



IMPROVING FOOD WASTE PREVENTION AND MANAGEMENT

A Research into the Possibilities for Small Food Service
Enterprises

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Executive summary

As food waste contributes to being a social, economic, and environmental problem, more research is needed for the prevention and management of food waste in food service enterprises. Thus, this report was written to gain more information about how the prevention and management of food waste and how this could be improved. For the scope of this research, small Dutch food service enterprises are examined. The central question in this research is **“How to improve food waste prevention and food waste management of small Dutch food service enterprises?”**. This question is important to get more insight into the different methods regarding food waste management, how food waste occurs and how it is prevented, and how food waste management methods can be improved when applicable. The research methods that have been used during the report are field research, desk research, qualitative research, and the use of primary and secondary data.

The results from the interviews reflect that all three restaurants apply several measures to decrease or prevent food waste, such as the reuse of leftover parts, the separation of waste, and the application of food waste management methods. However, the research showed that the implementation of alternative food waste management methods is not without exceeding difficulties. All three restaurants face several obstacles to implement or improve food waste management. These difficulties include the mentality of the owners and employees towards food waste management, the estimation of avoidable food waste, the collection of separated waste by the municipality, and the application of alternative food waste management methods. Additional research has been conducted for more adequate suggestions regarding these implications. These results suggested multiple ways on how to manage food waste, as well as the prevention thereof.

This led to the conclusion that the improvement of food waste prevention and food waste management is feasible with applicable adjustments and considerations regarding the difficulties that might occur. Suggestions that restaurants should consider for improving their food waste prevention and management include portioning meals, consistently separating (organic) waste, participating in projects that reuse waste, and implementing a (different) waste framework for waste management. A new waste framework has been developed for restaurants to consider when wanting to improve their food waste prevention and food waste management. It is recommended to do follow-up research on how the implementation of alternative food waste management methods affects small food service enterprises.

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Chapter 1 – Introduction

The problem of food waste

The global production of 1.3 billion tonnes of food waste per year, has become a social, economic, and environmental problem (Depta, 2018). The mentioned amount only reflects edible food waste and does not include non-edible peels, et cetera. The world population is rising, together with the need for food. According to an online news item by the European Commission, “More than 113 million people across 53 countries experienced acute hunger ...” (European Commission, 2019) all the while millions of kilograms of food is thrown away. Depta (2018) even stated that the 815 million undernourished people in the world could be fed over four times by food waste that is produced globally. In addition, Depta mentions that the approximate total costs of global food waste are estimated at 1.95 trillion euros.

From the European perspective, there is an annual food waste of 88 million tonnes. In addition, all the food that is wasted costs a total of 143 billion euros (European Commission, 2016). In Europe, most costs are associated with the food waste of households and are based on the retail value of the food that is thrown away. The value of the food that is thrown away in other sectors, such as retail, is lower, however, still contributes to a high total of costs of food waste (Stenmarck, Jensen, Quested, & Moates, 2016). The Netherlands produced between 1.8 and 2.5 million tons of food waste in 2017 (Voedingscentrum, 2019). This indicates that 4 to 5 billion euros of food waste are thrown away each year (Warning, 2019).

Furthermore, all these millions of kilograms of food waste have a certain impact on the environment. Not only does food production cost a lot of water, CO₂ emissions, and other resources, it is also a waste of energy that is used for the packaging, transport, and cooling of the products (Instock, 2020). The usage of resources and the emission of CO₂ differs per product, but this nonetheless makes each kilogram of wasted food important.

During this research, a closer look is taken at one of the sectors that produce food waste. In less developed countries, most food is lost during the harvesting and processing of the food, whereas in developed countries, more food waste occurs during the retail and consumption of food (Hanson, 2016). This means that for Europe, most food is wasted by retailers and consumers, including food services. A lot of data has been collected about households and food waste, however, the amount of data concerning the sector including hospitality and food services could still be improved. In addition, the food service industry has the highest possibility of food waste occurrence, relating to the preparation of food and the eating behaviors of consumers (Huang, Liu, & Hsu, 2020).

Scope and purpose

Since the food service industry differs per country, it is important to define the scope of this research. The country this research is focused on is The Netherlands and it is narrowed down into analyzing several cases of small Dutch food service enterprises. On average, 51.000 tonnes of food are thrown away per year by Dutch restaurants (Hotelschool The Hague, 2019). The purpose of this research is to examine the potential causes and approaches to improve food waste management among small Dutch food service enterprises. Improving waste management could be done by examining the food preparation stages and food waste in a restaurant. Therefore, the central question for this research is: **How to improve food waste prevention and food waste management of small Dutch food service enterprises?**

In order to answer this question, several sub-questions should be taken into account. The following questions are discussed in this report to include more information and support regarding the central question.

1. How does food waste occur in restaurants?
2. How is food waste currently managed in restaurants?
3. What are the possible strategic models that help restaurants manage food waste?
4. What is the feasibility of alternative methods for reducing or sustainably managing food waste?

Through this research, several topics are addressed. First, a closer look is taken at the current situation of food waste in the Dutch food service industry. The food preparation stages are examined to determine what stage is critical regarding food waste. Also, the management of food waste in restaurants is analyzed to collect more data on how different restaurants cope with the same situation. Several models that are addressed in the theoretical framework might help in understanding and improving food waste management. At last, the alternative measures that the food service industry can take on reducing the waste of food is vital regarding the central question, thus, the feasibility of each alternative needs to be questioned.

The research is done by examining secondary data and collecting primary data by conducting interviews with several small Dutch restaurants. It is important to know how this problem occurs and how it is handled in order to determine the feasibility of alternative methods as well. Additional research has been done to examine a Dutch restaurant that has already applied several alternative measures for the prevention food waste.

Structure

First, several concepts and models that are applicable to the research on the improvement of food waste management are examined and discussed. One model that is most applicable for this research is chosen and further explained as to how and why the model is most applicable. Various variables from the model are discussed. Second, the research methods for this report are explained, relating to how and why these methods were chosen. This is followed by the results of the research, derived from the interviews as primary data and desk research as secondary data. The results are divided per the discussed variables of the model, with a visual of the key findings at the end of the results. Some key findings are the occurrence of food waste in restaurants, which is mostly generated during the preparation of food and the serving and taking out of food. In addition, the biggest obstacles regarding food waste management are mentioned, which include the mentality of the employees as well as the practicality of the implementation of food waste management methods.

Furthermore, the results are analyzed and discussed together with answering the sub-questions. The results are compared, the obstacles determined, and some interpretations, as well as implications, are stated. Additionally, there are some new insights into the occurrence and management of food surplus in relation to food waste. The obstacles and implications are revised during the additional research, which conducts more information on possible solutions or alternative methods for food waste management. At last, the results and discussion are concluded and the recommendations for the food service industry regarding the improvement of food waste management are given.

Chapter 2 – Theoretical framework

This chapter will confer the concepts that are relevant to the research in paragraph 2.1, as well as various models that conclude applicable waste management frameworks in paragraph 2.2. The models are discussed and compared, which resulted in one model that is applied during the research. Furthermore, several variables of the model will be examined and explained in an operationalization table in paragraph 2.3, relating to how and why these variables are applied to the research.

2.1 Key concepts

The key concepts that are discussed during this research are food waste, waste management, and small food service enterprises. These concepts are related to the sub-questions as to what is defined by food waste, the concept that is mostly researched, and what waste management consists of. The definition of small food service enterprises is important for the relevance of the conducted interviews, as well as determining who the proposed recommendations are for.

2.1.1 Food waste

The definition of food waste is not fixed as it has different explanations in various research literature. For this research, the concept of food waste refers to “food appropriate for human consumption being discarded, whether or not after it is kept beyond its expiry date or left to spoil.” (Food and Agriculture Organization of the United Nations, 2013). This does not include food that has decreased in mass and quality, as the FAO defines this as food loss. The study of Papargyropoulou et al. (2014) suggests that food waste can be divided into the categories of avoidable food waste and unavoidable food waste. Unavoidable food waste refers to food that is not, and has not been, edible. This includes the peels or certain parts of fruits and vegetables, shells, and bones. However, what is defined as non-edible by the majority of people differs per culture, shares and beliefs, religion, and personal preferences. Avoidable food waste refers to food that has been disposed of due to the expiration of the food or because it is no longer wanted. It has been edible but might become not edible after the expiration of the food (Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2014).

2.1.2 Waste management

Waste management refers to how waste is thrown away. It includes ways of recycling, reusing, separating, and discarding waste. Sustainability is an important factor regarding the ways that are used for waste management. Especially food waste has different approaches as to how this can be discarded sustainably (e.g. composting or feeding animals). A distinction can be made

between food waste management and food waste prevention. “Waste prevention includes activities that avoid waste generation, for instance, reduction of food surplus, whereas waste management includes the options available to deal with food waste once it has been generated, such as composting and anaerobic digestion” (Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2014).

2.1.3 Small food service enterprises

The concept of small enterprises can be interpreted differently. As the scope of this research is primarily focused on restaurants within the Netherlands, the definition stated by the European Commission is most relevant for this concept. The definition is stated in the EU recommendation 2003/361. Various aspects that are taken into consideration for the definition of enterprises are the staff headcount and the turnover or balance sheet total. The European Commission states that an enterprise is considered small when the turnover is €10 million or less or when the balance sheet total is €10 million or less, and the staff headcount is 50 or less. In addition, the European Commission mentions that “(these factors) apply to the figures for individual firms only. A firm that is part of a larger group may need to include staff headcount/turnover/balance sheet data from that group too.” (European Commission, 2020).

2.2 Evaluating relevant theories of waste frameworks

Several theories and models are relevant to this research. For a model to be relevant, it should include an (improved) waste framework mentioning the preparation stages of food, the current stream of food waste, or possible solutions for improved waste management. Various waste frameworks have been conducted and developed by different studies related to food waste management in the hospitality industry. All these studies address the importance of improving or changing food waste management while explaining the occurrence or the process of food waste management. Three models that apply best to this research, due to the variables and theory behind the model, are explained and discussed.

The first model (Fig. 1) to be discussed is the model argued in the research of Martin-Rios et al. (2018), which has divided the waste of food into different sections from where it is generated (storage, kitchen, front-office) and whether it is avoidable or unavoidable food waste. Additionally, it includes examples of what type of food waste occurs. The theory behind the model is based on several interviews with food service managers that were conducted during the research. The model provides more insight into what kind of food waste is generated and in which process of the preparation of food it occurs. In addition, the model shows the waste management chain that includes the various stages of food waste management. “The waste management chain in food services consists of five main steps: collection, sorting, storage, disposal (public or private), including transport of waste that is not collected by a public or private third party but has to be brought to a waste sorting/recycling center” (Martin-Rios, Demen-Meier, Gössling, & Cornuz, 2018). This model is relevant for this study as it could help define the occurrence of the waste generated, together with how the waste is or can be managed.

