An Investigation into Consumer Food Waste Behaviour at the University of York: Redistributing Food to Limit Waste and Support Community Needs

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Declaration

I declare that the work submitted in this dissertation is the result of my own work and investigation and all the sources I have used have been indicated by means of completed references.

Signed: Emily Narey

Date: 4/5/23

Abstract

Every year in the UK six and a half million tonnes of food goes to waste (Armstrong et al, 2021). To put this into perspective, the food discarded prematurely that would have been safe for human consumption equates to ten billion meals (WRAP, 2010). This is enough to raise contempt during the current socio-economic climate with many of the population being pushed into financial insecurity and 16% of the UK population facing food insecurity as a result (Barker and Russell, 2020). In the UK, 23% of annual consumer food waste goes to landfill and 33% is incinerated (Jeswani, Figueroa-Torres, and Azapagic, 2021). These practices are detrimental to the environment, contributing to an estimated 8% of greenhouse gas emissions globally each year (Jeswani, Figueroa-Torres, and Azapagic, 2021) adding to the severity of the ongoing climate crisis. Redistributing avoidable food waste by rescuing it before its disposal and donating it to food banks has been found to have success in Australia in aiding those facing food insecurity and limiting impact on the environment (Reynolds, Piantadosi and Boland, 2015). The gap in the literature shows that food waste generated at universities is often overlooked as details of their contribution to national food waste totals is very limited. Research concerning food rescue and redistribution of avoidable food waste generated at UK universities was particularly limited and, to my knowledge, research of this topic at the University of York is non-existent. Therefore, this study aims to investigate if the food waste generated from the University of York could be reduced and if one method to reduce waste could help combat the impact of the cost-of-living crisis. This aim was undertaken using a mixed method approach to investigate consumer behaviour, personal perceptions, and common practises at the university using interviews and questionnaires gathering qualitative and quantitative data for descriptive analysis. This would determine if there is potential for the University of York to reduce their food waste generation and potentially have a positive environmental and social impact.

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1. Introduction

Approximately one third of the food produced globally is wasted each year; this equates economically to approximately 143 billion euros (Gustavsson et al., 2011 in Tonini, Albizza, and Astrup, 2018). Not all of this food waste is safe for human consumption otherwise known as "avoidable food waste" rather than "possibly avoidable food waste" or "unavoidable food waste" (Morawicki and González, 2018). Morawicki and González (2018) describe unavoidable food waste as parts of food that are not edible such as the bone or inedible types of fruit/vegetable peel etc whereas potentially avoidable is the food considered edible by some but discarded by others. Avoidable food waste is the food that was safe to be consumed before it was discarded, and the quantity of this waste is growing in size every year for a variety of reasons. It is not always clear why avoidable food waste is discarded but in literature some potential drivers have been identified relating to consumer attitudes towards food waste including misunderstanding 'use-by' and 'best before' dates (Thankappan, 2011). Morawicki and González (2018) found that consumer food waste generation has increased by 50% since the 1970s and linked this to the low cost of food in relation to an increased disposable income that causes consumers to be incautious of wasting food. If that is the reason for the drastic food waste increase then it could be predicted that food waste would decrease following loss of, or decreased income, due to the Covid-19 pandemic and cost-of-living crisis in the UK. This could be evident in future research but currently it is having detrimental effects on low-income households in the UK. Following on from the initial Covid-19 lockdown, a national survey estimated that the number of people experiencing food insecurity in the UK had quadrupled to 16% of the population (Barker and Russell, 2020). This highlights the need for research to find potential sources of food for those in need and studies have found that redistributing avoidable food waste to food charities can be a success. A study in Australia found that acknowledging food charity as a type of food waste treatment, despite a higher economic cost compared to landfill or composting, was more cost efficient than buying directly from vendors (Reynolds, Piantadosi and Boland, 2015). It is greater than an economic issue, it is social injustice, and with food insecurity becoming more prevalent in the UK (Barker and Russell, 2020), it is important to find helpful solutions. Thus, with such amassing quantities of avoidable food waste, this seems a logical place to start. This dissertation seeks to assess the reality and potential to reduce or redistribute food waste in York.

The city of York was selected as there are many local initiatives in the city centre that redistribute food waste to the York community. Such initiatives include Refill Café, which is home to a community fridge and a cafe/social enterprise that rescues food from local suppliers that otherwise would have gone to landfill (Refill, 2023). There is also an initiative based in SPARK (an outdoor community space in the city centre) called The General Store (formerly Adriano's No Waste Market), who are open every Saturday to provide people experiencing food insecurity with a £1 bag of groceries sourced and donated from local supermarkets (SPARK, 2023). This research specifically focuses on food waste generation at the University of York as throughout my degree I witnessed sizeable quantities of avoidable food waste at catering outlets and catered events. Upon further research, it became apparent that there is a gap in

the literature focussing on consumer behaviour at UK universities and redistribution of avoidable food waste from these institutions. There is an opportunity for further research and a potential positive impact to be had by investigating the potential of redistributing food waste at the University of York. It is clear from these initiatives that a significant amount of labour is needed to redistribute food and rescue it before it goes to landfill. Although these initiatives exist in York, there are few of them nationwide due to the lack of volunteers, funds, and ability to transport the resources (Filimonau, 2021). However, the University of York aligns itself and its values to act as a University for Public Good in its strategic vision for 2030 (University of York, 2023) therefore I was optimistic there would be potential for an initiative here.

Aim and Objectives

This research aims to investigate if the food waste from the University of York could be reduced and if one method to reduce waste could help combat the impact of the cost-of-living crisis. This ideology was inspired by the University of York's strategy to be a University for Public Good (University of York, 2023). To reach this aim, the objectives of this study were first, to identify areas where food waste was being generated. Secondly, to identify what (if any) of the food waste could be safe for human consumption by seeking answers to why the waste is discarded. Thirdly, to determine if people would consume food that is past its best before or use-by dates to clarify whether a positive impact could be made by the university if it were possible to redistribute some of the food waste. Finally, to identify potential routes to redistribute edible food by rescue interference to share this food for public good in the York community.

2. Literature review

2.1. Food Waste

Consumers in the UK dispose of over six and a half million tonnes of food waste annually (Armstrong et al, 2021) or approximately £13.8 billion nationally each year (Jeswani, Figueroa-Torres, and Azapagic, 2021). Although 37% of this is estimated to be unavoidable (i.e., bones, eggshells), it is predicted that 61% is avoidable food waste which could have been saved through improved food management (Armstrong et al, 2021). This is a cause for environmental concern because global food waste equates to 8% of global greenhouse gas emissions contributing to the ongoing climate crisis (Jeswani, Figueroa-Torres, and Azapagic, 2021). It is also a cause for concern socially, the UK's avoidable food waste is estimated to equate to over 10 billion meals (WRAP, 2020) which could benefit the 16% of the UK population who are currently experiencing food insecurity.

It is estimated that 46% of food waste generated in the EU occurs at the consumer level (Jeswani, Figueroa-Torres, and Azapagic, 2021) highlighting the importance of investigating reasons for avoidable food waste generation. One cause found for the generation of avoidable food waste is that consumers misunderstand the differences

between use-by and best before dates (with use-by relating to the safety of consuming the product and best before relating to the food's quality) leading to unnecessary, premature disposal of edible food. One U.S study found that clarifying or simplifying the meanings of these terms would be the most cost-efficient method to reduce food waste (Toma, Font, and Thompson, 2017). Thus far, research has focussed on the impact of food waste and government policy focusses on diverting this food waste away from landfill to limit environmental impact (Mena, Adenso-Diaz, and Yurt 2011). However, there is limited research into why avoidable food waste is generated and how this can be prevented at retailer and household consumption level in the UK. This literature gap needs acknowledging due to the large-scale of the issue (and its social and environmental impacts) and the potential social benefits that could occur if this food could be redistributed.

2.2. The Need to Redistribute: Food Insecurity and the Cost-of-Living Crisis

Food insecurity is the inability to obtain an adequate quantity or quality of food (Shinwell et al, 2021). It is driven by financial insecurity potentially resulting from unemployment, debt, homelessness, and limitations in the welfare support system (Barker and Russell, 2020). Food insecurity in the UK has been well-documented in the 21st century becoming more common following the Covid-19 pandemic, with its prevalence being estimated to have quadrupled resulting in 16% of the population thought to be experiencing it in 2019 (Barker and Russell, 2020). This led to an increased need for food parcels from food banks to support those experiencing food insecurity. Statistics show that after the first UK lockdown in March 2020, the need for food bank food parcels increased significantly by 81% (Armstrong et al, 2021). Food banks are heavily reliant on the philanthropy of society, from food donations to fundraising to the volunteers who assist in their operations. In some areas volunteers, who previously would donate to food banks, have been so heavily impacted by the rising cost of living that they now require food bank assistance themselves (Goodwin, 2022). This is concerning as many food banks do not have the capacity in terms of volunteers and donations to uphold support for the number of people in need (Goodwin, 2022). Therefore, it is of vital importance that as a society we seek out potential solutions to provide aid for those experiencing food insecurity to keep food banks in operation.

