Sustainable is Attainable

South Canterbury & Hawke's Bay

Sustainable is Attainable

A collaborative approach to sustainable waste and by-product management by South Canterbury's food processors and manufacturers

Venture Timaru DISTRICT

CallaghanInnovation
New Zealand's Innovation Agency

UC UNIVERSITY OF CANTERBURY
Te Whare Wānanga o Waitaha
CHRISTCHURCH NEW ZEALAND

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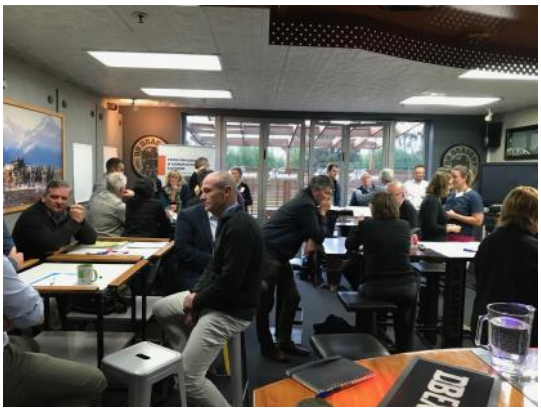
Introduction

The Timaru District and the wider South Canterbury area has a rich, productive primary sector, with more than 5000 people employed in the food processing and manufacturing sector alone. Timaru is home to small family food businesses, national and multi-national companies exporting food and beverages around the world. All of which are committed to working together to improve how they operate, including waste management.



Participants at the inaugural Sustainable is Attainable Hui

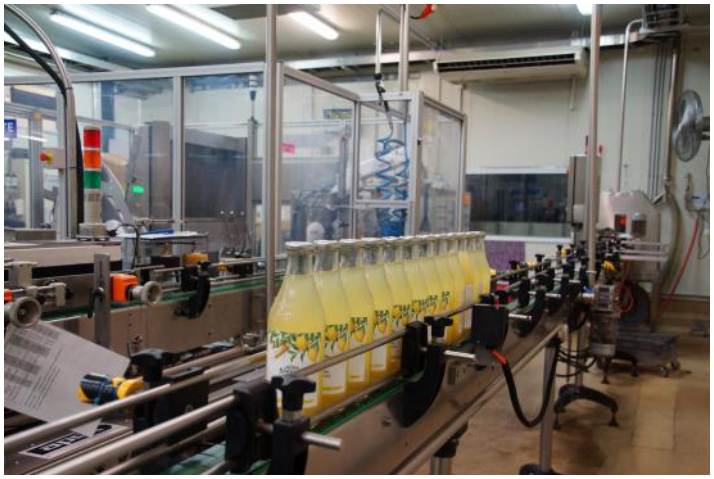
Established in May 2019, Sustainable is Attainable is a project launched by the South Canterbury Food Processors and Manufacturers Business Connection Group, led by Venture Timaru (formerly Aoraki Development) in collaboration with the University of Canterbury.

One of the biggest challenges identified by food and beverage processors and manufacturers is managing their waste streams and by-products. Many of these end up as very low value products or in landfill.

To better understand the problem and help identify possible solutions Sustainable is Attainable secured funding from Callaghan Innovation for three studentships. DB Breweries hosted two students and Barker's of Geraldine hosted one student. They collated and quantified the waste streams and by-products produced by each of the businesses over the 2019/20 summer.

Many of the companies seem to be taking action to minimise their biological and non-biological/ plastic waste. There is some variety between the methods used to deal with similar waste streams across different companies. This is due to a variety of factors including the volume of the waste stream, and the location and size of the business.

The companies have some common waste materials, which can place considerable strain on the region's waste management facilities, particularly the landfill at Redruth. The repurposing and reusing of some of the waste materials produced in the region could be a significant step in the right direction to extend the life of the landfill and to gain more value from these wastes, and moving South Canterbury towards a circular economy.