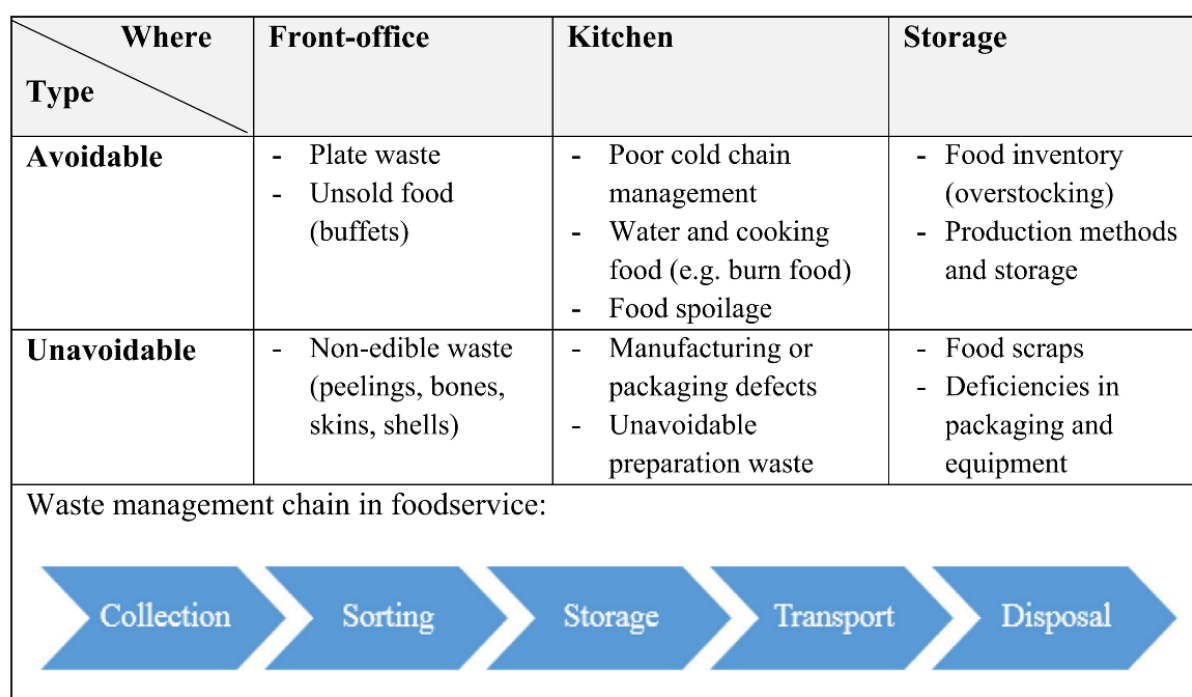


Figure 1 - Examples of waste (Martin-Rios et al., 2018, p. 200)

The second model (Fig. 2), provided through the study of Cicatiello et al. (2016), discusses different food waste types, the functions, and the possible uses of the waste. The study itself focuses on the social, economic, and environmental value of food waste in the retail stage of the food chain. The model is mainly based on the data collected by a case study on a food waste recovery project held in an Italian supermarket. Although the model is mainly developed for retailers such as supermarkets, it is still relevant for food service enterprises, by categorizing

the food waste and identifying its function and the various options to dispose of the waste. The model additionally identifies types of food waste as edible or inedible. At last, “(the model) shows some alternative uses of the food items wasted at the retail stage, either edible or not. Namely, edible items can be recovered and destined to human consumption,” (Cicatiello, Franco, Pancino, & Blasi, 2016). The model is relevant for this research as it discusses the occurrence and different types of food waste and the possible uses of food waste which is linked to the management of the waste.

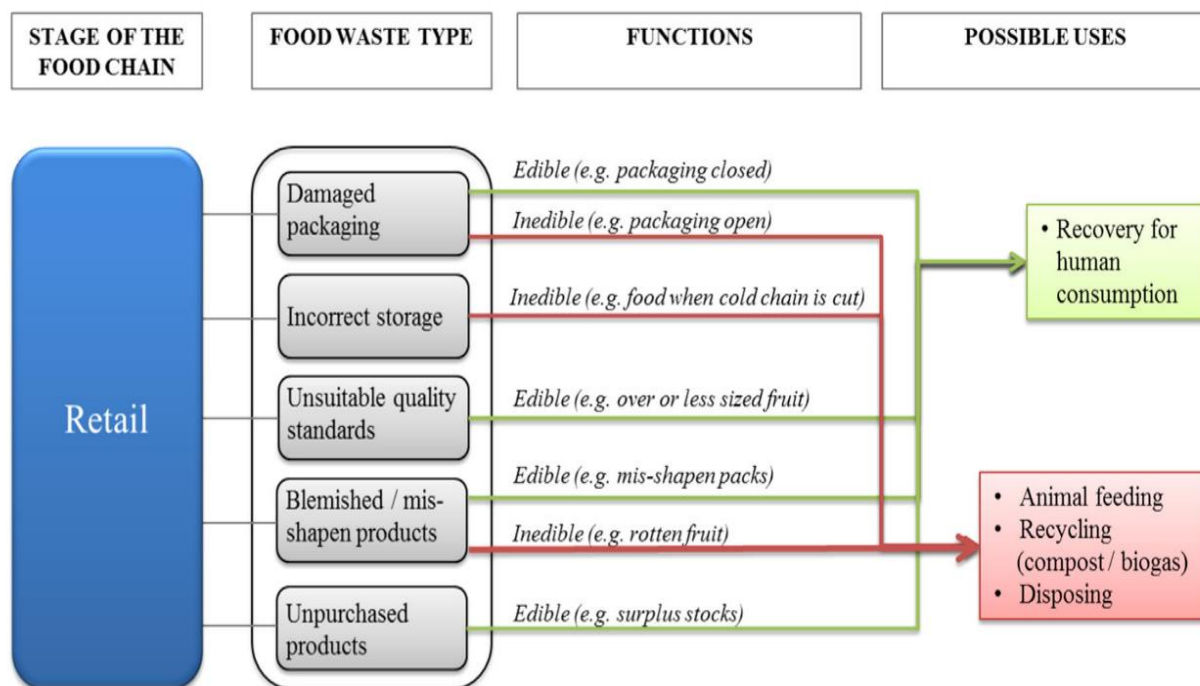


Figure 2 - Possible uses of retail food waste (Cicatiello et al., 2016, p. 100)

The third and last model to be examined (Fig. 3) is developed through the research of Papargyropoulou et al. (2014), which discusses food surplus and a waste framework for food waste. It divides food waste into different categories such as fit or unfit for human consumption and avoidable or unavoidable food waste. In addition, it divides the management of the waste into various segments, rating from most favorable to least favorable. The theory behind the model is based on interviews with UK based organizations that are mostly specialized in food waste. The model itself is additionally based on the European Waste Framework Directive, or the waste hierarchy, that aims to “identify the options most likely to deliver the best overall environmental outcome” (European Parliament Council, 2008). The study of Papargyropoulou et al. discusses that the prevention of a high food surplus could lead to a decrease of food waste, it mentions that “food surplus is food produced beyond our nutritional needs, and waste is a product of food surplus”. Furthermore, it argues that, due to the food surplus being an undesirable factor, “the priority is to prevent overproduction and

oversupply of food beyond human nutritional needs at all the stages” (Papargyropoulou, Lozano, Steinberger, Wright, & Ujang, 2014). The model is relevant for this research as it discusses the different ways of how food waste could be managed, together with the various ways on how food waste occurs.

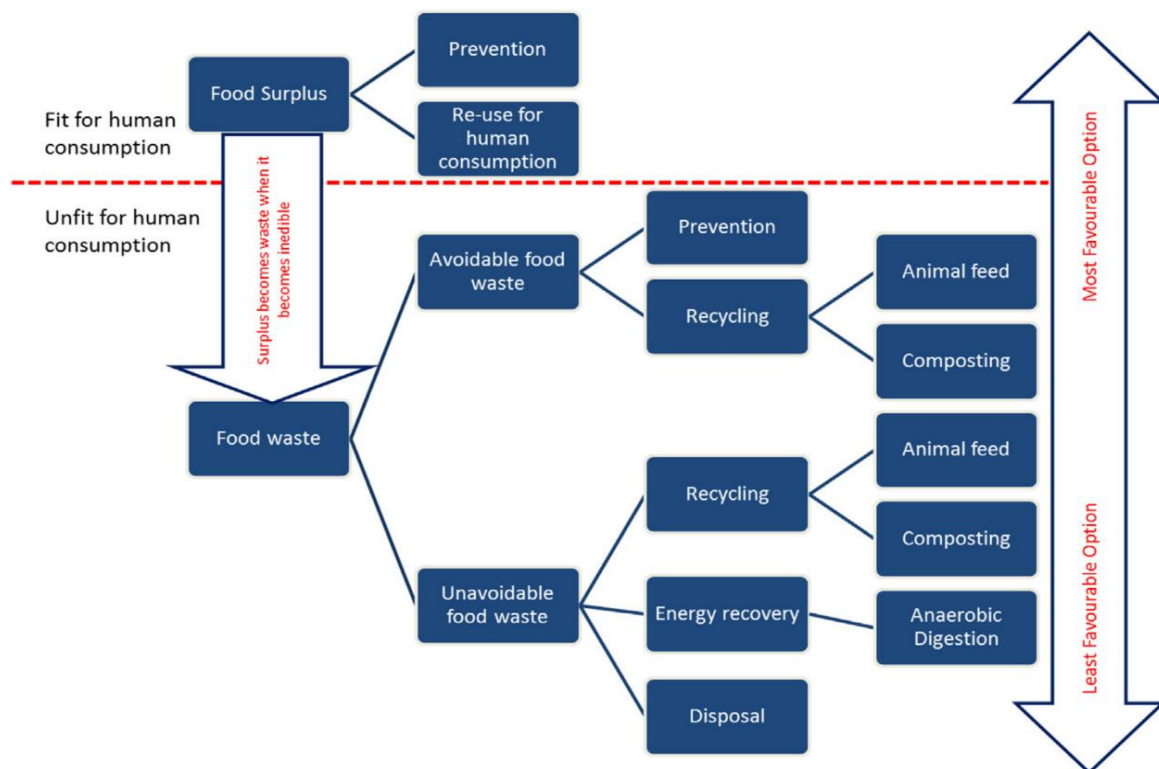


Figure 3 - Food surplus and waste framework (Papargyropoulou et al., 2014, p. 113)

Discussion of models

All three models are applicable to this research, as they all show a waste framework that could be implemented to keep better track of, and ultimately reduce, food waste. The first two models both show a more concrete framework of where food waste mostly occurs, and how this occurs. The model of Martin-Rios et al. (2018) is more related to the food waste occurrence in the food service industry. However, no possible improvements or solutions are mentioned. The model of Cicatiello et al. (2016) distinguishes the types of food waste differently and mentions the possible uses of the food that is wasted. The theoretical framework that has been chosen for this study is the model of Papargyropoulou et al. (2014). The variables and the model itself are most applicable in order to answer the sub-questions. This model is most relevant because, even though it shows the generation of food waste in the preparation stages of food to a lesser extent, it goes more in-depth on how food waste can be managed in different ways, which is essential to research the feasibility of alternative waste management methods. The separation between food surplus and food waste is valuable for the examination of the current food waste management in small Dutch food service enterprises.

