The Emirates Academy

An Analysis of Plate Waste and Consumer Behaviour at Buffets in Hotels in Malta

A Thesis submitted on the
30th of August 2022

by:
Jonathan Zammit
Student Number: 0210208/4

Submitted to:
Mr. David Pace

In partial fulfilment for the requirements of the MBA in International Hospitality Management

Declaration

I, *Jonathan Zammit*, declare that this is an original piece of work, produced entirely by me, and that all source material has been appropriately referenced. In addition, I attest that no portion of the work referred to in this thesis has been submitted in support of any other course, degree, or qualification at this or any other university or institute of learning.

Abstract

Food waste is an increasing critical concern for food service providers and their customers. Although research on plate waste reduction strategies was not difficult to find, most of the strategies proposed were either not empirically tested or mainly focused on food-preparation improvements. However, strategies focusing on customer interaction were very limited.

The main purpose of this research is to get an indication of the average amount of plate waste that is being generated from buffets offered by 4-Star and 5-Star hotels in Malta and explore different alternatives, such as changing the concept of how buffet layouts should be set up or having a mixed plated service. It will delve into the trends of customer behaviour at buffets in the local market, as well as determine customers' and businesses' approach to plate waste.

Due to COVID-19 and its imposed restrictions, buffet set-ups were either eliminated, served by Chefs or in some hotels, partly plated. These various buffet set-ups facilitated the evaluation of their correlation to plate waste. The research data comprised of questionnaires given to food and beverage managers and chefs, and an on-site food waste analysis held between November 2021 and April 2022. A total of fourteen questionnaires were collected and analysed prior to the researcher conducting on-site measurement of data. This worked twofold as it gave the researcher insight of what should be looked out for in gaining an understanding of the data whilst gathering the qualitative data.

The results highlight that a combination of a hybrid buffet, such as pre-plated items for starters and main for buffet, will generate less consumer plate waste and even less primary waste, such as over production from the kitchen. One needs to gain knowledge in establishing the essential factors when designing menus without forfeiting food quality and finesse.

Acknowledgments

Foremost, I would like to express my sincere gratitude to my tutor Mr David Pace for his continuous support and guidance in conducting this study which gave me the opportunity to further my knowledge in my line of work and career.

I thank my fellow work and course mates Stefan Hogan and Mark McBride for the motivation, inspiration, and encouragement especially when times get rough.

Finally, to my girlfriend Elisa, to my parents and family for all their patience, understanding and continuous support to complete this research. Much appreciated.

Table of Contents

CHAPTER 1 INTRODUCTION

1.1 Overview

In a society where food security and prices are on the increase, the issue of food waste is evolving into a daily matter of global concern, with present estimates suggesting that worldwide, one-third of food produced does not reach a human stomach. Food waste occurs at all stages, from production to consumption and at the consumption stage, the term "plate waste" is normally used to globalise food that has been served but had not been eaten (Chen Feng Kuo, 2016). Global food waste is linked along with vast amounts of greenhouse gas emission especially when considering adding household waste. On the Maltese Islands it is estimated that each person generates 647 kilos of waste per year (NSO, 2012) of which 180 kilos per capita are derived from food waste.

Food waste is a growing concern in Malta. Unfortunately, little public attention is given to this problem. Malta has one of the largest per capita waste generations in the EU and the know-how and willingness to recycle is low. Most of the food waste being generated lands in landfills, taking up more of the already limited land and most of the retail food waste which is still edible is not being donated to food banks (Friends of the Earth-Malta, 2020). One can find deterioration and wastage all around the food supply chain and a great deal of this is wasted at consumption, especially in developed countries. This is found particularly in restaurants and large catering establishments.

In the EU, it is estimated that 69 million tons of food waste are annually generated with a hefty cost of 143 billion euros (EU FUSIONS, 2016) and while an estimate of twenty percent of food being produced is wasted, one can add that around thirty-three million people cannot afford to nourish themselves every second day (Eurostat, 2022). When calculating wastage, one needs to add another 2.8 million tourists that Malta saw in 2019, from which 1,709, 966 opted to stay in hotels (National Statistics Office-Malta, 2019). According to the Waste and Resources Action Programme, it reveals that in the hotel industry in Europe, food waste costs approximately 367 million euros each year, which includes food procurement, employment such as in labour, utilities and even waste management costs. From that, 45% is mainly loss in food prep, 34 % is food left on plates by customers and 21 % of food spoilage and inappropriate

storage. Due to the size of the Maltese Islands and the fact that Malta has such a large population density, the volume of waste generated is more noticeable. By tackling food waste measurements during a buffet, it will provide the researcher a better tool towards understanding the challenges and monitoring the food waste hierarchy. As Chefs, our main objective when preparing a buffet is to have a broad selection of nutritional wholesome foods, prepared in a sustainable manner and as a researcher, the scope is to identify and determine the customers' perception and behaviour to avoid plate waste.

A considerable number of consumers do not contemplate on the unseen contribution of the global food waste problem produced by the Hospitality Industry. In fact, research in the catering sector has evolved due to the large costs for establishments, the food supply, and the Economy. A project focusing on training, education and prevention has been established by LIFE FOSTER to raise awareness on the problem of food waste and the optimal way of food storage. The strategic element of this agenda is that educational and support instruments will be implemented by 2030 as part of the Agenda for Sustainable Development for Zero Hunger, Responsible Consumption and Production (LIFE FOSTER, 2022). This research will be the first to look at the local issue of plate waste mostly contributing to buffets.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

To gain objective studies, literature review is a thorough summary and critical analysis of what research or non-research literature is readily available on this topic. This study is one of the first that explores issues in the Mediterranean Islands, particularly in Maltese Hotels. The research recognises and evaluates the amount of plate waste which is generated when food is served in a buffet style as well as the contributing factors to this form of wastage.

2.2 Food Waste

According to an analysis by the European Platform on Life Cycle Assessment (2011) it was found that a large contribution of food waste was created from individual households and the food industry, although other studies (B Wansink, 2014) (Effie Papargyropoulou, 2019) (Hennchen, 2019) indicated that the food service and hospitality industry play an important role in the process of waste management. In a study by Lin (2016), it claimed that the growth of these industries may have led to new trends and created a multiculturalism when it comes to food consumption, which in turn have caused a change in our demographic eating patterns.

Buffets are a key source of most food waste due to challenges to match supply and demand, especially in the all-you-care-to-eat format. The researcher believes that the widespread changes in food choices have a direct impact on the changes in the approach to consumption, which have radically increased the amount of food wasted. By default, our mentality is based on overproduction, that it is better to have a wide selection rather than guests complaining that there is too little food or variety. When faced with that bounty of food, guests will have a challenging time gauging their appetite and simply take more than they can eat, leading to excessive plate waste (Leanpath, 2019).

Kirsi Silvennoinen (2015) identifies eight elements which are linked with the contribution of food waste within the tourism and hospitality sector. These are: business concept,

administration, society, product development procurement, professional skills, customers, communication, and competitors. Due to the fast social and economic growth, even our family demographic has changed. Anticipating new trends and even increase in work schedules have led to household meals preparation decreasing, whereas one may find it more common to dine out (Klein, 2008). In Malta alone, it is estimated that the Maltese households are the third highest spenders in Europe when it comes to eating out, with an estimated total of 826.8 million euros spent in restaurants, cafes, and takeaways. This increase was recorded in Malta from 8.2% household expenditure to 12.6% in 2018.

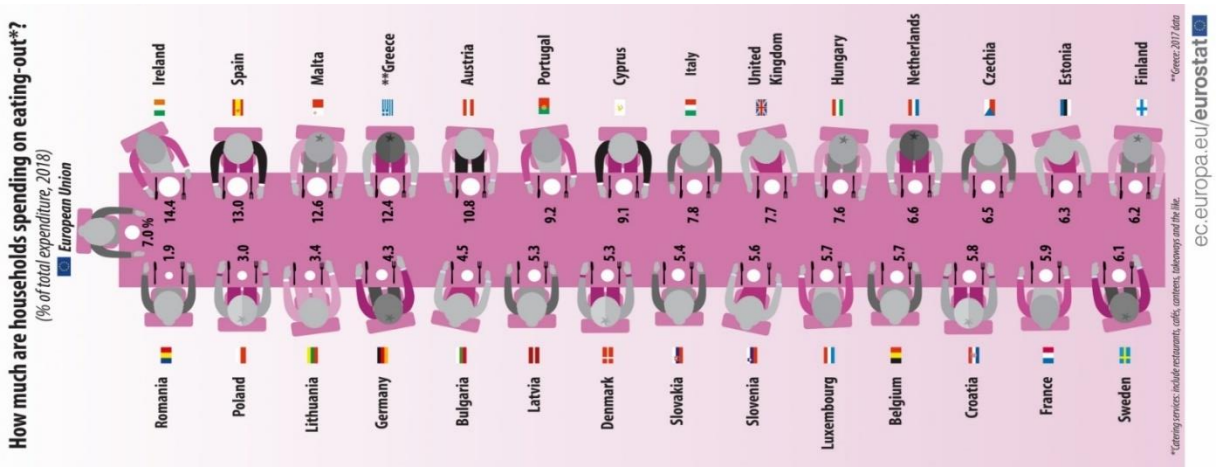

Figure 1.1: Average food away-from home expenditure in Europe. Source: (Eurostat, 2021)

Reducing a significant amount of food waste has become a strategic aspiration for several nations, specifically for the catering segment. The COVID-19 pandemic may have exposed some major weaknesses in our current global food system which may have resulted into a paradoxical reorganisation resulting into surplus, wastage, hunger and in some countries even poverty. These challenges of reducing food waste and losses in a world where several people are being affected by hunger has been on the rise since early 2014, when tons of edible food were wasted or lost every single day. According to Oxfam (2021), the pandemic has increased the hunger crisis and by the year 2021 around 12,000 people per day may die from malnutrition and hunger. On the 29th of September 2021, the Food and Agriculture Organization of the United Nations launched a new campaign to create awareness of food loss and waste. It is a once in a century change to communicate the message in developing a more sustainable business model which has been a decade long cry for this change. The scope is to call an action plan to both public and private sectors, to prioritise and be innovative in ways to reduce waste and rebuild a more sustainable food system. The goal is that by the year 2030, waste will be reduced by half, including retail, household, along the supply chain and post harvesting.

