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Reusable packaging systems on farms in the Waikato region.

The state of play today, barriers and opportunities for growth, and actions to increase the uptake of reusable packing systems in Waikato's animal agricultural sector.

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reuse aotearoa

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JANUARY 2025

WHO WE ARE

Reuse Aotearoa is an organisation dedicated to building the momentum and capability to scale reusable packaging systems in New Zealand. We focus on understanding and telling the story of reuse, and fostering collaboration to bring reusable packaging systems to life and grow their strength and presence across the motu.

The story of this report (Abstract)

In 2022, Waikato Regional Council commissioned Reuse Aotearoa to undertake a three-part research project into reusable packaging in the Waikato region. This report presents part two of the research project: an exploration of existing reusable packaging systems in the animal-based agriculture sector, and the challenges and opportunities to establishing, sustaining, and scaling further uptake of reusable packaging in this sector. The study employs a case-study and mixed-methods qualitative research approach, including desktop research, and interviews with farmers, producers/suppliers, packaging logistics operators, and industry representatives.

The report finds that reusable packaging exists to some extent in Waikato's agricultural sector, albeit in a niche capacity. Scaling and extending reuse systems could help to prevent and reduce the various single-use products and supplies used on Waikato farms, most of which is currently recycled or repurposed, or else disposed of via onsite burning, burying, bulk storage, or landfilling.

Identified barriers hindering the widespread adoption of reusable packaging in agriculture included financial constraints, management and logistics challenges, the recycling-centred focus of sustainability initiatives, concerns about contamination, and lack of onshore reuse infrastructure and options.

Interviewees recognise the benefits of reusable packaging for the agricultural sector including: reduced resource use and reliance on recycling; improved health and safety; community benefits; and financial and customer perception benefits. Key opportunities for increasing the uptake of reusable packaging systems included cost savings from buying in bulk, expanding reusable packaging to a wider range of products, focusing on products with fewer barriers, and incorporating reuse into product stewardship schemes.

Recommended actions for harnessing these opportunities include: 1) Councils to facilitate collaborative efforts to implement reusable packaging initiatives for key agricultural products; 2) Sector-led support for reusable packaging; 3) WRC and TAs to establish funding streams and work programmes to incentivise reuse in agriculture; 4) WRC to work with the GPSS to increase reusable packaging collections and take-back services for farms in the Waikato; and 5) Develop standard reuse protocols and product design.

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For this research project, we undertook both a desktop

study and a number of interviews with various individuals representing different businesses and organisations. As our desktop study traversed a range of materials already in the public domain, not every business or reusable packaging system that is mentioned or profiled in this report was interviewed, and not every business or organisation that was interviewed is mentioned in this report.

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EXECUTIVE SUMMARY

What this report is about

This report sought to understand current reusable packaging activity in the Waikato animal agricultural sector,[1] and the challenges and opportunities faced by the sector for establishing, sustaining, and scaling the uptake of reusable packaging; and to provide recommendations to support more reuse systems in the sector. It presents part two of a three-part research project into reusable packaging in the Waikato Region, commissioned by the Waikato Regional Council.

The report focuses on packaging used on farms to contain products such as baleage, agrichemicals, fertiliser, veterinary products and animal feed. The study does not include the primary, secondary or tertiary packaging used for shipping and retailing final products (such as meat, milk and cheese) to consumers. Reusable packaging systems for these products, like milk and yoghurt, are included in the stocktake completed for part one of the wider study (Blumhardt, 2024).

Why study reusable packaging in agriculture?

Packaging is a significant waste stream in Waikato's animal agricultural sector, with suboptimal waste management outcomes. Containers and drums, seed, feed and fertiliser bags, bale wrap and silage sheets contribute significantly to farm packaging waste streams both in the Waikato and nationwide. As with other waste streams, farms have traditionally dealt with packaging waste through the 3Bs – burning, burying, or bulk storing on site. Recycling initiatives have developed and expanded in the last two decades to help to prevent the 3Bs and recover common packaging waste on farms across New Zealand, primarily two product stewardship schemes for farm plastics that are being partnered under one national product stewardship scheme. Farmers are also practising repurposing on farms by retaining packaging like drums and containers and using them for a different purpose.

Increased adoption of reusable packaging systems offers an alternative approach that would help to prevent and reduce on-farm packaging waste and disposal. Reusable packaging systems can be categorised into three types:

1. **returnable packaging systems:** where empty packaging is returned by the customer/final user of the product, to be reconditioned and refilled with the same product or product type (such as drum or jerry can swap systems for oils);
2. **refill by bulk dispenser systems:** where product is presented "loose" and customers supply their own reusable receptacle to fill into (such as self-service silos for grains or fertiliser);
3. **reusable transport packaging systems:** reusable versions of the outer layers of packaging that are used to contain or protect a product when it moves through the supply chain, e.g. from producer to farmer and back again (such as reusable pallets).

However, the concept of reuse systems for packaging in agricultural settings and on farms is not widely discussed in New Zealand or internationally. This study helps to address this research gap.

What we did

We conducted a desktop study to understand the fate of single-use packaging for on-farm products, and to scan for existing reusable packaging systems in the region's agriculture sector. We also ran 18 qualitative, standardised interviews with individuals from across Waikato's animal-based agricultural supply chain – including farmers, agricultural producers/suppliers, organisations that manage packaging logistics, and industry representatives – to understand attitudes to reusable packaging and the perceived barriers and opportunities to increasing these systems.

1 This study focuses on reusable packaging systems in animal-based agriculture. Other systems such as horticulture and arable farming systems are outside of the scope of this report.

Existing reusable packaging systems in Waikato's agricultural sector: descriptions and learnings

Several reusable packaging systems exist in Waikato's animal agriculture sector. The systems we identified are predominantly niche, bespoke and vertically-integrated. However, their existence shows a baseline interest in reusable packaging systems, awareness about the value of reuse, and the potential for wider application throughout the sector. Overall, the uptake could be greatly increased.

Existing reuse systems are used on farms in the Waikato for products ranging from animal feed to fertiliser and fuel, using a range of different packaging units, from self-service silos and returnable feed kegs, to drums and jerry cans. The systems have various set-ups and structures and may be initiated and operated by the suppliers or retailers of the products contained in the packaging (vertically-integrated) and/or third-party packaging specialists.

Returnable packaging systems include plastic containers and drums for agrichemicals and oils that are collected back from farms, washed, and refilled (such as **McFall Fuel**'s returnable jerry cans for oil), or delivery of bulk quantities of product in returnable kegs that go back to the supplier once empty, replacing the need for small single-use bags (such as **Dunstan Nutrition**). In addition, to these vertically-integrated systems, third-party operators run reconditioning/preparation for reuse services for returnable packaging in the Waikato. For example, **NZ Drum** handles, washes and sanitises agricultural and chemical drums and Intermediate Bulk Containers (IBCs) through a standardised, food-safe cleaning process.

Refill by bulk dispenser models include using silos for bulk products like fertiliser, where large quantities of a product like grain or fertiliser is delivered to farms and deposited on-farm without packaging, or where farmers drive their own form of transport to a silo to fill (such as **Ballance Agri-Nutrients** self-service silos). Other refill by bulk dispenser models include those where suppliers/retailers vend product from a bulk dispenser and allow farmers to bring their own containers to fill into (such as farmers refilling animal hygiene products at their local vet). Several farmers reported proactively reusing packaging when retailers provided these bulk dispenser opportunities.

We interviewed representatives from several identified reusable packaging systems, or those who participate in these systems at some point in the supply chain. Their reflections offer some useful insights about important design features for a successful reuse system, including:

- packaging durability, strict cleaning protocols, and health and safety measures, particularly in preparation for reuse processes;
- reducing costs for farmers and ensuring clarity and transparency about the costs involved in reuse systems or services, and ensure costs are fairly allocated within a system (e.g. covered by manufacturers or service providers or integrated into packaging prices);
- incorporating effective incentives to support farmer/end-user participation in returnable packaging systems, such as rewards or deposits redeemed on container return or providing farmers with free returns/collection services;
- the necessity of widespread participation in reuse systems for economies of scale and efficiency;
- ensuring dedicated, trained personnel and support;
- designing reusable packaging process flows that are convenient, easy-to-access, achieve a sufficient scale to increase impact, and can be incorporated into routine activities; and
- portraying the evidence of container reuse, such as tracking reused containers.

In addition, the report also notes that **existing agricultural packaging logistics networks** (i.e, established product stewardship schemes) are supporting some reusable packaging reverse logistics like collection and returns. For example, Plasback is collecting and providing third-party operators with containers to prepare for reuse, although this is a very small part of their operations. However, the scheme has not actively marketed this small component, and the

scheme has been predominantly focussed on collecting used packaging for recycling and safe disposal. Plasback and Agrecovery are in the process of being partnered under one accredited product stewardship scheme, the GREEN-farms Product Stewardship Scheme (GPSS).

Although the GPSS is not geared towards reusable packaging for the four key farm plastic waste streams (i.e, agrichemicals and their containers, bale wrap and silage sheet, small bags, and large sacks), the existence of product stewardship scheme reverse logistics operation and networks for certain single-use agricultural products could potentially be leveraged to provide more on-farm collections for reusable packaging. In addition, Agrecovery (GPSS Manager) is looking at the potential to reuse for other waste streams, such as reusing wool fadges multiple times before they are considered too dangerous to reuse.

Barriers to increased uptake of reusable packaging systems

Several barriers are hindering the widespread adoption of reusable packaging in agriculture. Key barriers included:

- **the perceived downsides of reuse**, including time pressures and uncertainty (particularly for farmers) and the perception of unintended or unforeseen consequences from reuse system adoption, such as increased water consumption, freight and fuel usage, and continued consumption of petroleum;
- **financial constraints, including operational and capital costs** for management and logistics such as transportation to collect containers from remote farming communities, and the infrastructural and labour costs associated with reconditioning, cleaning and refilling packaging. Farmers expressed concern that they would have to shoulder the associated costs of reusable packaging systems, and smaller industries lack the financial support compared to larger industries. Taken together, reuse competes with the status quo of on-farm '3B' (bury, burn or bulk storage of waste) disposal practices; ultimately, on-farm disposal remains the cheapest option;
- **the recycling-centred focus of packaging sustainability initiatives,** including current product stewardship schemes, which diverts resources, attention and innovation away from solutions higher up the waste hierarchy;
- **management and logistics challenges,** such as farms being remote and dispersed and increased freight movements and costs for transporting reusable containers;
- **concerns about contamination, health and safety, quality control, spoilage, and potential liability risks.** For example, managing contamination and potential liability risks like cross-contamination between containers or farms, and liabilities of operating reconditioning processes, particularly in light of health and safety legislation in 2015;
- **lack of reuse infrastructure and available reusable packaging options,** such as a lack of infrastructure for cleaning and refilling containers onshore, a lack of reusable options available such as silage wrap, and a lack of awareness of current available options between participants.

Opportunities for increasing the uptake of reusable packaging systems

When reflecting on the compatibility of agriculture and reuse opportunities, most participants shared positive attitudes towards, and the potential benefits of, integrating more reusable packaging on farms.

Nearly all interviewees recognised the **potential benefits of increasing the reusable packaging uptake in agriculture**, citing environmental sustainability, health and safety, financial, community benefits, and commercial benefits such as providing a competitive edge for producers/suppliers. Most farmers incorporate reuse practices on their farms, which demonstrates farmers' existing values alignment with reuse, resource preservation and waste minimisation, and the potential for wider application.

Farmers considered that many single-use agricultural products have the potential to be in reusable packaging. Key opportunities included:

- **opportunity to optimise reuse system design to better incentivise participation**, such as economic incentives driven by big agricultural processors and/or industry bodies;
- **opportunity to focus on reusable packaging systems that generate cost-savings** such as buying in bulk and harnessing product stewardship schemes' existing collection routes to deliver cost savings;
- **opportunity for specific products that could be good candidates for reusable packaging;** such as large reusable bags for fertiliser, wool fadges, large containers for bulk quantities of dog food, calf meal and milk powder, drums for herbicides and oil, and small and medium containers for a range of other products commonly used on farms like drench;
- **opportunity to collaborate locally to coordinate reuse efforts,** such as bulk deliveries or collections, exploring opportunities for smaller lifestyle block owners, bulk deliveries for large farmers, and using veterinary clinics and other major rural suppliers as a potential distribution source for many animal health products that could come in reusable containers, particularly around key farming periods;
- **opportunity to incorporate reuse into product stewardship schemes and the GPSS,** such as incorporating and increasing collection and take-back services for reusable packaging within the scheme operations to overcome logistical/management challenges, which would reflect the gazetted product stewardship guidelines, and developing an appropriate financial and cost distribution model for reusable packaging system operation.

Summarised recommended actions to increase uptake of reusable packaging systems

Looking forward, five recommended actions were outlined, which Waikato's agricultural sector could harness to support more reuse systems for on-farm agricultural products. These are summarised below:

1. Councils could facilitate collaborative efforts to implement reusable packaging initiatives for key agricultural products.
2. Sector-led leadership and support for reusable packaging.
3. WRC and TAs could establish funding streams and work programmes to incentivise reusable packaging systems in agriculture.
4. The GPSS could increase reusable packaging collections and take-back services for farms in the Waikato.
5. Develop standard protocols for reusable packaging system management and product design.

1 INTRODUCTION

1.1 Background and scope

In 2022, Waikato Regional Council commissioned Reuse Aotearoa to research and report on reusable packaging systems in the region's animal agricultural sector, including:[2]

- identifying, collating and describing existing reusable packaging systems in the sector;
- exploring the barriers, and opportunities to establishing, sustaining, and scaling the uptake of reusable packaging systems in the sector; and
- providing recommendations to support more reusable packaging systems in the sector.

The report focuses on the packaging of on-farm products, such as products like baleage, agrichemicals, fertiliser, veterinary items and animal feed. The study does not include the primary, secondary or tertiary packaging used for shipping and retailing final products (such as meat, milk and cheese) to consumers.[3] The report focuses on animal-based agriculture; other systems such as horticulture and arable farming systems are beyond the scope of this report.

1.2 Why study reusable packaging in the animal agriculture sector?

Animal-based agriculture is a sector of critical importance and relevance to the Waikato region. Pastoral farming is the dominant land use, making up 53% of the region's total area (Waikato Regional Council, 2023). Waikato has more than 6,000 sheep and beef, and dairy farms, which collectively have around 3.5 million animals. In 2023, dairy farming in the Waikato contributed $1.9 billion to New Zealand's GDP, while livestock farming contributed $567 million (Infometrics, 2023; Appendix 1).

Due to the significance of agriculture in the region and the scale of its economic activity, a substantial amount of waste is produced and disposed of on farms. Indeed, the generation and management of waste is an ongoing concern for the rural sector across the country, including Waikato. In New Zealand, end-of-use farm plastics are largely buried, burned, stockpiled, or disposed of at landfill (Farm Plastics Project, 2022). Farm plastics, like packaging, contribute to microplastics leaking into the environment and food chain. Additionally, there is a risk of toxic chemicals entering the air and soils, leachates, and other health and safety issues if plastics and specific products like agrichemicals and their containers are buried or burned (MfE, 2019).

A survey of rural waste on Waikato and Bay of Plenty farms in 2014 estimated a total of 366,800 tonnes of rural waste in the Waikato Region (GHD, 2014). Packaging is a significant waste stream given most farm inputs arrive on-farm in packaging, and most of this packaging is single-use and requires disposal once emptied. Traditionally, **farms and agricultural properties have dealt with waste on-farm through the 3Bs – burning, burying, or bulk storage**, in addition to landfilling through waste management contractor collections (GHD, 2014). In the 2014 survey, 91% of surveyed Waikato sites reported burning rural waste either in open pits or piles, or enclosed in a container or drum, while 76% had an on-farm dump with an average of 37 tonnes disposed of on each farm property (GHD, 2014).

The survey also found that most (78%) farmers were unsatisfied with current waste practices and felt they could manage their rural waste differently, and in general, farmers felt that there could be more waste collection options (GHD, 2014). Indeed, concerns about rural waste have led to efforts to improve waste management and minimisation options for various farm waste streams. **To date, most efforts to sustainably**

2 This study is part of a wider research project into reusable packaging in the region, which also includes separate studies to:

stocktake existing reusable packaging systems across the Waikato region, focusing on the packaging of groceries and fast-moving consumer goods (FMCGs) across the supply chain; and

explore the current and future role of territorial authorities and the resource recovery sector in supporting reusable packaging systems through service provision.

3 Reusable packaging systems for these products, e.g. milk and yoghurt, are included in Reuse Aotearoa's stocktake completed for part one of the wider study (Reuse Aotearoa, 2024).

manage and reduce on-farm packaging waste have focused on repurposing and recycling. While these methods have an important role to play, reusable packaging systems provide an alternative approach that has received comparatively less attention. This is despite their potential to achieve a large waste minimisation impact by preventing packaging waste at source, and despite the compatibility of reusable packaging systems with the upper tiers of the waste hierarchy and the concept of the circular economy (as set out in the Waste Minimisation Act, New Zealand Waste Strategy, the Waikato Waste Prevention Action Plan, and various council WMMPs).

1.2.1 What is reusable packaging and what are its potential benefits?

Reusable packaging is durable, sturdy packaging that is refilled multiple times (in its existing form) with the same type of purchased product for which it was originally designed, or for the same purpose, in **a system of reuse**.

A system of reuse is the established organisational, technical and/or financial arrangements that ensure the packaging achieves a minimum number of trips or reuse cycles in practice, not just in theory (WasteMINZ, 2023, p.1). In contrast, packaging is considered single-use if, after its first use, it is repurposed (used again in its existing form for a different purpose), recycled or disposed of (ibid, pp.1-2).

Reusable packaging systems are not all the same and can be set up or operated differently. Broadly speaking, reusable packaging systems can be arranged into three main categories (Coelho et al, 2020; Blumhardt, 2022) as shown in Table 1:

- returnable packaging;
- refill by bulk dispenser; and
- reusable transport packaging.

This study primarily focuses on 'returnable packaging' and 'bulk dispenser' reuse models in agriculture', as these were the packaging types most commonly identified or discussed by interviewees.