2.3 Operationalization table

The study of Papargyropoulou et al. (2014) involves relevant and accurate insights on food waste management and the differences within food waste management. Hence, the model on food surplus and waste is used for this research. The model is explained within an operationalization table (Table 1) which gives a justification regarding the occurrence of food waste, the management of food waste, and the feasibility of alternative methods for food waste management.

VARIABLE	DESCRIPTION	LINK TO CENTRAL QUESTION	KEY RESEARCH QUESTIONS	RESEARCH METHOD
Food surplus	“... food produced beyond our nutritional needs and acts as a safeguard against unpredictable weather patterns affecting crops.” (Papargyropoulou et al., 2014)	Sub-question 1	- What does the food surplus in this restaurant consist of?	Primary data by conducting interviews with chefs of different restaurants. Secondary data through desk research regarding multiple studies on food waste management in the hospitality industry.
Food waste	Food that is thrown away, also a product of the food surplus (Papargyropoulou et al., 2014).		- How does food waste occur in the kitchen of the restaurant?	
Avoidable food waste	Edible considered food waste (Papargyropoulou et al., 2014).	Sub-question 1, 2, and 3	- How is food waste currently managed in this restaurant?	
Unavoidable food waste	Considered as non-edible food (Papargyropoulou et al., 2014).			
Waste prevention	The prevention and avoidance of producing food waste (Papargyropoulou et al., 2014).	Sub-question 2 and 3	- Are there any measurements taken for preventing food waste?	
Waste recycling (management)	Example of waste management, which involves “... options available to deal with food waste once it has been generated.” (Papargyropoulou et al., 2014)		- What are the difficulties or obstacles regarding the improvement of food waste management?	

Table 1 - Operationalization Table

Chapter 3 – Methodology

In this research, the question of how to improve the food waste prevention and food waste management of small Dutch food service enterprises is examined. The use of qualitative data to examine a rather under-researched topic refers to the interpretivism of this study. Various observers might interpret the perception and reality regarding the concepts differently. In addition, observations are made for hypothesis development, implying the inductive approach for research. The various research strategies conduct from secondary qualitative data, where the meaning and understanding of certain terms or situations are examined in order to answer sub-questions. Due to most sub-questions requiring an understanding and explanation of terms that are used, it is important to have these researched through descriptive data. The qualitative primary field research by conducting interviews is used to examine the current food waste management and possible alternatives. This mono-method technique consists of only using qualitative data collected through both primary and secondary resources. However, the data that is used during the research was collected in a shorter period, implying that the time frame is considered cross-sectional.

Primary data, consisting of field research through the comparative method, was applied to gain more in-depth information on the occurrence of food waste in the Dutch food service industry. The comparative method consists of “comparing a small number of cases and exploring facts, relations, or processes to find differences or similarities” (Starman, 2013). This method has been chosen as this is most relevant to the purpose of this research. Recognizing the differences and similarities is essential, as this will mostly determine the feasibility of alternative food waste management methods. The comparative method does therefore not cover an investigation within each case, as this is less relevant for the objective. For a correct comparison of the cases, “the specific features of each case should be described in-depth at the beginning of the study” (Goodrick, 2014). The restaurants that are compared are chosen due to the fact that they are all small and Dutch food service enterprises. They are from different locations in or near the city of Rotterdam. They are not part of a franchise or restaurant chain and the staff headcount for each restaurant is less than 50.

This research examined three small Dutch food service enterprises by conducting interviews, each interview lasted approximately 20 minutes. Interview techniques that were applied were consulted from *Research Methods for Business Students* (Saunders, Lewis, & Thornhill, 2007). The techniques consisted of face-to-face structured interviews by preparing questions that were identically applied in all interviews. Although Saunders et al. (2007) discuss that non-standardized interviews are often applied during qualitative research, the standardized

interviews in this research were necessary for the adequate comparison of the cases. The data collected through these interviews provided a practical image of how much food is wasted, where the waste ends up, and how the waste is managed. The data has been categorized in relation to the variables of the model of Papargyropoulou et al. (2014) and further analyzed to recognize differences and similarities. All interviews were recorded and transcribed (Appendices I, II, and III) and all interviewees were asked to sign a consent form for their approval on recordings (Appendix IV). The interviews were held in Dutch, however, for the aim of this research, all interviews are translated to English in person. The Student Ethics form concerning the sources that are used for this research can be found in Appendix V.

Secondary data, which included desk research of models and definitions, was consulted for all the variables to be researched, defined, and applied. In addition, the research of models was used to gain more information for answering the related sub-question: What are possible strategic models that help restaurants manage food waste? Desk research was used to gather information from existing sources explaining and defining what stages in the preparation of food generate the most food waste, and to make a better understanding of the food waste management in the food service industry. All secondary data has been derived from journals or similar studies related to food waste management. Journals are usually seen as reliable resources: any article has to be studied by credible experts for evaluation before it is published. Besides, multiple references from third independent parties to a specific website can prove that a source is to be trusted (Academy of European Studies, 2020).

The main reason as to why these methods were applied, is because they go well with the model. Although the study is solely based on the mono-method, consisting of qualitative data collection through several sources, it helped gain in-depth information and a more detailed insight as to how different food service enterprises manage their food waste. This improved the comparison and examination of the feasibility and possibility of alternative methods. The time frame of the study affected the results, implying that the frameworks regarding food waste management will be able to change and further develop over time. A longitude research time frame, where the data is collected over a longer period, might result in the collection of miscellaneous data. However, the time frame was reasonable for the research on this topic.

Chapter 4 – Results

This chapter presents the results that were found during the research. It consists of field research throughout various interviews that were conducted with three small Dutch food service enterprises. In addition, it presents desk research regarding the definitions of the variables. First, a short case study will be given per restaurant that has been interviewed in paragraph 4.1, this outlines the main similarities and differences between the enterprises. This is followed up by the results per variable in paragraphs 4.2, 4.3, and 4.4, relating to the theoretical model '*Food surplus and waste framework*' (Papargyropoulou et al., 2014, p. 113), which has been applied during this research. These variables are food surplus and food waste, avoidable and unavoidable food waste, and the prevention and management of food waste. All key findings per variable per restaurant are summarized in paragraph 4.5.

4.1 Short case studies of small Dutch food service enterprises

4.1.1 Restaurant Pasto

Restaurant Pasto is an Italian restaurant based in Berkel & Rodenrijs, a village near Rotterdam. The restaurant opened in 2015. It has availability for 100 people inside and it offers an outside terrace during the summer. It is opened daily for lunch and dinner, offering various Italian inspired food. During the day, people can choose between several sandwiches and antipasti mixes. In the evening, the menu mainly consists of starters (antipasti), main courses such as pasta, pizza, and other meat- and fish-based dishes, and desserts. The team consists of around 25 employees, including the chefs and other kitchen staff, the wait staff, and the owners. During their 5 years of operating, they have changed their menu several times, including some special courses that are offered at different times, other dishes remain steady. The menu offers various courses, while some guests prefer ordering a three-course meal, others prefer only ordering a pizza (Pasto, 2020; Barnard, 2015; Chef Pasto, personal communication, November 11, 2020).



Figure 4 - Impression and logo of restaurant Pasto (source: Pasto)

4.1.2 Restaurant Gusto

Restaurant Gusto is an Italian restaurant that is based in the center of Rotterdam and opened in 2007. The restaurant has around 30 employees, including the chefs and other kitchen staff, the wait staff, and the owners. There is room for 100 people inside and they offer space on their terrace outside during the summer. The restaurant is opened daily for lunch and dinner, offering various Italian based dishes. A large variety in starters but also main courses, including the pizzas. It is possible to order only one course or to choose from their daily changing four-course menu. The dishes on their course menu change every month, however, some dishes are permanent on the menu. They also regularly offer special courses (Gusto, 2020; Punt, 2014; Chef Gusto, personal communication, December 2, 2020).



Figure 5 - Impression and logo of restaurant Gusto (source: Trattoria Gusto Rotterdam)

4.1.3 Restaurant Nova

Restaurant Nova is based in Bergschenhoek, a small village near Rotterdam. It is located in a more natural area with room for 50 people inside, there is a second hall available with room for 40 people. During the summer they have two terraces, one that is only open for lunch and one that is only open for dinner. In addition, they only offer lunch during the summer months while dinner is offered the whole year-round. The restaurant is open six days a week and closed on Mondays. Their four-course menu offers various European based dishes, with a choice of around four different dishes per course. It is possible to order less than four courses, however, their concept is built around the four-course meal. The menu changes irregularly, while some dishes remain fixed on the menu. Their team consists of 20 employees, including the chefs and other kitchen staff, the wait staff, and the owners (Nova, 2020; Chef Nova, personal communication, November 20, 2020).



Figure 6 - Impression and logo of restaurant Nova (source: Nova)

4.2 Food surplus and food waste

During the interviews that were conducted, all restaurants were asked what stage of the process of food generates the most waste, including the stages of storage, preparation, and serving and taking out. The main similarities that are found consist of the occurrence of food waste in the serving and taking out stage, as well as the preparation stage. The stage of storing the products generates the least food waste. Additionally, a correlation is found between food surplus and food waste.

Food waste

Food waste can be explained in multiple ways, with no fixed definition attached to the concept. Food waste in the food supply chain occurs during the stages such as storage, preparation, and serving (Betz, Buchli, Göbel, & Müller, 2015). The two case studies of Betz et al. (2015) concluded that most food is wasted during the serving stage (including plate waste), whereas the preparation stage comes second. The study of Martin-Rios et al. (2018) suggests that most waste is generated in the back office and kitchen.

