

Food Waste New Zealand: A Case Study Investigating the Food Waste  
Phenomenon

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### Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

A handwritten signature in blue ink that reads "Harriet Parr". The signature is written in a cursive style with a light blue background behind it.

.....  
(Harriet Parr)

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## Abstract

Food waste is an increasing concern for Governments in developed countries and in New Zealand it is estimated that the annual value of household food waste is 750 million dollars. The looming crisis in global food security including food waste has resulted in a detailed report from the United Kingdom's Institute of Mechanical Engineers, IMechE's (2013) which concluded that education is critical to help consumers lower their generation of food waste; and that policy changes led by Governments, must be introduced, to tackle this escalating problem.

In New Zealand information on food waste is scarce however statistical evidence does show each household discards food valued at 450 dollars annually (Davison, 2011) yet ironically, 270 000 children in New Zealand live in poverty, where many do not have enough food to eat (Collins, 2012). This research aims to investigate the issues of household food waste, from the perspective of consumers, to discover if practical techniques can be applied to alleviate household food waste.

Currently, advertising and marketing campaigns to enable consumers to think about their household's food waste, instigated by Government or educational organisations are nonexistent. Also co-operation with supermarkets and food manufacturers to educate their consumers about the implications of creating food waste which would begin to address some consumer concerns raised in this research is unavailable. As with other issues of sustainability will it be consumer pressure or economic policy makers who will drive information transparency and best practice?

Disposal methods, and landfill diversion of food waste was not the focus of the case study. Rather the practical implementation of food waste reduction methods from website information and suggestions was important. Adding to the case study family's problem was that alternative food waste disposal methods, to divert food waste such as composting, or green waste collection services, were unavailable, in Auckland the service was not provided by Government. A case study methodology was used to underpin this research. The importance of using an in depth case study is highlighted by determining whether or not website information is informative enough to induce household behavioural change.

The value of website information is a priority for this research as the thesis tested if informative suggestions from websites could encourage a change in waste behaviour. The relationship between the case study family, website information and amounts of food waste is analysed throughout the project and is vital to inform the research about successful methods of reduction. The outcomes of this study outlined information techniques which the family applied to the experiment. In theory these methods could be used in further research to test another family's waste calculations.

Overall findings from this research revealed that with the correct education, tools and techniques, a household can reduce food waste to a minimum. Connecting waste reduction methods via a virtual knowledge sharing system would provide consumers, producers and Government agencies with the option to create and exchange food waste reduction concerns and techniques.

## **Chapter 1**

### **Introduction**

This research is an investigation into the issues of food waste in New Zealand. Various statistics and facts which have been published by TVNZ (2013) and The New Zealand Herald (2011), highlight the fact that New Zealand has a food waste problem that equates to 750 million dollars worth of food being thrown away by households each year. The figure equates to each New Zealand household being responsible for 450 dollars of discarded food per year.

The aim of this research is to discover if there are methods available to the public and how successful they are to prevent or reduce this substantial food waste issue. The source of information in this study has been found on websites which are widely accessible and an available resource for the study. The research websites are affiliated to Governments and educational bodies and are therefore assumed to be a source of reliable information and are assumed to have integrity. The websites give written tips and techniques for solutions to reduce food waste. The suggestions should be practical and easily applied to households to inform them of methods to reduce food waste, rather than waste diversion methods such as using a compost system or worm farm which are more sustainable solutions than simply discarding to the waste bin. However the primary focus for his research is what households can do to reduce their food waste before it reaches disposal agencies where landfill schemes are the norm. .

The purpose of this research is not to question if the published statistics on the generation of domestic food waste in New Zealand are correct. . Rather this research aims to 1) ascertain if there are practical methods which can be used to quantify household food waste. 2) If authoritative food waste website information is useful to each household in respect of waste reduction. 3) Can the implementation of solutions given by the websites reduce the food waste issue? 4) Will the research discover additional food waste avoidance methods? This website information forms the basis of a prevention strategy for the case study household, for research data gathering and analysis of the success of the food waste avoidance techniques. The research intends to establish whether or not website information provides viable solutions for household food waste, and whether these solutions can then be used to provoke a change in behaviour.

As mentioned previously, this research project is not concerned primarily with fact finding or quantifying results where the data collected is not intended to evaluate the amount of discarded household food waste in order to be compared to national statistics. However the research does establish quantifiable methods for setting a foundation for household food waste calculations. It is important that the current household food waste data collected from the case study family, before the implementation of web site food waste avoidance solutions, is then compared to the households' food waste scenario following the exposure to and implementation of the web techniques. This data comparison will determine whether or not the website suggestions could generate a change in behaviour leading to a reduction in the amount of food waste a household creates. It is important establish an accurate picture of the case study family's shopping, cooking, eating habits and food waste generation at the outset of the research experiment, so that a food waste reduction plan can be formed and implemented more effectively according to the households' behaviour. The principal information tools for behavioural change in the research project are websites therefore it is essential that the household has access to the internet. Previous literature has confirmed that studies have shown that the most wasteful category of food, by weight (Stuart, 2009, p. 25) is generated by an average family with children. Therefore this qualitative and quantitative research case study and field work is focussed on a family with children.

Food waste is a growing issue in New Zealand and should be addressed because of the impact it can have on the environment, governments, local councils and consumers which will be discussed later. Food waste information for New Zealand is scarce due to a lack of funded research into the problem; therefore the published statistics are sourced mainly from research studies conducted in countries such as Australia and Britain. Because of economic, educational and environmental similarities with these countries their data can be used to give background to and inform the New Zealand context to a certain extent. However data from other parts of the globe, when applied to New Zealand could give incorrect results and predictions by manipulating the facts relating to food waste now and in future for New Zealand. If the office for statistics conducted a national study into the issue and the Government implemented specific local solutions following the research, through correct information cascade and management of disposal t New Zealand could become the first country to achieve zero food waste to landfill.

This may seem optimistic, but, due to a relatively small population, and the abundance of resources (land, electricity, water) this could be a realistic target. This small scale research project will aim to confirm whether the consumers used for this research (a family) fall into the most wasteful category as it is claimed that it is general domestic consumers who waste the largest amount of food. It will also aim to determine whether or not waste reduction is viable through access to information. At present, there are no campaigns within supermarkets or shops to deter consumers from wasting food. There is no marketing, advertising or public service announcement campaigns which enable consumers to think about their food waste, or the impact it has on local and national economies. There is also no food waste reduction methods available to consumers in general, unless a specific search is made to find waste avoidance techniques, or methods are taught by education organisations. As a result, Website information becomes highly significant for consumers because currently there is no opportunity to find out about food waste information, throughout daily consumer routines. In contrast there is an abundance of information on recycling items, such as plastics, paper and glass which are 'end of pipe' solutions rather than eliminating waste at the 'start of pipe' by best practice through information, behaviour change or even design. Recycling information is filtered to consumers via local councils, education authorities and manufacturers, who give each item with a symbol as to whether or not the item can be recycled, via a code. This coding, in conjunction with public awareness campaigns increasing the notion of good citizenship has led to a significant diversion of these items from landfill and has become common practice. However there is yet to be a request for food manufacturers or councils, to provide consumers with the same food waste diversion assistance.

Despite the financial benefit a household could enjoy by reducing their food waste, estimated to be a saving of 450 dollars each year, there is a greater issue that would be addressed simultaneously by reducing food waste locally. This is the global issue of food chain safety in relation to supply and demand. If consumers became aware of the real value of the food they discarded, they may then be encouraged to consider other uses for this food, rather than throwing food away. The real value food equates to the true costs associated with a food item. For example, a tomato's real cost would take into account the resources used to grow the tomato (land, fertiliser, water, energy and manpower needed to plant the seed and cultivate the

crop), the harvesting, transportation, packaging and eventually sale of the tomato. These holistic costs are not incorporated into industrially produced food stuffs at present.

If consumers applied food waste reduction methods to their personal households, they would consecutively reduce the amounts of discarded food from farmers and suppliers in succession. This would be due to conservative shopping and purchasing techniques. If consumers changed their shopping habits, supermarkets, manufacturers and farmers would be forced to address consumer demands, in turn creating a less wasteful food chain process. For example, if consumers bought less fruit per week, because of reluctance to waste surplus stock, a supermarket would have to change their stock margins for fresh produce, creating less wastage for both supermarkets and consumers. This could simultaneously lower food prices through a transparent process in which all costs from farmer to supermarket are made available for consumers. This in turn may induce a change in global food waste issues.

Food waste has been on international sustainable agendas of various nations for a quarter of a century. It was first revealed as a government issue in 1987 through the United Nations "Our Common Future" report (UN, 1987). This report focussed on international countries co-operation to build a sustainable future. Although the report on food supply and demand issues was evident, it was over-shadowed by debate on sustainable energy, environmental development and sustainable industry practices. This report paved the way for many sustainable farming processes with regard to de-forestation for building materials, and developing sustainable ecosystems and species. Unfortunately food issues were overshadowed in favour of sustainable raw material management. Decades later and in particular since the G8 (eight nations participate in a discussion of issues, from climate change to economic growth) summit in 2008 there has been an upsurge in food waste publicity, with reducing food waste gaining public support. In the UK for instance the aim is for zero waste to landfill by the year 2020, but realistically aims at reducing business and household waste by 50% by the year 2020, (Department for Environment, Food and Rural Affairs, 2011, p. 8). The UK government has started to achieve its goal, seeing a reduction in food waste of 18% between 2009 and 2011 (Waste Resources and Action Programme, 2011, p. 3). Unfortunately in comparison, there is no available economic or quantitative information on New Zealand food waste and therefore it is unknown if there would be benefits and if it should be a priority.

## Chapter 2

### Significance of Study

Already mentioned, there is a lack of knowledge about food waste in New Zealand and a review confirms there is little published literature on the topic of household food waste. According to the NZ Herald (Davison & Johnston, April 18<sup>th</sup>, 2011), a “Lack of labelling” is the main problem in relation to the amount of discarded food in the country however statistical information available on the amount of household food waste in order to support or to deny this claim is rare. At present, some information on food conservation is available through governmental websites such as [www.mfe.govt.nz](http://www.mfe.govt.nz). But most available data is quantitative and does little to show why and how households waste food.

The research undertaken in this thesis aims to;

1. Document food consumption and food waste in a typical NZ family and observe and reflect in what situations food waste occurs.
2. Assess the qualitative value of NZ government website information on food consumption and evaluate its impact on the reduction of food waste in the test group.

These objectives aim to identify the usefulness and practicability of information which is available to the consumer i.e. whether and how this information aids to prevent or minimise food waste. The first and second research phases focus on what the test family discards as food waste and how they dispose of it, over a period of time. In a third phase, the family will be assisted by information from websites with proposed solutions for reducing food waste. A fourth and fifth phase of data collection supports the family's food conservation efforts through a reflective evaluation of what does or does not work with the information from the reference websites. The family is a test group to examine whether relevant website information is workable and practical enough to achieve a change in food waste habits.

This study asks the questions:

1. In what circumstances/situations do you waste food?
2. What food items/products do you waste?
3. What information assists you with a food waste prevention plan?

#### 4. What are practical implications to reduce household food waste?

This research considers if the solutions suggested to aid avoiding food waste work when implemented in an everyday family life. Websites identified for this study are:

[www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com)

[www.mfe.govt.nz](http://www.mfe.govt.nz)

These websites have been chosen for different reasons. The first UK site “love-food-hate-waste” is chosen for its established existence within the field of food waste (WRAP, n.d.) and its general contribution to food waste issues, statistics, problems and how to manage them over 13 years.

The second site is from the Ministry for the Environment, a key website for food waste solutions in based in New Zealand.

The study of these two websites coupled with data collected by the family, tests whether or not website information is viable to reduce a household’s food waste by initiating behavioural change. Again, Davison (2011) suggests that the average New Zealand family wastes 450 dollars worth of food a year. Therefore the family is important to the research not only as a source for data collection, but also the family is an immediate beneficiary and it is they who will benefit financially if they follow the guidelines of these websites and the change of behaviour is successful. The test family members in this research have expressed an interest themselves in wanting to reduce their household food waste.

This research experiment may result in:

1. Possibility of a reduction in food waste for the family (the consumers).
2. Possibility of a reduction in the cost of food bills for the family (the consumers).
3. The researcher authoring a food waste report for consumer and government agencies.
4. Possibility to lower the waste impact on the environment.
5. Possibility to lower the financial impact on the community for waste collection and disposal.

In the UK, it costs £120 (or 240 dollars) to take a tonne of waste to landfill, but only £40 (80 dollars) to recycle (North London Waste Authority, n.d.). In New Zealand it costs on average 85 dollars per tonne of waste to landfill (Ministry for the Environment, 2007). However, comparison studies (alike to NLWA) of waste diversion statistics and economic benefits for New Zealand are unavailable. Using UK logic, the amount of money saved from reducing food waste in New Zealand could then be used in different ways to communicate and to educate the public on food waste and other environmental issues. This research is significant, not just environmentally and economically as discussed, but also socially. For instance, reducing food waste could use the comparative model of the clothing industry where due to the increase in clothing recycling options, the public have become more aware of other possibilities available to them for throwing clothing away and has also introduced the idea of ethical and sustainable purchasing of clothing. This has resulted in a change in behaviour where less clothing waste is being sent to land fill. In America, it is estimated that “food makes up the largest percentage” of goods to landfill and ironically “an estimated 50 million Americans do not have access to enough food” (United States Environmental Protection Agency, n.d.) mentioned previously, the research uses website information as an intervention tool in order to asses if there can be a reduction in household food waste when solutions are implemented by the test family. It may be possible to draw conclusions about consumer food waste, and suggest what can be done further in order to prevent waste. Information from authoritative websites has been chosen as a primary platform for potential change in consumer behaviour in this research project because in New Zealand, the internet is used widely and access is good, ensuring this is an easier, more immediate and cheaper information dissemination resource for the test family than using traditional hard copy campaigns and printed and information. If this method is successful in the test case it suggests this could be a good method to adopt for informing the general population to change behaviour such as information ‘Tweets’ or e-banners on Google email servers in conjunction with usual mail and advertising campaigns.

## Chapter 3

### Literature Review

This section presents a thematic review of literature relating to the issues of food waste. Available in-depth literature on the subject is limited; therefore this review presents themes from a variety of sources of current literature. The main reference used is Tristram Stuart's (2009) book, *Waste: Uncovering the Global Food Scandal*, supported by relevant articles from newspapers and online sources. Stuart's (2009) book on food waste is mentioned in more depth throughout this review because of its seminal position as a key text within existing food waste discourses. Stuart (2009) is referenced by a number of articles covering food waste such as Broatch's (2009) Sunday Star Times NZ article, Jones' (2011) New Zealand Herald article and The Guardians' Green Living Blog (2009). There are four main patterns that arise from existing literature: (1) general food waste information and statistics, (2) manufacturer and distributor concerns, (3) labelling and (4) approaches to reduce food waste.

#### **General Food Waste (National and International)**

In 2011, the New Zealand Herald's headline read "Study: \$750m a year wasted on food" (Davison & Johnston, 2011). This article and a second article published by the New Zealand Herald two days later laid the blame on the domestic consumer for wasting food. This is in contrast to the United Kingdom where in 2007 a survey was conducted by the governmental organisation WRAP (Waste & Resources Action Programme) which took into account qualitative and quantitative data from 1728 households. The key findings from the research suggested only 60% of respondents checked their food supplies at home before going shopping, 19% stated they never shop to a list, 39% of respondents buy unintentional offers and specials, and are tempted further by shopping on an empty stomach. 6 in 10 respondents discarded food once it was past its use-by or expiry date. 8 in 10 respondents said that their food waste ends up in their household landfill bin, as opposed to other discarding methods such as composting or council green waste disposal methods (pp. 2-4).

The UK survey led to an investigation into food waste issues. Stuart (2009) used statistics and facts from WRAP's (2007) initial investigation to cite the food waste issue as a global problem. Stuart's (2009) methods for discussing food waste are underpinned by quantitative and

qualitative data. The research project here is informed by Stuart's mixed method approach to data gathering. Stuart (2009) focuses on the most up to date published worldwide food waste statistics and provides the reader with a consumer perspective on waste, which is underpinned with discussions on food both from a manufacturing and production point of view.

As limited information is available from New Zealand sources, Stuart's (2009) perspective and facts about food waste are used as the model throughout this research. Importantly Stuart (2009) discusses food waste from a global perspective unlike other literature in the field which usually has a local focus such as newspaper articles, both in the UK and NZ. His global perspective gives a more comprehensive view and analysis of an often complex food supply, use and disposal chain. Stuart (2009) uses the WRAP (2007) research as a source of facts concerning the UK. This is like to other published articles which also refer to UK data such as Television New Zealand's (2013) report and Davison's (2011) article on labelling. Stuart (2009) informs readers of the current food waste situation with regard to the production and consumption chain, individuals, supermarkets and manufacturers. The information given by Stuart (2009) regarding individual household waste agrees with other literature, which identifies the consumer as the problem for the majority of total food waste (in New Zealand): "40% of refrigerator food typically dumped is household waste" (Broatch, 2009, paragraph 3). When discussing international and national food waste concerns, Stuart (2009) focuses on the benefits the western society can achieve if laws were changed surrounding food waste. Here Stuart (2009) points to countries that lead by example when it comes to wasting the least food for example Japan, Taiwan and South Korea (p. 260). This is particularly important as Stuart (2009) is the only author who explicitly suggests examples of methods to use to reduce food waste for the consumer, and he encourages governments to change their attitudes towards food waste. The British Broadcasting Corporation touches upon the subject of national food waste law in their article "Clearer Food Labelling Plan" (2011). The BBC state new governmental policies to produce clearer labelling for food may achieve cuts in consumer food waste.

To combat the perception that it is consumers who waste the most food, Stuart (2009) explores manufacturing and agriculture as examples of industry food waste, and also informs readers of what they can do individually to reduce overall food waste in the home. Jones (2011) attempts to create an individual food waste reduction plan also, using the advice of Auckland restaurant

owner Mr Dearth. Jones (2011) states Mr Dearth implies “a use-by date is just a guideline” and to experience hygiene and food safety tangibly. Jones (2011) makes an attempt to provide solutions for individuals when reducing their food waste in his “Top tips to avoid being a waster”. These tips widely corroborate with the UK based website [www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com) (LFHW) top five tips to avoid household food waste. Jones’ (2011) suggestion to “buy fruit and vegetables loose” is the only shopping advice on quantity management that can be found through literature. It is important to note when mentioning Stuart’s (2009) work that he is based in the UK and therefore his first hand observations and statistics mainly come from a UK based platform. It is of equal importance that the articles published in New Zealand tend to agree with these UK conclusions although they are not NZ statistics. This suggests that New Zealand has not yet established a platform or gathered rigorous data to work from, regarding amounts of food waste in the country and its key reasons. The western statistics on food waste from Stuart (2009, pp. 300-308) are referenced throughout the book and his deductions on food waste have been published in the appendix. He has applied different methods of treating the quantitative information by producing graphs and charts, pictures and tables. It appears appropriate to mention that although the book states a “global’ perspective, statistics for New Zealand food waste are limited throughout his study. Some data is available in Stuart’s (2009) appendix for Australasia as a larger region, but specific information for New Zealand is unapparent. There is no New Zealand government body found in the literature that appears responsible for collecting quantitative, let alone qualitative data, regarding NZ facts on food waste in homes.

### **Supermarket concerns; shopping and statistics from supermarkets**

According to Stuart (2009), food waste is not just the responsibility of consumers but also of supermarkets and governments. The issue of a supermarket’s role concerning food waste is addressed by Stuart (2009), who references British Prime Minister Gordon Brown’s comments. PM Brown warns that the dangers of escalating food demand, coupled with supermarkets providing cheaper food, could essentially result in more food waste and the subsequent issue of waste disposal when consumers buy more than they need to. Brown is quoted by Stuart (2009) at the G8 summit in Japan 2008 stating “If we are to get food prices down [globally] we must also do more to deal with unnecessary demand [for food]...by all of us doing more to cut our food waste” (p. 70). Television New Zealand’s’ One News reported in January 2013 (TVNZ, 2013) that “rising food and commodity prices will drive the need to reduce waste, making the

practice of discarding edible fruit and vegetables on cosmetic grounds less economically viable" (paragraph 19). This statement appears to disagree with the public address given by Brown (cited in Stuart, 2009, p. 70). The UK stance on food waste suggests "doing more to cut...waste" will decrease food demand, which in turn will drive down food prices. This challenges the statement by One News, who state that it is only after an increase in food prices that society will become more aware of the need to reduce food waste. The report by One News also reiterates the view that labelling is to blame for poor consumer behaviour when it comes to discarding food, "30-50 percent of what is bought in developed countries is thrown away by customers, often due to poor understanding of "best before" and "use by" dates" (TVNZ, 2013, paragraph 10). This statement agrees with other articles by Hennessy (2011) and Davison (2011) who also find fault with the labelling system.

When focussing on national food waste in the UK, Stuart (2009) quotes statistics from WRAP's 2007 qualitative case studies. Stuart reports that 6.7 million tonnes of household food are thrown away by the British public per year (p. 70) some of which is still edible, but some of which is not, such as tea bags and orange peel. 4.1 million tonnes of food would be edible but had been managed incorrectly; either by individuals storing food inappropriately or deciphering food labels incorrectly. 1.3 million tonnes are thrown away because of individual choice; potato skins, bread crusts, apple peel, which all are edible but not appealing to all persons (p. 71). These are interesting statistics, the relevance of which will become clear when working with the case study family, as to whether or not individual choice relates to a higher or lower amount of household food waste. Note 18 (Stuart, 2009, p. 74) indicates that households with children are wasting 56 per cent more food than households without children; this is by weight not per capita. These statistics published by Stuart (2009) contain the most information on food waste statistics from a UK perspective. Literature from New Zealand appears to reference these UK based statistics, even though NZ statistics on food waste are scarce. One News report (TVNZ, 2013) attempts to uncover some NZ based statistical information stating "in New Zealand each of us is responsible for over 60 kg of food waste" (2013, paragraph 4) although does not state a time period for this waste; for example 60 kg of waste per year, or per month, and does not state the source of the information either. One News (2013), Broatch (2009) and Davison (2011) all attempt to uncover some meaningful NZ based statistical information, although it appears the UK has gathered extensive material on the phenomenon of food waste (see WRAP's 'We Don't

Waste Food' household survey report, 2007) which could conclude why Britain is quoted in most NZ literature referenced here.

Shopping habits of consumers are also discussed briefly in literature. The issue that consumers buy more food when more food is available and prices are low, is a concern that Stuart (2009) addresses. From 1941 to 1992 food prices dropped 47 per cent (p. 77) which coincides with statistics from WRAP with regard to the "buy more waste more" mentality (p. 79). Stuart states that only 9 per cent of the UK household income is spent on food, compared with 75 per cent in Pakistan, and links this to issues of obesity in the West, and malnutrition in the East (p. 82). He calculates statistical information on how many malnourished people there are globally. Stuart (2009) worked out the amount of extra calories needed, per person per day, to alleviate their 'malnourished' category, as only 250 calories per day (p. 82). He has used the calorific content of what the UK and USA wastes per year as a starting point to calculate that at that time (2009) there was enough edible food wasted, by the UK and USA, per year to feed malnourished people three times over (pp. 306-7). These facts agree with the report from TVNZ's One News (2013) who make note of rising populations, and developing nations not having enough food due to poor transportation and storage strategies. Nonetheless, neither Stuart (2009) nor One News (2013) attempt to give a solution or relief to the food waste problem in developing countries, rather both voices point towards government policies in order to aid a change in consumer behaviour: "[G]overnments should not wait for food pricing to trigger action on this wasteful practice, but produce policies that change consumer behaviour and dissuade retailers from operating in this [wasteful] way" (TVNZ, 2013, Paragraph 19). These statements from both One News (2013) and Stuart (2009) insinuate changes to consumer behaviour would indirectly influence food scarcity in developing nations. Correct purchasing methods from the West could provide a decreased demand for food items, in turn, resulting in decreased pressure on resources from countries such as India who provide the West with cereals, cauliflowers and green peas (Stuart, 2009, p. 162). If these products did not have to be so widely available to the West there would be a decrease in amounts of food waste resulting from poor storage and transportation (2009, p.163), and also give India an opportunity to use arable land for their own farming and food production techniques to feed their population of 1,100 million (2009, p. 305). Therefore, this research attempts to uncover whether governmental information can provoke a change in consumer behaviour and alleviate western food waste effects.

A series of studies surrounding supermarkets, manufacturers and individuals by Stuart (2009) is most relevant to food waste generated by households. Stuart (2009) discusses the individual person's position, within a wider context of supermarket waste. He is the only author who attempts to connect the two categories (individual and company) of food waste. For instance, statistics from the UK and USA are used to provide a foundation for a discussion surrounding the amount of food currently being wasted by supermarkets. Stuart (2009) bases his discussion on supermarket food waste statistics (data verified by WRAP) and how and why these supermarket statistics can or cannot be evidenced. WRAP is deemed to be a reliable information hub and operates independently from commercial supermarkets and growers. "WRAP has been established as an independent not-for-profit company limited by guarantee since 2000" (WRAP, n.d.). WRAP's information regarding supermarkets is significant because the reader is exposed to the different statistical information, clearly identifiable within the appendix, and is then able to make an informed decision about supermarket shopping. Suppliers and store managers linked to UK food retailers such as Marks and Spencer and Asda offer their opinions, which are discussed in detail by Stuart (2009). It becomes evident here, even on a personal level, how complicated retailers find the food waste situation in their respective businesses (p. 25). The situation is complicated to manage for retailers because of the need to supply correct quantities of stock to various stores to satisfy consumer demands for goods. Therefore substantial statistical data on 'what' is discarded is supported by qualitative data on 'why' supermarkets waste so much food. Relying on the assumptions that "supermarkets feel they have to ensure that their customer's favourite products are always available for fear of losing dissatisfied clientele" (p. 25) can lead to over stocking and more waste. This is addressed first hand by a manager from the UK supermarket chain Asda, stating that the supermarkets "always put more stock on there [the shelves] rather than less, even if it means ending up with wasted food" (2009, p. 25).

The material gathered by Stuart (2009) is crucial in informing this food waste research project, which has a focus on household food waste. A significant factor in food waste generated in the domestic environment (alongside issues of food storage and preparation) depends on shopping habits as explored by WRAP's (2007) extensive qualitative data collection on the subject of food waste in the UK. Some of the responses WRAP received as to why people throw away food are dependent on shopping habits such as "[wasted] stale bread as often the smaller loaves are

more expensive... religiously sticks to sell by dates whether it appears to be gone off or not...over-purchased fresh food...over-shopping...overbuying...general over shopping” (WRAP, 2007, pp. 98-102).

A discussion that centres on single person households is reported by Stuart (2009, p. 68) who explains the situation of an individual household and how individuals are typically the most wasteful type of person. This, Stuart (2009) suggests, is because of the ready-made meals that are available, that may only get partially eaten, then sit at the back of the fridge and are spoiled (p. 68). Special marketing ploys such BOGOF (Buy One Get One Free) feature commonly at supermarkets in the UK. Stuart (2009) states consumers buy these because of their value for money. However, bad storage coupled with the surplus volume of food packaged with these offers, often means that single person households cannot consume the extra food, resulting in waste. Stuart (2009) mentions that supermarkets realise they have overstocked a particular product, and instead of dealing with their waste first-hand, simply pass it on to the consumer with these BOGOF offers (p. 68). TVNZ's One News (2013) covers the issue of specials and promotions but refers to British statistics and another recent report by the Institution of Mechanical Engineers (IMechE, 2013). The issues here surrounding single occupancy households causing increased food waste levels and effects would require further research.