Within each of the categories outlined in Table 1, reusable packaging systems can also vary in their operational structure. For example, they may be:

- **vertically-integrated systems** operated by the supplier/producer of the goods that are in the packaging;
- **vendor-operated systems** operated by retailers; and
- **third-party systems** operated by independent packaging, logistics and/or resource recovery organisations.

In the context of a reusable packaging system, **reverse logistics** are the services and infrastructure that keep reusable packaging circulating between uses, e.g:

- on-farm collection services or the provision of return points for used packaging;
- transportation, sorting, and consolidation activities for retrieved containers;
- systems and equipment to prepare/recondition containers for reuse, e.g. inspecting, washing, sanitisation and/or repairs; and
- redistribution of reconditioned reusable packaging back to the producer/supplier to be refilled.

Numerous studies have found that reusable packaging systems are environmentally preferable to single-use systems across a range of measures, including waste, greenhouse gas emissions, and resource usage, provided breakeven points are met (Blumhardt, 2022; Global Plastics Policy Centre, 2023).[4] In addition, reuse has potential co-benefits, such as reducing the costs of waste management, and creating new jobs and business opportunities.

The waste hierarchy clearly illustrates the best and least favoured options to reduce and manage waste in New Zealand (**Figure 1**). The top layers of the waste hierarchy represent the best, circular approaches to managing materials, and the layers below the yellow line make up the waste management system. Internationally, the

4 To read more about the benefits that can be created by effective reusable packaging systems, see chapter 1.1 of Blumhardt, 2022.

Table 1: Reusable packaging systems and examples in Waikato's agricultural sector

Type of reusable packaging system	How it works	Examples in Waikato's animal agriculture sector
Returnable packaging model	Empty packaging is designed to be returned by the customer/final user of the product, to be sanitised and refilled with the same product or product type (e.g, glass bottle swap systems or kegs for beverages). Returnable packaging can be business-to-business (B2B) or business-to-consumer (B2C).	Plastic containers and drums of various sizes or metal drums are used to provide a product (e.g., agricultural chemical or feed). When empty, they are returned to a third-party or the product manufacturer for washing, sanitising and refilling with the same product or product type. For example, **McFall Fuel** returnable jerry cans and **Dunstan Nutrition's** returnable feed kegs.
Bulk dispenser model	The product is sold loose with the intention that the customer either fills their own reusable containers or they purchase/use a supplied empty container (e.g, bulk food bins at grocery stores).	**Ballance Agri-Nutrients'** self-service silos for fertiliser, where farmers bring their own form of transport (e.g. a spreader) to fill in. Smaller retailers selling unpackaged goods where customers BYO smaller reusable containers. For example, veterinary clinics provide farmers with the option to refill their own containers with animal health or hygiene products.
Reusable transport packaging	Where the outer layers of packaging ('secondary' and 'tertiary' packaging) used to contain or protect a product when it moves through the supply chain (e.g, from producer to warehouse to retail store) are reusable, such as reusable produce crates or pallets.	Transport-related packaging reuse models are often used for bulk deliveries of product (e.g. trucks or towed trailers/ wagons), but may also include products delivered on returnable pallets.

waste hierarchy is a recognised framework for prioritising different waste minimisation and management options. It is recognised by New Zealand's waste legislation, national policy documents like the New Zealand Waste Strategy, and territorial authorities.[5] The waste hierarchy places reuse as a better approach to managing materials and products than other methods like recycling and disposal.

However, **the concept of reuse in agricultural settings and on farms is not widely discussed in New Zealand or internationally**. For example, none of the 107 articles reviewed in a 2023 literature review on reusable packaging considered reusable packaging in agricultural settings (Bradley & Corsini, 2023). While many findings from the literature on reusable packaging may be transferrable to the agricultural context, the unique nature of many products used in animal-based agriculture justifies focused research.

1.3 Methodology and structure

This study helps to address the above research gap by exploring the existence of, barriers to, and opportunities

5 The Waste Minimisation Act 2008 (WMA, s43) requires territorial authorities to adopt waste management and minimisation plants (WMMP), and states that a council's WMMP must have regard to the waste hierarchy (alongside the Aotearoa New Zealand Waste Strategy and the council's most recent waste assessment).

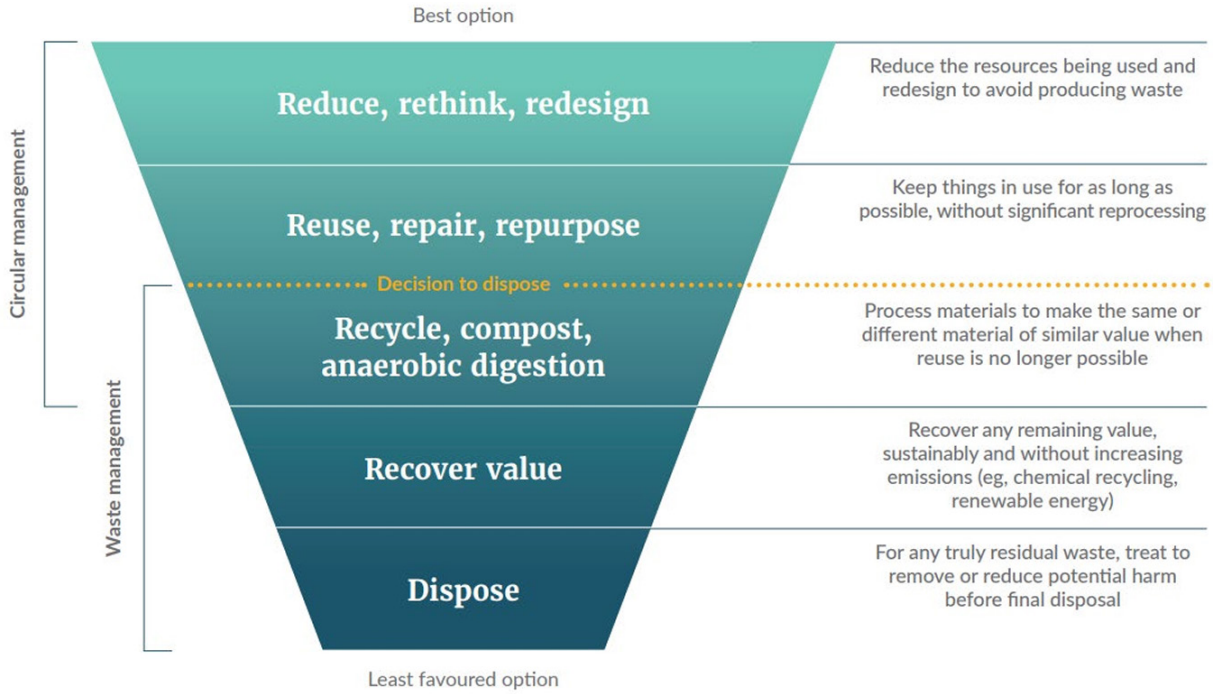


Figure 1: The waste hierarchy (Ministry for the Environment, 2023)

for reusable packaging in the Waikato's animal-based agriculture sector. While this study does not provide a quantitative stocktake of reusable packaging within Waikato's animal-based agricultural sector, it employs a case-study and qualitative research approach to inform an understanding of the barriers and key opportunities for increased adoption of reuse systems in the region.

The methodology adopted to generate these understandings combined:

- **a desktop study** into the sources and fate of agricultural packaging waste, and to identify reusable packaging systems existing in the sector; and
- **eighteen focused one-on-one interviews** with a representative sample of interviewees from across the agricultural and packaging supply chain, specifically: farmers; producers/suppliers and retailers of agricultural products; and organisations that play a role in managing the logistics for agricultural packaging after its use (whether in a reusable or single-use system).

The Reuse Aotearoa lead researcher was supported in the initial desktop study by a co-researcher from the kaupapa Māori zero waste organisation, Para Kore, to identify potential Māori participants, assist in the preparation of culturally appropriate questions for the interviews, and ultimately undertaking two interviews with Māori participants from the agriculture sector.

1.3.1 Desktop study

The desktop study was predominantly based on gathering sources and information about existing reuse systems and packaging waste management practices in New Zealand agriculture via internet searches using keywords.[6] Additional reuse systems were identified through word-of-mouth based on the lead researcher's pre-existing knowledge of the sector and established relationships. Identified systems were analysed in order to understand the basic features of the system (the reusable packaging system category and its operational structure). Some reuse systems were drafted into case studies, with the content of the case studies checked with the relevant organisation to ensure accuracy.

6 Keywords included: silage, agricultural sprays, oil, aerosols, animal health packaging (e.g., drench, metabolic solutions), cardboard, twine, seed bags, mineral, fertiliser, plastic pallet wrap, disinfectants, dairy chemicals. These keywords were matched with terms including: reusable, reuse, refillable, refill, farm, NZ, New Zealand, and container.

1.3.2 Identifying and shortlisting interviewees

The desktop study, along with the lead researcher's pre-existing connections, supported the generation of a longlist of potential interviewees. Additional considerations supported the list's refinement to ensure the sample was representative of farming sectors, industry bodies, producers and suppliers of key agricultural products, and organisations that manage packaging within the agricultural sector (both single-use and reuse). Once interviews began, several interviewees were subsequently invited to participate after being recommended by other participants.

Various factors guided the selection of agricultural sectors for interviews, including farms with high animal numbers (which offer insights into bulk delivery options), and smaller emerging industries like dairy sheep farms (which offer insights into the feasibility and attitudes of incorporating new reusable packaging systems). Interviews were conducted across livestock farm types, ensuring representation across different segments of the agricultural sector, with participation being voluntary and anonymised.

Shortlisted interviewees were approached via their respective websites and via the lead researcher's established contacts in the agriculture sector. Initial contact included an invitation to participate in the research, with a succinct summary of the research purpose and goals.

1.3.3 Participant characteristics

As reported in Table 2, all participants except for one farmer were either Waikato-based or a national entity that conducted at least some of its business in Waikato.

Participants were grouped into broad themes based on their roles in the agricultural and/or packaging supply chain, to support interview analysis and to assist with maintaining anonymity. These categories were:

- **farmers** (individuals who own, manage or work on a dairy cow, dairy goat, dairy sheep, deer, sheep & beef, or pork facility);
- **producers/suppliers** (individuals that spoke on behalf of organisations that make or distribute agricultural products contained in packaging, whether single-use or reusable);
- **packaging logistics providers** (representatives from organisations that manage or process packaging after/between uses, whether single-use or reusable, e.g. packaging collection, recycling or washing services); and
- **industry representatives** (individuals that spoke on behalf of a processor of an on-farm product(s), or representing a specific animal agriculture sector).

We note that several participants fit into more than one category. For example, some producers/suppliers are also packaging logistics/processing operators if they manage a vertically-integrated reusable packaging system. Furthermore, farmers are both end-users of agricultural packaged products and producers/suppliers.

While Table 2 outlines the broad agricultural sectors represented in the participant sample, it is important to note:

- several additional sectors (e.g., meat processors, animal health/veterinary, equine industry, poultry/egg production, honey production) engaged with the research team broadly. While one veterinary participant provided insight on one specific topic, we were unable to secure full interviews with the remainder of these sectors;
- industry representatives were under-represented, with just three participants agreeing to participate and speaking on behalf of a specific animal product processor or industry body; and
- the results highlight largely singular experiences of participants working in, or linked to, a specific animal agricultural sector and do not represent each sector's perspective on reusable packaging.

Table 2: Participant summary and their respective sector or expertise

Category	Number of interviews or responses	Number of participants in the interview	Sectors or expertise[7]
Farmer[8]	6	9	Dairy cow, dairy goat, dairy sheep, deer, sheep & beef, pork
Producer/supplier	6	8	Various products, including fertiliser, feed, chemicals and animal hygiene products
Packaging logistics provider	3	3	Third-party operators of various aspects of the single-use and reusable packaging recovery and processing chains
Industry representative	3	3	Representatives of animal product processors and/or industry bodies
Total	18	23	

1.3.4 Interview methodology, data collection and analysis

A total of 18 interviews were conducted. Interviews were standardised, with questions developed beforehand based on the findings of the desktop research, as well as the key themes of the study (existing systems, barriers and opportunities).

Interviews were conducted by one of two researchers; one interview was conducted together to standardise the approach. All interviews had a single participant, except for: one farmer interview with three participants; one producer/supplier interview with three participants; and one farmer interview with two farmers representing two different agricultural sectors.

The results were captured in-person, online or over the phone, or from written responses:

- **in-person:** Seven interviews were conducted in person. This included five farmer interviews, one producer/supplier, and one industry interview;
- **written:** Two written responses were captured. One industry participated via a written response to interview questions. Another producer/supplier participant provided written insight on the challenges faced by veterinary practices regarding sterilising potentially reusable packaging but did not complete the entire questionnaire; and
- **online or over the phone:** Nine interviews were done online or over the phone. This included one farmer interview, four producers/suppliers, all three packaging logistics providers, and one industry participant.

Except for two written responses, all interviews were audio recorded using Sony IC Recorder, ICD-PX470 and transcribed using an automatic speech recognition algorithm WhisperX. This model was run on a local machine and set up to ensure data confidentiality.

The lead researcher reviewed the transcriptions and conducted qualitative thematic analysis to identify the overarching themes with supporting quotations (Castleberry & Nolan, 2018). Quotations have been transcribed as spoken, apart from minor grammatical and logical clarifications.

7 Several farmers indicated they were running a diversified system (e.g., their business earned money from multiple sectors, including forestry or an additional species etc.)

8 Most of the 'farmer' category participants were either owner/operators or general managers. However, one interview was conducted with three farm personnel that were selected by their industry as being highly motivated to reduce waste on their specific farming operation.

Reflections and quotations from interviewees are kept anonymous to protect interviewee identity. While case study text has been checked with the featured organisation to ensure accuracy, not all those featured as case studies were interviewees.

1.3.5 Limitations

Despite efforts by the researchers to engage, industry and sector bodies were under-represented (three participants). This was a significant limitation because this report has identified the necessity of industry involvement in future reuse initiatives, alongside the support of large industries and processors

In addition, this report focused on reuse within the animal agriculture sector. Further research could explore opportunities for reusable packaging in other parts of the wider agriculture sector, including horticulture and viticulture.

Although this project involved a kaupapa Māori researcher from Para Kore, and interviews with two Māori participants, neither the content of these interviews nor the content of this final report delve deeply into indigenous perspectives on reusable packaging systems in the agriculture sector. Reuse Aotearoa and Para Kore recognise the context of colonisation and land confiscation within Aotearoa and the Waikato region specifically, and the severing impact this has had for many Māori in terms of connecting with, or cultivating, ancestral lands. In this context, we recognise that the role of reusable packaging systems for commercial agricultural applications, while potentially bringing environmental benefits within the realm of packaging and material usage, may not be the foremost priority when it comes to restoring and exercising tino rangatiratanga and kaitiakitanga rights of mana whenua for the air, soil and waterways of the Waikato region.

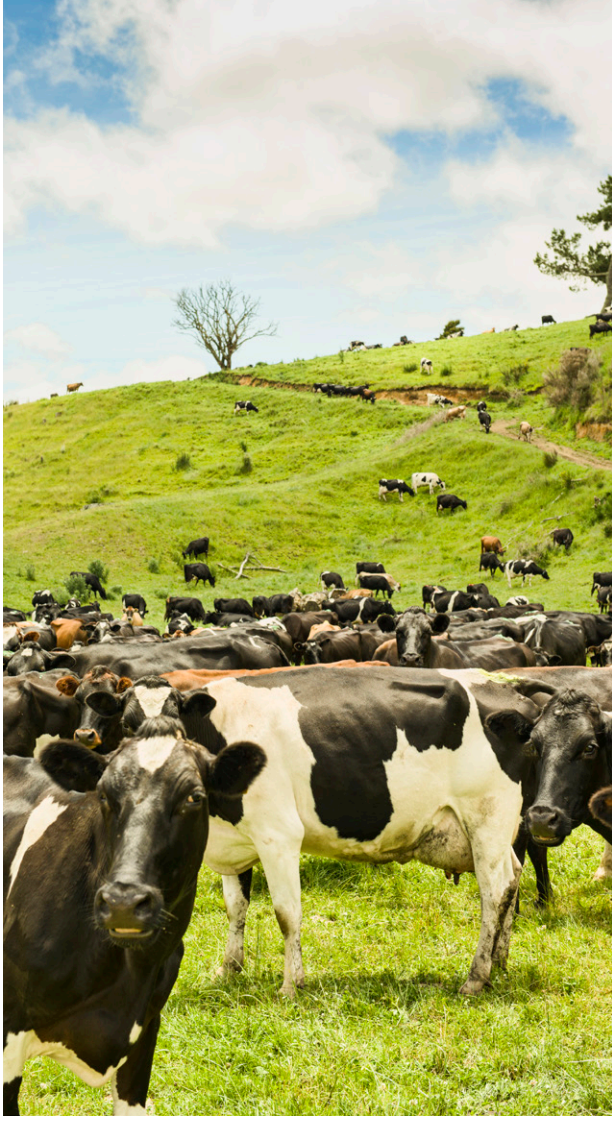
2 SOURCES AND FATE OF SINGLE-USE PACKAGING ON WAIKATO FARMS

2.1 Available data on typical sources of on-farm packaging

The sources of packaging waste on farms derive from the various products that are used for farm operations, many of which now arrive in single-use packaging. These include products such as oil, feed, fertiliser, silage, supplements, agricultural chemicals, and animal health products. With a diversity of products brings a variety of packaging, including differences in size, material type, and other features like reusability and recyclability. Packaging types can also vary depending on the type of farm, as this affects the quantities and volume of product needed.

To understand packaging types used on Waikato farms, several regional district reports were reviewed from the Environment Canterbury, Waikato Regional Council, Bay of Plenty (GHD, 2013; GHD, 2014), alongside publicly available information from recycling providers, farms and manufacturers. Due to limited historical data on packaging in Waikato's agricultural sector, this study does not provide a comprehensive quantitative stocktake of all packaging types used on farms in the region, nor does it provide an inventory of historic and current reusable packaging used on farms.

At the completion of this report, the most recent estimates of packaging waste on Waikato farms were a decade old, and grouped the Waikato with the Bay of Plenty (GHD, 2014). In that report, of the 46 surveyed farms in the Waikato, 42 were animal-based, and most were between 50 and 500 hectares. The report found that relative to the total inorganic waste reported for each sector (dairy: averaging 21 tonnes per farm; livestock averaging 9 tonnes per farm) agricultural packaging makes up 6% and 8% of waste, respectively, by weight (GHD, 2014). Despite the age of this latest packaging waste research, **these estimates provide compelling evidence of the potential impact of increased reusable agricultural packaging on waste reduction on farms**.