Two out of three restaurants mentioned how the serving and taking out stage, especially the waste of plates considered, generates the most food waste. The chef of Pasto stated that “for example, we serve mashed potatoes and salad with our main courses, this is often not (entirely) eaten by the guests, so these come back and are then thrown away.” The chef of Gusto referred more to the plate waste generated during group arrangements. “I think that most plate waste is generated by the groups that we serve big batches, not the guests that order food per plate. With these groups we are inclined to set up a well-stocked table with food, it has to look good and appealing for the groups as well”. In addition, plate waste is more difficult to keep track of, and therefore more difficult to manage. He also stated that the preparation stage does not involve or generate a lot of food waste, all leftover parts are often reused, giving it several purposes before it is being discarded, which corresponds with what is mentioned by Pasto. These purposes include the making of broth or sauce of leftover parts.

The chef of restaurant Nova discussed that the preparation stage is the stage where they generate the most food waste. “We often reuse the leftover parts to make a sauce, cream, soup, or broth. (...) But generally, this stage produces the most food waste, often the waste of vegetables.” Nova also mentioned that the serving stage comes second regarding the generation of food waste, mainly consisting of plate waste. This comes second as the portions are adjusted to a four-course meal, with optional side dishes for a small price, which results in less plate waste.

Food waste regarding the stage of storing the products is minimal for all three restaurants. Pasto stated that they “try to work with the freshest products possible, except for the home-made products that we can store for a couple of days. We store these products for a maximum of 4 days, but they are often already gone by then.” It applies to all three restaurants that different suppliers of fresh goods and other products deliver multiple times a week. In addition, Nova mentioned how their turnover rate is fairly high, which results in them not having to store a lot of products.

Food surplus

Papargyropoulou et al. (2014) state that food surplus becomes food waste the moment it becomes unfit for human consumption. Food surplus can be minimized by supplying only what is needed, serving the right portions, and “addressing unsustainable consumption patterns”. Redistribution of food surplus that has not been consumed to groups affected by food poverty, is proposed as an option as well, assuming food safety can be secured.

All three restaurants concluded that excess food that has already been served, must be thrown away. In addition, when too much food is prepared, it can be stored in the freezer. Restaurant Gusto often makes so-called ‘specials’ from their food surplus, “that way we can still sell it, otherwise we use it for the meals of the staff.” The food surplus at restaurant Nova is minimized by keeping good track of the stock and the order list. “We try to take a critical look at our orders when there is too much of something. When we see that we ordered too much of a product or ingredient, we then send it back to our supplier since we do not need it”.

4.3 Avoidable and unavoidable food waste

For the examination of these variables, the interviewees were asked how their food waste is managed and why these methods are applied. Some correlations were found between the practicality of food waste management and the implementation thereof. The main similarities that were found are related to unavoidable food waste, which is defined by Papargyropoulou et al. (2014) as “waste arising from food that is not, and has not been, edible under normal circumstances”. Unavoidable food waste is often reused. Avoidable food waste, food that is edible but is no longer wanted or needed, is often thrown away.

Two out of three restaurants, Pasto and Gusto, do not separate their waste, except for glass and carton. Gusto also separates oils and fats. No distinction is made between the preparation stages of food since mostly everything is thrown into the same bin. For Pasto, the main reasons are the lack of interest and the practicality of separating waste: “when you see how much food

is processed, it is hard to put it into practice. I think it will take too much effort to implement this in a restaurant.” For Gusto the main reason is the practicality of separating all kinds of waste: “We do not have separate organic waste. That gets unpractical as well, there will be trays and bags of different sorts of waste everywhere.” Gusto wants to separate more of their waste but is limited to the options that the municipality offers. Although unavoidable food waste is often given a new purpose, avoidable food waste is hard to keep track of. Pasto mentioned how avoidable food waste is sometimes reviewed. They discuss regular plate waste that is thrown away to try and minimize this. When asked if these discussions are effective, the chef answered with a hesitant no. “We do discuss whether to do something with this or not. However, we rather give a bit too much food than too little.” For Gusto, especially when talking about the plate waste of group events, the chef stated that they “try to lessen this and we indicate to the groups that they can always ask for more food so that we can offer less in the beginning. However, for some groups, it might be a high threshold to ask for more food, and we do want it to look appealing and festive since that is what most group events are for.”

Nova stated that they separate their waste during the storage and preparation stage, but that it becomes impractical during the serving and taking out stage. Their separation of waste consists of plastic, organic, glass, carton, oils and fats, and residual waste. Unavoidable waste is waste that is easier to take into account and therefore easier to process. Avoidable waste, often plate waste in this case, is rather challenging to estimate and therefore more difficult to separate. “During the preparation stage we are more strict with separating our waste but in the evening when the food is served, and everyone is busy, we tend to lack”. Several factors influence this partial separation of waste. The mentality of the employees and the available space for different trash cans are the main factors.

4.4 Prevention and management of food waste

Papargyropoulou et al. (2014) mention that a clear distinction can be made between the prevention and the management of food waste. The prevention of food waste involves activities that reduce or minimize the generation of food waste during the preparation stages of food. The management of food waste, however, conducts the handling of food waste once it has been generated in the stages. This includes all various options for discarding food waste. The most favorable methods regarding food waste disposal include recycling into animal feed or composting. This is followed by the “treatment of food waste with energy recovery, such as with anaerobic digestion (...). Finally, disposal in landfill is the least favorable option for managing the remaining fraction”. The study mentions that avoidable food waste can potentially be reduced by a “shift to more sustainable consumption patterns and practices, and

increased awareness of food waste's impact on the environment". Other methods include improved food labeling and improved shelf life for fresh products.

The interviewees were asked several questions on their interest, knowledge, and feasibility of more sustainable waste management methods. The explanation of sustainable waste management during this interview involved mostly avoiding food surplus and food waste, the separation of waste, and different ways of discarding organic waste. Similarities that have been found are the obstacles that have been named by the restaurants. All three mentioned the mentality of the employees as well as the share of the municipality in the process of collecting separated waste.

Interest and knowledge

Both restaurants Pasto and Gusto have little familiarity or knowledge regarding sustainable food waste management. The chef of Pasto mentions that this mainly has to do with the practicality of the methods and how this affects the interest as well. The key factor that influences the decisions of Pasto on their food waste management is the practicality and implementation of (new) sustainable food waste management methods. "I think it also has to do with the lack of interest, it certainly is not impossible to implement, but it is just not something that is on our mind." The chef of restaurant Gusto mentioned how they do not have particular knowledge about sustainable waste management, but they do know most basics and apply this basic knowledge to their daily procedures. Nonetheless, they have an interest in alternative methods of sustainable waste management. The chef mentions that they are keen on doing responsible business, mentioning several examples of their biological and sustainable suppliers. "By doing business with these suppliers, we at least know that we have so-called 'honest' products to work with."

Restaurant Nova mentions that they do have knowledge as well as interest in sustainable food waste management. Although not all knowledge is applied in practice, they do try to (re)use every single part of each product and take part in projects that provide various options for discarding organic waste, such as the cultivation of mushrooms on coffee grounds. They have an interest in new sustainable food waste management methods and they already look into these methods while considering whether they are applicable to their way of working or not. "In practice, it is hard to apply these methods since they often take up more of our time. However, we notice that, once a method is integrated into our system, it goes a bit quicker since we no longer think about it too much."

All three restaurants mentioned that the measures that are already taken for the avoidance and minimalization of food surplus and food waste are making optimal use of leftover parts and storing products the right way, so it can be stored longer. Anticipating the order lists on the stock is what helps both Gusto and Nova avoid food surplus and food waste, as overstocking might lead to a redundant waste of food. On the occasion a product does not sell that good, a different purpose is found for the product in order to avoid throwing food products away. In addition, Nova has its own herb garden which allows them to waste less as they do not have to buy a lot of herbs and they can leave them to grow if the herbs are not needed.

Obstacles and difficulties

The main obstacles and difficulties are regarding the practicality of waste management, the mentality of the employees, and the lack of waste management options through the municipality.

Restaurant Pasto stated that the obstacle for the application of these methods is mainly the implementation itself. The chef clearly states that it is hard to put these methods into practice as it might be too much effort and take too much space. In addition, the mentality of the owners and employees remains an obstacle as well. The implementation of new waste management methods is not something that is discussed often and when they notice that certain procedures could use sustainable improvement, no action is taken. At last, the chef mentions that it could be a difficult task to make sustainable food waste management more appealing to restaurants. Gaining more information or knowledge about the alternative methods would not be effective since the mentality of the employees would still be an obstacle. However, the chef does mention that “there is a financial reason we do not really separate our waste, the cheapest way for us is to not separate it and throw it all together. An improvement could be made for the collection of separated waste by the municipality.”

The biggest obstacles for restaurant Gusto to apply more sustainable waste management methods are the practicality of it all, together with the municipality that does not offer to pick up organic waste. “We have to store this organic waste somewhere, or it should be picked up by the municipality regularly. Taking care of this organic or separated waste ourselves is not permissible.” Related to the difficulties, their answer on how to make sustainable waste management more appealing for small food service enterprises, was for municipalities to at least offer the option of collecting separated organic waste. A small financial compensation could be an incentive for some restaurants to actually start separating their waste as well, although the financial part of sustainable food waste management is not the main factor that

influences their choices. “You do not make these choices for personal interest or financial interest but for common interest. It is not cheaper to work sustainably.”

The main difficulties that restaurant Nova experiences are the space that is needed for the separation of food waste, as there is not enough space inside or outside for all the different garbage cans. In addition, one difficulty is the “stubbornness and ignorance” of some employees: “The importance of sustainability and the environment differs per person.” The main factor for considering and applying sustainable food waste management is the personal opinion of the owner and the chef on the importance of these methods. However, the implementation of these methods relies on all employees. At last, Nova stated that, to make sustainable waste management more appealing for other restaurants, the municipality has to step in as well: “for us, the separation and collection of waste are arranged quite well by the municipality. However, this is not the case in all municipalities, restaurants would have to arrange it themselves and deal with different waste companies, which, in addition, leads up to higher costs of waste management.” Furthermore, the chef stated that the analysis of their own food waste could result in various approaches and techniques to avoid and minimize food waste even more, but this does take time. One additional method, less related to food waste but more to waste overall, is the reduction of plastic packaging by suppliers and wholesale.

4.5 Key findings

For a better analysis of the results, the key findings and reflections of the data have been summarized in Table 2. The table shows the key findings per variable, per restaurant.

