market share to estimate dairy food waste across the sector.

Table 10 Summary of dairy food waste and destination | retail/distribution

Destination	FY 2020/21	FY 2022/23
	Tonnes	Tonnes
Prevention	3,300	2,400
Recycling	-	2,600
Recovery	-	-
Disposal	5,100	8,200
Other	-	-
Total	**8,400**	**13,200**
Actual dairy food waste	61% of total	82% of total

The detail on the product type of potential food waste is also greater in the FY 2022/23 reporting period (Figure 8) and provides greater insight into the composition of wasted product types.

Figure 8 Summary of all potential dairy food waste by product type | retail/distribution



5.1. Data limitations and data methodology

The FY 2022/23 Waste Account included some changes to the methodology of how data is analysed and reported:

- Some data provided by the retailers required further analysis and a range of assumptions on product types and weights (average weight was generally applied).
- Due to the unknown proportion of product mix, calculations for the milk equivalent tonnes are based on averages of the milk equivalent conversion factors developed. These were also applied to the FY 2020/21 Waste Account to allow a comparison.

6. Food service and households

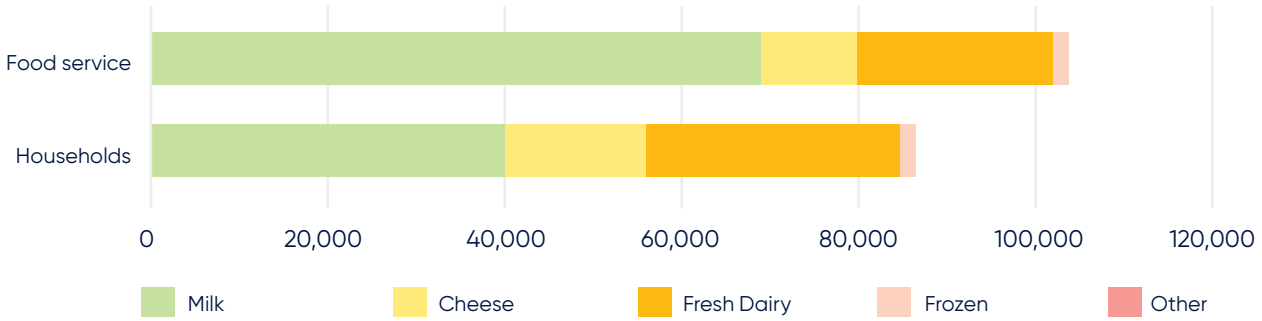
There is no change between the estimated dairy food waste for the Food Service sector and households between the FY 2020/21 and FY 2022/23 Waste Account (Table 11 and Figure 9). The data taken from the National Food Waste Baseline to estimate the dairy food waste has not been updated.

Table 11 Summary of dairy food waste and destination | food service and households

Destination	Food Service	Households
Prevention[2]	-	-
Recycling	4,600	18,400
Recovery	-	-
Disposal	98,800	67,800
Other		
Total	**103,400**	**86,200**
Actual dairy food waste	100%	100%

2. Data limitations from food rescue organisations means an estimate of the tonnes of dairy products rescued for human consumption cannot be estimated.

Figure 9 Summary of all potential dairy food waste by product type | Food Service and Households



6.1. Data limitations and data methodology

The FY 2022/23 Waste Account included some changes to the methodology of how data is analysed and reported:

- Data is based on the End Food Waste Australia 'National Food Waste Baseline 2018'
- Due to the unknown proportion of product mix, calculations for the milk equivalent tonnes are based on averages of the milk equivalent conversion factors developed. These were also applied to the FY 2020/21 Waste Account to allow a comparison.

7. Conclusions and recommendations

The difference between the two Waste Accounts indicates a slight decrease in potential dairy food waste and increase in materials to food waste prevention destinations. However, it is too early to identify this is a positive trend that can be attributed to improved performance, a natural variation in the data or a data quality issue.

7.1. Recommendations

The largest opportunity for the dairy sector is to capitalise on the positive actions already completed and work through the Dairy Sector Food Waste Action Plan to implement actions that address dairy food waste.