Common packaging types[9] associated with dairy and livestock farms in the Waikato are shown in **Table 3**.[10] On average, Waikato dairy farms generate more packaging waste than livestock farms, much of which is single-use. Fertiliser bags, animal feed bags, silage wrap and twine constitute significant proportions of packaging waste on both dairy and livestock farms. Animal feed bags were a significant waste stream for dairy farms, while twine was common for livestock farms. Other types of waste, particularly building waste, untreated timber offcuts, used vehicles and machinery, woodchips, are also significant sources of farm waste, but are not included in Table 3 because they are not packaging items.

9 Table 3 includes the categories defined in GHD: 'packaging waste' (fertiliser bags, seed bags, animal feed bags, animal health plastic packaging and plastic sheep dip, oil containers, and miscellaneous) and 'plastic waste' (containers, drums, silage wrap, netting, mulch film and crop cover).

10 Throughout this report, effort is made to present Waikato-only data, but this was not always possible as the GHD (2014) report often grouped the two regions together.

Table 3: Estimated amount (mean kg per farm) of common packaging produced on animal-based farms (split by dairy and livestock)[11] (GHD, 2014)

Packaging Type	Dairy[1] (mean kg/ farm)	Livestock[2] (mean kg/ farm)
Fertiliser bags[4]	514	107
Silage wrap	190	170
Animal feed bags	155	56
Miscellaneous	80	57
Drums[5]	75	65
Twine	68	111
Animal health plastic packaging[6] and sheep dip containers	56	23
Pallets	52	67
Oil containers	50	38
Containers[7]	17	20
Seed bags	13	4
Cardboard	3	10
Aerosol cans	3	1
Glass containers	1	0
TOTAL	**1277**	**729**

1 Dairy farm waste estimate based on survey of 48 farms (36 in Waikato, 12 in Bay of Plenty; 5 of these farms were mixed use, where dairy production was combined with either livestock or horticulture)

2 Livestock farm waste estimated based on a survey of 11 farms (8 in Waikato, 3 in Bay of Plenty; 5 of these farms were mixed use, where livestock production was combined with either a dairy or crop operation). Livestock included beef, sheep, deer, pigs, poultry, and horse stud.

4 Fertiliser bags were listed twice in the source document, but reported as different values; they have been combined here for ease of interpretation.

5 Drums were noted as being 220L and either metal (20kg) or plastic (10kg).

6 Such packaging is often extremely hazardous, as it contains sharps/needles and/or blood/tissue etc.

7 Containers were not well defined. The report mentioned containers as being varied in plastic density and size, and assumed a 1kg weight per 20L container.

These main packaging types in Table 3 reflect nationwide trends. Across New Zealand, the four plastic waste streams that are reportedly the most voluminous, and which are included in the product stewardship scheme for farm plastics[12] are (Farm Plastics Project, 2021; Farm Plastics Project, 2022; Table 4), 1) Agrichemical containers and drums stream; 2) Bale wrap and silage sheets stream; 3) Small sacks and bags stream; and 4) Large sacks and bags stream.:

Agrichemical containers and drums stream

Containers and drums are typically made from high density polyethylene (HDPE, #2), a high-value, highly recyclable plastic typically not found in other farm plastic streams. Containers are between 1-60 litres, and drums are 61 - 1,000 litres, and Intermediate Bulk Containers (IBCs) are 1,000 litres. Some drums are also metal. Due to their agrichemical contents, this stream often has contaminated plastics, and treatments differ from the other stream plastics (such as triple-rinsing, standardised cleansing procedures and recycling processes).

11 Note, this is not an exhaustive list.

12 See section 2.2 below for details about the existing product stewardship schemes in agriculture and the role they play in the recovery and management of on-farm packaging waste.

Bale wrap and silage sheets stream

Bale wrap. Image supplied by Plasback.[12]

Bale wrap and silage sheets are made from low density polyethylene (LDPE, #4) soft film composition, different from plastics used in the other streams. This stream is by far the highest volume (by weight) of plastic used on New Zealand farms for many years, and has value as a recycled plastic, subject to contamination levels (e.g, bale wrap can contain up to 50% contamination from moisture, mud and grass).

Small sacks and bags stream

Small sacks and bags. Image supplied by Plasback.

A significant number of small bags (under 25kg) are sold and used across the entire farming sector in New Zealand and are a common packaging waste generated on Waikato's dairy and livestock farms (Table 3). The composition is typically polyethylene, woven polypropylene (PP, #5) plastics, or a blend of LDPE and other plastics. Products commonly packaged in small bags include animal feed, seed, agrichemicals, and fertiliser. Most (around 90%) of small seed and feed bags are made from a mix of plastics, making them difficult or impossible to recycle.

Large sacks and bags stream

Large polypropylene feed and fertiliser bags (500kg and 1 tonne bags). Image supplied by Plasback.

Typically 500kg and bulk one tonne woven polypropylene (PP, #5) bags for packaging across seed, feed and fertiliser brands, although they are mostly used for fertiliser. Most bags are single-use and cut open from the bottom to access the product safely.

Most of these major waste streams are growing annually and are projected to continue growing, except for small fertiliser bags. Bale wrap and silage sheet is projected to slow in the coming years. The product stewardship scheme manager, Agrecovery, reports that agrichemical containers and drums are projected to grow 6% per year, and growth is likely to continue at current rates (Farm Plastics Project, 2022, p.16).[13]

2.2 Management approaches to single-use packaging waste

Since the introduction of single-use packaged products, on-farm packaging waste has largely had the same

13 Large fertiliser sacks have a 3% growth rate per year. Bale wrap and silage sheet have a 4% growth rate per year, which is likely to slow in the coming years due to changing practices. Small seed and feed bags have a ~5% and ~6% growth rate, likely to continue and possibly increase, respectively. Small fertiliser bags have a 0% growth rate given industry appears to be moving towards larger half and one tonne sacks.

fate as the rest of the rural waste stream, i.e. one of the 3Bs, landfilling, or leakage into the environment. Efforts to develop alternative pathways for some packaging types have either focused on recycling (e.g. via product stewardship schemes, see **Box 1**) or repurposing activities (at the initiative of individual farmers), rather than the reinstatement or development of reuse systems. To date it is estimated that the product stewardship schemes have diverted roughly 50% of the targeted packaging waste streams (Farm Plastics Project 2022). As repurposing is an informal activity that occurs on-farm, the impact of these efforts is not documented.

Farmers are resourceful and often practise **repurposing**, whereby they retain an item after it has served its original function in order to use it for a different purpose, such as an empty molasses bucket being repurposed to carry milk for calves. Evidence indicates that repurposing is engrained in the culture of agriculture, particularly for containers. For example, farmers in the Waikato often use large drums for other purposes like seed containers, rubbish bins, or storage bins. Farmers also tend to store empty barrels, feed and fertiliser bags, containers, and other products for potential repurposing on-site (GHD, 2014).

Even if farm plastics are collected for **recycling**, there is not enough onshore plastics recycling capacity in New Zealand to process current plastics collections, let alone farm plastics on their own (Farm Plastics Project, 2022). Large volumes of farm plastics have been exported to Asia for a number of years, due to this lack of domestic recycling capacity (e.g, sent to South East Asia, for pelletisation and recycling into secondary plastic products like furniture, paneling and car parts (Farm Plastics Project, 2022; Agrecovery, n.d, a; Agrecovery, n.d, c)). Agrecovery and Plasback have overseas markets and processes in place to export farm plastics, which is likely to continue for the other GPSS farm plastics streams collected from 2024 onwards (Farm Plastics Project, 2022).

In addition, the sustainability of New Zealand exporting much of its plastic waste by shipping it to Asia is also in question. For example, a petition presented to the New Zealand House of Representatives in August 2022 (signed by 11,000 people) requested to ban the export of plastic waste to developing countries, calling this practice a form of "waste colonialism", given that New Zealand's plastic exports are creating adverse effects for the health of communities and the environment in developing countries like Malaysia (New Zealand Parliament, 2022; House of Representatives, 2023). Exporting our farm plastic waste offshore may not be a long-term solution, and more durable, circular solutions need to be found onshore in New Zealand (Farm Plastics Project, 2022).

BOX 1

PRODUCT STEWARDSHIP FOR ON-FARM PACKAGING

In 2006, two individual voluntary and accredited product stewardship schemes arose to support the recovery and processing of farm plastics, and agrichemicals and their containers – Plasback and Agrecovery. A large proportion of the waste streams targeted by these schemes are the single-use packaging types commonly used on farms across New Zealand, such as silage wrap, bale wrap, feed bags, rigid plastic containers and drums. The schemes were set up differently:

- **Agrecovery** provides farmers with a nationwide, fee-funded (by participating brand-owners) drop-off service to collect and recycle agrichemical containers and drums. Agrecovery receives a levy from participating brands that covers the cost of the service and recycling. As a result, programme users like farmers and growers do not have to pay for the service at the time of accessing it. Agrecovery has over 160 collection sites nationwide and provides on-farm collections (Farm Plastics Project, 2021; Agrecovery, n.d, b); and
- **Plasback** focuses on bale wrap and silage sheet farm plastic waste, and is a commercial scheme where farmers pay for collections. Plasback provides a user-pays on-farm collection service for farm plastics including silage wrap, bale wrap and pit covers. Collected plastics are inspected, sorted, washed, shredded and recycled into finished products like tuffboard (a plywood replacement), tuffdeck and plaswood (Plasback, n.d).

Until recently, these schemes were voluntary and separate, but are being partnered under one farm plastics scheme the **GREEN-Farms Product Stewardship Scheme (GPSS**) following a scheme co-design process after farm plastics, and agricultural chemicals and their containers, were declared 'priority products' by the then Minister for the Environment under s 9 of the Waste Minimisation Act in 2020.[14] Agrecovery will operate the GPSS and Plasback will remain an independent entity providing services to the scheme.

The GPSS will be a single, regulated and accredited farm plastics product stewardship scheme to coordinate the collection, treatment and processing of the four key farm plastic waste streams throughout New Zealand – agrichemicals and their containers, bale wrap & silage sheet, small bags, and large sacks. Eleven additional plastics will be added after the first initial three years of the scheme.

Although the GPSS is not geared towards reusable packaging for the four key farm plastic waste streams (i.e, agrichemicals and their containers, bale wrap and silage sheet, small bags, and large sacks), Agrecovery is looking at the potential for reuse for other waste streams, such

14 This triggered a statutory requirement that a product stewardship scheme be developed for those products, which has since occurred, via a multi-stakeholder co-design process. The resulting GPSS has now been accredited by the Minister for the Environment and will be eligible for regulation under s 22 of the WMA (which could include making participation in the scheme mandatory). Regulations have not yet been consulted on.

as reusing wool fadges multiple times before they are considered too dangerous to reuse.

As a regulated scheme, the GPSS is intended to be mandatory for producers and manufacturers of farm plastic to participate in and will use cost recovery fees (calculated for each of the four individual farm plastics streams, and charged to producers) to provide free farm plastics collections and processing services to all farmers, growers and farm contractors. This is expected to reduce the administrative and cost burden to farmers and thus reduce free rider concerns, increase farmer participation and the volumes of farm plastic recovered by the scheme. Under the new model, it is projected that by FY 2026, up to 80% of all GPSS farm plastics will be returned (an increase from 40% of farm plastics returned in 2024), with 90% of all farmers and growers participating in the GPSS by December 2029 (Farm Plastics Project, 2022 p 24 – 27; 87).

The GPSS producer-funded cost recovery fees will cover the scheme costs including:

- regional farm plastics collection costs, including management (e.g, 145 farm plastic collection/drop-off sites across New Zealand including TA transfer stations, existing and new sites), transport (including on farm visits for 200 remote farms per region), and assets (including collection site maintenance costs);
- eight regional Recovery Hubs15 , including management, transport, and assets, and plastics treatment activities (e.g, sorting and cleaning material, baling and bundling of the plastics prior to domestic recycling or for export); and
- GPSS plastics treatment activities, which will be undertaken at regional recovery hub locations across New Zealand, one in each of the eight geographic regions (including one in Waipa, for the Waikato/Central North Island). Activities and assets at these sites will comprise sorting and further cleaning, hoists to move the material, and baling and bundling of the plastics prior to domestic recycling or for export.

Collection and processing for recycling of the four main plastic/packaging types noted above are the focus of the scheme (and its two precursor schemes). During the scheme design process, the scheme manager, Agrecovery, projected that in 2024, the scheme collection weights (approximate) would consist of the following packaging types: 10% from agrichemical containers and drums, 10% from small bags, 10% from large sacks, and 68% from bale wrap and silage sheets (Farm Plastics Project, 2021).

Currently, reuse outcomes represent a small portion of the fate of scheme materials, as discussed in the following section. In time, this balance may be expected to change given the gazetted General Guidelines for Product Stewardship Schemes for Priority Products (which apply to the scheme for farm plastics and agrichemicals and their containers), state that such schemes should achieve "circular resource use", including "increasing end-of-life management of the priority product higher up in the waste hierarchy".

15 The 8 Regional Hubs are located in: Whangarei (Auckland/Northland); Te Puke (Bay of Plenty/Thames Valley); Waipa (Waikato/Central North Island); Hastings (East Coast North Island); Fielding (Wellington/Manawatu/Whanganui/Taranaki); Blenheim (Marlborough/Nelson/West Coast); Methven (Canterbury); and Invercargill (Southland/Otago).

3 EXISTING REUSABLE PACKAGING SYSTEMS IN WAIKATO'S AGRICULTURAL SECTOR

Reuse and resourcefulness are practices that are familiar to New Zealand's agricultural sector and rural communities, which is evidenced by the prevalence of historic reuse practices and continued reuse systems today. Research-based findings and anecdotal evidence reveal that prior to the shift towards single-use packaging in the mid-20th century, many agricultural products were commonly supplied in reusable packaging. For instance, a light review of historic articles from the *New Zealand Journal of Agriculture* shows that during the 1950s and 1960s, many agricultural items were reused, including:

- reusable jute bags were frequently used on farms, often for wool fadges;
- dettol (antiseptic for stock), teat salves and paints were sold in reusable tins; and
- drenching guns designed for multiple uses, administering up to 100,000 doses.

It is unclear whether a supporting system of reuse existed for collecting, sanitising and refilling these reusable items, and why many of these practices were eventually discontinued. However, it is plausible that the widespread availability of cheap, disposable single-use packaging played a significant role in this shift. Nevertheless, the normality of reuse on-farms until relatively recently supports the notion that successful reuse systems could potentially be reintroduced for at least some packaging types for on-farm products.

Furthermore, through our desktop research and focused interviews, this report has identified various reusable packaging systems currently operating in Waikato's animal-based agricultural sector. These systems may be vertically-integrated producer operated systems, refill by bulk dispenser systems that involve the participation of both retailers and farmers, or third-party operated systems. Some systems receive logistical support from product stewardship schemes. This prevalence demonstrates an ongoing **baseline interest in reusable packaging systems, awareness about the value of reuse, and the potential for wider uptake throughout the sector.**

In addition, we note that **repurposing i**s also widely practised by farmers in the Waikato. In interviews, farmers mentioned that they repurpose empty buckets, tubs, drums, containers, and bags for other uses on farms. We also identified some New Zealand companies currently marketing bags made from materials like hessian, jute, and bulk woven PP as 'reusable' (Sackman, n.d; Hubco Inc, n.d). However, in practice, these bags will likely be repurposed on farms rather than reused, given the absence of a supporting system to collect and redistribute the packaging. Repurposing practices are not examples of reusable packaging systems; nevertheless, they do demonstrate farmers' commitment to on-farm sustainable practices, and suggest an openness to, and values-alignment with, well-designed reusable packaging systems.

This section describes some examples of the reusable packaging systems identified via our desktop study and/or interviews. The systems are categorised according to the model type they reflect, and details are provided about their operational structure. The impact of the systems are not quantified, but general learnings provided by these examples observed by the research team or noted in interviews are highlighted.

3.1 Returnable packaging systems

Returnable packaging systems involve the delivery and/or sale of product in a package that is designed to be returned after use for washing/reconditioning and refill with the same or similar type of product.

Returnable systems can be set up with varying operational structures. If the entire system (including the reverse logistics like collections, return and reconditioning) is managed by the producer/supplier of the product, the system is considered to be **vertically-integrated**. In some vertically-integrated systems, a producer/supplier might outsource certain aspects of post-consumer reverse logistics to a third-party, such

as the collections or reconditioning. In these cases the reuse system remains vertically integrated because the producer/supplier owns or controls multiple stages of the supply chain. In contrast, **third-party systems** occur where the packaging ownership, collection/returns, and reconditioning are managed by an independent operator, separate to the producers, and the system typically serves multiple producers within a shared system.

Returnable packaging systems reduce packaging waste because each time a package is successfully returned, reconditioned and refilled, the need for a new single-use package is avoided. In Waikato's agriculture sector, a number of returnable packaging systems reflecting the different organisational structures described above are in operation. These systems reduce the usage of a range of single-use packaging types, including small bags, large sacks and one-way containers and drums.