2.3. Methods of Reducing Food Waste: Redistributing as a Means of Reduction

There is clearly a need for those facing food insecurity to access affordable food and it is clear from Goodwin's (2022) interviews with food bank workers that they need more sources of food and a larger volunteer network. It has also been found that people facing food insecurity consume a less diverse diet (Shinwell et al., 2021). Shinwell et al (2021) found marginally non-significant trends identifying that those experiencing food insecurity in the UK tend to consume more carbohydrates and less protein and fibre (vegetables and fruit) than their food secure counterparts. Interestingly, 15% of food waste in the UK hospitality sector consists of fruits and

vegetables (Jeswani, Figueroa-Torres, and Azapagic, 2021) and the redistribution of this could provide the food insecure with a more diverse diet in terms of fibre. Rescuing and redistributing food could prevent the disposal of a portion of this avoidable food waste. However, redistribution has constraints including concern surrounding the importance of use-by dates for food safety and best before dates in terms of food quality. Armstrong et al (2022) estimated that 15% of food waste was discarded due to exceeding its expiry date but there is a consensus across literature that use-by and best before dates are consistently misunderstood by the public and there is some uncertainty surrounding whether people trust and follow the date labels on food. Toma, Font, and Thompson (2017) found that consumers with a deeper level of understanding of best before dates would be less likely to consume foods in the absence of the best before label or past the suggested best before date. However, in the research by Armstrong et al (2021), they found that 58% of survey respondents had indicated that they knew someone who consumes food past its expiry date demonstrating mixed findings and perceptions from the public. Armstrong et al (2021) also found those facing food insecurity were more likely to consume food past its use-by date. This raises concerns for food safety and the implications of lack of awareness of potential consequences of consuming food past its use-by date. However, it also indicates that those facing food insecurity are already consuming food past its best before and/or use-by date. Therefore, perhaps the focus of these date labels could be to inform consumers of food safety guidelines specifically, or of potential health risks if consumed unsafely. There is evidence that redistributing avoidable food waste can be executed safely as this is the case in Australia. In Australia, food rescue is acknowledged as an informal means of food waste treatment because, despite being more costly than landfill, it is deemed more cost efficient than direct purchasing of food from alternative sources (Reynolds, Piantadosi and Boland, 2015). In the study by Reynolds, Piantadosi and Boland (2015), they discussed rescued food from hotels, cafes and restaurants but did not specify any detail on food rescue from universities. This is a consistent gap in the literature of this topic indicating that universities may be overlooked in their potential as a source for avoidable waste to be rescued.

2.4. Food Waste Consumer behaviour within universities and in context at University of York

Previous research into food waste at universities focuses on the consumers' behaviour and finding preventative measures in terms of alterations to the integral structure of the catering outlet (Davison et al., 2022) or signalling with written messages to inform the consumer of the topic of food waste causing them to waste less food (Whitehair, Shanklin, and Brannon, 2013). The literature tends to focus on the consumer at the catering outlet investigating individual trays or plates with few studies exploring food waste generation across the whole catering with consideration into food waste generated from the kitchens. Studies including Davison et al (2022) and Whitehair, Shanklin, and Brannon (2013) found that informative posters signalling to consumers at university dining halls to waste less food by considering how much food to take on

their plate has had some success. Both studies found that this preventative measure would reduce food waste generation by consumers, however, there is no detail of how this impacted the food waste generated in the kitchens. I would predict that students reducing the amount of food they take away from the server would increase the quantity of cooked food leftover at the end of the workday in the kitchens at the catering but due to the limited amount of research into this, this is currently unknown.

Literature surrounding the redistribution of avoidable food waste and the specifics of the commonly wasted items of food from university dining halls is very limited. This emphasises that these institutions are often overlooked as sources of avoidable food waste. One piece of literature had explored the implementation of a social media tool to redistribute food between students at a University in the West Midlands (Lazell, 2016). Unfortunately, Lazell (2016) found that, although many students had positive feelings towards the tool in theory, realistically it was difficult to implement and had little interaction from students and was not supported by staff members. However, in recent years, similar social media tools or apps have been implemented and had reasonable success including TooGoodToGo and Olio. TooGoodToGo is an app that allows businesses to sell food for collection close to its use-by or best before date for a reduced price rather than discarding of it and contributing the generation of avoidable food waste. Olio is an app that allows the public to share non-food items and food items past their best before date or on their use-by date with other members of the public rather than wasting them. So, it could be predicted that in current times, and in the current socio-economic climate with the rising cost of living, using these apps could have some success in the university environment and reduce food waste generation on campuses. However, to confirm this, research on a greater scale is needed but this dissertation will gather consumer perspectives on this method of redistribution at the University of York.

3. Methods

3.1. Data Collection

To fully investigate the aims of this study, a mixed method approach was implemented as research shows that using both qualitative and quantitative data collection would generate a more in-depth level of research (Almaki, 2016). Therefore, primary data was collected through interviews and questionnaires to understand, at greater depth, the varied perspectives of different stakeholders at the University of York. Secondary data detailing specific quantities of food waste (See Figure 4.1) was provided by interview participant A (see Table 3.1) to give insight into food waste from on-campus catering outlets across the year 2021-22. This secondary data highlighted five popular catering outlets with a large generation of annual food waste (shown in figure 4.2) which then became the focus of this research project. For context, these outlets are shown on a map in figure 3.1.
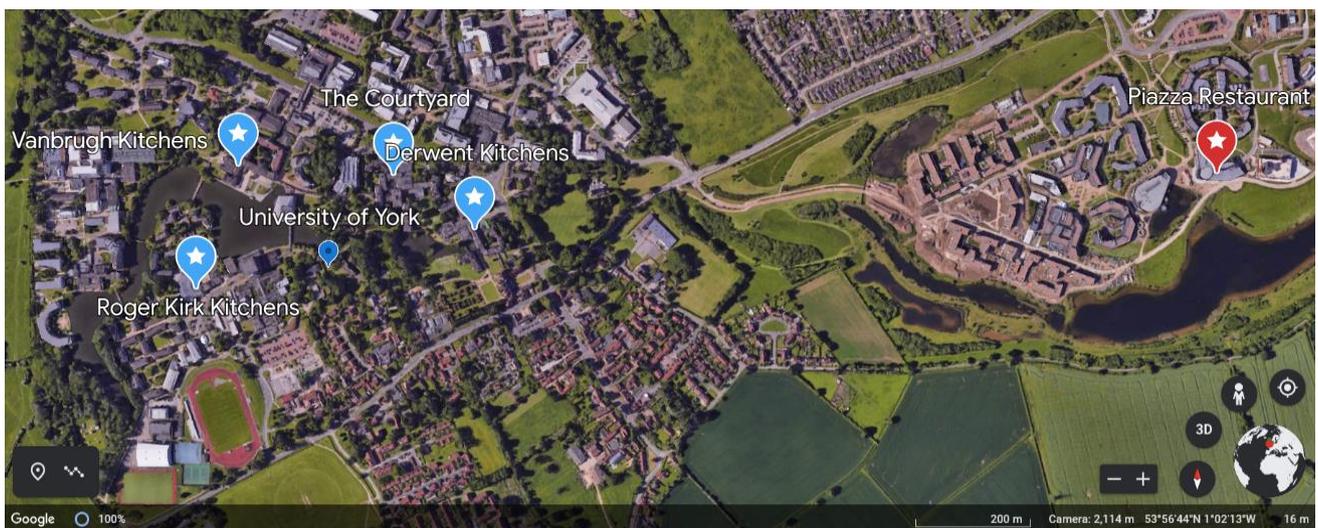

Figure 3.1 displays five popular catering outlets, marked with stars*, at the University of York: Vanbrugh Kitchens, The Courtyard, Derwent Kitchens, Roger Kirk Kitchens, and The Piazza. *(Red star indicates the outlet is located on East Campus and blue indicates West Campus).