Additional opportunities include:

- Improve data and reporting
  - Manufacturing sites should explore ways to improve data collection and accuracy of dairy waste data. By coupling this improved data collection with a focus on understanding the true cost of these waste streams – factoring in loss of raw milk equivalents, value of lost products, costs of production to the point of loss, cost of disposal – operational teams may be able to build a stronger business case for food waste reduction projects.
  - Standardised and regular reporting (that doesn't rely on surveys) would make it simpler to track progress against the Action Plan.
  - The retail sector would benefit from greater reporting of dairy waste (and destinations) considering they are products with a high commercial value and environmental impact product.
- Update the National Food Waste Baseline data to revise the estimates of dairy food waste in the Food Service and Households sectors.
- Explore and measure dairy food waste in the Food Service and Households sectors more closely to provide better data and metrics.

Appendix B

Implementation plan: responding to market pressure

As part of a broader dairy industry project[3] to deliver on priority activities outlined in the Dairy Sector Food Waste Action Plan (Action Plan), End Food Waste Australia conducted food waste assessments and developed individualised action plans for ten dairy manufacturing sites across Australia.

These site-based food waste assessments were designed to support progress against Action Two within the Action Plan (Implement Practices that Prevent Process Wastes).

In carrying out the site-based food waste assessments, several sources of potentially avoidable food waste were identified that were common to multiple manufacturers. Guidance documents have therefore been developed to support dairy manufacturers across the sector tackle these common areas of food waste within their operations.

Three such guidance documents have been developed and are referred to as Dairy Sector Implementation Plans. The topics that they cover are:

1. Responding to market pressure for more product types and meeting retail contract requirements
2. Underutilisation of stockfeed arrangements
3. Residual Loss During Milk Tanker Unloading

The intention of these Implementation Plans is to provide a starting point for dairy manufacturers to have discussions within their business and across the value chain as to how they might further reduce food waste.

This Implementation Plan relates to tackling the challenges associated with **responding to market pressure for more product types and meeting retail contract requirements**.

Further support for site waste assessments and root cause analysis can be discussed with End Food Waste Australia via the Australian Food Pact.

What is the food waste challenge associated with responding to market pressure for more product types and meeting retail contract requirements?

The 10 site assessments conducted across Victoria, New South Wales and Queensland revealed a recurring four-pronged challenge driving dairy food waste: stock keeping unit (SKU) proliferation, accepted minimum order quantities (MOQ) under minimum batch size, minimum-life-on-receipt (MLOR) requirements, and agreements on disposal of private label product.

- **Product Change-Overs**: A proliferation of product offerings, such as numerous SKUs of flavoured milk, contribute to a high number of product change-overs with embedded material waste during cleaning. One medium-sized manufacturer estimated 165,000 L losses from change-overs per year. Keeping slow moving SKUs in product portfolio furthered this issue.
- **MOQ under minimum batch size**: It was found that some manufacturers accepted MOQs under the minimum batch size, resulting in excess product being discarded when alternative arrangements to utilize the surplus could not be made. One site reported annual losses of $100,000 due to this issue.
- **MLOR Requirements**: Customers often require a minimum remaining shelf life upon delivery to help reduce in-store waste. This limits the time manufacturers have to sell through stock, increasing the risk of waste due to approaching expiry dates, particularly for slow-moving stock and stock produced to orders below minimum batch size.

3. Titled "Delivering on the Dairy Sector Food Waste Action Plan", this project was a collaboration between Dairy Australia, End Food Waste Australia, Australian Dairy Products Federation, and Gardiner Foundation. In addition to cash and in-kind support provided by the project partners, the project also benefitted from a grant from Sustainability Victoria's Circular Economy Business Innovation Centre's Business Support Fund.

- **Disposal of private label products**: Agreements varied between private label customers and suppliers on how the supplier may dispose of the product, if it is not sold to the customer. In some cases, the agreements (whether formal or informal) did not allow the manufacturer to distribute excess product to food rescue. As the product was already in packaging, diverting to stockfeed was cost prohibitive, leaving the manufacturer with the only option of sending the product to landfill.