3.1.1 Trucks to deliver bulk unpackaged product

Most participants noted that a large portion of the product they used or worked with are **either transported off-farm in bulk by truck** without additional packaging (such as products sent from the farm for processing or sale) or **delivered to the farm in bulk by truck** (including feed, fertiliser, fuel, and chemicals) into bins and silos. For example, products arrive to farms unpackaged inside a truck and are emptied directly into a silo, hopper or spreading device (such as trucks, wagons, aircraft), or products arrive packaged on pallets that can be returned for reuse. Bulk unpackaged deliveries avoid the need for product to be packed into single-use small bags or large sacks. As mentioned by a producer/supplier:

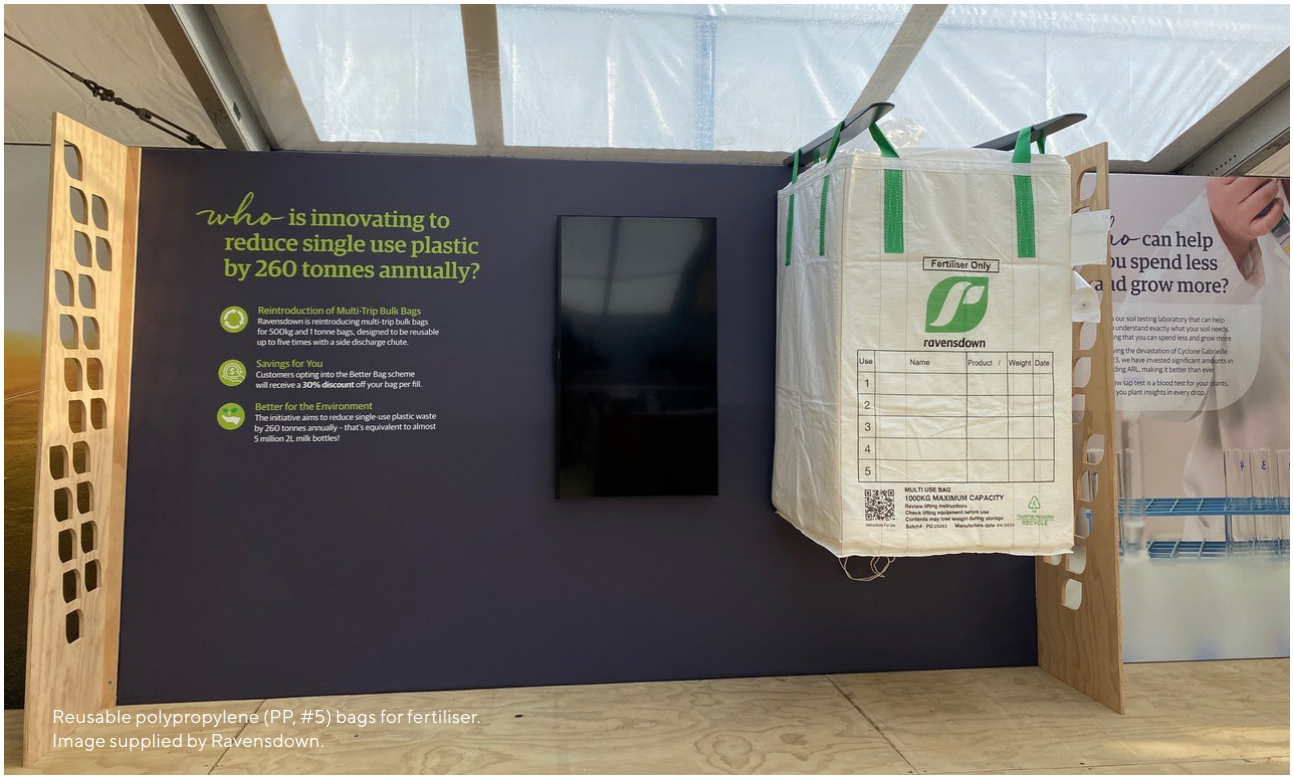
"If we consider a truck as the reusable package, then that's the majority of our packaging [...]. A huge part of our business is the trucking of our materials around the country, not just to customers, but also between our sites"

3.1.2 Returnable fertiliser bags

In the past, large 40kg multi-trip reusable fertiliser bags were commonly used by farmers. However, to comply with changes to New Zealand's workplace health and safety law in 2015 (the Health and Safety at Work Act 2015), and because of health and safety concerns over individual handling of sacks and bags over 25kg, bags have reduced in weight and size to be 25kg and smaller, for feed, seed and fertiliser (Farm Plastics Project, 2022). For example, **Ballance Agri-Nutrients** and **Ravensdown**, major agricultural companies and suppliers of agricultural inputs, previously shifted from reusable multi-trip fertiliser bags to single-use bags after 2015 due to health and safety concerns relating to the risk of people potentially leaning underneath multi-trip 500 kg or 1 tonne bags to untie the cord in order to open the bag (Ballance, n.d.) As a result, higher numbers of single-use bags are now used and sold to farmers, and the added convenience factor has also increased their use. Unfortunately, around 90% of these small 10kg to 25kg seed and feed bags are designed for single-use and typically made from a mix of plastic types, making them difficult or impossible to recycle (Farm Plastics Project, 2022).

However, in July 2024, aligned with their sustainability strategy, **Ravensdown** re-introduced reusable, multi-trip plastic 500 kg and 1 tonne polypropylene (PP) 'Better Bags' for fertiliser, and is moving away from single-use polypropylene bags. Reportedly, the bags cost less overall than single-use polypropylene bags, have been designed to be reused up to five times (after which they are sent offshore for recycling), and are safer than the historic reusable bags because they have a side discharge chute to release the chute without leaning under the bag. However, the bags are more time-consuming to fill. Farmers are responsible for returning the bags to the store in good condition for refilling. Small 20kg bags cannot be reused, only recycled (Ravensdown, 2024; Ravensdown Customer Service, 2024).

The historic reuse of fertiliser bags in New Zealand, alongside recent design changes to move to modern reusable bags (Ravensdown's 'Better Bags')



Reusable polypropylene (PP, #5) bags for fertiliser. Image supplied by Ravensdown.

demonstrates how packaging unit design can be used to overcome barriers to reuse. It also suggests that other small bags, such as animal feed and seed bags, could potentially be replaced by larger returnable bag systems, if the logistical arrangements exist or could be created to facilitate their return and refill.

3.1.3 Returnable kegs for feed

Dunstan Nutrition is a dedicated equine feed manufacturer and supplier that operates a vertically-integrated bulk equine feed delivery system using swappable kegs for their clients across the Waikato and Auckland, eliminating the need for single-use woven polypropylene bags. Dunstan Nutrition has a line of more than 45 different products, catering for the entire scope of the NZ equine industry, from the Thoroughbred and Standardbred breeding and racing sectors, through to the equestrian sport horse sectors.

Dunstan Nutrition introduced the returnable keg system in response to customer demand for reduced bag usage. The changes to accommodate the keg system required investment. Dunstan Nutrition sought endorsement from local Councils to develop their packaging systems based on reduced waste, which ultimately led to financial support from the Ministry for the Environment (through the Waste Minimisation Fund) to fine tune their processes.

"We had a number of our larger clients coming to us to say, 'we're buying all these bags every week, how can we do this better?' So, we engaged. We sourced the design and started having the kegs made locally. We had to modify our processes, and our trucking contractor had to engage with the concept. But now, the kegs are going strong. Every keg saves around 30 polypropylene bags from the waste stream. These kegs are part of our sustainability journey."

Dunstan holds a significant pool of the kegs, which were developed in Australia and are now produced locally.

Returnable kegs for equine feed. Image supplied by Dunstan Nutrition.

designed to be rodent-proof, easily moved by a forklift, and highly durable (Dunstan's first keg deployed in 2010 is still in circulation). The kegs are low maintenance with only occasional fixes to minor components.

In terms of system design and logistics, all kegs are in a swappable rotation between Dunstan's clients' farms and Dunstan's production facilities. Dunstan relies on its established relationship with each customer to ensure keg returns, rather than charging a deposit or bond. Dunstan's freight supplier was willing to alter their trucking system to accommodate the kegs, including hydraulic tail lifts, battery powered forklifts, and scanners to keep track of each keg's location. Kegs are supplied to and returned from the clusters of large horse studs and stables in the Waikato, Auckland and Canterbury regions. Dunstan attributes customers being closely located to one another as the key to the initiative's success, as it streamlines delivery and pickup. Reconditioning involves internal cleaning between loads, which occurs at Dunstan's plants using compressed air.

Dunstan's returnable kegs eliminate the need for polypropylene woven bags, thereby significantly reducing single-use packaging usage and resultant waste. Dunstan estimates that since inception of their keg initiative (2010), approximately 2 million woven PP bags have been avoided and therefore removed from the waste stream, the equivalent of 160 tonnes of plastic waste.

3.1.4 Reusable drums and containers

We identified several returnable packaging systems for containers and drums, some of which are vertically-integrated (i.e. operated by the producer of the product contained in the packaging), and some of which are supported logistically by the product stewardship schemes.

For example, **McFall Fuel**, a provider of fuels, lubricants, and tank maintenance services, runs a vertically-integrated returnable packaging model for 20L plastic containers for oil and lubricant (e.g., chain bar oil, engine oil). Their initiative operates across the North Island, including remote farming areas in the Waikato. McFall Fuel offers the rural sector the option to participate in a reuse program, whereby they collect empty containers, wash them, and either refilling or recycling them.

The company provides an on-farm collection service, returning containers to their facility where waste oil is removed, and the containers are cleaned, inspected, and refilled. While McFall Fuel does not use financial incentives like deposits, the system engages customers with a low-tech refill tracker label on containers, which gets a tick each time the container is returned and refilled, allowing customers to track how many times a container has been reused (McFall Fuel, 2017; McFall Fuel, 2019).

We also identified examples of farmers and suppliers liaising to establish informal returnable packaging systems for repeat purchases. For example, **Patoa Farms**, a Canterbury free-farmed pork producer (that manages 5,000 sows and their offspring annually), receives weekly deliveries of pig semen from a Hamilton supplier. Together, Patoa Farms and their supplier have implemented a returnable chilly bin system for these deliveries. Through reusing standard plastic chilly bins, the system avoids the use and disposal of 60 single-use polystyrene containers annually.

Patoa Farms initiated and proposed the idea to the supplier and ensured the system would work by managing the process, investing in the reusable chilly bins, and allocating staff time, and budgeting for freight costs associated with returning the containers to the supplier. The manager is already dedicated to reducing the farm's waste (for example, participating in the Agrecovery programme, and striving to repurpose items wherever possible, such as converting old grain silos into additional piglet shelters) and is exploring implementing the system across other parts of the business:

Returnable chilly bin system. Image supplied by Patoa Farms

"We receive semen from Hamilton weekly and in the past, it would have been delivered in polystyrene containers. But now we ship a standard plastic chilly bin back and forth. We started doing it because we were always putting the packaging in the rubbish, and the chilly bins were a reasonably easy fix. Yes, we need to consider biosecurity, costs associated with the shipping and staff time to deliver it to the post office, but we are producing less rubbish, and we avoid damaged containers too, as chilly bins are durable. Now, I am considering all our medication, as it comes in big polystyrene containers almost monthly. There's actually no reason we cannot do the same chilly bin solution with them, because we get it from the same supplier."

Reverse logistics is critical for enabling returnable packaging systems to work. In the aforementioned vertically integrated case studies, McFall Fuel and Patoa Farms operate the entire system, including collections, transportation, and refilling. **In other cases, a third party operator is involved in helping to make returnable packaging systems viable**, such as **Ecolab**, who outsources collection and cleaning/reconditioning of their returnable packaging to third-parties.

Ecolab is a global organisation that has been operating for over 100 years, and provides a range of agricultural, animal health and hygiene products to New Zealand's agricultural sector, predominantly dairy farmers, followed by poultry. Ecolab has two main arrangements in place with existing third-party packaging logistics providers to collect their returnable HDPE containers and drums from across the country:

- to collect off farms, Plasback collects Ecolab-branded used drums and containers (20L – 1000L), which are reconditioned by a third-party and then returned to Ecolab for refilling; and
- to collect from cities and regionally, a third-party logistics provider collects Ecolab-branded empty containers and drums on their standard collection routes.

After collection, Ecolab outsources cleaning and reconditioning of their containers to specialised, third-party industrial cleaning providers, and the containers are delivered back to Ecolab for refilling. All containers 20L and above are returnable, including 20 and 25L jerrycans, 200L drums, and 1000L IBCs. Drums range in size from under 100L, through to larger sizes (100 - 1000L), and are reused up to 8 times, after which they

are recycled. IBC bladders are reused and recycled after five years.

Using Plasback's existing reverse logistics network has enabled Ecolab to retrieve their branded packaging from farms that are often in remote locations and significant distances apart, and maximise the amount of drums collected per trip (e.g, 20 to 30 drums per collection). Although return rates are seasonally dependent, utilising this existing collections network has enabled Ecolab to achieve an estimated 70% return rate for their reusable packaging. This system demonstrates how a product stewardship scheme's logistics network is a logical asset to leverage to grow a cost-effective reuse service to minimise packaging usage and generation in the agriculture sector.

Ecolab-branded returnable drums. Image with permission by Ecolab.

"In animal health, it's not so easy, because as you can imagine... there's thousands of farms, trying to get them back off farms... that's why we use Plasback."

Third-party operators also run returnable container and drum services and infrastructure to support returnable packaging systems for drums and containers. For example, **NZ Drum** is located in Hamilton and operates a third-party preparation for reuse service to sanitise and clean used plastic (HDPE) and metal drums and IBCs across the upper North Island for a range of companies in preparation for reuse, with a focus on the agricultural sector. NZ Drum's customers are typically chemical companies associated with the agricultural industry, and the containers and drums are typically used for cleaning products, sanitisers and chemicals, and 60% of the product that NZ Drum deals with is from the agricultural industry.

Preparation for reuse service for reconditioning returnable drums. Image supplied by NZ Drum.

Existing collection networks (e.g. those managed by product stewardship schemes and any third-party logistics providers) collect and provide NZ Drum with various containers to clean. In addition to cleaning, NZ Drum operates its own pick up and delivery service for chemical companies, operating an estimated 20% of the transport reverse logistics for the returnable packaging service, collecting drums around the upper North Island using their own trucks.

NZ Drum has been operating for about 25 years, has strong relationships with their customers and has a relationship with Ecolab. While the system used to have a deposit-return element in place, they now incorporate a 'reuse fee' into the purchase price of the initial chemical (purchased from the chemical company), which covers the cost of the reuse collection and cleaning service.

NZ Drum handles, washes and sanitises roughly 35,000 containers (200L HDPE and steel drums and 1000L

IBCs) annually through its standardised, food-safe cleaning and tracking process, and the containers are returned to producers for refilling. Reportedly, they also accept 100L plastic drums and small containers of various sizes (NZ Drum, n.d). Rather than reprocessing containers into base materials via traditional recycling schemes, NZ Drum ensures that most of the containers are sterilised and reused in their original form, for their original purpose.

"We have a lot of checks and balances to make sure we are doing things correctly. We follow a strict protocol and exclude chemical [...] Is that could pose a safety risk, plus we have a rigorous food safe cleaning process, which stops cross-contamination and makes the drums safe to go back to customers, and to go elsewhere at the end of the cycle. We do pH tests to ensure there are no residues. Drums have a labelling scheme that allows us to monitor how many times they have been used, and how old they are."

NZ Drum's preparation for reuse service has significant packaging reduction benefits. For example, one of their customers has reduced their new drum purchase to less than 20% of their total drum requirements. Once the plastic drums have reached the end of their life in the NZ Drum cycle (after five cycles or two years), they are cleaned and nominally sold for repurposing in public projects. While the steel drums do not have a set life, they also eventually become repurposed.

3.2 Refill by bulk dispenser systems

Refill by bulk dispenser systems involve producers and retailers collaborating to vend product without packaging, via dispensing systems that enable customers to provide their own containers to fill into. By using their own containers, farmers avoid the need to bring disposable packaging such as small bags onto their farm. Where the packaging to fill the dispenser is returnable, packaging waste in the supply chain is also reduced.

3.2.1 Self-service silos for feed and fertiliser

Several refill by bulk dispenser systems for feed and fertiliser in the Waikato are displacing the need for some single-use feed and fertiliser bags. For example, one farmer described a centralised system provided by two large fertiliser suppliers, allowing local farmers to self-dispense fertiliser into their own containers or directly into their trucks.

Ballance Agri-Nutrients operates a bulk fertiliser delivery system to farmers across New Zealand, including eleven self-service silos (with another two ready to be relocated), which eliminate packaging and reduce customer travel distances. Ballance started as Bay of Plenty Fertilisers and is now an amalgamation of various fertiliser companies across New Zealand. Ballance is a key supplier of the country's agricultural fertiliser needs. From three manufacturing facilities, fertiliser is shipped to 40 main bulk storage centres, from which it is then distributed to customers via various methods.

One such method is self-service silos, which not only remove packaging altogether, but also reduce the journey distance customers need to make to pick up the product. Ballance reported that while it is difficult to estimate accurate figures, when looking at the frequency of 1-2 tonne orders, data shows the operation of these silos have undoubtedly helped reduce the number of small and bulk bags (PP) in circulation.

"Our various self-serve silos allow farmers to either pre-order or order at the time. They just turn up with their tractor, spreader, or wagon, drive up under the silo, and pick up their order at any time of the day or night. We've since been rolling these silos out at a rate of approximately two a year."

Bulk dispenser reuse system - self-service silos for fertiliser. Image supplied by Ballance Agri-Nutrients.

3.2.1 Dispensing animal health products

Some **veterinary clinics** vend certain animal health or hygiene products via refill by bulk dispenser models, so farmers can bring their own containers to refill product into. Several farmers reported proactively reusing packaging when retailers provided bulk dispenser opportunities, such as bringing containers for refill of animal hygiene products at their local veterinary clinics, or wanting to be able to refill products from their vets. For example, one farmer's veterinary clinic purchases **disinfectant solution** in 200 litre drums, from which the farmer refills their 5L containers during trips to town.

3. 3 Summary

Table 4 below outlines the common farm packaging waste streams discussed in this chapter, current waste management routes, as well as some examples of existing reusable packaging system alternatives. Overall, more farm packaging in the Waikato is increasingly expected to be collected through product stewardship schemes for recycling. However, current examples of reusable packaging systems in the sector, as well as the historic use of reusable packaging signals the potential for more agricultural products to transition out of single-use packaging towards reusable packaging supported by effective and efficient reuse systems.

Existing reusable packaging systems in the Waikato's animal-based agricultural sector (e.g, for fertiliser, feed and fuel) prove that reuse activity already occurs in the sector and that systems are possible to implement. Nevertheless, reuse continues to be niche, not mainstream.