Plate waste has received interest in a variety of studies (Emil Juvan, 2017), (Effie Papargyropoulou, 2019), (Sara Dolnicar, 2020), (Knezevic, et al., 2019) and (Mirosa Miranda, 2016). Researchers have been more focused on plate waste based on nutritional aspects rather than finding ways to lower food waste and the cost that it involves (Mike Von Massow, 2015). 'First World Menu Reports' by Unilever Food Solutions (2011) has conducted a survey showing that 80% of the analysis were concerned about the issue around restaurant food waste. One may argue that most of this wastefulness and carelessness is found just in our homes and may have become prevalent. The Unilever Food Solutions (2011) report states that there is a large amount of food wasted in professional kitchens such as food ordering from suppliers, ignorance when it comes to storage shelf-life, over preparation and what is left by the customers on their plate. Lipinski Brian (2013) suggests that the restaurants should take a refined approach to examine what type of food trends are being left by their customers, to modify their dishes accordingly and gain insights. This poor management and mis calculation can fluctuate in sale and contribute to commercial food loss. In fact, in Britain alone, restauranteurs and governments spend almost 722 million each year to dispose 50,000 to 60,000 tons of food waste created by this industry (Unilever Food Solutions, 2011).

Food waste can be seen from two aspects which are known as intentional or unintentional behaviour. Foods that rot or spill before reaching the final retail stage are called food losses while food that is suitable for consumption but has been deliberately disposed by consumers is called food waste. To the catering industry the term “plate waste” is referred to uneaten food by patrons but according to ChenFeng Kuo, Yahui Shih (2016) no consumer considers the operational deficiencies such as unwanted food quality, incorrect portion sizes or menu designing. In the United States, this problem has been highlighted since the year 1970, where restaurants would market large portions as their selling point, suggesting to consumers that they are getting a bargain due to the amount of food they get and what they are paying for. However, this fashion into bulk plating has caused more food waste since they are unable to finish the meal (Lipinski Brian, 2013). When food gets disposed of in landfills it eventually rots and is turned into a source of methane which is a powerful greenhouse gas, 21 times more than the global warming potential of carbon dioxide (Forbes, 2018).

	Responsibilities	FW Reduction Behaviours	FW Reuse or Redistribution Behaviours
Kichen food waste Food wasted during the preparation phase, due to overproduction, peeling, cutting, expiration, spoilage, overcooking, etc.	**Restaurant's managers and chefs**	Careful ordering and menu planning; Avoiding spoilage waste by monitoring used by dates and storage ; Offering different portion sizes. Educate the client to carefully order to avoid leftovers.	Reuse edible food items for making other recipes; Donation of surplus food; Offering a doggy bag to the client.
Client food waste Food wasted by the client after the food has been served to them	**Restaurant's clients**	Avoid leftovers	Doggie bag adoption

Figure 1.2: The process of food waste and recycling in a restaurant. Source: (B Wansink, 2014)

2.3 Contribution of Food Waste

It is estimated that Hospitality and Food business in the UK generates 2.87 million tonnes of waste per year where 46% is recycled or being composted (WRAP, 2020) and is equivalent to 21 kilos per person (Life FOSTER, 2019). Reports show that 920,000 tonnes come from wasted food, 75% of this food could have easily been avoided from being discarded and could have been eaten. In the UK alone, this amount of food waste is evaluated to be equivalent to 1.3 billion meals lost (WRAP, 2020) . The EU is targeting to reduce the capita of food waste from retail by 2030 and introducing the so-called Farm to Fork strategy to boost the health, quality, and nature care. This means that produce is delivered directly from the farm to the restaurant (European Commission Food Safety, 2019). Since 2018, around 200 Chefs have participated in a global campaign called the "One Planet Plate'' which will enable diners to discover sustainable sourced specials. In fact, Martin-Rios (2021) emphasizes on Sustainable Gastronomy which takes a new consideration of where all the ingredients have been grown, supplied and eventually served onto the plate. The food industry should focus on these sustainable opportunities and enforcing these roles in the global food chain. These crises give opportunity for restaurants to be optimistic and creative in how they can implement new strategies regarding our food and production.

In the hospitality industry 21% of food waste is derived from spoiled food, 45% from preparation of food and 34% from plate waste (WRAP, 2020) highlighting that one should raise awareness amongst kitchen staff and to use all ingredients. One needs to acknowledge the customers' needs in the industry, however in responding to any customer requirements one should do so in a responsible manner and ensure that expectations are exceeded especially when taking the role of improving sustainable practices. Saving food waste is a way of improving insurance through consumption of nutrients and calories that otherwise be discarded and of, enhancing sustainability (Knezevic, et al., 2019).

Academic research suggests that food waste varies greatly by countries and is influenced by cultural characteristics, geographics and shopping behaviours, however, no typology of customer characteristics of food waste has been identified (Knezevic, et al., 2019). Plate waste can consist of three classifications which are edible, inedible, and possible edible food (Silvia Scherhaufer, 2018). Edible food waste is a sizeable portion of the total food waste, being food that might have been eaten but instead discarded possibly because the food was not up to

standard or of personal preference. Inedible food waste comprises of food which cannot be eaten such as bones and eggshells whilst possible edible food consists of meat cartilage, offal's, and potato skins. Cooking is not just simply preparing, cooking, and presenting your food but includes the basic structure, how to buy and what you can create without leaving any leftovers, using the "head-to-tail" concept when preparing meat, where you utilise all parts of the animal. Chef Gissur Gudmundsson, former president of the World Association of Chefs Society, states that it is the training and influencing of professional Chefs that need to cope with the high volumes of productivity and ensuring their ability in reducing waste and promoting sustainability. Chefs need to be more sustainable in their line of work and being more disciplined when it comes to cooking practices. One needs to take a conscious approach and take action to start cooking efficiently which eventually, through this model, it will benefit the owners in the industry by firstly reducing food and energy waste and at the same time proposing financial gains by dropping labour and energy costs as well as lessening waste charges.

Estimates from the European food waste (Knezevic, et al., 2019) noted that the food wasted away occurs in various stages, from production, distribution process, cooking, and food distribution. European waste can be structured into 53% household, 19% in food processing, 12% in catering establishments, 11% in primary production such as growth and harvesting and the other 5% in retailing wholesale. Theory implies that the more knowledgeable one is when it comes to choosing the correct food for ones' wellbeing, cooking skills and food labelling knowhow, the more likely one is to partake in lower waste behaviour. In catering establishments, case studies have highlighted the size of food waste problems showing that catering habits and public purchasing impacts waste generation. By reducing portion sizes, bulk meal planning and forecasting of dining rooms, this can in turn affect the minimisation of waste. Studies show that only a little more than half of the food put out in hotel buffets was consumed (Troitino, 2017) meaning that Chefs are overstocking buffets and that Finnish buffet restaurants can generate plate waste as equal to 48% of all the food that was intended to be eaten (Juha-Matti Katajajuuri, 2014).

2.4 Customers' Food Waste Behaviour

Further through their studies Dhiman, et al. (2018) revealed that one must understand the influence of self-accountability and self-regulations, whereby one's individual conscious effort can change the behaviour towards an appropriate mind goal, and it is proposed that when an individual lacks strong external accountability, self-accountability influences their decision and performance. Sara Dolnicar (2019) highlights some psychological factors why people waste, mainly that people tend to be insatiable with food by taking more than they can eat, greedily go to the buffet many times to get their money's worth, which leads to having a mini buffet on their dining table, with most of the food being left uneaten and wasted. Other factors would be, inexperience of choosing food, lack of familiarity with certain food especially if they are choosing from a different ethnic cuisine.

People consume food because they are hungry or for the sheer pleasure of eating, this term is known as "Hedonic eating". B Wansink (2014) states that hedonic eating is clearly related with food consumption, body weight and food waste. Wansink concludes that people overfill their plates more so if it is their first time experiencing a buffet restaurant and through hedonic motives they would wish to explore and try all the dishes to discover what they like or dislike. Kahn (2004) suggests the main issue is due to the visual aspects of food and that a buffet table can lure guests into eating more than they normally eat. Research shows that visual aspects and how food is displayed with the variety of colours may entice people to eat more. Food shapes and volume can contribute to how much we can eat and unless one is physically stuffed with food, one can always make space for some more serving. Throughout their study Dhiman, et al. (2018) illustrate the use of self-accountability by weighing and displaying remaining food waste produced by students. This conceptualization left the individual feeling accountable for having wasted food.

In the context of food waste, one can identify behavioural aspects determined by situational factors such as food presentation, taste and flavour and internal factors which are associated with desire, hunger, fullness, or personal taste (Working to Reduce Food Waste, 2020). Many of the research found, show theory explanation of food waste, which is often incorporated and associated with behavioural studies. By using Theory of Planned Behaviour (TPB) (Working to Reduce Food Waste, 2020), Taiwan acknowledged the value of sustainable consumption in relation to food related behaviours. Surveys exhibited that the Taiwanese have

a constructive attitude towards reducing food waste and that climate change and global warming is a serious environmental and conservation problem. Through cost analysis, businesses and even citizens now a days have a clear concept to catalyse and change their way of eating and developing a nourishing, sustainable, reasonable food system. According to studies by Rockefeller foundation they estimated that American citizens alone spend around $1.1 trillion on food in which most of the food is unhealthy. This unhealthy diet is related to heart disease, hypertension and diabetes may have an impact even on taxpayers, as some of the majority costs attributed to health care is around $604 billion a year (Rockefellerfoudation, 2021).

A partial number of studies have been identified by Sara Dolnicar (2020) to measure plate waste generated by customers in Hotels and Restaurants and concluded that a patron in China generates 93 grams of left overs per meal out of which one third consists of vegetables, 17% meat and 14% rice, whilst a tourist in Slovenia accumulated only 15.2 grams per day of leftovers, showing a significant difference when one changes the ambience or even buffet characteristics. This demonstrates that there is a substantial gap in knowledge related to plate waste, with statistics relying primarily on estimates and only a small number of studies have measured plate waste per person in Hotels and Restaurants. Studies conducted by Emil Juvan (2017) discovered that Slovenian tourists generated less plate waste when compared with Russian tourists, this was done by creating two groups, one being influenced with a flyer in their hotel room appealing to them to help the Hotel reduce food waste and supporting the pro-environment. The other group were provided with a stamped booklet which would be stamped if any leftovers were left on their plates. The study provided an insight of conventional theories of human conduct; hence, social norms remain the only influence point for interventions. These are thoughts of a pattern affecting the ought to behave (Working to Reduce Food Waste, 2020) which is why it is normally refereed as “ought” norms (Emil Juvan, 2017) and are taught not to leave any food on the plate.

Magda Wilewska-Bien, Lena Granhag, Karin Andersson, (2020) focused their studies on finding a sustainable solution where ships can manage the food waste generated in the Baltic Sea region. Primarily effort should be put in separating food waste from the rest of waste streams as it enables a clearer picture of the waste produced. However, from further analysis it became evident that by alternating their buffet-type restaurant it could impact their guest eating behaviour, and as a result would lower their amount of food waste. Creating two groups, one experiment involved the Restaurant introducing a smaller portion at the buffet table, placing

smaller serving plates and even improve the “flow” for the guests serving themselves. By observation it was noted that when having long queues, guests would pile their plate to avoid getting in the queue again. This proposal would allow those who are still hungry to eat more without wasting food. In their research it showed that by adding another Chef serving protein food this will help avoid guests who are eagerly taking large portions, consequently decreasing plate waste. It has been noted that by analysing these studies, shipping companies can adjust and point towards food reduction programmes.