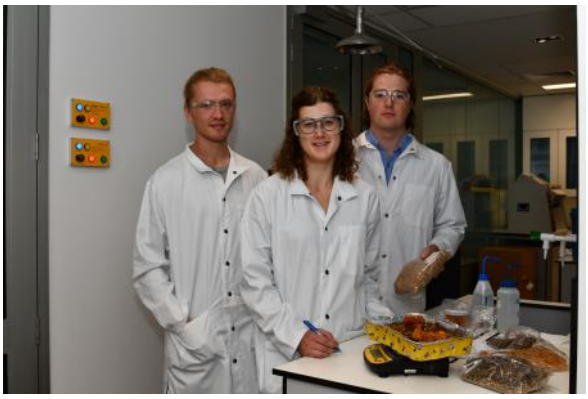


Research overview

Twenty-two businesses in the food processing and manufacturing sector opted to be part of the Sustainable is Attainable research project. The students focused on biological wastes (biowastes) and non–biological wastes.

Each site was visited, and tours were completed, showing the entire production process and highlighting biowastes and by-products and incoming and outgoing packaging at each site. From these tours, floor and process plans were produced for each site.

The students collated data on the average amount of biowaste produced weekly, monthly or yearly (e.g. waste quantities by weight; frequency of bin or skip pickup) and the cost of disposal. For non-biological wastes, each company was sent a list of data required and participated in a face-to-face semi-structured interview.



Greg Hatley, Courtney Wright-Watson, Blair Masters: the students funded by Callaghan Innovation

For the biowastes investigation, three samples of at least 50 grams (dry weight) were taken of each biowaste stream. Once the site visit was completed, samples were promptly frozen to prevent rotting. A number of samples of non-biological wastes were also taken.

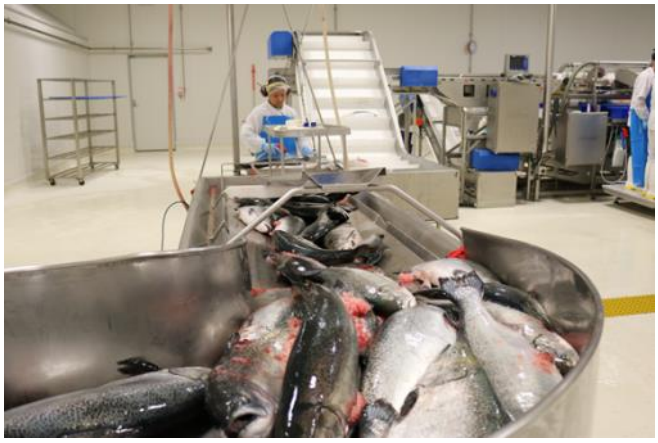
Confidential reports were drafted and summaries shared with the companies, including some specific recommendations for individual companies where applicable.

The researchers are grateful for the openness in which companies shared their information and welcomed the students onto the sites.

Biowastes

The students identified over 35 discrete biowaste streams with a combined total of more than 120,000 tonnes annually.

This included eight streams common across multiple business such as solid food waste, general animal waste, oil and sludge. A minority of the biowaste streams go directly to landfill with the majority being used on farm, on-sold directly to end-users or sold to other organisations who develop new products, including stock feed.

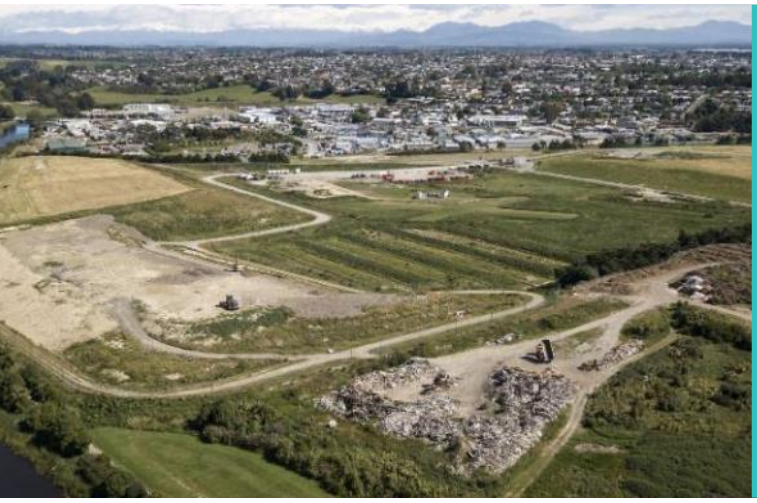


Some smaller businesses use the Timaru District Council three bin (recycling, waste and compost) to dispose of their wastes.

Several businesses produce compost onsite from their biowaste streams. The compost is then either used on-farm or on-sold. The ability of businesses to produce compost on-site is limited by locality, space and resources.