### **Supermarket concerns; manufacturing**

The food manufacturing industry relates to the complex chain of food waste issues as addressed above, and is revealed by Stuart (2009) through his first-hand account of conversations with various manufacturing companies. It is pertinent to mention that all literature concerning manufacturing is dealt with most thoroughly by Stuart (2009), with the only exception being IMechE's (2013) recent report. Stuart (2009) implies that manufacturing statistics on waste generation are merely estimates and therefore can be inaccurate. This is because of the vast amounts of by-products that are created when producing food (such as excess slices of bread, or pastry trimmings). Edible and non-edible waste, which manufacturers accumulate as by products, is hard to accurately quantify, particularly if not separated into component parts. Consequently, if company food waste statistics are published, the supermarket and suppliers' rivals then know their competitors figures and can produce marketing techniques to lure consumers toward their particular brand (p. 43). As the facts on food waste are deemed unreliable (p. 43) because of their contradictory and unverified claims, it

is hard for manufacturers to construct targets for sustainable practice. A call for manufacturers to officially publish and educate consumers on food waste is suggested by Stuart (2009, p. 44). This perhaps informed the IMechE's (2013) efforts to gather manufacture and supply data for the UK. Readers are told by Stuart (2009) that food technologists are finding ways of "transforming by-products back into food ingredients" (p. 44). For instance, a by-product in the beer industry became known as the popular yeast spread Marmite or Vegemite. A by-product of cheese making, whey can be used for the production of chocolate bars and cakes. Nutrients like citric acid from piths and peels of citrus fruits could be obtained from juicing. Stuart (2009) makes an argument that consumers have forgotten the uses of by-products of foods (pp. 44-45). The use of by-products will be discussed further in the research project as this falls into a category under data collection, relating to ways to reduce household food waste. Stuart (2009) says that scientists are using discarded skins and seeds from juicing and pulping to use as additives in other foods (p. 45). Eliminating manufacturing waste via expensive methods, such as landfill is unsustainable in the long term (pp. 232-242). Stuart (2009) argues that anaerobic digestion or composting could be a productive way of reducing food waste from manufacturers (p. 51).

Stuart (2009) poses the argument that it is the supermarkets that have much of the control over food stock orders, and that it is difficult for suppliers to keep up with their demand of types of food (p. 47). An example is given whereby a supermarket (Marks and Spencer PLC) is described telephoning a supplier with a future estimated order, for an amount of sandwiches the store would need, weeks in advance. This is referred to as a 'forecast order' (p. 47). However, it is common for supermarkets to then confirm their order 48 hours before delivery, because of the shelf life of perishable goods. So in the case of the M&S order, a manufacturer of sandwiches has to prepare and make possibly thousands of sandwiches which then may or may not be bought by the retailer, hence generating a huge amount of waste. In addition, supermarkets often require their own brand for labels so manufacturers cannot simply sell them on to another retailer. Manufacturers are left with no option other than to discard the pre-ordered food items (p. 50-51). Some food manufacturers supply many supermarkets with items, in the above example this sandwich manufacturer may supply up to 10 different supermarkets with sandwiches, determining huge losses in food waste. An alternative way of avoiding such waste is to market food items under a manufacturer's brand name. Stuart (2009) uses the UK food

manufacturer Ginsters ([www.ginsters.co.uk](http://www.ginsters.co.uk)) as an example of a manufacturer with good practice. Ginsters produce pies, sausage rolls and savoury pastries, and they manage to be resourceful due to the fact that they are independently managed by themselves and not by supermarkets. If a supermarket first places, and then cancels their order with Ginsters, they are then able to sell their product onto another retailer. They also have adequate storage techniques within warehouses and can reuse a lot of their pastry trimmings as most products are made under the same roof (p. 52). Competition from supermarkets and the will to please large food retailers by smaller suppliers who make good profits if food orders are successful, have decreased the need for buyers to be 'smart', with relation to food waste predictions to manufacturers' for supermarkets demands (p. 53). Progressive Enterprises Limited (PEL), which is responsible for the chain supermarket Countdown, only publishes limited amounts of material relating to their corporate responsibility and does not publish information on food waste quantities (PEL, n.d.) Instead, PEL records a single page of 'Food Safety Tips' for users (PEL, n.d.) It could be argued that this information could actually lead to more food waste, for example "damaged skin allows[s] the air to penetrate and encourage growth of microorganisms" (PEL, n.d.) This quote relates to tips from PEL (n.d.) on how to best pack your supermarket shopping. However, this statement may discourage some shoppers to purchase, handle or eat fruits and vegetables with damaged skin. Conversely, Australia based Woolworths (also affiliated with Countdown) publish their environmental commitment to food waste by indicating that they "[d]iverted over 9,000 tonnes of food waste to EarthPower and fit-for-consumption food to food relief organisations" (Woolworths Ltd, 2012). In spite of this, there is no further information relating to this quote nor is there a report or quantitative survey available for users to compare information, or further sustainability objectives by the company. Information about food waste as a globally connected phenomenon seems to be soundly addressed by Stuart (2009) only. Other published authors and reports relating to food waste challenge the subject of food waste from a consumer liability perspective and focus mainly on issues of date labelling.

The Institution of Mechanical Engineers in the UK published a report in early 2013 regarding levels of global food waste. IMechE (2013) determined to record global food waste levels and advise some solutions to the problems through engineering, stating "this level of wastage is a tragedy that cannot continue if we are to succeed in the challenge of sustainably meeting our future food demands" (p. 2). The report addresses waste at three different demographics: (1)

fully developed nations (UK, USA), (2) late-developing nations (China) and (3) newly developing nations (sub-Saharan Africa, south-east Asia). The report directly relates to the article discussed by TVNZ's One News (2013). Regarding fully developed nations the report advises "more-efficient farming practices and better transport, storage and processing facilities ensure that a larger proportion of the food produced reaches markets and consumers" (paragraph 18). This would connect with what Stuart (2009) argues above about devising better techniques and transparency between manufacturers, supermarkets and consumers. New Zealand would fall under the fully developed nation bracket and it would therefore be worthwhile to research whether manufacturing techniques posed a concern for New Zealand supermarket consumers.

### **Labelling**

Labelling is a central concern in this research project where there is significant literature relating to current labelling and food waste. Stuart (2009) discusses the problems surrounding food labels, mainly "best before" and "sell by" dates. This is particularly relevant to household food waste and this research project, as there are cases where literature (Stuart, 2009; Hennessy, 2011; Davidson, 2011) and popular press accuse manufacturers and international legislation of a confusing food labelling system for consumers (The Telegraph UK, 2010; Guardian UK, 2008; BBC UK, 2011; New Zealand Herald, 2011). As mentioned previously, the statistical data for Stuart's (2009) labelling chapter was collected in the UK, which alongside Germany, is at the vanguard of green or environmental policy (Yale University, 2012) and where the major investment in collecting and publishing data is found. The individual data sets may or may not be relevant to NZ consumers, however, what is important are the macro philosophies, methodologies and analysis which can be used as a model and a tool for knowledge transfer to be used in an Antipodean context. The methods and solutions to food waste posed by Stuart (2009) could be transferred to this research, for example, the issue of children wasting food at the dinner table could be avoided by parents hand feeding children, instead of letting children feed themselves at a young age (2009, p. 74)

The issue of transferring knowledge from a Northern hemisphere context is highlighted in Davison and Johnson's (2011) report, which gathers facts statistically and draws conclusions mainly from Australian and British data. The main statistic, from a survey by the Food Standards Agency UK ([www.food.gov.uk](http://www.food.gov.uk)) in 2007, as quoted in Stuart (2009), indicated that "up to 80 per

cent of the British public misinterpret the function of the various terms” (p. 62). For example, Stuart (2009) discusses the breakdown of information cascade where consumers “treat a best-before (quality) date as if it were a use-by (safety) date” (p. 63) and explains the different misunderstandings by signalling various labelling systems. These misunderstandings are also noted in Davison and Johnston’s (2011) New Zealand Herald report.

The information gained from Stuart (2009) aids this research project in contextualising and locating it in a domestic setting. Australian literature is also appropriate to review as Australia fall under the southern hemisphere bracket, and may have adopted different tactics to tackle the food waste problem. For example, Dr Denniss, an economist and executive director of Australia Institute made it clear that he did not know exactly why consumers are throwing away so much food “whether it’s because it was off, or people just didn’t like the look of it, we don’t know” (Davison & Johnston 2011, paragraph 13). Davidson and Johnston (2011) continue to provide a definition of a “best before” and “use by date”. They state that “a ‘best before’ date means the products quality will reduce after that date. However, there is “no immediate health risk” and “it is illegal to sell a product after its ‘use by’ date. Supermarkets usually discount or dispose of products close to this date” (paragraphs 30 & 31).

Davison and Johnston, (2011), produced an article for the New Zealand Herald arguing that the current labelling systems of ‘best before’ and ‘use by’ dates are to blame for \$750 million worth of food waste. The key concept in their piece of work surrounds food waste with regard to ‘use by’ and ‘best before’ labels, on packaged supermarket food. Davison and Johnston (2011) discuss how consumers are confused over “best before” labels which are contributing to a food waste of \$450 per year, per household in New Zealand (paragraphs 1 & 10). Davison and Johnston (2011) state “This equates to a national figure of about 751 million dollars of food being discarded annually”. Davison and Johnston (2011) created this report from surveys of New Zealand households carried out by Australia Institute, and from other sources such as the Ministry for the Environment, Food Standards Australia New Zealand and Professor Richard Bremer (University of Otago) an “expert on the shelf life of food” (paragraph 20).

Within this discussion around food waste is the origin of labelling indicated by Stuart (2009). Personal communications with Lord Haskins, director of a readymade meals company (Northern Foods) in the UK, are used by Stuart (2009) to draw conclusions as to how food labelling

started. Stuart (2009) says of Lord Haskins “he was in discussion with Marks & Spencer...they came up with the idea of coding dates to help staff bring old stock to the front of display shelves” (p. 64). Once this became practice other food goods started carrying labels also, such as biscuits. Therefore food labelling became common practice, even for goods that by UK law are not required to be labelled, “such as fruit, vegetables and any bakery products” (p. 61). This concurs with the Department for Environment, Fisheries and Rural Affairs (Defra) 2011 report on food goods required labels. It is easy to recognise how an originally balanced idea of hygiene and aesthetics became a legislative battle between government departments to protect its people (2009, pp. 62-63). The different articles clearly highlight how confusing the situation is for the consumer regarding labelling, and how easy it is to misunderstand. This is confirmed by the previous UK Environmental Secretary, Caroline Spelman, who in 2011 stated to BBC Radio 4 that too many labels on food can create confusion. “There are products that have several dates on them; use by, best before and a display until,” which produces too much information for the consumer to decipher (BBC Radio Four, 2011).

Stuart (2009) argues that manufacturers have the final say on guides to food safety, and label food according to a worst case scenario (p. 65). This relates to Smithers' (2012) report on how Sainsbury's (UK supermarket/food manufacturing chain) are going to change their advice on labelling frozen food. Packaged food from Sainsburys used to read a statement “freeze on day of purchase” (Smithers, 2012) but the company, and shoppers realised the food does not know what day it has been purchased, and therefore does not have an exact date for expiry (Smithers, 2012). Stuart (2009) also points towards more factors being included in food hygiene with expiration dates being just one issue. These further factors include handling, temperatures of stored food and cooking. Stuart (2009) cites an example of successfully communicating information by other methods, such as storing a lettuce using photographs (p. 63). In this example, the lettuce is stored in a glass of water, like flowers, subsequently this food then lasted longer than any other method he tested. The other methods tested were storing at room temperature and in a fridge. This guidance competes also with other advice given on websites such as stuff.co.nz (2012), a popular NZ based digital site run by Fairfax Media, which states it is better to store salad “in the fridge, in an airtight container... with a damp towel laid across the leaves” (Sydney Morning Herald, 2012).

Stuart (2009) probes the argument for governmental change by discussing legislation in the USA. Stuart (2009) writes that the US has “no Federal laws requiring date labelling on food” (p. 65). However, some states have enforced their own laws requiring labels on food. He argues that by doing this the United States embarks on an even messier situation than the UK whereby there is more confusion and that there “are too many variables” (p. 65) that determine whether a food is safe to eat or not.

In Britain the “best-before’ and ‘use by’ labels are going to be replaced by more informative labels which will make shoppers more reluctant to throw food away. Bad labelling systems in the UK are being blamed for an annual food waste of \$12.26 billion (Davison & Johnston, 2011, paragraphs 3 & 6). However, New Zealand authorities do not seem to want to make any changes to the labelling system in New Zealand as yet.

The first article published by Davidson and Johnston (April 18<sup>th</sup>, 2011) seems to suggest that consumers [in Britain] knew little about the differences between ‘use by’ and ‘best before’ labelling. This prompted a change in the UK labelling system.

The second New Zealand Herald article from Davison (April 20<sup>th</sup>, 2011) includes quotes by “food and grocery Chief Katherine Rich” (paragraph 8) who expresses her concerns over changing the current labelling system in New Zealand. She says that “consumers want more information, not less, and removing the best-before [label] could leave them in the dark” (paragraph 9). She explains the best way to reduce food waste would be to educate consumers about ‘best before’ and ‘use by’ dates (paragraph 11). The Food Minister Kate Wilkinson also agreed with the overall impression that changing the current system would not necessarily mean less food waste. She states “I haven’t seen any advice that suggests removing them [food labels] and introducing new, more complicated labelling is going to be of any use to New Zealanders” (paragraph 18). Davison (2011) states that Food Minister Ms Wilkinson “would watch the British policy change with interest, but had no intention of following its lead” (paragraph 19).

What is unclear in both the New Zealand Herald articles is the relationship to food waste in Britain. The reader is exposed to some statistical information on food waste in Britain and such comments as “households in New Zealand were nearly as wasteful as in Britain” (Davison, 2011, paragraph 3). However, the reader is misinformed that in Britain the labels to be scrapped are the ‘best-before’ labels, with clearer labelling for ‘use by’ products such as yoghurt and fish

(BBC, 2011, April 17). Grocery chief, Ms Rich, seems misinformed when she states “consumers want more information not less”, as it suggests the new labelling system in the UK will provide less information for consumers, which is incorrect (Davison, 2011). As Hennessy (2011) expresses in his article “[n]ew guidelines are expected to be unveiled which will provide better information for shoppers”.

The Telegraph article by Hennessy (2011) discusses the growing dispute between “best before” and “use by” labels in the UK. Hennessy (2011) gives information to the reader through factual content. Arguments include statistics from information bodies such as WRAP about the amount of food being wasted in Britain annually, (paragraph 7). This article by Hennessy (2011) was published before the New Zealand Herald articles by The Telegraph on April 16, 2011. The result of Hennessy’s (2011) information is that there is “confusion” over “food labelling” which has “greatly expanded over the past decade” (paragraph 2). This can lead to misinformation and the consumer becoming unclear as to what to throw away, and what foods are edible (paragraph 1). Hennessy (2011) states that the UK coalition government wants to reform the way in which packaged foods are labelled. A source from the government stated “we cannot carry on simply throwing away tonnes of food like this,” (paragraph 6 & 7). The reader is led to believe that the issue around labelling is confined to “best before and sell by dates” (paragraph 8), which is adding to the confusion surrounding food that may still be perfectly fine to eat (paragraph 6). WRAP provides statistical information on how much food goes to landfill per year in the UK (paragraph 8) stating that over half of it is edible. Hennessy (2011) says that a change to the labelling system will include a different strategy for labelling foods, whereby the health risks with the foods concerned will be available to the consumer on the label. Hennessy (2011) does not state the source of this information however (paragraph 4). The article isolates health risks in regard to the labelling system of best before and use by dates. Here ‘health risks’ is not to be misinterpreted as health risks that food may carry, such as grams of fat or additives. For example the article suggests that food such as fish and poultry would be labelled with “detailed warnings of potential risks of food poisoning” (paragraph 4) if goods are consumed after a certain date. Hennessy (2011) also suggests that critics have put the blame on supermarkets who offer specials such as “buy one get one free” but does not state how these special offers relate to the amounts of food a household wastes. He rather leaves the reader to conclude that

specials may lead to over stocking of a particular product, which is then not used, which then leads to waste, but he does not explicitly say this, and neither does WRAP (2007).

At the outset, the research project could suggest that the relationship between labelling and household food waste seems quite distant and in both Hennessy (2011) and Davison and Johnston's (2011) articles neither authors include quotes from consumers as to whether this is the case. Both articles propose that labelling may be to blame for high amounts of food waste but only Hennessy (2011) points to WRAP as a reference to support this. There is not a first-hand account from the consumer if this is the case, in this article. The BBC (2011) does attempt to gather evidence from the general public on the issue of labelling although produces a very balanced argument. Six people were questioned on the street about food labelling; two people suggested they stick to sell-by dates, three were more frugal when it came to labelling and one person provided a balance stating "if it's bad [food], it's bad, but I don't throw food out just because of a date" (BBC, 2011). However, a further search reveals an article written earlier in the previous year, March 2010, which states that WRAP and government funded Food Standards Agency (FSA) have completed a survey with customers. The Head of Consumer Campaigns at WRAP said "[r]esearch carried out by WRAP and the FSA has revealed that consumers are confused about the meaning of date labels and also that labels are not always applied consistently by industry. For example some cheddar cheeses may carry a 'use by' date while others carry a 'best before' date" (The Telegraph, 2010). This coincides with Stuart's (2009) discussion on labelling whereby he points to WRAP and FSA as a reference of statistical information. This article from The Telegraph (2010) appears to be the earliest available newspaper article online whereby food waste is of printable importance.

The literature surrounding food waste is sourced majorly from newspapers and online articles following current food waste issues. Overall, the only research underpinned by statistics and facts originates from WRAPs' (2007/8) household surveys and Stuarts' (2009) evidence based text. Written works appear in the New Zealand media (online and traditional journalism) concurrently with British published reports. For example Davison and Johnston's (18 April, 2011) food labelling report appearing two days after Hennessy's (16 April, 2011) report; Television New Zealand's' food waste report (11 Jan, 2013) appearing one day after the published IMechE report (10 Jan, 2013). Due to the close timings of the published articles assumptions can be made referencing how closely New Zealand follows UK narratives

surrounding food waste topics. What is unclear from all NZ based articles is the current NZ situation supported with referenced facts, statistics and comments from a governing body or the public. From the available literature the food waste situation in New Zealand is unclear, therefore making declarations and reports about food waste is difficult to verify.

## Chapter 4

### Methodology

The research is conducted using case study methodology. Silverman (2010) states that Keith Punch (1998, p.150) summarises a case study quite simply with “the basic idea is that one case...will be studied in detail...the general objective is to develop as full an understanding of that case as possible” (p. 138). By using one, or a number of methods, a detailed enquiry of a particular phenomenon may start to form.

The research project examines behaviour within a family in relation to food waste which forms the ‘case’ for investigation, and how selected websites inform their efforts to make a reduction of waste. The family acts as an instrument through which the research question can be answered. A case study (multiple or single cases), is an in-depth investigation into a particular issue, and the different types of case study that can arise from a research question (Silverman 2010; Yin 2003).

Silverman (2010) states that Robert Stake (2000, p. 139) identifies three different types of case study;

1. “The *intrinsic case study* where ‘this case is of interest...’ no attempt is made to generalize beyond the single case or even to build theories.
2. The *instrumental case study*...[and]
3. The *collective case study* where a number of cases are studied in order to investigate some general phenomenon.”

The research in this case study falls under that of an instrumental case study, into the issue of food waste. This is a study in “which a case is examined mainly to provide insight into an issue...although the case is studied in depth, the main focus is on something else” (Silverman, 2010, p.139). This statement relates to the research into the family’s food waste habits, even though the main investigation of the research is to analyse the quality of governmental and institutional website information in relation to food. Food waste is to be studied in depth, although the ‘main focus’ is on how informative and practical website information provides a solution to household food waste.

It is also appropriate to summarise Yin's (2003) findings when determining a definition of case study. He defines a case study as

“an empirical inquiry that

- Investigates a contemporary phenomenon within its real-life context, especially when
- The boundaries between phenomenon and context are not clearly evident” (p. 13).

The contemporary phenomenon is the issue of food waste. The context is within the home, and useful website information to reduce waste. The relationship between the family, their food waste, and website information does not yet exist. It requires research undertaken between the website information and the family's' waste to determine what, if at all, relationship exists between the family's' food waste, and website information.

The case study of family's food waste habits and how existing information can help them to reduce their waste is to be explored. In this case the 'study' surrounds the family's food waste habits, and website information to change their behaviour. The case study is not a general study of everyday family life but had been narrowed down to one issue within a single family environment, coupled with the impact of website information to lead to a reduction of food waste generated within this family. This agrees with what Silverman (2010) writes as an analytical feature of case study research, stating “case studies seek to preserve the wholeness and integrity of the case. However, in order to achieve some focus, a limited research problem must be established that is geared to specific features of the case” (p. 138). The limited research problem, in this instance, is the study of food waste over a defined period of time and how it could be lessened using websites as an information tool in the investigation. The theory was that if the right information was available and practical for the family to use, it would be possible to reduce food waste.

To answer the research question “how do websites help inform a family to reduce their household food waste”, is primarily a qualitative study however, a combination of qualitative and quantitative methods are used. “Quantitative methods may sometimes be used to infer from one case to a larger population” (Silverman, 2010, p. 140), and research would begin to use Silverman's' comparison technique by testing the statistical data (summarised by Broatch, 2009) against raw data collected from a family, first hand. This quantitative data could then, possibly, be used to reflect against a larger population. However, this study does not intend to

generalise any findings from the case family to a larger group or population. Quantitative data collection methods for this research are consequently limited. This is so that the research does not become a collection of quantities, facts and figures but will begin to understand the qualitative questions surrounding food waste in the home. Conversely, Silverman (2010) remarks that a single case can give reason to a sense of generalisation “since the basic structures of social order are to be found anywhere, it does not matter where we begin our research. Look at *any* case and you will find the same order” (p. 147). Silverman (2010) then explains the reasoning behind such a statement is that a single study can produce general results. For this research, data collected is not comparable to what other families do with their waste, but descriptions of what other families *could* do, given they have the same array of information, techniques and tools available to them may be equivalent (see Silverman, 2010, p. 148). According to Silverman (2010) and Yin (2003), case study research may be able to form conclusions about best methods for families to aid decreasing their food waste.

Using a case study to frame the research project ensures that qualitative methods for data collection and analysis can be used in favour of quantitative methods. Data for this study include interviews with the family, records of food waste, records of website information as utilised by the family, and notes and recordings of discussions between the researcher and the family. Interview questions are posed in such a way that the family feels comfortable enough to discuss collecting data, and expressing their thoughts and views on food waste. Questions asked will be primarily centred on their personal data collection for that week. This type of questioning may then lead to naturally occurring talk which will be recorded during data collection. This technique for recording data ensures nothing is missed or forgotten when taking notes, but also serves a purpose to replay participant responses. The research takes into account the unpredictability of collecting valid responses when conducting interviews. Should “interview responses be treated as giving direct access to ‘experience’ or as actively constructed ‘narratives’ involving activities which themselves demand analysis” (Silverman, 2010, p. 48). These discussions that concern ‘narratives’ and ‘experience’ is what the research aims to record. The family’s personal experience with food waste, and narratives surrounding their experience would neither hinder nor aid the data collection process. To record a narrative would attempt to give a fuller understanding to the case for analysis. The point Silverman (2010)

raises here about the honesty of an experience would be discussed further within the data analysis chapter.

The original purpose of this research is to explore government websites to test how informative and feasible their information on food waste is, and whether website information makes it possible for a family to change behaviours and to reduce household food waste. The end goal is to provide a specific example of whether or not this change in behaviour is possible and facilitated by the respective website information. This research is only a snap-shot of the food waste issue, and would not be an example to use for all families. However, through conducting this research in this way, an initial assessment of government food waste websites may be possible. The outcomes of this study could be to glean what type of information works with the test family to reduce food waste and what methods could perhaps be employed by other families to reduce food waste.

As the family are being used to aid the evaluation of website information, the research adopts some functions similar to content analysis. Content analysis is usually confined to texts (Silverman, 2010) where-by “researchers establish a set of categories and then count the number of instances that fall into each category” (p. 147). This method is very rigid and usually used to produce codes and values for the data collected. This research project uses similar techniques to code interviews and data tables. The set of categories in this case are the “useful information found on websites”, and the ‘count’ is the number of times the same information or a useful piece of information becomes available for the family to use (see data collection tables figure 27 & 28). Content analysis of texts will occur, but only for personal website analysis by the family, and on a very superficial level. The ‘text’ in this research is not the traditional manuscript as thought of primarily by researchers, rather ‘text’ found within the three websites being used. Data will be categorised as ‘information found’, ‘information used’, and ‘practicality of information’ within data collection. Thematic analysis is integrated into the research via website examination and by way of data collection. For this research coding interviews is used as a qualitative technique, recording what waste prevention information was found, how it was found, and how useful the information found was.

In summary, this study uses a case study approach to frame a typical food waste situation in a NZ family and deploys various techniques from content and from thematic analysis to examine how the family utilises website information to alleviate their food waste situation. This examination is further supported by interviews with the family as well as notes taken of the narratives offered by the family about their individual food waste habits.

## Chapter 5

### Research Design

This research initially begins by creating an individual test experiment of the current household food waste situation in New Zealand. Previous research into this topic included visually and physically collecting food waste at home and at the supermarket (figure 2). There are various reasons as to why supermarket waste may happen. Categories of use by and sell by dates dictate how food is stored and when it is discarded (see Stuart, 2009). However, some fruits and goods found during supermarket collection experimentation had no sell by date but were not aesthetically pleasing; ripped labels, broken lids and dented tins, although the product inside seemed fine. The question that arises from this initial research at the supermarkets is how much food waste is created, as individuals? Therefore experimentation into individual food waste needs to take place to record data against published information from Broatch (2009) and Davison (2011). By calculating Broatch's (2009) statistics on individual food waste to an amount of 500g per person per day, a need to test this assumption ensues. Devising methods to record data visually and weighing food within the home initiates a small scale research project. Results from individual experimentation are shown in Figure 1.

**Figure 1:** Individual Experimentation by Researcher

Day	Meal/Food	Food Wasted	Why it was wasted	How it could have been prevented	What could have been done with surplus food?
Monday	Pork chops	4 strips of fat from chops. 1 slice of potato. (150g)	Don't like to eat thick fat from meat, potato fell on floor (partner threw in bin).	Could have bought leaner chops/a different cut of pork at supermarket. Could have washed potato that fell on the floor.	Potato could have been composted, if we had a dog the fat could have gone to the dog.
Tuesday	Mash potato	¼ of a small pot of mash potato. (110g)	From previous Saturday, forgot to make fritters on Sunday morning.	Could have made fritter for Sunday morning breakfast. Could have made less mash potato.	Made into fritters (which usually happens) or composted.
Wednesday	Smoked chicken salad (takeaway)	4 or 5 cubes of mango dressing (10g)	Dressing too overpowering for salad.	Less dressing on the salad. Could have eaten it but was full already.	Composted
Thursday	-	None	-	-	-
Friday		¼ of a small pot of rice (100g)	Saved from previous Sunday to make another dish with but forgot about in back of fridge	Remembered food was there. Made a dish on Monday morning for dinner. Cooked less rice.	Frozen/composted/made another meal.
Saturday	Chicken burger from work	Slice of tomato, small lettuce leaf, little bit of burger bun (couldn't measure)	Too full to eat	Could have kept half of burger, half way through meal for later when I got hungry again. Restaurant could 'down size' their burger.	Composted
Sunday	Roast Dinner	2 Half potatoes, ¼ handful of peas, some gravy, large cube of pumpkin (220g)	Partner was too full to eat	Not over-filled plate, just taken the meat and a few vegetables, instead of the same amount of meat and vegetables.	Instead of thrown away could have been made into 'bubble and squeak'². If food hadn't gone onto plate (with gravy) could have been retained for another dinner/composted.

Tracking an individual experience with food tables and photographs ascertains whether the deduction gained from the Sunday star Times and NZ Herald can be tested, and whether these statistics are relevant. The calculation of these statistics came from Broatch's (2009) article by

NZ Sunday Star Times who reported waste to landfill in tonnes. 3.2 million tonnes of rubbish were going to landfill then, 23% of which was organic waste. This equated to 736 thousand tonnes of organic waste in 2009. For the New Zealand population, the given figures, divided by 4 million people, calculates a figure of 500 g of food waste per person, per day.

Figures 2, 3 & 4 visually records the contents of a supermarket bin throughout the individual experimentation. This coincided with media coverage on the topic in April 2011.

Figs 2, 3 & 4. Contents of a supermarket landfill bin photographed and gathered by the researcher. (See Appendix pp. 137-139).

**Figure 2:** Contents of a Countdown Supermarket Bin (April 2011)



**Figure 3:** Contents of Landfill Supermarket Bin (June 2011)



**Figure 4:** Inside the Landfill Bags (June 2011)



A photographic assessment of the food waste project over a period of one month determined that there was a need for the project to gather more factual data. Quantitative data collected in isolation from figure 1 is informative but numeric, and does not deduce the reasons for or find methods to question individual scenarios relating to food waste. Collecting, weighing and recording food waste cannot answer why one might waste food in the first instance, or how this waste could be prevented, what gets thrown away, and what can be done to manage the excess food waste? Previously mentioned in the literature review by Stuart (2009, p. 42), that it tends to be individuals who discard the highest amounts of food, it was apparent that for more detailed results, a family was needed to test the questions, and gather additional qualitative results. The experiment was adequate for devising a recording plan for data collection.