A similar study was done by Mirosa Miranda, (2016) at a college foodservice where one increased the spread but provided smaller cuts of meat to accommodate different cravings. One should even consider offering a sample of the dish to avoid having a full portion and minimise plate waste. Another strategy that was brought up by Mirosa Miranda (2016) was the “pay for what you don’t eat” which has been introduced in cafés and restaurants eventually increasing the mindset of the individual to eat all the food on his plate and not over order. It is believed that this cast of minds of consuming all food should be passed from parents to the younger generation.

2.5 Food Waste Factors in the Hospitality Industry

One may notice numerous reasons in relation to employee behaviour when it comes to food waste, such as waste derived from over-cooking, spoilage, excessive trimming and even over-catering (Effie Papargyropoulou, 2016). Food preparation excess is relatively the main contribution for the total food waste in the Hospitality business, although Sara Dolnicar (2019) have identified other contributors in their studies such as, using cheap ingredients, ready-made frozen food rather than fresh food, items that do not stay fresh when displayed and incapability by chefs to cook certain food products. In their study Edmund Goh (2019) discovered that Generation Z had a more negative attitude towards wastage, where they emphasize that the customer is key and that they must get rid of old stock to get fresher ingredients and that wasting food is a good stock rotation. "*We need to throw out old stock so that we can purchase fresh ingredients to cook quality dishes to satisfy customers*". On the other hand, they still show attributes of guilt, most of them stating that they feel bad for throwing away leftovers since there is nothing, they can do about it. A possible explanation could be that although it responds as a negative feeling, Generation Z still consider that the importance of achieving customers satisfaction and using fresher ingredients is more important.

In his research study, Effie Papargyropoulou (2019) concludes that employees had been emotionally affected after being witness to food waste activities. One candidate said it was an ordeal watching trolleys of untouched food being thrown away after a function, due to HACCP regulations, being that food cannot be reheated, so they have no choice but to discard it. This can easily be given to organisations feeding the homeless or even soup kitchens. (Effie Papargyropoulou, 2019); (Effie Papargyropoulou, 2016); Edmund Goh, (2019) highlight that most decisions that attribute to food waste are not within the control of the front of house employees but somewhat due to the menu design and buffet service style. In a study in UAE restaurants Sanaa I. Pirani (2016) calculated that a total of 73.6 kilos of preparation wastage was recorded from 5 outlets. In the same research Sanaa I. Pirani (2016) calculated that from a buffet wedding the amount tripled to 247.5 kilos in food preparation waste. One has not yet identified food wastage as an unethical behaviour, this could be due to harmless perception of waste, so employees are more lenient and likely to perform unethical behaviour that causes no harm to others. One example could be that of cooking large portions without referring to a recipe book for self-convenience. In fact, 42 % of restaurant patrons complain of lack of portion

control, where employees where serving large portions which contributed to their food waste (Alexandra Betz, 2015).

This wastage from the restaurant brigade shows lack of appreciation of food from the chefs, its importance and its worth whilst not holding the correct knowledge and experience in this line of work. A professional chef should have the know-how of what can be done with leftovers or other ingredients in season, such as cooking a soup or even a basic stock from scratch by using bones and vegetable trimmings. Mass volume Hotel restaurants have the guiding principle that one should prepare large portion sizes to ensure that their customers leave their table satisfied.

One should establish and implement portion size by using containers of certain sizes to evaluate approximate portions. The ability to portion is an embodied skill with the activity of cutting in equal size and same weight without any loss. Most of the ability is built through repetitive training during their apprenticeship which can be used during later stages of their career, although Hennchen (2019) suggests that information should be provided to the predominant educating professionals to discuss how one could integrate any innovations that can become part of our establishments. One can debate whether these practitioners are even capable to incorporate new innovations into their work life. In addition, one must focus on integration instead of education, a learning process by cooperation between different hierarchy, instead of trying to teach top to bottom.

Hennchen (2019) suggests that a fundamental aspect would be to start forecasting guest numbers, by gathering information from advance for necessary portion numbers, which can be accomplished either through orders or catering systems. Access to food waste feedback to help kitchen management should be obtained to better results. Sharing knowledge can also be construed and encouraged between restaurants cooperation. Hargreaves (2011) proposes that although other restaurants are competitors when anticipating daily food demands, we should consider deciding in the restaurant community to exchange information when it comes to local experience and help each other with information such as food quantity for events. This contribution can allow for a greater accuracy and consistency which could lower expenses and redistribute any food surplus.

Establishments should start to introduce rewards to their staff for reducing food waste, in fact the brand Hyatt brand Hotels has already encouraged the team to participate in reducing

food waste in the establishment and in the community, by engaging into activities and share ideas, at the same time giving back, encouraging the companies CSR - Corporate, Social, Responsibility. Through the Hyatt World of Care program, at the end of the year, the staff would get paid up to 16 hours for the engagement effort (Hyatt, 2022). While menu planning restaurants must factor healthy cooking methods such as grilling or steaming. Consumer plate waste behaviour found out that a higher waste of 37 % was left for fried food, 10% for healthier options and starchy food 30% (Alexandra Betz, 2015). This shows that customers might tend to have more plate waste if they feel that their food is too oily.

2.6 Hidden Cost of Food Waste in the Kitchen

Often food waste is associated with disposal cost, but one should consider food purchase and labour which aggregates nearly 90% of the cost of food waste. Each step of the supply chain is a hidden cost that is lost once the food is wasted. FUSION (2016) estimates that food waste in EU-28 accumulates 88 million tonnes annually with associated cost of 143 billion euros. It is observed that by reducing food waste, one can financially save up to 8 euros per kilo and that 1 kilo of food waste is responsible to the Lifecyle emission produced to 1.9 kilo of CO2. On average, it was noted that food waste evolves from 21% from spoilage, 45% when food is being prepared and 34% of plate waste (Andrew Parry, 2019). Economic reports state that cost of food wastage worldwide amounts to 1 trillion each year and that food that is produced and never consumed will still cause environmental impacts (FAO, 2014).

In 2011, the UK Hotel sector estimated around 317.8 million worth of cost in food waste (WRAP, 2016) and that each catering establishment loses around €10,920 of food waste each year. This study shows that if one deducts 5% in food waste, it will gain a saving of 250 million in 2 years (WRAP, 2016). Chef and owner Hartmut Handke discusses how he believes that a cross-utilization is the way forward to reduce food waste but depends mostly on training and the imagination of the Chef. Cross-utilization implies that you use the product for several times on the menu or turn scraps that are normally thrown away into nourishing appetizing dishes (Somerville, 1995). Hotel guests hardly acknowledge what happens to all the food that has been left over and its waste, however, it is a major concern for Chefs, Food and Beverage managers and directors. By adjusting the way food at the buffet is presented, this can cut down food waste,

increase the hotels return of investment and simultaneously leave a satisfying feeling to the food and beverage team.

Austin Clowes (2017) created this financial business case study to help reduce food loss and waste in the catering sector, stating that within two years of applying this system 80% of their sites regained their investments. This was done by measuring food waste, train and engage all the staff in measuring to reduce waste, smart purchasing, reduce over production of food and excess food. One should conduct a pilot project for the establishment and where possible involve the kitchen team as they often create and effect strategies to combat waste (Austin Clowes, 2017). Another recommendation would be to establish an inventory food list and consider placing excess food for a food bank or even convert food waste into animal feed. Biodiesel is also a good option, especially when a fast-food chain uses a lot of cooking oil, which could be sold and recycled. EHL Campus Passugg was the first culinary art school to create a workshop for their culinary students to develop and induce the upcoming hospitality managers in the food waste issue. In fact, they were the first to test the Food Save App established by the United Against Waste, where this App is a source of inspiration and can provide insights and valuable methods within the kitchen processes, design and ideas of food offered and even what dishes can be created by recycling of leftover food. The objective is to teach new skills and provide opportunities to problem solve, critical thinking and be more aware of the social and ecological issues.

2.7 Perceived Abundance of Food and Food Waste

The ‘All you can eat’ defines a different aspect of a buffet and experience which includes a hefty amount of food and being in an environment with a surplus of wastage. A westernized economic development which may have led to an obese nation (Zeeshan Ali, 2017). One can become greedy, and this may be a major impulse when dinning in a an all you can eat establishment (Zeeshan Ali, 2017). Due to its nature and how serving practices have evolved in an ‘all you can eat’ establishment, it is considered and associated with matters related to over consumption, unbalanced diet and even food waste. In addition, Lin (2016) concludes in their studies that the higher the price of the buffet, the more the customers would over consume, which leads to more waste. They specified that when compared to customers who paid half of the normal price, the customers that paid the full price consumed nearly 30% more food. Researchers have noted that buffets not only involve excessive food consumption but may even increase weight and obesity, and more so increase the possibility of uneaten food since the restaurant may have prepared a certain amount of food to cope with the demand and the consumers might associate going out to a buffet as a feast resulting in them needing to recover the cost spent on their dinner.

To combat food waste in the hospitality segment such as restaurants and other food outlets, the amount of food waste needs to be determined and considerably extended by the portion size being offered. Therefore, the change in serving size should be changed to the customers real needs, keeping it simple but effective, with the approach of reducing food waste. Penalties policies or fees imposed to customers (ChenFeng Kuo, Yahui Shih, 2016) at buffet restaurants may be a solution but may increase customers compliance or customer conflict and people will opt to go to restaurants that do not have this policy (Micheal S. McCarthy, 2000). Penalties are generally implemented when a restaurant suffers an irreversible revenue loss. A more creative approach such as offering smaller plates could play a valuable role. Majorie R. Freedman, (2009) in their research demonstrate that larger plates lead to more food waste and through their research prove that by conducting an experiment to reduce the plate size, 20% of the customers still did not eat what was on the original plate. Steffen Kallbekken (2013) even demonstrate that if you reduce the plate size by just (1 cm) you reduce waste by 7% and by decreasing even more to (3 cm) waste will be reduced by 22%. From their studies Majorie R. Freedman (2009) conclude that by using a (24 cm) plate on an average person generates 5.2 grams less waste than the normal (27 cm). In a different study, Brian Wansink (2013) illustrates that customers

consume 45% more food and waste 135% more food at a buffet with large plates rather than buffets that offer small plates. Other factors that could be considered would be ease and food accessibility which has a superior impact on higher food serving.

