What is known about food waste in New Zealand.

This summary of food waste and loss in New Zealand formed part of a submission made by WasteMINZ to the Environment Select Committee. The information below was accurate for October 2018. More up to date research has since been undertaken on household food waste.

When considering food loss and waste it is important to consider all the stages in the supply chain.

There are four key stages in the supply chain for developed nations[1]:

1. Agriculture
2. Food processing and manufacturing
3. Retail
4. Consumption

Consumption can be sub-divided into three different categories:

1. Households
2. Hospitality – Commercial e.g. cafes and restaurants
3. Hospitality – Not for Profit e.g. schools, prisons, hospitals etc

The Food Loss and Waste Accounting and Reporting Standard (or FLW Standard) is a global standard that provides requirements and guidance for quantifying and reporting on the weight of food and/or associated inedible parts removed from the food supply chain—commonly referred to as "food loss and waste" (FLW). Using the standard enables countries, cities, companies, and other entities to develop inventories of how much FLW is generated and where it goes. It was published in 2016.

There are two different ways to measure and report food waste. They are

1. **Inference by calculation.** This involves estimating the amount of FLW based on other data. It might take the form of deducing FLW from other relevant data (e.g., calculating the difference between food inputs and food outputs in a process such as food manufacturing). The amount may also be inferred by using models, which apply factors known to influence the amount of FLW
2. **Measurement.** This is the most direct way to quantify FLW. It involves determining the amount of FLW by using an instrument or device marked in standard units or by comparing the FLW with an object of known amount. The results of measurement are expressed in weight, unit count of items, or volume. Typically, some kind of audit is required. This involves physically sorting through food waste weighing, categorizing, and in some instances estimating its value.

In addition to commissioned research on FLW from governments or independent studies conducted by universities and other institutions data can also found via:

[1] For developing nations post-harvest storage is included as a separate category given the known infrastructure issues.

- **Self-reporting.** This is where organisations or individuals self-report on how much food they have wasted. This may involve completing mini audits or using sales data or may just be a best guess.

- **Observer- reporting.** This is where organisations or individuals report on how much food they have seen others waste.

1.1 Inference by calculation

The Waste Minimisation Act (2008) places responsibility on local government (territorial authorities) to promote effective and efficient waste management and minimisation within their districts. Every six years councils are required to complete waste management and minimisation plans (WMMPs). They must also complete a waste assessment for their district to understand the types and tonnages of waste created.

To date New Zealand does not have a mandatory National Waste Data Framework. This means that councils are not required to report on the waste in their region using standardised formulas and terms and therefore the results of audits by individual councils are not able to be aggregated to provide national waste statistics for food waste in New Zealand.

In 2004 and 2008, the Ministry of the Environment commissioned a series of audits at four landfills to determine the national waste composition. However, these landfills only accounted for 6% of all waste disposed of to landfill. Based on these audits the 2009 Ministry of the Environment Solid Waste Composition Report Card, states that "Organic waste was the largest proportion of waste disposed of to landfills in 2007–2008, representing 28 per cent of the overall waste stream". Of that 17% was estimated to be food waste an increase of 3% compared to 2004. [2]

Waste sent to Class A landfills is levied at $10 a tonne. In the absence of a National Waste Data Framework for collecting and aggregating waste data, revenue from waste levies is used as a proxy for tonnage to landfill.[3] In 2016 levied waste to landfill was 3,400,000 tonnes. Using a revised estimate from 2012 of 16.8%[4] that would mean food waste to levied landfills from all sources would be approximately 571,000 tonnes.

Prior to 2013 the only estimates of supply chain food waste in New Zealand came from an FAO report in 2011.[5] New Zealand was grouped together with Australia and the United States purely for

[2] WasteNot Consulting. (2013) Reviewing the 2008 National Waste Composition Estimate and Producing a 2012 Estimate.
[3] Only 45 of the 426 known, consented waste disposal facilities are levied in New Zealand. The levy is applied only at class 1 facilities that receive household waste.
http://www.mfe.govt.nz/sites/default/files/media/Waste/Review-of-the-effectiveness-of-the-waste-disposal-levy-2017.pdf

[4] WasteNot Consulting. (2013) Reviewing the 2008 National Waste Composition Estimate and Producing a 2012 Estimate.
[5] FAO. (2011). Global food losses and food waste – Extent, causes and prevention.

geographic and cultural reasons as there was no existing New Zealand data. The report estimated that total food waste in North America was 300 kg/year/ per capita and that food wasted by consumers in North America was 115 kg/year. This would give for New Zealand a total of 1,315,200 tonnes total food waste and 504,160 tonnes household food waste per annum.

The report then went on to make estimates for 7 commodity groups. The figures were based on North American datasets, results from the literature on global food waste and assumptions from the report's authors the Swedish Institute for Food and Biotechnology (p.3).