Our interviews with representatives from several identified reusable packaging systems and those who participate in them at some point in the supply chain offer some useful insights about important design features for a successful reuse system, including:

- packaging durability, strict cleaning protocols, and health and safety measures, particularly in preparation for reuse processes (like **NZ Drum**'s packaging reconditioning operations);
- reducing costs for farmers and ensuring clarity and transparency about the costs involved in reuse systems or services, and ensure costs are fairly allocated within a system (e.g. covered by manufacturers or service providers or integrated into packaging prices), raised by various participants and packaging logistics providers;
- Incorporating effective incentives to support farmer/end-user participation in returnable packaging systems, such as rewards or deposits redeemed on container return or providing farmers with free returns/collection services (most case studies provide farmers with free return);
- the necessity of widespread participation in reuse systems for economies of scale and efficiency;
- ensuring dedicated, trained personnel and support (for example, reconditioning operations requires staff to have deep technical knowledge of chemicals and residues, as seen in the **NZ Drum** case study);
- designing reusable packaging process flows that are convenient, easy-to-access, achieve a sufficient

scale to increase impact, and can be incorporated into routine activities. This includes efforts to simplify financial and time requirements on the product end-user (e.g. farmers) for participating in the system, e.g. handling and returning packaging, incorporating reuse return logistics with other existing activities to minimise transport and dedicated trips. The **EcoLab** example shows how product stewardship schemes can be leveraged to support the critical reverse logistics for returnable packaging schemes; and

- portraying the evidence of container reuse, such as tracking reused containers in an interactive app, supports impact measurement, but can also be used for developing a positive brand story. For example, a producer/supplier operating a reuse scheme mentioned that tracking a container's life history (i.e., its number of reuses, or 'trippage rate') could enhance brand reputation and consumer appeal.

The following chapters discuss general interviewee attitudes to reusable packaging systems in the agriculture sector, particularly perceived benefits and downsides; and the barriers and opportunities to establishing, sustaining, and scaling the uptake of reusable packaging in Waikato's animal-based agricultural sector. These reflections are drawn from the eighteen interviews we conducted with representatives from across the agricultural supply chain, many of whom had experience with participating in or operating reusable packaging systems in tandem with single-use packaging.

Table 4: Common farm packaging waste streams, current waste management routes, and existing reusable packaging models in the Waikato (Farm Plastics Project, 2021; Farm Plastics Project, 2022)

Main farm plastic waste stream	Material and size	Current return rates	Leakage and environmental impacts	Current status quo waste management routes	Examples of reusable packaging systems
Containers and drums (e.g, agrichemcals)	HDPE (#2). Containers 0-60L; drums and IBCs 61 – 1,000L	Agrichemical stream collections achieve a recovery rate of over 50% in 2020/21 and are expected to grow to at least 70% in 2024 (Farm Plastics Project, 2022, p.18)	• Agrichemicals and their containers are toxic and pose a risk to the environment and human health (MfE, 2019) • Farm waste surveys indicate that the majority of these wastes are disposed of into unlined farm dumps or landfills, being burnt or stored (MfE, 2019)	• Collection for recycling through Agrecovery (agrichemical containers constitute 10% of Agrecovery's total projected collection weight in 2024) • Predominantly recycled into underground cable cover and products like rubbish bags and plastic plywood (Agrecovery HDPE Acceptance Criteria, n.d) • Repurposing on farms • 3Bs	Returnable packaging models for containers and drums like **Ecolab** and **McFall Fuel's** returnable jerry cans and **Dunstan Nutrition's** feed kegs Collection/transportation services include **product stewardship schemes** and other packaging logistics operators Reconditioning/preparation for reuse services for containers and drums include **NZ Drum**
Bale wrap and silage sheets	Low-Density Polyethylene (LDPE, #4) and Linear Low-Density Polyethylene (LLDPE) (#4)	Bale wrap and silage sheet have a projected return rate of 35% in 2024, anticipated to increase to 70% in 2026 (Farm Plastics Project, 2022, p.18)	• It is estimated that the majority of an estimated 10,000 tonnes of LLDPE bale wrap and silage sheet film currently used on New Zealand farms annually is not currently being collected for recycling. • T he majority remains on New Zealand farms, or is disposed of unsustainably, such as burning or burying (Farm Plastics Project, 2022, p. 103)	• Collection for recycling through Plasback and Agrecovery (projected to contribute to 68% of Agrecovery's total collection weight in 2024) • If recycled, converted into products like Tyffboard (plywood replacement) (Plasback, n.d) • The majority is dealt with unsustainably through the 3Bs	The reuse of bale wrap and silage sheet is currently deemed **"not possible"** (Farm Plastics Project, 2022, p. 31)
Small bags and large sacks (for seed, animal feed and fertiliser)	Small bags are mixed plastics, often woven PP (#5) and LDPE (#4) and are 10kg – 25kg Large sacks are typically made from woven PP (#5), and are standardised 500kg and one tonne woven PP (#5) bags	Small bags and large sacks have a projected return rate of 60% in 2024, anticipated to increase to 80% in 2026. (Farm Plastics Project, 2022, p.18)	• Around 90% of the small seed and feed bags (10kg to 25kg) are typically made from a mix of plastic types making them difficult or impossible to recycle (Farm Plastics Project, 2022) • If collected, most large sacks are exported to Asia for recycling (Farm Plastics Project, 2022)	• Collection for recycling through Plasback and Agrecovery (small sacks and large sacks collectively accounted for 20% of Agrecovery's total projected collection weight in 2024) • Repurposing on farms • 3Bs	Returnable packaging models, such as **Dunstan Nutrition's** returnable feed kegs and **Ravensdown's** returnable multi-trip fertiliser bags (500 kg and 1 tonne bags) Bulk dispenser models such as **Ballance Agri-Nutrient's** refill by bulk dispenser (self-service silo) system for fertiliser

4 BARRIERS TO INCREASING THE UPTAKE OF REUSE IN WAIKATO'S AGRICULTURAL SECTOR

Despite some examples of reuse systems operating in Waikato's agricultural sector, several barriers to growth persist, as do practices such as the 3Bs. When asked to identify barriers to establishing, sustaining and scaling reusable packaging systems, participants identified several interconnected factors, rarely mentioned in isolation. These included financial constraints, lack of available options and awareness gaps, management challenges, contamination and liability risks, logistics challenges, lack of infrastructure and time. Many of these barriers reflect existing literature, which commonly cite time, finances, knowledge, and lack of scale and shared infrastructure as typical barriers to the uptake of reusable packaging (Ellen MacArthur Foundation, 2023; GHD, 2014; Gabzdylova et al., 2009; Collins et al., 2010).

4.2 Fear of time pressure and uncertainty

Despite generally positive attitudes towards reusable packaging systems, all farmers expressed hesitation about the feasibility of reuse systems. Participants who had a cautious or negative view of reuse focused on perceived challenges of implementation and participation, particularly additional time, effort and unintended consequences. However, some farmers expressed willingness to embrace reuse initiatives despite the perception of an added workload.

A key theme that emerged among most interviewees was **hesitancy, rooted in the perception that reuse systems require additional time and effort.** Participants generally perceived that establishing and participating in agricultural reusable packaging systems would take more time and/or require a change to the status quo that comes with added work, costs, logistics, and inconvenience, and cognitive burden for farmers. For example, while all farmers described being open to participating in reusable packaging systems, most expressed reservations about added work and time, alongside added costs and inconvenience, especially in light of how time-poor farmers are.

We heard that farmers' **lack of time** is compounded by a high cognitive load and mental health concerns associated with managing farming operations. Several farmers cited concerns about the lack of time to learn new practices and undergo forward planning for reuse systems, particularly for farmers in isolated areas. These factors all reduce farmers' capacity to participate in reusable packaging systems, and also play a role in farmers' reduced capacity to engage in recycling initiatives.

In other cases, hesitation stemmed from a fear of **unintended or unforeseen consequences** of reuse initiatives, particularly regarding leading to other environmental issues or diverting resources from other environmental efforts. Some of these potential unintended consequences related to increased water consumption for cleaning reusable containers, higher fuel usage due to additional transportation requirements to transport bulky reusable containers, and the continued consumption of petroleum for reusable plastic products (contributing to carbon emissions). In addition, one producer/supplier operating a reusable packaging system emphasised the need to ensure that reusable products can be effectively recycled or disposed of at the end of their lifecycle:

"[We need] to make sure we can handle it on the other end. So, when the reusable gets to an end of life, can we [recycle] it? Can we treat it? Can we dispose of it in the right way?"

As noted previously, numerous studies have found that reusable packaging systems are environmentally preferable to single-use systems across a range of measures, including waste, greenhouse gas emissions, water usage and resource usage. However, they do need to be designed to ensure breakeven points are met (Blumhardt, 2022 p.3; Global Plastics Policy Centre, 2023).[16]

4.1 Financial constraints

The operational and capital costs of setting up and running reusable packaging systems was the barrier interviewees raised the most. Participants assumed the costs to establish and run reusable packaging systems would exceed any projected return. Farmers raised concerns about the potential upfront costs of purchasing some reusable products and different equipment, given the incompatibility of some reusable containers with on-farm machinery, as well as uncertainty around the financial comparisons of reuse versus recycling systems for common agricultural products.

Producers/suppliers highlighted significant capital expenditure required for handling and freight of reusable containers, and the need for significant investment for critical infrastructure, e.g. a wash-plant and associated decontamination system, and ongoing operational costs. They raised doubts about the economic feasibility of operating reverse logistics as buying new, single-use items is likely cheaper than covering the costs of recovering packaging from farms, cleaning, and redistributing it to producers. Indeed, the Agrecovery scheme used to operate more collections for reusable drums and IBCs, but essentially "turned that off" due to the high transportation costs for shipping whole drums for reuse rather than shredded drums for recycling (e.g, a truck can fit about 120 whole 200L reusable drums or about 3,000 - 4,000 shredded drums).

Producers/suppliers and packaging logistics operators noted that ongoing costs related to either farmers' or processors' time, such as collecting small numbers of containers spread across remote farming communities and geographic areas, making collection financially unfeasible. Some participants considered that processes like returning containers to the factory for reconditioning, washing, and refilling were economically infeasible due to the time involved. A producer/supplier operating a reuse system mentioned that cost is the main barrier to expanding the service to additional products, and several participants mentioned that reuse systems require significant forward planning. They indicated that since many farmers are located in remote, isolated locations, bulk deliveries are challenging to coordinate, and costs increase with the remoteness of a farm (more time, effort, and fuel).

These additional costs were seen as a significant barrier because, despite a theoretical appetite among Waikato-based farmers to adopt reusable packaging systems, we heard that if faced with additional costs, farmers would likely choose cheaper, single-use options, rather than exacerbate existing financial pressures. We heard that the on-farm 3B disposal practices remain the cheapest option for farmers, and in the absence of regional legislation and support or incentives to do otherwise, one participant told us "matches are cheaper" than reusable alternatives. As such, farmers felt that reuse systems would struggle to compete with the 3Bs. To support this point, these participants referred to the existing product stewardship schemes, noting that despite these schemes, farmers continue to dispose of at least some packaging waste on their farms or in the farm's rubbish collection given scheme participation costs, lack of transparency of costs, accessibility, and unclear rules about contamination.

Indeed, all but one farmer said that the costs of reusable packaging systems were a deterrent. In the case of existing reusable packaging systems, most farmers expressed concern that they were already shouldering the associated capital start-up and operational costs of those systems, and that farmers are shouldering existing costs and pressure. The interviewees who operate reusable packaging systems recognised this, and expressed a desire to minimise any additional burdens to already time and resource-constrained farmers.

16 To read more about the benefits that can be created by effective reusable packaging systems, see chapter 1.1 of Blumhardt, 2022.

In addition, some participants mentioned that **it will be harder for smaller agricultural industries to incorporate and implement reusable packaging initiatives**, without the substantial financial support that other industries such as dairy has, particularly in light of decreasing meat and wool export revenue and falling farm profit (MPI, 2024). For example, while dairy export revenue is also reported to decrease alongside farm profitability, the sector remains our largest export earner, contributing 44% ($23.698b) to New Zealand's export revenue (MPI, 2024). As one participant mentioned:

"We're very lucky with our position in dairy, and to a certain extent, red meat... but some of these other industries must be doing it really, really tough. How do you make any money when you've got next to no margin?"

4.2 Recycling-centred focus of current packaging sustainability initiatives

Recycling single-use packaging is the focus of those developing sustainable alternatives to the status quo on-farm 3B disposal practises. However, the competition with, and reliance on, recycling and other normalised disposal methods for managing single-use packaging, diverts resources, attention and innovation away from solutions higher up the waste hierarchy.

This project elucidated an initial lack of awareness from farmers, businesses and industry participants about the different tiers of the waste hierarchy, the differentiation between reusing, recycling, and repurposing, as well as the ingrained perception that recycling is the primary, effective waste minimisation strategy. Broadly, **most participants initially tended to use 'recycling' and 'reuse' terms interchangeably**, and some participants initially referred to reuse as 'recycling'. For example, all farmers mentioned using Agrecovery and Plasback recycling schemes when asked to describe any product packaging that they 'reused'. In addition, some participants insisted on referring to their 'reuse' services or practices as 'recycling', with one logistics operator preferring to describe their reuse system as 'true recycling'. However, four producers/suppliers described how they had successfully built reuse systems into their business operations, and the systems closely aligned with the definitions used in this report, and some acknowledged the interchangeability of recycling and reuse terminology.

Most participants repeatedly returned to the concept of recycling instead of reuse throughout interviews, and farmers tended to associate sustainability efforts with recycling programs like Agrecovery and Plasback. Indeed, the primary mechanisms for improving sustainability outcomes for packaging in the agriculture sector to date have been the two product stewardship schemes, which overwhelmingly focus on recycling. One interviewee reflected that the schemes were "embedded in recycling". Reuse is barely mentioned in the new GPSS scheme, which will focus on recycling packaging (Farm Plastics Project, 2021; Farm Plastics Project, 2022). As this research has noted, while one scheme does provide support for reusable packaging reverse logistics (e.g, collections), this support has not been actively marketed, and represents a small portion of the scheme's overall operations (<10%), and has reduced, rather than increased, over time.

In addition, **the recycling-centred focus of packaging sustainability initiatives** was noted across all interviews, and participants identified this as a significant barrier to wider adoption of reusable packaging systems. For instance, several farmers expressed openness to participating in more reusable packaging systems, but emphasised the need for a broader shift in farming and industry attitudes, highlighting the entrenched nature of current practices and the current focus on recycling. One farmer felt strongly that their industry's focus on recycling initiatives was steering people away from considering alternatives like reusable containers. Another farmer reflected on how recycling has been a barrier to them considering reusability:

"I guess I'm just so focused on recycle, recycle, recycle... it's quite hard to kind of step off that train and go 'well, now instead of recycling it, how can we reuse it?'"

Meanwhile, all participants perceived that increased reusable packaging systems would require **changing the status quo** (e.g, away from 3Bs and from the focus on recycling), which was seen as a large hurdle to overcome. Some participants considered that the focus (both locally and overseas) on increasing recycled plastic content in packaging has further reinforced the emphasis on recycling over reuse. Some participants' skeptical attitudes toward reuse were linked to **a general resistance to change**. In some cases, scepticism or doubt about the feasibility of reuse systems and their financial viability was linked to **perceived failures in the current recycling system** (e.g, some participants expressed the perception that recycling collections get landfilled locally or overseas).

Aside from interviewed participants who are operating reuse systems, generally, larger producers/suppliers and industry representatives were predominantly focused on recycling, with few plans for implementing reuse schemes and/or reuse constituting a small portion of their operations. Participants considered that issues like cost, health and safety concerns, and product quality concerns would likely limit participation in reuse to smaller, dedicated manufacturers rather than large manufacturers.

4.3 Management and logistics challenges

A number of participants pointed to management and logistics challenges associated with operating reusable packaging systems within the agriculture sector specifically. For example, participants noted that farms are often remote and dispersed, which increases the cost and complexity of retrieving and tracking returnable packaging.

We also heard that implementing bulk dispenser models could be difficult for producers or retailers stocking multiple products, given the associated space needed for storing the product, and for transporting bulk containers. One farmer also told us that while self-service silos were a good solution for generic products that most farmers buy, it would be difficult to extend to cases where each individual farmer requires customised products (as can sometimes be the case for fertiliser, for example).

The inability to compact empty reusable packaging can mean increased freight movements for returnable packaging reverse logistics vis-a-vis single-use systems. This was cited by four participants (including one packaging logistics operator that provides reuse services) as a key barrier/disincentive to operating the logistics for reusable packaging systems. Participants noted that trucks can fit thousands of shredded products destined for recycling, but only a few hundred reusable drums.

For example, one participant reported that a truck can fit 1 tonne of empty reusable drums or 24 tonnes of chipped, recyclable drums, at the same freight cost of $1,800 per trip (West Coast to Christchurch), as illustrated in **Figure 2**. In other words, they are able to transport about four times as much recyclable materials, at the same freight cost:

> "Ideologically, I understand reusing the drums, but I think that in practice, the average cost of drums will get so high, that they'll go 'you know what, we're actually better off using virgin [recyclable] drums.'"

Figure 2: Freight comparison of shipping empty 200 litre reusable drums versus shipping compressed plastic (reported by a business participant)

Furthermore, while not directly related to the Waikato region, participants mentioned that freight costs from the South Island to Auckland are a significant barrier to participation in reuse systems for South Island farmers. One participant noted that baling and exporting containers of drums offshore for processing is cheaper than transporting across the Cook Strait and to Auckland for reuse:

"Now we've got a really silly situation in NZ, it's slightly embarrassing [...]in the South Island the freight to get the product to Auckland is more expensive than it is for us to export it. So, we bale the product... a huge bale of HDPE drums – and then we send container-lots of that offshore for processing because it's cheaper than sending it to Auckland."

4.4 Contamination, health and safety, quality control, spoilage, and potential liability risks

Participants across the agricultural sector expressed concerns about managing **contamination and potential liability risks** in reusable packaging systems, particularly regarding containers coming off farms, and the need for vigorous sanitisation and washing facilities and processes. One packaging logistics operator noted that they had reduced their reusable packaging offerings over time, in part because of safety concerns about unknown materials that might have been put in the containers while on-farm. Indeed, six participants were hesitant about the reusability of containers that come off farm, compared to those originating in other sectors. Concerns about sources of contamination associated with reuse systems in agriculture included:

- cross-contamination of containers or products with different agricultural chemicals;
- concern about chemicals leaching into packaging;
- cross-contamination between farms of soil and plant materials; and
- biosecurity issues and potential pathogen sources entering farms (like fears of pathogen or disease transmission between farms).