Leanpath (2019) suggests that venues that serve buffet, need to implement the “Kanban” method, which was introduced by the manufacturing process, developed for the car giants, Toyota. This system involves preparing just before you run out, according to demand. One must establish when it is the busiest time at the buffet and should know when to decrease when demand shrinks. The buffet layout and shaving dishes should be designed up accordingly and could be adjusted according to the number of guests, so at the end of the service, one has less potential waste. In Taiwan a study by Lin (2016) shows a stream of waste with an average of 449.71 to 928.84 gr of waste per meal which is considered higher when compared to other restaurants. À la carte restaurants should have the possibility to offer the choice of portion size, with different prices and refine the approach to examine which types of food tend to be left over on customers plates so they can adjust the dish appropriately and gain insight.

2.8 Closing the Food Gap

Identifying the core challenge and mitigating these gaps which are combined into food production, agricultural land, and greenhouse gas is critical. The food industry contributes to about 8% of the worlds greenhouse gases and calls for the massive number of natural resources. 70% of the worlds fresh water and almost half of the worlds land is used for agriculture, just for 1 kilo of beef requires 15,400 litres of water. The food industry is facing a challenge to create a future of food sustainability and that by 2050 the world must be capable to feed more than 10 billion people, meaning that it must be capable to produce 56% more crop calories than it had previously produced in 2010. The food future needs to achieve and meet a sustainable growing demand in food, preventing deforestation and at the same time help stabilise the climate, boost the economy, and diminish poverty (Tim Searchinger, 2018).

Through studies one can project that animal-based food consumptions can rise to 68% between 2010 and 2050 resulting in more animal feed, land input and emitting more greenhouse gases. Half of the planet's population already consumes 50% more protein than their body needs, not underestimating that most plant-based products can already meet their daily protein requirements. Managing the food demand is the first step one needs to consider as it is far more difficult, as one cannot slow down the growth rate. Slowing growth demand will require reducing food loss and waste, shifting high protein diets derived from animals and altering customers towards a plant-based diet. This food gap can be shut down if correct applied measures such as decreasing the rate of excessive demand growth and measures that increase supply. In his report, Tim Searchinger (2018) suggests that one needs to reduce the growth in demand for food and other agricultural products and should increase food production without expanding agricultural land as all the food produced around the world each year, approximately one-third by weight is being lost or wasted in various stages from farm to fork. These strategies should be looked in such as, increasing fish supply and reducing emissions produced by the agricultural production. By reducing food loss and waste by 25% worldwide, this would reduce the food gap by 12% and land use gap by 27%.

To accomplish a sustainable food future, we need to boost our natural resources, reducing property development and producing more food per hectare. With the increase of the population and food requirements merged with inadequate access this is hindering food security. According to W Bender (2002), 840 million people including 200 million children are living in

poverty with not enough food to eat. Now, the world produces sufficient food to feed 6 billion people, but due to lack of geopolitical factors, poverty from natural disasters or even political violence, 1/7 of the global population has no access to food. On average 40% of the food coming from middle income countries and 30% of high-income countries is being lost or wasted. The gap between the actual and potential yields can be brought closer if one can consider improving the management and land quality.

2.9 Potential Benefits of Reducing Waste

The European commission has set targets to reduce by 50% the amount of food waste in Europe by 2020. If these targets were to be extended worldwide to 2050, they suggest that the food industry would not need to produce 1,314 trillion kcal of food per year (Lipinski Brian, 2013). “The Great Balancing Act” suggests that we need to cut the global rate of food loss and waste from 24% kcal to 12% kcal, closing roughly 22% kcal per year gap between food available today and needed by 2050. This means that by reducing food waste and loss we could achieve a more sustainable food future.

CHAPTER 3 METHODOLOGY

3.1 Introduction

Ontological assumptions are frequently used by researchers when dealing with studies on nature of reality and human behaviour. The research onion structure, shown in Figure 3.1 below assisted in creating and organising the methodology. By taking a deductive approach, the researcher based his hypothesis on the literature that he gathered during the collection of research and progressively tried to test these hypotheses. By including the secondary data, it will better support the fundamental structure of the research which will be collected from different articles, journals and even theories within the sector. This will give a broader and credible idea for the readers as to why this analysis is being conducted. The main purpose of this study is for the researcher to identify and understand the motives of plate waste during buffets and find ways to eliminate this waste. The COVID-19 Pandemic has brought buffets to a halt, therefore the researcher had to find alternative ways or set-ups to retrieve the answers.

In this chapter, the researcher illustrates how the evidence was collected, the lay out which was used and why these research methods were chosen, with a further detailed analysis of the targeted participants. One may find the methods selected and any limitations which were encountered whilst fulfilling the research. The methodology regarding food waste in the Maltese Hospitality sector, involved using both qualitative and quantitative research. The researcher had to adapt the research and most of this study has been done by visiting and analysing different scenarios of buffet layouts and concepts, therefore one had to make a relevant combination between these scenarios and the waste produced. This helped to recognize the strategies that must be implemented to minimise the food waste being generated in this sector.

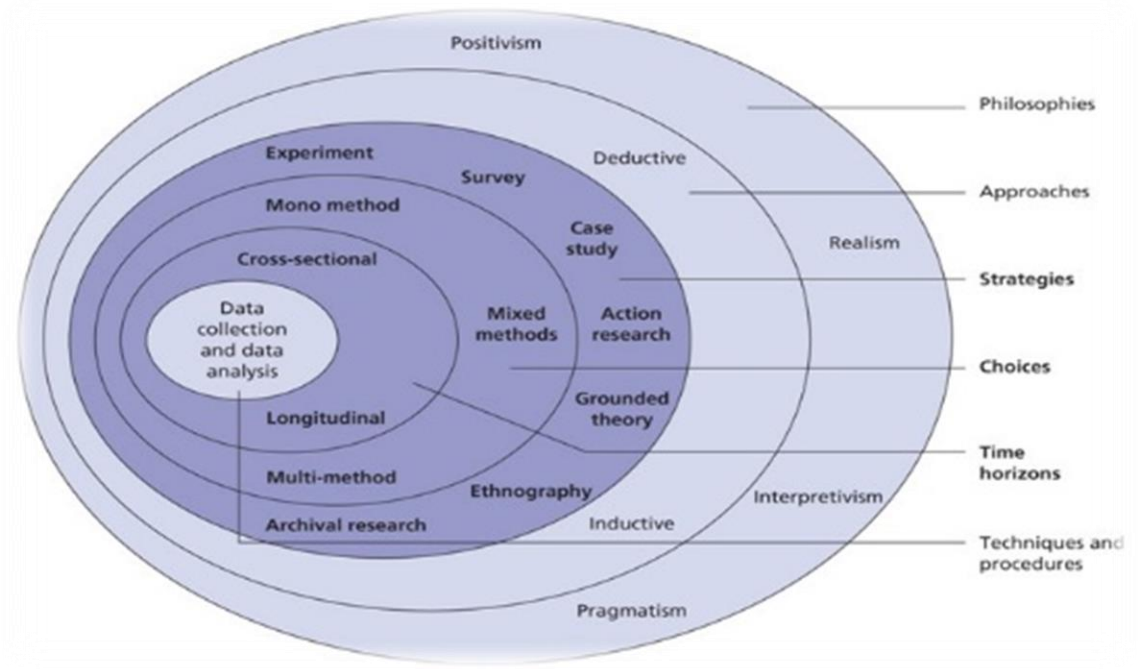

Figure 3.1: The research onion method (Carol S. Saunders, 2019)

3.2 Research Aim

The objective is to move towards a sustainable food system where the common practice will be to measure food waste using quantitative and qualitative waste practices. The goals are to develop a set of ideas that can be used to reduce the level of plate waste so that it can be used during menu planning and buffet set-ups. The researcher will have the opportunity to take advantage of the current COVID-19 situation due to all the restrictions which have been implemented and measure the concept of plated buffet as it is currently being provided vs self-service buffet. The purpose of this study is to analyse the condition of buffets in most of Malta's Hotels and collecting the perspective of the key individuals and their role for change in the area. The aim is to gather information, which until now has not been fully available. The researcher will also retrieve information from questionnaires provided to the Head Chefs and Food and beverage managers, who are operating in the hotels to assess their perceptions and insights. Through this, the researcher will gain a clearer perspective of the food waste problem.

The main objectives are:

1. To critically understand guests' eating behaviours and expectations, which may further contribute to the amount of waste generated.
2. Why and how food plate waste occurs.
3. Employee's insights through behind the scenes.
4. New buffet layout or menu design to reduce plate waste

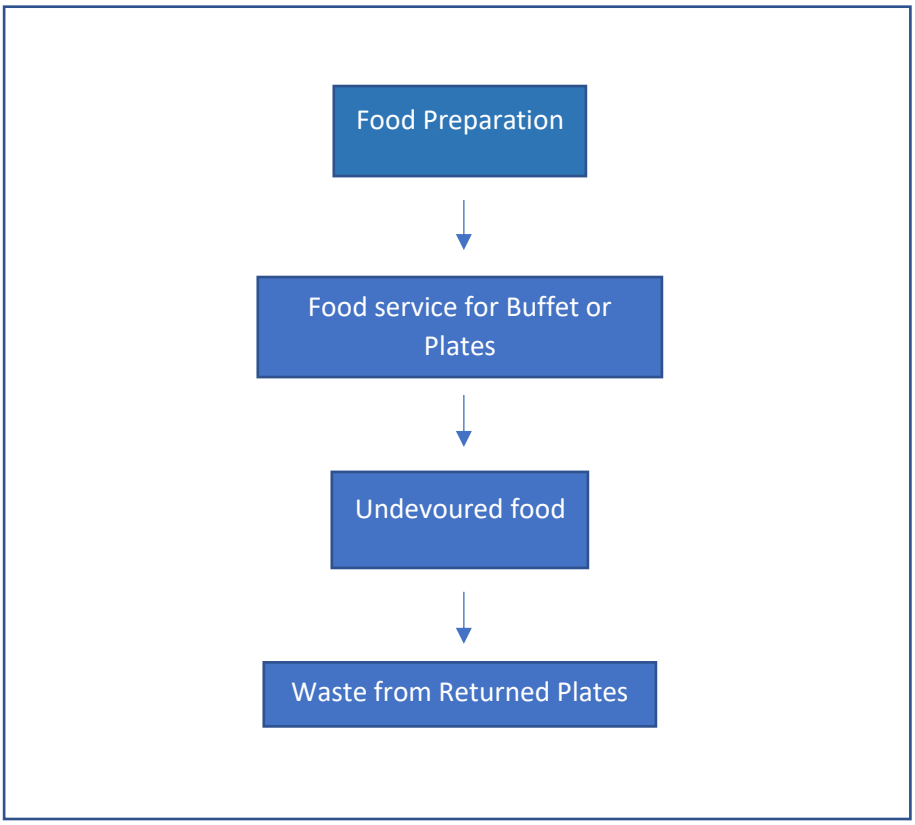

Figure 3.2: Description of the flow in the food service process

3.3 Research Approach

The Mixed-Method research approach of data collection was selected as it includes different methods design and recommendations. This will help the researcher provide a more complex picture than simply standalone qualitative or quantitative studies. The methodology used provides hard data for more accurate measurements and associated with Quantitative research gave a broader insight by looking at different buffet / menu setups and weight measurements. The Quantitative approach is normally used to collect data numerically and which in a later stage can be interpreted statistically to draw certain assumptions. Mixed methods are often used when the research involves human behaviour and in multidisciplinary setting.