Figure 2. Per capita food losses and waste, at consumption and pre-consumptions stages, in different regions

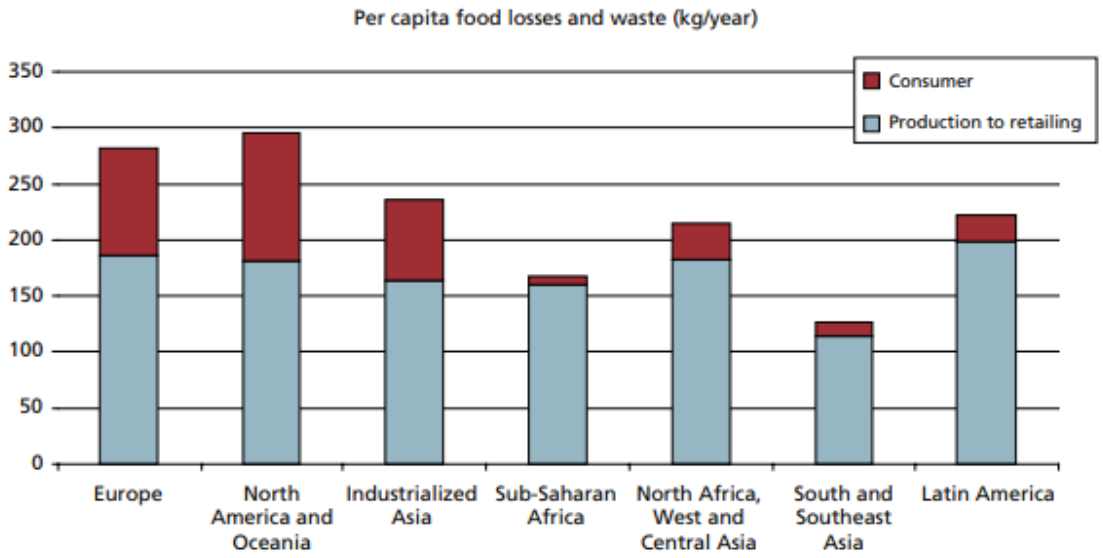
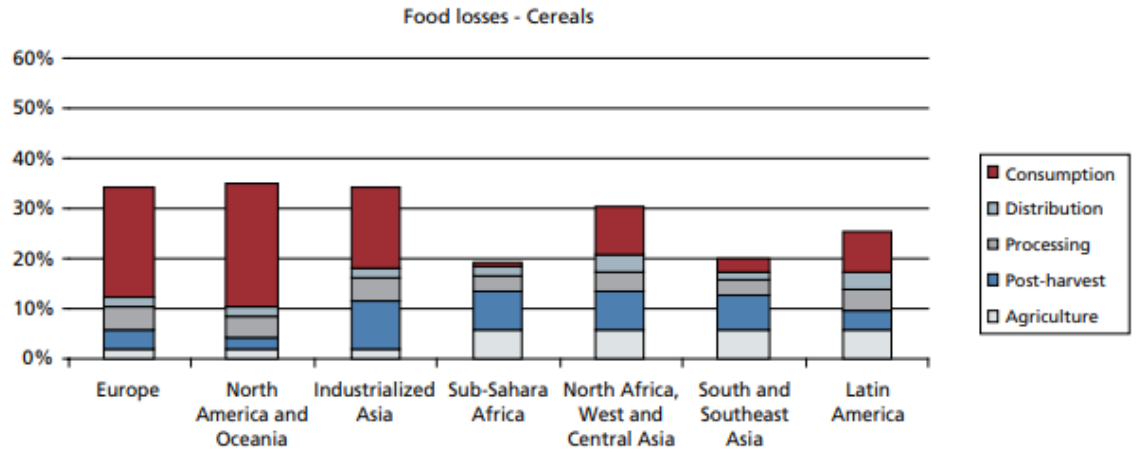


Figure 3. Part of the initial production lost or wasted, at different FSC stages, for cereals in different regions



In 2015 similar research using inference by calculation was undertaken by the University of Otago [6]. They used macro-economic data and aggregated waste data to estimate food waste data. Waste generation was assumed to be proportional to production and the consumption in each sector and is analysed as part of the material flows of the economy.

They calculated that in 2011 New Zealand households generated over 224,000 tonnes of food waste, and New Zealand industry generated over 103,000 tonnes of food waste. This would be equivalent to 50 kilos per capita per year for household food waste and 70 kilos per capita per year for total food waste.