Alternatively, Redruth Resource Recovery Park also has a composting option for organic matter, which is managed and turned until decomposed before being sold. Further research is underway to find ways to increase the value of composting, for example balancing nutrients in the compost by combining and blending multiple different waste streams.

Many of the businesses work with a local company to manage their by-products. The local company typically pays the transport costs involved, and sells the product to farmers as stock food. While this is an efficient option, it may not be the highest value opportunity available to the businesses.



Redruth Resource Recovery Park

Redruth Recovery Park is the site of the Timaru District Council landfill used by the local companies. There is a current focus on reducing waste to landfill by diverting waste streams. Onsite is a large recycling centre for sorting contents of the yellow bins, separating soft and hard plastics, cardboard, paper, glass, polystyrene, aluminium cans and tins, and other items. The valuable objects and materials are either sold through the Crow's Nest or at the Salvation Army. The pyrolysis plant, the first of its kind in New Zealand, was designed and installed on site and is now able to turn waste wood material into charcoal, which can then be bought from Redruth. This reduces the volume of the waste and produces a viable product.

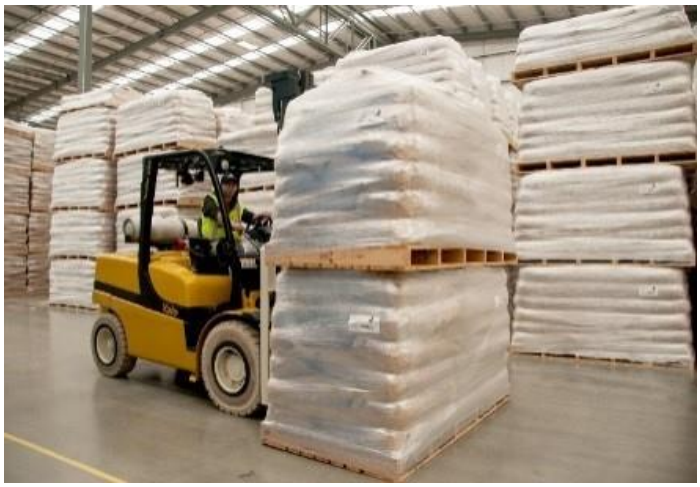
Plastics and PPE

Almost every company identified soft plastics, of varying composition, as problematic. This included both wastes produced onsite, sent to the Redruth facilities, and waste sent offsite to retailers and consumers. Clean soft plastics waste is either bailed onsite or collected and recycled while contaminated soft plastics are sent to landfill.

Some companies are already exploring opportunities for new methods of packaging and processing which will reduce the need for soft plastics and other waste materials.

The difficulties the majority of companies are facing with reducing packaging are food safety requirements and the shelf-life requirements of the customers. All companies said that reducing packaging would affect the shelf life of the product to some extent. Currently, no companies have a successful reusable packaging scheme in place, except for the returnable crate bottle system.

The companies use a range of different packaging suppliers and the composition of their waste streams varies, however there are a lot of common waste materials. All companies that use chemicals from ECOLAB and Diversey have systems in place to return the packaging to be reused.



The packaging most commonly used by these chemical companies are 20L HDPE containers and 200L HDPE drums, which are rinsed after use and then palletised and trucked back. Pallets are used by most companies and are reused and returned to suppliers.

1000L IBC's (intermediate bulk containers for liquid handling) are generally underutilised with many companies giving them to staff or are stockpiled onsite.

A specific problem within the food processing industry is Personal Protective Equipment (PPE) that is necessary to meet food safety requirements. This includes mixed plastic aprons, gumboots, nitrile gloves, hairnets, and sleeves. All companies that export products are required to use these and presently there is no alternative. Some PPE are single use like nitrile gloves and hairnets while others, for example aprons, may last weeks, depending on the application. Finding a solution to deal with waste PPE would significantly reduce the amount of waste sent to landfill by the companies.

Opportunities

It is widely recognised that some of the key obstacles to getting value from waste streams are coordination problems and high transport costs. To overcome these problems at a local level, there may be opportunity for companies to work together to reduce waste or add value to their respective waste streams. Some of the opportunities for collaboration identified in this project involve similar waste streams, while other opportunities create value by combining complementary waste streams.