The sample population was taken from four and five star classified Hotels located around the Maltese Islands. The focus was on these hotels as they typically provide buffets and cater for event venues. Soft Data which is not conducted but is derived from the methodology, was also conducted by the researcher which gave the researcher an idea of the opinions and interpretation of those who work in the industry, and context behaviour of an individual such as Qualitative research.

Qualitative research is associated with market research where the data is derived through undetermined and conversational communication. This will assist in understanding how the public, that is, the management may vary their approach in their offerings. This approach involves gathering non-numerical data which are intended to achieve in depth behaviour and even perception on the observations of the niche segment. It will not only reveal what the clients want but what they are thinking. A Self-administered questionnaire was dispensed to strengthen and clarify the results and objectives of the outcome and derive further significant data. Managerial staff such as Head Chefs and Food and Beverage managers were approached to take part in this study where they all consented to participate, and the data collection process was carried out by filling in questionnaires.

The questionnaire comprised of fourteen open-ended and closed questions which were divided into five sections:

1) The knowledge of food waste and its occurring phenomenon.
2) What measurements are being deemed to reduce plate waste.
3) Strategies or action that are being considered.
4) Managing food surplus.
5) Staff and guest perspective.

Naturally, the chosen personnel are very much engaged in food waste procedures within the hotel setting. The researcher was able to obtain consent from four Hotels that have met the predefined criteria and were willing to allow such a study to take place. Keeping in mind that due to the COVID-19 pandemic, measurements and new health regulation procedures had been introduced, therefore, most buffet layouts had to be adapted to these limitations, making it harder for the researcher to efficiently carry out the analysis. These questionnaires were completed by a mix of fourteen chefs and Food and Beverage managers.

3.4 Sampling Framework

For the Data collection and Data Analysis the researcher conducted a Quasi-experiment. By using this type of mixed method approach the researcher had the opportunity to focus his study, which a limited number of studies have not potentially answered, such as “why” the driver of plate waste occurs during diverse buffet layouts and “what if” one should opt to introduce different concepts, such as plate sharing. Would it be cheaper and reduce wastage? By analysing the different layouts and collecting information from the primary individuals these questions will be answered.

To reduce food waste, one must quantify the waste, find reasons why it occurs and measure the food waste which is being brought back to the kitchen. The final consumption is then analysed and reported. Qualitative techniques such as data reporting methodology was used including the participants own experience and knowledge, this will provide the researcher with a more human communicative approach. When using Quantitative research, the researcher had more than one statistical hypothesis which included predictions and connections between each variable. The researcher planned to test that if by changing these buffet setups, it will reduce plate waste. This type of serving method has been chosen as it involves many different dishes prepared and includes a large variety of food. The researcher examined how much plate waste is discarded and what methods can be used to avoid this. This will help both Hotels and restaurants avoid extra costs from the disposal of food. The researcher came up with the following hypotheses.

Hypothesis 1 (H1): Guests eating behaviours may cause a ripple effect on the environment due to amount of extra waste produced.

Hypothesis 2 (H2): Customer trends may spread to a positive outcome thus reducing food waste.

Hypothesis 3 (H3): Individuals habits could have a positive effect on not wasting food.

Hypothesis 4 (H4): By educating guests in changing their perception on wastage, having a positive influence on their purpose not to waste consumable items.

3.5 Techniques

Most of the buffets were abolished during the COVID-19 Pandemic and many hotels opted for plated or set menus with a choice of three starters, three main courses and a selection of two desserts. The quantification of the food waste collection was accomplished from different hotels around Malta, gathered from breakfast and half-board set-ups, event lunch buffets with a chef assisting and another two pre-order events with a sharing concept. The data for the analysis was obtained directly by the researcher with the help of staff on duty. Although the data being presented was collected from a small branch of Local Maltese Hotels, the data procedures and even the research methodology were still designed within acceptable parameters regarding qualitative data. Furthermore, the research took on elements of different events, thus making the appropriate link between the quality of an event and waste generated. This helped to understand which type of strategy needed to be implemented to reduce food waste generation.

One 5-Star Hotel that the research data was collected from, altered its concept of a buffet, and incorporated the family style and plated menu. This consisted of a selection of six small plates of antipasti such as Calamari fritter, Cold cuts, and other small bites, to keep the feeling of a buffet but at the same time being shared on the table, which preserved the same bubble.

For the Intermediate dishes, guests had the option to choose either pasta or soup, and for the main a selection of six plated dishes, a choice of one with a side of seasonal vegetables and roast potatoes. Dessert was in the same format with three small dishes to share. This set-up gave the clients a possibility to enjoy a variety of food which the Maltese love but most importantly, engage in portion control, preparation and reducing excess food waste from buffet shaving dishes and plate waste. For the data collection, the method used by the researcher was to weigh all the plated plates being produced from the kitchen, and at the same time observe the guest's preferred choice of food. At the end of the meal, all plates were returned to the pantry and weighed for any leftovers.

The researcher took the opportunity to conduct another study in this 5-Star Hotel later in the year during the breakfast service, when COVID-19 regulations where reduced and guests could help themselves. In this study, the researcher noticed that the Head Chef at this hotel used a wide variety of ingredients but smaller plates with a different table layout. Food data was obtained by weighing all food before being set-up at the buffet and individually weighed after.

This helped identify the most popular dishes. The researcher weighed every item being returned to the pantry, known as post-consumer food waste—all the unconsumed food and leftovers that had been generated and food waste from customers' plates. This was calculated to obtain the amount of food consumed and the average plate waste produced per person. In addition, an informal interview was conducted with the Chef and supervisor in charge to get a better idea of the operations and the observed trends. In these types of buffets, one may calculate the material flow analysis or (MFA). The amount of food being replenished was physically measured at different stages. Much care had to be taken at the pantry when it came to properly segregating the waste and the garbage bags that were being weighed consisted only of food and no other waste from guest plates such as dirty tissues. It was made sure that the food being discarded, was only from the event being monitored, since many hotels have a central kitchen where they may cater for the other outlets.

Time horizons (restraints, checks, etc) where needed for such research design and according to the research methodology used. The researcher had started a cross-sectional study at the place of work by observing people at a single point in time, where he noticed a wide amount of food being wasted, and that most food being generated was not consumed afterwards and being disposed by clients. Heuristic investigation is usually used where the experience and observation of the researcher will help with the research subject (Michaelson, 2018). In benefit of longitudinal studies, the researcher could extend beyond a single time frame and establish a sequence of the trials. The researcher therefore had the ability to conduct the experiment with the same sample of individuals but through a different scenario.

3.6 Study Setting

The researcher used a Quasi-experiment with some intervention of the experiment such a changing plate size but did not randomize any groups with a time series design, where he observed which, dependent variable can be measured before and even after an involvement. By completing multiple measurements, it helped to strengthen the study.

In the Quantitative study, the researcher's intentions are to spread the experiment over different Hotel establishment around the Maltese Island, with different buffet layouts, different banquet events being from plated pre-ordered events, self-service buffet in half board Hotels, Chef service and even partly plated, such as family style table buffet and plated main course. With the help of the Chefs and F&B team the researcher has evaluated which type of set up is ideal to reduce waste in general. The research included a thorough detailed menu plan from different Chefs throughout the 4 distinct Hotel segments across Malta and an evaluation from food preparation and methods, guest consumption and discarding of the remaining food. The researcher did not interfere with the buffet set-up nor with the choice of events menu.

3.7 Data Analysis

The researcher began by leading a qualitative data analysis which was done by conducting some formal in-depth interviews to gain further answers before moving on with the quasi-experiment. The personal interviews involved the hotel Chefs and F&B Management who were asked a set of questions to find the answers of the "why" "what" and "how". This provided a chance to accumulate precise data about what people believe and what are the key drivers for waste. The researcher conducted most of the interview's face-to-face, keeping in mind the COVID-19 regulations and restrictions, to gain a better opportunity to elaborate upon the questions and read any body language to the responses given. The researcher would have liked to get answers from the guest at the events or buffets, however the management felt that it was not the ideal time to add more stress to the situation particularly since most guests made that extra effort to get out of their homes and even have the courage to start travelling again.

By using an independent variable, the researcher can manipulate the set up to influence the outcome of the experiment. Through the different set-ups the researcher observed, took notes, and weighed the food that was being prepared by the kitchen and placed them either on the buffet or served, weighed the food after each service, calculated the food consumption of each guest and finally weighed the food that was left on each guest's plate. This was listed and analysed through a table where the researcher was able to compare the food waste of all the different set-ups and in each different hotel. The data collected was generated into numbers by calculating the food waste per cover, which is equal to the number of covers divided by the total food waste (David Pace, 2020).

The questionnaires conducted with the personnel in the industry will be analysed by listing each question and comparing what each interviewer has said. The researcher intends on recording the interviews to later replay them again. The benefit of this approach is focusing on what is being said during the interview and broaden the questions depending on the answers without having to take notes.

3.8 Research Limitations

Limitations may include methodological approaches that may impact the portrayal of the findings in the study, this may include the amount of data collected, interviews filled incorrectly, or interviewees being biased in their opinion. Some limitations may have been evident before the start of the study, but others might become clear while the research was being conducted. When conducting the study in the Hotels, the researcher had a mixture of families, mainly locals, having different cultural backgrounds and educational levels. This may have influenced the level of plate waste.

Another limitation was that when conducting questionnaires to employees who work in the industry, they may have been bias due to their personal perspectives, thus the researcher must ensure that there is a distinct balance to have a clear picture as since they work in the establishment, they might leave out certain vital information, not to put a bad light on the Hotel. This may be observed when the questionnaires were given to the managers, they stick to their personal opinions and feel uncomfortable answering questions. The response rate may be a possible limitation as it will be low and will not be representative.

One of the main limitations was the impact of Covid-19 currently affecting the Travel and Tourism Industry. Hotels are undergoing very low occupancy levels since many people are not travelling. The researcher had to wait for the ideal time or event to occur to conduct the research because of the low occupancy and focus on qualitative rather than quantitative methods.