This research design uses a case study family of four people, to generate valid results by collecting, and recording the household food waste they generate and subsequently trying to reduce their personal food waste volumes, over a period of time utilising NZ government website information.

First, the case family is introduced to the aims of the study to;

1. Log and analyse what a normal household generates as food waste is over a specific period, and
2. Discover whether steps, if any, can be made to reduce the amount of discarded, edible food, over a period of time, using governmental based websites.

Next, data collection occurs in five phases as shown in figure 5:

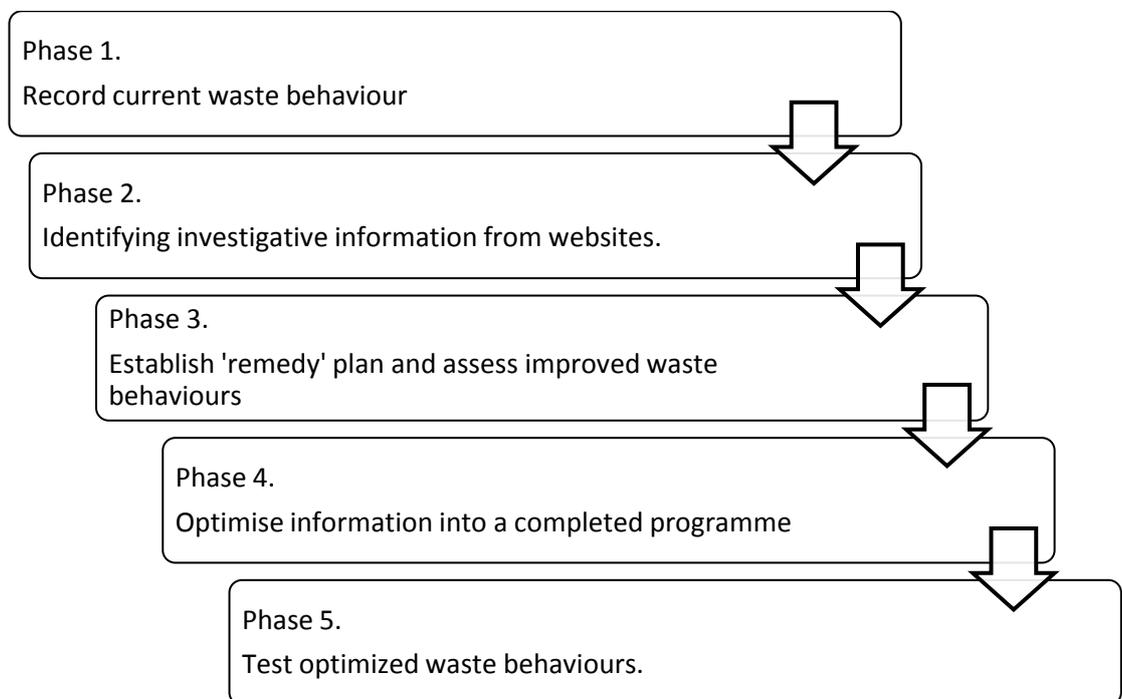
1. Identify current waste behaviour by recording food waste (type and amount)
2. Reviewing and assessing food waste prevention information from relevant websites
3. Establish a suitable 'remedy' plan and assess changed waste behaviours (if any)
4. Optimise information into a sustainable food save programme
5. Test optimised waste behaviours

The researches' five phases' document and measure food waste relating to the household over a period of three months. During the first phase the family is asked to record the weights of discarded food within the home. This is to set a foundation, or base control, for the research. All

edible food waste is collected and then weighed by the family. The collection method uses a small plastic container to collect food waste whilst cooking, and to collect again after eating. The collected food waste is then weighed on a set of small scales. This happens for all meals throughout two weeks. It includes food that is used to cook with, or bought throughout the day to be eaten, even if there is only a small portion of waste. The family was given data collection sheets and weighing equipment to record their results for the research project.

For the purpose of this research finding a typical New Zealand family (Statistics New Zealand, 2012) was relevant. Although this was designed to be a small scoping study, the results would reflect the 'norm' regarding a typical sample of the New Zealand population. Indicators as to what the 'average family' is in New Zealand are varied. In The UK for instance, an average family profile is described as having 1.8 children and has an average wage of 32,000 GBP. In contrast, however there seems to be less reliable information on what constitutes the average NZ family. Following the data relating to UK, this study assumes a family would be two parents and two children.

**Figure 5:** Data Collection Phases



## **Phase 1**

It was important to explain at the outset, the benefits to the family of being involved in the research. For instance there would be long-term financial gains by understanding how they generate waste, buying surplus produce, poor storage, cooking, disposing and so to avoid wasteful practices. The children may already be learning about the concepts of reduce/re-use/recycle at school and this research project could be an opportunity to further learn about food waste and put these principles into practice at home.

This first phase of research requires the researcher to work with the family for one week to establish their current disposal methods with regard to surplus food generation. This is the preliminary week of investigation which establishes foundation data for the research (the control). This foundation week will involve the family collecting data on their current surplus disposal and re-use of food. The family are then given the 'tools' with which to consistently collect the food data needed for the study. The researcher decided the tool box would be composed of by written record, photographs and weight measurements of discarded food. This decision was made based on Chapter 4 of Silverman's' Doing Qualitative Research, (2010) in which he describes different methods for collecting data. These methods range from interviews, gathering online data, using audio/ visual data and combination approached to data gathering (p. 43-61). These multiple methods provide accurate data regarding discarded surplus food, and supply written information regarding what gets thrown away. At the start of each phase it is important to spend an appropriate length of time with the family to discuss the methods, and equipment to be used in that phase of the research. This time was also appropriate to ensure they understood the tasks and the reasoning behind the phase. (The researcher would not have to be present at the time of food preparation or consumption as the research was not focussed on how they cooked or what recipes they used.) After each phase of data collection there would be a feedback session with the family to assess the data collection phase. If there were any amendments or improvements to the data gathering technique that could be merged with the next phase of research it would become apparent here. Silverman also states that Miles and Huberman suggest expanding field notes, as per feedback session as during case studies "you [the researcher] forget to think, to make deeper and more general sense of what is happening" (p.231). This provides a chance for both participants and researcher to voice any concerns about the project. Preliminary investigations before the start of Phase 1, established the

research design and appropriate tool box using the individuals as an example. Designing the 'food table' proved to be a good method of recording surplus discarded food (Figure 1). The family could simply and accurately record, via this food table, what got discarded and why in the study (Figure 6). The researcher remains available to the family for the duration of the project should they want assistance with data collection for any reason.

**Figure 6:** Foundation Food Table

Day	Meal/Food	Food Wasted	Why it was wasted	How it could have been prevented	What could have been done with surplus food?
Monday					
Tuesday...					

The following table, (Fig 7) would be used as a column format to indicate what types of food were bought that week and whether any of it was composted. This is used in addition to the first foundation table for phase one, (Fig 6) to gather any other relevant data pertinent to the study for analysis. Two tables seemed easier to complete, rather than one extensive data gathering table.

**Figure 7:** Weekly Food Table

FOOD → DAY ↓	Bought	Used	Stored	Discarded	Composted
Monday					
Tuesday...					

Throughout the research the family and the researcher discussed food consumption. These topics for discussion were drawn from literature surrounding the current food waste issue, Davison, (2011) and Stuart, (2009). The themes from existing literature suggested analysis should focus on buying (shopping), preparing (cooking), eating (consuming), storing (recycling) and discarding (waste) which were key factors in why households and individuals waste food. Interview style questions were constructed for the family to provoke a conversation around these themes, which was recorded, but at no point was a response suggested, the researcher took care to remain neutral. Naturally occurring talk was also documented throughout data gathering as "the beauty of naturally occurring data is that they may show us things we could never imagine" (Silverman 2010, p. 132). After this initial week of research there was time to process the information which was gathered.

## **Phase 2:**

Phase two was designed as an interim phase. This was a staging point between;

- a) Establishing and recording data for a foundation, set from the case study of waste collection in phase 1, and
- b) Creating an 'improved food waste behaviour plan' by utilising existing knowledge, hints and tips.

In this study for ease, having access to and using website information will be critical. The websites have been chosen for their dedication to reducing food waste. [www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com) was founded in the UK by WRAP (Waste Reduction Action Programme) with British government funding to make the public more aware of food waste and its environmental impact. WRAPs' motto is "working together for a world without waste". The website encompasses this idea for food waste. It is a well-known website and is referenced in the literature by Stuart and also when searching generically for 'food waste reduction' through NZ search engines on the internet.<sup>1</sup> Another website yielded from a specifically NZ based search on food waste was [sustainability.govt.nz](http://sustainability.govt.nz). This website suggested different sections for recycling with different suggestions for each recycling topic. The third website to be used is the forward site for [sustainability.govt.nz](http://sustainability.govt.nz) which since closed but can be located at [www.mfe.govt.nz](http://www.mfe.govt.nz). This will be useful as it may have the same suggestions as the closed website, and website affiliation with the government suggests integrity. It was anticipated that in stage 2 it would be noticeable through the data gathering, what was wasted by the family and therefore how that could be avoided. This would result in the need to find information and identify solutions to the problem. The 'remedy' to food waste generated in the family would be to form a plan of action with the objective to "reduce/re-use/re-cycle" where data collected mainly from governmental-based NZ websites will be utilised.

The websites used to identify information and underpin the improvement plan, will be [www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com), [www.mfe.govt.nz](http://www.mfe.govt.nz) and [www.sustainability.govt.nz](http://www.sustainability.govt.nz). The latter information website was an important part of the research and one specifically aimed at NZ, the information gained from there will be used in paper format as the web site was unexpectedly

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<sup>1</sup> Google.co.nz, Bing.co.nz and Yahoo.co.nz all return [lovefoodhatewaste.com](http://www.lovefoodhatewaste.com) as a suggestion when searched, April 2011.

taken down in September 2011. Fortunately a hard copy was made of the site at the beginning of the research project because the information on the website was well informed and advised the literature review. This phase will clarify what available information or not the family uses already. This information will be recorded in order to compare phase 1 knowledge (quantitative) to that gained as the project progresses and to be reassessed in phase three. (See figure 27). A tailor made 'program' will be developed for the family and will be constructed to gauge if the program can be effective to reduce and/or enable the reuse of their surplus food in the latter part of the research.

### **Phase 3:**

This phase, part three, is to establish and implement the 'remedy' plan with the family and assess if there are any improved waste generation/reuse behaviours evident yet. The researcher will revisit the family to assist with the implementation of the proposed 'remedy' plan. A discussion will take place with the family here, including a "show and tell" conversation around the 'remedy' plan. Silverman states "not to have a predetermined pattern [like surveys]...interviews can give direct access to experience" (p.190) which is what the research will try to uncover in this phase. This involves the researcher giving the family the specific websites to use. The researcher is aware of consciously directing the family to a specific site, however uses judgement so as not to direct the family specifically to information within the site. This is to avoid the researcher influencing the data collected.

To assist the family in creating a remedy program they will be given the website addresses and web pages as hard copy to obtain information from. The third phase of data collection relies on the willingness of family to engage with the research, by reading and interpreting methods suggested by websites to reduce their edible household food waste. How the family reads and interprets information should be done by themselves with no input from researcher. This is so that the researcher does not influence what the family should be looking for, and therefore influence the data which is collected. The only input the researcher should have in this stand-alone experimental phase is direction to the websites. The websites should be accessed individually and the information given by each website separated and applied holistically to the problem under investigation. This will ensure separate data collection and analysis later will take place to assess the success of the information from each source in relation to the possible

result, which could be a reduction of waste. The websites will also be measured with two objectives; how the website works as an information tool, and how practical the information given is. The plan will have to take into account what the family can and cannot practically do. If there are particular family commitments that prevent the plan from working over this period, or if there are any other circumstances that prevent the plan's implementation, for example the family may not have a freezer, or a place for a compost bin, these will have to be considered in the findings.

Through recording food waste the family will be supported by the researcher so that they do not feel abandoned, as they will be closely tied to the project and committed for a six week period over three months, to the research project and results. Once again the family will use the same data collecting techniques as in phase one, but with the adapted 'solutions' found in their web research applied to improve their existing situation. It is at this stage where it should be apparent whether the governmental information given to reduce food waste is effective or not.

For this phase a refined data collection table will be used (figure 8). This is used to ensure correct collection of data, but also to simplify what is being recorded by the family. Phase one was to ask what could be done with discarded food, before website intervention, whereas this phase three, asks the reasons for non-consumption of edible food only, after the website information intervention has taken place. A further data collection sheet is specifically designed for the study of the websites (figure 9). Again this information is collected separately for each website and inquires about the type of information found, whether the suggestions are practical enough to be used in a family environment and whether the material given was useful to successfully reduce waste.

**Figure 8:** Data Collection Table

Day	Discarded Food (Weight) (Total Amount in Grams)	Type of food (Peel, skins, piths and pips)	Could be edible? (Yes, No)	Reasons as to non-consumption
Monday				
Tuesday...				

**Figure 9:** Website Enquiry

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
Monday					
Tuesday...					

**Phase 4:**

Phase four acts as a bridging phase between the information collected from the first, second and third phase. Here the researcher works with the family to corroborate findings and create an optimised food waste plan. Over this time an optimised resolution plan for their habits will be created. The optimised plan will aim to include information from websites, but will also consider the primary field study data collected throughout the phases. Combing all the information found primary and secondary, quantitative and qualitative data relative to the case study will give the greatest opportunity to reduce family food waste.

**Phase 5:**

The final phase, five, relies on the family solely to implement the optimised plan. This further period of time will establish whether the family received enough information to change their habits surrounding surplus food, whether there was enough information provided for them to be able to change their habits and whether it was practical for them to do so. Any changes in behaviour should be noted and the researcher will be able to assess the family for the final time and ask questions around the plan. This should probe into whether the plan was right for them, if there was enough information given for them to implement the plan correctly, and if it was a workable plan considering their daily routine. The table in figure 9 will be again used to record data.

The research design has been created with a case study methodology in mind. However some of the features typical to a case study will not be followed here. For example, typical interviewing questions and observation protocols will not be used by the researcher. This is because the researcher does not want to be responsible for implementing various outcomes during the data collection. The data should be gathered by the family as it is them who will have to address changes, if any. The drawback from the researcher not being heavily involved in the data collecting is that the family could be dishonest, or change data results if they felt

necessary. However the benefits from being honest during this data collection will yield better results for both researcher and family if no tampering of data occurs. Silverman (2010) states that Bryman (1988) says

“There is a tendency towards an anecdotal approach to the use of data in relation to the conclusions or explanations in qualitative research. Brief conversations [and] snippets from unstructured interviews...are used to provide evidence of a particular contention” (p276). To avoid this all interview transcripts, notes and data collected will be made available in the appendix pp. 139-148.

## Chapter 6

### Data

This chapter presents all the data collected for this study. All raw data can be found within the list of figures, tables and appendices. Data collection happened in five phases as outlined in the research design. It was gathered chronologically, however for this chapter data is discussed in three segments;

1. Family's food waste behaviour before research intervention
2. Treatments of website information
3. Optimised waste reduction behaviours by the family

The purpose of this study is to identify, to reveal and to explain characteristics of food waste and website family intervention study. This gathering of data occurs over a three month period. Data is recorded in three methods; audio recording, tabular format recording and visual images. The audio recording only occurs at three points throughout data collection. The periods where audio is collected are at key times during research. These are at segments (1) after an initial data collecting period, (2) during website intervention and (3) after use of website intervention. Tabular format data collecting happens throughout all stages listed in the research design. These tables are completed by the family throughout the research and are provided in the appendix. They have been used in this chapter to reference talking points throughout and are also a source of quantitative data. The tables collected and what they reveal are analysed further in the data analysis Chapter 7. The visual images are of a supporting nature used to illustrate how the family gathered and stored food within the home. Some of the images shown relate to storage solutions or discarding solutions within the family's home.

#### **Background of family**

The family has been in Auckland for 3 years. They have 3 children. They are very well informed about environmental issues. This informed view derives mainly from them being involved in "outward bound scheme". This is a scheme whereby school children and families take residence in rural areas and, in essence, live off the land. The father taught at an outward bound centre in the South Island and the family lived there for 5 years, whilst the father ran

classes. The people who stayed there had to live from the land and return all waste back into the land. There were compost areas and worm farms. The food waste that went into these composts would be separated first into different categories for compost. Meat went to pigs. Bodily waste went to a central pond area which was then dispersed through a pump into an irrigation system. Rainwater was captured, filtered through a UV light system, and then used as clean water. (See Appendix pp. 146-147).

The family has moved around a lot since then, 10 years ago, and therefore does not have a compost system at their current family home. They eat at the dinner table. The children are asked how hungry they are before they are served food by the mother. The father will not eat anything that has gone past the expiry date. Although the mother is practical in assessing whether food is good or bad to eat by smell/touch and will not mention to the husband if she has used something that is 1 or 2 days past expiry, (see Appendix I and I-1).

#### **Family's food waste behaviour before research intervention**

As the research focuses on website intervention/information to reduce food waste, it is purposeful to identify an initial benchmark with regard to the family's current food waste situation. Meetings were set with the family to discuss initial collection and recording of their current food waste habits. This is in order that a quantitative measurement of their current food waste can be assessed, to compare against another quantitative measurement of their food waste after a period of website intervention. This primary measurement of food waste is recorded over a two week period so an average amount of discarded food can be calculated. For example, if the family ate more takeaways one week, or ate in restaurants more frequently one week their food waste data may be irregular. A period of two weeks or more will be able to determine an average calculation, so a solid quantitative foundation of waste can be set. Assessing averages gives the family an opportunity to begin the research without benefiting from incorrect weight calculations. The foundation for waste collection starts when the family is prepared and lasts three weeks.

This record of the first segment of food waste data with the family is at their home of residence in Auckland, NZ. A brief outline of the research project is given to the family and their comments recorded via note taking. This informal meeting has been set to formally introduce the research

project to the family. The family has been collecting food waste to establish their waste calculations for the first week, unaided, in a container to be weighed (see appendix E). This initial collection period launches the project. To enable the family to take full advantage of the information from the websites, the research needs to record the types of foods that were discarded. This is so that any information found in the latter stages of research would not be ignored due to limited information recorded during this foundation phase. Figure 10 shows what types of food the family collected for that week. Figure 10 visualises the ways in which the family collects food. At this point the family has no tables to physically record their data; however, the way in which they have collected their food preserved the food items needed to calculate their food waste.

**Figure 10:** Broken Down Food Waste Items for One Week

Food Waste	Weight in Grams
Half a sandwich	200
Egg shells	24
Broccoli stalks	306
Carrot tops + 1 whole carrot	120
Banana peel	50
Chicken bones	438
Miscellaneous (comprising of broken cracker, tacos, mincemeat)	360
Total Weight in Grams	1498

In this study, establishing an entirely quantitative food waste scenario for the family is not the actual aim of the research. As the research is interested in how information from websites can help reduce the family's food waste, it is essential to gather information on what factors may influence discarding food. How well website information might work could not be recorded by quantitative means. For example, questions posed such as "how well did the website information help you, on a scale of 1-10?" will not return meaningful results, as much as "how practical was the information from the websites?" From Stuart's waste review (2009) and from the articles produced by the NZ Herald (2011), available information on reducing food waste for the consumer focuses on labelling, shopping and storage issues of food. Connecting the concerns from the literature to this study is essential to form the framework to analyse website information.

The conversations recorded during the foundation period focus on the family's personal food and organic waste situation in their household. These conversations are recorded via note-taking. The family is willing to describe their methods surrounding eating, shopping, cooking and storage of food within the home. The children are described as "always looking for food," therefore food has to be readily available, quick and easy. Another factor that plays into this 'quick and easy' lifestyle is the information that their choice of supermarket is not in their own town. It is located about 5 km away so the opportunity for easily accessible supermarket shopping is not a viable option to them. Therefore the mother buys in bulk, and 'quick and easy' food for the children is the mother's home cooking, as opposed to takeaways or convenience shopping for dinner.

### Shopping

The family shops weekly. The family freezes leftovers and re-uses leftover scraps for pizzas. The scraps for pizzas are usually left over mincemeat from tacos/bolognaise or chicken pieces from left over roast chicken. The mother of the family describes that they shop in bulk as the supermarket is far away, but she is aware of not over-stocking on perishable foods such as fruit and vegetables. Milk and dairy products are also bought weekly. The mother shops to a budget and the family consumes all fresh items by the end of the week, in time for the next weekly shopping. She makes a shopping list and sticks to it. She describes herself as a "brand tart" and has no brand loyalty when shopping. She shops for specials on food. She shops for a good special regardless of the brand she is buying. She bakes a lot and mostly cooks all meals. There is the exceptional take away on a Sunday night from the local takeaway store, which may be fish and chips, a burger or sushi. Lunches are different as the children are at school and therefore breakfast and lunches are very routine, unchanged meals.

The family portrays breakfast as bread (toast) and butter of which everything is eaten, or 'light and right' cereal for one parent and one of the children, of which no breakfast food is wasted. Lunch box meals for the children consist of a nibble bag (either biscuits/crackers or a muesli bar) a piece of fruit, a biscuit or muffin and fresh bread. The children "aren't keen on sandwiches" so she would rather give them fresh homemade bread to have with butter. The father has the same routine lunch every day and spends the same amount of money on lunch

per day. This is a box of sushi which cost \$10.60. The family describes beef mincemeat as a staple food, as are mushrooms, broccoli, carrots and onions, and that these are bought weekly.

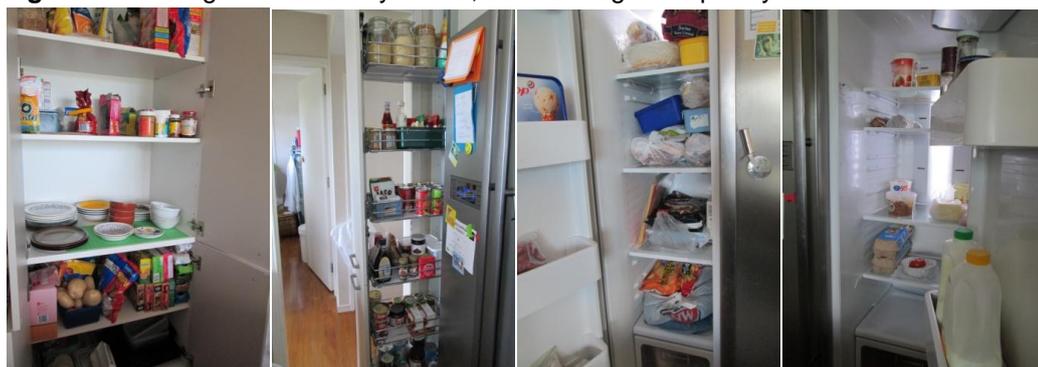
### Cooking

The mother uses pastry to make cases for tarts and Cornish pasties, or “expands it for other uses such as pizza bases or fresh bread”. She does not follow a recipe but rather cooks by eye when cooking for a family of five. The family likes to bake and will bake muffins twice weekly for children’s packed lunches. She uses fresh fruit in the muffins such as feijoas, peaches and passion fruit and does not mind if they are past their best. Her reasoning behind this is that the fresh fruit is pulverised before being added to the muffin mixture and therefore she may pulp and freeze fresh fruit before it turns bad, or will just use it anyway (see appendix F) . The mother bakes muffins using feijoa pulp from the neighbours’ gardens to re-distribute when donated. She does not boil vegetables as they are not eaten by the children, they would rather eat raw vegetables and she does not buy potatoes as the youngest child does not eat them, so they eat a lot of home-baked bread to substitute that. The youngest child does not eat fish and eats minimal pastry; they do not buy a lot of fish but there are exceptions and the child will eat them at a family dinner meal.

### Storing

The family freezes to re-use a lot of left over meals. They also freeze fresh meat to make it last longer and freeze fruit pulp for later use in sweet tarts. The family has a large fridge/freezer unit and two pantries. The mother describes using mostly everything in the pantry on a weekly basis although may have “odds things” such as green peppercorns, leftover from two years ago, and maybe some leftover dried goods (see Figure 11).

**Figure 11:** Storage in the Family Home; double fridge and pantry



From this first collection of food waste, as figure 10 shows, both edible and non-edible food items are collected. Non-edible food items are described as pips, skins, off cuts and peels. Generally, these are not eaten by most people from similar societal structures. Both types of food are collected as the family begins establishing their foundation unaided by the researcher. From the recorded data it is possible to deduce the types of food items the family is mainly discarding. Mostly these items are not whole food items. Therefore it is reasonable to assume there is no food which has expired or reached its use by date. The one exception is half a sandwich, which has been left, explained by one of the children, who had forgotten to take it as lunch. The items are mainly leftovers (crumbs of tacos and crackers) and vegetable stalks and peels (see figure 12). It is, at this point, that it becomes imperative that the family is able to use the collection tables. This is so that the family could precisely record what edible food items they are discarding and not include items such as peels and skins. Peels and skins were void from data collection as some skins are generally considered not fit for consumption, for example orange skins from commercially grown crops.

**Figure 12:** Initial Food Collection by Family



Data is recorded independently by the family. This data is noted on the first phase data collection table (see Figure 13).

**Figure 13:** First Phase Data Collection Table (gathered during a one week period)

Day	Meal/ Food	Food Wasted	Why it was wasted	How it could have been prevented	What could have been done with surplus food?
<b>Monday</b> 03/09/2012	Butter Chicken with rice Mud cake- Birthday	None	N/A	N/A	Surplus food was frozen- to be eaten later in week. Dessert will be eaten again
<b>Tuesday</b> 04/09/2012	Chicken Pad Thai Birthday cake with cream	Veggie stalks	Don't eat these	N/A	Cake used in lunchboxes and afternoon tea.
<b>Wednesday</b> 05/09/2012	Spaghetti Bolognese Birthday cake	Tops off veggies	Don't eat these	N/A	Frozen- three servings of pasta sauce
<b>Thursday</b> 06/09/2012	Chicken drumsticks with rice and stir-fry veggies	Chicken bones, bits of rice/ stir-fry scraps on plates	Don't eat bones. Boys didn't clean plates completely	<ul style="list-style-type: none"> <li>• Cook bones down to create broth</li> <li>• Make sure family ate everything on plate.</li> </ul>	Surplus rice covered and put in fridge to eat tomorrow for lunch
<b>Friday</b>					
<b>Saturday</b>					
<b>Sunday</b>					

In the table above (figure 13), the family has only collected food waste for 4 out of the 5 days of the week (excluding the weekend). As meetings with the researcher happen on a Friday, this does not give them an opportunity to collect data over the weekend. The mother states that she would have started the data table earlier however may not have received much food waste from the previous weekend as the “children were out of the house for the majority of the time”. This does not seem to hinder the data collection process, but is accounted for within the need for two weeks or more, for an average calculation of food waste.

There are no breakfast items on the recorded table. As mentioned earlier, the family eats routine breakfast meals every day, with “each person eating everything for breakfast as they

each enjoy it". If there are crumbs from toast, the mother "throws them out to the birds, only crumbs though as the children eat crusts". A lot of the discarded foods are items such as carrot peels, banana skins and broccoli stalks. The mother states that she could compost, however they seldom stay at one property for more than a few years because of work, and therefore have not invested in a traditional composting system as composting requires time.

The data collected in figure 13 is from dinner times only over four days. As mentioned before, as of the breakfast and lunch situation in this household being consistent everyday there was no need to record that data. The family column 'Food Wasted' and 'How it could have been prevented' are scarce with recordings. This is because the family treats vegetable stalks and peels as non-edible foodstuffs. If there is food that is left over, this is not treated as wasted because of the tendency in the family to freeze leftover meals. Therefore the column labelled 'what could have been done with surplus food?' in Figure 14 mostly contains information on how the leftovers are stored, or the other methods of re-use, such as snacks in lunchboxes or afternoon tea.

To define food further in these two tables a separate recording sheet is given to the family to record food items bought and used, and what was composted (Figure 14). Although the family does not have a composting system the column 'composted' was left in the table as a self-check, to query what types of discarded food can be utilised by different means. It becomes clearer from working with the family that if they did have a composting system their waste would be very low. From figure 14, it is possible to assume that the items that could have been composted are non-edible, for example veggie off-cuts. (See appendix 11 & 12).