There are fifteen catering outlets at the University of York, consisting of restaurants and cafés that serve a range of food and drinks across the year (University of York, 2023). Catered accommodation is served only on West Campus at Roger Kirk Kitchens, Vanbrugh Kitchens, and Derwent Kitchens. This consists of breakfast and dinner Monday to Friday every week during term time (University of York, 2023). The Piazza Restaurant hosts a weekly meal, known as 'College Nights', for students on Campus East where none of the accommodation is catered. The meals at the Piazza Restaurant occur Monday to Friday with each day of the week devoted to one University of York college. At both examples (College Nights and catered accommodation) students are welcome to a two-course meal of either a starter and a main course or a main course and a dessert, which they are served by a catering outlet employee (University of York, 2023). The Courtyard was included as an interesting contrast to other restaurants/cafés as it operates on table service rather than a buffet

system. It is unclear from online sources how many students these services cater for. However, it estimated that the Piazza Restaurant serves approximately 500 visitors daily but for the other outlets this information is unknown.

Food waste is also generated from catered events on campus which was a concern of this research due to my first-hand witness of the amount of food wasted while undertaking a placement at the University of York that required facilitation of catered events. Campus Kitchen is the on-campus caterer for University of York events, and it was with this in mind that a member of their team was interviewed (See Table 3.1).

3.1.1. Consumer Behaviour/Perspective Questionnaire

To investigate opinions of consumers at the catering outlets at the University of York, a questionnaire was created using a Google Form (see appendix 1). An online questionnaire was shared with participants in the presence of the researcher to maximise interest and response rate based on the research of Jones et al. (2008). To gain responses and interact with participants, the questionnaire was shared through a QR code so that on entrance to the catering outlet, participants could access the link and complete the questionnaire. Also, in response to the Jones at al's (2008) findings on the limits of digital questionnaires due to ability to access a smartphone or the internet, it was thought that researcher presence would aid those unable to take part, as the researcher would support with their smartphone as a contingency plan to maximise participant accessibility. The strategy of having a researcher in person conducting the questionnaire also meant that participants were known users of the catering outlets and were the confirmed target population of this aspect of the study.

A pilot study was first conducted in mid-November 2022, this ensured that participants would be available at the time of the research and that the QR code was functional to access the survey. It was found during this pilot study that there were a greater number of visitors to the catering outlets past 17:30 and that prior to that time it was unlikely that any participants would get involved. Another finding was that the original QR code used initially took participants to an advertisement from the QR generator website, which was a strong deterrent preventing participants from completing the survey due to confusion on how to access it. So, this was promptly changed to a different (advertisement-free) QR code, which performed successfully in maximising the questionnaire completion rate.

Following on from the findings of the pilot study, this aspect of the research project was completed across two days during November 2022 each day ranging from 17:30 to 18:40 which was found to be the busiest eating times. Participants were selected randomly through a convenience sampling method and in the end 55 participants took part. All were briefly told the researcher's name, the aim of the research and were then asked to scan the QR code and complete the survey at their convenience. It's important to note that several participants were interested to know the researcher's

background and on finding out that the research was environment-based may have caused some bias in their responses, but this is unknown.

3.1.2. Interviews with University and Catering Services Employees

Four interviews were conducted with staff in ranging seniority at the University of York; displayed in table 3.1. These interviews were conducted to address the second objective of this study; to identify what (if any) of the discarded food may be edible by identifying why the food is discarded. The interviews also helped to address the final objective of determining potential routes to redistribute any edible food safely by understanding the procedures in place to handle food waste at the university. Relevant people were identified based on these objectives and their roles at the university to be approached for an interview.

An interview schedule was created and edited to apply to each participant depending on what was relevant to their role. The structure of these interviews was split into four key themes shown in Figure 3.2.
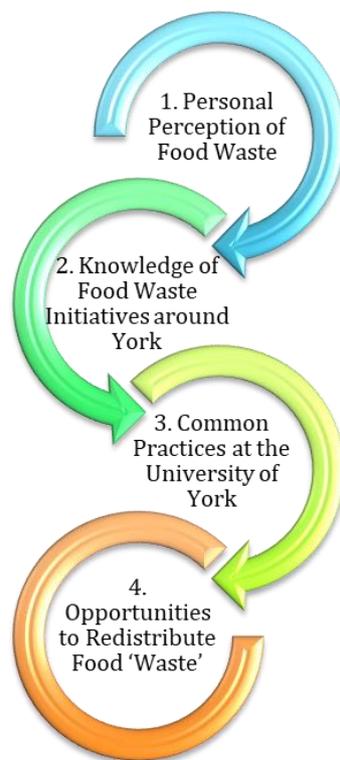
Figure 3.2. Displays the four key themes used to generate topics for discussion in the interviews with all interview participants. Questions within these themes varied to maintain relevance and apply to each interview participant.

The interviews with Participant A and Participant C were conducted online by Zoom to best accommodate their busy schedules and covid safety guidance. The interviews were recorded to ensure accuracy when their responses were later transcribed. Participant D offered their knowledge from their experience of booking campus

catering for events on campus. Interviews with Participant A, Participant C and Participant D all lasted between 30 and 45 minutes. However, Participant B did not have time in their schedule for a face to face nor online interview but was enthusiastic to be involved, and so agreed to participate in their own time by digitally responding to the questions on the interview schedule and keeping in touch by email at their convenience.

Table 3.1 Displays interview participants, their role at the University of York, and the method of interview.

Participant	Role at the University	Interview Method
A	Senior role in the Sustainability Team, Involved in Estates and Facility Services, Policy Interference including the Sustainability Strategy element as well as Waste Contract Management	Online Interview, recorded and transcribed digitally.
B	Senior Role in Campus Kitchen (on-campus event caterer). Oversees operational functions including stock control, food safety and driver logistics	Completed the questions on the interview schedule independently using Google Sheets and kept in touch by email.
C	Role in the catering outlet serving food to visitors primarily during the evening shift and occasionally during breakfast and lunch shifts. Serves food, cleans up the kitchen and serving area at the end of the shift.	Online Interview, recorded and transcribed digitally.
D	Role at the University that requires use of campus catering at on-campus planned events	In person interview.

A fifth interview was originally planned with the company that handles the University's food waste at their off-campus facility following their mention in participant A's interview but unfortunately this could not go ahead due to confidentiality surrounding the account. On a greater timescale this would be interesting and could be beneficial to explore in subsequent research.

3.2. Ethical Considerations and Quality Control

Prior to the questionnaire, participants were requested to give consent and were informed of their right to withdraw and the researcher's contact details. The online google form approach was taken not only to maximise completion rates but also to minimise paper waste. This approach also increased accessibility and ensured that participant information would be kept confidential and could be stored safely and securely during the research time. Ethical approval was obtained before starting this research and every care was taken to ensure that all participants in this research remain anonymous which is also why interview participants were assigned a letter in Figure 3.1.

3.3. Data Analysis

The questionnaire responses were kept anonymous and compiled in a secure Google Drive to ensure confidentiality. The data collected was then divided into each question and descriptive analysis was performed and presented in charts using Excel; the key findings from the questionnaire are displayed in section four.

The interview responses were transcribed and/or recorded at the time and later reviewed using thematic analysis. The transcripts and recordings were reviewed to identify themes among the responses as it is very important to avoid creating a bias and restricting research findings by setting themes based on the research question (Delve, Ho, and Limpaecher, 2020). These themes were identified using a qualitative codebook, which organised all the initial trends that were examined across the interview transcripts and responses. For example, one category identified was reasons food could not be donated, which then identified the themes of *food safety, use-by dates, limited resources/workforce/time*. This made the qualitative data digestible resulting in the quotes seen supporting the findings in section 4.

4. Results and Discussion

The results of the interviews highlighted potential gaps in the communication of knowledge between seniority levels at the University of York revealing some confusion regarding the destination of the food waste. The questionnaire received 55 responses with a majority being from young adult students; 94.5% were aged 18-25 and 96.4% were students. Results from the questionnaire were equally interesting revealing an overwhelming amount of support for local causes, which really highlights the University of York being a university for public good as they suggest in their 2030 strategy. However, the responses also highlighted an interesting ambiguity to the meanings of 'use-by' dates and 'best before' dates which brings into question whether they are needed and whether they are really serving their purpose regarding food safety. This ambiguity supports the literature on this topic that suggests use-by dates and best before dates are often misunderstood and that simplifying and clarifying these terms could reduce generation of avoidable food waste (Toma, Font, and Thompson, 2017).