3.9 Research Tools

In this study the researcher conducted a collection of food waste data for the examined restaurants at different operational periods mostly during the weekend when occupancy was high with many locals, and the lack of tourists due to the COVID-19 pandemic. This includes breakfast, lunch, and dinner services with different hotel locations.

The researcher collected food left on plates from guests, sat the afore-mentioned times and location on every observation day where each day different set-ups where created and food was weighed and measured before being placed on the buffet counter and weighed and measured again after service. The number of guests present were recorded for each examined day. The comparison and analysis among the food waste generated at the different hotels were based on plate waste for every meal that was calculated when the left-over plate waste divided by the number of guests for that service. The researcher also determined the theoretical regaining rate of the food wasted by the restaurants.

3.10 Conclusion

The above review of methodology emphasised how the researcher analysed ways of reducing plate waste in hotels, and the effects and expectations it has on the guests if changes occurred. The methods used revealed to be promising for the researcher to satisfactorily carry out the study.

CHAPTER 4 DATA FINDINGS ANALYSIS

4.1 Introduction

The study was conducted between November 2021 and April 2022, and it was based on a sample of four Hotels, varying from 4 star to 5 star. This chapter outlines the analysis of the quantitative and qualitative data collected. The main aim of the study was to test the hypothesis that by tweaking buffet patterns, this could affect food consumption by guests, minimising plate waste. Recent studies have shown that people waste more food when self-served as they are spoiled in a wider variety of choice. Therefore, in this study the researcher set out to provide insight into why different buffet set-ups may impact food waste because of possible changes in food consumption patterns. This was done by gathering diverse questionnaires and conducting onsite measurements and calculations of plate waste. The main arguments have been assembled and the predominant justifications are discussed hereunder.

4.2 Interview with Hospitality Personnel

In assessing the factors which instigate plate waste, experienced personnel in the hospitality industry were asked a total of fourteen questions, to aid the researcher to gather valuable information and hold a thorough flow of opinions and elaborate on their thoughts.

These questions revealed information gathered from personnel who witness first-hand how and why food is wasted, leading to a better understanding of what must be done to reduce such waste and assist the establishments in creating a more sustainable approach towards food waste.

4.2.1 Plate Waste

The first question of the research focused on the theme of the research: plate waste, the respondents' opinion on plate waste and how they think it occurs. All fourteen interviewees agreed that plate waste mostly occurs in self-serving buffet set-ups, where guests can overindulge in a variety of different foods due to the temptation of the diverse offerings. It was noted that almost half of the interviews, 43%, stated that this could also be linked to the plate size offered to guests. Large plates are sometimes provided as this may look more aesthetically pleasing to the eye of those consuming the food. Though this may limit portion control.

Guests may look for 'value for money'. This was noticed by two interviewees where they remarked that nowadays, individuals still book or visit certain hotels which serve a self-service buffet to ensure that they are receiving what they paid for. An interviewee also stated that guests tend to "*try new dishes, which one might not really like in the first place*" resulting in plate overload. He also stated that "*not properly labelling food might also be a problem as certain foods might be confused with something familiar which is not to their taste*".

Moreover, the interviewees were further asked what categories of food, in their opinion, should be limited to reduce plate waste. The common answer here was side dishes, such as condiments, warm vegetables, and potatoes. Several noted that guests were more inclined to finish their protein rather than the side dish. The pasta section in a buffet set-up and the diverse selection of large cakes rather than individually served desserts were also mentioned.

The study also sought to determine which part of the food cycle produces a lot of wastage. Whilst most of the interviewees answered that this could be the antipasti, side dishes and dessert section, others believed it is the preparation of main dishes. The latter argued that in transforming raw foods into actual dishes, with many chefs opting to use prime cuts of meat and fish and trimming down vegetables to create their vision of a perfect dish to impress their guests, most waste is generated here when edible portions are removed such as crusts, peels, and skin.

Some other observations made by the interviewees with regards to food waste were as follows:

- Guests visiting after a long day, having only taken breakfast will likely have an increased appetite and tend to overfill their plates
- Guests with the mindset of taking a portion of each item on display to ‘try’ everything, end-up leaving most in the plate as waste
- Late table cancellations
- Last minute changes of items from the menu
- Mismanagement in the kitchen can lead to over-ordering and over-production of food
- Not making use of the FIFO method (first in first out), where ‘old’ products are the ones to be taken out first, would lead to spoilt food
- Inferior quality raw materials
- Over-ordering high-cost produce

4.2.2 Menu Planning

The researcher continued by assessing the thought processes, regarding menu planning and creation, assessing if the establishments note their target market preferences when planning their menu to create a seasonal menu with food that is enjoyed by their guests. When asked if they keep sustainability and seasonality in mind when they are creating a menu, twelve out of the fourteen interviewees all agreed that they do and that it is a valuable factor. Two of the interviewees stated that using seasonal and sustainable products may not always be cheap, especially when they are included in buffet set-ups, however certain types of fresh produce may be cheaper during certain seasons. Furthermore, it was stated that "*One tends to always look at prices. On the other hand, clients have gotten used to having a selection of exotic (for the Maltese islands) and prime quality options like pineapples and avocados. However, prime cuts of meat and perfectly looking vegetables in locally sourced products are either not available in quantities required or do not meet the desired look*." An interviewee who disagreed with this question stated that menus are typically trend driven and the chosen menu items are selected according to what is popular in the market in that period.

The interviewees were further asked if they research their target market's preferences when designing the menu to prevent waste. Here, 71% responded that they do, stating that it makes sense to create a menu depending on their guests' nationality. However, in large hotels, international cuisine is usually served. Moreover, one individual stated that the Chef holds regular meetings with the sales team to analyse the nationality of guests arriving in the upcoming weeks to diversify the menus and meet their expectations. Furthermore, the 29% who disagreed, argued that since the hotel attracts a large mix of guests, it is hard to please everyone, thus, dishes are mostly from a Mediterranean origin.

4.2.3 Manning

Employing the right team is an essential component in finding the right staff with the correct knowledge and skill. The study sought to determine whether employing Chefs with the proper aptitude and motivation to minimise wastage, both during preparation and serving/plating, was deemed an important factor in plate waste. The majority of the interviewees (13 out of 14) responded in the affirmative and pointed out that daily supervision and monitoring must be performed by a supervisor on duty. One of the interviewees mentioned that "*During a new recruits probation period, the Chef checks for wastage which is derived from preparation*" showing that this establishment considers waste a high cost. Furthermore, due to the COVID-19 pandemic it is not as easy as it once was to find the desired Chefs with the right enthusiasm and ambition. This led to lack of competent staff available on the market or a request for high wages from the experienced ones.

In assessing whether restaurant staff were generally involved in the prevention of food waste, the researcher noticed a mixed approach. Whilst most establishments train their team to be aware of food waste and value its importance, however, the training provided needs to be adequate and regularly followed up by continuous mentoring by the F&B Manager or Head Chef for the training effective. Busy service and lack of staff which the hospitality industry is currently facing has a large impact on this strategy.

4.2.4 À la Carte vs Self-Serving & Hotel Occupancy

Furthermore, the interviewees were asked to give their opinion on food waste generated when serving À la carte or a self-serving buffet. It was mutually agreed by all the participants that during a self-service buffet there is no control of waste especially since many dishes must be prepared. On the other hand, as well explained by one of the interviewees, "*In À la carte there is minimal wastage as there is portion control and a balanced dish. The only time we see wastage is when people order too much food especially when not guided by the waiting staff about the size of the dishes. Nowadays many people expect to be given whatever food is left in take away boxes, but many items are just disposed of at their houses together with the takeaway containers generating more waste and costs*."

The participants were also asked if they consider and note the Hotel's occupancy or walk-ins to avoid over-prepping food. Here, it was noted that all the participants verify the forecast and occupancy daily, having one participant commenting that it is still somewhat difficult to minimise wastage even whilst knowing the number of patrons for the evening.

To gain a clear perspective on how the interviewees prepare their buffet set-up, they were further asked about their strategy: whether they bulk up the buffet table or just offer a wide variety of options. A range of answers were provided, most of which stated that they normally offer a wide variety of options. However, one interviewee commented that when the establishment is catering for in-house guests alone, they would rather go for good quality and less variety. Then at the weekend, when they expect increased volume in food consumption, they would choose to offer a wider variety of food. Strategies such as: not pre-heating the food; having a chef that attends the buffet; and halving the chafing dishes and not filling them up to the brim for the food to remain fresh, were also mentioned as measures taken to reduce food waste.

4.2.5 Guests Expectations and COVID-19

To get a clearer understanding of the thought process of how hotels choose the type of dishes they include in their menu/buffet selection to avoid wastage, they were asked if guests' eating behaviours and expectations were considered to ensure that the food which is served to them is consumed and not thrown away. Most of the interviewees answered "Yes." They remarked that customer expectations are usually gauged by regularly reviewing guests post-stay surveys/questionnaires and taking note of feedback and comments received during/after meals.

Food nutrition has also become a major attribute in menus and this, in turn, supports food waste by reducing food portions and eating healthier. It was particularly mentioned that "*one must try to be aware on how much food is served on a plate, during COVID; however, during* normal operation when it is self-service this is not controlled".

Since COVID-19 has greatly impacted both the service and the offerings which establishments were providing guests due to lack of staff or to minimise costings, the researcher asked the interviewees if they would consider leaving half of the buffet plated and a waiter serving or if they prefer returning to the self-service system which, most guests are used to. Many emphasised that they will be returning to the self-service system as this is the most desired option by guests or buffet serviced by Chefs. Some would like to maintain the waiter served or semi buffet which was adopted pre-COVID-19 as with a plated system where waste is more likely to be avoided. However, many guests unfortunately are not enjoying the experience as much as before where they were freer to choose, mix and match and fill their plate. Though, this system requires more staff and so, this has shifted food costs to labour costs and in some instances offering a smooth operation cost may be even higher as wages have gone up due to staff shortage.

4.2.6 Leftovers

Lastly, the research delved into leftovers, mainly enquiring what is done with these: are they reused or thrown away. All the respondents agreed that if the leftover food is good for consumption, of an untouched quality and not re-heated, it is given to the hotel staff to be eaten during their break. Health and safety regulations are taken into consideration as not all food may be 'reused' or left out for a prolonged period. In fact, one respondent stated that desserts, after a 4-hour service must be disposed of. Additionally, dishes which are safe to eat when reheated and do not lose quality these are thoughtfully repurposed and are used as antipasti or converted into other dishes. A particular Hotel even has a 'cat café' where they feed the cats around the property to safeguard the area from pests.