	Total food waste per capita	**Household food waste per capita**
FAO (2011)	300	115
University of Otago (2011)	70	50
MfE estimate (2016)	110	Not known

[6] Reynolds, C. J., Mirosa, M. & Clothier, B. New Zealand's Food Waste: Estimating the Tonnes, Value, Calories and Resources Wasted Agriculture 2016, 6(1),9; https://doi.org/10.3390/agriculture6010009

The researchers divided New Zealand's food waste into 14 food-waste categories and found that 7% is related to "fresh" produce, and 93% "processed" food waste. It is not possible to directly compare this data with the FAO data due to the different categorisations.

The value of New Zealand's food waste in 2011 is estimated to be NZ $568 million, or $131 per person.

1.2 Measurement

1.2.1 Households

The National Food Waste Prevention project decided to undertake food waste audits to quantify how much food and what kind of food is wasted. This approach had been successfully used by WRAP in the UK in 2007[7] to quantify food waste.

Given that councils have direct responsibility and influence for dealing with household food waste and only indirect responsibility for commercial food waste it was decided to initially quantify the amount of food waste send to landfill by New Zealand households.[8]

This research was fully funded by local government and conducted in partnership with the University of Otago and WRAP between 2014 and 2015. Bin audits were conducted for 1,402 bins households. These audits separated out food waste from kerbside collections. The food waste was then analysed to understand how much food waste is:

- Avoidable, i.e. could have been eaten e.g. a slice of bread
- Potentially avoidable e.g. apple and potato peels
- Unavoidable e.g. banana skins

229,022 tonnes of food waste is disposed of to landfill every year via council kerbside collections. Of this 54% is avoidable 122,547 tonnes and 12% is potentially avoidable 27,482 tonnes. This translates to 51 kg/person/year for total food waste and 27 kg/person/year for avoidable food waste.

$872 million worth of avoidable food is thrown away every year.[9] This is equivalent to $563 household/year. It is not known how much household food waste is disposed of via composting, feeding to animals or garbage disposal units.

The National Food Waste Prevention Project is repeating the bin audits in 2018 in order to determine any changes over the last three years. The results will be published in February 2019.

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[7] WRAP. (2007) Understanding Food Waste
http://www.wrap.org.uk/sites/files/wrap/FoodWasteResearchSummaryFINALADP29_3__07.pdf

[8] WasteNot Consulting. (2015) New Zealand Food Waste Audits; https://lovefoodhatewaste.co.nz/wp-content/uploads/2016/03/New-Zealand-Food-Waste-Bin-Audit-Report-2015.pdf

[9] More information on what food is wasted by households can be found in the Love Food Hate Waste submission

1.2.2 Supermarkets

Together with the University of Otago it was identified that the next logical sector to quantify was the retail sector specifically focusing on supermarkets. A University of Otago Master's student[10] conducted physical waste audits at New World, Countdown and PAK'nSAVE supermarkets around New Zealand in 2017.[11] Research was conducted using protocols developed by WRAP in the UK.[12]

For this research, the destinations of supermarket food waste were also quantified e.g. how much was donated to food rescue, given to pig farmers etc. Councils and WasteMINZ supported the research by providing staff to physically assist in doing the audits as council staff were keen to see with their own eyes how much food was being wasted by supermarkets in their region.

In total it is estimated that 60,500 tonnes of food are wasted per annum by supermarkets in New Zealand.[13] This equates to approximately 160 tonnes per store per annum. This averages out to 13 kg/person/year compared to 4 kg/person/year for food waste and diversion in the UK.

Table 4.6 Estimated total (tonnes) annual and per capita (kg/person/year) retail food waste and diversion in New Zealand and the UK

	Mean retail **food waste and diversion** in New Zealand[1]	Mean for retail **food waste and diversion** in UK[2]
Total food waste and diversion per annum (t)	60,500	240,000
Annual food waste per capita[3] (kg/person/year)	13	4

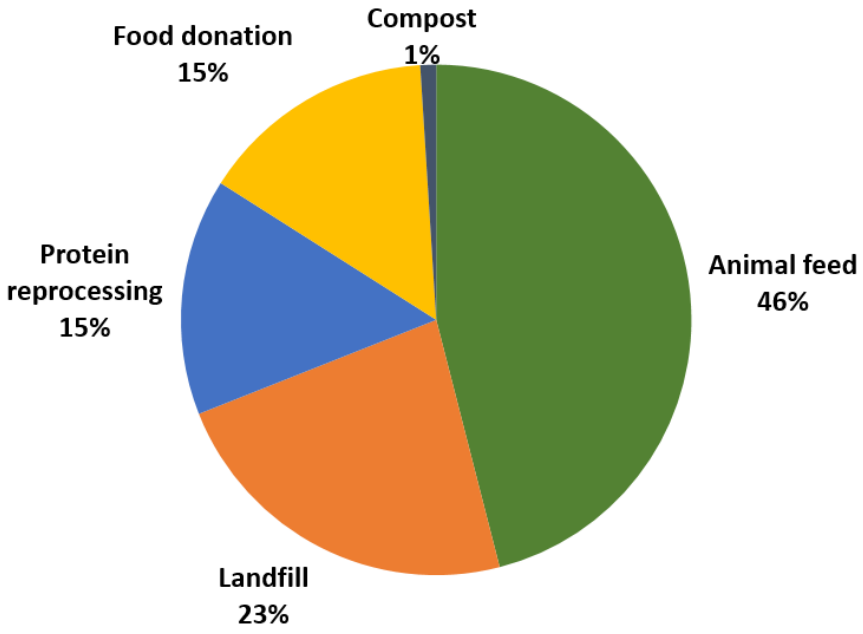
[1]Scaled using data from the present study for food waste, animal feed and food donation for all Countdown, PAK'n'SAVE, and New World stores (n=377)
[2]WRAP estimates for food waste, animal feed and food donation in the UK retail sector (18)
[3]Estimated using census data (65)