4.1. Food Waste at the University of York

In figure 4.1, the annual food waste across five of the catering outlets during 2021-22 totalled at 62.2 tonnes for the year. To put this into perspective, a study comparing Indian and UK universities found that a UK university canteen was generating approximately 35.7kg of food waste per day (Davison et al., 2022). On average, that would equate to approximately 13.03 tonnes a year which is at least 2 tonnes less than any of the catering outlets shown in figure 4.1. This highlights the necessity of investigating the causes of food waste on campus at the University of York to determine whether this is unavoidable or whether intervention could avoid costs to the university and the environment.
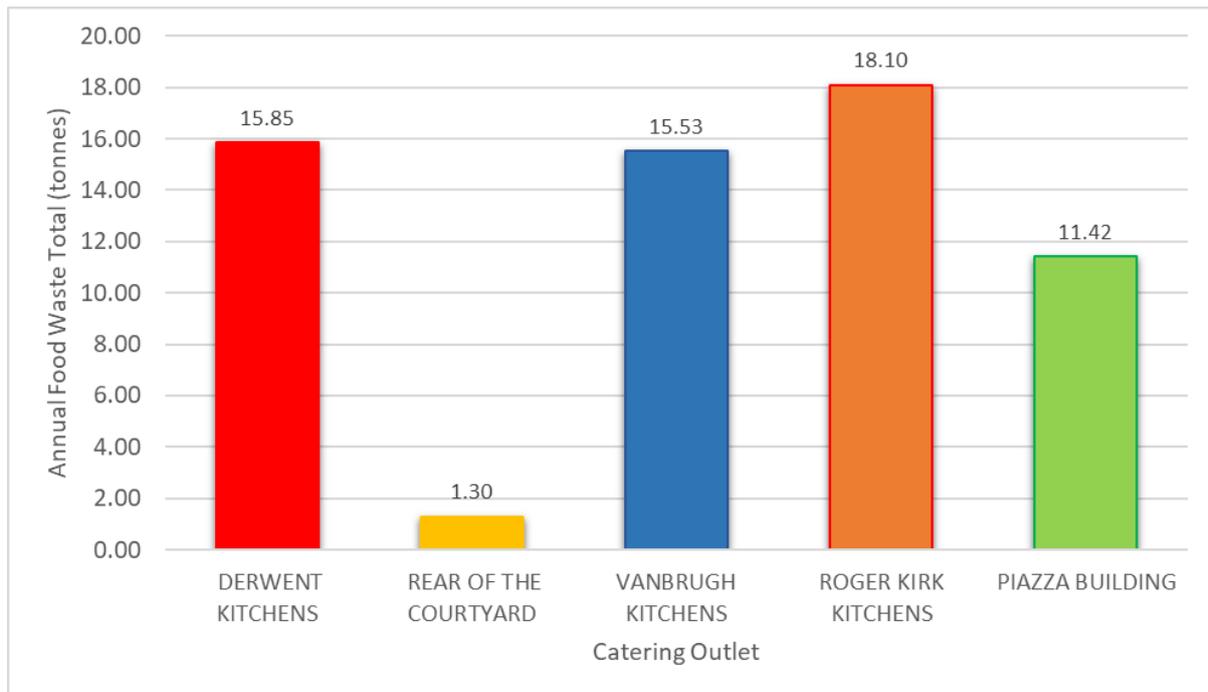
Figure 4.1 displays annual food waste (in tonnes) from 5 catering outlets on campus in 2021-22.

The figure below (Figure 4.2) shows how the amounts of food waste change each month across the year 2021-22. From this figure it is clear that the lowest amount of food waste is achieved when term ends and students have left for example in April at the end of spring term or the outlets have closed, i.e., during December for winter break. It also appears to show a trend that the highest amounts of food waste tend to occur the month before closure/end of term, for example Derwent Kitchens in November, Roger Kirk in March before the end of Spring term. This may be explained by the kitchens potentially having overstocked or being unaware of precisely how many students/catering outlet users would be on campus and how many would have left campus for the term-break. However, to confirm this, further research would be needed.

In conversation with a staff member (participant D), she speculated that there may be an increase in waste in some sites at the university during summer when conferences are held on campus as from her experience there seemed to be a lot of food leftover and fewer students on campus who may make use of it. This is supported by the findings shown in figure 4.2, where there are still large amounts of waste being generated at sites such as Roger Kirk and Vanbrugh in June/July, despite it being common for many students to have returned home and left on-campus accommodation at that time. Participant D also mentioned that when arranging catering for her on campus events, they are not permitted to use catering from businesses outside of the university catering team, which could again explain one cause for the amounts of food waste generated at Piazza, where their events are held, in November, March, May, and June (shown in figure 4.2). Another explanation for the high generation of food waste in the Piazza could be taken from the weekly college nights. The weekly college nights are operated similarly to the catered accommodation evening meals which would explain why they follow the similar trend of peaks near the end of term time which, again, could be explained by overstocking or being unaware of how many students/catering users to expect.
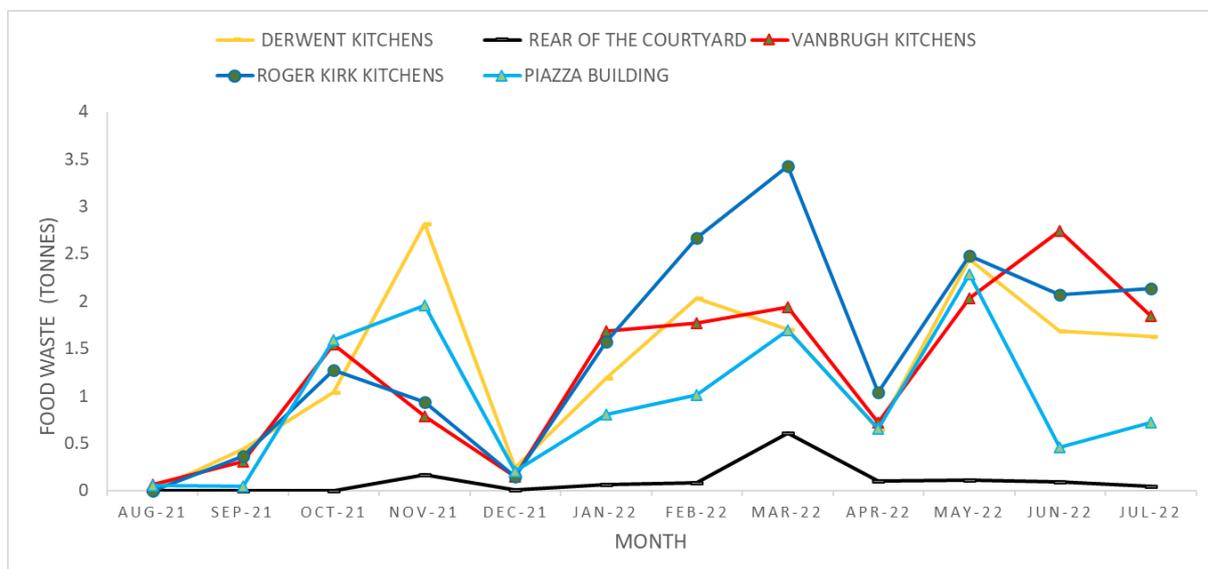
Figure 4.2 displays how food waste changes across the year 2021-22 at popular catering outlets on campus with the largest amounts of food waste at the Roger Kirk kitchen during March 2022 and the lowest amount of food waste at all outlets during December 2021 when outlets closed for the winter break.

It is clear from figures 4.1 and 4.2 that The Courtyard had much less waste throughout the year, excluding a peak during March, where approximately 0.5 tonnes of food was wasted. It is unclear why the difference between The Courtyard and the other outlets investigated was so large, with Roger Kirk peaking at approximately 3.5 tonnes in the same month (a 3-tonne difference). However, it is probable that this difference is influenced by the fact that Derwent Kitchens, Vanbrugh Kitchens, and Roger Kirk Kitchens are all used for catered accommodation, which operates a buffet system. Therefore, are likely to have a constant, and larger amount, of food available during

open hours, whereas The Courtyard operates on table service. A study investigating the impact of behavioural interventions at a university in the UK and in India, found that catering outlets operating on self-serve buffets could generate up to three times more food waste than those operating with table service (Davison et al., 2022). This supports the findings shown in figure 4.1 and figure 4.2. However, more research would be needed, as the University of York's catering outlets do not operate on self-service buffets, instead the food is served by catering employees. Secondly, further research would be needed to determine why the food generation levels at the Piazza and Vanbrugh Kitchens are so similar and why the Piazza's levels exceeded Vanbrugh's in November. One explanation, again, could be the weekly college nights combined with a lunch service during the day. However, Vanbrugh serves breakfast, dinner, and has a café open during the day serving bakery items and lunch similar to the Piazza's lunch service therefore Vanbrugh's food waste generation was predicted to be higher, but this is not shown in figure 4.2. This would need further research into the specific food items that are commonly wasted at these outlets and further interviews with employees at those specific outlets to understand these trends. Changing to table service would be an interesting avenue for University of York catering outlets to explore in the future as it was successful in the study by Davison et al. (2022). This study found that altering integral aspects of the catering facilities such as the catering style, the portion sizes, or menu size could significantly lower the amount of food waste generated.