Restaurant Variable	Pasto	Gusto	Nova
Food surplus	Almost non-present, otherwise the products are directly frozen	Preparing specials or staff meals out of food surplus	Food surplus prevented by accurate stock and order tracking
Food waste	Mostly generated by plate waste	Mostly generated by plate waste during group arrangements	Not as much plate waste due to portioning, mostly generated by preparing fruits and vegetables
Avoidable food waste	No measures are taken for avoiding avoidable food waste	Prevention of avoidable waste is considered but not always applied	Avoidable food waste hard to estimate and therefore hard to process

Unavoidable food waste	Leftover parts are mostly reused for making gravy or broth	Some unavoidable food waste is used for making gravy or broth	Unavoidable food waste easier to estimate, reused for making sauce, cream, soup, or broth
Waste prevention	Reuse of leftover items and correct storage of products	Sustainable business, order lists based on stock, reuse of leftover items	Use of self-grown products, high turn-over rate, reuse of leftover items, and order lists based on stock
Waste management	No separation of waste. No interest but basic knowledge of new methods, difficulties are the implementation of waste management and the mentality of employees	No separation of waste. Both interest and basic knowledge of new methods, the difficulty is the lack of the collection of separated waste by the municipality	Partial separation of waste (depending on food process stage). Both interest and knowledge of new methods, difficulties are the space for waste management and the mentality of the employees

Table 2 - Key findings per variable

Chapter 5 – Discussion

In this chapter, the results are discussed and connected to the model of Papargyropoulou et al. (2014) that is used during the research, and the various sub-questions are reviewed. The most important findings relate to the implementation, difficulties, and opportunities regarding food waste management in small Dutch food service enterprises. The data of the three restaurants that have been examined and compared, suggests that there are similarities and differences regarding the implementation of sustainable food waste management in restaurants. The knowledge, interests, and most of all, the practicality of these methods play an important role in what type of food waste management is applied. The following sub-questions are discussed in paragraph 5.1: How does food waste occur in restaurants? How is food waste currently managed in restaurants? What are possible strategic models that help restaurants manage food waste? What is the feasibility of alternative methods for reducing or sustainably managing food waste? The sub-questions are answered through the analysis of the results per variable. This will be followed by paragraph 5.2, which states the limitations concerning this research.

The implications of the current state of affairs, as well as the complications that are addressed, are followed by additional research in paragraph 5.3. This research conducts information of the restaurant Instock, a Dutch restaurant that is specialized in preventing and managing food waste.

5.1 Sub-questions

5.1.1 How does food waste occur in restaurants?

The occurrence of food waste in small Dutch food service enterprises is examined through the variables of food surplus and food waste, as well as avoidable and unavoidable food waste. These results show that for the restaurants Pasto and Gusto, most food waste is generated in the stage of serving and taking back the plates. This is in line with the study of Betz et al. (2015), which claims that most food waste is generated by plate waste. Restaurant Nova generates most food waste during the preparation of food, which corresponds with Martin-Rios et al. (2018), who state that most food waste is generated in the back-office and kitchen, that is, the preparation stage.

The difference between these outcomes could have to do with the size and portions of the dishes that are served in the restaurants, and what is offered on the side. Pasto mentions how some side dishes remain not eaten and are therefore discarded after returning. Restaurant Nova offers optional side dishes for a small price, which could potentially lower side plate waste. In addition, due to Nova's four-course menus, the amount of food in the portions has been adjusted, so that a four-course menu does not contain too much food. Gusto, however, indicates that plate waste is not so much a problem in relation to the people who order per meal but mainly a problem regarding group arrangements. This could also relate to the predictability of avoidable and unavoidable food waste. Both Gusto and Nova mention how unavoidable food waste is easier to manage or process since this can be estimated, whereas the amount of avoidable food waste is more difficult to estimate.

The stage of receiving and storing the products does not generate a lot of food waste according to all three restaurants. The freshness of the products can be seen as an important factor that influences the generation of food waste during this stage. All three restaurants work with products that are delivered by several suppliers, multiple times a week. This way, the freshness of the products can be guaranteed, and it lowers the risk of over-stocking which might result in food waste.

The results provide new insight into the relationship between food waste and food surplus. Restaurants Nova and Gusto try to minimize their food surplus by keeping good track of their stock as well as the shelf life of products and adapt their order lists based on this information. Gusto also mentions how some food surplus is used for the meals of the employees or is given a new purpose by processing it as a special dish. Some products are frozen when too much of it is prepared, which corresponds with Pasto's method. However, all three restaurants confirm

that when food is prepared incorrectly, or when a wrong dish is served, it becomes food waste. This is also mentioned as avoidable food waste.

Some complications that can be interpreted from the results consist of serving the right amount of food to the guests without it affecting the appetite or image regarding the hospitality of the restaurant. This relates to the estimation of avoidable food waste and how this actually can be avoided.

5.1.2 How is food waste currently managed in restaurants?

The current management of food waste is discussed by analyzing the results of the avoidable and unavoidable food waste variables, together with the prevention and management of food waste. The data contributes to a clearer understanding of the various complications of food waste management. Both Gusto and Pasto do not separate their food waste, only glass and carton are separated. Nova partly separates their waste as this is done during the preparation stage, but not during the serving and taking out stage, as this becomes impractical. The different motivations behind separating or not separating waste imply that there is no trend or generalization. The results show that the practicality of waste management remains an obstacle. Pasto states clearly that a separation of waste is impractical within the kitchen of a restaurant. By the number of products that are processed, separation of waste would take a lot of time and effort to be properly managed. All restaurants indicate that most leftover parts of food, or unavoidable food waste, are reused by making broth, sauce, or gravy out of it. All the food waste that comes from serving the dishes, or plate waste, goes directly into the garbage.

The municipality is a reoccurring factor as well. Both Gusto and Pasto do not have the option for the collection of organic waste through the municipality. Gusto states that they would like to separate their organic waste if this option was available, similar to the separation of glass and carton. Pasto mentions that an improvement could be made by the municipality as separation of waste is currently not financially attractive. Nova explains how their municipality does offer the collection of separated waste. However, it is a practical and financial obstacle for restaurants that do not have that option.

Other methods include sustainable projects. Nova takes part in these projects that make the separation of organic waste easier and more useful. Their coffee grounds are collected by a company that uses these coffee grounds for the cultivation of mushrooms. These projects and possibilities could have a positive impact on food waste management, notwithstanding that they must be known and offered to the restaurants.

5.1.3 What are possible strategic models that help restaurants manage food waste?

The models that are discussed in Chapter 2 – Theoretical framework, are all possible models for restaurants to help (improve) their food waste management. The model '*Examples of food waste*' by Martin-Rios et al. (2018) is useful for restaurants as it describes what type of food waste, divided avoidable or unavoidable, is generated in what stage of the process of food. With this model, it is easier for restaurants to track down where their main food waste is generated, or what they should pay attention to in order to prevent this. Once a restaurant knows what kind of food waste is generated during what stage, it can be implied that it is easier to manage as well, as it can be estimated and prevented.

The model '*Possible uses of retail food waste*' by Cicatiello et al. (2016) is more descriptive as it categorizes the food waste, defines it as edible or inedible, and identifies its function and the various options to dispose of the food waste. Although the model is more accurate for retailers such as supermarkets, it is useful for restaurants as well. The model makes it easier to identify the type of food waste and what an accurate option for disposal could be. For restaurants to keep track of their food waste and categorize and identify it into the variables mentioned by this model, eventually could help the restaurant gain new insights into their waste management as well as the prevention of food waste.

The last model, '*Food surplus and waste framework*' by Papargyropoulou et al. (2014), is helpful as it categorizes and identifies the different types of food waste, the preparation stages of where food waste can occur, and possibilities for discarding the food waste. In addition, the possibilities for discarding food waste are sorted from most to least favorable option regarding the best overall environmental outcome, based on the waste hierarchy. This model is particularly useful for restaurants as it describes and categorizes the possible disposal options, according to the different types of food waste. It will still require some time and research to define what type of food waste is generated and when this is generated, however, the management thereof will be easier to identify. This could result in the improvement of managing food waste more sustainably.

5.1.4 What is the feasibility of alternative methods for reducing or sustainably managing food waste?

The results regarding the variables of avoidable and unavoidable food waste, together with the prevention and management of food waste, are discussed for revising the feasibility of alternative methods. Papargyropoulou et al. (2014) state several ways on how generated food waste can be disposed of, concluding the most favorable and least favorable options. Most favorable methods included recycling by processing food waste into animal feed or by composting, followed by energy recovery. The least favorable option is disposal in landfills.

The feasibility of these methods relies on the interest and knowledge that restaurants experience while managing their food waste. The interest in food waste separation can be elucidated as an important factor. Both Gusto and Nova state that there is interest in more sustainable food waste management methods. Nova is already trying to apply a few of these methods. On the contrary, Pasto does not show or mention their interest in more sustainable food waste management methods and thus does not see the implementation thereof happening quickly either. This mainly has to do with personal interest regarding sustainability. Both Nova and Pasto mention that, what is found important by the chef or the owner of the restaurant, determines what is implemented. This shows that the mentality of both the owner and the employees affect the feasibility as well.

In addition, the results on the current food waste management imply that there are several obstacles and difficulties regarding the improvement or the implementation of sustainable food waste management. Nova mentions how there is not enough space for all sorts of trash cans, inside and outside. Gusto refers to the storage of organic waste and how this is not applicable. Pasto, in addition, points out that the implementations of food waste management methods will take too much effort and space. This shows that space is a relevant factor that influences the feasibility of (food) waste separation, which relates to sustainable food waste management.

Prevention of food waste is mainly implemented. The measures for the prevention of food waste of all restaurants include the optimal use of every part of a product, together with keeping track of the stock and properly storing the products. This suggests that the prevention of food waste can largely be improved by focusing on the evasion of avoidable food waste.

The feasibility is affected by several factors, such as practicality, the mentality of employees, and space. Based on the data that has been collected and analyzed, it can be implied that the implementation of alternate, more sustainable, food waste methods is feasible. However, the owners and employees have to be interested and must consider their mentality towards food waste management as well, otherwise, it becomes not feasible.

5.2 Limitations

The generalizability of the results is limited by the number of restaurants that have been compared and analyzed. For the results to be completely generable for the scope, more restaurants need to be researched and analyzed. Due to the lack of data on the implementation of sustainable food waste management methods in small Dutch food service enterprises, the results cannot confirm the exact feasibility of these methods. There is only to speculate based

on the collected data of the three restaurants. The qualitative in-depth interviews provided sufficient data to write the results and analysis, as well as the recommendations for this research. By using primary research data from three comparable restaurants, validity is guaranteed. The primary research data adds value to the secondary research data regarding the current state of affairs and the possibilities of alternative methods for food waste management.