15% of supermarket food waste is donated to food rescue groups and only 23% is sent to landfill with the balance to animal feed or protein reprocessing.

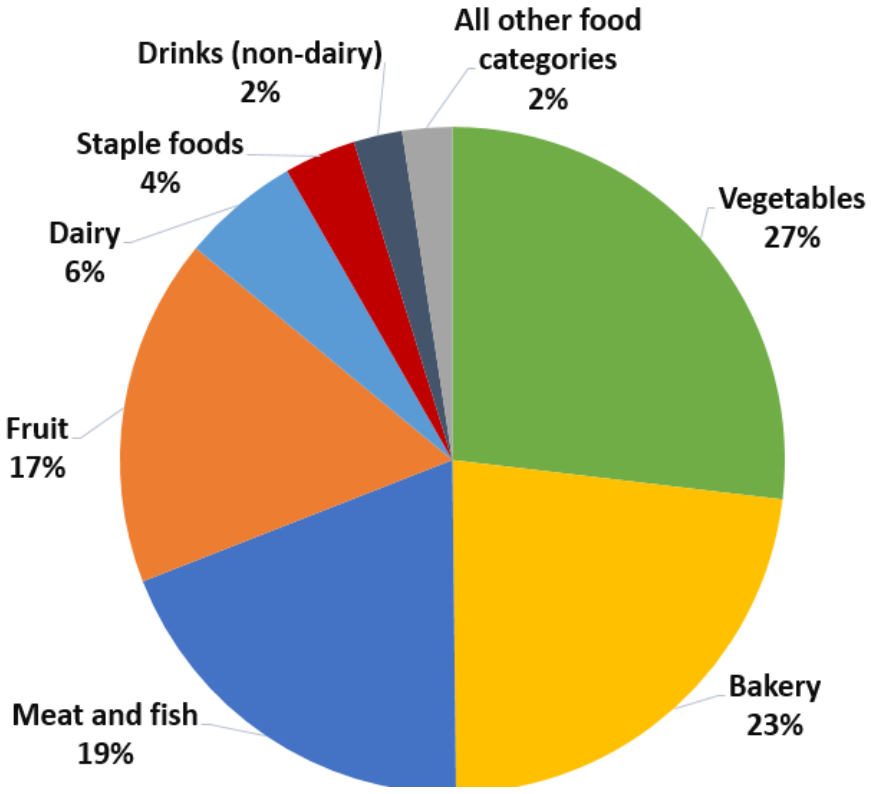
[10] Goodman-Smith, F. (2018). A quantitative and qualitative study of retail food waste in New Zealand (Thesis, Master of Science). University of Otago https://ourarchive.otago.ac.nz/handle/10523/7972

[11] Note Fresh Choice, Supervalue and Four-Square Stores were not included in the audit so further research needs to be done to fully quantify supermarket foodwaste.

[12] Whitehead P, Parfitt J, Bojczuk K, James K. (2013) Estimates of waste in the food and drink supply chain. Banbury: Waste and Resources Action Programme,