The move to alter these aspects is supported by findings from the questionnaire in this dissertation, as it was found that only 32% of students would agree that they always finish their meals. In the suggestions question at the end of the questionnaire a majority related to altering the portion sizes with one participant suggesting that they would prefer to be asked how much of each food component they would like to be served. This aids to the findings of the earlier mentioned study that altering the catering style could be beneficial in reducing food waste generation and further research into the implication of this at the University of York is recommended.

4.2. Food Consumer Behaviour and Perspective on Food Waste

Consumer behaviour affects the quantity of food waste generated and consumer perception of food waste heavily influences this behaviour. Perception of food waste is driven by consumer knowledge and so in this research, questionnaire participants were asked to share their knowledge and perception of food waste to form an understanding of whether this could influence the high amount of food waste shown in figures 4.1 and 4.2.
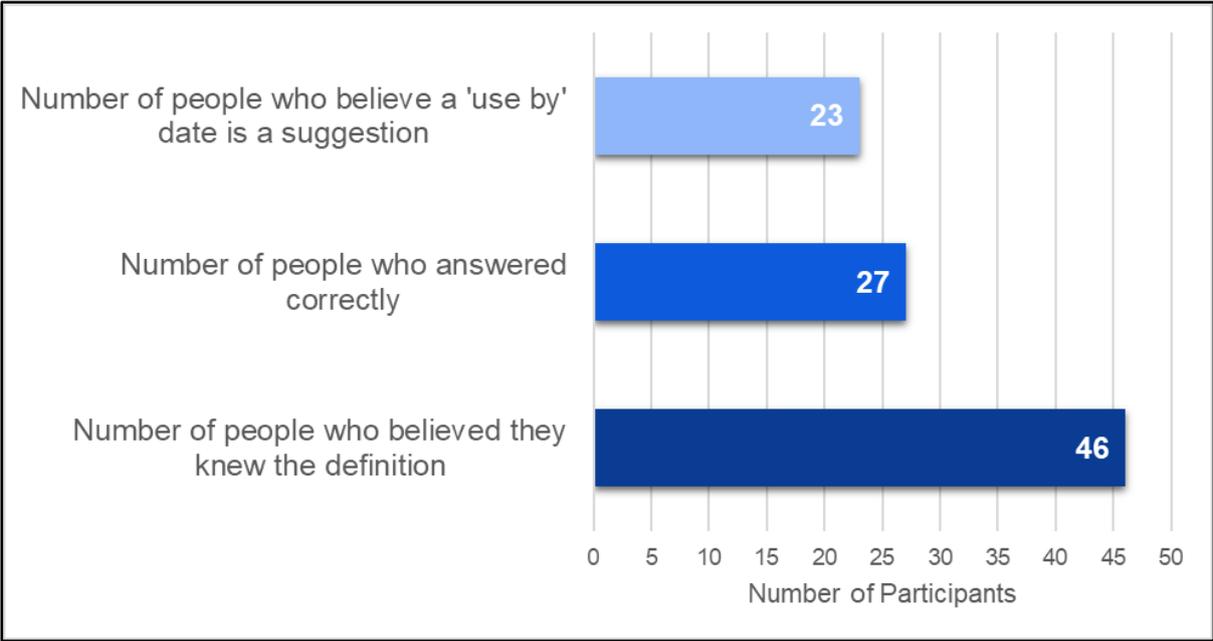
Figure 4.3 displays the number of participants in the questionnaire who believed they knew the correct definition of 'use-by' and 'best before' dates vs the number who did and the number who didn't.

One cause of high food waste generation by consumers is a misunderstanding of 'use-by' and 'best before' dates as they often cause consumers to pre-emptively discard food before necessary (WRAP, 2007 in Thankappan, 2011). To gain an understanding of this in context to this study, the questionnaire asked participants to first answer whether they confidently knew the difference between use-by and best before dates. It then followed up by asking participants to select the answer containing the correct definitions of 'use-by' and 'best before' dates (Appendix 1). Best before dates were correctly defined as "Best before dates are about quality: The food will be safe to eat after this date but may not be at its best." and use-by dates were defined as "A use-by date on food is about safety: You can cook and eat food until midnight on the use-by date but not after." (Food Standards Agency, 2023). Figure 4.3 demonstrates the perception and understanding participants to the questionnaire had of use-by dates and best before dates. The lowest bar shows that 44 (out of 55) believed that they knew the correct definition of both terms but when given a multiple-choice question containing one correct definition and three false, only 27 answered correctly. The top bar in this graph shows that 23 people selected the false answer describing a use-by date as a suggestion of when to consume food by. This clearly evidences that there is a misunderstanding of 'use-by' dates on food supporting the suggestion by Toma, Font, and Thompson (2017) that these terms need clarification to the public. Interestingly, although approximately half of the participants did answer correctly, there were still 23 incorrect responses who chose the multiple-choice answer describing a 'use-by' date as a suggestion. This opposes the theory that this misunderstanding is leading to higher amounts of avoidable food waste (Armstrong et

al., 2022) as a large proportion of participants do not know that the use-by date is not suggestion. This is also supported by figure 4.4 which shows that 40% of participants choose to ignore use-by dates and follow their own intuition on whether a food is safe for consumption. This highlights the question of whether 'use-by' and 'best before' are serving their purpose in terms of food safety or whether the date label could be altered to a food safety guideline label with clearer signs to look out for and clearer warnings of which foods cannot be consumed past their use-by date.
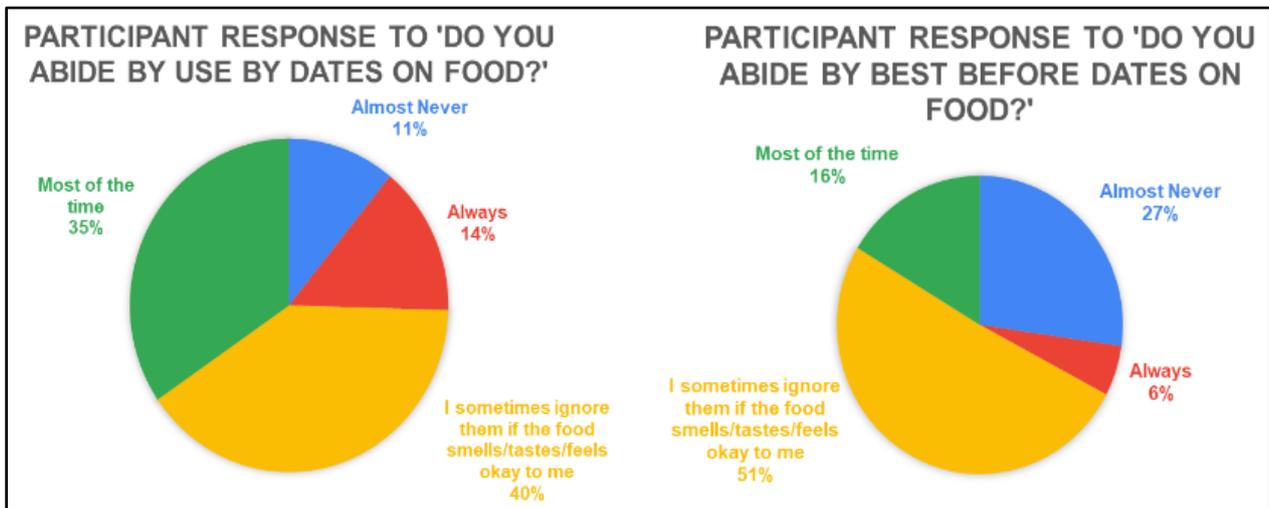
Figure 4.4 displays how many participants abide by use-by dates (left) alongside what percentage of participants abide by best before dates (right).