**Figure 14:** Phase One Data Collection; cooking habits (collected during a one week period)

<b>FOOD</b> →	<b>Bought</b>	<b>Used</b>	<b>Stored</b>	<b>Discarded</b>	<b>Composted</b>
<b>DAY</b> ↓					
<b>Monday</b> 03/09/2012 Butter Chicken	800g chicken breast Butter chicken sauce Long grain rice, veggies Made a cake	Chicken sauce, sour cream, rice, salt, oil, veggies, flour, cocoa, icing sugar, eggs, butter, sugar	Frozen left-over dinner, 2 servings.  Cake wrapped and eaten during week.	Nothing	Veggie off cuts e.g. carrot, onion, broccoli, mushroom stalks/ends
<b>Tuesday</b> 04/09/2012 Pad Thai Chicken	Chicken, pad Thai noodles, nuts, lemon juice, bean sprouts, cream. Cake and cream	Oil to stir-fry  Birthday cake and whipped cream.	Nothing left  Cream Cake	Nothing	N/A
<b>Wednesday</b> 05/09/2012 Spaghetti Bolognaise	Pasta, mince, tomatoes, sauce, veggies, garlic, herbs Cake and cream	All the oil	Frozen left-overs 3 servings  Cake wrapped in plastic	Nothing	N/A
<b>Thursday</b> 06/09/2012 Chicken Drumsticks	Drumsticks, rice, seasonings, stir-fry veggies Biscuits/ cake	Oven, micro waved rice, oil	1 serving rice- stored in fridge	Chicken bones. Bits of scrap rice/ veggies	N/A
<b>Friday</b>					
<b>Saturday</b>					
<b>Sunday</b>					

The data collected in figures 13, 14 and 15 will be averaged out to produce a quantitative recording over a period of three weeks (see chapter 7). The qualitative data recorded by way of note-taking and discussion tapes is useful in assisting websites information. It is also important to note the recordings do not account for pips, peels and skins (which could easily be composted). This particular data gathering technique, of not recording skins and peels, is practised in order to focus on how website intervention can prevent, not circumvent food jettison.

**Figure 15:** Refined Data Collection; edible food waste only (collected during a one week period)

Day	Discarded Food (Weight) (Total Amount in Grams)	Type of food (Peel, skins, piths and pips)	Could be edible? (Yes, No)	Reasons as to non-consumption
<b>Tuesday</b> 25 <sup>th</sup> Sept	148gms + 48gms banana peel	Apple core- lunchbox Crackers- lunchbox Pasta- dinner Banana- afterwards Dinner- left over pasta sauce with extra pasta added Lunches- used remaining fresh bread for sandwiches. Plus nibbles: muesli bar & grapes Breakfast- fresh bread- no waste- plus coffee/ milk/ juice	No Yes Yes No	Don't eat core/ pips Got soggy in lunchbox Eyes bigger than stomach
<b>Wednesday</b> 26 <sup>th</sup> Sept	106gms  *Didn't include veggie end/ top bits	*Dinner stir-fry- few veggies. Lunches- rolls nibbles, muesli bars Breakfast- cereal dregs	Yes Yes- waste chips/ apple core  Yes	Bit of left over greens. Don't eat apple core, chips soggy.  What was left on rims of bowls (x3) others had toast
<b>Thursday</b> 27 <sup>th</sup> Sept	150gms + 255gms- bones	Dinner- veggie scraps Dinner- chicken bones Lunches- apple core/ pips Breakfast- cereal dregs	Yes No No Yes	1 child not so hungry Don't use for soups etc. Don't eat What was left on rims of bowls (x3) others had toast

The edible food waste is an important factor in the data collection process because of the need for website intervention. Non-edible items such as banana skins should not be taken into account through the weighing method of collection. This is because banana skins are biodegradable and therefore cannot be seen to count as waste at all, but rather a benefit to the food waste issue, if discarded correctly. Items such as apple cores are recorded on the table by the mother. The mother is unsure about recording these types of foodstuffs. Apple cores however do get recorded here as the mother correctly notes that some people do eat apples, all the way to the core. Also food types such as bones are recorded because although inedible in the traditional hand to mouth sense, they can be re-directed into food stuffs like stocks for soup

(see appendix E-2). The mother records these items, even though her family does not utilise them, as she realised other people might, and wants to include as much information as possible. These food items like apple cores and bones account for the majority of the weights collected for that week. In addition, the mother records foods that get discarded such as soggy chips (Wednesday 26<sup>th</sup>). The mother accounted here that even though she knew the children could have eaten these chips she has a tendency not to force them to eat food they do not want. Therefore this waste of a few chips was from what was left on three children size plates after dinner time. Recorded are also veggie scraps; however, from the explanation in the far right column it appears that one of the children was not so hungry.

### **Treatments of Website Information**

This section of the chapter discusses the role of the websites, with reference to the information the family may use. The websites were found through references from literature and also through generic internet searches. The website [www.sustainability.co.nz](http://www.sustainability.co.nz) was the first website found. This came from internet searches from New Zealand that provided a more sustainable way of discarding food; it also provided information on recycling and business initiatives to produce more sustainable outcomes. The website was found in April 2011 and was to be incorporated into the research as the only New Zealand based website that dealt sufficiently with food waste. Since 2011, however, the website closed and now re-directs users to [www.mfe.govt.nz](http://www.mfe.govt.nz). As this [Ministry for Environment] website is available for public use, it acquired the position of [www.sustainability.govt.nz](http://www.sustainability.govt.nz).

“The Ministry for the Environment has retired its [sustainability.govt.nz](http://www.sustainability.govt.nz) website at [http://www.sustainability.govt.nz/...](http://www.sustainability.govt.nz/) All content has been removed from the website however; you may find the Sustainability initiatives on the Ministry for the Environment website helpful” (MfE, 2012).

The third and final website to be used is [www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com). This website is quoted in literature from the Telegraph (2007) and Sunday Star Times (2011) newspapers. It has been established in the UK since 2007 by WRAP. “The Love Food Hate Waste campaign features a website [www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com) which gives advice, ideas on preparation, storage, portioning and recipes,” (The Telegraph, Nov 2007).

The use of websites as a waste reduction tool enables the family to make decisions surrounding their waste habits. Before recording this type of data, a list of suggestions from the website is drawn up, by the researcher, to evaluate against information the family may find; but also to evaluate against what the family already does. Suggestions from websites [lovefoodhatewaste.com](http://lovefoodhatewaste.com), [mfe.govt.nz](http://mfe.govt.nz) and the [sustainability.govt.nz](http://sustainability.govt.nz) are listed in the appendix.

The treatment of websites incorporates phases 2 and 3 of the research design. Below is a remedy plan of five of the most frequent suggestions from [lovefoodhatewaste.com](http://lovefoodhatewaste.com), compiled by the researcher, which seemed to be the website with the most information regarding edible food waste.

This 'Remedy Plan' started to form here without family involvement.

1. Planning Meals. This involves planning what to cook for the next week so that correct ingredients are bought. Using up what is left in the fridge/pantry factors into this step. Planning to cook around what is already available in the house saves money and food.
2. Use up leftovers. Correctly storing food from a leftover meal can provide food for the next day, or the following week. The website suggests freezing leftover meals or keeping them in an air tight container in the fridge to create into something else. Apart from providing links to recipes for leftovers it also suggests composting, methods of composting and links to how to make your own compost.
3. Correct storage of food. Suitable storing of food is important. Putting oranges in the fridge can give them an extra two weeks life. Suggestions such as air tight containers for rice and pastas, and how to avoid food expiration dates is provided here. Suggestions such as freezing meat before it goes off and how to blanch to freeze fresh vegetables are supplied ideas.
4. Correct portion sizes. Re-packaging of large meat pack into smaller portions for the freezer saves time, and subsequently food when preparing dinner. Managing to create fresh vegetables into frozen individual portions also saves food that may go to waste if too much is cooked. Links to [lovefoodhatewaste.com](http://lovefoodhatewaste.com) gives an interactive page, with portion guidelines for different vegetables and takes into account the number of adults and children in the family.

5. Use-by and best-before dates. Information is given here on the exact difference between these two terms. It teaches that human sense is natural equipment to detect whether food has gone off or not, as well as labels. There is also information here on how to preserve food (therefore discounting best-before dates) and how to maintain your fridge-freezer to get the most out of the expiry dates on food.

The information found on [mfe.govt.nz](http://mfe.govt.nz) was scarce regarding edible food waste. The statement below is taken from the website and was the most relevant piece of text addressing the issue of food waste: “Almost half of the average rubbish bag could be composted. Composting food and garden waste saves space at your local landfill, and using fewer rubbish bags can also save you money. A good way to reuse your food waste is to compost it or use a worm farm; both are great for the garden” (MfE, 2012).

As the website [sustainability.govt.nz](http://sustainability.govt.nz) closed down, the information gained from [mfe.govt.nz](http://mfe.govt.nz) is used as this is where the closed website redirects to. The original [sustainability.govt.nz](http://sustainability.govt.nz) website can be located in paper form in the appendix. However the paper format does not replace the website information as some links and tabs are missing and were not printed during the initial stage of research gathering.

The start of the remedy plan from feasible websites signalled the next phase of data gathering. The family are determined to investigate edible food waste only which is the only data now collected. The family starts to gather relevant information from websites to put in place to record what information may help them reduce their surplus food waste. The family continues to record their food waste data, using suggestions from the sites to decrease their food waste. The only food item that is unsuitable in the table is broccoli stalks. Figure 16 shows the data table results and the scarcity of the information in the last column. Most of the food recorded here is frozen, or re-used the next day therefore the column ‘reasons as to non-consumption’ renders obsolete for this phase.

**Figure 16:** Family's' Data; using website treatments to decrease their food waste

<b>Day</b>	<b>Discarded Food (Weight) (Total Amount in Grams) NON-EDIBLE</b>	<b>Type of food (Peel, skins, piths and pips) EDIBLE/WEIGHT</b>	<b>Could be edible? (Yes, No)</b>	<b>Reasons as to non-consumption</b>
<b>Monday</b> Chicken drumsticks (x10) with baked diced potatoes and stir-fry veggies	Discarded bones, carrot stalks, potatoes were in their skins, broccoli stalks, mushroom stalks, capsicum stalk	None that was edible	No	N/A
<b>Tuesday</b> Spaghetti bolognaise with homemade bread	Discarded all stalks again from carrot, zucchini, mushrooms, capsicum, garlic and empty tomato tins (x2)	Frozen left over sauce	N/A	N/A
<b>Wednesday</b> School Halloween Disco	Eating at school disco	Hotdogs, candy floss, fizzy drinks, lollies!!!	Nothing good	N/A
<b>Thursday</b> Butter chicken, rice	Stalks from broccoli, carrots, onion skin, mushroom stalks, capsicum ends	None discarded that was edible. Frozen left over rice/ chicken for lunch	No	N/A
<b>Friday</b> Bolognaise sauce (leftover) with pasta	Frozen left over from Tuesday night + extra pasta and cheese	N/A	N/A	N/A
<b>Saturday</b> Stir-fry with rice, vegetarian	Discarded stalks etc. long grain rice $\frac{3}{4}$ cup with lemon honey sauce.	N/A	N/A	N/A
<b>Sunday</b> Lasagne with homemade bread	Used frozen spinach, tinned tomatoes and tinned pasta sauce, mince 500gms. Discarded stalks from carrot, onion, garlic Fix this chart H?	Froze leftovers	N/A	N/A

At this point in the research, the family is instructed by the researcher to begin drawing together their optimised food waste reduction plan. This incorporates information they have found themselves on the specified websites. They will use the websites to gather any relevant information to inform their personal optimised plan of food data collection. The researcher advises the family of the specific websites but does not mention the findings from each site. This will be for the family to gather, to test whether relevant information is easily accessible to the general public, and whether any information found can inform a remedy plan for the family.

It is central to the research that the family can find information themselves, without researcher intervention. This is so that the researcher cannot influence what the family may find, and to demonstrate how accessible the information is to new users of the websites.

The family is given the website to visit as URLs. The initial treatment of websites consists of the family viewing the three websites (one in paper format) and reviewing relevant information from all three to incorporate into a self-remedy plan. This period of website consideration was one week. The family takes written notes to record relevant information gained from the websites which is then discussed further through conversations with them (see audio transcript 2). It is this treatment of websites when it becomes clearer what information is useful to the family, how they use that information, and what information is already being practiced.

The family takes notes on the different website information. The mother suggests that the site [lovefoodhatewaste.com](http://lovefoodhatewaste.com) is the most informative from all suggestions and had been particularly intrigued by their 'portion planner' tool. This website contains various methods and tips for reducing food waste in the home. A majority of the website is focussed on shopping and cooking and gives hints and tips as how to shop better to waste less at home. Some of these tips are included in the above 'remedy plan'. One of the tips is regarding shopping and cooking is a 'portion planner' whereby visitors can input the food item they want to use, against the number of people eating, and the site suggests the amount of that particular food item to buy. For example, a recipe with roast potatoes; users' first click on potatoes, then input family members, and the site suggests the amount of potatoes needed for a family of that size (see figure 17).

**Figure 17:** Example of Portion Planner; from [lovefoodhatewaste.com](http://lovefoodhatewaste.com)



The mother comments on the usefulness of the tool and describes the tool as overestimating a lot of food quantities. As from the example above the site suggests 19 small potatoes for a family of five having roast potatoes. It is unclear, she points out, whether this is a suggestion if only having roast potatoes, or if this is an accurate measurement if cooking other vegetables too? The quantity, she states, seems “too much!!!”

The mother creates her own method of testing their family’s food consumption compared to portion planner suggestions. Her personal recordings are shown below. It is explained that as she does all of the family cooking so she knows exactly what to buy, and sticks to her shopping list. Therefore she seldom buys extra fresh produce as she is aware of it diminishing quickly. This is why it was easy for her to draw up her own table of what the family uses currently, against what was suggested by the websites. Figure 18 is her example of this. Only three out of the 11 food types she took note of were accurate when compared to the portion planner. These were rice, chicken and fish. This information will only be relevant to this particular case study.

**Figure 18:** Mother A’s Analysis of Portion Planner against Current Food Usage

Food Type	Portions suggested by LFHW	2 (adults) + 3 (children) currently uses:
Broccoli	8 florets	6 florets
Carrots	3 medium	2 carrots
Zucchini	2 large	1 zucchini
Capsicum	1 large	½ caps
Mushrooms	320gm	100gm
Potatoes	7 medium	4-5 medium
Beef (mince)	450g	500-700g
Chicken	600g	600g
Fish	600g	600g
Pasta	1 ½ cups (380g)	200-250g
Rice	1 cup (250g)	250g

Queries from Mother noted on the table:

Are portions based on a bigger general sized populous?

Are veggie portions [calculated] as if they are the only 1 [thing] on plate- seems like a huge amount when we have several veggies on a plate.

Will compare the weights I purchase for meat and keep it in mind for chicken.

Will now date when I freeze a meal.

The family is left with recording tables for phase 4 and 5. These phases are described as optimised family waste reduction behaviours. They are instructed to record any viable website information found into the table. Any information found that is already taking place within the household will be recorded in this phase 4 collection table also. Weighing of food continues to happen simultaneously, if it is edible waste, and the websites had no suggestions for the item.

### **Optimised Family Waste Reduction Behaviours**

A meeting between the family and the researcher discusses what information they have found and put into practice. The three websites are discussed separately, along with suggestions the websites has made to reduce waste. The mother acknowledges that the data collection tables looked quite scarce. It later transpires this was because a substantial amount of suggestions from the websites are details she already puts into practice, such as 'shop to a list' ([www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com)). The tables are laid out in a format whereby the family can record various points. The points are; information found, information used, practicality of information, achieved/successful and time spent on site. The analysis of these tables will be included in the following chapter. From glancing at the information recorded (Figures 19, 20 & 21), it is possible to deduce that [lovefoodhatewaste.com](http://lovefoodhatewaste.com) provides the most information whilst [mfe.govt.nz](http://mfe.govt.nz) is limited with the information it provides. For [lovefoodhatewaste.com](http://lovefoodhatewaste.com) the family notes "learnt the most from this site- in regards to portions of meat & veggies, pasta & rice. Don't agree with all portion sizes but very interesting to note my differences". Here the family focuses on what has been found through the websites portion planner. Discussions are based on what the differences may be in terms of size of vegetables estimated (see appendix H-2) and the differences in portion planner compared to their notes. Could this be because of the different staple foods a country has, the difference in population size or because the website it set up to

deal with individual portions, rather than a range of vegetables that may be used for dinner?

This will be looked at further in chapter 7.

Figures 19, 20 & 21: Optimised Family Waste Reduction Behaviours

**Figure 19:** www.lovefoodhatewaste.com

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
<b>Monday</b>	*Informative website- needs a seasonal change to suit southern hemisphere recipes				
<b>Tuesday</b>	Fruit and veg waste Potatoes the most waste Recipe tips	Checked fridge was set at correct temperature	Freeze and date foods Always have pasta, rice as staples Portions to suit pax (number of people)	→ Do and will date now Do this already  Always do this and make a little more for lunches	30 mins/ yes
<b>Wednesday</b>	Portion planning	Looking at veggie quantities	Making a note of portions and apply in meals and to shopping quantities	Will alter my original portions after reading this info	50 mins/ yes
<b>Thursday</b>					
<b>Friday</b>	Learnt most from this site- In regards to portions of meat and veg and pasta+ rice. Don't agree with all portion sizes but very interesting to note my differences.				
<b>Saturday</b>					
<b>Sunday</b>					

Figure 20: www.sustainability.govt.nz (closed site reviewed in paper format)

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
Monday	Plan meals for a week	Check supplies prior to shopping- always make a list, shop to a list	Common sense	Do this	
Tuesday	Blanching veggies	Store/ freeze fruit pulp and add lemon juice to it	Don't blanch veggies- good ideo but we don't have much left over that is fresh	Don't do this Do freeze seasonal fruits and portions	
Wednesday					
Thursday	*Good information [overall] and makes sense to do this to reduce waste				
Friday					
Saturday					
Sunday					

Figure 21: www.mfe.govt.nz

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
Monday	Looked around website but didn't see anything directly relating to reduction of edible waste.				
Tuesday					
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

The mother states that mfe.govt.nz (Fig 21) is not a helpful information sources and says: "it [the site] contained lots of topics around ways to reduce waste; however these were mostly

about recycling plastics, paper and green garden waste”. She also comments that she “looked around [the] website but didn’t see anything directly relating to reduction of edible waste”. This is an important website to include for this research project due to its links with the closed website. The closed website sustainability.govt.nz is included in paper format in the appendix. The mother gathered more information from this sustainability website than mfe.govt.nz. Therefore it cannot be reasoned as to why this site would close in replace for one with minimal information. Throughout conversations with the family the same topics kept arising. These are shopping, storage and manufacturing of food. These topics will be discussed further in the next chapter. The family will continue collecting data for a further two weeks using existing, and new knowledge of food waste to test their optimised waste reduction plan. The family are also allowed to collect new data through any additional methods (books, newspapers, leaflets) to enhance their waste reduction experience.

Any new information the family may find to create the ultimate waste reduction plan is discussed towards the end of the data collection period. From the data collected (Figure 22) it is possible to note, that even with the new websites found, the family implements most of the websites suggestions. The family is still not in a position to compost so cannot use that advice as a waste reduction means. However, composting solves only a portion of the waste problem, as most foods used for compost are inedible anyway, such as skins and peels. The mother notes at the bottom of the table collection the 10 most reiterated tips from the websites which by her determination are;

1. Use up leftovers
2. Use a shopping list
3. Don't shop when hungry
4. Rotate items in cupboards
5. Look at what you throw away
6. Check fridge seals
7. Portion control
8. Freeze leftovers
9. Plan a menu
10. Use a compost

These are suggestions that the mother listed as “all do-able” except for composting in their circumstances. However she states that there is no new information to be found that is “out of the ordinary”. There are no unordinary suggestions for using up stale bread or potato skins to create new foods, or different methods of composting by any of the websites. The analysis of what is found will be taken further in the discussion. There is also a chance here for the mother to state what works and what is difficult for her family to accomplish during the research process. She states that overall they feel that the project was a good experiment, but she would rather use it as a self-checker against what the family already does, rather than a means of new information to reduce their food waste. She is disappointed that there isn’t more to experiment with to reduce their food waste, with the exception of a compost bin. She is also grateful that the researcher has given enough time in between phases for them to “return to being a family” before continuing with the next stage. She also acknowledges that her family may not be the correct demographic for this type of project as they are already well-educated in the domain of reduce, re-use, recycle.

**Figure 22:** Phase 5 Data Collection

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
<b>Monday</b>	www.thedailygreen.com	10 easy ways to reduce food waste	Manageable	Already doing	10 mins searching site
<b>Tuesday</b>					
<b>Wed</b>	www.aucklandcouncil.govt.nz	2 tips to reduce food waste	Composting courses, create your own Eden website	Not in a position to create a compost or worm farm	5 mins on site
<b>Thursday</b>	www.stuff.co.nz	5 ways to reduce your food waste (Sydney Morning Herald)	All practical	Undertaking	Read article, 5 mins
<b>Friday</b>	www.good.is/post/10 ways to reduce your food waste/	UK site but applicable to NZ	Good tips	Will check fridge seals Do 8 out of 10 tips, not composting	10 mins looking through
<b>Saturday</b>	10 tips- menu plan; use up leftovers; use shopping list; don't shop when hungry; rotate items in cupboard and fridge/ freezer; look at what you throw away; check fridge seals; portion control; look at leftovers as ingredients for new meal. "All do-able"				
<b>Sunday</b>					

The methods that are used to employ data collected provide a range of techniques that should overall capture the food waste situation in this household. Data recorded will be discussed further in detail within the subsequent chapters and assessed against website advice.

## Chapter 7

### Data Analysis

Data Analysis presentation has two approaches; quantitative and qualitative. Quantitative data analysis focuses on why this method was used, what it gave to the research and how it informed the results collected. Qualitative techniques used will be discussed in relation to what information was gained from the websites, how this information was used to inform a change in the family's behaviour and why the information found created a change, or not.

The use of quantitative versus qualitative data was used to create an overall understanding of the food waste topic within a household. The primary concern for this research was website analysis which lent its hand to qualitative techniques, more so than quantitative. The quantitative methods were used to produce a quantifiable result by way of measurements of food waste. In brief, the numeric weight quantities recorded were to be used as an assessment regarding the usefulness of website information. Measurements of the households food waste would be recorded at specific time intervals (phases 1, 3 and 5 as stated in the research design) to evaluate whether website information induced a change in behaviour. The hypothesis would be that the weights of discarded food would decrease, if the websites provided practical, functional information to aid household food waste reduction.

The use of qualitative data informed the research by extrapolating website information to provide a functional food waste reduction program for the family to work with. The interesting information arising from the websites could only be recorded via qualitative techniques, with discussions and written records realising what the websites revealed. This could not be calculated in any meaningful way via quantitative methods. The critical function of this website analysis was to provide the family with new methods, or new information, which could help them reduce their food waste. Generic responses from websites such as "a good way for you to reuse your food waste is to compost" ([www.mfe.govt.nz](http://www.mfe.govt.nz)) did not address the issue of food waste for the family as their circumstances pose an impossibility for them to utilise that information. Therefore the information found from websites needed to be able to provide the family with a greater understanding of what can be done, or what other methods are available to them to produce zero grams of food to landfill waste.

In addition to the information collected from websites' material, was that the family case study provided the research with a narrative of their personal waste habits. The narrative will briefly be discussed in this chapter and again in the conclusion chapter of the research project.

### **Quantitative data analysis**

Presented in this section is any data collected that falls under the bracket of quantitative data. This will be data that was collected using equipment to measure, such as the scales to weigh food. Within this quantitative data lies the issue of edible versus none edible food. "None edible" is categorised here as skins from vegetables/ fruits, pips, peels and piths, bones from chickens, fat trimmings, any food item that is not considered as readily edible. However this also opens discussion for individual preferences when depicting what is suitable to eat, as one person's preference may differ from another's. This will be discussed in more detail in the qualitative data analysis under shopping and cooking themes, and relates to Stuart's (2009) evaluation of individual food waste.

The table below (figure 23) depicts how the average quantitative figures for phase one was calculated. As already discussed in the data chapter, the family first collected and weighed all food stuffs, including pips and peels, which was then refined to edible food only. For the remainder of the project, during phases 3 and 5, the family only recorded weights of edible food. It is important, however, that the data collected during the three week foundation period is discussed. This is so that the family's data can be unravelled slightly to unveil their definitions of edible and non-edible, for comparison against later website analysis.

**Figure 23: Averages of First Phase Data Collection (see figures 13, 14 & 15)**

Data Collection Phase One	Total weights of food	Weights of none edible food	Weights of edible food	Percentage of discarded edible food
Week 1	1.210kgs	677g 20 (carrot head) 24g (egg shells) 306g (broccoli stalks) 72g (citrus peel) 50g (banana peel) 225g (chicken bones)	513g 200g (sandwich) 100g (whole carrot) 213 (tacos, crackers, mince)	42%
Week 2	1.212kgs	962g 326 (chicken bones) 180g (broccoli stalk) 36g (egg shells) 10g (carrot head) 24g (orange peel) 386g (apple core, mushroom stalk, tomato heads, onion skin) 20g (teabag)	230g 2g (bruised avocado) 180g (soft apple) 10g (cracker) 10g (mince) 28g (slice of bread)	18%
Week 3	707grams	529g 225g (chicken bones) 48g (banana peel) 106g (apple cores) 150g (vegetable heads/tips and stalks)	178g 10g (crackers) 22g (soggy chips) 64g (left-over cooked vegetables) 82g (left-over cereal and soggy lunch box weights)	25%
Averages	1.043kgs	722g	307g	29%

The family's definitions of different food items are shown in figure 23. What the family portrayed as non-edible food, may actually be edible to another family. Food items such as broccoli stalks and chicken bones were discarded during this recorded research. Stating this, however, some people may choose to eat broccoli and mushroom stalks and even freeze chicken bones to create soup stock. These data discussions will therefore, be analysed according to what the family collected and recorded, instead of what could have been imagined or created with non-edible food stuffs. However, where appropriate, the family's data will be analysed in depth to support specific case study arguments. The use of websites, as an information tool, was to unravel this grey area of non-edible food to suggest other uses for the food, with the main aim to uncover different systems to create uses for this discarded food.

It is apparent from the above table, that all of the items (except meat products) within the non-edible category could have been eliminated with the use of a compost bin. At present, the family discards these items with their regular landfill rubbish collection. This research, however, does not aim to explain the positives and negatives of using a compost, but is required to take note that the majority of the food waste collected (over 50% in each of the first three weeks) could have been eliminated with the use of a compost, or other green waste recycling technique. This agrees with the statement made by [www.mfe.govt.nz](http://www.mfe.govt.nz) that “almost half of the average rubbish bag could be composted” (reference). This discussion will continue further under the qualitative data analysis with regard to the websites’ suggestions for composting, and alternatives if you do not have the space or time to create beneficial compost. The qualitative discussion will also cover ways in which the websites’ suggestions could have prevented the edible food waste as depicted in figure 23. In column four, Figure 23 “weights of edible food”, the family advised, through written statements and discussions, why these items were discarded. Quotes such as “soggy” and “eyes bigger than stomach” were recorded under “reasons as to non-consumption” in the collected data tables (Figure 15). At times, the family also recorded ‘cereal dregs’ as discarded edible food. Deposits of such small items (“cereal dregs”) of food may seem insignificant, but it was important that the family had recorded every food item which was discarded, as this recording technique encouraged more data, which could then be discussed alongside website advice.

**Figure 24:** Summary of Quantitative Data Collected (Average food weights)

Phases of data collection	Weights of discarded food in grams (Edible)	Weights of discarded food in grams (Non-edible)	Total weight in grams
Before website intervention (Phase 1)	307	722	1043
During website intervention (phase 3)	605	470	1075
During optimised website intervention plan (phase 5)	0g	0g	0g

It is important to note here that the data collected for figure 24 was recorded using averages, so although the family’s waste was low throughout the project, the figures recorded do not suggest a decline in recorded weights of food. There is a slight increase of recorded weights during website intervention, although this could be due to the averages used for phase 1 data

collection. It also important to note that participants may have disturbed an honest data collection process as the project progressed.