Causes & contributing factors

- **Desire to meet customer and consumer demands**: The desire to cater to diverse consumer preferences and competition to maintain retail shelf space drive organisations to keep slow moving SKUs.
- **MOQ under minimum batch size**: Manufacturers have minimum batch sizes for effective production runs to optimise equipment usage and reduce costs. This constraint exists in any manufacturing environment however it is pronounced in causing dairy waste, when MOQ under the minimum batch size are accepted and when combined with a high number of SKUs.
- **Minimum-life-on-receipt**: MLOR stipulations aim to ensure product freshness and maximise shelf life for customers, but can contribute to waste at the manufacturing level, due to a short window of time to sell through excess stock.
- **End-of-life agreements on excess stock**: Private label customers may have restrictions on how excess stock can be used. Instances were found of customers requiring secure burial of branded product or limitations to use product for food donations, however it was also found that misconceptions of the agreements caused products to be wasted which could have been donated.
- **Challenges in demand forecasting**: Accurately predicting consumer demand for a wide array of products is complex, resulting in overproduction, frequent product change-overs and waste of redundant materials.

List of actions

Short-term actions

- **Data collection**: Quantify food waste specifically attributable to SKU proliferation, orders under MOQ, and MLOR issues. This will help build a business case for change and identify priority areas for action.
- **Review and optimise production Planning**: Conduct a cross-department review of forecasting, planning, ordering and the organisation's Sales & Operation Planning (S&OP) process. Discuss how the current process can be improved upon, leveraging collected data to substantiate the need for improvement.
- **Strengthen collaboration with key private label customers**: Engage in open dialogue with key private label customers to address challenges around order frequency, size and MLOR. Ideally, this should be cemented in a joint business plan.
- **Explore repurposing options**: Identify potential avenues for redirecting surplus products, such as donation to food rescue organisations, planned options for selling excess product into secondary markets, or conversion to animal feed if the other options have been exhausted. Confirm with customers, which products they allow to be sent to food donations.

Long-term actions

- **SKU rationalisation**: Review product portfolios and strategically reduce the number of SKUs offered, focusing on core products and consumer preferences.
- **Joint business plan**: Produce a joint business plan which balances dairy waste mitigation between customer and supplier. Flexible contracts between manufacturers and customers are encouraged, however order fluctuations should be controlled to minimise waste across the supply chain.
- **Invest in research and development**: Explore process and packaging innovations that can extend product shelf life, as this will increase manufacturer's time to distribute stock before meeting a MLOR limit.

Stakeholders

- **Dairy manufacturers**: Directly impacted by the financial and environmental costs associated with food waste.
- **Private label customers**: Responsible for setting MLOR requirements and influencing product variety.
- **Industry organisations**: Support collaboration, knowledge sharing, and the development of best practices, and can support negotiations between members and customers by providing sector-wide data.
- **End Food Waste Australia (EFWA):** Provides guidance, resources, and data on the environmental and social impact of dairy waste and provide technical support to businesses involved in the Australian Food Pact.

Implementing actions to reduce dairy food losses from operational challenges such as SKU proliferation, MOQ, and MLOR, could offer the Australian dairy industry an opportunity of financial savings and help in reducing manufacturer's environmental footprint. This aligns with both Australia's national commitment and the United Nations Sustainable Development Goal 12.3, both aiming to halve food waste by 2030.

By optimising the business' product portfolio, S&OP procedures and scheduling, financial benefits and a reduced environmental impact can be achieved.

Appendix C

Implementation plan: underutilisation of stockfeed arrangements

As part of a broader dairy industry project[4] to deliver on priority activities outlined in the Dairy Sector Food Waste Action Plan (Action Plan), End Food Waste Australia conducted food waste assessments and developed individualised reports for ten dairy manufacturing sites across Australia.

These site-based food waste assessments were designed to support progress against Action Two within the Action Plan (Implement Practices that Prevent Process Wastes).

In carrying out the site-based food waste assessments, several sources of potentially avoidable food waste were identified that were common to multiple manufacturers. Guidance documents have therefore been developed to support dairy manufacturers across the sector tackle these common areas of food waste within their operations.