To emphasise the need to reconsider use-by dates further, Armstrong et al (2022) found that 58% of surveyed UK consumers knew someone in their household who had eaten food past its use-by date and the results shown in figure 4.4 strongly support this finding. Figure 4.4 shows that a majority (51%) of consumers surveyed at the university catering outlets trust their own intuition regarding food past its best before date. This encourages the idea that best before dates may be becoming irrelevant with only 6% always abiding them whereas this doubles to 14% of participants 'always' abiding by use-by dates.

PARTICIPANT RESPONSE TO 'WOULD YOU
CONSUME FOOD THAT HAD BEEN THROWN AWAY
BY SUPERMARKETS/CATERERS?'

No. If it has been thrown away into a bin, I would NOT eat it even if it looked aesthetically pleasing (I don't agree with 'dumpster diving')
11%

I don't know
2%

Maybe. I would consider taking it, if it was aesthetically pleasing and accessible.
29%

Yes. If it is still consumable and I could access it, I would still eat it even if it's not aesthetically pleasing
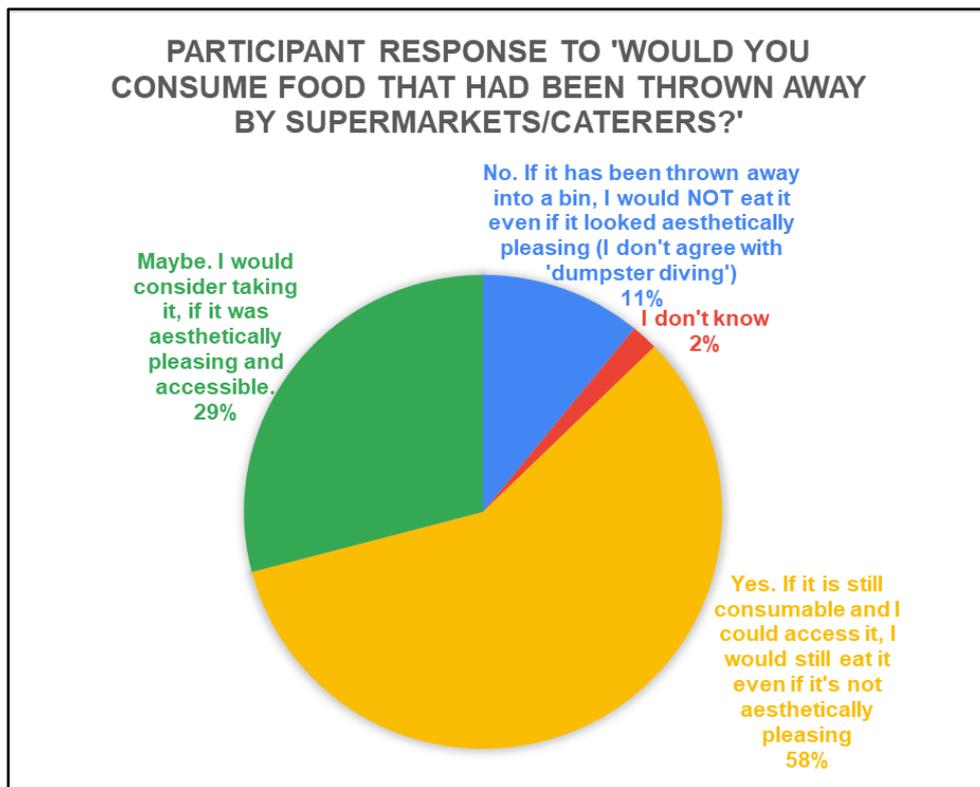58%

Figure 4.5 displays the percentage of questionnaire participants who would consume food that had been considered 'waste' by supermarkets and catering outlets. The most common factor affecting whether they would consume the food was whether it was edible and accessible.

A majority of participants (58%) indicated they would consume food that had been 'wasted' by caterers and 29% indicated that they might consider taking the discarded food if it was still aesthetically pleasing (shown in figure 4.5). This is a similar finding of attitudes towards redistribution of avoidable food waste found in Levell's study (2016) where redistribution made positive impressions amongst students. However, when put into practise, there was little interaction due to inaccessibility to the location of the food or limited knowledge of the food's quality. These limitations could resolved using the Olio app or a similar app in which photos can be uploaded of the food available and pickup of the food can be arranged over private message independently. Figure 4.5 indicates that there is a desire for this food to be made accessible to students at the University of York, but it is important to note that making this food accessible, safe for consumption and arranging the collection with students is not a simple task. Levell (2016) found that there was some resistance from members of academic and catering staff regarding sharing excess food or avoidable food waste with students which was also found in interviews with staff at the University of York. Participant C stated concerns for food safety and legal concerns for the university if someone were to contract food poisoning from consuming avoidable food waste from their catering outlet as shown in the quote below.

> "But I think that I remember I saw like on LinkedIn like (//York is//) the greenest city in terms of like sustainability and stuff like that. So, they clearly know how to be sustainable but they're not doing it with food because they're worried about a lawsuit so I think they can be sustainable but they're choosing not to."
>
> (Participant C, 2023)

Participant C's quote shows that the university could be doing more to reach their sustainability goals but is acting more cautiously for consumer safety and for their own legal safety. This is understandable as use-by dates are there for consumer safety (Food Standards Agency, 2023). However, more food could be rescued if employees had the capacity to apply detailed safety guidelines to food past its best before date similar to the policies in place for TooGoodToGo. This could include reheat instructions or warnings, texture/taste/smell guidelines for certain meal items. Figure 4.4 and Armstrong et al's (2022) research show that food is being consumed after its use-by date so the University of York could work to ensure food safety guidelines are in operation ensuring this can take place safely. This may be optimistic as Participant C went on to say that, although the university would theoretically support food rescue from the catering outlets, they would struggle to find a staff member with the capacity to execute this work. Participant C said that "we're only making living wage and the chefs work long hours" going on to say that it is unlikely anyone would be willing to stay later for extra work.

To identify why food waste is generated by consumers in the university catering halls, questionnaire participants were asked why they leave food on their plates. This was to inform the integral alterations that could be made and have been found to successfully reduce food waste (Davison et al., 2022). It is important to consider that the amount of food waste from consumer's plates is unknown and has been combined into the total for each outlet shown in figure 4.1 and figure 4.2. However, it is predicted to vary with each consumer and that some consumers leave large amounts of waste as noticed by Participant C, who works at the catering outlet. Participant C stated that some consumers will request items of food from the servers and proceed to not touch them at all during mealtime and ultimately discard of them untouched. This could be due to the integral aspects of the catering outlets at university as consumers have a pre-set amount of food determined for them and served to them which is not altered to suit personal preference.

Table 4.1 displays reasons why catered accommodation users tend to waste food when eating at the on-campus catering outlets.

Reason why catered accommodation users leave food	Percentage of catered accommodation users who leave food because of this (%)
"I leave food that I don't like"	40
"The food goes cold too quickly"	5
"I am in a rush to finish my meal"	14.5
"The portion sizes are too big"	56
"Sometimes just not hungry enough"	2

Table 4.1 indicates that 56% of participants leave food on their plates because 'the portion sizes are too big' emphasising the need for changes to the integral aspects of the catering outlets. The reasons for leaving food identified in Table 4.1 could be resolved by altering serving sizes on request to suit personal preference or operating on a 'pay as you eat' system which has been found to reduce food waste in other universities (Davison et al, 2022). It is important to note that one questionnaire participant indicated that they take their leftovers back to their accommodation which emphasises the need for clear food safety guidelines on the reheating and consumption of products in the dining halls. This is further evidence that people are consuming the excess food considered to be avoidable food waste at the University of York already. The primary concern of the staff interviewed (participant A, participant B, and participant C) regarding food redistribution was food safety but this is evidence that consumers are already rescuing and consuming food independently. Therefore, to effectively safeguard the health of their consumers, the solution is not to gatekeep access to avoidable food waste but, instead, to update food safety guidelines clearly and simply to go alongside it.