Producer/suppliers and packaging logistics operators were particularly concerned about the associated liabilities of operating the reconditioning processes for returnable packaging. These participants cited the potential risks they would be taking on by putting reusable products back on the market where they cannot guarantee what farmers may have used or repurposed containers for previously.

"Everybody is really worried about their liabilities... we know that there are some people acutely affected by agricultural chemicals... and so everybody's so risk adverse that they don't really want their drums going anywhere other than being run through the chipper [for recycling]."

Some participants mentioned that even after agricultural chemical containers have been washed and sterilised for reuse, the HDPE still "has a smell to it" and is considered to be "contaminated", which reduces the container quality and means the product cannot compete with food-grade plastic. One producer/supplier considered that recycling will always be a large part of waste management for agricultural products because of the tendency for chemicals to leach into plastics. Producers/suppliers also emphasised that manufacturers tend to require virgin plastic for their product to avoid any potential contamination, or to meet customer's colour requirements (e.g., recycled plastic colours tend to be limited due to their mixed nature). Interestingly, conversations around recycling being the only option due to chemical leaching into plastics rarely mentioned the contamination that remains in plastics when they are recycled (Eriksen et al., 2018).

Some participants considered that some agricultural products may be unsuitable for reuse given their use for hazardous substances and contamination and suggested that low-level non-hazardous products like feed may be more appropriate. While non-hazardous products may indeed be easier to incorporate into reuse systems, current examples of reuse systems like Ecolab and McFall Fuel demonstrate that containers used for chemical or hazardous product can be reused, provided that systems and logistics are set up to ensure containers are only reused for the same product.

Many participants mentioned that changes in **health and safety legislation** in 2015 (Worksafe 2015) undermined a large-scale reusable packaging system for 500 kg and 1000 kg fertiliser, feed and other bulk dry goods (through distribution via a closable bottom hatch), resulting in a new, significant single-use packaging waste stream. Most participants were concerned about the new health and safety concerns of emptying, stacking or storing reusable bags. As one producer/supplier stated:

"We used to have reusable bags, but we found we had too many health and safety concerns. If they're reused, we won't know what condition they're in, if they've been degraded in the sunlight, if they've been damaged in some way... If one of those bags falls... that can lead to bad injuries and even fatalities. So as much as we would love to use reusable bags, it's just too much of a health and safety risk."

However, several farmers perceived unintended consequences of the health and safety regulations. Farmers flagged that the switch from reusable bags to single-use 500kg and 1000 kg fertiliser and feed bags is expensive, given farmers now need to pay $35 for every single-use bag, and has introduced an unsafe method where farmers now need to 'slash' the bag from underneath with a "sharp knife" or a "slasher" to access grain, which renders the bag useless for any future reuse or repurposing.

It is important to note that near the end of this research project, a returnable packaging system for fertiliser bags was re-introduced. **Ravensdown** re-introduced reusable plastic 500 kg and 1 tonne polypropylene (PP) for fertiliser (designed to be reused 5 times) and is moving away from single-use polypropylene bags (Ravensdown, 2024; Ravensdown Customer Service, 2024). Participants interviewed were unaware of this system due to the timing of the interviews, which took place a year before the system's launch.

While bulk dispenser, silo-based models for feed and fertiliser are a viable alternative to single-use bags, as demonstrated by **Ballance Agri-Nutrient**'s bulk fertiliser delivery system, some participants were concerned about quality control, spoilage, and product loss related to bulk dispenser models. Specifically, some producers/suppliers and farmers expressed concerns about potential product waste and associated financial loss related to bulk packaging formats or silo models (as opposed to single-use sealed polypropylene bags), particularly for large farms. For example, a producer/supplier that was using a silo system for animal feed mentioned that it could only be used by large farms that could use up the feed within three to four weeks, to prevent loss in nutritional value and spoilage. Similarly, we heard a concern that surplus of bulk product in silos during off-seasons may lead to moisture, product waste, spoilage or nutrient loss, and resulting financial loss.

4.5 Lack of reuse infrastructure and available reusable packaging options

"A lot of the agricultural chemicals are imported... [reuse] is not as simple as it probably sounds because you've got to get the drum back... [you are] going to clean it, and then it's probably going to be sent in containers offshore to be refilled."

Most participants highlighted a need for more reuse infrastructure and systems that increase the viability and availability of reuse over recycling. Without infrastructure for cleaning and refilling containers onshore, participants noted the only option is to chip and ship offshore for recycling. In particular, the absence of infrastructure for washing and sanitising reusable packaging in the South Island, coupled with high freight costs to North Island facilities, is prompting South Island businesses to export what might otherwise be intended as reusable packaging to recycling markets overseas. Commenting about a supplier of a preparation for reuse service, one packaging logistics provider stated:

"They tried to get a wash plant down to the South Island and nobody will play the game."

Several participants also made the point that many agricultural products are imported, which renders reusable packaging systems impractical for these products. For example, one company who provides a returnable packaging service to farmers noted that increasing reusables further within their business would be challenging due to the fact that some products are imported from Australia or America, and the onshore infrastructure is not available to refill the product onshore.

In addition, there is a **lack of available reusable packaging options and systems** for reuse in agriculture. For example, many participants mentioned that silage wrap is a significant single-use plastic waste stream on their farms, which does not yet appear to have any viable reusable alternatives (Farm Plastics Project, 2022). Most farmers listed products they would be willing to purchase in bulk or in reusable or refillable containers (e.g., dog biscuits, various feeds, medicines, oils, drench, drench guns), but as far as they knew, reusable options were not available.

In addition to the lack of options, we also perceived a general **lack of awareness of current available options and reuse companies between participants**. For example, some producers/suppliers operating reuse systems were unaware of other services operating in the same sector. These knowledge gaps create a barrier to success for the reusable packaging systems that do already exist.

5 OPPORTUNITIES FOR SCALING THE UPTAKE OF REUSABLE PACKAGING

Several opportunities for scaling the uptake of reusable packaging are outlined in this section. Key opportunities include:

- the positive attitudes toward reuse within the sector, which is an opportunity that could be leveraged;
- optimising reuse system design to better incentivise participation;
- focusing on reusable packaging systems that generate cost-savings (such as bulk dispenser models)
- focusing on specific products that could be good candidates for reusable packaging;
- collaborating locally to coordinate reuse efforts;
- incorporating reuse into product stewardship schemes and the GPSS; and
- distributing the costs of managing reusable packaging systems.

5.1 Positive attitudes towards integrating more reusable packaging on farms

Nearly all participants acknowledged the potential benefits of integrating more reusable packaging on farms, citing benefits including environmental sustainability (like intergenerational sustainability, waste reduction and resource conservation, and emissions reductions); marketing benefits and a competitive edge; and health and safety benefits.

When asked to reflect on the potential benefits of reusable packaging for farms and in the agricultural sector as a whole, participants typically mentioned **environmental sustainability** first, and the long-term environmental benefits of shifting to reusable packaging. Waste minimisation and resource conservation were both perceived and reported as an environmental benefit because reuse systems keep existing packaging in use and displace the need for new packaging. For example, one producer/supplier that has incorporated reusable packaging into its product delivery reported that their single-use packaging has since reduced to 40%. Some participants noted that this not only reduces waste, but also reduces emissions as reuse is a more energy efficient process than single-use recycling systems, which not only rely on continual manufacture of new packaging, but also energy-intensive reprocessing steps.

"...it's more energy efficient, you're using the existing packaging which means you're not having to create more packaging which is good for the environment."

Intergenerational sustainability was another consistent theme, with decisions to use reuse systems seen as a way of reducing environmental impact now, to protect and safeguard the land for future generations. Participants also raised the emotional benefit derived from doing the right thing by being involved in good environmental practice and stewardship.

"... you think of your generation, our children's generation and our grandchildren's generation... if we don't make changes now, they won't have much of a life."

Several farmers associated reuse with **positive nostalgia**, reflecting on their childhood when using reusables was commonplace, and suggesting reuse could be possible again, if perspectives could be changed.

"When I was a young lad... when we harvested the corn, it was all done in hessian bags and it was delivered to the co-op and we'd get the hessian bags back, and...do that again. There's quite a bit of effort involved, but that was what we did, you know... I think we've got a mentality of throw away these days [but] I don't think it's something that you can't overcome."

Producers/suppliers operating reuse systems considered that reuse provides **marketing benefits** like a point of difference for customers and improved sustainability. Some expressed that reuse offers a competitive edge, and that those who do not participate in sustainable practices *"will be left behind"*. The idea of reuse as a competitive edge was also reinforced by the idea of reuse systems supporting businesses' social license to operate in the future. Channeling the *triple bottom line* concept, where profits are balanced with social and environmental progress (Singh & Srivastava, 2022; Gimenez et al., 2012), one producer/supplier suggested that they, and others in their sector, need to have an "environmental tick" on their balance sheets and that reusable packaging could support with that. They noted that businesses should allow environmental benefits to guide some of their decisions, commenting, *"you can't just be motivated by profit at the expense of the environment."*

"[Reuse] gives you a point of difference... as time goes on, this point of difference is going to end up being [that] those of us that aren't [reusing], will be left behind"

Some producers/suppliers operating reusable packaging systems also suggested that reusable packaging can offer superior function and performance compared to single-use packaging and improve workflows. For example, reusable packaging can be more durable and therefore better protect goods from damage. Well-functioning reuse systems also reduce the expense and inconvenience of recycling packaging or having to store or dispose of packaging.

Some participants also considered that reusable packaging systems offer **health and safety benefits** by reducing manual handling or minimising the risk of contamination. For example, one producer/supplier that delivers bulk reusable, self-service containers to farmers reported that their system has improved on-farm health and safety by reducing manual handling and lifting of individual bags by farm workers and truck drivers. In addition, using these containers has reduced rat populations and minimised rodent damage, reducing associated health risks.

5.2 Opportunity to optimise reuse system design to better incentivise participation

A few farmers, a packaging logistics provider, and a producer/supplier who is participating in a reuse scheme mentioned that **returns of reusable packaging should be incentivised**. To boost participation and system efficiency of reuse schemes, participants suggested that packaging could carry a deposit (examples given included South Australia's container return scheme, and ABC's swappa crate scheme) or customers could receive credit at the return location (e.g, at Farmlands). Dairy board crates and containers were provided as examples of this happening in practice. For example, wooden pallets from bulk fertiliser can usually be returned to the supplier in return for a credit (DairyNZ, n.d).

In addition, several farmers noted that unless big agricultural processors and/or respective industry bodies are on board and help to incentivise reuse, farmers are unlikely to get on board. For example, participation in Plasback and Agrecovery schemes significantly increased in 2023, partly due to Fonterra offering the 'Co-Operative Difference' (The Co-Operative Difference, n.d). The first step, Te Pūtake, provides farmers with an incentive of 7 cents per kilogram of milk solids on all milk supplied (on top of the base rate) if they successfully meet achievements in four focus areas.[17]

Several participants mentioned the Co-Operative Difference as an example of a successful economic incentive to increase participation. The 'Environment' focus area includes having a Farm Environment Plan in place that is achieving key practices, such as participating in a product stewardship scheme for on-farm plastics and agrichemicals. Fonterra's industry-led framework provides an economic incentive for farmers to participate in product stewardship schemes, which

17 Achieving Te Pūtake criteria requires meeting achievements in the following four focus areas: Co-op and Prosperity; Environment; Animals; and People and Community (Fonterra, n.d).

led to a doubled return rate for Plasback in 2022. Similar economic incentives could be designed by industries and companies across the agricultural sector to incentivise farmers to participate in existing reuse schemes (e.g, sheep and beef, deer, poultry, etc).

"I think one of the best things I've seen come in in the last couple of years is the incentives coming from the dairy companies to their farmers to be demonstrating that they're doing the right things around sustainability, animal health, and all of that – and I think then about what it's done, is that it's got farmers [on board] – because they can recognize extra money back in their milk cheques."

5.3 Opportunity to focus on reusable packaging systems that generate cost-savings

Despite concerns raised by farmers about costs hindering their participation in reuse schemes, other farmers and participants highlighted **potential cost savings associated with reusable packaging, particularly bulk refill systems**, despite initial investments that may be required. In fact, farmers who purchase products in bulk reported significant financial savings, including for products like fertiliser and disinfectant, given bulk purchases are cheaper. For example, one farmer reflected on their financial savings associated with refilling 5L disinfectant containers through a partnership they had set up with their vet, only paying for the disinfectant they use, leveraging the bulk buying price:

"[My veterinarian is] actually charging me just for what I take, whereas ...buying a new container each time, that's built into that price. [By refilling] you can basically... piggyback on the vet's bulk price."

This cost-saving principle of buying in bulk applies not only to small containers, but also to large bulk deliveries that most participants reported using or being involved in. Removing single-use containers from 'refill by bulk dispenser or truck' models reportedly reduces the cost of the product. For instance, several farmers mentioned that their fertiliser price was dramatically reduced when purchased in bulk from self-serve silos instead of in 1000kg bags. One farmer, who receives bulk fertiliser deliveries by truck, noted that buying fertiliser in bulk is cheaper:

"We mainly do all bulk...sometimes we're buying it up to $300 a tonne cheaper... the cheapest thing you can get is a bulk bin truck."

These reported cost-savings contrast with the perceptions shared by some participants who did not anticipate financial benefits from agricultural reuse systems. It indicates that bulk dispenser models or bulk-sized returnable containers could present an opportunity focus area for growing reusable packaging systems in the sector. Bulk dispenser models can also increase the convenience and accessibility of products to farmers, as seen in the **Ballance Agri-nutrients** silo-model, whereby farmers or growers can purchase fertiliser online, drive to a regional silo, and fill their own trucks or tractors with the product.

5.4 Opportunity for specific products that could be good candidates for reusable packaging

Some packaging and product types may be more suitable for reuse in agriculture than others. Concerns about reusable products being contaminated with agricultural chemicals, or posing biosecurity and health and safety risks, point toward the potential for bulk dispenser models for animal feed products to be better candidates for agricultural reuse systems, at least at the outset. As discussed in this report, there are **several existing and successful returnable packaging or bulk**

dispenser models for feed and fertiliser, which could be increased in number and reach across the Waikato. On the other hand, the reuse of silage and baleage wrap is currently deemed "not possible" (Farm Plastics Project, 2022, p. 31). While reuse may not currently be an option to pursue for silage and baleage wrap, consideration could be given to better waste management routes (including the potential for designing for reuse), given that this waste stream is projected to contribute the vast majority of farm plastic collections in 2024, and given the majority currently remains on farms or is burnt and buried (Farm Plastics Project, 2022).

Most participants shared positive statements about the potential for future farming systems to include more reusable packaging. When asked, most farmers shared ideas about the specific single-use products that they thought could or should be available in reusable packaging instead. Common suggestions included fertiliser bags, animal feed, agrichemicals, and animal health and hygiene products, and specific suggestions included:

- large bags for fertiliser (raised by many participants and by all farmers);
- large bags (fadges) for wool;
- large containers for bulk quantities of dog food, calf meal and milk powder;
- drums for herbicides and oil;
- reusable containers for vehicle oil; and
- small and medium containers for a range of products including drench, lubricant, bloat oil, teat spray, vaccine blister/pillow packs, and medication shipment.

In particular, all farmers mentioned they would like large **reusable fertiliser bag systems** (500kg and 1000kg) to be reinstated. Previous experience with the returnable packaging model for these durable bags has resulted in a strong motivation for farmers to return these fertiliser bags for reuse. As noted, **Ravensdown** has redesigned and re-introduced reusable, multi-trip plastic 500 kg and 1 tonne polypropylene (PP, #5) bags for fertiliser from July 2024 (designed to be reused 5 times), and is moving away from single-use polypropylene bags (Ravensdown, 2024; Ravensdown Customer Service, 2024). Participants were unaware of this system due to the timing of the interviews, which took place a year before the system's launch. The reuse of these fertiliser bags in New Zealand is promising, and demonstrates how manufacturing and packaging design can be used to overcome barriers to reuse while adhering to health and safety legislation. It also suggests that other small bags, such as woven PP animal feed and seed bags, have the potential to be candidates for replacement via similar reuse systems, if the packaging and systems are designed to facilitate their return and refill.

The GPSS product stewardship scheme co-design report anticipated that where large single-use PP fertiliser and feed bags have not been cut open and remain intact, the bags will be repurposed by the scheme, with contractors, and farmers and growers using the bags to collect and transport other plastic waste streams off farms, such as bale wrap and small bags (Farm Plastics Project, 2022). The GPSS could also explore the potential for a returnable packaging system for these bags. This is particularly relevant given that currently, most large sacks are exported to Asia for recycling (Farm Plastics Project, 2022).

Farmers also identified several other examples of products they felt had potential for reuse, with the caveat that the manufacturer or supplier should drive the initiative to solve the current barriers, such as containers for medications, drench, oil, lubricant, and syringes. In relation to **syringes**, farmers noted the significant amount of single-use, disposal plastic syringes used in farming. Reusable, sterilisable syringes are available in New Zealand, typically advertised for use with drenches and other oral applications (Shoof International, 2024). One participant, experienced in veterinary practices, shared examples of clinics using autoclaving to sterilise certain items like orthopedic kits, surgical pin bags, kidney dishes, and syringes. This approach enabled products to be reused in procedures that did not require complete sterility. However, despite cost savings and waste reduction, the clinics discontinued the practice due to concerns like plastic warping.

Meanwhile, **bulk deliveries of agricultural products may be best suited to large farmers who are purchasing large quantities,** as is the case with **Ballance's Agri-Nutrient's** regional silo-system for fertiliser and Dunstan's returnable keg system for equine feed. However, we heard that for new bulk delivery models, consideration will need to be given to ensure the product remains in good quality over time and during storage, and to be careful about the risk of bulk-delivery resulting in surplus in the off-seasons (and potential product waste and financial losses for the farmer). Several farmers mentioned their willingness to purchase small quantities of bulk feed like calf meal and milk powder (milk powder is sometimes delivered in single-use packaging to farmers), if they were provided with a small silo or returnable containers to protect the product during storage from spoilage and rodents. Several participants emphasised that producers/ suppliers should drive such systems as part of their own waste minimisation and sustainability efforts.