Three such guidance documents have been developed and are referred to as Dairy Sector Implementation Plans. The topics that they cover are:

1. Responding to market pressure for more product types and meeting retail contract requirements
2. Underutilisation of stockfeed arrangements
3. Residual Loss During Milk Tanker Unloading

The intention of these Implementation Plans is to provide a starting point for dairy manufacturers to have discussions within their business and across the value chain as to how they might further reduce food waste.

This Implementation Plan relates to tackling the challenges associated with **the underutilisation of stockfeed arrangements**.

This document is not intended legal advice but offers suggestions for industry consideration. Before implementing changes regarding materials sent to stockfeed, it is recommended to seek approval from the relevant regulatory authorities.

Further support for site waste assessments and root cause analysis can be discussed with End Food Waste Australia via the Australian Food Pact.

What is the dairy waste to stockfeed problem?

The National Food Waste Strategy is aligned with global practises, which considers sending food waste (including dairy) to stockfeed as a reduction activity, hence counting towards the goal of halving Australia's food waste by 2030.

Through the 10 sites assessments conducted at dairy sites in Victoria, New South Wales and Queensland, it was found that many dairy processing sites were not fully utilising opportunities to divert their waste streams to stockfeed, resulting in additional costs of disposal, wastewater treatment and environmental impacts. One site estimated a loss of $350,000 per year due to discontinued stockfeed arrangements, while another site incurred $117,000 in annual expenses for organic waste disposal, some of which could have been avoided by sending waste streams to stockfeed.

Misinterpretation of regulations around permissible food ingredients for stockfeed had caused one ice cream manufacturer to send up to 20,000 L of waste to landfill rather than stockfeed.

4. Titled "Delivering on the Dairy Sector Food Waste Action Plan", this project was a collaboration between Dairy Australia, End Food Waste Australia, Australian Dairy Products Federation, and Gardiner Foundation. In addition to cash and in-kind support provided by the project partners, the project also benefitted from a grant from Sustainability Victoria's Circular Economy Business Innovation Centre's Business Support Fund.

Causes and contributing factors:

- **Ceased stockfeed arrangements**: Several sites previously sent their waste to stockfeed destinations, but these arrangements had lapsed for various reasons such as staff changes.
- **Lack of designated responsibility**: Rarely were specific personnel tasked with maintaining quality and coordinating stockfeed arrangements, leading to missed opportunities.
- **Information gaps and misconceptions**: Limited understanding of stockfeed regulations, including restrictions on specific ingredients, created uncertainty and discouraged potential diversion of dairy excesses to stockfeed.
- **Logistical challenges**: Transportation costs and difficulties in connecting with suitable stockfeed recipients were found to be barriers to establishing consistent arrangements.
- **Packaging removal**: Several sites quoted the separation of product from packaging as a barrier to dispose of dairy waste in ways other than landfill. Compounding this challenge for the industry was a reported increase in landfills not accepting packaged food products.
- **Limitations at livestock farmers**: A reported barrier for using dairy waste as stockfeed was the stockfeed recipients' capabilities to handle varying types or forms of food waste. Lack of appropriate storage tanks and the ability to blend with other stockfeed ingredients to ensure balanced nutritional diet for the animal is an additional barrier.

Animal feed regulations

To address common misunderstandings of regulations, this implementation plan provides a brief overview of relevant stockfeed regulations for dairy. This is not legal advice, and readers are encouraged to liaise with relevant local authorities before making changes to stockfeed arrangements.

Many Australian food products are permissible as stockfeed, however regulations apply as to which products are allowed to be fed to different types of livestock. Most relevant to the dairy industry are regulations around materials that can be fed to pigs and ruminants (e.g., cows, sheep, goats).

Restrictions on material, which can be fed to livestock, are in place to avoid the spreading of animal diseases through feedstock. Particular food stuffs, which are prohibited from use in ruminant and pig feed, are controlled through the Australia-wide Ruminant Feed Ban and regulations on Prohibited Pig Feed. Animal Health Australia (AHA) is the central source of information on any emergency animal disease (EAD) responses and coordinates projects that include the two feed bans.