The most wasted food category is vegetables 27% followed by bakery at 23%

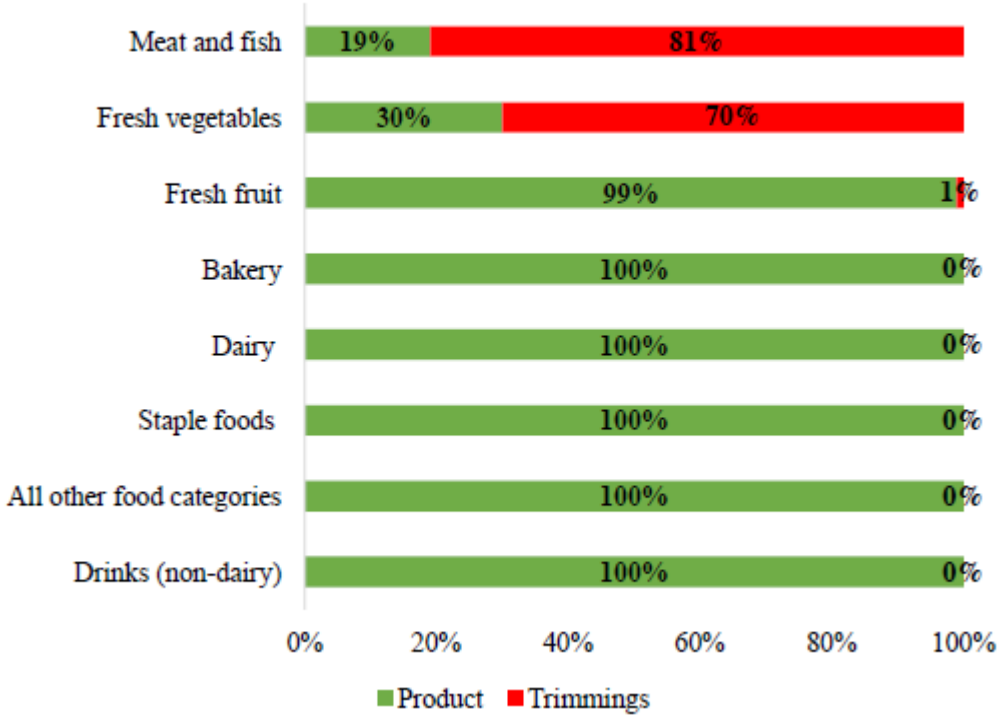


The most common items sent to landfill are:

- Dairy – 23%
- Bakery – 21%

- Meat and Fish - 21%

The study also analysed the percentage of product (food that was intended to be sold to customers) and trimmings (the portion of the food removed prior to sale and are not intended to be sold).[14] Only for meat and fish and vegetables were the percentages of trimmings – i.e. non – avoidable food waste significant. 66% of supermarket food waste is avoidable waste 39,930 tonnes rather than trimmings.



1.2.3 Cafes and restaurants

In 2017 two University of Otago Master's students conducted food waste audits in the hospitality sector focusing on cafes and restaurants.[15] They were only able to complete audits in the South Island so WasteMINZ staff conducted audits in the North Island to add to the dataset and the quantity of food waste for the sector was calculated. All food waste was measured; however, disposal routes weren't analysed e.g. how much was composted; how much was landfilled.

[14] This roughly compares to the avoidable v non-avoidable category for household food waste.
[15] Chisnall, S. (2018). A Taste for Consumption: Food Waste Generation in New Zealand Cafés and Restaurants. (Thesis, Master of Dietetics). University of Otago. https://ourarchive.otago.ac.nz/handle/10523/
Jones, E. (2018). An investigation into food waste produced in New Zealand restaurants and cafés. (Thesis, Master of Dietetics). University of Otago. https://ourarchive.otago.ac.nz/handle/10523/7924

In total 24,366 tonnes of food waste is wasted per annum by restaurants and cafes in New Zealand. [16]The average café and restaurant generates approximately 2.8 tonnes of food waste per annum, of which 61% is avoidable.[17] So avoidable food waste is 14,863 tonnes per annum for the sector.

For this research, food waste was divided into three categories: spoilage, preparation waste and plate waste.

- Spoilage occurs with the over-purchasing of ingredients or poor stock rotation, which causes food to spoil and be discarded before it is even used.
- Preparation waste occurs in the kitchen and includes things like vegetable peelings, eggshells or toast that gets burnt. It also includes any unsold food that is left at the end of the day.
- Plate waste is whatever customers leave behind on their plate uneaten.

Spoilage was found to be 7% of all food waste; preparation waste was 60% and plate waste was 33%.

For cafés and restaurants, which offer prepared food such as scones, sandwiches, pies etc., 30% of the preparation waste was unsold food.

By category, the food wasted the most in the sector is:

- Vegetables 28%
- Bakery 26%
- Meat 13%
- Fruit 9%

1.2.4 Summary of measurement data

	Total food waste **Kg/person/year**	**Avoidable food waste** **Kg/person/year**
Households	51	27
Supermarkets	13	8
Cafes and Restaurants	5	3

[16] WasteMINZ. (2018) Food waste in the café and restaurant sector in New Zealand. http://www.wasteminz.org.nz/wp-content/uploads/2018/10/New-Zealand-cafe-and-resturant-food-waste-WasteMINZ-2018.pdf

[17] Whilst similar studies have been undertaken overseas in the UK and in Australia, it is not possible to make a direct comparison with their results due to differences in the types of businesses surveyed.

1.3 Self-reporting

A third way of measuring food waste is via self-reporting.