5.5 Opportunity to collaborate locally to coordinate reuse efforts

Several participants specifically highlighted the opportunity to **collaborate on a local level** to coordinate bulk deliveries of products or pick-ups/ collections of used packaging and to explore new target sectors and container types that could be reused, such as reusable containers or packaging for products used by lifestyle blocks. Focussing on products and parts of the sector where there are fewer barriers, and where coordination is possible, will be important when designing new systems. The importance of collaborating locally is demonstrated by **Dunstan Nutrition's** reusable keg system for equine feed. Dunstan Nutrition attributes the success of the reuse initiative to customers being located closely and conveniently to each other in the Waikato. This geographical concentration streamlines delivery and pick ups operations, allowing for efficient drop-offs and collections in a specific area.

Veterinary clinics and other major suppliers were seen as potential local distribution sources for many animal health products that could come in reusable containers, or which could be sold at store via refill by bulk dispenser systems. For example, one farmer who had established a relationship with their local vet to refill animal hygiene products also listed many other products that they would like to buy in this way. They thought this would be a valuable service for veterinarians and manufacturers to offer on a larger scale, and an opportunity worth exploring.

Several participants thought that there could be a greater opportunity to introduce or trial new reusable packaging systems for products intended for smaller **lifestyle block owners**, who may be better suited for returnable packaging models than large farms, given they typically manage less stock and may have more flexibility to make purchases without financial incentives. However, some participants mentioned that reuse systems on lifestyle blocks would capture a comparatively insignificant portion of packaging. In any case, **suggestions for reuse opportunities for lifestyle block owners, which involve suppliers**, included:

- allowing lifestyle block owners to bring their own containers to suppliers, such as veterinary clinics or Farmlands for refills (e.g, with animal feed), especially given many lifestyle farmers are located closer to rural suppliers than remote farmers;
- installing durable receptacles that can remain on lifestyle blocks permanently, to be refilled on-site by suppliers through bulk deliveries of unpackaged product; and
- suppliers targeting areas with high concentrations of lifestyle block farmers, to design and implement tailored and efficient reuse models.

Farmers saw an opportunity for bulk deliveries or pick-ups of common products to be localised and collaborative. Farmers suggested that bulk deliveries and collections of common products and packaging could be coordinated around key time points. Notable suggestions included:

- **veterinarians** coordinating trips to visit many farm dogs in one day in a specific area with dropping off bulk products simultaneously, like dog biscuits; and

- **local suppliers** (e.g, PGG Wrightsons, Farmlands) delivering bulk product to farmers like disinfectants around key time points (e.g, lambing and calving).

"Vet clinics have shelves full of multiple different products, but they're often stacked four or five back. Could they get sent hundred litre drums of a drench or a Ketol[18] product for metabolic problems and farmers could come and refill?"

We also heard that **existing product stewardship schemes' collection routes are being harnessed to deliver cost-savings and effectively offer free reusable packaging collection/return to farmers**. One producer/supplier providing product in returnable packaging to farmers recounted their arrangement with the product stewardship schemes, whereby the product stewardship scheme collects reusable products off farms and returns them to the producer. The packaging is washed and sterilised by a third-party, and then refilled and redistributed by the producer/supplier. Reportedly, this system has reduced costs and enabled the producer/supplier to overcome the challenges of collecting and transporting packaging from remote farms across the country. Coordinated, collaborative efforts like this could be expanded across the Waikato and, across the country, to overcome management and logistics barriers.

5.6 Opportunity to incorporate reuse into product stewardship schemes and the GPSS

The two long-standing product stewardship schemes within the agriculture sector are now being partnered under one scheme (the GPSS) that is now accredited under the Waste Minimisation Act, and eligible for regulation. As discussed in the following section, building a greater focus on reuse within the GPSS presents a critical opportunity as it will help to:

- overcome some of the the logistical/management challenges for reuse; and
- provide a mechanism to better distribute the costs of managing reusable packaging systems.

Overall, incorporating and increasing services for reusable packaging within the GPSS operations would incentivise and facilitate producers offering reusable packaging options and allow the creation of efficient operational and financial models for reuse. This could in turn help to set industry direction for effective waste minimisation, while providing practical avenues for farmer participation in reuse. A greater focus on reuse within product stewardship schemes would also **align with the gazetted guidelines for priority product stewardship schemes, which encourage schemes to prioritise circular management further up the waste hierarchy, including reuse.**

"The priority packaging scheme... doesn't specifically require reusable packaging, unfortunately it almost discourages it. That scheme is quite focused on recycling, unfortunately. [Product stewardship schemes] are supposed to be focused on sustainability-related visions and ambitions [but they are]... kind of pushing for solutions that are quite low down the waste hierarchy, which is a lost opportunity, I think."

5.6.1 Opportunity to overcome logistical/management challenges

The existing logistical service and networks within the GPSS could be utilised to support the reverse logistics needed for returnable packaging systems, in particular, to provide collections of reusable agricultural packaging for businesses/suppliers. This kind of practical, logistical support would help to distribute the responsibility and the costs of setting up and running these systems, fairly and efficiently (discussed further below), and would provide farmers with options to further reduce their waste and 3B practices on-farms by participating in reuse systems.

18 An energy supplement used in agriculture for cattle and sheep with added minerals.

The support the schemes already provide for existing reusable packaging systems (albeit a small proportion of their overall operations), in terms of providing collections services for reusable packaging on farms, demonstrates the appropriateness of the schemes as a vehicle for facilitating reuse systems, and the availability of existing reverse logistics networks (e.g, on-farm collection, transportation and take-back services) that can continue to be leveraged for reusable agricultural packaging. Some of the farmers we spoke to expressed a specific desire for product stewardship schemes to prioritise more return-for-reuse options.

To help to overcome freight, management and logistics challenges, **existing collection sites could facilitate more reusable packaging systems and collections from remote farms**. For example, the existing Agrecovery product stewardship scheme has established over 160 collection sites nationwide, located primarily at agrichemical container and drum distributor sites such as Farmlands, Farm Source and PGG Wrightson retail stores (Agrecovery, n.d, b). At each collection site, farmers can drop-off their agrichemical containers and drums to a dedicated cage or container that is emptied periodically. These existing sites could equally act as a collection point for reusable packaging returns prior to reconditioning/preparing the packaging for reuse.

Existing transportation routes could also be leveraged. As part of the co-design process for the GPSS, Agrecovery modelled the transport costs for a local transport entity to collect farm plastics across a region to be $2.50 per km (covering collection, contractors operating cost and overheads). They estimated that around 200 remote farms per region will require a farm visit to collect their plastics, at an average km per farm collection of 250 km (round trip), because they are further than 25-35 km from a local drop-off point (Farm Plastics Project, 2022). Given the GPSS scheme will have a nationwide farm plastics packaging collection network in place that includes remote farmers, these existing farm site collections could also be an avenue to provide farmers with collections and drop-offs for agricultural products in reusable packaging. This would enable more farmers to participate in reuse schemes and more producers to establish and sustain reusable packaging offerings for their products.

5.6.2 Opportunity to better distribute the costs of managing reusable packaging systems

Incorporating reuse into the GPSS would also offer the **opportunity to develop more appropriate financial models for reusable packaging systems that distribute the costs more fairly across the supply chain**. This would help to address the cost barriers to participation cited by farmer interviewees, and producers/suppliers operating niche reusable packaging systems already. As the product stewardship framework has established a cost recovery model for recycling (see Box 1), a similar approach could be taken for reuse. Such an exercise would also assist in evaluating the financial implications of reconditioning agricultural packaging for reuse compared to recycling packaging into new products.

Our interviews demonstrated that **a multi-faceted debate surrounds who should bear the costs of implementing, establishing and operating reuse systems** for packaging within the agricultural sector. We heard that farmers may be more receptive to reusable packaging if they perceive that the added cost is absorbed by the manufacturer or integrated into the purchase price rather than directly affecting them (e.g, as is the case in the Agrecovery model), although farmers were divided on whether manufacturers should be responsible for shouldering this social responsibility (even if it entails higher costs).

In any case, all farmers expressed a preference for reuse schemes to have free return (e.g, to their local farm store). This is happening in practice; many successful reuse systems in this study that remove packaging altogether are providing reverse logistics services to their customers for free (e.g, **Ecolab**'s returnable drums and **Dunstan Nutrition**'s kegs). Generally, to make it easier on farmers to adopt sustainability initiatives, participants considered the costs for recycling and reuse schemes need to be either:

- covered by the manufacturer or service provider (as described by several reuse providers); or
- integrated into packaging prices (possible when participation in a scheme is mandated), with some advocating for manufacturers to shoulder responsibility to change their packaging systems.

Ensuring transparency and clarity regarding costs and the expectations around who should cover them requires stakeholder input and discussion. As such, the product stewardship scheme may be best placed to hold this conversation and arrive at an appropriate resolution. Ultimately, the same reasons that drove the need to declare farm plastics and agrichemical containers as priority products to enable a regulated scheme (e.g, a need to distribute the costs of packaging recovery fairly across the supply chain and to do so while avoiding the free rider problem) also apply to reuse systems, which currently rely too much on voluntary participation or on certain parts of the supply chain carrying an unfair proportion of the overall cost burden.

6 RECOMMENDED ACTIONS TO INCREASE THE UPTAKE OF REUSABLE PACKAGING SYSTEMS

Based on the barriers and opportunities interviewees shared, the following recommended actions could help to scale reusable packaging systems in Waikato's animal-based agricultural sector.

6.1 Councils could facilitate collaborative efforts to implement reusable packaging initiatives for key agricultural products

Waikato Regional Council (WRC) and territorial authorities (TAs) could play a key role in facilitating collaborative efforts to implement additional reusable packaging initiatives for one or more key agricultural products in the region. Based on interviewees' insights, a coordinated approach led by institutions such as council would accelerate the development and rollout of these initiatives.

This would bring together stakeholders across the supply chain, providing an opportunity to prevent farmers burning, burying and bulk storing waste on farms (3Bs), grow the presence of reuse in the agricultural sector, and troubleshoot barriers through the active implementation of a system.

This initiative would align with:

- local government's broader responsibilities for waste prevention and waste minimisation; and
- the current focus of the Waste Minimisation Fund (WMF), which prioritises funding infrastructure to divert priority materials, including farm plastics, from landfill, through improved sorting, separation, resource recovery or processing (MfE, 2024).

TAs could consider submitting a joint application to the WMF or providing seed funding to kickstart these efforts.

Effective leadership and coordinated action are needed from WRC, TAs, industry stakeholders, and producers/suppliers to ease the burden on farmers. This research highlighted the limited time available to farmers and the cognitive load associated with managing operations. These factors must be considered when developing and implementing new reuse systems.

Given the diversity of products and packaging types in agriculture, collaboration should also extend to the broader animal agriculture sector—including farmers, producers/suppliers, packaging logistics providers, manufacturers, and industry representatives— to identify and prioritise key single-use items for reuse (a 'prioritisation list'). Working with existing logistics networks, such as product stewardship return/collection systems, could enhance efficiency and reduce freight costs. Additionally, refilling systems must be safe and comply with relevant standards (e.g., food safety, health and safety, PR3). Some products and packaging types may be more suitable for a reusable packaging system trial than others—see **Box 2** for key considerations in this process.

While the decision on which products, packaging, and sectors to prioritise for reuse systems rests with TAs and stakeholders, our research has identified **several promising opportunities for reuse initiatives**[19]:

1. **Large returnable bags**: There is strong interest in reinstating return systems for large (500kg–1000kg) reusable fertiliser bags. With a new system in place as of July 2024 that adheres to health and safety regulations (Ravensdown, 2024), there is potential to trial similar systems for other products like seed and feed. This could be an opportunity to replace the need for small seed and feed woven polypropylene bags (10kg - 25kg), most of which are difficult or impossible to recycle in New Zealand (Farm Plastics Project, 2022). If pursued, packaging design should adhere to circular principles like end-of-life recyclability.

19 These are based on successful existing reuse models, key waste streams in the Waikato, and suggestions and themes from participants about how to address key agricultural waste streams.

2. **In-store refill by bulk dispenser options**: Veterinary clinics and producers/suppliers could collaborate with farmers to identify commonly used products where local farmers have an interest in refilling, to design in-store returnable packaging models and/or refill by bulk dispenser systems, whereby farmers and lifestyle block owners can bring their own containers for refill to retail stores (e.g, similar to other refill models for domestic grocery goods, like Bin Inn). We heard that farmers would like products provided in this way for a range of products like dog food, calf meal, milk powder, lubricant, and animal hygiene products.

3. **Targeting a particular area with high-concentrations of lifestyle block owners**. We heard that lifestyle block owners may be more ready to adapt and innovate, and that the smaller quantities purchased may be more manageable for new reuse systems. A collaborative reuse initiative could therefore work with producers/suppliers and lifestyle farmers in a particular area to arrange bulk delivery of a commonly used agricultural product to farms, such as arranging to leave a permanent, durable receptacle on lifestyle blocks for suppliers to fill with product delivered in unpackaged bulk quantities; or

4. **Targeting Waikato's dairy sector**: Waikato's dairy farms, which generate significant packaging waste (fertiliser and animal feed bags, silage wrap), present an opportunity to introduce returnable packaging systems or bulk delivery models to design out waste. Unpackaged bulk delivery systems have significant waste reduction potential, as well as cost-savings, both for small containers and large bulk deliveries (e.g, delivering product to farms in trucks). For large-scale farmers, consider working in with producers/suppliers of existing, successful reuse systems, like Ballance Agri-Nutrient's bulk silos and Dunstan Nutrition's returnable kegs for feed, to identify opportunities for expansion throughout the Waikato and/or to provide similar models for other commonly used agricultural products and key waste streams.

Opportunities 1, 3 and 4 above could involve **leveraging existing reverse logistics and collection routes** to maximise efficiencies and reduce costs, time and freight. In particular, if pursuing returnable packaging models such as drums, containers, or returnable fertiliser bags, consider collaborating with existing product stewardship scheme collection/returns to deliver cost-savings and effectively offer reusable packaging collections/returns to farmers in remote areas. **Likewise, consider coordinating veterinary trips to rural, remote areas with collections/drop-offs, and collaborating with local suppliers** to deliver bulk products to farmers in a particular area around key time points (e.g, disinfectants around lambing and calving season).

Once specific products are targeted and reuse initiatives formulated, the **initiative(s) should be supported by**:

- **monitoring and evaluation** (e.g, to track and measure return rates and participation, along with reductions in waste and other associated environmental benefits);
- **lifecycle analysis** of the initiative to generate advice on the ongoing optimisation of the reuse system design in order to maximise the system's positive environmental and economic outcomes over time;
- **financial comparisons** of the reuse trials versus the status quo (recycling) to assess cost-effectiveness (e.g., a cost comparison between recycled drums with reconditioned, reused and refilled drums), and support ongoing improvements for economic efficiency; and
- **a communications and engagement campaign** led by industry or WRC, to elevate the narrative around reuse to encourage its wider adoption, similar to the historic support that these sectors have provided for recycling initiatives in New Zealand. The campaign could also raise awareness for the distinction and benefits of 'reuse' compared to lower tiers of the waste hierarchy like recycling, and about existing reusable packaging options available for farmers and agribusinesses.

Overall, successful, scalable reusable packaging initiatives will help farmers and the broader agricultural sector to see proof of efficacy, accelerate waste reduction on farms, and foster increased uptake and confidence in reuse models. These initiatives would be critical to getting reuse off the ground in agriculture, overcoming the uncertainties around the costs of reuse systems, and encouraging wider participation from farmers and producers/suppliers.

Dunstan Nutrition's keg system.
Image supplied by Dunstan Nutrition.

BOX 2

QUESTIONS TO CONSIDER WHEN DEVELOPING REUSABLE PACKAGING SYSTEMS IN THE AGRICULTURAL SECTOR

- **What is the target sector(s)?** (e.g, dairy, sheep, beef, equine, etc.)
- **What is the target product(s)?** Identifying the target product(s) is necessary to ensure that producer and suppliers are involved in the system at the outset. Given producers and suppliers choose the packaging for their products, reusable packaging systems need buy-in and support from them.
- **What is the target packaging to displace and why?** Prioritise designing reuse systems that replace problematic waste streams (e.g, replacing woven PP bags with returnable packaging systems) or that may be easiest to implement.
- **What type of farmers are the focus of the system?** Consider whether the target is large-scale farmers or lifestyle block owners in a particular area, and what products these farmers have an interest in for using reusable/refillable options.
- **Can the project harness existing systems and reverse logistics?** To increase efficiencies and reduce freight costs, consider collaborating with existing logistics networks, such as product stewardship scheme return/collection logistics and/or with suppliers and veterinary visits to farms to deliver remote farmers with bulk supplies and collect used returnable packaging.
- **What existing standards and regulations need to be taken into account for this product/packaging system?** Including health and safety, hazardous product management and existing reusable packaging standards.
- **Does a system like this already exist in the region?** If so, consider collaborating to increase scale and impact, however, if the systems are already highly established and impactful, then consider focussing on a different target product/packaging.
- **What type of reuse model would be most suitable for the farmer and for the product?** E.g, refill by bulk dispenser/bulk deliveries for large farmers, or returnable packaging systems for repeat purchase items. Ensure health and safety requirements and product quality needs are met for the particular model.
- **How will participation and high return rates be ensured?** Consider designing the reuse systems to be as convenient and efficient as possible for farmers to participate in, and incorporating economic incentives into the scheme to facilitate return, such as refundable deposits or credit. Consider whether relevant agricultural industries and companies could come to the table and help to incentivise farmers to participate (e.g, through economic incentives).

- **What design elements will ensure packaging/ containers are suitable for reuse, and that the product is delivered safely and in adherence with relevant regulations?** Producers/suppliers, manufacturers, and farmers could collaborate with industrial design and other packaging design experts to troubleshoot/identify and resolve any potential challenges such as contamination concerns. Align packaging design with PR3 standards to ensure that packaging is designed for factors including increased durability and lifespan (PR3 2022 - 2024).
- **How will the system costs be managed?** Consider whether costs will be covered by the manufacturer or service provider, or whether costs will be integrated into packaging prices. Consider ways to provide farmers with free returns. Consider holding these conversations in partnership with the scheme manager for the GPSS.
- **How will the system be communicated?** Consider developing a supporting communications and engagement throughout the trial.
- **How will success be measured and achieved over time?** Ensure that monitoring and evaluation is built into any reuse trials to track and measure return rates, participation, waste reduction, and any other associated environmental benefits, and to enable ongoing improvement over time (in the outset, reusable packaging systems may underperform, but will improve over time if effective and responsive monitoring and evaluation is built into the system).