General conditions for stockfeed materials

Materials used for stockfeed needs to follow these general conditions:

- **Safety and quality**: All materials must be free from harmful contaminants, including pathogens, chemical residues, and heavy metals.
- **Processed to mitigate risks**: Materials derived from animal carcasses, like meat and bone meal, require rendering to eliminate disease-causing agents if intended for pig and poultry feed. No mammalian products or product that have been in contact with these can be fed to ruminants.
- **Compliance with regulations**: Adherence to biosecurity regulations is essential, which may be established at a Commonwealth level, or have additional variance between states and territories.

- **Restricted foodstuffs for animal feed**: Each state and territory have its own regulations on what materials are restricted to be used as animal feed, however all states follow the restricted animal materials (RAM) as set out in the ruminant feed ban and have generally harmonised regulations on prohibited pig feed, e.g., swill.
- **Nutritional adequacy**: Stockfeed needs to be fit for purpose and the nutritional composition is highly important. Some businesses have the ability to blend food waste sources for the optimal nutritional profile for feed.

Regulations vary as to what materials are allowed to be fed to different livestock and between states. Harmonised across all states and territories are prohibitions to feed pigs swill (including meat, meat products or anything that has come in contact with meat[5]) and the ruminant feed ban prohibiting the use of the following material in feed for ruminants: meat and bone meal derived from vertebrates, including fish and birds[6].

Quicks facts about Australian stockfeed regulations:

- **Australian ruminant feed ban**: Australia has an inclusive ban on the feeding to all ruminants any meals, including meat and bone meal (MBM), derived from all vertebrates, including fish and birds (including eggs). AHA coordinates the ban, which prescribes what can and cannot be fed to ruminants nationally.
- **Permitted use in non-ruminant feed**: RAM, after appropriate processing like rendering, can be used in feed for non-ruminant animals like pigs and poultry.
- **Repurposing imported dairy ingredients for human consumption to stockfeed**: Restrictions apply to using imported dairy ingredients, particularly those sourced from countries not deemed free of specific animal diseases. DAFF advises that "To enable imported dairy for human consumption to be eligible for repurposing as animal feed, importers must hold a valid permit that allows for the dairy to be repurposed and seek and be granted approval by the department for each lot of goods prior to the goods being repurposed."[7]
- **Whey**: This by-product from cheese manufacturing is a valuable source of protein and is extensively used for pigfeed.

Ruminants stockfeed regulations

Ruminants cover animals such as cows, sheep, goats, and deer.

Animal Health Australia (AHA), who coordinates the ruminant feed ban states:

"Restricted Animal Material (RAM) is any material taken from a vertebrate animal, other than tallow, gelatine, milk products or oils. It includes rendered products such as blood meal, meat meal, meat and bone meal, fish meal, poultry meal, feather meal, and compounded feeds made from these products. All milk, milk products or milk by-products, either of Australian provenance or legally imported for stockfeed use into Australia, are exempt."

Pig feed regulations

In Australia, permitted feed for pigs includes milk, eggs (excluding Queensland), dairy waste, vegetable waste, and bread without meat toppings. RAM-containing stockfeed is permitted for pigs and poultry, provided it has been treated by an approved process such as rendering according to Australian Standard AS5008:2007. Feeding pigs prohibited pig feed (PPF) or swill, which covers all meat and food products that have come into contact with meat, is strictly prohibited.[8,9]

The table below summarises the regulations on feed for pigs for the 3 main dairy producing states: New South Wales, Queensland, and Victoria. Regulations are dynamic and the summary only covers overarching regulations. The reader is advised to confirm pig feed regulations with local authorities as liabilities may include persons supplying materials for pig feed[10]:

5. Swill Feeding – It's Illegal – Fact Sheet, Australian Pork, November 2018
6. **Australian Ruminant Feed Ban**, Animal Health Australia, accessed Dec 2nd, 2024
7. "**54-2021: Dairy for human consumption eligible to be repurposed for stockfeed**", DAFF, 2021, accessed Dec 2nd, 2024
8. Torok, V. A., Luyckx, K. & Lapidge, S. 2021. Human food waste to animal feed: opportunities and challenges. "Animal Production Science", 61(2), pp.97-108.
9. **Prohibited Pig Feed Compliance and Awareness**, Animal Health Australia, accessed Dec 2nd, 2024
10. Section 41 of Livestock Disease Control Act 1994, Victorian Government, accessed Dec 2nd, 2024