**Figure 25:** Phase 3 Data Collection; calculated for one whole week

Discarded Food (edible)	Discarded food (non-edible)	Weight breakdown of items (grams)
Bones+ broccoli stalks+ mushroom stalks	Carrot stalks+ capsicum stalks and seeds+ onion skins+ garlic skins	Bones=225 per week Broccoli stalks=150 each Carrot ends= 20 each Mushroom stalk=8 each Capsicum stalks=20 each Onion+ garlic skins=150 per week
$225 + (150 \times 2) + (8 \times 10) = 605g$	$(60 \times 4) + (20 \times 4) + 150 = 470g$	TOTAL 1075g

From original data collection in phase one, weights of food items can be established as a reference for what the family discarded in phase three (see appendix E, E-1 and E-2). As the family had discarded relatively the same amounts of food collected in the first three weeks, it is reasonable to assume these weights of items of food would remain similar throughout the project. Figures of weights are only concluded from the measurements the family had already recorded. For example, chicken bones are recorded as weighing 225 g over the first two weeks. Broccoli stalks weighed 306 g over the entire week and 3 mushroom stalks weighed 24 g. The portion comparison table drawn up by the family (Figure 18) show the family using 320 g of mushrooms per meal. Therefore it can be calculated that if an average mushroom weighs 32 g, and a stalk weighs 8 g ( $24 \div 3$ ) the family uses 10 mushrooms per meals, their discarded stalks in grams is 80 ( $10 \times 8$  g). This type of calculation has been assessed for phase three, dependent only on what the family has recorded their weights of food to be. Some data has derived from a combination of their portion explanation (Figure 18), and from the original data collected in week one. This amendment of the family's collected data happened as the family did not weigh their discarded food in phase 3. They had been instructed to weigh edible food stuffs only and therefore disregarded stalks, peels and pips for this phase of research. However, for this discussion it is appropriate to note the food items that are still discarded, as the family do not currently have a compost or green waste disposal system, via general rubbish.

**Figure 26:** Phase 5 Data Collection; calculated for one whole week

Discarded Food (edible)	Discarded food (non-edible)	Weight breakdown of items
0g	0g	0g

It is of importance to note that phase 5 quantitative data collection is non-existent. At this point in the research the family had explained that their weight recordings were minimal because of the requirement to record edible food items only. As the majority of what the family had indicated to discard up until this point was mostly off cuts from vegetables, and the occasional cracker, the family stopped recording weights of food and focussed their energies on gathering and interpreting the website information; which will be discussed more thoroughly in the qualitative section of this chapter.

The assumption posed in the literature review, and again in the research design, that an individual New Zealander could potentially discard up to 500g of organic waste per day (Broatch, 2009, Sunday Star Times) was the quantifiable figure to be tested throughout this research. From the data gathered from the family, it is apparent that their individual organic waste is a lot lower than the national statistic. Their average discarded food waste was 30 g per person, per day. That calculation also includes their non-edible waste. The calculation was from totalling the amounts of their first and third phase food waste ( $1075 + 1043 = 2118$ ) finding the average ( $2118 \div 2 = 1059$ ) then dividing by 7 ( $1059 \div 7 = 151$ ) for the days of the week. This equalled 151 g of food per day, as there is five people in the family this could be seen as ( $151 \div 5 = 30.2$ ) 30.2 g of food per person, per day. What should be taken into account from these calculations, however, is that it is unclear as to how many people ate at each cooked meal per day. In stating this, the measurement of 151 g for the family, per day, still remains valid.

If we use this quantifiable measurement as a starting point (500 g per person per day), then this family wastes very little compared to the published NZ statistics. Quantifiable research methods proved that this family waste 6% of what the national statistics suggest as organic waste per individual. Nonetheless, it is important to note that the definition of 'organic' within Broatch's (2009) original report was never disclosed; therefore it is unclear as to whether this amount also included green waste. As the research wanted to focus on website information this measurement of food waste was taken to gauge a reduction in waste for the household, not to compare against national statistics. That said, it is relevant to note the differences in weights of data collected first hand, from the family, and data published by the press. Thus, it can be said that these quantities of data are for this family only, but using the methodology of a case study to produce general results will become of importance during the qualitative discussion.

Discussion questions such as “if this family can produce so little food waste, why can’t everyone?” became relevant when analysing the measured data. The qualitative discussion will try to reveal some basic principles of reducing food waste, alongside the family’s case study, of information they found most beneficial from the websites.

### **Qualitative Data Analysis**

The four themes to be analysed for this study, as outlined in the methodology chapter above, are:

1. Interview recordings and family tables
2. Website intervention to reduce waste
3. How information is applied practically
4. How do the websites [food waste] reduction methods compare to the family’s current methods?

### **Interview recording and data tables**

The interview recordings and family data tables reveal much about what methods the family used to discard their food, and what information they found most practical from the websites. The audio discussions from phase one reveal that the family already has a solid background in re-using and recycling, from their time living at an outward bound scheme. Some of those practices they still applied to their everyday lives, and they give a narrative to why their food waste measurements are low. Such practices include shopping for perishable goods on a weekly basis and limited convenience shopping as the supermarket is not close to their home. The recordings also reveal how frequently the family freezes and re-uses leftover food. Even perishable items, especially fruits, which may be bruised, are frozen to use in baking muffins (such as feijoa pulp see appendix 14). The family’s recorded data through the tables disclose what they thought of as edible and non-edible. From this data, the topic of individual choice could be used to describe why certain foods became the bulk of their discarded food. Items such as broccoli and mushroom stalks were measured in quantities of 306 g and 80 g per week. This is because of their personal choice not to eat these parts of the vegetable, instead leaving them to be discarded with their general waste. As already noted, the family’s waste per week is comparably low (1.2 kg) compared to the national statistics (an individual can waste up to 3.5 kg of organic waste per week), but could have been reduced further by eating these foods instead

of discarding them. The websites although, do not mention individual cooking/eating preference at all in their reduction information. Nor did the websites suggest other uses for stalks, pips or peels to re-use in a family home.

Through listening and reading through the audio discussions, a coding system was able to occur. This happened through listening to questions asked, and responses given, alongside naturally occurring talk from the family. Naturally occurring talk was captured surrounding the topic of household food waste. However, within these discussions certain themes emerged. Three themes in particular were captured over the 3 audio data recordings. They were (1) food waste reduction methods (through personal experience and website information), (2) cooking methods to reduce waste and (3) supermarket waste and supermarket supplies (indirectly related to food manufacturing). There was also discussion, although minimal, around the topic of labelling food; personal labelling (for storage purposes) and 'use-by', 'best-before' and 'sell by' dates on food products.

### **Food waste reduction methods**

General food waste for the family has been established as limited, but through further analysis of their data collected before website intervention, the family recorded some examples as to why they wasted particular types of foods. When recording the "tops of veggies" the reasons as to waste was "don't eat these". The websites do not address this individual food preference to reduce waste. Under the column "what could have been done with surplus food", the family lists examples of what they already do with surplus food. For example, they recorded methods such as "frozen-to be eaten later in week...cake used in lunchboxes and afternoon tea...frozen, 3 servings of pasta sauce". These responses establish an educated method to their surplus food waste. Although this was before website intervention, it was still important to use the websites to draw more practical information with regard to the family's left over, mostly organic (inedible), waste.

Figure 15, chapter 6 presents the family's reasons for discarded foods, stating "eyes bigger than stomach" and "one child was not so hungry". "Don't use [bones] for soups" was another reason as to why some food was wasted. What was interesting to note here (see audio transcript 2, appendix H-1) was that the family was already aware of practising certain methods for food

waste reduction. The mother had already stated that she asks the children how hungry they are and divides portions accordingly, which is in contradiction to what they recorded as to reasons for non-consumption (“eyes bigger than stomach...one child not so hungry”). This data reveals that although methods are already known for reducing food waste, applying them practically, and repetitively every day, might be difficult even for those families who have an established routine methods for preserving food.

Figure 27 is a summary of the website information as applied by the family. It lists food save methods already used by the family. These methods compare to some of the information found on the sites. This may explain the reason as to why the family’s food waste weights are small. Out of the 16 methods listed in figures 27 and 28, the family already utilises 9 reduction methods. Figure 5 was drawn up from what the family had already discussed in the audio transcripts and from expanded written field notes on days of meetings. The information obtained after website intervention is also included in figure 6. Figure 6 is the information gathered from the websites that the family collected themselves, without any direction from the researcher. The only direction given was the website addresses.

**Fig 27:** Waste Reduction Methods Employed Currently by the Family

<b>Methods the family already uses</b>	<b>Suggestions from website</b>
<p>“I can tell you exactly what the boys do for lunch and breakfast everyday”... “I shop to a menu so I try to make sure by the end of the week I’m out of everything”...(audio transcript 1)</p> <p>“well I always shop to a list anyway...as where we used to live you had to shop once every 10 days as you were so far away, so that training is already in place” (audio transcript 2)</p>	<p>Planning Meals, check your cupboards, write a list, take it to the shops and stick to it. (www.lovefoodhatewaste.com)</p>
<p>“Is it so wrong if I have something that’s frozen, sitting there for 6 months frozen?” (audio transcript 2)</p>	<p>Use-by and best-before dates (www.lovefoodhatewaste.com &amp; www.sustainability.govt.nz)</p>
<p>The family uses fresh fruit in the muffins and does not mind if they are past their best. The father will not eat anything that has gone past the expiry date. Although the mother is practical in assessing whether food is good or bad to eat by smell/touch and will not mention to the husband if she has used something that is 1 or 2 days past expiry (see written notes appendix).</p>	<p>Check the date (Ifhw &amp; sustainability)</p>
<p>The family has a large fridge/freezer unit and two pantries (see written notes appendix).</p>	<p>Correct storage of food (Ifhw &amp; sustainability)</p>

“surplus food was frozen-to be eaten later in week...frozen left-over dinner, 2 servings” (Figure 4, 5 & 6 data collection)	Use up leftovers in freezers (lfhw & sustainability)
“I already freeze fruit in portions” (audio transcript 2)	If you have large packets of chicken pieces or fish, divide them up and freeze individual portions (lfhw & sustainability)
“Frozen left over sauce, frozen cake” (fig 7 data collection) “you could separate that [food items] before it gets to the table...if I have left over mince I will use it again for tacos...because it’s not mixed in with the pasta” (audio transcript 3)	Batch-cooking is a simple way to help with meal planning (lfhw)
“I don’t buy a bag of carrots, because I know how much I use...I just buy 6 carrots” (audio transcript 2)	Buying fruit and vegetables loose so you know exactly what you need (sustainability)
The mother described using mostly everything in the pantry on a weekly basis although may have “odds things” such as green peppercorns, leftover from two years ago, and maybe some leftover dried goods. The family described beef mincemeat as a staple food, as were mushrooms, broccoli, carrots and onions, and that these are bought weekly (see written notes appendix).	Staple foods- have the ingredients standing by to pull together a delicious meal (lfhw)

### Website intervention to help reduce waste

This part of the research incorporates the most important data collected referring to the research question. The data found here would be the most informative in assessing how successful website information is in introducing a change to reduce household food waste. The information in figure 6 is the additional information the family gathered in phases 3, 4 and 5 of the research. The information was gathered from all three websites.

**Figure 28:** Additional New Information; found by the family during phase three, four and five

<b>Additional first-hand information found by family in phase three</b>	
“I know exactly what I use” (audio transcript 2)	Correct portion sizes – Links to <a href="http://lovefoodhatewaste.com">lovefoodhatewaste.com</a> gives an interactive page, with portion guidelines for different vegetables and takes into account the number of adults and children in the family. (lfhw)
“blanching vegetables, we don’t seem to have a surplus of vegetables that we need to freeze...I know how many of each thing that I use...so, I don’t blanch...I think it’s a good idea but we don’t have much left over to do that sort of thing” (audio transcript 2)	How to blanch to freeze fresh vegetables (sustainability has methods to blanch, lfhw just mentions it but does not provide the method)
“With the dating food information it never really occurred to me because...I know when we’ve bought it” (audio transcript 2) “will date it now” (Fig 10 data collection)	Label your frozen leftovers with a date
“Don’t use [bones] for soups etc.” (Fig 6 data collection)	Making soups and salads from almost anything (lfhw)

"we don't preserve as such...when you do have a glut of that type of fruit then I will freeze it, I'll pulp it and freeze it in bulk" (audio transcript 2)	Preserving food (pickling and chutney links to recipes from sustainability.govt)
They eat a lot of home-baked bread, crumbs go out to birds (see personal written notes appendix)	Toast bread, pita, bagels straight from the freezer (lfhw)
"I could compost but I haven't"... "the basis of composting is overtime...trying to justify why we don't compost"... (audio transcript 1)	A good way to reuse your food waste is to compost it or use a worm farm (MfE)

### **How information is applied practically and cooking methods to reduce waste**

From figure 28, it is possible to denote that for every new piece of website information, the family had reasons as to why they cannot employ the website's suggestions. Some of this new information could not be practically applied such as the Ministry for Environment's suggestion of composting. The family had already stated early on in the research that this was not practical for them as they move around a lot. This explanation reveals that the family is not prepared to set up a compost heap. However, there are other methods for composting and disposal of food waste which are available through Auckland city council (<http://www.createyourownden.org.nz/>). Nonetheless, the family felt that they could not commit to a food waste disposal system at the time of data gathering. This would possibly be due to the fact that they were preparing to sell their home and move again. It would have been beneficial in the short term to set up a system (such as a small worm farm) for the duration of the project. This would have disposed of most of their inedible food waste, but would still not have addressed the issue of using other website methods to dispose of their edible food waste.

The new information the family found was not employed throughout the remainder of the project, apart from the exception of labelling frozen food, the family stated that they "will date it now" (figure 22) and would check the fridge seals (to keep the fridge functioning properly so food is not wasted via incorrect storage means).

There were also some extra methods the family used which were not mentioned by the three sites, such as;

1. Buying in season ("I try to do seasonal buying" (audio transcript 1)) and
2. Serving correct portion sizes at meal times ("they [the children] will only eat proportionally for their size and eat it all...I ask the boys how hungry they are" (audio transcript 3)).

The initial remedy plan, in phase 3, suggested extra information gained from websites. This new information is listed in the above figure 28. Some of the treatments were impractical for the family, as mentioned above, the use of a compost system. Other new information did not directly relate to reducing edible food waste, such as using bones for soups, as bones fell under the inedible waste category. In response to the reason as to why the family does not use bones for stock and soup is that the mother is “not a flamboyant cook” (audio transcript 2). Therefore she does not divert from what she knows; “I’m not going to go and buy an exotic piece of fruit” and “I will cook things I know everybody will eat” (audio transcript 2). Therefore, it may be assumed that soups and broth do not fall under the statement “everybody will eat” and it may also be a challenge to present new foods to the family, and to cook new foods. By not using this suggestion, however, the portion of food waste calculated still remains (225 g of bones) and still is discarded with general waste.

Blanching vegetables did not seem to be appropriate as the family buys frozen vegetables (already blanched by manufacturers) and does not have a surplus of vegetables to blanch “I shop to a weekly quota” (audio transcript 2). The closest technique the family uses to blanching is direct freezing. From data gathered, it can be deduced that the family freezes most surplus edible food for use at a later date, and also freezes surplus fruits. Reasons as to not preserving foods, by chutney or pickling methods were similar to reasons for not blanching vegetables (see figure 28). It is also more common for society to buy chutneys or pickles, if needed. This method usually relates to individuals who grow their own vegetables, or fruits and have large quantities of these food items to preserve.

The family had already been freezing their food and they already knew when they had frozen their food “I know when we’ve bought it [meat]” (audio transcript 2), so they did not feel they had to label their food with dates. However by the end of the research, during phase 5, this had changed and the mother suggested that they now would adopt the frozen food labelling behaviour; “freeze and date foods-do and will date now” (figure 19 data collection).

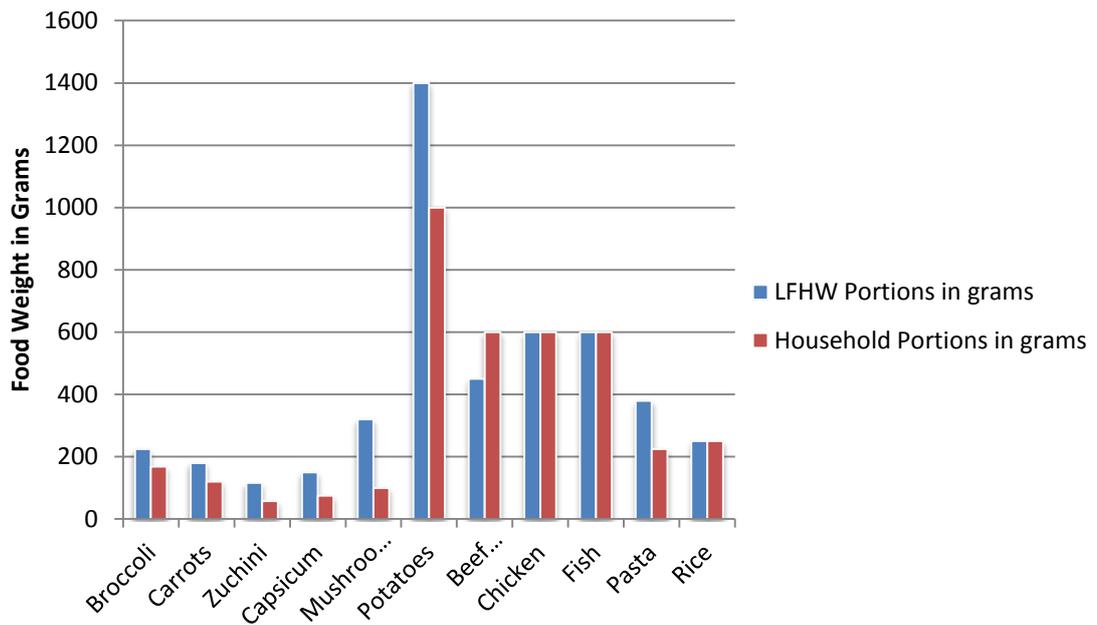
The top five suggestions as described by [www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com) were; (1) planning meals, (2) use up leftovers, (3) correct storage of food, (4) correct portion sizes and (5) knowing the difference between use-by and best-before dates. As seen in figure 27 and from audio

transcripts, the family already uses all of these methods. The website LFHW has two main themes of information. The first is a small history of food waste, how much food is wasted in the UK and 'what's new' in the food waste genre. The second part of the website describes methods for users on how to reduce their food waste. It provides categories such as 'portion and plan', 'recipes', 'save time and money' and 'storage'. The family focused here on portion and plan. This was because they felt the other categories involved things that they were already doing "again the information from that website confirmed that what I was doing was correct, to go through your cupboards before going for a shop, make a list, shop to the list" (audio transcript 2).

An interesting note is that the family did not follow the portion suggestions from the website [lovefoodhatewaste.com](http://lovefoodhatewaste.com). Portion guidelines are suggested when searching the website and users are asked to calculate portion sizes of particular items of food for a certain family size (see figure 17). Problems arose, for the family, with this website information because of the lack of descriptive information on the website. Statements such as "it just seemed ludicrous to buy [those] quantities of food...quite shocked at the quantities of vegetables...doesn't state how long that [portion calculator] is for" were recorded during audio transcript 3, phase 5 of the research. The portion calculator seemed quite straight forward to the family on face value "I thought this was going to be great" (audio transcript 2). The family, as users of the site, recorded their issues with the calculation method.

The data gathered in figure 29 is directly from information found by the family at the website [www.lovefoodhatewaste.com](http://www.lovefoodhatewaste.com). It relates to figure 9 of the data collection chapter. [Lovefoodhatewaste.com](http://Lovefoodhatewaste.com) provides users with an online 'tool' to calculate how much of a certain type of food is needed for a defined family group. For example, a user can click on 'potatoes' and select '2 adults' and '3 children' and the tool will calculate the information needed to how many potatoes to use for that family.

**Figure 29:** LFHW Portion Calculator versus Current Family Portions



As the case study family eats fixed meals per week, “I shop to a menu”, and the mother states “I don’t like to cook... so there is things I don’t buy, and because ...I’m tight on time I will cook things that I know everybody will eat” (appendix H), meant that the family knows exactly how much of a particular fresh item to purchase when shopping. The family uses this website (lovefoodhatewaste) to record a list of food items for their family of five against what the website suggested for a family of five. Figure 29 above shows the family only used more of one item (beef) per week than the website suggested. All other items the family used less, or equal amounts to the suggestions on the website.

This recording requests further investigation. As already established by recording waste in phases one and two, the family has minimal edible waste. What is left over from dinners is frozen for use a later date. Audio transcript 2 (appendix p. 142) describes the family’s methods “when you do have a glut of that type of fruit then I will freeze it, I’ll pulp and freeze it in bulk... I made a lot of casseroles from that [meat] over winter but if it wasn’t eaten, [name] will take it for lunch, or I’ll have it for lunch the next day.”

Therefore if they followed the guidelines of LFHW, it can be assumed that the family would actually waste more than they do currently. Audio transcripts 2 and 3 record a lot of discussion around this particular website lovefoodhatewaste.com. The family describes this website as “a very good site” and state they “learnt the most from this site” (Figure 19). Although the portion

calculator needed further explanation, such as how many types of foods is the calculator portioning for. For example (from audio transcript 2 and 3), does the calculator take into account that the family will eat more than one type of food per meal? Does it just calculate for one item per plate? How many meals is it calculating for? Lovefoodhatewaste.com did not advise answers for these questions. The family, however describes the portions calculated by the website as an “enormous quantity of food”, “too much” (audio transcript 2) and “ludicrous” (audio transcript 3).

Using recipes to correctly measure portions is suggested by LFHW. As the family already knows to cook, what everyone will eat, and the mother states she is not an ambitious cook, this website advice is not helpful to the family and may actually produce more waste in the given case (see figure 29). Rather, the family has established cooking and shopping habits for a long period of time so that they already know what food items to buy and use when preparing meals. The family does not explicitly state this although conclusions can be drawn from comments “I always shop to a list...that training is already in place...I know how much I use...I will cook things I know everybody will eat” (audio transcript 2).

In phases 1 and 2, it was established that the family had their own methods of food waste re-use and prevention. The circumstances when the family wasted food was minimal throughout the research. However, food was wasted, both edible and non-edible, when the family had decided to cook in a particular way or not diverted surplus food correctly. The family's individual choice not to use whole vegetables, skins and stalks led to slightly higher weights of food being recorded. Some methods for re-distribution could not be applied such as a food composting or worm farming. Also ‘quick’ methods, such as checking the fridge, or remembering packed lunches for school, resulted in some initial food waste. For the majority of the time that data was collected the family knew their reasons for the circumstances in which they discarded food. For example “1 child not so hungry” (figure 15) when “veggie scraps” were left over.

Stuart (2009) uses WRAP's statistics (p. 74) in determining a conclusion that households with children waste more food than individuals. Stuart (2009) states “the way we feed children is crucial in determining how much food we waste”. In this case study it is revealed that the family has their own routines for feeding the children. Making sure to ask them how hungry they are

before food is served, separating items in lunch boxes and giving the children types of food they will eat to prevent food waste, as described in audio transcript 3, and described in figure 15 with regard to “chips soggy”, all help the family to preserve food

From the data tables and audio discussions, it can be deduced that the majority of what the family wastes it classed as inedible, organic food. Under this category falls peel and skins from fruits and vegetables, along with stalks and pips which the family classes as inedible. It has also been established that this personal choice about not eating stalks prevents the family from reducing their food waste further. In stating this, however, websites did not persuade users to use stalks from vegetables, nor did it suggest methods for using pips and peels as suggested by Stuart (2009, p. 44). When the family did waste small portions of food from cooking dinner, waste could have been prevented (by methods such as making children eat food, or double checking how hungry children were) but was always appropriately re-distributed after meals (such as freezing leftovers).

What is interesting about the foods that were discarded during the research was that most of the items were vegetables or fruits (disregarding bones from chickens). This is associated to Stuart's (2009) findings of WRAP's report in 2008 and more recently IMechE's report (2013) who both state that the majority of wasted food is fresh produce. 47% of [UK] household food waste is fruit and vegetables (by weight) (Stuart, 2008, p.307) and “up to 30% of the UK's vegetable crop is never harvested” (IMechE report, 2013, p. 3) because of aesthetic issues. This relates directly to food issues of supply and demand, and manufacturing of goods. Another statement suggested that the family had picked up on issues of supply and demand themselves. The mother states her views on an ideal situation where she would be able to pick and choose what sorts of fresh produce she would like; “often with the mushroom, I will break the stalk off as I only use the head, as I know I will just put them in the rubbish. I know they [the supermarkets] will only put them in the rubbish too, but I'm hoping they will have had more of an opportunity to use that, in a recycling manner” (audio transcript 1). Here, it is evident that the family thinks about their shopping habits and more importantly the issue surrounding their individual choice to not eat particular parts of a vegetable. Stuarts' (2009) relates individual choice to greater amounts of food waste, “it is clear that the amount of food a society wastes is

dependent on cultural attitudes” (p. 201); this statement may lend itself to the reasons the family chooses to discard vegetable stalks, or peel their vegetables.

The family also discussed stock supplies and manufacturing issues surround marmite (audio transcript 1). What was of importance throughout this discussion was the use of brands to appeal to some customers, and the conversations implying that if consumers cannot purchase a particular product, are they satisfied with another (vegemite versus marmite scenario-see p. 141) and whether when the food does become available, will more get wasted because of that supply influx. This conversation relates directly to the views expressed by Stuart (2009) about manufacturing and supply techniques, detailed in the literature review (chapter 3).

### **Labelling (including supermarket waste and supplies)**

Davison and Johnston (2011) state that bad labelling systems in the UK are being blamed for high amounts of food waste, and continue to compare UK statistics to New Zealand information. When recording discussions about the family’s personal views on labelling, common sense prevailed whereby tangible methods are used to assess food. The family talks about using fresh pulverised fruit in muffins even if they are passed their best. This is because the mother has pulped and frozen the fresh fruit already, even if it was a bit bruised, as “bananas, if they go off will become cupcakes” (audio transcript 2). As of this the family’s method eliminates the need for following labelling advice for fresh produce religiously. Included is the information given in the data collection chapter that “the father will not eat anything past its expiry date...although the mother is practical in assessing whether the food is good or bad by smell/touch”. This is a practical assessment applied by the family to physically judge the validity of best before, and use by labels on food.

### **Supermarket waste**

This evaluation by the family disagrees with the article published by Davison and Johnston (2011) who follow the Food Standards Agency’s [UK] statistic that “up to 80% of the ...public misinterprets the function” of a label. It is reasonable to assume that the family in this case study fall into the 20% who correctly identify with labels, or use different methods to test the wellbeing of food. “Supermarkets will deliberately overstock because they believe that shoppers like to see full shelves” (Stuart, 2009, p. 27). This sweeping statement emanates from Stuart’s

personal interviews with supermarket managers. This statement relates directly to the issues of labelling, whereby stock rotation was the original reason as to why food was date labelled (Stuart, 2009, p. 64). Using this information it was necessary to determine the family's views on using labels as a system to check hygiene of food, as discussed above, but also to gauge their views on surplus stock on shelves. The discussion with the family about supermarket supplies would either agree or disagree with Stuart's (2009) statement. From the data collection chapter and audio transcription 1, the family examines their first-hand account of supermarkets overstocking in the USA. The statement "it was complete overload...how can you justify this choice?" promotes the shock the mother described when seeing overstocking in the United States. She then describes how she feels New Zealand is taking the same approach with supermarket supplies but states "I would like to see less on shelves, I still don't think we need that much choice". Although these conversations surround supermarket food waste, they are appropriate to website information. This is because although the issue of overstocking has not been covered in so much detail by the media, it relates directly to household food waste. If supermarkets stock more, and do not sell as much, they produce more specials to pass onto consumers, and indirectly produce more waste, both for themselves and their customers. However, website information suggests nothing to encourage shoppers to make a change with regard to shopping aesthetically such as buying odd shaped vegetables, or not over shopping for specials.

In New Zealand, the supermarket chain Countdown has referred to their own policy of "not a bean goes to waste - that's our zero food waste goal" (PEL, 2012) by donating surplus stock and supplies to charities such as Fair Trade and The Salvation Army. However, there is little information on their website to determine why there are such issues of surplus stock initially, or published measurements of diverted food. It is also not clear whether surplus stocks reach charities on time to be of value to their missions or, contrarily, whether they might end up as food waste there. While this aspect of passing on surplus stocks is not related directly to food waste within households, it might request further research around supermarket food waste issues. Countdown neither addresses nor reports on household food waste and ways to reduce waste.

In relation to supermarket shopping is the discussion surrounding specials, and offers. Usually these offers are for items that are near to their use by or expiry dates. Other specials are because of the seasonal offers available in New Zealand supermarkets. As indicated in the data chapter, the mother describes herself as “a brand tart”. This explanation relates directly to household food waste as the family is more “price conscious” and does not buy more when foods are on special. This goes against Stuart’s (2009) argument that BOGOF offers encourage more household food waste. In this family’s case, specials or offers help keep their food waste amounts even, as they can buy what they need, what will get eaten, at a lower price. The key reason as to why specials do not create more household food waste for this family is that “on the fresh produce side I still won’t buy more, when on special, than I would for that whole week anyway” (audio transcript 1). This is an apparent food waste reduction method by the family.