5.3 Additional research: Restaurant Instock

Additional research has been conducted in order to gain more information concerning the gaps within the analysis. The gaps are mainly regarding the implications and complications of food waste management. Instock has been mentioned as an example of a good case regarding food waste prevention and management, hence a closer look is taken at the restaurant Instock to suit the complications and gaps. The research is done through content research online, referring to the website of Instock and several articles written about the restaurant. The results include a small analysis of the data as well.

Restaurant Instock

Instock is a social enterprise that is based in Amsterdam and exists since 2014. The main idea behind the restaurant is the collection of food surplus and using these food surplus products for the dishes on their menu. The food surplus consists of unsold products of various supermarkets, as well as the food surplus of local farmers and food stores. The idea was brought up by four supermarket colleagues who saw the opportunity of giving this food surplus a better destination. When the enterprise started, their daily supply of food surplus products remained inconsistent. The chefs had to improvise and be creative with the daily changing products. Due to the growth of the enterprise and the offered food surplus products, they have been able to apply more consistency to their menu and also deliver surplus products to other food service enterprises through their website Instockmarket.nl (Instock, 2019).

Avoiding avoidable food waste

One of the challenges for the restaurants consisted of serving the right portions, including side dishes. Instock mentions how a lot of this food waste is to blame on “overly large portions, strict food safety demands, inadequate stock acquisition or a lack of creativity to make use of decent products in different dishes”. Instock explains how they try to prevent avoidable food waste “by simply not serving too much food on a plate. (...), it’s always possible to order a portion of fries” (Instock, 2020). This suggests that serving smaller portions with optionable side dishes works for restaurant Instock to minimize their avoidable food waste.

Food waste management

Restaurant Instock does not make a clear distinction between avoidable and unavoidable food waste but does try to reuse all the parts of all products. All the leftover parts of fruits and vegetables often get a second purpose by turning it into a sauce or seasoning powder, as well as using parts as decoration on the plates when they are served. Some of these options are, for example, done with the peel of an onion. Food waste that is, in any way, unfit for human consumption, such as a piece of bone, is thrown away separately: “Another way in which we manage our waste is by separating the kitchen garbage. This way, we can make sure that the waste will be processed into products like biogas or fodder, for as good as possible.” (Instock, 2020). Separated waste is collected by the municipality, although some of the (food) waste is used in projects that give this waste a new purpose. Such projects that were set up by Instock is the production of several beers by using discarded potatoes, raspberries, and bread. The spent grains that are left after the process of brewing this beer, are used for making their granola (Instock, 2019). Products that are part of Instock’s own food surplus, are given a new destination by donating to different charities, such as the Dutch food bank. Products that are not food safe anymore or cannot be given a new destination is turned into biogas (Instock, 2020).

Chapter 6 – Conclusion and recommendations

In this chapter, the conclusion on all findings will be given by answering the central question: **How to improve food waste prevention and food waste management of small Dutch food service enterprises?** In addition, recommendations are given to small Dutch food service enterprises suggesting possible food waste management methods or measures that can be taken in order to help improve their current food waste management.

This research aimed to identify how food waste prevention and food waste management of small Dutch food service enterprises can be improved. By analyzing the qualitative data of three small Dutch restaurants through the comparative method, it can be concluded that the improvement of food waste prevention and food waste management depends on the willingness of the restaurant itself and the feasibility of the food waste management methods. The results indicated that food waste management improvements regarding sustainability are feasible for restaurants to implement, while the prevention of food waste is mainly applicable for food waste that is categorized as avoidable. A new waste framework has been developed, based on all research data that has been collected during this report (Fig. 7). The framework refers to the several preparation stages of food and what type of food waste is possibly generated during this stage. In addition, several options for preventing or managing food waste are described, which small food service enterprises can apply in their current food waste management.

The prevention of food waste, the reuse of leftover parts, as well as the possibilities regarding alternative food waste management methods are already doing well, however, other areas are not. All three restaurants cope with several similar obstacles, such as the practicality of separating waste, as well as estimating avoidable food waste. The following suggestions are based on the data conducted through the additional research of restaurant Instock. Small Dutch food service enterprises, or restaurants, should consider portioning their dishes and offering side dishes for a small price, as this might result in the minimalization of avoidable food waste.

In addition, restaurants should consider the implementation of consistently separating their waste. For this implementation, the mentality of the employees and the options regarding the collection of waste must be considered. As an alternative for the collection of separated organic waste through the municipality, restaurants should consider taking part in projects where (organic) waste is used for an alternative cause, such as making beers or the cultivation of mushrooms. Furthermore, restaurants should consider applying a (different) waste

framework for the management of their waste, whether it concerns only food waste or all waste generated. At last, restaurants should consider improving their food surplus impact by buying products from alternative suppliers such as InstockMarket.nl, which offers products that come from food surplus of other food retailers or farmers. Further research is needed to determine the direct effects of implementing such methods at small Dutch food service enterprises. Future studies could address the relationship between implementing a waste framework together with the implementation of alternative food waste management methods, and the reduction of food waste.

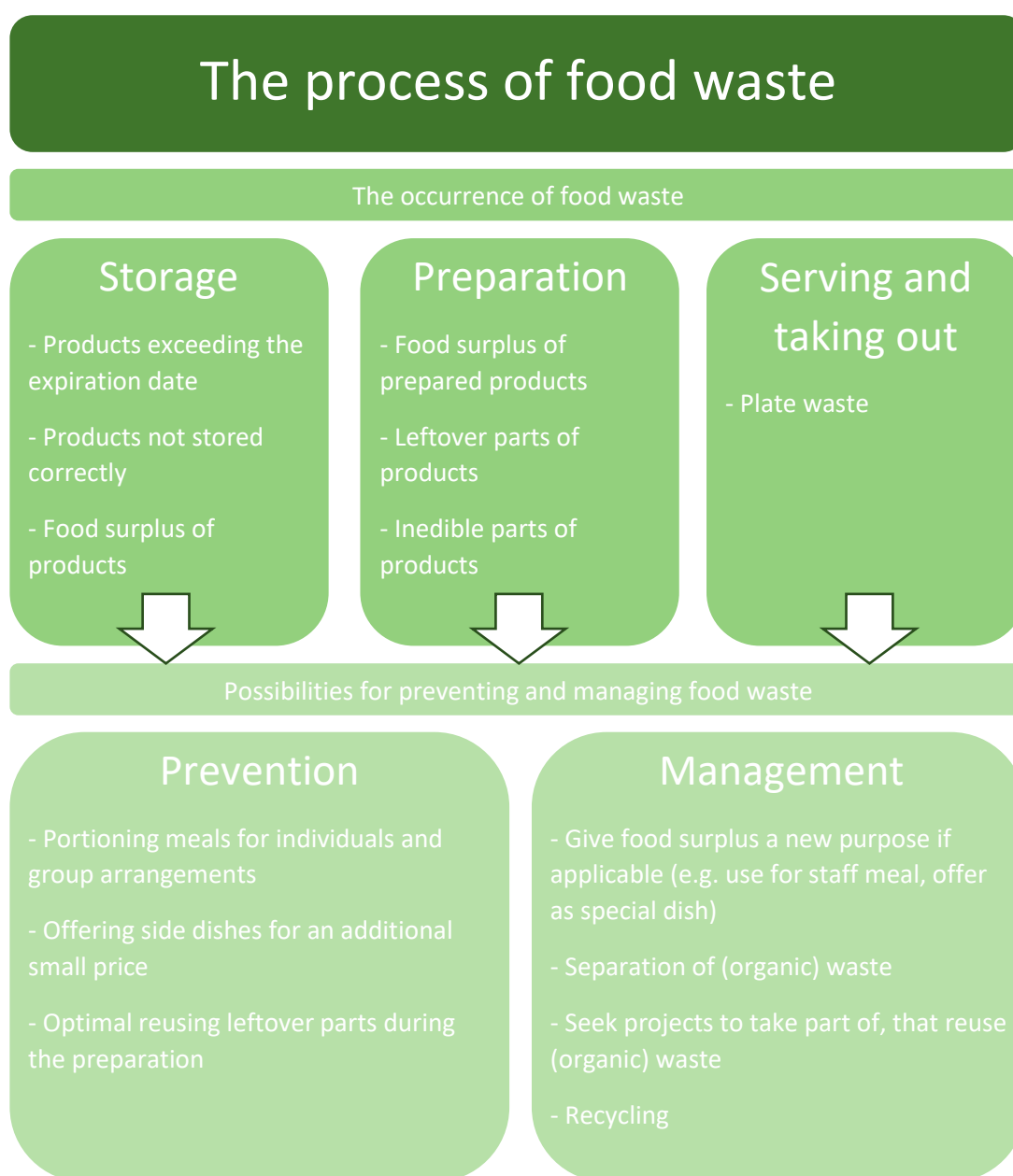


Figure 7 - Waste framework for food waste prevention and food waste management of small food service enterprises

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Appendices

Appendix I – Interview transcript Nova

Interviewee: Chef of restaurant Nova (R)

Interviewer: Audrey Janssen (I)

Date: 20-11-2020

Location: Restaurant Nova, Bergschenhoek

I: Thank you for participating and for your time. All questions are related to the process of food in this restaurant and how food waste is managed. The first question is as follows, what is the process of food at this restaurant? Concerning the days of storage and how long some products are prepared in advance as well. The process from when the products get delivered at the restaurant till the moment the food is served.

R: It begins with the orders that we make. Every day, the supplier delivers our fresh goods such as fish, meat, vegetables, and dairy. Some products do not have to be delivered every day, for example, frozen goods, prepacked items, or dry goods. We get fresh products mainly delivered on the same day we use it. We sometimes vacuum package our meat so that it can be kept longer. Fruits and vegetables are ordered by us every day or every two days, this also depends on the meals that we have on our menu and what we will prepare. We mostly make everything ourselves which ensures that the expiration date is within 3 to 8 days, depending on the product, what it contains, and if it can be vacuum packaged. Most of the time, when a product is heated and cooled down, it can be kept for 3 days. We try to minimize this by keeping track of the turnover rate of meals and our order list.

I: What about the different components of meals, when are they prepared?

R: For example, the duck we are currently serving is in brine for 4 days and cooked at a low temperature for a day, because the duck is candied it can be kept longer. The sauces that we serve along the duck are first made in a big batch and frozen in small portions so we can take out and use the portion that we need. The vegetables are cut and prepared on the day itself.

I: Do you have any idea what stage in the process of food produces the most food waste? The different stages are the delivery and storage of food, the preparation of the products, and the serving of food.