State	Feed for pigs
NSW	A person must not feed material to a pig if the material contains a mammal product unless authorised by clause 37 in Division 9, i.e.: • It has been rendered in accordance with relevant standards and approved processes. • Milk (including milk products and by-products) may be fed to a pig if the milk is of Australian provenance or it has been lawfully imported into Australia for stock food use.[11]
QLD	It is illegal to feed swill to all pigs. Swill is material that: • contains, or may contain, the carcass of a mammal or bird • contains, or may contain, material from a mammal or bird (including meat, eggs, blood, faeces) • has been in contact with either of these (including food or food scraps from a restaurant, hotel or home that may have been in contact with meat or meat products or other material from a mammal or bird) Pigs can be fed various animal products, which have been rendered in accordance with the current Australian standard for the hygienic rendering of animal products, as well as bakery or vegetable scraps that do not contain, and have had no contact with, eggs, meat or meat products, and fruit, vegetables and cereals. Pigs can be fed: • Milk of Australian origin • Milk products or milk by-products made in Australia and derived from milk of Australian origin • Milk or milk by-products lawfully imported into Australia as feed for livestock[12]
VIC	Foods that are banned: Meat, meat products and any food that is served on the same plate or that has come into contact with meat is prohibited feed and must not be fed or supplied for feeding to pigs. Dairy products from overseas are banned, unless imported for stockfeed. Food that cannot be fed to pigs include: • salad and vegetables that has been served with meat • butcher's shop waste • pies, pasties, deli foods — including bacon, cheese (from overseas) and salads that contain meat. Pigs can be fed: • Commercially prepared pig rations, • Grain, • Fruit and vegetable waste from markets, • Bread that does not contain any meat material (for example bacon or ham), • Milk, • Milk product or by-products that originate from a factory or milk processing premises (licensed under the Dairy Act 2000).[13]

11. Biosecurity Regulation 2017 (217-232), NSW Parliamentary council, accessed Dec 2nd, 2024.
12. **Laws against supplying and feeding prohibited feed to pigs (swill)**, Business Queensland, QLD Gov, accessed Dec 2nd, 2024 (link)
13. "**Feeding Prohibited Pig Feed**", Agriculture Victoria, accessed Dec 2nd, 2024

List of actions:

Dairy processors suspecting an opportunity to increase waste volumes sent to stockfeed, are encouraged to:

Quantify the opportunity

Organisations are encouraged to quantify their waste at status quo to have a measure of the size of the opportunity and a benchmark. Key datapoints are yield (incoming vs outgoing), cost estimate on losses based on cost of raw materials, and the annual cost of disposal and the estimated volume of dairy waste. For the food going to waste destinations such as landfill, compost or wastewater treatment, consider if it could have been sent to stockfeed.

Establish synergetic stockfeed relationships

Sending dairy waste streams and waste to stockfeed is common practice, however arrangements may lapse with change of staff or minor obstacles on either side of the partnership. It is crucial to establish relationships with multiple stockfeed partners, ensuring a consistent outlet for waste streams if one arrangement falls through. Knowing the current cost of disposal will enable sites to establish a cost structure for the stockfeed partner, which fosters a lasting relationship through reduced cost for both parties.

Make it someone's job

To make sure waste streams are suitable for stockfeed, you need a dedicated person or team responsible for their collection, storage, and dispatch. Waste streams need to be permitted for use, free from contamination and in good condition for their intended purpose. Assigning this task to specific roles within the business ensures these standards are met consistently. Hygienic collection and storage are essential, along with proper rotation and timely dispatch. Because this process often spans different departments like Operations and Logistics, the responsibility should be clearly outlined in the job descriptions of those involved.

Enhance information accessibility

To promote the safe and effective use of dairy materials in stockfeed, a collaborative effort is needed to develop and distribute clear and concise information outlining relevant regulations. This should target overcoming challenges such as misinterpretations, uncertainties, and missed opportunities for waste reduction through stockfeed utilisation.