### **Summary**

Audio transcripts 2 and 3 provide the most information on how successful the use of websites was to produce a reduction in household food waste. Here the family focuses the majority of their efforts on deciphering and using the portion calculator from LFHW. The portion calculator was deemed unsuccessful by the family. The amounts of food given were ‘ludicrous’ and portion suggestions for vegetable shopping seemed too much. The mother produced her leftovers in containers from shopping and cooking from the amounts directed by LFHW. Thankfully the family were able to re-use these extra portions in further meals.

In discussing website LFHW, the family could not find any useful information relating to the use of peels and pips (inedible foods) stating “no information on alternative recipes for in-organics except composting”. With reference to how easy the site was to navigate to information it was through “trial and error” that the essence of portion control was realised. It was also noted that southern hemisphere eating habits were not reflected in the website and that it was unclear whether the portion calculator measured food items for a whole meal, per person, or per family, and for how long the measurements were for. For example, did the amounts of potatoes calculated for a family of five refer to one particular meal being cooked? Or did it refer to the use of other vegetables within that meal?

The family described LFHW as being the most useful website, followed by [www.sustainability.govt.nz](http://www.sustainability.govt.nz) and lastly [www.mfe.govt.nz](http://www.mfe.govt.nz) providing least information. The positives from the LFHW site provided “positive affirmation” that the family were following the right advice by already using the five tips from LFHW as described in chapter 6 (treatments of website information). Figure 19 (chapter 6) notes the family “learnt most from this site-in regards to portions” but they “don’t agree with all portion sizes” (see figure 19) and “needs seasonal change to suit southern hemisphere”. The sustainability website provided “common sense” for the family in regards to their suggestions for reducing waste. The issues of blanching and preserving fruit and vegetables arose when searching through this site. The third site [mfe.govt.nz](http://mfe.govt.nz) received the comment “looked around website but didn’t see anything relating to reduction of edible food waste” from the family. This will be discussed further in the discussion chapter because of its close relation as a governmental environment department and also in relation to the closed website, which appears to have more useful information for households to reduce their waste.

For their own amendments to website information, the family researched their own remedy plan to find more information that may not have been realised on the given websites. Their results are recorded in figure 22, chapter 6. The only new information they received from this exercise was to check their fridge seals as noted “will check fridge seals”. This information relates directly to correct storage of food, dictated by LFHW and sustainability websites, though neither site suggested this information.

Overall, assuming the stalks of vegetables would be eaten, the family’s food waste weight would be even less. It is important to note that even though these types of foods (pips, skins and peels) fall under the inedible category, presently the food waste still reaches landfill. Comparatively, the family only wastes 6% of what national statistics suggest for organic waste. Information gathered through the websites do little to further reduce this wastage.

## Chapter 8

### Discussion

This chapter aims to discuss some of the insights from the data analysis. A central theme running through this analysis is the interpretation of information from three websites by the case study family. The independent data collected by the family during the process was compiled, analysed by the researcher and then compared to the data and findings given by the key websites. For comparison, the data took the form of tables (figures 27, 28 & 29, chapter 7). In order to put various complex forms of 'website' versus 'family' information into a comprehensive format, tabular methods are used, for context to analyse the research findings. From the resulting tables it became clear that the family already employed many of the key website food waste avoidance suggestions. This fact was evidenced by the family's weekly shopping patterns, cooking methods and food storing routines. During the interviews with the family on their waste reduction methods, it became apparent that the family had connections with the outward bound schemes (audio transcript 1) and had a personal commitment to achieving a low carbon foot print. The food waste reduction methods that the family employed are compared with suggestions from the key websites'. Suggested techniques and the comparisons and differences from websites, and family methods, will be discussed. A discussion on the reduction methods from websites will also be assessed, with references to available literature.

#### **Website vs. Family Information (sharing hubs)**

This section addresses the feasibility of the key website's information. Figure 28 shows the food reduction methods that were 'new' to the family. Some of these methods could not be implemented by the family such as 'preserving food' by methods such as pickling as they do not have a surplus of fruits or vegetables. From the data in table 6, it may be deduced that the family has either (1) no need for this advice (2) already uses this advice or (3) has their own methods similar to this advice. There was no additional information that this family could use which was practical except to label their frozen foods with the date of freezing. This indicates that the websites' advice is either (1) too generic (2) not geographically specific or (3) narrow scope.

To put these conclusions into context requires an expansion of terms. For example websites are;

(1) Too generic, meaning that they inform a certain population or demographic, therefore the information given is wide ranging to cater for as many users of the site as possible. By doing this, however, generalisations about food waste statistics appear (such as consumers wasting the largest amounts of food, LFHW) and obvious solutions to reduce food waste appear (such as utilising a compost, not buying more than you need, shopping tips), and advice becomes repetitive.

(2) Not geographically specific; websites do not cater for the seasonal change in climate (such as southern versus northern hemisphere) as there are different food types and availability of them in different regions. In the UK potatoes are the most wasted vegetable type (LFHW) although it is unclear what the statistics are for New Zealand. The websites do not cater for New Zealand's food consumption habits, such as seasonal or restaurant eating; nor do they suggest methods for different financial budgets (see audio transcript 2). Examples of recipes cater for "upper-middle" socio economic groups, (see audio transcript 3) not the low budget users who could use advice which is inexpensive more readily.

(3) Narrow scope; meaning that the information provided derives from that particular website only. No attempt is made to connect different organisations or websites externally or internally. Websites are limited in their practical information as they all seem to imitate advice and repeat the same food waste reduction methods.

Information which comes from reduce-reuse techniques was gathered by the family who also found their own information by visiting different websites. This information was then used in conjunction with the study website suggestions during phase five of data collection. The positive waste reduction results, found in the research data, could be due in part to the family connecting and using information from these three websites. Could connecting various website information, blogs, media and government reports for instance, provide a virtual core food waste reduction centre for information, for users, governments, manufacturers, producers and social organisations to exchange and create reduction techniques? The reasons for linking information

sources via a central food waste website may seem detrimental to corporations marketing or advertising image, as they would have to be willing to publish their food waste data, cost and figures. Over time, however, the connectivity of sites could herald new, open source information to develop techniques to reduce food waste. If the core information centre was country or continent based it would enable information to be narrowed down to nation or locally specific information. If each 'locally specific' information centre was linked globally in turn, exchange of information on each site could be analysed from around the globe. In simple terms who (manufactures, supplier, supermarkets, consumers) needs what and where (global, national, local, website) is the appropriate information. This sharing of information could enable an education process where producers, users and consumers become informed, whilst governments and organisations become aware of what consumers want and need. This information sharing web presence could have the potential to filter reliable reduction methods from governments to consumers and vice versa. Currently food reduction methods available through websites are compiled from organisations, and there is no opportunity for users to share advice, or contribute their (users) techniques of food conservation.

The emphasis on 'new' information is that environmentally aware consumers, like the case study family, who are educated in issues of sustainability and knowledgeable about 'green' techniques, now require more dynamic information, where basic remedies or tips for reducing food waste, to create impactful change are insufficient. If consumers were more widely aware of food waste issues, it could, as the research findings suggest, enable an informed decision making process, as seen in this family's experiment. If the economic costs of distributing food long distances (food miles) was added to till prices and compared with savings from viable waste distribution and reduction methods, the public could make an informed decision about discarding food. Similarly if costs to the tax payer for taking and burying food to landfill were made publically available in New Zealand, the population could then be able to create their own conclusions as to whether or not discarding food with general rubbish is a meaningful solution to a current problem. However, unless the government or an affiliated organisation can gather an informative report (alike to the UK's WRAP 2007 quantitative and qualitative surveys) New Zealand consumers and government decision makers are left uninformed. The available literature on food waste, information and statistics, have few authoritative sources to reveal hard facts, but instead draw on data and deductions from Australian and British based research

which is interesting but unspecific (as with the New Zealand Herald and stuff.co.nz articles'). Australian economist Dr Denniss states "we don't know" (Davison & Johnston, 2011) why people are throwing away so much food, suggesting that Australia has not yet conducted an extensive qualitative food waste report either. The question is why has this work not been undertaken?

'Old' information here refers to reduction techniques that are "common sense" (audio transcript 3) or already used by the family. 'Old' and 'new' techniques could be concluded with a qualitative survey also, classifying techniques as 'common sense' or 'innovative knowledge'. As already discussed this family is competent with their recycling techniques, therefore this "common sense" information may not apply to another family indicating further research. Nevertheless, some techniques listed by the websites would be common practise for most families such as "shop to a list" (LFHW). However, there is no research to say whether or not this is accurate but anecdotal at present. Further surveys into the differences in 'old' versus 'new' information would have to be conducted to determine whether or not this qualitative information (tips and remedies given by websites) are put into practise by the public. A comparison of case studies would yield quantifiable results, such as 4 out of 5 families shop to a list, which was not the object of this research, but would at least be a foundation for review. Even the debate between 'new' versus 'old' information and its findings is a basis for further research. Techniques of waste prevention, shopping strategies and a consumer need for food waste collection schemes (MfE, 2008) are all issues that have not been assessed. Understanding these issues for a successful waste reduction strategy, verified by a qualitative survey, suggests the basis for further research. A snapshot of the food waste issue can be seen in the Ministry for Environments' household sustainability report (2008). This data includes statistics such as 79% of respondents' plan what they buy, cook and eat to avoid food waste. 63% compost garden and kitchen waste at home. 10% have a worm farm and 9% do nothing to deter waste. However data is limited and quantifiable.

The issues of 'old' versus 'new' information can be characterised through the confusing debate for the consumer about food date labelling. 'Old' information for labelling advises food is better eaten prior to a date specified by the manufacturer with 'best-before', or 'use-by' and 'sell-by' dates. Methods for food waste diversion for households, testing, and universal education of

hygiene issues for food should be published on websites. The consumer would then be able to search for a solution to their particular problem, without the need for independent website information. For example, many of the tips given by websites do not explain the debate surrounding food safety date labels leading to confusion, for instance if I eat this after the date will I be sick? In the research case study family scenario, the mother uses her own judgement on assessing whether a food is safe to consume.

This is alike to advice from Jones (2011) who cites Mr Dearth when stating that food date labels are just a guideline. However, some consumers will rigorously stick to food date labels because of food safety fears. Comments such as “worries about food poisoning so doesn't risk going past sell by dates”, can be found scattered throughout WRAP's (2007) household survey, suggesting a need for more scientific information to be made easily accessible to the public. This could affect a consumer decision about consuming and discarding food. In the above quote the consumer is clearly confused about sell by dates, as this is a date given for staff for stock rotation (Stuart, 2008, p. 64) and has no relation to the consumption safety of the food item. This conflicts with what grocery chief Katherine Rich states when she says “consumers want more information, not less” (Davison, 2011).

This conflict arises due to the large quantity of labels already produced on food items, causing confusion. However these comments, from Ms Rich, imply more labelling will solve the problem although there has been no research to show whether or not this is the case. Her comments are invalid as there is no reference to published food diversion research. Her justification for these comments states “educat[ing] consumers” as a method to alleviate food waste, although she does not expand on education programmes or plans. Research into the food safety scenarios, such as consuming yoghurt after a best-before date (Defra, 2011, p. 16), backed with scientific information, could educate the public and ease food safety fears. This information could be published on food items, in the form of a table, with the time period it takes for that item to perish in different situations; such as in a freezer, in a fridge and at room temperature. The UK's Department for Environment, Food and Rural Affairs (Defra) attempts to make sense of food labels in their 2011 report. Although this report is informative, it is lengthy (26 pages) and therefore specific information is inaccessible to the average family. For instance, if a family is cooking, and a food item is near its 'use by' or 'best before' date, it is hardly likely that a family

would read the Defra report to confirm whether or not the item is safe to consume. Rather a clear labelling system could aim to re-direct food from a general waste bin. Through inspecting the Defra report, attention was drawn to the items of food required by EU law to carry hygiene labels. Fresh fruit and vegetables (excluding legumes) are exempt by law from carrying a date of any kind (Defra, 2011, p. 18). Nonetheless these items are most commonly discarded (LFHW). Among the given websites, there was no information on food safety guidelines, or alternative advice for checking food safety.

A request for more scientific, and concise, advice to be made available for consumers so they could decide what consume could reduce the amounts of food wasted. With reference to appendix I and I-1 (p. 147), the mother in this case study uses her senses when making decisions around to food safety. What is unclear is whether or not this self-testing method is common for the households or individuals to use when thinking about discarding food, as the researcher did not uncover any study data or information to compare her method to. It is relevant to mention here that a more cautious consumer would assume sell-by, use-by or best-before dates are exact and would not use food past these dates unless they had no alternative. If there were widely available scientific based facts printed on food items, the public may have a better chance of applying food waste reduction practises. If food hygiene guidelines were printed on packaging with reference to a law, such as the fresh produce example stated in the Defra (2011) report, the public may be inclined use their personal judgement, as oppose to the manufacturers', when considering discarding food. This hygiene information research could be commissioned by education authorities who could give factual findings to schools and governments to alter food waste behaviours. In this case, the family are rational when deciding on using food past it 'best-before' date in their household (see appendix I-1). As stated by Hennessy (2011) a new labelling system in the UK is set to educate consumers about the "safety risks" concerned with food labelling. Since starting this research this new system has been implemented. The Daily Mail (2013) reports that a new labelling system could help reduce the £700 worth of discarded food in Britain per household per year. The new labels change colour from orange to bright pink, indicating visually when food should be consumed.

The phenomenon [food waste] is described in its case study context of a family household. In this case study, the research question "how do websites help reduce a family's household food

waste” is investigated by defining a phenomenon and testing a question. The research question was that government websites could be used to minimise waste within households. The purpose of this research was not to create new methods for reducing food waste, but to define the current NZ food waste situation and ascertain whether governmental websites could help in the procedure of reducing food waste. This case study method was appropriate to review government websites as the questions raised did not require ‘yes’ and ‘no’ answers. The questions surrounding website information such as ‘how practical is the information found on the website?’ involved a more descriptive answer than quantitative methods would result in. The research objectives here were not to quantify how much information was on the website, or how many examples of information were found to reduce food waste in the home but focussed on qualitative data collection methods. Through the case study, the family was able to provide feedback on the usefulness of information within websites, over a period of time.

As already observed in Chapter 7, new information found by the family on the given websites was limited. They stated via figure 19 that LFHW was most useful, followed by sustainability.govt.nz and finally classed mfe.govt.nz as the least helpful. Relevant to those findings is the concern that sustainability.govt.nz had closed in September 2011, and directed users to mfe.govt.nz. The family felt that there were more relevant methods for food waste reduction on the closed website than what was available currently on the Ministry for the Environment’s site. Further research would be needed to discover if that the judgement of closing the site was the correct decision.

Figures 27, 28 & 29 (chapter 7) aim to compare the information given on all the websites against the family’s implementation of reduction methods. Figure 27 records the information that was already employed by the family when determining food to discard, compared to what the website advice was. All of the information recorded is similar. Consequently, when the family was asked to search for new information, in phase five, there was little to report concerning techniques, or advice which they did not already use. What was even more surprising was that they family had some reduction tactics that were not listed on any of the websites used in the investigation. These methods were “buying in season” and “asking how hungry the children are before serving”. It is notable that the family’s suggestions are not covered by the websites, and therefore questions if other people may also have good suggestions not recorded on websites?

This family also buys vegetables loose instead of pre-packaged. A technique suggested through Jones (2011) literature, but not apparent on websites. WRAP's (2007) qualitative survey on why households discard food laid blame, amongst other things, on children (WRAP, 2007, p. 98) either not being hungry, not finishing their food or wanting more than they could eat. This coincides with Stuarts' (2009) findings, which states that a family with children wastes up to 56% more food than a family without children (2009, p. 332). It is unclear whether these statistics can be compared in New Zealand because of the lack of a qualitative study. Stuart (2009) had the only literature found understanding the debate of children's eating patterns and advice to avoid food being wasted this way (Stuart, 2009, p.74 & p. 288).

Figure 28 showed some differences in website advice and the test family's re-use techniques. The family showed an inclination to be influenced by the advice from websites suggestions, such as date labelling frozen leftovers ("I don't, but will now" figure 28). However, they still commented upon why some of the advice was impractical, or why it was not possible for the advice to be implemented ("we don't seem to have a surplus of vegetables that we need to freeze", figure 28). It is plain from the family's responses for figure 6 that the family are quite aware of their own uneaten items, and have assessed what they can do to further reduce waste, or why some strategies cannot be implemented as are invalid such as blanching. This supports the assessment that they are well-versed in behaviours relating to environmental issues already, discussed in the data collection chapter.

Alongside their engagement with information was the family's own interpretation of the portion planner (Figure 29). This advice was found mainly on the LFHW website, although sustainability.govt.nz also recommended "cooking to a recipe" which can be equated to using correct portions. The statistics from the family's own experimentation found that the advice given by the websites on portions yielded too high amounts of food items to be consumed (see figure 29), likely to result in waste. Also the family highlighted that there was a lack of vital information given by the site, the measure scale of the proportions planner; would this be per meal, per food item, or per week/month? This suggests a need for more user specific information to be made available on the site, to correctly calculate quantities of meals. There was also no information on the site that indicated how or for whom the portion planner was created, it is unknown whether results are for an average family, or a vegetarian family, for a particular

season, or just for clients in the northern hemisphere. If this information were provided on the website it would enable users to alter website suggestions to fit their family's' eating habits. This would have enhanced the family's experience on the site, and given them an opportunity to evaluate their portions. An interesting outcome of the confusing information on the website was that after using this tool the mother of the case study family became concerned that she may be under-feeding her children (see audio transcript 2) and consequently bought more food for the following week. The family purchasing more food happened as an accumulation of website (portion planner) advice, and also to test the portions calculated from the site, compared to the family's 'normal' shopping behaviour. The family normally uses 2 carrots per meal (audio transcript 2), so buys 6 carrots per week. LFHW portion planner suggested 3 carrots per meal for the family size; therefore the mother experimented with these calculations. Due to her frugality she was able to divert this extra food from the residual bin into meals (see appendix 10), and the family ate a "lot more vegetables" (audio transcript 3) that week. However, a less knowledgeable family may use this tool and as a result end up with more waste than originally intended. The thoughts behind the creation of this tool is obviously to help individuals reduce their waste, but maybe it is more suitable to investigate families personal eating/discarding food habits before attempting to use this tool. In the case of this family, they knew their eating habits thoroughly and were able to test the given advice before making purchases, or cooking with food. This information highlights the need for education in food use and reuse methods. Food education within the home would determine the amounts of food that families would eat, foods children will not eat, and suggests the amounts of foods to buy and cook with. Using these approaches diverting food waste to landfill is a possibility.

### **Composting Issues (Local Council Information Sharing)**

The critical issue of diverting food waste from landfill is discussed by all the websites. This problem appears to be the main goal of these websites. The sites offered few solutions except for composting. During discussions, the family showed knowledge that creating a sustainable environment is good practise. They had worked with, and were familiar with the mechanics of worm farming, and returning nutrients to the land. They acknowledged there should be a balance between modern living and using techniques of sustainability from an older generation. Comments such as "our population is so mobile" compared to an older generation that "stayed put" indicted an objective thought process to the sustainability controversy. These comments

created a conversation about older generations who did not move around so much, who could therefore afford the time for a vegetable patch or composting system, (see appendix audio transcript 1). Also discussed in detail were the composting systems from the outward bound scheme where the family had lived in the South Island. The different composting methods and how different composts were used and separated, alongside what happened to bodily waste were discussed, drawing conclusions that the family is familiar in the practice of composting and carbon footprint issues. The United Nations 1987 Brundtland report starts to address issues of sustainability and carbon emissions using agriculture and manufacturing methods as examples. The UN states “there are broad areas of the Earth, in both industrial and developing nations, where increases in food production are undermining the base for future production” (p.86). However there is no information in this report which addresses the needs of the western individual consumer, and methods to lessen household food waste. This signifies a need for an individual waste connection hub for users to share advice and sustainable food disposal techniques.

The family composed balanced arguments for being well-equipped and able to reduce food waste, commenting that some families do not have the time, space or techniques to implement changes to improve food waste behaviour. The family’s opinion was that older generations who “stayed put” had more of an opportunity to be in tune with their surroundings; creating compost heaps as “the basis...is over time” and identifying what was in their gardens to use through different seasons. In the test family’s case they remain in the “modern family” category where producing a time consuming composting system, or creating a worm farm is not practical because of their constant relocating for work commitments. This project aimed to find a solution for the family, to this problem. However the websites returned no new practical information for them relating to other food waste diversion tactics. Further investigation into composting systems and solutions is beyond the scope and is an extension of the research project which has only been touched on throughout the discussion, Yet research around this composting systems, for assorted demographics and types of households such as for apartments, single persons, families and businesses could be conducted. A functional system that was appropriate for the family and their mobile lifestyle is a Bokashi system (Fowler, 2012), developed in Japan, for use in small apartments. This system produces soil for gardens in 6-8 weeks, compared to the lengthy traditional compost time of 6-8 months. As the physical system

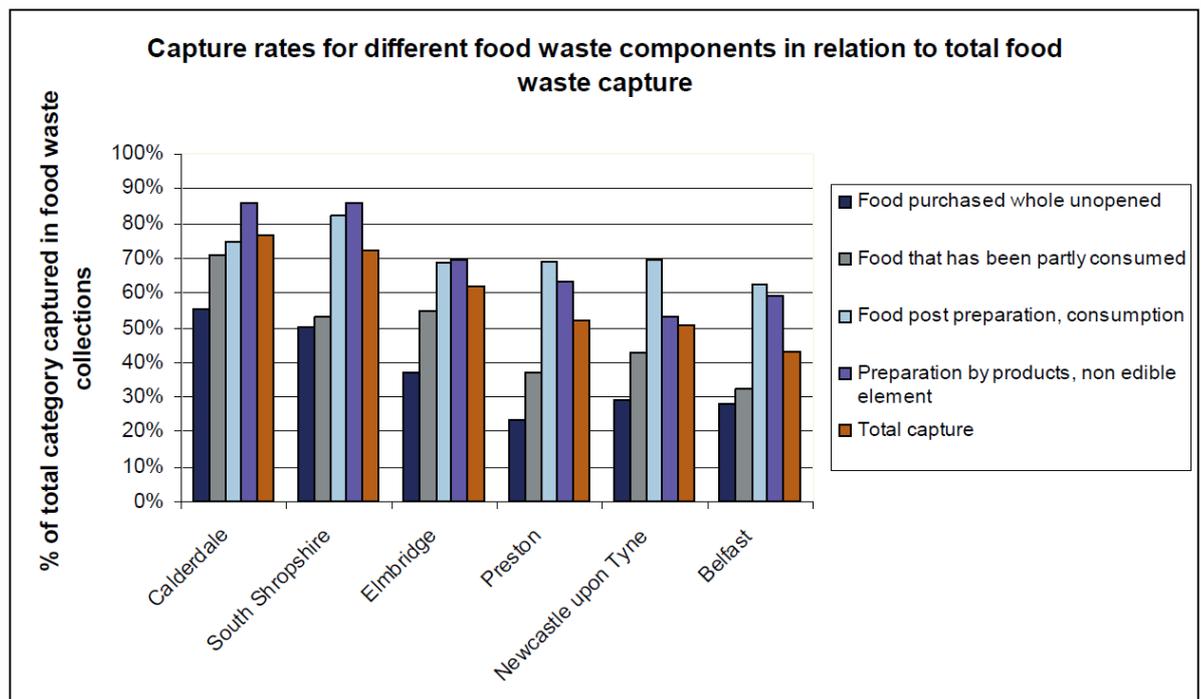
is quite small it can be transported, donated to neighbours, kept at the property, or just spread on the land before moving house.

These composting techniques were not given adequate reviews within the websites and no information was found that directed users to external composting sites. Tips from websites suggested “compost or use a worm farm” (MfE, 2008) but provided no further explanation or advice on where users can purchase, or research food waste systems for their households. A side note to this compost discussion is the information that the local council (Auckland City Council) does not currently provide a system for collecting food waste either. Presently, it is the responsibility of the household if they wish to discard their food waste sustainably (via a compost bin or Bokashi system). To succeed households need to purchase the equipment or employ a private company such as “We Compost” to collect food waste directly. The Auckland City Council is reviewing ways of collecting household food waste with “a new collection for organic waste (such as food scraps and garden waste) in urban areas, paid for by rates” (Auckland City Council, 2013) although it is unclear when the new system will start, how much it will cost and how frequent the service will be. The ACC has a goal of zero waste by 2040 (2013, p. 2).

Already available for the public to view is a report from WRAP (2009) who employed trials across England and Scotland for collection of household food waste. As mentioned throughout this research WRAP is renowned for their efficiency in creating and producing surveys of household food waste and reports for analysis. New Zealand has yet to establish such an organisation or complete trials or questionnaires for households regarding their food waste weights and measurements. It is also unknown whether or not the public require, or want a food waste collection service. MfE (2008) conducted a household sustainability survey which took into account all manners of sustainability from food waste through to recycling, building and transport concerns. The report for food waste is brief (pp. 36-37) and states 79% of respondents plan what they buy, 63% compost at home and 10% use a worm farm. What it does not report is the demographic of these statistics, how many people were surveyed and has a very broad concluding set of results. As this was an overall report on the sustainability of households, food waste is not given an adequate review. A more detailed survey into food waste causes and effects from households is needed to determine whether a council kerbside collection of waste

is needed and/or wanted by New Zealanders. WRAP (2009) ran trials across the UK from 2007 to 2009 to ascertain whether there was a want from the public for a council driven collection scheme. The report is advantageous regarding the methods they used to attain public response. They collected food over different time periods (weekly and fortnightly collections) and collected different grades of waste (separated food waste and mixed food and garden waste). The report (2009) found that respondents who could recycle both garden and food waste together yielded the highest amounts of waste collected overall. This is due to the efficiency of the recycling system within the home. They also found that of all food waste collected at the kerbside, a capture rate of 59% separated food waste was collected during their trials. The largest fraction of food waste was unavoidable (trimmings, peeling, pips) at 50% of the overall food collected (pp. 8-9). Figure 30 shows the component parts of food waste collected by the different trial areas.

**Figure 30:** WRAP. (2009). *Findings for Household Food Waste in Trial Areas* [Graph] Retrieved from <http://www.wrap.org.uk>



This report from WRAP verifies what was found with the case study family. The majority of the family's food waste is classed as unavoidable waste. In the family's situation where they are not in a position to compost, a kerbside collection of food waste would be the most appropriate method to divert food from landfill. An in-depth study needs to be undertaken in New Zealand, alike to WRAPs' (2009) trials to reveal whether or not this method of food waste (or mixed

garden and food waste) disposal would benefit households. WRAP (2009) took into account the various demographics of households (apartments, houses, houses with gardens, no gardens) and catered for the different needs of dwellings. A detailed study conducted by a New Zealand organisation could imitate the methods used by WRAP to cater for NZ demographics, and then attain whether or not kerbside collection is viable. If so, New Zealand could then frame the collection service through WRAP's (2009) report. To employ WRAP's (2009) report correctly, however, emphasis first lies with gathering a qualitative survey on New Zealand household food waste. To imitate the resolutions of the UK's food waste management strategies, will not address correctly the issues of food waste for New Zealand, without a comprehensive qualitative household survey.

There are already techniques available to government to immediately employ food waste reduction methods, as re-directing food waste to compost only solves a portion of the food waste problem. The government could introduce policy changes that offer initiatives (tax breaks) for suppliers and manufacturers who produce the least food waste. They could also make it law that a higher landfill tax is payable for companies who do not recycle food waste efficiently. Government led councils who provide collection food waste services to re-direct food from landfill, without undertaking a qualitative household survey, possibly masks the underlying (qualitative) issues of why people waste food, and what can be done to lower the food waste issues within the home. The council system of collecting food could create a societal passive apathy towards food waste via thoughts such as discarded food is going into a large composting programme anyway, why is there a need to reduce food waste further. The concern that is not covered by ACC or websites however, is that although it is relatively cheaper to send a tonne of food waste to compost than to landfill (£41 for anaerobic digestion compared to £85 landfill, WRAP, 2012), the same problems arise within distributing compost, land availability for large compost sites and the capital needed to employ workers, distributors and disburse land rates. Prevention is better than a cure, in this scenario, would imply a need for food waste education for consumers, before the food waste reaches council waste bins. In the case of this family, their educated foundation concluded their leftover food weights were very low, of which all food materials could have been composted in a home system, with very little effort, or need for a council system whatsoever. If minimal amounts of food waste are possible in this family, their methods should be a model for other families.