R: I think it is mostly produced in the preparation stage. For example, when we only use the pretty parts of a vegetable or when a certain shape is cut. We often reuse the leftover parts to make a sauce, cream, soup, or broth. So, when I cut celeriac in small squares, I use the leftover parts to make celeriac cream. But generally, this stage produces the most food waste, often the waste of vegetables. The waste that comes from fish and meat is often easier to process.

The stage of serving the food, or the plate waste, comes second. Some parts that are not eaten by the guest because it is too much or the guest did not like a certain part of the meal, which produces food waste as well.

I: What is done with a food surplus? This contains meals that are served wrong or when too much food is prepared.

R: We always try to find a solution by processing this food into something else. You have to be very strict with your orders by knowing exactly what you need and how much. We try to take a critical look at our orders when there is too much of something. When we see that we ordered too much of a product or ingredient, we then send it back to our supplier since we do not need it, otherwise, we will order it in two days again. So, we try to minimize this.

I: What is your current approach to discarding food waste? Does this differ in the various stages in the process of food?

R: During the preparation of the food we separate organic waste. During the serving and removing of plates, the leftover food gets discarded in the general trash. We separate plastic waste, cartons, and glass as well. During the preparation stage we are more strict with separating our waste but in the evening when the food is served, and everyone is busy, we tend to lack.

I: Are other things done to avoid and minimize food surplus and food waste?

R: I'm trying to think of other methods we use. Mostly just keeping a close eye on our order list and our stock. It is a bit easier for us since our menu is not that extensive, restaurants that do have a lot of different meals on their menu need a bigger stock as well since you do not want to risk a shortage of products. Here the turnover rate is high, so we have to stock fewer products. Of course, it happens that sometimes a product does not sell that good, then we use that product for the meals of the staff, so we do not have to throw it away. We also adjust the portions of all the courses so that a four-course meal has the right amount of food. If people are hungry, it is optional for them to order a side dish such as fries for a small price.

I: Are you familiar with different methods and approaches to sustainable usage of, minimizing, and avoiding food surplus and food waste?

R: I am familiar with several methods but we do not apply them. Of course, we try different things, for example, a company collects our coffee grounds which they use for mushroom cultivation. We try to take part in these different kinds of projects. We try to reuse the leftover parts of products during the preparation stage as much as we can, we do not go to extremes, but we try our best.

I: Would you be interested to get to know more, or receive more information about different methods regarding sustainable usage of, minimizing, and avoiding food surplus and food waste?

R: Yes, as I mentioned I often look into these different methods or things we might be able to apply here. In practice, it is hard to apply these methods since they often take up more of our time. However, we notice that, once a method is integrated into our system, it goes a bit quicker since we no longer think about it too much, we just do it. We are always open to improvement.

I: What are the important factors or reasons regarding sustainable usage of, minimizing, and avoiding food surplus and food waste? This could be, for example, financial reasons, your personal reasons, or the brand awareness of the restaurant for customers.

R: This also has to do with what is important to me and what the owner finds important. In addition, when looking at the different garbage cans for residual waste, glass, carton, and organic waste, this takes up a lot of space.

I: This also relates to my next question, are there any obstacles or difficulties regarding sustainable usage of, minimizing, and avoiding food surplus and food waste?

R: Yes, especially space, we do not have the room for a lot of garbage cans inside or outside.

I: Are there any other obstacles that you or your colleagues experienced?

R: Hmm, the stubbornness and ignorance of some people (laughs). The importance of sustainability and the environment differs per person. One person thinks that it is not that bad, the other person is more strict with certain methods, we notice this here as well. Some

colleagues throw plastic packaging in separate waste and some just throw it in the regular trash bin.

I: How can sustainable usage of, minimizing, and avoiding food surplus and food waste be made more easy or attractive for restaurants?

R: Well, it does not directly link with food waste but in general, suppliers could try to reduce their plastic packaging for their products. In addition, for us, the separation and collection of waste are arranged quite well by the municipality. However, this is not the case in all municipalities, restaurants would have to arrange it themselves and deal with different waste companies, which, in addition, leads up to higher costs of waste management. This would make it less easy or attractive to separate your waste as a restaurant. What else (...), maybe analyzing our own food waste and think of more creative ways to reuse parts of fruits and vegetables, but this again takes time.

Appendix II – Interview transcript Pasto

Interviewee: Chef of restaurant Pasto (R)

Interviewer: Audrey Janssen (I)

Date: 22-11-2020

Location: Restaurant Pasto, Berkel & Rodenrijs

I: Thank you for your time and your participation in my research. All questions will be about food and food waste regarding this restaurant. Here comes the first question, what is the process of food at this restaurant? Concerning the days of storage and how long some products are prepared in advance as well. The process from when the products get delivered at the restaurant till the moment the food is served.

R: Yes, this differs per product, most products come in on the same day we use them, except for products from wholesale. Most of the products are produced by us on the same day we use them, but things like tapenade or aioli, for example, are made in big batches and stored in small portions. We like to keep everything as fresh as possible, although some products, sauces, for example, can be kept a bit longer. We have a greengrocer who delivers fresh products every day, except for Sunday, so we are able to work with fresh products every day. We try not to freeze any products since we mostly only buy what we need for the same day we get it delivered. So every day we start at 11 to prepare the food and products we need, some things can be stored for several days, but overall we like to keep our products as fresh as possible.

I: What about products from wholesale? How many times a week do they deliver these products?

R: They deliver around 3 times a week since have a small stockroom, they deliver mostly dry goods. We have a separate fish seller, butcher, and cheesemonger. The butcher and fish seller deliver every day as well. So, yeah, we try to work with the freshest products possible, except for the home-made products that we can store for a couple of days. We store these products for a maximum of 4 days, but they are often already gone by then.

I: Do you have any idea what stage in the process of food produces the most food waste? The different stages are the delivery and storage of food, the preparation of the products, and the serving of food.

R: I think, if all kinds of food waste count, that the serving stage, or actually the returning of the plates, conducts the most food waste. We do not throw a lot of food away; we try to reuse a lot of parts and elements of food by putting it in our gravy which will steep for a few days. So, that stage of food does not produce a lot of food waste. But the stage of serving in the evening does. For example, we serve mashed potatoes and salad with our main courses, this is often not entirely eaten or not even touched at all by the guests, so these come back and are then thrown away.

I: Okay, what about a food surplus? This contains meals that are served wrong or when too much food is prepared.

R: If a wrong meal is already served and it comes back, then we have to throw it away. Sometimes the dishwasher staff will eat parts of this meal if they are hungry, but we cannot reuse it in some other way. If we prepared too much food and it has been there for a while already, we throw it away as well.

I: What is your current approach to discarding food waste? Is there a different approach to the various stages?

R: Here, everything is thrown into the same trash bin. The only thing we separate is glass and carton. Everything else goes into the same trash bag, not really environmentally friendly (...) but yeah, we do not have different trash cans.

I: And, for example, during the preparation of food, is any waste separated?

R: No, we do not separate our waste at any stage. Like I said, only glass and carton are separated.

I: Are other things done to avoid and minimize food surplus and food waste?

R: I already mentioned the reuse of certain items for our gravy. We also try not to freeze any products, however, if we are preparing a certain product and we immediately notice that it will be too much, we do freeze it. Nothing else I think, it does not happen that often that something is left over, except for the food that comes back after serving.

I: What about, for example, the mashed potatoes that are served but often come back and are thrown away, are these situations discussed?

R: Oh yes, of course, we do discuss whether to do something with this or not. However, we rather give a bit too much food than too little. The chef wants that, so we do that. We also take some products home when there is a lot of leftovers.

I: Is there any familiarity with the different methods and approaches to sustainable usage of, minimizing, and avoiding food surplus and food waste?

R: No, we are actually not familiar with this or looking into this at all. We are not so environmentally conscious or sustainable. I think that not only knowledge is missing but also interest. Sounds a bit harsh but it is true. At home, for example, I am more concerned with it, but for restaurants, it is really hard to practically do this. That is why I think there is not enough interest to be really sustainable. What we lately are trying to do is to minimize our use of plastic packaging.

I: That also concludes my next question if there would be any interest in these methods. Then we will move on to the following question, what are important factors or reasons for not applying sustainable usage, minimizing, and avoiding food surplus and food waste? This could be, for example, financial reasons, your personal reasons, or the brand awareness of the restaurant for customers.

R: I think it is a bit hard when you see how much food is processed, it is hard to put it into practice. I think it will take too much effort to implement this in a restaurant. I think it also has to do with the lack of interest, it certainly is not impossible to implement, but it is just not something that is on our mind.

I: What are possible obstacles or difficulties regarding sustainable usage of, minimizing, and avoiding food surplus and food waste?

R: I think it also has to do with the mentality and the priorities of the employees, the chefs, and the owners. We do not think too much about it, we do not talk about it often. Of course, we sometimes notice that some things are not really environmentally friendly, but we do not take any action.

I: How can sustainable usage of, minimizing, and avoiding food surplus and food waste be made more easy or attractive for restaurants?

R: Oof, that is a hard question. How we can counter food waste?

I: Yes, it can be anything, anything to make it easier and more attractive for restaurants, or you, in this case, to reduce or avoid food waste.

R: Hmm, I do not have a concrete answer to this. People could come over to educate us more on this topic and how to implement ways to reduce food waste, but I do not know if we would do something with that information. (...) Maybe also regarding the separation of waste, there is a financial reason we do not really separate our waste, the cheapest way for us is to not separate it and throw it all together. An improvement could be made for the collection of separated waste by the municipality.

Appendix III – Interview transcript Gusto

Interviewee: Chef of restaurant Gusto (R)

Interviewer: Audrey Janssen (I)

Date: 02-12-2020

Location: Restaurant Gusto, Rotterdam

I: Thank you for your time and your participation in my research. All questions will be about the process of food and food waste regarding this restaurant. Here comes the first question, what is the process of food at this restaurant? Concerning the days of storage and how long some products are prepared in advance as well. The process from when the products get delivered at the restaurant till the moment the food is served.

R: We place our orders every evening and then we get our products freshly delivered the next day. Our goal is to get it freshly delivered every day, so we only use and make small portions. We do this to keep the shelf life as short as possible. It does depend on the kind of product; we keep fresh fish or meat for a max of 2 to 3 days while trying to use it all by then, and we keep products such as fruits and vegetables often a bit longer. We also get deliveries of products from Italy once a week, these products are mainly dried ham, vegetables, and fruits, these often last longer. But in general, the daily fresh products, we keep these 2 to 3 days maximum.

I: You mentioned how you get products shipped from Italy; do you have a lot of different suppliers?

R: We have 3 different vegetable suppliers from 3 different locations including Italy and Dordrecht. We are very happy with a more local vegetable supplier (Dordrecht), he does everything biologically and organically, and the distance between the supplier and us is not that big, meaning that the products do not have to travel across the whole world to get here. In addition, we have one wholesaler, 2 meat suppliers, and 2 fish suppliers.