Dairy Australia, ADPF, DMSC, and End Food Waste Australia (EFWA) are well-placed to take the lead in creating such resources. The Department of Agriculture, Fisheries and Forestry (DAFF) is undertaking a risk review of imported dairy ingredients, which includes a review of repurposing imported dairy products for stockfeed. The second draft report from the Department states: "Dairy products imported for human consumption that enter or are intended to enter the human food chain may become unfit for human consumption and are withdrawn from sale. Currently, dairy products (except for colostrum) of bovine origin from countries/zones that are free from FMD and LSD may be eligible for repurposing from human consumption to animal feed. A different import permit is required for dairy products imported for human consumption that are repurposed as animal feed." (**link**)

Stakeholders:

- **Dairy processors**: Generating various waste streams, including organic waste, whey, and DAF sludge, with the potential for stockfeed utilisation.
- **Stockfeed manufacturers**: Processing various ingredients to create balanced animal feeds for different livestock species.
- **Livestock farmers**: Requiring cost-effective and nutritious feed options for their animals, including dairy cows, pigs, and poultry.
- **Industry organisations:** Dairy Australia (DA), the Australian Food and Grocery Council (AFGC), and End Food Waste Australia (EFWA) can support the dairy industry with information dissemination and policy development.
- **Government agencies**: Relevant state and federal departments are continuously reviewing regulations on stockfeed.

It has long been standard practice to direct dairy waste streams to stockfeed, and this remains common. However, the industry is encouraged to reassess waste streams currently excluded from stockfeed, as intentions may not always align with daily operations. Regulations governing what can be fed to animals exist for valid reasons and are being reviewed to better balance biosecurity and animal health risk and sustainability.

Dairy manufacturers are encouraged to ensure that all waste streams legally suitable for stockfeed are utilised appropriately.

Appendix D

Implementation plan: residual loss during milk tanker unloading

As part of a broader dairy industry project[14] to deliver on priority activities outlined in the Dairy Sector Food Waste Action Plan (Action Plan), End Food Waste Australia conducted food waste assessments and developed individualised reports for ten dairy manufacturing sites across Australia.

These site-based food waste assessments were designed to support progress against Action Two within the Action Plan (Implement Practices that Prevent Process Wastes).

In carrying out the site-based food waste assessments, several sources of potentially avoidable food waste were identified that were common to multiple manufacturers. Guidance documents have therefore been developed to support dairy manufacturers across the sector tackle these common areas of food waste within their operations.

Three such guidance documents have been developed and are referred to as Dairy Sector Implementation Plans. The topics that they cover are:

1. Responding to market pressure for more product types and meeting retail contract requirements
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3. Residual Loss During Milk Tanker Unloading

The intention of these Implementation Plans is to provide a starting point for dairy manufacturers to have discussions within their business and across the value chain as to how they might further reduce food waste.

This Implementation Plan relates to tackling the challenges associated with the **residual loss during milk tanker unloading**.

Further support for site waste assessments and root cause analysis can be discussed with End Food Waste Australia via the Australian Food Pact.

What is the food waste challenge associated with residual loss during milk tanker unloading?

End Food Waste Australia conducted 10 sites assessments at dairy sites in Victoria, New South Wales and Queensland. A consistent challenge at sites receiving raw milk was residual milk left in tankers after emptying.

- **Significant losses**: Incomplete emptying of milk tankers during deliveries can lead to substantial financial losses for dairy processors. Multiple sites reported 50-150 L of losses per tanker. One site estimated potential losses of $60,080 to $120,160 per month from residual milk in tankers. Another site reported approximately 55,000 litres of milk losses annually due to drivers not complying with burst-rinsing procedures, and this even at 97.5% burst-rinse compliance. Another site only achieved 7.6% of unloads being burst-rinsed and recorded up to 2.3 ML of losses annually.
- **Environmental impact**: Wasted milk represents a loss of valuable resource and contributes to manufacturer's environmental footprint. Only considering carbon emissions related to the milk itself, 2.3 ML of wasted milk would emit 2.7m kg CO2-eq[15].
- **Widespread issue**: The issue was found to occur at most of the assessed sites, some of which are operated by large dairy manufacturers. It is assumed that the issue would be prevalent at most sites with fresh milk receival in tankers.