## **Supermarket Responsibility**

A qualitative survey into consumer perspectives on supermarket and manufacturer food waste responsibility is needed to conclude if the family's thoughts on supermarket shopping are common. A large scale comparative study on family food waste, supported by the evidence in data gathered in this small study, has been important to reveal one family's food waste patterns and methods of diversion via various tactics, which have shown encouraging results. The family makes choices with regard to what is eaten and purchased which is discussed in audio transcript 1 (see appendix p. 138) where the mother states she hopes to buy vegetables without stalks, therefore she would have no waste, with the idea that the supermarkets would have had the opportunity to manage this waste first and with better outcomes than the family. She states that if she could she would rather buy products from the supermarket that were de-stalked, or de-headed beforehand, in the hope that the supermarket would have a more effective approach to discarding or recycling them. This statement is interesting, as already mentioned in the literature, manufacturers and supermarkets are wary of publishing their waste statistics or disposal methods. However, there seems to be a wish from this family, for supermarkets and manufactures to take more responsibility when dealing with waste. The concept of de-heading vegetables, or selling vegetables with no stalks, could inform the debate on the genetic modification of foods, to design out waste at the growing stage could be research for agriculturalists and a solution for manufacturers and supermarkets in the future. What is also of interest is that 'Ginsters' the UK pie manufacturer can deter waste through sales to other clients (Stuart, 2008, p. 52), because of the way they have modified and marketed their brand. If supermarkets could follow the same patterns as Ginsters maybe they too would be able to reduce their food waste deficits. For example, if the suppliers would manufacture sandwiches without the supermarket logo label, it would be possible to re-sell if the sandwiches if the supermarkets ordered too many, instead of them going to waste. With this family's scenario, where they do not consume stalks and heads off vegetables it may be improbable that farmers will start producing vegetables with no stalks. Yet, if the supermarkets, or manufactures had the opportunity to de-head, and de-stalk maybe half of their fresh produce, it could be fed to pigs, uncontaminated, or discarded as compost, rather than passing the waste onto the consumer. Another option could be that the family attends an eating habit educational programme. This programme could include methods for using foodstuffs that are socially thought of as inedible,

such as potato peels, but could also include techniques for using food by-products as food sources.

As the audio transcription (1) reveals discussion moves onto talk surrounding extra stock in supermarkets. The Mother had first-hand experience, of the USA supermarkets and how they differ from NZ in respect of surplus choice of food within supermarkets. The literature it is mentioned that supermarkets feel a need to create aesthetically pleasing shelves, with lots of produce on the shelves to satisfy customers (Stuart, 2008, p. 25). The family disagreed with the supermarket view stating "I would like to see less on shelves, I still don't think we need that much choice" (audio transcript 1). Therefore, assuming this family's view is typical of other families, supermarkets could lower their waste amounts before food items were even stocked on shelves, but having smaller stores for instance or online virtual shops and door step delivery from a warehouse as the UK's OCADO (OCADO Ltd, n.d.) The participation of supermarket waste reduction could be eliminated through correct ordering of stock from suppliers and manufacturers. This observation would need further investigation through a qualitative survey of New Zealand supermarket shoppers. At present, there is no information on whether or not NZ clients want to see full shelves.

The issue of manufacturing is a concern for the family as they also discussed the topic of supply and demand, through an example of Marmite. This yeast based food was scarce at the time of data collection, due to the Sanitarium factory, based in Christchurch, sustaining damage from the previous year's earthquakes (Shears, 2012), however Vegemite was still available. The children had discussed with their mother issues such as availability and demand for Vegemite when Marmite is available again. An educated family view amongst food waste issues is suggested by this audio recording. This also suggests that if the children are observing supply and demand issues with food, then there is a possible lack of food economic education in schools. It has been observed through the audio transcripts and data collected that the parents have tried to implement some of their sustainable tactics with the children. In this case their methods have been successful, as their food waste calculations show. These results were not tested against other families and no comparisons were drawn. The family's discussion about Marmite coincidentally relates to the use of by-products as a food waste diversion method. The use of by-products was not covered by the websites even though food can be re-made from in-

edible goods, or by-products of meals, such as potato peelings. Potato peelings can be converted into chips, or used as a base for gnocchi (Agriculture and Horticulture Development Board, n.d.)

Further research needs to be conducted to assume amounts of actual food waste for families in NZ. This would then establish whether a government led initiative for tackling food waste could be introduced in schools. At present some primary and secondary schools participate in recycling methods such as composting food or making worm farms (ACC, 2013) although these programmes are only methods for eliminating food waste once it is eaten and discarded. Education should be sought not to only divert food waste, but to ensure it is of minimal amounts in the first instance. Transparency of information, and statistics, maybe through a central food waste centre as mentioned above, would start conversations and maybe produce policy changes for NZ government and education curriculums.

### **A National Survey to Address Food Waste Concerns**

There are already some schemes in place in NZ promoting systems of recycling food waste. Auckland Botanic Gardens encourage schools to participate in their waste reduction education programmes (ACC, 2013). Schools can visit the gardens and learn how to create composting systems themselves. As the Auckland City Council encourage education providers to become involved in food waste diversion processes, there is a simultaneous food shortage presenting itself in New Zealand schools. There has recently been a wide spread message through the media that not enough school children are receiving breakfast each day. Statistics show that 270,000 New Zealand children live in poverty with many starting school without breakfast (Collins, 2012). A scheme called 'Kids Can' aims to alleviate this problem through donating essential items to schools (clothing, food) and currently feeds 4500 children per day. However the charity states it should be addressing the needs of 15,500 children per day (Collins, 2012). Aided by TV3's Campbell Live programme the charity has managed to raise 319,000 dollars and receives 150,000 dollars from the government. Food donations from companies such as 'Tip Top Bread' and EaziYo yoghurt also assist schools with this food shortage problem. Food giants Sanitarium and Fonterra supply Weetbix and milk for their 'kick start breakfast' agenda in schools. Currently food waste from supermarket Countdown is donated to charities such as the Salvation Army, although weights or amounts of food remain unpublished, as do statistics on

how many people this scheme feeds. Kids Can charity relies on donations from companies, individuals and families albeit other retailers such as Pack N' Save, New World and fruit retailers like Nosh and Fruit World also have food waste that could be re-directed, or supplied to schools. There needs to be a request for research as to why the issue of hungry school children is not being addressed as simultaneous food waste occurs, in households, businesses and supermarkets.

The solution of directing surplus stock from supermarkets to schools cannot be applied correctly unless there is a demand for NZ food waste statistics to be gathered, analysed and be published to support this solution. It is unclear exactly how much food is wasted in this country, and what could be diverted, or re-used if useful, without a comprehensive qualitative study and fact sharing agenda. The issue of feeding school children may not relate directly to the results collected from the family case study. Although it does directly link to the requirements for food waste education and prevention in schools and at home, alike to the family's own parent-child education process. Hunger in schools could be improved once statistical details can be published from a governing body and acted upon correctly. It is advised that the country's decile 1-4 primary and intermediate school children are the majority affected by hunger (Collins, NZ Herald, 2013); therefore these schools should be targeted for supermarket food waste diversion schemes first.

A New Zealand food waste survey is needed to evaluate against information from the UK. Currently British information on food waste is being used to inform a New Zealand version of food waste scenarios and create dialogue, for example with the food date labelling issue. This exchange of information could be detrimental to New Zealand if it follows the UK's stance on food waste without conducting a national survey of its own. WRAP's extensive research into food waste in the UK found that individuals and households with non-related adults would cook and prepare different meals every day. "The households that are most likely to be serving different meals every day are those made up of non-related adults; 4 in 10 (40.7%) of these households have different meals each day" (2007, p. 3-4). WRAP's (2009) holistic study on household food waste diversion tactics also produces a qualitative view from the public and their willingness, or reluctance, to reduce their food waste. Statistical surveys such as this should be conducted to obtain a NZ perspective on food issues, and include published facts on

family households. UK based Improvement and Efficiency Social Enterprise (iESE) runs a waste improvement network with the ideals of sharing advice and methods of reducing food waste for councils. The information available on their website could easily be transferred to New Zealand government for methods of collecting food waste, and creating surveys such as WRAP's (2007; 2009) reports. Deductions and improvements could then be made for a NZ demographic. As this research was small scale, (limited budget, time, and resources) a larger quantitative data collection was not currently possible (such as sampling from more families). Had the research scope been larger, data would have been cross-examined by maybe three or more families to validate or annul the New Zealand statistic of an individual person wasting 500g of food per person per day<sup>2</sup>. This quantifiable technique would then be one of "three methods through which we can attempt to generalize from the analysis of a single case: obtaining information about relevant aspects of the population of cases and comparing our case to them" (Silverman, 2010, p. 140). A national survey on the population's food habits could produce these generalisations which may then, in association with information from WRAP and iESE, be used in an attempt to rectify major food waste concerns.

Qualitative methods applied in WRAP's (2007) report questioned 1,182 households. If the same number of households could be surveyed in New Zealand, there would be a greater advantage of securing representative facts on food waste due to the lower population of the country. Limitations to this type of surveying would be the honesty, and truthfulness of data collected. This is addressed by Silverman (2010, p. 48) who tackles the problem of honesty within interview responses. However, if this survey was approached as a philanthropic scheme with benefits to the public for taking part, there would likely be an honest response from participants. Honest verification of food waste statistics could greatly improve New Zealand's chance of retaining its "clean, green image" (MfE, 2001). The "impetus behind much of the way New Zealand markets itself to the international community" is by advertising the clean, green brand (MfE, 2001, p. 2). A national survey on qualitative food waste data could push New Zealand to be a leading country with respect to food waste diversion tactics because of the relatively small populous. The New Zealand population is educated, it has the resources, and its scale enables

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<sup>2</sup> The first source of these statistics came from an article in 2009 by NZ Sunday Star Times who reported waste to landfill in tonnes. 3.2 million Tonnes of rubbish were going to landfill in 2009, 23% of which was organic waste. This equated to 736 thousand tonnes of organic waste. Broken down, divided by 4 million people, a figure of 500g per person, per day, could be calculated.

the country to be nimble regarding legislation and implementing change and with correct methods in place, could become the forerunner and world leader in the reducing food waste debate.

Main points extracted from the research and concluded in the discussion are the use of website information, contrasted with family information, resulting in the need for an information action centre. Through a connected action centre the issues food waste diversion from suppliers, manufacturers and consumers can all be addressed. The major issue for consumers within the food waste disposal problem is the lack of composting techniques and methods provided for by the council or other governing body. Within this disposal issue is the need for more viable information on New Zealand's food waste problem through a qualitative survey method as suggested by iESE or WRAP. Overall a request for education programmes, or educating food waste reduction plans, is needed to sufficiently address the needs of the New Zealand people.

## Chapter 9

### Conclusion and Implications

#### Education

This family is well versed in food sustainability issues and was able to divert the majority of their household's food waste away from landfill, facts evidenced by the data analysis. Sustainable practices of food waste reduction were already practised by this family before the research began. This included their knowledge from the Outward Bound Scheme on composting techniques, and also their own personal methods for reducing food waste at home. Their strict shopping habits used methods of diversion and assisted their techniques towards minimal food waste. Methods ascribed to the family included buying vegetables loose, buying fresh produce weekly and ascertaining how hungry the children were before serving meals. This awareness contributed directly to low amounts of food waste being gathered throughout the entirety of the research. Additional information to add to the family's existing knowledge bank included only two suggestions which the family would employ. These were; checking their fridge seals (for correct storage purposes) and date labelling leftovers (for food safety purposes). The overall findings from this case study on the family are that with the correct education, tools and techniques, a family can produce very low amount of food waste in their household (30g per person, per day).

Comparing the data gathered in this study to the original research statistic,(ref?) that 500g per person per day, of food waste is generated in New Zealand, is unfortunately not applicable in this instance. This is because the actual statistic (Broatch, 2009) cannot be verified and is theoretical based on data gathered from British and Australian figures, for comparison, and then applied to New Zealand. The figure was assumed for 'organic' waste, as a whole field of study, of which there was no further information to attain exactly what "organic" waste referred to. Organic may have included green garden waste, and therefore further dissection of organic may have proved food waste to be far lower than the 500g standard calculation. Further confusion ensues when interpreting more recent literature such as TVNZ's (2013) report. This states that New Zealand population wastes 60kg of food, but does not state a time period for the measurement, or how it was accumulated. These problems pose a concern for this research as there is no valid data to compare the case study family to. The family's data cannot be placed

within evidenced measurements when it comes to calculations of food waste, as there is no solid, verified amount to equate their food waste weights to. The concerns listed above include thoughtful issues for further research. These are the implications of comparing countries statistics, the difficulty in finding a conclusive transparent food waste statistic for New Zealand and the apparent need for public education about food waste issues.

The effects of comparing countries statistics appear detrimental to New Zealand. This was presented by the case study family through their discussions about [lovefoodhatewaste.com](http://lovefoodhatewaste.com) and the portion calculator. It was unclear for the family as to which countries the site was catering for. The issues of different countries eating and agricultural habits became apparent (figure 18). Imitating another country's statistics without accurately calculating food waste in New Zealand first, may end up wasting time and resources by rectifying a problem which has not yet been evidenced (500g [Broatch, 2009] or 60kg [TVNZ, 2013] or 750 billion dollars per year [Davison & Johnston, 2011] of food waste?) Primarily there should be a qualitative data assessment conducted of New Zealand households to attain figures of food waste. Only then, assuming the information can be verified can a solution to the problem start to be addressed. This will in turn eliminate the issue of finding a conclusive statistic for food waste, per person, per day in New Zealand. The findings from this qualitative survey will then affect the requirement of education. It is only after conducting these surveys can the issues surrounding food shopping, purchasing storing and discarding be addressed.

For now, however, assuming the lowest calculation for food waste in New Zealand is correct (500g per person per day or 450 dollars per household per year) this food waste amount is still high. The underlying issue here is primarily what value does western society place on food products? The 'throw away' mentality could be tackled through the education system. For instance, there is a demand, in the UK, which will be implemented in 2014 to bring back home-economic (cooking) classes, to educate children on not just how to cook, but how to be creative with leftovers, and how to create food out of ingredients that may otherwise not get used (Hope, 2013). The thinking behind the advantages of cookery classes is that if children learn to cook, as opposed to eating ready-made meals, they will learn to value the meals they create and in turn, may not be so quick to dispose of food. This call for food education in schools could be implemented here, in New Zealand, through policy changes through government, and a more active behavioural approach from parents. Ironically there is an issue with under nourished

school children in New Zealand, whilst parallel food waste occurs. This issue could be eliminated by correct diversion and supply of food in the first instance. If facts on New Zealand's food waste issues were published, consumers would have the opportunity to make informed decisions. Presently the information available is limited and unreliable.

Educating school children about the facts on food waste begins to tackle the food waste issue for the longer term. However some schools may be reluctant to teach children when there is already a food shortage. Home economic classes could begin to teach children to understand some of the methods used in diverting food waste from landfill, whereas universities could start exploring food by-products as ingredients into their research initiatives. Individuals would also have to become more aware of the full price of food items, not just the retail price. An identity label could clearly demonstrate how much a food item cost to produce. For example: calculations could be printed on a yogurt illustrating how much it cost to raise a cow, to feed it, to milk it, to churn the milk, to let it rest, to churn again, to set it, to package it, to transport it and finally to sell it. This type of information may deter people from wasting the item if monetary material was physically presented on the items. A QR code, utilised as another information tool, could appear on food items to provide the same information. This would educate consumers on the costs of food, not just as a commodity but as an essential necessity of living. However manufacturers, farmers and supermarkets would all have to agree on this transparent technology.

### **Qualitative National Enquiry**

Methods of educating and creating specific techniques for a food waste reduction programme cannot be successfully delivered without a national study. This study should aim to draw qualitative food waste data from the population. Only after a survey of this kind is conducted will the problems of food waste be known. After the facts for food waste are reviewed, an optimised waste reduction programme can occur, nationally. Currently local governments in Hamilton and Wellington are trailing food and green waste collection procedures. This could lead the way for a nationwide waste diversion programme. However, this collection process only disposes of waste and does not address the issue of food waste from manufacturer to consumer. As already suggested a "zero waste" food education programme in schools may teach children the facts on food waste, costs involved and the situation in less developed countries. This could be

incorporated into home economic or culinary art classes, and could also integrate composting, and other food waste disposal and diversion methods.

As poor shopping behaviour is being held responsible for amounts of food waste (Broatch, 2009; Davison, 2011; Stuart, 2009) education on how to shop should be sought. Shopping behaviour requires a national review to be completed to assess how the public's shopping habits and whether their methods can be improved. A survey similar to WRAP's (2007) report would aim to determine these findings. With the case study family, improvements to their shopping behaviour were not needed, as they already utilised all of the shopping suggestions from websites. It would be beneficial to conduct an enquiry to determine whether or not the websites' shopping tips are out-dated. An advanced technological approach (such as the QR code) may be the best way to teach consumers how to shop. An information label requiring "food-air miles" or "land to mouth" costs may drive consumers to take more time to review food with an ecological function, rather than a nourishing entitlement for human consumption.

Specials and BOGOF offers need to be confronted in NZ as these deals may be promotions used by supermarkets to divert waste to consumers. This was found to be the case in WRAP's (2007) report, whereby respondents found they were throwing away food due to over-stocking via supermarket promotions. The public has no similar report to reference in New Zealand. In stating this, the case from the research family was that they did shop for good specials, and did choose price before brand (see appendix). In their case purchasing more food, through buying specials, or when using the LFHW portion calculator did not yield higher amounts of waste. Rather the mother had enough knowledge of food, and cooking, to convert surplus food into meals, to be frozen and re-used, or taken as lunch. She was conversant in returning nutrients to the land, by which she had learned the costs and time required to produce good compost, rather than utilising a landfill bin for surplus food.

There is a current conception that consumers want to see fuller shelves in supermarkets, which in sequentially combines a consumer sense of fresher produce. When asked if this was the case with the study family, their response was that they would actually like to see less on shelves. Whether or not this is a public view needs to be verified. Countdown is responsible for a "fresh or free" (n.d.) advertising campaign whereby if consumers feel that the item they

purchased is not as fresh as it should be, it will be replaced, and the value of the food item refunded. This purchasing mentality encourages shoppers to commit to fresher produce, and if this is not adhered to by the supermarket, they will receive their money back, along with another food item of similar value, without judging the waste that they produce in this instance. Supermarkets should be responsible for sustainable shopping practises, not marketing wasteful practices of edible food items.

This responsibility is highlighted in the recent IMechE's (2013) report which suggests recommendations for food waste reduction:

Governments in developed nations [should] devise and implement policy that changes consumer expectations. These should discourage retailers from wasteful practices that lead to the rejection of food on the basis of cosmetic characteristics, and losses in the home due to excessive purchasing by consumers (IMechE, 2013, p. 5).

Changing consumer expectations starts with a shift in behaviour via supermarkets and manufacturers leading the way in sustainable procedures. Therefore publicising methods such as Countdowns' "fresh or free" policy (n.d.) is in contradiction to IMechE's (2013) recommendations. The Mechanical Engineers (2013) report also highlights the differences between less developed, developing and fully developed nations. Overall the majority of food waste in developing nations is through poor transportation, harvesting equipment or storage conditions. For example in South East Asian countries 37-80% of rice is lost due to these factors (2013, p. 17). In comparison, in fully developed nations fruit and vegetables are discarded due to their aesthetic qualities. 22% of potatoes grown in the UK do not reach the shelves as they are rejected for these appearance factors (2013, p. 18).

"[E]dible fruit and vegetables are rejected by the major buyers at the farm in the pre-harvest stage because they do not meet marketing standards for their physical characteristics, such as size and appearance" (IMechE, 2013, p. 18).

The differences here between developed and developing nations could be highlighted through a labelling system, as mentioned above, or via a quick response code (QR) reader for smart technologies. There is no research to determine whether these facts and figures for developing vs. developed nations are publically known, or whether the public would want an opportunity to be educated to make informed purchasing choices. Other issues highlighted in the report include natural material wasted through the production of food. For example 550 million cubic

metres of water is wasted, used to cultivate crops that never reach the consumer. These issues could be addressed for consumers, at an early age, when behavioural change is achievable, such as in a school environment.

### **Family case Vs. Information (not) gained**

In this instance, the family conforms to the recommendations set out by IMechE (2013). They do not over-stock on particular food items, and when they do, are able to convert food into meals, or divert it from landfill. They are also familiar with farming practises, via the outward bound scheme, setting a good foundation for sustainable practice. This family produces little food waste, all of which could have been diverted to composting systems. What is apparent from this study is that a well-informed family, like the case study family, has no new knowledge available to them to assist them with reducing their food waste situation further. They are in an optimum position of the food waste scale. However, if they were informed further about food miles, water wastage, or other such food waste related issues, they would be able to converse about these subjects with their family and networks (as already shown in audio transcript 1). This may then give them the opportunity to discuss and influence behavioural change. For example, if they knew the total cost of producing a broccoli, would they still discard the stalk? In the food waste disposal chain, it is not only the food item that is lost to landfill, but the human, and environmental (water, land, soil, seeds, energy) cost too.

Information gained through using the key websites was limited on this occasion. Although what is unknown is whether the results from this experiment, repeated on another family, would remain the same. In stating this, methods that the family used to reduce their food waste could be replicated within another family. Techniques such as shopping to a list, buying fresh produce once a week and asking how hungry the children are before serving food, may all be used as waste prevention solutions. Interlinking website and consumer information would also create a reliable network for communication and education. Unlikely considerations for diverting food waste may be issued here, such as using by-products as food ingredients or using peels as food ingredients, such as potato skins for gnocchi. Publishing manufacturing and supermarket waste statistics within these sites would also provide more information to be assessed by the public. Creating information workshops for food waste would enable the public and communities to become involved and create food waste diversion and re-use tactics. The current food waste

projection for New Zealand (500g per person per day) roughly equated to 37 Auckland sky towers filled with food waste (figure 31).

**Figure 31:** Food Filled Sky Towers; calculated by researcher from edible tonnes of waste in NZ



Limitations for this research centred mainly on the honesty of the participants. This was raised through Silverman (2010) when discussing the case study scenario. Within this research, however, the family appeared to give honest data deductions. During the first stage of research they collected their waste physically to be examined by the researcher signifying their honesty of findings. This would have continued if the researcher had not given other directions. Their honesty was also detailed through “cereal dregs”, “half a sandwich” and “eyes too big for stomach” in their collection tables. Other limitations included the methodology used to investigate food waste. Using a case study method only analysed one particular family’s waste. If the research scope was larger comparisons between families would have been useful to compare quantities of waste and techniques of diversion. It may have also been beneficial to the project to conduct a small quantitative survey to determine amounts of avoidance

suggestions used by families, although a quantitative survey is rather a case for further research, applied for by government, to determine behavioural change.

The available literature overall suggests poor labelling and consumer shopping habits as the factors that influence food waste. If that is to be determined as the case in New Zealand a qualitative study will need to reveal those factors. Stuart (2009) alerts readers that households with children will be most likely to more food, compared with those without children. This example should also be addressed and verified. As this research project had limited resources, surveys of more households were not considered. The main aim of the research was to uncover website information therefore examining more families was not considered. Website information for this research was limited. Tips, methods and techniques of food waste avoidance were obtuse and therefore not viable for this family. Specialised literature on methods for securing a zero food waste lifestyle should be more available for environmentally aware families. Similarly education should be sought as a main tool to advocate food reduction methods. This education tool could be available through connecting websites, information registered on items of food, or through tactile means such as at an information stall at schools or supermarkets. Any of these methods provides the public with an opportunity to become conscious of food waste, as a societal issue, and determine behavioural changes, if appropriate.

The design of the research was created with the case study family in mind. However the research would have been relevant for any family and so the methods for collecting data were designed to be simple this domestic environment in mind. The family were not hindered financially, except when using the portion calculator. As mentioned in the discussion, the mother became concerned about the amounts of food the calculator suggested for her children, resulting in purchasing more food, and cooking more vegetable dinners. The family acknowledged this research as a “self-checker” rather than an innovative food reduction experiment, classing many of the suggestion from websites as “common sense”. Further research would be required to determine whether these tips are in fact common sense, or whether this family is abnormal with their food techniques for shopping, cooking, preparing, storing.

Perhaps most encouraging for this research is that IMechE's (2013) report has just called for consumer behavioural change, like that seen in the case study family's scenario, as a technique to challenge food waste within households stating "education, training and management systems need to be installed... to work towards reductions in current [food waste] levels" (2013, p. 25).

### **Further Research**

Further points of interest are listed below. These points would require further research to gather a comprehensive view of New Zealand's food waste habits.

1. To identify a reliable and valid statistic for New Zealand.
2. Utilise a qualitative survey method to identify consumer concerns, and household food waste habits.
3. Incorporate available information via a cyber 'sharing centre'
4. Invest in advertising, marketing and public service announcements on the issues of food waste, alike to recycling campaigns for plastic bottles.
5. Apply the methods and techniques from this case study family to another family, or a range of families, for comparison. Test these methods to combat household food waste amounts.

Identification of a reliable and verified New Zealand statistic needs to be gathered in order to prevent, or deflect food waste within households becoming a problem. As stated above, statistics are scarce and relative to Australia and Britain. 'Organic' waste statistics are not applicable as separate food waste calculations. A clear waste measurement should be available that states an amount of food waste (by weight), per person, per year.

Using a qualitative survey could gain this calculation. It could also be used to provide a specific insight in to issues of food waste in New Zealand. What is unclear is whether there is a current food waste problem or not. This needs to be addressed from a consumer perspective.

Interlinking waste reduction methods via a centralised sharing hub is one way of alleviating part of the food waste issues. This website centre could be used by individuals and families, but also by schools and businesses as an educational tool. Governments may use this centre by way of interpreting consumer wants and needs. Governments and councils may use this centre to

address and exercise policy changes, surrounding food waste, to gather public feedback and suggestions.

An investment in food waste education, alike to the plastic recycling initiative, would give food waste issues publicity and attention. Advertisements or marketing campaigns could be created, in association with supermarkets, to educate consumers on the issues of creating and disposing of food waste. Public service announcements, alike to drink driving and reduce, reuse, recycle campaigns, would intentionally force the public to develop a societal conscience for food waste issues.

Using this case study's reduction techniques as a starting point, these methods could be applied to another family, or a number of families, to evaluate their household's food waste amounts. Calculations could determine whether the family's and website's techniques produce a decrease in food waste measurements, or whether these methods are also deemed "common sense" for the general public.

Further research into these above points would begin attain a holistic perspective of present food waste issues for New Zealand. Crucially, New Zealand's "clean, green" image may depend on it.