I: Do you have any idea what stage in the process of food generates the most food waste? The different stages are the delivery and storage of food, the preparation of the products, and the serving of food.

R: Definitely not in the stage of delivery and storage, an interesting question because I think that a lot can potentially be lost in the preparation stage. Our main goal is to use every piece of food, for example, we use the trimmings of vegetables, fruits, fish, and meat for making

bouillon or sauce. But some food waste is inevitable, such as expiration dates or portions that were misjudged. Overall we try to keep the waste of food as minimal as possible during this stage, however, the stage of serving food and plate waste is something that is out of our hands. I think most plate waste is generated by the groups that we serve big batches, not the guests that order food per plate. With these groups we are inclined to set up a well-stocked table with food, it has to look good and appealing for the groups as well. Of course, we try to lessen this and we indicate to the groups that they can always ask for more food so that we can offer less in the beginning. However, it might be a high threshold to ask for more food, and we do want it to look appealing and festive since that is what most group events are for. So for us, most food waste is generated in the last stage.

I: Okay, what about a food surplus? This contains meals that are served wrong or when too much food is prepared.

R: When too much food is prepared, we can often process this into a special course, that way we can still sell it, otherwise we use it for the meals of the staff. If too much was served or the wrong meal was served, we cannot use that again, so we will have to throw this away. It sometimes happens that someone prepared too much of something, we then try to turn this into a special course, or we freeze it so we can use it later. This is often done with soup and sauces. We always try to find a new or extra purpose for food surplus.

I: What is your current approach to discarding food waste? Is there a different approach to the various stages?

R: To be honest, everything goes into the same bin. We do separate our glass, carton, and oils, but the rest goes into the residual waste. We do not have separate organic waste. That gets unpractical as well, there will be trays and bags of different sorts of waste everywhere. The municipality does not offer to pick up our organic waste, they only do this for glass, carton, and residual waste. The oils are picked up by a different company, but we then get a little bit of money in return for every barrel that is picked up.

I: Interesting, I will get back to that. Then the following: are other things done to avoid and minimize food surplus and food waste? You already mentioned that you prepare smaller portions to avoid the preparation of too much food. Can you think of something else?

R: Not really, we check our stock every day and anticipate our order lists on that. That way our stock will not be too big, together with our food surplus or food waste.

I: Is there any familiarity or knowledge of different methods and approaches to sustainable usage of, minimizing, and avoiding food surplus and food waste?

R: No, we know the basics and apply this, but that is it.

I: Okay, would there be any interest to get to know more about sustainable usage of, minimizing, and avoiding food surplus and food waste?

R: Yes, I think there would be interest. We like to do business, as I mentioned before, we have our vegetable supplier from Dordrecht. This is a supplier that we have consciously chosen, though this supplier is a bit more expensive than other vegetable suppliers, we know that the impact on the environment is less since it is quite local. I know that we also have a supplier from Italy, however, there the products grow naturally instead of using greenhouses or other materials to keep the crops at the right temperature. With fish, we look at the species that are not overfished. The same goes for our meat, it comes from biological farmers that also do responsible business. One farmer, for example, takes care of everything, from birth to slaughter of the animal. By doing business with these suppliers, we at least know that we have so-called 'honest' products to work with.

I: What are the important factors or reasons for not applying sustainable usage, minimizing, and avoiding food surplus and food waste? This could be, for example, financial reasons, your personal reasons, or the brand awareness of the restaurant for customers.

R: You do not make these choices for personal interest or financial interest but for common interest. It is not cheaper to work sustainably. We find it important to do what we can do and to do that as responsible as possible and it should last for generations. We should not exhaust everything on this earth and only profit only for 50 years from this. It is an upcoming trend as well, more and more people start living more consciously, however, this is not yet financially rewarding for us.

I: What are possible obstacles or difficulties regarding sustainable usage of, minimizing, and avoiding food surplus and food waste?

R: I think for us it is more the practical side of it. We have to store this organic waste somewhere, or it should be picked up by the municipality regularly. Taking care of this organic waste or separated waste ourselves is not permissible. If the municipality would offer to pick it up every two weeks and we are able to store it somewhere, it would already be more practical

for us. Now we are limited to only separate our glass, carton, oils, and fats, and residual waste, since these waste streams are picked up.

I: This ties in with the net question: how can sustainable usage of, minimizing, and avoiding food surplus and food waste be made more easy or attractive for restaurants? You already mentioned the collection of organic waste by the municipality, do you have any other additions to this?

R: Maybe a small financial compensation, just like for the oils and fats barrels, not that it is all about the money, but this might be an incentive for some restaurants to start separating the waste. We do not mind the effort of separating our waste, but there should be an option for us to let it be picked up because this is the biggest struggle.

Appendix IV – Interview consent forms

CONSENT FORM INTERVIEW

Concerning: research into food waste in the Dutch foodservice industry.

I hereby declare that I have been clearly informed about the nature, method and purpose of the research.

I understand that:

- ☒ I can stop participating in this research at any time and without stating a reason
- ☒ Data is processed anonymously, without being traceable to the person
- ☒ The recording is destroyed after the interview has been completed

I declare that I:

- ☒ Am willingly willing to participate in this research
- ☒ The results of this interview may be processed a report or scientific publication
- ☒ Give permission to leave to take the interview through a voice recorder

The researcher has provided an oral explanation about the nature, method and purpose of the research. I declare that I am willing to answer any further questions about the research if needed.

Name:

Jeffrey Magdelyn

Date:

30-12-2020

Signature:

A handwritten signature in blue ink, appearing to be 'Jeffrey Magdelyn', written over a dotted line.

CONSENT FORM INTERVIEW

Concerning: research into food waste in the Dutch foodservice industry.

I hereby declare that I have been clearly informed about the nature, method and purpose of the research.

I understand that:

- I can stop participating in this research at any time and without stating a reason
- Data is processed anonymously, without being traceable to the person
- The recording is destroyed after the interview has been completed

I declare that I:

- Am willingly willing to participate in this research
- The results of this interview may be processed a report or scientific publication
- Give permission to leave to take the interview through a voice recorder

The researcher has provided an oral explanation about the nature, method and purpose of the research. I declare that I am willing to answer any further questions about the research if needed.

Name:

PASTO

Date:

22-11-2020

Signature:



CONSENT FORM INTERVIEW

Concerning: research into food waste in the Dutch foodservice industry.

I hereby declare that I have been clearly informed about the nature, method and purpose of the research.

I understand that:

- ☐ I can stop participating in this research at any time and without stating a reason
- ☐ Data is processed anonymously, without being traceable to the person
- ☐ The recording is destroyed after the interview has been completed


I declare that I:

- ☐ Am willingly willing to participate in this research
- ☐ The results of this interview may be processed a report or scientific publication
- ☐ Give permission to leave to take the interview through a voice recorder

The researcher has provided an oral explanation about the nature, method and purpose of the research. I declare that I am willing to answer any further questions about the research if needed.

Name: Dennis de Jong

Date: 2/12/20

Signature: 

Appendix V – Student Ethics form



European Studies Student Ethics Form

Your name: Audrey Janssen

Supervisor: T.C. van der Spek

Instructions:

Before completing this form you should read the APA Ethics Code (<http://www.apa.org/ethics/code/index.aspx>). If you are planning research with human subjects, you should also look at the sample consent form available in the Final Project and Dissertation Guide.

- a. Read section 2 that your supervisor will have to sign. Make sure that you cover all these issues in section 1.
- b. Complete section 1 and, if you are using human subjects, section 2, of this form, and sign it.
- c. Ask your project supervisor to read these sections (and the draft consent form if you have one) and ask him/her to sign the form.
- d. Always append this signed form as an appendix to your dissertation. This is a knock-out criterium; if not included the Final Project/Dissertation is awarded an NVD.

Section 1. Project Outline (to be completed by student)

(i) Title of Project: Improvement of food waste management for Dutch small foodservice ei

(ii) Aims of project:

The aims of the project conduct research into the current state of affairs regarding the occurrence and management of food waste in restaurants. In addition, the feasibility of the implementation on prevention and more sustainable food waste management methods are researched.

(iii) Will you involve other people in your project – e.g. via formal or informal interviews, group discussions, questionnaires, internet surveys etc. (Note: if you are using data that has already been collected by another researcher – e.g. recordings or transcripts of conversations given to you by your supervisor, you should answer 'NO' to this question.)

Yes

If yes: you should complete the section 2 of this form.

If no: you should now sign the statement below and return the form to your supervisor. You have completed this form.

This project is not designed to include research with human subjects. I understand that I do not have ethical clearance to interview people (formally or informally) about the topic of my research, to carry out internet research (e.g. on chat rooms or discussion boards) or in any other way to use people as subjects in my research.

Student's signature AJM Janssen

Date 16/12/2020

Section 2 Complete this section only if you answered YES to question (iii) above.**(i) What will the participants have to do? (v. brief outline of procedure):**

The participants will represent their restaurants during the interviews. They will have to answer around 10 questions concerning the occurrence and management of food waste. These answers are essential to answer the central question and sub-questions of this research.

(ii) What sort of people will the participants be and how will they be recruited?

The participants will be chefs or (partial) owners of the restaurant, who know about the process of food products (delivery, storage, preparation, and serving) as well as their current food waste management. These participants will be asked for when contacting the restaurant if they would like to take part in this research.

(iii) What sort of stimuli or materials will your participants be exposed to? Tick the appropriate boxes and then state what they are in the space below

- | | | |
|-------------------------------------|----------------|------------------------------------|
| <input type="checkbox"/> | Questionnaires | |
| <input type="checkbox"/> | Pictures | |
| <input type="checkbox"/> | Sounds | |
| <input checked="" type="checkbox"/> | Words | Several questions of the interview |
| <input type="checkbox"/> | Other | |

(iv) Consent: Informed consent must be obtained for all participants before they take part in your project. By means of an informed consent form you should state what participants will be doing, drawing attention to anything they could conceivably object to subsequently. You should also state how they can withdraw from the study at any time and the measures you are taking to ensure the confidentiality of data. A standard informed consent form is available in the Dissertation Manual. Appendix the Informed Consent Form to your Final Project/Dissertation as well.

(vi) What procedures will you follow in order to guarantee the confidentiality of participants' data?

No names will be mentioned during the interviews or in results. The participant can choose to write down their own name or the restaurant's name on the signed consent form.

Student's signature: AJM Janssen

Date 16/12/2020

Supervisor's signature:



Date 16 Dec 2020

(if satisfied with the proposed procedures)