PARTICIPANT RESPONSE WHEN ASKED THEIR INITIAL THOUGHT IN REGARDS TO FOOD WASTE IMPACT

Economic impact (it's a waste of money/resource) 9%

Social impact (other people in society could have made use of this) 51%

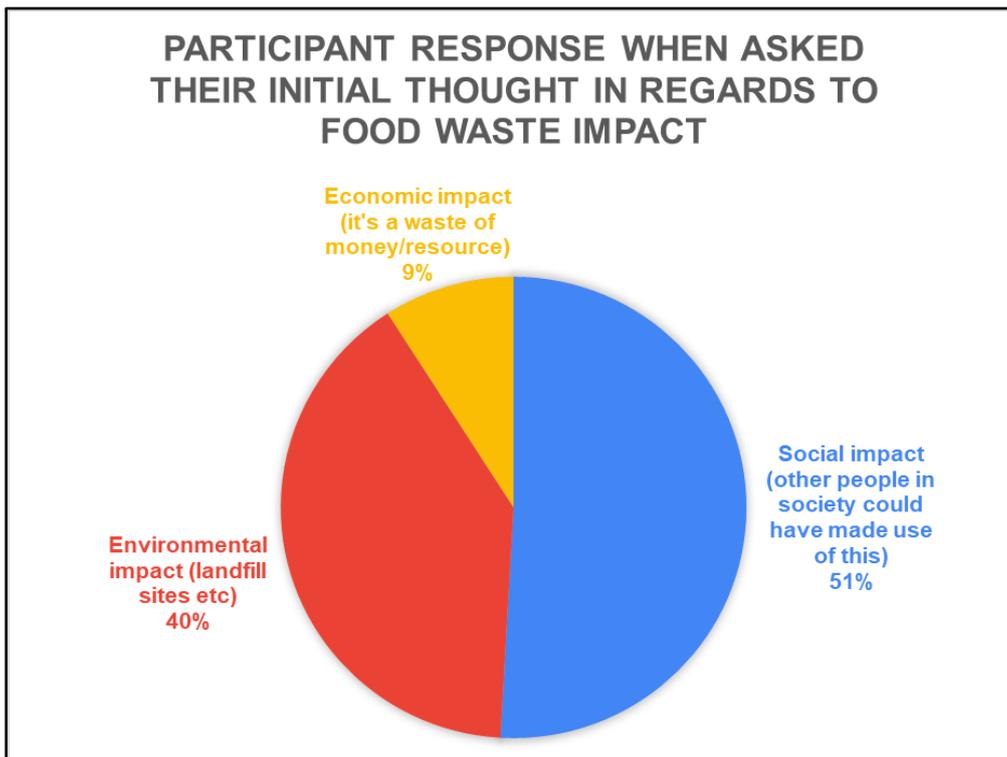Environmental impact (landfill sites etc) 40%

Figure 4.6 displays what participants first think of when considering the negative impact of food waste with the majority saying that they initially think of the social impact (that other people in society could have benefited from the food being thrown away).

Thankappan (2011) found that, generally, there are few modern consumers that consider food waste generation an environmental issue. At the University of York, a slight majority considers it primarily a social issue, but it was closely followed by 40% of catering outlets being primarily concerned with the environmental impact. It has been found previously that exhibiting informative posters in catering outlets can reduce food waste generation to the extent of 20% (Davison et al., 2022). Based on figure 4.6, making these posters centred on the environmental and social impact of food waste could reap significant benefits for reducing food waste generation in regard to the University of York. During the conduction of the questionnaire, limited examples of informative posters on food waste impacts were observed therefore it may be an interesting avenue to explore in the future.

4.3. Potential to Mitigate Food Waste and Redistribute to Local Community

PARTICIPANT RESPONSE TO 'DO YOU USE NO WASTE APPS SUCH AS TOOGOODTOGO AND OLIO?'

- Yes, often. 4%
- No, it's not for me 9%
- I haven't heard of those apps 47%
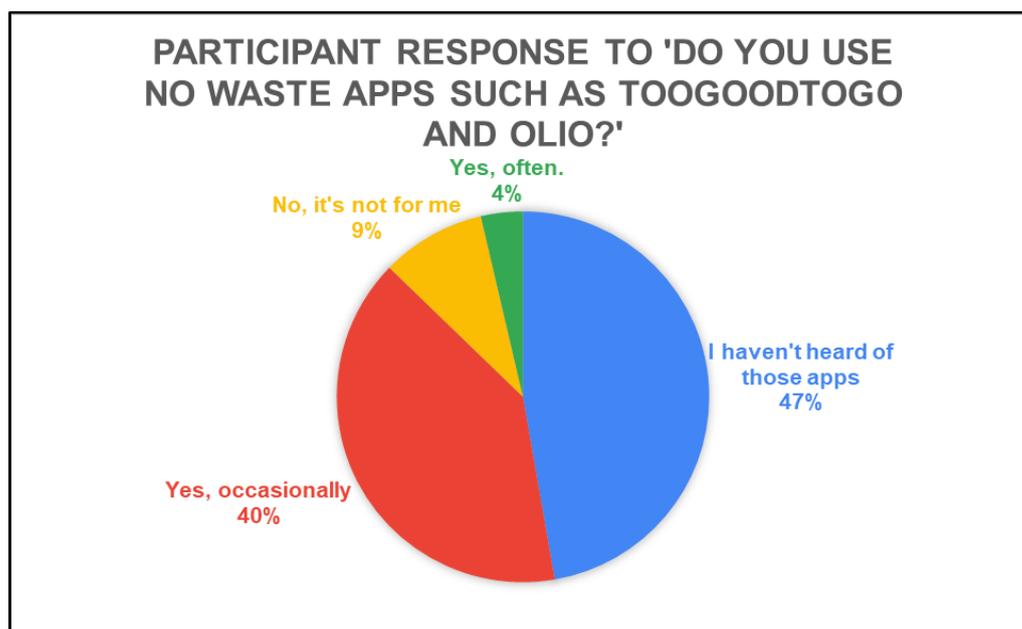- Yes, occasionally 40%

Figure 4.7 displays the percentage of participants that use no waste apps as a means for rescuing or redistributing food that is going to waste.

Participant A, a senior member of the sustainability team, suggested that the catering outlets use TooGoodToGo to redistribute food to reduce food waste but participant C, a server at one of the catering outlets, made clear that they were unaware of that process. This highlights a clear issue in the communication chain of food waste management processes in the staff hierarchy. If participant A is correct, and TooGoodToGo is currently used to redistribute food, then figure 4.7 suggests that this needs readdressing as 47% had not heard of the app or 9 % don't use it. Redistribution through this pathway needs more awareness and could benefit from advertising in outlets or around campus as, from observations in these outlets, it is unclear that this initiative was in place. Food rescue may be a superior method of reducing food waste by offering the excess food with no monetary cost as figure 4.5 indicates that surveyed catering users would like access this food if it was consumable and easy to access with no mention of costs involved.

The safety of consuming rescued food was the primary concern in its feasibility to interviewees in this study. However, this dissertation has shown that a majority of consumers at the outlets are willing to, and often do, prefer to follow their intuition on whether food is safe to consume based on its texture/taste/smell. Interestingly when asked if they personally overlook these guidelines (i.e. best before and use-by dates) and follow their own intuition, every interviewee said they have done so with some food-types. This indicates that the concern may not necessarily be for health and food safety but rather for legal safety. However, there have been cases where food rescue has been a success in York specifically including TooGoodToGo, Refill café, and

SPARK's General Store as well as it's informal acknowledgement as a food waste route in Australia (Reynolds, Piantadosi and Boland, 2015). Therefore, it is possible to redistribute rescued food safely and to benefit those in need while doing so but it seems to be limited at the university by staff members with limited capacity to fulfil the workload according to participant C. This is understandable and has also been found to be the case in the hospitality sector when the Covid-19 lockdowns occurred, and volunteers were needed to redistribute excess food to those in need but limited due to the laborious nature of the task (Filimonau, 2021). A potential solution to this is to advertise this role as a voluntary role to students. Figure 4.6 indicates that University of York students care about the social impact of food waste and 96% of respondents to the questionnaire were in support of rescuing food from the catering outlets to aid those in need in the local community. This voluntary role would allow students to gain invaluable volunteering experience while supporting the university's sustainability goals as part of their 2030 strategy to be a university for public good and one participant enthusiastically responded that they would "advocate" for this food rescue. This, again, may be optimistic but it would be an interesting avenue for the University of York to explore in the future to reduce their food waste.