For non-biological wastes, there may be opportunity for the businesses to share equipment and expertise. For instance, in bailing soft plastics for recycling. This is not done by smaller companies who instead dispose of their plastics to landfill. Another example of this is PET strapping which could be pooled together which may make it worthwhile financially to send it to a company such as Flight Plastics.

The project highlights that, while some businesses in the cluster have very good data and knowledge regarding the amount of waste produced on-site, this high level of knowledge is not universal. This may present an opportunity for the Timaru cluster to share approaches and best practice to monitor waste. With regard to plastics, it may also inform government efforts to improve plastics data collection, as identified in the 2019 Rethinking Plastics in Aotearoa New Zealand report.

Examples of higher value uses of biowastes

Spent brewer's yeast	Food industry applications such as thickeners, fat replacer, dietary fibres; antioxidants
Potato waste	Potato peels into new food products, production of glucose, antioxidants, ethanol
Broll	Masa flour for food products
Expired or rejected product waste	Potential to extract bioactive compounds; fermenting sugars into probiotics
Solid plant biowaste	Potential to extract bioactive compounds; higher value soil conditioners
General animal waste	Pet foods; keratin for industrial, personal care and medical uses
Fish offal and fish meal	Food, medicine, cosmetics, pet food and industrial processes.
UHT	Pet foods
Oil	As a substrate for PHA (bioplastics)
Spent brewer's grain	Bioplastics; bioethanol; feedstock for black solider flies; fat substitute for high-dietary fibre and low-fat meat products
Starch (liquid and semi-dry forms)	Bioplastics, thickener, crockery and serving dishes
Manure	Fertiliser; feed stock for black soldier flies
Animal skins	Protein source for pet foods; recovery of cholesterol; fire-retardant insulation
Fatty acid	As a substrate for PHA (bioplastics)
Whey	Feed supplement; bioplastics

Next steps

The initial work described here has generated a wealth of potential opportunities to explore. The next step is to prioritise these opportunities and establish their feasibility, both from a scientific and commercial perspective, and create a plan of short term and long term projects and improvements.

The researchers and partner institutions want to investigate sustainable opportunities and global best practices associated with prevention and minimisation, value extraction, energy recovery, alternative uses and environmentally friendly disposal methods.

For example, researchers are interested in:

- Blending food grade by-products into baked, puffed or extruded food products
- Exploring the polyphenols and antioxidant potential of the biowaste products for multiple different uses
- Isolating plant proteins for human food products
- Generating edible plastics from biowaste streams
- Using DAF sludge and other protein and carbohydrate-rich waste streams to generate biohydrogen
- Using insects to consume waste
- Blending wastes to generate high value soil conditioners

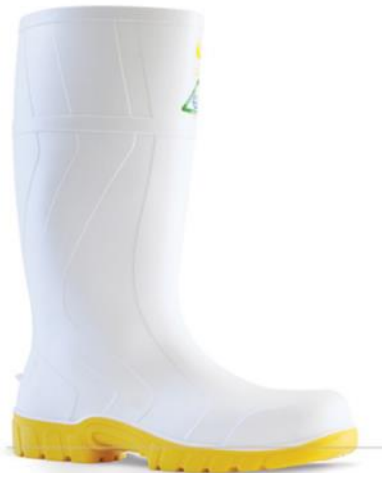
Small-scale pilot projects could initially be seeded through the University of Canterbury or other entities. Following this, it may be possible to apply for further funding from groups such as the Bioresource Processing Alliance (BPA) or Callaghan Innovation to progress the research and development.

Alongside this, researchers propose applying to the Ministry for Primary Industries (MPI) for grant funding for a feasibility study to examine the opportunities and the economic potential of managing the waste streams and by-products differently. This will include evaluating taking a collective approach to manage waste/by-products in a physical exchange of materials, by-products, infrastructure and joint provision of services.

If it weren't for your gumboots

Gumboots have high usage across all of the businesses. Gumboots can last up to nine months in some circumstances, when used by a full-time staff member. In companies that have hundreds of staff the waste gumboot stockpiles are significant and unless a solution is found they will end up in landfill.

Technology exists within a Canterbury gumboot manufacturer (Sanford Industries) to granulate gumboots into rubber which can be used to create gumboots or other equipment out of recycled materials. There may be potential to work with this manufacturer to dispose of gumboot waste in a more environmentally responsible way. Alternatively, the cluster may want to explore the business case for Timaru to have its own granulator which can process used gumboots and produce usable material.



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