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## Appendices

Appendix A- Data Collection Table (Figure 13)

Day	Meal/Food	Food Wasted	Why it was wasted	How it could have been prevented	What could have been done with surplus food?
Monday	<del>DINNER</del> Baked Chicken in Rice	None	N/A	N/A	Surplus food was frozen - to be eaten later in week Dessert will be eaten again.
3/9 Tuesday	Mud Cake - Birth Day Chicken Pad Thai	Veggie steaks	Don't eat these	"	
4/9 Wednesday	Birthday Cake & Cream Spaghetti Bolognaise	Tops of veggie	Don't eat these	"	Cake used in lunchboxes & afternoon tea. Frozen - 3 servings of pasta sauce.
5/9 Thursday	Bday cake Chicken Drumsticks in rice & stir fry veggie	<del>plate</del> Chicken bones / bits of rice / stir fry scraps on plates	Don't eat bones Bones didn't clean plates completely	• Cook bones down to create broth • Make sure family ate everything on plates	Surplus Rice covered a portion of fridge to eat tomorrow for lunch.
6/9 Friday					
Saturday					
Sunday					

Appendix A-1- Data Collection Table (Figure 14)

Weekly table for data collection **Dinner Only.**

FOOD DAY →	Bought	Used	Stored	Discarded	Composted
Monday 3/9	Boon chicken-breast Butter chicken sauce Long grain rice, veggie Macha & cake.	Chicken, sauce, souflem rice, salt, oil, veggie Flour, cocoa, egg, sugar eggs, butter, sugar Oil, to stir fry	Frozen left over dinner - 2 servings Cake wrapped & eaten during week.	Nothing.	Vegetable cuts eg: carrot, onion, broccoli, kudzu stalks/ends
Tuesday pasta Chicken 4/9	chicken, parmesan mushrooms, lemon juice bean sprouts cream Cake & cream.	Oil, to stir fry Biscuits, cake & whipped cream.	Nothing left.	"	n/a.
Wednesday spaghetti Bolognaise. 5/9.	pasta, mince, toms, sauce, veggie, garlic, herbs. Cake & cream	All the oil.	Frozen left over. 3 servings.	Nothing.	n/a.
Thursday Chicken Drumsticks 6/9	Drumsticks, rice, seasoning, stir fry veggie. Biscuits / cake.	Oven, microwaved rice, oil.	Cake wrapped in plastic. 1 serving rice - stored in fridge	Chicken bones. bit of scrap rice/veggie.	n/a.
Friday					
Saturday					
Sunday					

Appendix A-2- Data Collection table (Figure 15)

Day	Discarded Food (Weight) (Total Amount in Grams)	Type of food (Peel, skins, piths and pips)	Could be edible? (Yes, No)	Reasons as to non consumption
Tuesday 25 <sup>th</sup> Sept	148gms. + 48gm banana peel.	Apple core - lunchbox. Crispers - lunchbox. Pasta - dinner. Banana - afterwards. Dinner - leftover pasta sauce in extra pasta added Lunches - used remaining fresh bread for sandwiches. B'fast - Fresh bread - no waste plus coffee / Milk / Juice.	No Yes Yes No.	Don't eat core / pips. Got so soggy in lunchbox Eyes bigger than stomach.
Wednesday 26 <sup>th</sup> Sept	106gms	* Dinner stir fry - few veggie Lunches - rolls, nibbles, mush B'fast - cereal, dregs	Yes Yes Yes	bit of leftover greens. Don't eat apple core, chutney, soggy. what was left on rims of bowls x 3. Others had toast.
Thursday 27 <sup>th</sup> Sept.	150gms. + 255gms - bones.	Dinner - veggie scraps. Dinner - chook bones. Lunches - apple core / pips B'fast - cereal dregs	Yes. No. No. Yes	I child not so hungry. Don't use for soups etc. Don't eat. what was left on rims of bowls x 3. Others had toast

Appendix A-3-Data Collection (Figure 16)

Day	Non Edible.		Edible. Weight.		Reasons as to non consumption
	Discarded Food (Weight) (Total Amount in Grams)	Type of food (Peel, skins, piths and pips)	Could be edible? (Yes, No)		
Monday Chicken Drumsticks x10 □ baked diced potatoes + shrimp veggies.	discarded bones, carrot stalks, potato skins, broccoli in their skins, broccoli stalks, mushroom stalks, capericum stalk	None that were edible.	No.		
Tuesday spaghetti bolognese □ homemade bread.	discarded all stalks spinach from carrot, 3ucchini mushrooms, capericum, shallots empty tomato tins x2.	Fridge left over sauce.	-		
Wednesday School. Halloween Disco.	Empty □ Disco	Hotdogs, candy floss, fizzy drinks, lollies!!!	Nothing good.		
Thursday Butter Chicken, rice.	stalks from broccoli, carrot onion skin, mushroom stalks capericum seeds.	None discarded that was edible. Fridge left over rice chicken for lunch.	No.		
Friday Bolognese sauce (left over) □ pasta.	Fridge left over from Tues night + extra pasta + cheese.	-	-		
Saturday Stripy □ rice vegetarian.	discarded stalks etc. homemade rice 3/4 cup. □ lemon honey sauce.	-	-		
Sunday Lassagne □ homemade bread	Used frozen spinach tinned tomatoes + tin sauce pasta. mince 500gms. discarded stalks from casserole, onion, garlic.	Fridge left over.	-		

Appendix B-Portion Calculator Comparison (Figure 18)

Food type	Portions.	2+3. currently.
Broccoli	8 florets	↓ 6 florets
Carrots	3 medium.	↓ 2 carrots
Zucchini	2 large	↓ 1 zucchini
Capsicum	1 large	↓ 1/2 Capsicum
Mushies	320 gm	↓ 100 gm
Potatoes	7 med.	↓ 4-5 medium
Beef (mince)	450 gm	↑ 500 - 700 gm (creates left overs).
Chook	600 gm	✓
Fish	600 gm	✓
Pasta	380 gm 1 1/2 cups	↓ 200 - 250 gm
Rice	1 cup 250 gm	✓

- \* Are portions based on a bigger general sized population?
- \* Are veggie portions as if they are the only 1 on plate - seems like a huge amount when we have several veggies on a plate.
- \* Will Δ the weights I purchase for meat & keep it in mind for chicken
- \* Will now date when I freeze a meal. 55211519 20 01m - 600 gm

Appendix C- Information from websites (Figure 19)

www.lovefoodatewaste.com

\* information website - needs seasonal Δ to suit SA Hemisphere recipes.

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
Monday					
Tuesday	Print a Veg Waste. Reduce the most wasted Recipe tips.	Checked Fridge was at correct temp.	Freeze & date foods. Always have portion/size as simple portions to suit pack.	→ did & will date. Know. → did & will date. Know.	30 mins / Yes.
Wednesday	Portion Planning.	looking @ veggie quantities.	Mealing a note of peaks & empty in meals. & to shopping quantities.	→ delays as this & make a little more for lunches. → will alter my original portions after reading this info.	30 mins / Yes.
Thursday					
Friday					
Saturday					
Sunday					

haven't the most from this site - in regards to portions of meat & veggie & pasta/rice. Don't agree to all portion sizes but very interesting to note my differences.

Appendix C-1- Information from websites (Figure 20)

sustainability paper format.

\* Good information & makes sense to do this to reduce waste.

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
Monday	Plan Meals for a week.	check supplies prior 2 shopping - always make a list. Shop to list.	Common sense - do this.		
Tuesday	Blanching Veggies	Store Freeze fruit pulp & add lemon juice to it	Don't blanch veggies - good idea but we don't have much left over fruits. & portions. That is further.	→ don't do this. → do freeze seasonal	
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

Appendix C-2- Information from websites (Figure 21)

*www.mfe.co.nz*

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
Monday	looked around website but didn't see anything directly				
Tuesday	relating to recovery of <del>eff</del> edible waste.				
Wednesday					
Thursday					
Friday					
Saturday					
Sunday					

Appendix C-3- Optimised Waste Reduction Techniques (Figure 22)

Day	Information Found	Information Used	Practicality of information	Achieved? Successful?	Time spent/ Easy to find?
Monday	www.thedailygreen.com	10 easy ways to reduce food waste.	manageable	already doing	10 mins searching. Site
Tuesday					
Wednesday	www.acklandcouncil.govt.nz	2 tips 2 reduce food waste.	Composting courses create or own Eden website	No in a positi to create compost at work place.	5 mins on site.
Thursday	www.stuff.co.nz	5 ways to reduce your food waste. (Sydney Morning Herald)	All practical.	Undertaking.	Read article. 5 mins
Friday	www.good.is/post	10 ways to reduce food waste UK site but applicable to NZ	Good tips	Will check fridge seals. Do 8 of tips. Not composting.	10 mins looking thru
Saturday					
Sunday					

10 tips - Menu Plan; use up leftovers; use shopping list; Don't shop when hungry; Rotate items in cupboard s. FIFO; look at what you throw away, check fridge seals; Portion control; look at leftovers as ~~new~~ ingredients for new meal.  
 ⇒ "All doable."

Appendix D- Family leftovers from surplus portion planner calculations



Appendix E- Weighing tools for discarded food



Appendix E-1- Weighing Method; Citrus peels



Appendix E-2- Weighing Method; Chicken Bones



Appendix F- Food waste diversion; Frozen feijoa pulp



Appendix G-Supermarket waste (Images from researcher) August 2011



Appendix G-1- Supermarket waste (Images from researcher) June 2011



Appendix G-2- Supermarket waste (images from researcher) June 2011



Appendix G-3- Inside the supermarket landfill bin (images from researcher) August 2011



Appendix G-4- Supermarket food waste (images from researcher) August 2011



Appendix G-5- Supermarket waste (images gathered by researcher) July 2013



Appendix G-6- Supermarket waste (images gathered by researcher) July 2013



**Interview 1. ( 08-09-2012) Initial Discussion around Current Food Waste Behaviour** (Audio Recording) approval

H. How have you got on with recording? It must be annoying to fit it all in know you are busy.

S. No its here, have done three nights (recording), wasn't sure if you wanted me to do more, I can give you the information now. There's no problem about that and I wasn't sure if I was filling it out correctly

H. No this looks good, breakfast is pretty straight forward?

S. Yes that's right, lunches are pretty straight forward, S\*\*\*\*\* buys his lunch every day, I can tell you how much it charges, 10 dollars sixty for sushi every day.

H. Yes this looks great,

S. It was only dinner; I can tell you exactly what the boys do for lunch and breakfast every day,

H. Yes I already have it (recorded).

S. Yes its cereals and toast, B\*\*\*\*\* always has 2 pieces of toast, one with vegemite one with peanut butter, C\*\*\*\*\* will always have cereal, cornflakes, S\*\*\*\*\* has cereal, I have cereal with one drink.

H. This looks great, do you know what I realised looking through your rubbish; most of it is inedible anyway. (Referring to pips, skins and stalks from fresh vegetables).

S. Yes the end parts, yes most of it is stalks or onions peel and yes I could compost that, but I haven't. I suppose an egg shell, that's the other sort of thing.

H. It's really interesting that the family I assumed I would get is an everyday regular family, whereas this family has an awareness of waste, compared to national statistics. (Meaning that the statistical average for a family of four is that they produce 14kilograms of organic food waste per week)

S. Well yes from my perspective you don't get a choice, I would rather at the supermarket have the opportunity to take the head off the broccoli so I'm only taking the broccoli head off, I don't need the stalk, you know, but I have to pay for the stalk. Carrots I would rather have loose ones as oppose to bagged ones because often you will get rotten ones or older stock. If I have the opportunity to I would rather pick the vegetables I want. But if I could again, on top of that, I will, often with the mushroom, I will break the stalk off as I only use the head, as I know I will just put them in the rubbish. I know they [supermarkets] will only put them in the rubbish too, but I'm hoping they will have had more of an opportunity to use that, in a recycling manner.

H. Yes it's a tough one, it amazes me. My thinking this week is to leave you alone for the next couple of weeks as my main priority is the second phase of data collection with websites, so I will come with suggestions of websites. Before that, however, just for reference, what are your habits of shopping?

S. I shop to a menu so I try to make sure by the end of the week I'm out of everything especially fresh fruit and vegetables. Then I will relook at everything I've got, because there are things on special that I've bulk bought like muesli bars, [but] on the fresh produce side I try to make sure that I am buying just for the week. Society tends to be now, well my parents were unusual, we

moved a lot, whereas my grandmother stayed put, she knew everything she put in the garden and sold off the garden later on, so if you settled and stayed [you can do that], but our population is so mobile, we become removed from our family and origins. The basis of composting is overtime, and yes I could set it up but I know in my heart I wouldn't actually do it justice, yes I could put things in there but to turn it over, to mulch it, to aerate it, to make it actually work right, [I can't] I know it would just be rotting. And also at a certain outlook or age where people love their garden, (we're not), it's practical, it's a practical space it has to work for use. We don't garden, I mow and trim, because of the kids, on a weekend or down time we go bike-riding or [do] sporting activities, so yes [here I'm] trying to justify why we don't compost.

H. So you said when you used to work at outward bound you did a lot of composting?

S. Yes, so we had a worm farm that we worked with diligently and what we ended up doing was, with the worm farm, once it was set up and running, we separated the actual food scraps so there was no citric, no banana peels no oranges, no lemons, they can't have any of that so that got separated off, and there was something else that we couldn't put in there like bones and

H. Onion skins?

S. Yes onion peels so we had separate compost.

H. A separate system?

S. Yes, and what would end up happening for bones and things we had a fella who had pigs who would come and collect the meat and things for pigs. So yes all of that was spilt up on the food side of things, and all the liquid that would come out of the worm farm we would put back into the garden, regenerating the entire bush from the dairy farm, so the gold from the worm farm would become part of the nutrients.

H. Have you ever had a worm farm in the house? Since outward bound?

S. No you have to be really careful with the worms, there very sensitive and a lot of them died, something lacking in the nutrients, there we had a huge drum and something to collect it. But we ended up putting too much of something in and the first time it didn't work.

H. Was it large?

S. Yes (shows me height and length using the dining table as an example) but we did something wrong, can't remember what it was.

H. (Referring to recoded data collected) can I get in touch if I can't work out some parts of the table?

S. Yes of course.

H. Would you please sign the consent forms? And you've collected food again this week?

S. Yes it's just out there waiting for you.

H. You know when you go supermarket shopping; if you saw an empty shelf, or less on the shelves would that deter you from shopping? Have you thought about that before?

S. Yes because I went to the USA in 89' and it was 8pm at night and there was 3 rows of bread! It was stocked and I was blown away because I'd been living in Queenstown [NZ] with one four

square [shop] and if there were five loaves of bread [left] you just had to have it. There [USA] it was complete overload, and I thought how can you justify this choice? I used to go down there and not able to make a decision like sensory overload. And then NZ took it on the same mantle [like] at Pack N' Save, I would like to see less on shelves, I still don't think we need that much choice. We [the children] were talking today about marmite. Marmites not available anymore, B\*\*\*\*\* would prefer it but where marmite used to be is now covered full of vegemite and Buster said, 'now people are seeing vegemite and having to replace it if they wish to have that sort of spread, this [vegemite] is the only alternative they've got and they're using it, what happens when marmite comes back on the market? Is there suddenly this major 'Oh My Gosh' it's back let's put it all up again!!! Or do they go oh well, I'm ok, I've had vegemite do I need a choice?' You know and that was really interesting [for me] and that's from a 15 year old, and you know it's like, well why do they have 5 [shelving] layers of vegemite?

H. Of the same thing?

S. The same thing. I don't think we need, we've got into this bigger is better [view], so more choice is better, but honestly do we really need this? For the size of our population do we really need all this food stuffs sitting on shelves?

H. So do you shop for the freshest?

S. I'm actually very price conscious, and I'm not brand [loyal], I'm like a brand tart, it doesn't matter what the brand is, if it's on special [I'll buy it]. Chopped tomatoes I will buy home brand as oppose to Watties. And with that regard I buy in season you know, I try and do seasonal buying, but the boys like a particular apple so I will buy that because I know they will get eaten, so I will grit my teeth and do that. So yes on the fresh produce side I still won't buy more, when on special, than I would for that whole week anyway. Some of the things I used to do, I'd go to the supermarket in Blenheim, I would go and say we've got a school fundraiser coming up, I know you have food coming up to use by dates, but we have a wine and cheese function, so instead of you tossing them out, I would try and grab most of those things to use.

H. They [supermarkets] would never do that now.

S. No if someone got sick and said oh we got this from Pack N' Save, but [that said] that's only going back 5-6 years.

H. Supermarkets are trying to get on board [with their waste] now.

S. Yes like in Wellington they take the food and then can divvy it up either between chicken farms or [the] homeless.

H. Soup kitchens?

S. Yes.

H. Well I think that's it for this time, and I'll leave you alone for the week.

S. Well if there's any questions you can just e-mail me them anyway.

## Interview 2. (02-11-12) Conversation around using Website Information to Reduce Waste

S. So what I thought is to run through these things with you, what we've been doing for the last week. We had the Halloween disco of course, that's on the Wednesday, but for the last three [recording days] we ended up doing drumsticks so there was no edible waste from that, but I then explained why there is no weights [recorded] as such because there has been no edible waste for the last three meals. But I have included the stalks and the recipe so you don't just think we having a slab of meat, that why there's no waste.

H. What did you think of the websites? Are they giving you much?

S. Right. The one, "love food hate waste" is a very good site, didn't think much of the government what is it "MfE" one in a sense that it had lots of information on recycling but nothing on food, or edible food waste, nothing on that. So, lots about campaigns or programmes and processes of things that you can go through, or worm farms, or environmental concerns, fantastic, but not relevant to the specific area that you're talking about. I didn't find anything, [suitable on MfE] and I had a good trawl, on two occasions through that. So that was the points I noted on that particular one. The sustainable brochure<sup>3</sup> that you've given me, I put as an overall comment, 'good information,' it makes sense to do this (10 tips to reduce waste) to reduce waste but again, it was sort of more, [about] things that I'm already doing. So the things that I've found that were interesting to me, that plan meals for a week, which I already do that and check supplies prior to shopping, always make a list, well I always shop to a list anyway, because that's just how I do it, as where we used to live, you had to shop once every 10 days as you were so far away, so that training is already in place so I suppose all of this sustainable paper format information just confirmed that what I was doing was correct.

H. Ok

S. The only new information, 'blanching vegetables', we don't seem to have a surplus of vegetables that we need to freeze, because I shop to a weekly quota, I know how many of each thing that I use.

H. Yes and then you said that you try and use them up by the end of the week.

S. Exactly, like one apple, (points to fruit bowl with one apple and three bananas) which will be for afternoon tea today and then those bananas, if they go off will become cupcakes, or [I will] put them in the freezer, so that's fine. So, I don't blanch vegetables at the moment, I think it's a good idea but we don't have much left over to do that sort of thing [with vegetables].

H. Do you buy frozen veg anyway?

S. Yes I do, so yes if I run out I use them anyway, and something that I found amusing I can't remember if it was on this site but I don't buy a bag of carrots because I know how much I use, like 2 carrots per meals so I just buy 6 carrots, so I think that also means I don't have much wastage. Because then I have a stable situation where I know how much I use which kind of rocked my boat with the other website which I made some notes on, thinking that my children were being malnourished.

H. And the paper format used to be a website which was the only New Zealand based site around and they now direct you to MfE.govt.nz.

S. Well that [paper format] was much more informative than the MfE site so, it was interesting that I already freeze fruit in portions, frozen bananas, I always use three bananas in every recipe.

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<sup>3</sup> Paper format of closed website [www.sustainability.govt.nz](http://www.sustainability.govt.nz)

H. Is it quite general, or food type specific? What did you draw from the site?

S. I think the positive side is that people go “ah! I am doing the right thing so I am on the right track,” so I think that’s what I drew from that information. It was a positive affirmation that yes I am on the right track. As I said the blanching, well, we don’t, were not in a situation where I don’t have a vegetable garden where I suddenly have all the peas or beans ripe at the same time and so you need to have a way of being able to preserve them, and because we don’t ‘preserve’ as such, for the urban person, which I suppose is where most of the waste is coming from, for the urban person I don’t see that [preserving/ blanching] as being [a must], they’ll have a [different approach], and I shouldn’t be a generalist, but in most situations if you had a vegetable garden it would have been a small scale and you’d plant to the size of the family that you actually had, so it’s not as if you’re going to have half your land in a vegetable patch these days, in our parents generation, yes, they might have, as they may have had a barter system where you swap for bottled fruit, or whatever. It’s a funny old thing really because we planted fruit trees, things that we wanted so we’ve got 2 peach trees, 3 feijoas, we’ve got a passion fruit and a lemon tree down the back, so for me that’s great, and the boys really enjoy it, so all of that’s great so when you do have a glut of that type of fruit then I will freeze it, ill pulp and freeze it in bulk.

Going on to the next website, that’s the one there [lovefoodhatewaste.com]

H. Did it throw you off [hinder your findings] that this is a UK based site?

S. Well that’s what I said here “information on website needs seasonal change to suit our southern hemisphere recipes,” so they’re all talking about Halloween, but it’s all pumpkin, winter food, or autumn going into the winter season, so some of it doesn’t apply. But I mean, you know, that’s where the larger population base is, [northern hemisphere] and that brought me to an interesting thing, information found, again finding out that potatoes is the most wasted thing, and I thought that was quite profound since we’re not a huge potato eating family.

H. But I wonder what it [most wasted food item] would be if they did it over here.

S. Exactly, I thought it might be more dairy orientated, because we use a lot of it. Anyway, recipe tips, they were straight forward they were good. Portion planning, now I thought this was going to be great, and I did a, a reference thing here (points to personal recoding sheet, see appendix B) All the food types we use, their recommendations and what we use, because I know exactly what we use. So only the fish and meat were different. We don’t eat a lot of fish, so I use tuna for fishcakes, or tuna bake, but if I buy fish I’ll bread crumb and cook it myself. I use less pasta then they are suggesting and on par with rice. This horrified me at first I thought oh my god the children aren’t getting enough nutrition but when I pulled out [at the supermarket] how much they’re suggesting we have for 2 adults 3 children it seemed like an enormous quantity of food. And does that lead too much of your [societal] waste? Because that to me is far too much for them to eat, or does that again reflect, more of that European, or that [particular] continents eating habits, as oppose to ours? I mean I started to wonder is that [portion] because of the type of eaters, but there was no other relevant information for me to gage that against.

H. Yes that’s what I was thinking [about the site].

S. Well that’s why I ended up writing them down, either they’re [website creators are] looking at much larger quantities for people to consume or they’re looking at it like meat and two veg. Are they looking at trying to increase individual types of portions? Not thinking that we are using other types of vegetables too. Either you use theirs [portion control calculator] and freeze the leftovers or state that this is what you are going to use per meal, if the latter is the case then that is too much!!! I mean I like having this, this was a great comparison, a checklist, but I mean I’m a person that knows exactly what I’m having per meal, so for me, to see where I was sitting against what information they were recommending, so that’s why the queries that came up, where these sorts of things down here [on the recording sheet], so they’re questioning points

that I had in regards to that particular website. So, the information that I found that was useful, was that I don't date my foods, because I know that I will use them.

H. So there's nothing in your freezer that's old?

S. No absolutely not. Say on average I spend \$240 per week, and I will go through the cupboards and what I need to stock up on before I go to the shop, so I will have two of something, so if I use it I know I will need to replace it, and because of lack of storage space, I mean maybe tins may sit there for a while, a couple of months or a season out. Again the information from that website confirmed that what I was doing was correct, to go through your cupboards before going for a shop, make a list, shop to the list. That also suits me because I'm not a flamboyant cook, I don't like to cook, I'm not going to go and buy an exotic piece of food, so there is things I don't buy, and because I've got a family and I'm tight on time I will cook things that I know everybody will eat. With the dating food information it never really occurred to be because I know that there's fruit in there (points to freezer) from March but I know that's when the last seasonal fall was and I won't be getting them again for a year and I will use them within that year, but also is it so wrong if I have something that's frozen, sitting there for 6 months frozen? I mean I can understand if people have a deep freezer, or if we've bought a quarter of a beast but [then again] I know when we've bought it. We bought it in April so we don't have very much left of that. I made a lot of casseroles from that over winter but if it wasn't eaten Steve will take it for lunch, or I'll have it for lunch the next day. And about portion control I thought hold on, if I've got left overs with what I'm cooking with, and then use theirs [portion calculator], it won't actually fit in the frying pan, one night I got it out, what they requested for the portion control and I would need 2 pots and pans (she showed me her butter chicken recipe and what was left in frozen Tupperware containers [Appendix D]). I thought it was a really interesting exercise to do that, it goes against my grain to buy in that much food, I mean that would feed more like 8-10 people.

Appendix H-2-Audio Transcript 3

### **Interview 3. (09-11-12) Conversation when Family used Websites and their own Resources to Reduce Waste**

H. How did you get on using the website information to inform your food waste habits?

S. Well it was interesting really because I did my shop on Monday, and I looked at the amounts of food and I tried to [shop to their suggestions] well it just seemed ludicrous to buy [those] quantities of food. I ended up bagging out what they suggested, and was quite shocked at the quantities of vegetables that I had to consume, because that's what we were concentrating on, the organic side of it, so that's what I looked at, and were on Friday [now], so I bought more than what I usually bought.

H. And will you be able to use that?

S. Well it won't be wasted but now I won't shop on Monday, I may go on Wednesday, and again on the website it doesn't state how long that [the portion calculator] is for, so yes we've been eating a lot more vegetables.

H. When you were looking how did you navigate through [the site]?

S. Well first I looked at the homepage, and found what was the waste, so I ended up going straight to the tab and what I found through trial and error was that I was going individually to vegetables, when I realised I could go to multiple vegetables for portion control, also the same tabs were along the top that were along the side.

H. Why is it possible or not to use all the information given?

S. They [the site] just needed more clarity on how all this was put together, because we're looking at organics, they haven't got a long shelf life, I've got a fairly good handle on what I should be eating, I think the sites good, but if you're going to use it, or make it work for a southern climate they've got to tweak it and make it work for our countries eating habits. I just felt when I bagged up a quantity of carrots there is no way were going to eat that, it was a massive bag of carrots like 2 kilos, 20 carrots and I thought my goodness, are they [website creators] just eating carrots and a piece of meat on the side?

H. What was the best piece of specific information they gave worked best?

S. Shopping list and meal preparation, but to me that seemed common sense and I'm surprised if people don't do that, but I have seen lots of people in supermarkets shopping to a budget, so buying specials around that, that's one thing that I didn't see there [portion control if you are shopping to a budget].

H. What type of people would you associate the recipes to cater for on that site?

S. I would say upper-middle, defiantly not lower socio, absolutely. Having said that it is again because of the diet of the country, like having lots of potatoes, is it because of the demographic of the country?

H. Did you find any information for inorganic food stuffs like potato skins, peels or pips?

S. No, no information on alternative recipes for in-organics except composting and like on MfE. And no waste this week as I've made the boys eat the left over sandwiches for lunch, I've made the nibble bag smaller this week because I've been home baking. So they will get a muffin, smaller nibble bag, muesli bar and one bread roll, a third to Stephan and two thirds to B\*\*\*\*, that means that they will only eat proportionally for their size and eat it all. The trouble is I don't want to give him [S\*\*\*\*] a whole bread roll, and he takes one bite and goes, 'no I don't want it anymore,' throws it back in the lunch box and then it spreads through everything and then it becomes inedible for afternoon snack when he gets home. So if there is a crust or something that goes out to the birds.

H. How is the waste this week?

S. I have more inorganic waste because of the uptake in vegetables and also more leftovers in the freezer. So I've consciously looked at the amounts of meat that I have bought, the quantity of meat is less, and more vegetables.

H. Have you spent more time cooking because of more food?

S. No. The other thing I do is I ask the boys how hungry they are, because the reality is they go through growth spurts, some are steady others can eat more than Steve, so they can always go back for seconds, so I make an effort to adjust quantities of food for the individual. Because say I give them all the same, the youngest is never going to eat it in a pink fit, and by that time it's mashed in with everything else no one else wants to eat it, or on the other hand do you sit there and force the child to eat? Is that why the obesity rate has shot up? I don't know, not as a main factor but this thing about 'I've got to eat everything on my plate' so I'm getting to a point where a seven year old is eating as much as a 16 year old I mean I don't know, could that reduce your waste because second hand food isn't a nice prospect? But you could separate that before it gets to the table. Like if I have left over mince because I haven't given it to the boys, I will use it again for tacos, or pizza, because it's not mixed in with the pasta (shows me leftovers in small containers) they're relatively even portion sizes small bowls but if I'm hungry I'll eat that, B\*\*\*\* will have that one for lunch, so I can pull them out, the quantities aren't huge but I can always add to it if the boys are home.

Family learning in December  
shared timetable for project  
Food collecting Bin

~~15, 11, 6 long ago~~

Buying \*

- Woodlawn
- Using scraps for pizza \*
- lots of baking home \*
- milk
- boy always looking for food
- Growing kids, stide to list, specials
- PACK N/1 SAVE → sweet muffins
- Black peaches, peaches & passionfruit
- Kims lamb + cattle 1/2 cattle
- OTHER FOOD RESOURCES → chicken

→ Kims & Leanne from neighbours  
freese into pulp.  
saves & teleguise for pizza \*

No Brand loyalty, specials, not seasonal.

LUNCH

nutbale bag, mussels, fruit & biscuit or muffin  
fresh bread

youngest - no fish & pastry. & potatoes

mush canola broccoli & onion

No boiled veg & crak pots.

freeze & reuse. Mince as a staple. pastry cases with mince & cornish pasties. Or expand it.

cooking. - Not a recipe cooking for five.  
Casseroles from never soups bin

STORAGE big freezer & fridge.  
- two pantries, odd things.  
green pepper corns left over.  
→ dried goods.

GARDEN / RUBBISH / RECYCLING  
↓  
green bins.

liquor - wasting hands issues

- ~~will~~ will not eat past expiry  
- practically, mould

→ ~~run~~ run the school for <sup>school</sup> ~~run~~  
OUTWARD BOUND - Fruit handle

- 3 years in Auckland  
- 4 years after.

Septic + rainwater very good background history from outward

environment importance good foundations.

(2-12 ~~outward~~ outward bounds

- 5 where 1st left  
→ lots of moving so no composting

- eating at dinner table

→ Dave a cook burgers or fish for takeaways. on secondary night

→ Swain for takeaways

→ at TAKAWAYS - force of habit

BREAKFAST

bread & butter / toast for lunch  
like & like cereal