1.3.1 Agriculture and Horticulture

The Bioresource Processing Alliance (BPA) was a six-year programme funded by the Ministry of Business, Innovation and Employment (MBIE) to take primary sector biological by-products and turn them into high value products for export. Businesses in the agricultural and horticultural sector who had identified significant food waste streams in their businesses contacted the Alliance for assistance in finding new uses for their waste. From the businesses who have approached the Alliance 350,000 tonnes[18] pa of food by-products are going to landfill, being spread on land or are going to no value, or low value applications (such as fertiliser or animal feed).

308,000 tonnes comprised of items such as skins, seeds, spent grains from breweries, whey etc which would require commercial processing to turn them into food products or nutraceuticals.

42,000 tonnes comprised of items which could have been sold or donated to the public. This included potatoes which were considered too small or ugly to go on sale, tomatoes, kiwifruit and fish offcuts. That is equivalent to 8kg/person/year.

It is important to note that this is waste from individual businesses within a sector not a sector as a whole.

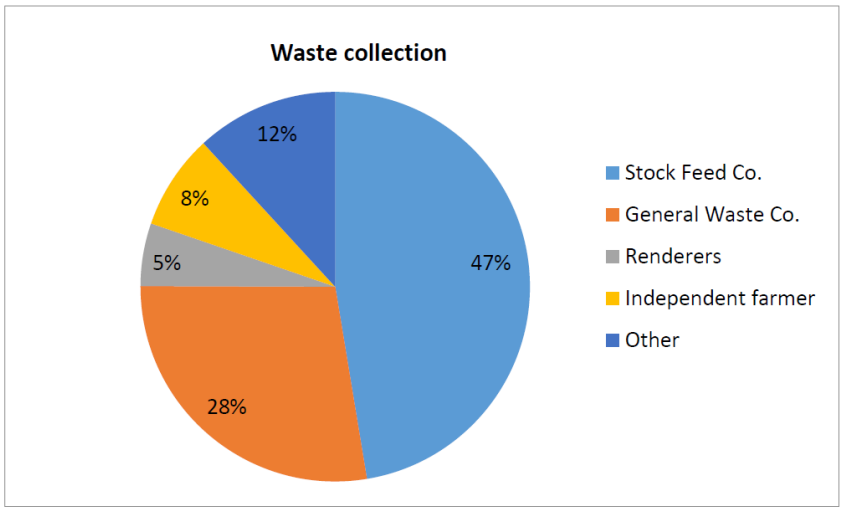
Zespri reported to Radio New Zealand in 2016 that 2.5 million[19] trays of export grade kiwifruit were not sold for human consumption either in New Zealand or overseas as they were oversupplied in some sizes. They describe this practise as crop management and it is done to maximise profit margins.[20] It is not known whether this surplus fruit was sent to landfill or composted.

1.3.2 Manufacturers

The Sustainable Business Network conducted research into manufacturers food waste in Auckland in 2017.[21] This piece of research was part funded by the Waste Minimisation and Innovation fund of Auckland Council. Manufacturers were asked to self-report on how much food was wasted and how it was disposed of. 28 businesses incorporating 34 manufacturing sites were surveyed.

In total 40,800 tonnes of food waste was generated per annum from these businesses.

[18] Personal communication Anna Yallop BPA 2017
[19] Estimated tonnage at 3.6kg per tray is 9,000 tonnes
[20] Radio New Zealand Rural News. A copy of the audio is available on request.
[21] Sustainable Business Network. (2017) Industrial food waste research – Auckland.



45% of businesses were producing more than 120 tonnes of food waste per annum, with almost a third producing over 600 tonnes per annum.

47% of the food waste 19,176 tonnes was being collected by stock feed companies and 28% 11,424 tonnes was sent to landfill. The research did not ask how much was being diverted to food rescue but presumably less than the 12% 4,896 tonnes which was listed as other in the survey.

6% of the food waste was sludge and another 6% was liquid. However, no further questions were asked to determine how much of the food waste was avoidable.

WasteMINZ is not aware of any other research which has been undertaken into manufacturers food waste which of.

1.3.3 Supermarkets

Supermarkets have started self-reporting on how much food is donated to food rescue every year. Traditionally supermarkets have donated dried and tinned foods to food banks which are nearing their best before dates. In recent years food rescue groups have also sprung up around the country. These groups often have refrigerated vans and chilled storage units so are able to rescue fresh produce, bread and other goods which have a shorter shelf life.

Foodstuffs states that over the last 12 months they have donated the equivalent of 5.1 million meals (14,571 tonnes[22]) which has a value of approximately $5.8 million. Foodstuffs' stores are owner operated so it is at the discretion of each store as to whether they donate food or not.

In 2017 Countdown stated that they have donated around $3.7 million of food to foodbanks, plus an additional $2.1 million of food to farmers as food scraps for their animals. If a similar donation

[22] Foodbanks typically use the formula of .35 kilos = 1 meal so 5.1 million meals would be equivalent to 14,571 tonnes.

profile to Foodstuffs is assumed [23]Countdown has donated 9,296 tonnes to foodbanks and 5,276 tonnes to farmers.