6.2 Sector-led leadership and support for reusable packaging

Recycling initiatives in the agricultural sector have benefited from long-standing and continued reliance on clear and vocal messaging from large industries. These entities could be substantial contributors to the wider uptake of reusable packaging by backing and demonstrating their support for reuse. Direct, sector-led support for reuse could help to level the playing field between reusable packaging and single-use alternatives, and reward organisations that prioritise sustainable practices and are driving agricultural activity up the waste hierarchy.

The appropriate sector-led support provided should be determined with stakeholders in the agricultural sector, including producers/suppliers, farmers, and early adopters of reusable packaging systems.

Sector support could include:

- **Raising and allocating funding for reuse and investing in infrastructure:** Investing to fill key infrastructural gaps to provide collection, sanitisation and decontamination services (including in the South Island) will enable reuse systems to grow in the agricultural sector For example, while not directly related to the Waikato, we heard that if reconditioning/cleaning services and infrastructure were available in the South Island, reusable containers collected in the South Island could be cleaned and reused in practice rather than exported for recycling, as is the case currently. Industry representatives could explore the potential of coordinating and taking on the administrative burden of applying for funding for reuse projects and the critical reuse infrastructure and systems/logistics needed to provide, sustain and scale agricultural reuse systems, both in the Waikato and nationally.
- **Sector sustainability strategies, actions plans and work programmes for reuse:** Currently, there is an absence of specific goals or targets relating to reuse systems for packaging within sector sustainability strategies and action plans. Industry bodies could take the lead by establishing reusable packaging strategies for the sector, with specific, time-bound targets and economic incentives for supporting and increasing the uptake of reusable packaging, as well as reusable packaging programmes of work.
- **Sector promotion of early adopters:** This study has identified several successful case studies of reusable packaging initiatives operating in the Waikato that are actively designing out single-use packaging waste on farms. Many of these initiatives do not actively market the reuse component of their business, and/or are unaware of parallel reusable initiatives that are running concurrently. Sector representatives and industry bodies could recognise and promote early adopters of reuse systems within the agricultural community. This would also help to create a greater awareness of what reusable packaging is and options for participation.
- **Economic incentives for reuse:** designed by industries, suppliers and companies across agricultural sectors to incentivise farmer participation (e.g, sheep and beef, deer, poultry, etc), similar to Fonterra's Co-Operative Difference economic incentive for farmers.
- **Collaborating and providing logistics solutions:** Industry bodies can work alongside councils to facilitate collaboration with actors across the sector to provide solutions for reusable packaging system logistics and freight challenges, such as coordinating bulk deliveries and take-back services into rural areas.
- **Suppliers' involvement in ideation along the supply chain:** It is crucial for agribusinesses to work collaboratively with suppliers early in the process when ideating and implementing reusable packaging systems. By building strong partnerships with suppliers, agribusinesses can better plan and manage reverse logistics, such as the return of reusable packaging, and ensure that the system operates smoothly and efficiently.

6.3 WRC and TAs could establish funding streams and work programmes to incentivise reusable packaging systems in agriculture

In Reuse Aotearoa's recent research and report on the potential role for Waikato's TAs and resource recovery sector in supporting reverse logistics for reusable packaging (Blumhardt, 2024), some TA waste officers emphasised that given the centrality of agriculture to the region's economy, farm plastics, such as silage wrap or other agricultural product containers, are relevant opportunities for reuse systems for their districts. In addition, Reuse Aotearoa has previously researched key actions councils can take to support both B2C and B2B reusable packaging systems. Many of these actions are relevant for the Waikato more generally (Reuse Aotearoa, 2022, see section 3.1).

Four specific actions WRC and the region's TAs could take in relation to addressing the barriers and opportunities outlined in this report to increase agricultural reusable packaging in the Waikato include:

1. **Develop funding streams and/or waste minimisation grants specifically for reusable packaging projects and trials in agriculture.** WRC and/or several TAs could establish waste minimisation grants, or pooling for a joint grant, that is targeted to incentivise the agricultural sector to trial and implement reusable packaging systems on farms to reduce waste (as described in recommendation 6.1). This type of support – providing funding and direction – is critical to getting reuse off the ground and enabling sector innovation.
2. **Include specific actions in TA WMMPs**, separate to waste diversion strategies, that prioritise increasing reusable packaging systems in agriculture.
3. **Work with the Green-farms Product Stewardship Scheme (GPSS)** to identify and increase collections and take-back services for reusable packaging in the Waikato.
4. **Work with other councils** regionally and nationally to take a consistent approach to reusable packaging in agriculture.

6.4 The GPSS could increase reusable packaging collections and take-back services for Waikato farms

Some farm plastic waste streams targeted for collection through the Green-Farms Product Stewardship Scheme (GPSS) currently lack circular onshore waste management options. For example, even if collected for recycling, 90% of the small seed and feed bags are difficult or impossible to recycle, and large sacks are typically exported to Asia. Due to limited onshore recycling capacity for farm plastics, large volumes have been, and will continue to be, shipped offshore for recycling (Farm Plastics Project, 2022).

Plasback has demonstrated the potential for reusable packaging systems by providing reverse logistics support for Ecolab—collecting reusable drums and containers from farms for cleaning and refilling by a producer/supplier. This initiative shows the GPSS could play a crucial role in facilitating reusable packaging systems, to act as a packaging logistics operator for reuse systems, as well as recycling. The GPSS could leverage existing nationwide infrastructure and reverse logistics networks (e.g., on-farm collections, drop-off points, transportation and take-back services), which would help increase the availability and viability of reusable agricultural packaging.

Integrating reuse outcomes into the GPSS, in line with the Government's gazetted product stewardship guidelines, would enable the scheme to increase its focus on reusable packaging reverse logistics, both in Waikato and nationally. It would also help develop an effective cost recovery model for these systems. Setting time-bound targets for increasing the use and collection of reusable packaging could be considered, as this would incentivise producers and suppliers to offer more reusable options, accelerating the uptake of reuse systems for on-farm products, especially given the wide reach of product stewardship schemes in rural areas. Ongoing monitoring by the Ministry for the Environment

would be needed to ensure compliance with the gazetted guidelines, once in progress. The GPSS could work with producers and suppliers to align reusable packaging systems with the PR3 Standards for Reusable Packaging (PR3, 2022–2024).[20]

Consideration of how reusable packaging can be integrated into existing product stewardship schemes will need to be worked through, such as responsibilities, costs, packaging types, and freight needs (as reusable packaging tends to be bulkier). Stakeholder discussions will be required to determine how costs are distributed within agricultural reuse collection collection models, to apply existing product stewardship scheme cost recovery models to accommodate reusable packaging. Over time, the scheme could be iterated to incorporate financial mechanisms to raise and divert resourcing towards developing and implementing reusable alternatives to single-use farm plastics (e.g. scheme fees earmarked for reuse R&D).

Additionally, because existing product stewardship schemes bring together stakeholders from across agricultural product supply chains, they have the potential to serve as collaborative platforms to advance reusable packaging opportunities, such as:

- **knowledge-sharing and problem solving** to enable the wider sector to discuss challenges and opportunities, share best practices, and problem solve to address barriers to increasing reusable packaging in the agricultural sector; and
- **joint funding applications:** the scheme could support applications for joint funding for reuse projects or critical infrastructure to enable reverse logistics (e.g, washing plants).

20 While the existing PR3 standards provide a solid foundation, they may need to be adapted to better suit agricultural products or address the specific needs of the agricultural industry.

6.5 Develop standard protocols for reusable packaging system management and product design

Concerns about contamination, liability risks, health and safety, and handling reusable packaging in agriculture signal a **need for sector-specific standardised protocols and product design for reusable packaging systems and sanitisation/reconditioning processes.** Establishing these standards would boost industry confidence in reuse systems and understanding about what reuse systems are. Development of these standards could involve collaboration between industry bodies, agricultural product manufacturers, producers/suppliers, end-users (including farmers), the GPSS, and local and central government.

Reusable packaging units must be designed for durability, able to withstand farm conditions, have circular solutions at their end-of-life, and circulate in a system of reuse. Reuse systems should include rigorous sanitisation and washing processes to prevent contamination from chemicals, cross-contamination between products or packaging, or contamination of packaging between farms with soil and plant materials.

The role of the manufacturer in supporting reuse, including redesigning packaging to be reusable, was discussed in many interviews. **Manufacturers are seen as key in exploring and providing reusable packaging options,** particularly for bulk-dispenser systems, and addressing concerns raised by many producers/suppliers, packaging logistics providers and farmers about cross-contamination and potential liability risks. Manufacturers may need to collaborate with farmers to pinpoint and resolve potential product design challenges for reusable packaging (particularly for bulk-dispenser silo models), and to address concerns raised by many producers/suppliers, packaging logistics providers, and farmers around managing cross-contamination and potential liability risks.

Transitioning to reusable packaging may require redesigning some packaging for greater durability and increased lifespan, as most agricultural packaging is designed for single-use. In some cases, manufacturers

could work with suppliers of existing reusable packaging to extend the lifecycle of packaging like reusable plastic drums (currently recycled after 8 uses), IBC bladders (recycled after five years), or bulk fertiliser bags (designed for 5 trips), while ensuring compliance with relevant regulations. At the end of their lifecycle, reusable packaging should also be recyclable.

Existing and new returnable packaging systems must be designed to maximise return rates, which is critical to a system's economic and environmental performance. The draft international PR3 draft standards for Reusable Packaging Systems sets baselines for collection points and return incentives, recommending that collection points should provide return incentives awarded to the person that returns the packaging (e.g., refundable deposits, discounts, and subscription/penalties) to incentivise returns.[21] In general, it is advised that the deposit or reward value should be optimised to achieve a 90% or higher return rate (PR3, 2021, 2024).

Sector-specific reuse standards for agriculture could be developed with consideration of existing guidelines, including:

- **draft PR3 standards** for reusable packaging system design such as guidelines for container design, reverse logistics, labelling, and return incentives (e.g, PR3, 2022; PR3, 2023a; PR3, 2023b; PR3, 2023c; PR3, 2024);
- **WasteMINZ's guidelines** outlining the factors that should be adhered to in order to qualify packaging as reusable (e.g., set number of reuse cycles and optimal return rates) (WasteMINZ, n.d.);
- **European Commission's revision of the Packaging and Packaging Waste Regulation (PPWR),** such as the definitions and targets for reusable packaging (European Parliament, 2024); and
- **other relevant standards** such as New Zealand's health and safety regulations (Worksafe, 2015) and food safety legislation (MPI, 2023), to ensure reusable packaging product design and associated systems for washing and preparing for reuse are safe and adhere to regulations.

21 PR3's Reusable Packaging System Design Standards provide shared design and performance requirements for reuse infrastructure and operations, to increase the financial and environmental performance of reuse systems.

7 CONCLUSION

This study explored the state of play, barriers and key opportunities for increasing reusable packaging in Waikato's agricultural sector. We undertook a desktop study and interviews with 18 representatives of the farming community in the Waikato, producers/suppliers of agricultural products, industry representatives, and those involved in packaging logistics and processing.

To date, recycling and product stewardship schemes have arisen as waste management options for single-use packaging of agricultural products. However, deeply ingrained practices like on-farm burning, burying and bulk storage remain prevalent in farms across the Waikato. Moving away from single-use packaging and toward reusable packaging systems would help to move the Waikato toward a circular economy.

In general, interviewees support increased uptake of reusable packaging, identifying multiple benefits, particularly environmental sustainability. Most farmers are already incorporating reuse on their farms, and most participants provided suggestions for situations where agricultural single-use packaging could be replaced with reusables. Several successful reusable packaging systems operating in the Waikato were highlighted, alongside third-party packaging providers and processors that offer some systems with critical logistical support, including collections and reconditioning/washing services. However, most systems operate in a niche capacity.

Despite positive attitudes towards reusable packaging systems, barriers to establishing, sustaining, and scaling the uptake of reuse in the sector remain prevalent, such as costs, management and logistical challenges, concerns about contamination and safety, and a lack of time or awareness about the possibilities. Several key opportunities were highlighted, including leveraging existing reverse logistics and cost distribution frameworks of the GPSS product stewardship scheme, targeting specific agricultural products where there is a recognised desire to introduce reuse systems or where reuse could be most feasible, and collaborating regionally or locally to coordinate reuse efforts.

Looking forward, five recommended actions were highlighted to help to scale reusable packaging systems in Waikato's animal-based agricultural sector:

1. Councils could facilitate collaborative efforts to implement reusable packaging initiatives for key agricultural products.
2. Sector-led leadership and support for reusable packaging.
3. WRC and TAs could establish funding streams and work programmes to incentivise reusable packaging systems in agriculture.
4. The GPSS could increase reusable packaging collections and take-back services for farms in the Waikato.
5. Develop standard protocols for reusable packaging system management and product design.

Overall, there is significant potential for a greater uptake of reusable packaging systems in Waikato's agricultural sector. Every sector needs to play their part for New Zealand to become a low-waste, low-emissions circular economy. Increasing and scaling the uptake of reusable packaging in Waikato's agricultural sector presents an opportunity not only to reduce waste being burnt, buried and stored on farms, but also for paving the way for other sectors and regions nationwide.

APPENDIX 1: SUPPLEMENTARY INFORMATION

Table 5: Animal numbers for Aotearoa New Zealand and the Waikato region in 2022 (source: Stats NZ, Livestock Improvement Corporation Ltd and DairyNZ Ltd 2023).

Species	Aotearoa (# animals)	Waikato (# animals)
Sheep[1]	25,333,562	1,300,242
Poultry (total)[2]	24,962,997	-
Dairy cattle[3]	6,136,041	1,710,763
Poultry (egg)[4]	5,015,600	1,261,961
Beef cattle[5]	3,898,207	544,117
Deer[6]	794,109	45,802
Piglets (weaned)	672,501	91,199
Pigs[7]	275,291	42,181
Goats (dairy)[8]	58,290	44,149
Dairy sheep	43,302	18,053
Horses[9]	33,531	10,945
Goats (meat)	30,138	6,886

1 Includes rams, pregnant and empty hoggets and ewes, and ram, wether and hogget lambs (excludes dairy sheep).
2 Includes broiler chickens, breeding stock chickens, chicken egg layers and replacement pullets, and other poultry such as turkeys and ducks.
3 Stats NZ source includes lactating and dry cows and heifers, replacement heifers, dairy bulls and other calves on farm (excludes those born, but no longer on farm). Industry source reports lactating cows.
4 Includes layers and replacement pullets.
5 Includes all pregnant and empty cows and heifers, calves and 2 year + (heifer, steer and bulls), and breeding bulls.
6 Includes mated and unmated does, does and bucks under a year, breeding bucks.
7 Includes breeding sows, mated gilts and 'all other pigs' (excludes weaned piglets).
8 Potential mismatch between national figures for Stats NZ and industry records. Personal communication with a representative from the Dairy Goat Cooperative suggested approximately 70,000 dairy goats across Aotearoa.
9 Includes race horses.

Table 6: Farm numbers across Aotearoa New Zealand and the Waikato region.

Species	Year	Aotearoa (# farms)	Waikato (# farms)	Source
Sheep & beef[1]	2022	23,382	3,099	Stats NZ, 2022
Dairy cow[2]	2022/2023	10,601	3,020	Livestock Improvement Corporation Ltd and DairyNZ Ltd, 2023.
Horse	2023	1242	345	Stats NZ, 2023b
Deer[3]	2022	750	57	Stats NZ, 2022
Poultry (total)[4]	2022	447	108	Stats NZ, 2022
Pigs	2023	93	9	Stats NZ, 2023
Goats[5] (dairy)[6]	2017	92	-	Scholtens et al., 2017
Dairy sheep	2019	18	–	MPI - Massey University, 2020

1 Includes grain farms.

2 Figures from Stats NZ (15,321 farms; 2022) differ from industry reported (10,601 farms; 2022/2023) figures. Stats NZ value likely includes farms providing services to dairy (e.g., heifer rearing). Presented value from industry in the table, as this is based on actual supplier numbers.

3 Figures from Stats NZ (750 farms; 2022) differ from industry reported (1400 farms; 2020) figures (Deer Industry New Zealand, n.d). The more recent value is presented in the table.

4 Includes egg production and broilers.

5 No confirmed farm numbers for meat and fibre goats available.

6 Published farm numbers from 2017 (Scholtens et al., 2017); personal communication in 2024 with a representative from the Dairy Goat Cooperative suggested 68-70 farms across Aotearoa; Waikato numbers were not confirmed at the time of this report. The published value is presented in the table.

APPENDIX 2: GLOSSARY

Reusable packaging
Reusable packaging is durable, sturdy packaging that is refilled multiple times (in its existing form) with the same type of purchased product for which it was originally designed, or for the same purpose, in a system of reuse.

Returnable packaging model
Empty packaging is designed to be returned by the customer/final user of the product, to be sanitised and refilled with the same product or product type (e.g, glass bottle swap systems or kegs for beverages).

Refill by bulk dispenser model
The product is sold loose with the intention that the customer either fills their own reusable containers or they purchase/use a supplied empty container (e.g, bulk food bins at grocery stores).

Reusable transport packaging
Where the outer layers of packaging ('secondary' and 'tertiary' packaging) used to contain or protect a product when it moves through the supply chain (e.g, from producer to warehouse to retail store) are reusable, such as reusable produce crates or pallets.

Repurposing
Repurposing is the practice of retaining an item and using it for a different purpose after it has served its original function, such as an empty molasses bucket being repurposed to carry milk for calves.

Recycling
Recycling is the process of reprocessing used materials or products to produce new materials or products, with the aim of maintaining or improving their value.

Product stewardship
Product stewardship (also referred to as Extended Producer Responsibility) is where producers or manufacturers, brand owners, importers, retailers, consumers and other parties accept responsibility for the environmental impact of their products throughout their entire lifecycle. Producers are typically required to take financial or operational responsibility for the collection, recycling, or disposal of packaging once they are no longer in use, with the aim of reducing waste, improving resource efficiency, and supporting the transition to a circular economy.

The Waste Hierarchy
The waste hierarchy is an internationally recognised framework for establishing the order of preference for different waste prevention, minimisation and management options, demonstrating that source reduction activities such as reuse are preferable to waste management options like recycling.

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