14. Titled "Delivering on the Dairy Sector Food Waste Action Plan", this project was a collaboration between Dairy Australia, End Food Waste Australia, Australian Dairy Products Federation, and Gardiner Foundation. In addition to cash and in-kind support provided by the project partners, the project also benefitted from a grant from Sustainability Victoria's Circular Economy Business Innovation Centre's Business Support Fund.
15. Ref: Clune, Crossin, Verghese, "Systematic review of greenhouse gas emissions for different fresh food categories", J. Cleaner Production, V. 140, Pt 2, 2017

Causes & contributing factors

Driver behaviour

It is generally considered good practice to perform a burst-rinse of tankers at the end of unloading, though this does not always occur. One site became aware of the issue because the logistics partner's tanker cleaning area was located nearby, allowing site staff to observe residual milk being flushed down a drain. Reported reasons for not consistently performing burst-rinsing include time constraints faced by drivers during unloading and a lack of attention to completing the task thoroughly, as well as lack of infrastructure.

Lack of infrastructure

The design of the tanker bay itself can impact the efficiency of unloading. Tanker bays without inclines can make it difficult to fully drain the tanker, leading to residual milk being left behind. Additionally, burst-rinse fittings vary between tankers, and the tanker bay hose design might not be compatible with all tanker designs. These factors highlight the importance of considering infrastructure improvements to tanker bays, including the addition of awnings for weather protection and the incorporation of inclines to facilitate complete drainage.

Limited data collection

Sites, which were consistently monitoring tanker unloading procedures and the losses associated with this, were found to have better leverage to mitigate the issue. Lack of systematic tracking of residual milk volumes makes it difficult to accurately assess the scale of the problem.

List of actions

Short-term actions

Data collection and cost analysis

- **Establish measurement procedures**: Implement standardised procedures for measuring residual milk volumes in tankers after unloading. Initial measurements may be conducted by observing tanker unloading and sampling milk residuals.
- **Calculate financial losses**: Determine the financial losses associated with incomplete emptying based on current milk prices and the volume of residual milk measured and extrapolated for a full year of operations. This information will help to build a business case for implementing solutions.
- **Conduct cost-benefit analysis**: Quantify the costs and potential benefits of implementing complete emptying measures, considering additional water usage for burst-rinsing. This will enable informed decisions about investments in infrastructure or training.

Collaborate with logistics partners

- **Logistics partner collaboration**: Establish channels of communication and collaboration between manufacturer and milk logistics companies. This will help to address challenges, share best practices, and find solutions that work for all parties involved.

Long-term actions

Infrastructure improvements

- **Evaluate and improve tanker bay designs**: Assess the design of existing tanker bays and consider modifications, such as installing inclines to facilitate drainage, and assessing compatibility between tanker burst-rinse fittings and tanker bay configuration. This may require significant investments, and data collection will be required to substantiate the spend. Protective awnings should be considered as part of the project, to improve food safety and preserve milk quality.

Stakeholders

- **Dairy processors**:
  - Most directly impacted by financial losses from milk waste.
  - Responsible for implementing infrastructure improvements and collaborating with logistics companies.
- **Milk tanker drivers**:
  - Play a crucial role in executing proper unloading and cleaning procedures.
  - Require adequate training and clear guidelines.
- **Logistics companies**:
  - Responsible for driver training, ensuring compliance with procedures, and optimising delivery schedules.

Ensuring complete unloading of milk tankers could offer substantial financial savings by recovering residual milk, often amounting to significant volumes annually. The financial benefits are particularly relevant given rising input costs and consumers' heightened price sensitivity in the current economic climate. Additionally, complete tanker emptying directly reduces the company's environmental footprint by minimising milk waste, associated carbon emissions and loss of natural resources. This proactive approach aligns with both the United Nations Sustainable Development Goal 12.3, which aims to halve food waste by 2030, and Australia's national commitment to the same target.

This commitment to sustainability not only reduces the sector's environmental impact but also enhances its ethical practices and strengthens its image among consumers and stakeholders.

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