4.4. Limitations

In future research, it would be beneficial to interview more employees of the catering team to explore exactly which foods are wasted. This would allow for researchers to determine how much of the food waste generated is unavoidable, potentially avoidable, and avoidable. The food waste data used in this dissertation was limited to the weight of the food waste bins near the catering outlets so there may be some inaccuracies to the weights described. The dataset in figure 4.2 does not specify direct wastage from the on-campus event caterers, Campus Kitchen, it was assumed that the food waste generated from this supplier was likely to be combined with the catering outlets' food waste. This may cause some abnormally high wastage data at catering outlets that often host events but more specific research into the Campus Kitchen's food waste generation would be necessary: responses from the questionnaire and Participant D suggest that they would generate a high volume of food waste. Also, with more resources, this food waste could be quantified economically and put into context of calories wasted similarly to the research of Reynolds, Piantadosi and Boland (2015). However, due to the limited resources and short-term nature of this dissertation, this has not yet been possible at the University of York.

The next step for this project would be to research further into whether the reality of redistributing to local initiatives such as Refill Café or SPARK's General Store. However, this would ultimately depend on the specific contents of the food waste generated at the University of York which is still unknown. This could be explored by contacting Biffa who manage the University of York's food waste disposal in partnership with the member of staff who handles the account information, However,

again due to limited time frame, this was not possible during this project but would be one of the next steps in the future.

Lastly, it is important to mention that it was difficult to find updated information regarding how many visitors the catering outlets have across any time frame including how many catered students there are at the University of York. This made the quantity of food waste generation hard to contextualise as Davison et al (2022) found that a university catering hall in Yorkshire generated 35.7 kilograms of food waste a day in a hall that serves approximately 260 students. This is challenging to compare to the food waste generation data from the University of York because the outlets at York may be catering to a larger number of students and therefore would be predicted to generate a larger amount of food waste. To improve the accuracy of this research, this would be important to explore and clarify in further research.

5. Conclusion

This research aimed to investigate if the food waste generated at the University of York could be reduced and if one method to reduce waste could help combat the impact of the cost-of-living-crisis. This research has identified five catering outlets generating the largest quantities of food waste on campus which equated to 62.2 tonnes annually thus identifying the need to seek methods of reducing this waste. It conclusively proved there is potential to do this through identifying why food waste was initially discarded which indicated one method of reducing food waste by altering the integral aspects of how the catering outlets operate. For example, altering serving size to fit personal preference and potentially trialling a 'pay as you eat' design inspired by the Indian University described in Davison et al's (2022) research. Also, by incorporating signage to dining halls focusing on environmental and social impacts of food waste to reduce waste on the consumer side. Finally, yes, there is potential to reduce food waste and help with the cost of living by introducing a food rescue scheme that would rescue safe to consume or avoidable food waste and redistribute it to local people in need. This was supported by 96% of surveyed catering outlet visitors and concerns by interviewees surrounding the safety of the initiative can be resolved by implementing clear and simple food safety guidelines with the redistributed food. This is to ensure consumer safety and to legal safety to the catering outlet. It is recommended that this scheme is run on a combination of specialist staff expertise to guide food safety guidelines as well as a team of student volunteers to give them volunteering experience as well as a chance to support those need in in York.

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7. Appendix

Appendix 1-Questionnaire

Please confirm that you are over the age of 18 and consent to taking part:*

I agree

I disagree

What is your age group?*

18-25

26-35

36-45

46-54

55+

What is your affiliation to the University of York?

Student

Non-catering Staff (i.e. academic, administrative, etc.)

Catering Staff

Visitor

What college are you in? (if applicable)

Derwent

Alcuin

Vanburgh

James

Wentworth

Langwith

David Kato

Constantine

Goodricke

Anne Lister

Halifax

Do you abide by 'use-by' dates on food?*

Always

Most of the time

I sometimes ignore them if the food tastes/smells/feels okay to me

Almost never-I very often ignore them and find that food is still good quality/edible past this date

Other…

Do you abide by 'best before' dates on food?*

Always

Most of the time

I sometimes ignore them if the food tastes/smells/feels okay to me

Almost never-I very often ignore them and find that food is still good quality/edible past this date

Other…

Do you know the difference between best before and use-by dates?*

- Yes
- No

Which of the options below are the correct definitions of 'use-by' date and 'best before' date?*

    A. A use-by date on food is about safety: You can cook and eat food until midnight on the use-by date but not after. Best before dates are about quality: The food will be safe to eat after this date but may not be at its best.

    B. A use-by date is a suggestion of when you should use the food by. Best before is a suggestion of when the food will stop tasting its best.

    C. A use-by date is about quality: The food will be safe to eat but not its best. Best before tells you when the food is at its best: After this date it is no longer safe to eat

    D. I don't know

How often do you buy 'yellow-ticket' items from supermarkets?*
'Yellow-ticket' items are also known as 'whoopsie' items and are the items that are approaching their use-by/best before date and therefore are sold at a reduced price by supermarkets in order to sell them faster.

Often - I always go to the 'still fresh'/reduced section of a supermarket when shopping
Sometimes - if something I normally buy in my weekly shop is reduced I'll buy the reduced item.
Very occasionally - if there's a really good reduction I will buy it
Never - I never purchase items that are close to their use-by/best before date.
Other…

Would you consume food that had been thrown away by supermarkets/caterers?*
The food described in this question is still consumable (it will not cause you illness and is not mouldy) but it has been thrown out by a catering team/supermarket due to being surplus or not aesthetically pleasing.

Yes. If it is still consumable and I could access it, I would still eat it even if it's not aesthetically pleasing

No. If it has been thrown away into a bin, I would NOT eat it even if it looked aesthetically pleasing (I don't agree with 'dumpster diving')

Maybe. I would consider taking it, if it was aesthetically pleasing and accessible.

I don't know

Other…

If you answered, 'No...' to the previous question, please could you give a short reason why.

Short-answer text

If you are in catered accommodation, do you regularly finish your meal?

Always

Most of the time

Sometimes

Never

Other…

Why do you leave food? (Please tick all that apply)

- The portion sizes are too big
- I leave food that I don't like
- The food goes cold too quickly
- I am in a rush to finish my meal
- Other…

Do you use 'no waste' apps such as TooGoodToGo and Olio?*

Yes, often.

Yes, occasionally

No, it's not for me

I haven't heard of those apps

Have you used any local no waste initiatives e.g. Refill Café, All Should Eat (UOY society), or Adriano's no waste market in SPARK? *

Please specify which ones, or write NA or No.

Short-answer text

Would you support the university catering outlets donating surplus food to local food banks/local food waste reduction initiatives?*

Short-answer text

If you answered 'No...' to the previous question, please could you give a short reason why.

Short-answer text

Lastly, when you think about the negatives of food waste, do you first think of...*

Economic impact (it's a waste of money/resource)

Social impact (other people in society could have made use of this)

Environmental impact (landfill sites etc)

Other

Please use this space for any extra notes or suggestions of how we could lessen food waste at our university (optional)

Long-answer text

Appendix 2-Interview Schedule
Introduction
So to start with, please could you tell me a bit about your role at the university?

So, I'll tell you the themes I was hoping to discuss today but you are free to end the interview at any time you need to. There's 4 themes; your perception of food waste, your awareness of food waste initiatives in York, what are the common practices at York for keeping food waste sustainable, and lastly opportunities to redistribute surplus food if possible.

Theme 1:
Perception of food waste
- E.g. Would you consume food that's past its Best Before date? Past its use by date? Are there some foods you would treat differently i.e. dairy, eggs, fruit/vegetables, bakery items? Would you consume food that was past it's best before/use by dates if it was baked/cooked into a meal/cake etc?

Theme 2:
Knowledge of food waste initiatives around York
i.e. Refill, York, Adriano's no waste market at spark as well as online/social media alternatives i.e. TooGoodToGo and Olio

Theme 3:
What are the common practices at York?
- What foods are most commonly thrown away?
- Do you 'rescue' food to take home for you/your family/friends?
- How much/how often do you know of the catering outlets throwing away food across an average month?
- For catering teams-How do you feel when throwing it away? (potentially go onto say- do you feel that the food could be rescued/reused or does it feel warranted to get rid of?)
- Potentially for catering teams-What are the common reasons for throwing away food within the catering team?
- What are the regulations at York-which people are able to say what happens to the food at the end of a shift?
  - Ask about the 'shop, save, and sustain' and campaign.

Theme 4:
Opportunities/willingness/ability to redistribute food 'waste' to help students and other local communities during the cost of living crisis.
- Do you think the university would be willing/able to donate the food to support initiatives such as too good to go/Olio or on campus initiatives such as All Should Eat or local initiatives such as Refill cafe and the no waste market at Spark?
- Would you be willing to donate the food to an initiative that would redistribute the food to students at the university?
- Do you think that during the cost of living crisis, the university would be able to donate some of the food to local food banks as others now find it difficult to donate?