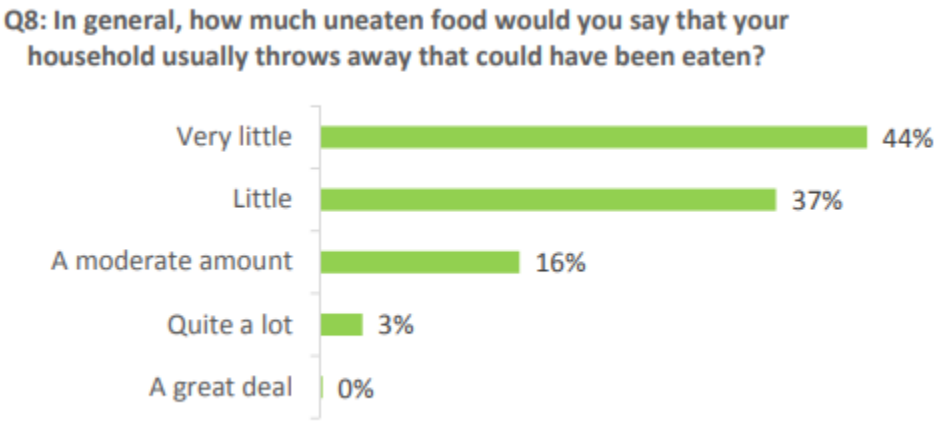
This is an increase from 2016 when Countdown donated $3.5 million (8,793 tonnes) of surplus food to The Salvation Army and other local foodbanks and food rescue groups and an additional $1.2 million (3,015 tonnes) of food that is not suitable for people to eat is donated to farmers as food scraps for their animals. All of Countdowns stores participate in food rescue programs.

So total self-reported food waste from supermarkets is 29,413 tonnes.

1.3.4 Households

The National Food Waste Prevention Project worked with a market research company to undertake a survey of 1,354 New Zealanders in 2014.[24] The survey examined their attitudes and behaviours to food waste and also asked them to self-report on how much food they wasted.

Participants were asked how much food they throw away uneaten. Most people believed they threw awary little to very little food.



Participants were also asked how much money they spend on food every week and what percentage of their food shop did they think they wasted.

- People thought they bought $140 worth of food per week in their grocery shop
- And they estimated they wasted 5%
- So, the total amount they thought they wasted was **$390** per household per year

[23] $5,800,000 worth of donations is equivalent to 14,571 tonnes i.e. $398 per tonne.
[24] ***WasteMINZ. (2014) National Food Waste Prevention Study https://lovefoodhatewaste.co.nz/wp-content/uploads/2016/03/Online-Survey-of-attitudes-to-food-waste-.pdf***

Dollar value of food wasted per week	% of total sample
$0 to $3.00	27%
$3.01 to $7.00	22%
$7.01 to $16.00	25%
$16.00 and over	26%
Median dollar value of food wasted per week	**$7.50**
Median dollar value of food wasted per year	**$390**

However, the bin audits showed that New Zealanders significantly **underestimated** how much they wasted as they actually wasted $563 per household.

In 2017 Rabobank independently completed a similar survey[25] asking the same questions and found that:

- People thought they bought $180 worth of food per week in their grocery shop
- And they estimated they wasted 12 %
- So, the total amount they thought they wasted was **$1,071** per household

This suggests that people are possibly becoming more aware of the issue of food waste.

The National Food Waste Prevention Project is repeating the same study conducted in 2014 in 2018 in order to benchmark changes in attitudes and behaviours. The results will be published in February 2018.

1.4 Observer reporting

Anecdotal evidence or reports by outsiders have also been used to identify areas of concern for food waste. International food waste campaigner Tristram Stuart shone light on the large volumes of banana waste in the third world due to stringent appearance specifications from supermarket chains on the desired curviness of bananas.

1.4.1 Agriculture and Horticulture

Kiwifruit

In 2016 WasteMINZ was contacted by Kiwifruit growers and told

[25] Rabobank. (2017) http://www.scoop.co.nz/stories/PO1710/S00296/shift-from-attitude-to-action-needed-to-reduce-food-wastage.htm

“This year Zespri instructed pack-houses to dump approximately three million trays of export grade kiwifruit because they considered that they had insufficient export markets for the fruit. The pack-houses were not permitted to supply the NZ or Australian markets with this good fruit. In the newspapers this "dumping" was called "crop management". Zespri considered that by dumping this fruit they could drive export market prices higher and shorten their supply season.

Export kiwifruit are required to have a dry matter content of >15.5% to be accepted into the export inventory. If you ask Zespri they will say that "3 million trays of lower dry matter fruit was crop managed". Our fruit had a dry matter content of 16.4% - these were **not** low dry matter fruit
This is an example of huge food wastage.”