Composting leftover food, scraps, spoilt food, plate waste and other food that would end up as waste in landfills is crucial in reducing food waste, especially in large establishments which generate waste in bulk. This also reflects well on the hotel in its Corporate Social Responsibility efforts. Although not many hotels have invested in a food waste composter as it may be costly, can take up space and be difficult to transport the waste, the researcher took the opportunity to ask the interviewees if they would consider one in their place of work. Out of the fourteen respondents, three of them stated that they would not consider this, however the majority, 79%, all agreed that they would consider it. Some of the respondents stated that if they have enough space, investment, and an appropriate procedure it is worth a try. One respondent even stated that as part of the Hotel's current refurbishment, they are planning to have a designated area of composting; in turn the waste will be bartered to a neighbouring farmer who already supplies the Hotel with organic vegetables.

4.3 Quantitative Analysis

The sample study was conducted from seven types of events, mainly all buffets, except one for which was a pre-order event and another which was a family service event. Most of the people attending these events were Maltese, aged between 18 to 68 years.

In collecting the data, the researcher used a professional digital kitchen scale. For every event, all the prepared food was individually weighed and categorized. The data was logged into a predesigned excel sheet listing all the dishes in the menu obtained from the Chef. Throughout the service, any remaining food that was returned into the kitchen was weighed and documented. This allowed the researcher to calculate the average food consumption per person and to determine which dishes fared well with customers throughout the whole buffet. A separate waste bin was provided to collect any customer plate food waste, making sure that no other items, such as napkins or jam jars, were being thrown in. The plate waste was then weighed by the researcher and logged in the excel sheet to determine the average plate waste per person.

The following tables and diagrams illustrate the quantitative data collected.

Type of Service	No of Pax	Amount of Food Prepared	Leftovers[1]	Total Plate Waste	Total Food Consumed[2]	Average Consumption	Average Plate Waste
Set-up A **(***Breakfast buffet self-service)*	60 pax	57.3 kg	15.3 kg	5.9 kg	36.1 kg	602gr	98.3gr
Set-up B **(***Half board dinner buffet self-service)*	30 pax	50.85 kg	31 kg	2.57 kg	17.28 kg	576gr	85.6gr
Set-up C *(Half board buffet dinner self-service, plates dimension reduced)*	60 pax	75.3 kg	22.2 kg	7.2 kg (5.04 kg) [3]	45.9kg	765gr	120gr (84gr) [3]
Set-up D *(Chef assisted lunch buffet)*	43pax	42.6 kg	18.6 kg	0.46 kg	24 kg	558gr	10.7gr
Set-up E *(Bowl food buffet starter/ chef assisted hot section - lunch)*	70 pax	82.94 kg	39.04 kg	2.15 kg	41.75 kg	596gr	30.7gr
Set-up F *(Pre-order event)*	41 pax	43.29 kg	0 kg	4.2 kg	39.09 kg	953gr	102.4gr
Set-up G *(Family service starter, choice for Intermediate and Main Course - lunch)*	42 pax	43.1 kg	0 kg	3.2 kg	39.9 kg	950gr	76.2gr

Table 4.1: Data Analysis for each Set-Up

[1] Any food returned to the kitchen other than plate waste

[2] Total Food Consumed = Amount of Food Prepared – Leftovers – Total Plate Waste

[3] Allowing for 30% bone waste

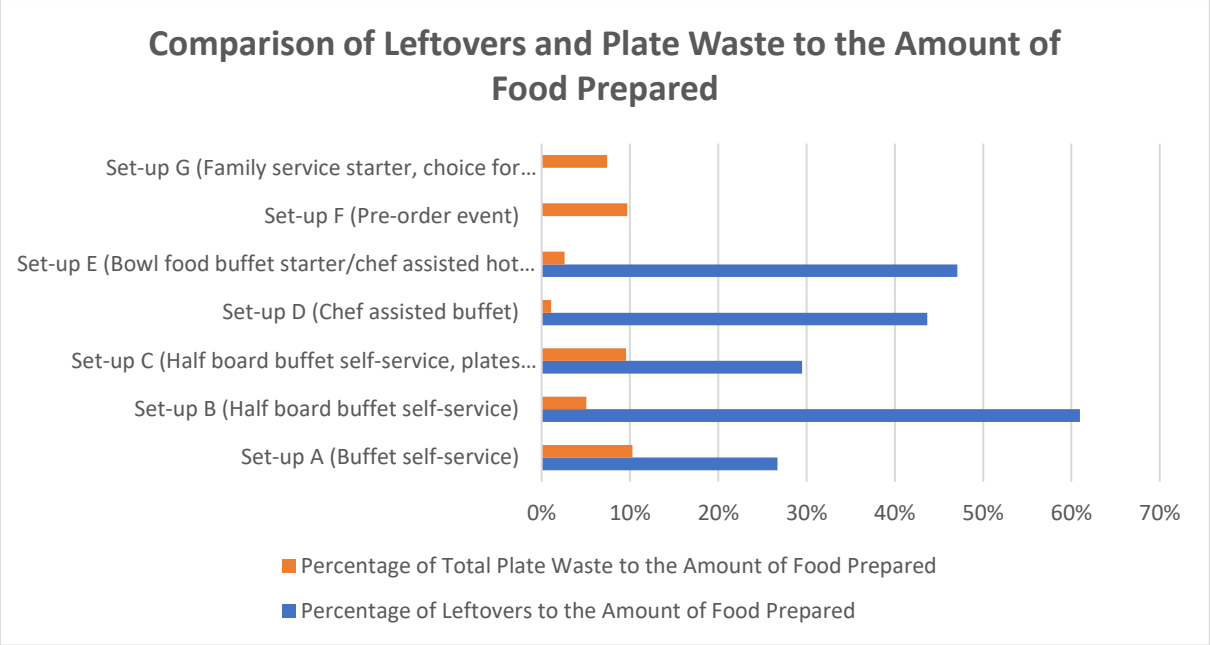

Figure 4.1: Comparison of the Percentage Leftovers to the Amount of Food Prepared per Set-up and the Percentage Plate Waste to the Amount of Prepared Food per Set-up

From the structured interviews it was acknowledged that plate waste occurs mostly in self-service buffets and according to plate size, but in the data analysis, it resulted that even plated meals such as in a pre-order event (Set-up F) can generate plate waste. In fact, the self-service buffet and pre-ordered menu had a similar plate waste average of 10% of the amount of food prepared. However, one should point out that the portions of the pre-order menu were on the large side and the menu was over-elaborate.