Onions

A New Zealand composting facility received this year several thousand tonnes of export grade onions. They had been affected by stemfidium which meant that some of the brown layers of skin that surrounded the onions were missing. The onions were safe to eat but didn’t meet export standards so were sent to the composting facility for disposal. The same facility also receives truckloads of apples from packhouses, which are graded as too ugly or too small to sell.

1.4.2 Manufacturers

Organisations such as Ecostock which turn foodwaste into stockfood or Wallace Corp which renders animal by-products would be able to provide data on how much food waste they process which can shed light on volumes of food waste.

Food Rescue

Most food banks do not report on how much dried or tinned food they have been donated, however of New Zealand’s 15 food rescue groups operating in 2017,[26] 14 kept records of the tonnages of food donated. Food is rescued from supermarkets, manufacturers, growers and sometimes hotels and restaurants. In 2017 2,777 tonnes of food was rescued.

1.4.3 Supermarkets

Whilst many supermarkets have partnered up with food rescue groups or foodbanks there are still many who do not. Whilst dumpster diving is illegal there are people who have shared online what they have found in supermarket skips

“We went to three supermarkets in Auckland on this particular night, quitting because it was getting late and the car had hit capacity. There were boxes of food in the boot, the back seat, the floor and on our laps. None of the bins were locked, and the food was easy enough to find. The most common

[26] Food rescue groups operating in 2017: 0800 Hungry; City Harvest; Fair Food; Food Rescue Northland; Good Neighbour; Just Zilch; Kaibosh; Kaivolution; Kiwi Community Assistance; KiwiHarvest; Love Soup; Satisfy Food Rescue; The Free Store. Waiwaste Note: Waste Not What Not Whakatane and Gizzy Kai Rescue began operating in 2018.

items we were finding were fruit and vegetables which were often in separate food waste bins. We also found 30 packets of flat bread which had a 'best before' date for the following day. We discovered bins full of one particular fruit or vegetable, an entire rubbish bag of packaged crackers, and packaged meal kits containing tin cans, herb packets, fresh vegetables and dried couscous. This is only a small fraction of what we found dumpster diving on one night."

This video shows the amount of food waste rescued from supermarket skips in the Bay of Plenty region in 2017.

1.5 Summary by sector by overall tonnage[27]

Sector	Inference by Calculation		Measurement	Self-reporting
Agriculture and Horticulture	570,000 (MfE, 2016)	811,040 (FAO, 2011) 103,000 (Reynolds, 2016[28])		360,000 tonnes (BPA,2017)
Manufacturing				40,800 tonnes (SBN, 2017)
Supermarkets			60,500 tonnes (Goodman-Smith, 2017)	29,413 tonnes[29]
Cafes and Restaurants			24,366 tonnes (WasteMINZ, 2018)	
Hotels, Bars				
Not for profit hospitality sector e.g. hospitals, prisons etc				
Households		504,160 tonnes (FAO, 2011) 224,000 tonnes (Reynolds, 2016)	228,000 tonnes (WasteNot Consulting, 2015)	$390 per household per year (WasteMINZ, 2014) $1071 per household per year (Rabobank, 2017)

[27] Note not all food waste is disposed of to landfill
[28] Note this was the year the research was published but the data was for 2011
[29] Calculation from published figures by supermarkets

1.6 Summary by sector of known avoidable food waste

Sector	Tonnes	How measured	Completeness of data for sector
Agriculture and Horticulture	42,000 tonnes 2.5 million trays kiwifruit	Self-reported to Bioresource Processing alliance Self-reported by Zespri	Incomplete - only self-report measures available for some sectors
Manufacturing	Not known		Incomplete
Supermarkets	39,930 tonnes	Measured by bin audits (Goodman-Smith, 2017)	Partially complete - no data from Fresh Choice, Supervalue and Four-Square stores.
Cafes and Restaurants	14,863 tonnes	Measured by bin audits (WasteMINZ, 2018)	Complete[30]
Hotels, Bars	Not known		Incomplete
Not for profit hospitality sector e.g. hospitals, prisons etc	Not known		Incomplete
Households	122,547 tonnes	Measured by bin audits (WasteNot Consulting, 2015)	Partially complete. It is not known how much avoidable food is disposed of via garbage disposal units and composting.
Total known avoidable food waste	219,340 tonnes		

Limitations in existing New Zealand research

1. Most research was conducted before the Food Waste and Loss Accounting Protocols were developed in 2016.

[30] None of the cafes and restaurants used garbage disposal units so it was possible to fully audit their waste.

2. Some parts of the supply chain have been thoroughly researched in New Zealand in particular household food waste. In other parts such as the agricultural and horticultural sector very little research has been done.