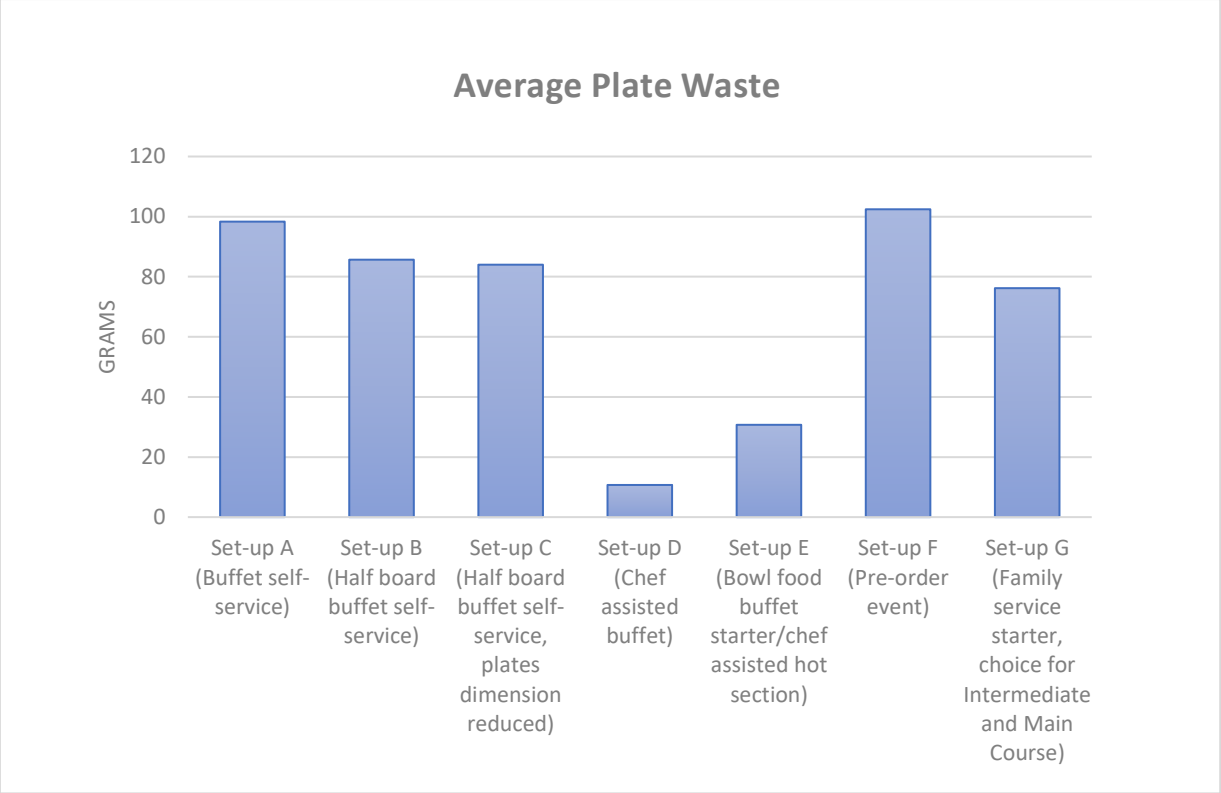

Figure 4.2: Average Plate Waste per Person

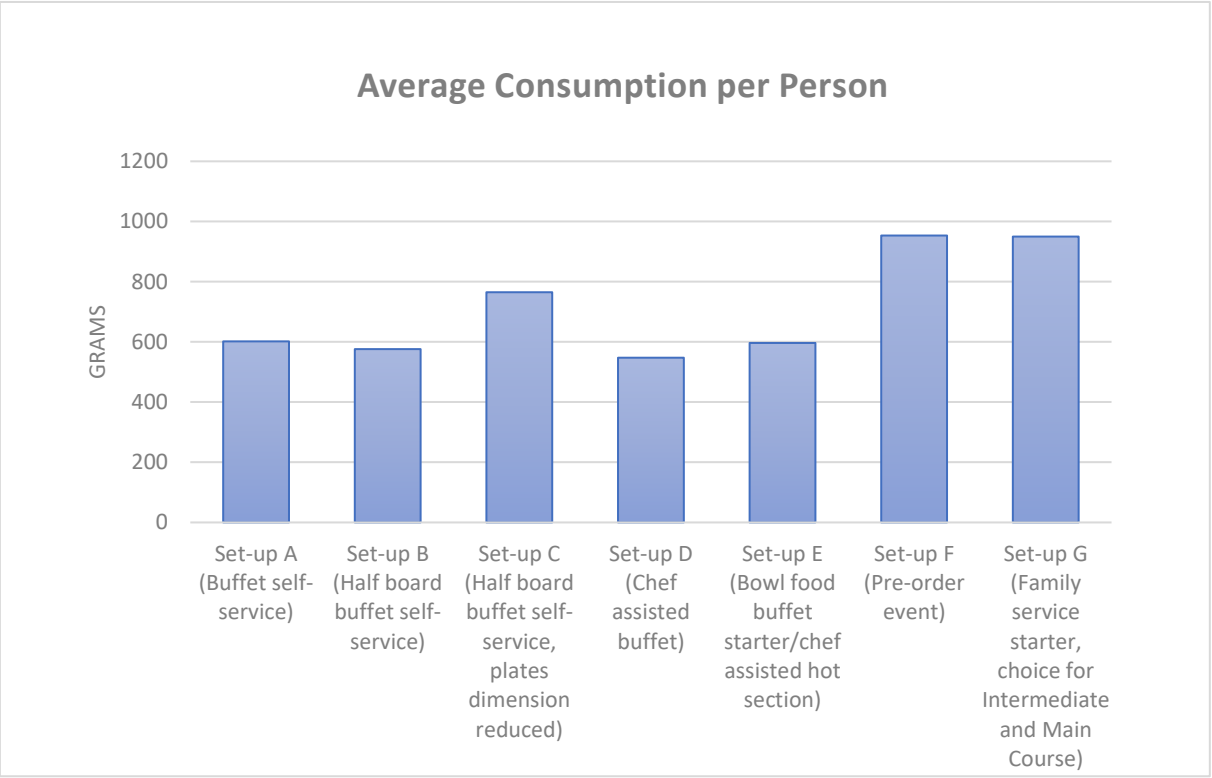

Figure 4.3: Average Food Consumption per Person

Figure 4.5: Self-service buffet half-board

Figure 4.6: Self-service buffet reduced plates

Figure 4.7: Plated cold starters, buffet main, chef served

Figure 4.8 & 4.9:

Buffet self-service breakfast


Figure 4.10 & 4.11: Family service starters choice

4.3.1 Set-Up A - Buffet Self-Service

This part of the study was conducted in a 5-star hotel breakfast set-up, with an attendance of sixty hotel guests aged between 30 to 63 years. In this venue, Covid-19 public-health restrictions had just been lifted by the Health Authorities, and whilst ensuring correct hygiene measures, the guests had the opportunity to self-service.

The buffet lay out consisted of five tables. The first table offered a wide selection of cold charcuterie, cheeses, and salads; the second table provided a range of seasonal carved and whole fruit; and another table consisted of a variety of cereals, dried fruit, seeds, milk, and drinks such as almonds and cashews. With these sections, 7 inch-plates were being used, which are adequate for salads and fruit. On a separate table, guests had a selection of hot savoury English breakfast, items including Cumberland sausages; eggs - scrambled, fried, or poached; mini rosti potatoes etc. On this section 9-inch plates were kept in a hot plate. Lastly, a bread table with a selection of Maltese bread, soft bread rolls, Danish pastries, and dry cakes was presented. With this table side plates were made available in case guests wanted a separate plate to add bread or Danish. At each table, sanitisation wipes and gloves were provided, and the kitchen team made sure to change and sanitize utensils regularly.

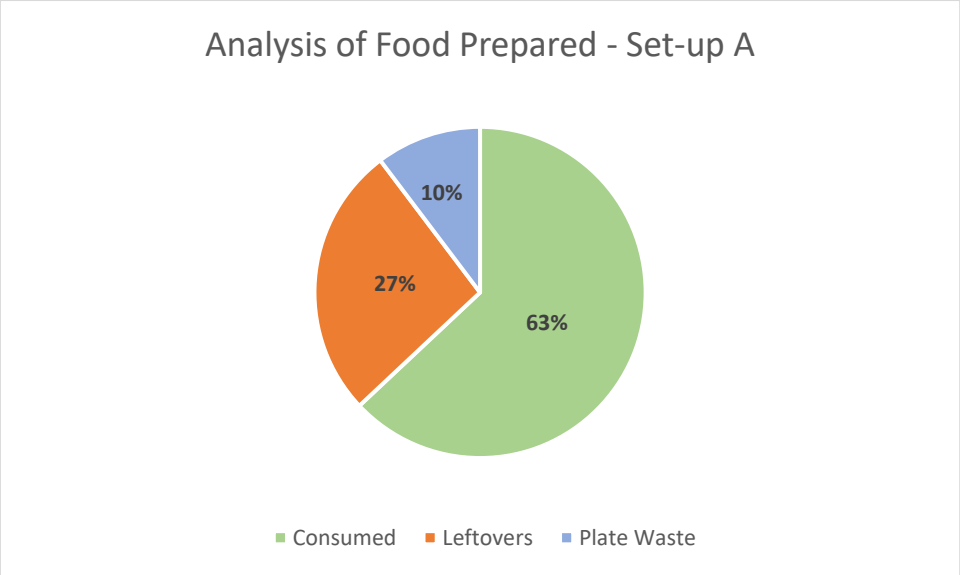

Figure 4.12: Analysis of Food Prepared – Set-up A

As depicted in Figure 4.12, in this set-up guests consumed 63% of the total food prepared for that service. The remaining unconsumed food was primarily leftovers, 27%, and 10% plate waste. Whilst examining the leftovers, it was noted that the most consumed items were from the hot section and the fruit section. This is justifiable as generally traditional food items are prefered by most guests, and whole fruit might not necessarily be eaten during the service but sometimes it might be taken as a snack for later.

4.3.2 Set-Up B – Half Board Buffet Self-Service

Another set-up which was analysed, was set in a 4-star hotel where most of the guests opted for the weekend package deal on a half board basis. The sample consisted of thirty guests, the majority of which were local visitors on a weekend getaway and were aged between 26 - 58, since the hotel's policy is strictly adults only. During this dinner buffet set-up, COVID-19 rules and regulations had just been eased, so guests were given the opportunity to self-serve themselves.

The buffet consisted of a selection of Mediterranean antipasti and fresh salads and another table with one type of vegetable soup, and pasta with Maltese sausage. For this section, 7- inch plates were used. For mains, one could choose from chicken with mushroom sauce, cottage pie, grilled swordfish, noodles, cauliflower with mornay sauce and roast potatoes. The service team was using 10-inch plates for this section. Since the occupancy was low, the chef decided to place bread and butter on the guest tables. Dessert consisted of an array of small items: ricotta cannoli, traditional "*prinjolata"* and Victoria sponge cake.

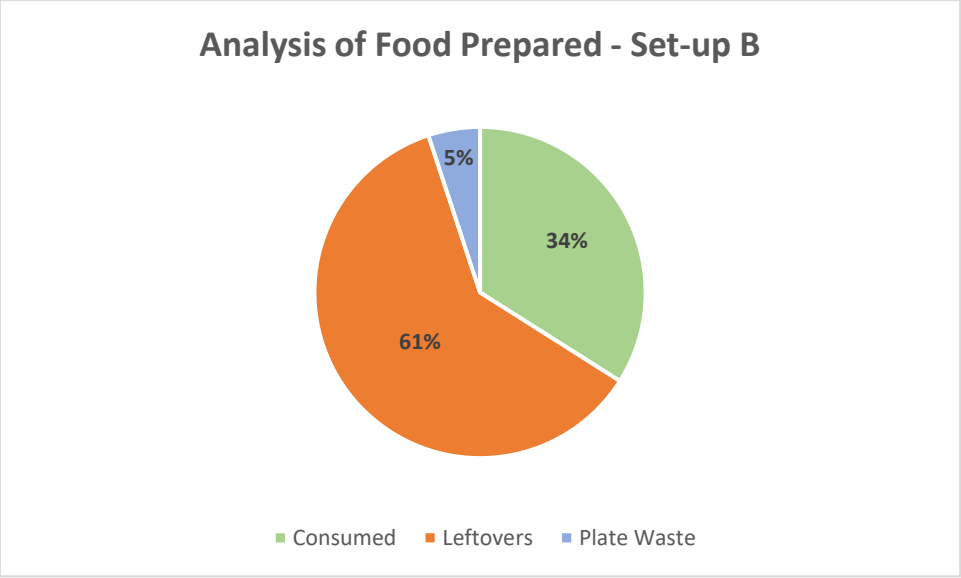

Figure 4.13: Analysis of Food Prepared – Set-up B

During the buffet, it was observed that barely any of the dishes needed to be replenished as there was plenty of food considering the number of inhouse guests dining. In fact, the

researcher weighed 31kg of leftovers (refer to Table 4.1) which amounted to 61% of the total food prepared. This large amount of food could still end up being wasted if not well stored or adequately used the following day, as no in-house staff food was provided. To obtain a clearer understanding of this overproduction, the researcher spoke with the Chef who explained that only one part- time Chef was on duty for the service, and they wanted to make sure that he had enough food in case of any walk-in guests.

It was also noted that given the selection of soup and pasta was limited, and the bread and desert was served at the guests' table, only 5% of the food produced was plate waste (refer to Figure 4.13).

4.3.3 Set-Up C – Half-Board Buffet Self-Service, Plates Dimension Reduced

Data for this set-up was collected from a 4 star-hotel, with guests staying on half-board basis. There were sixty diners, aged between 45 and 70, mostly locals and British people. For this buffet, the researcher managed to convince the management to change all the plates and use plates which were one inch smaller than they normally used. Therefore, 6- inch plates were used for starters and 8-inch plates were used for the main course.

The dinner buffet was self-serviced and consisted of an array of antipasti and salads such as sliced Parma ham, deep fried white bait, pickled cauliflower, and other natural salads. Soup was not placed on the buffet, instead it was an option which was plated and served from the kitchen. The Chef also decided to place the pasta as a side with the main dishes; since it was noted that usually when the pasta is displayed on a separate table guests tend to have a plate full of pasta and end-up not eating it all. The mains included Perch (fish), Rabbit Adobo style, curried beef Madras, seasonal panache of vegetables, potato gratin, steamed rice, and warm couscous. For dessert, a selection of two tarts and one gateau was displayed, with a selection of two cheeses and crackers.

Although smaller dimension plates were provided, the researcher observed that some guests did not take smaller portions and still filled their plate to the brim. The researcher also noticed that a lot of plate waste being returned to the kitchen consisted of untouched pieces of rabbit from the main course. When the servers asked the guests for feedback, the response was

that they just wanted to try it, since it was something different and they had never tried it before, however, it was not to their taste. This resulted in an average of 120 grams per person of plate waste (refer to Table 4.1). However, since most of the waste was coming from rabbit which had bones, if one had to quantify the correct amount of plate waste one needs to reduce the amount by 30% which would come to 84 grams per person. In the same manner, the calculated plate waste of 10% of the food prepared shown in Figure 4.14 would go down to 7%.

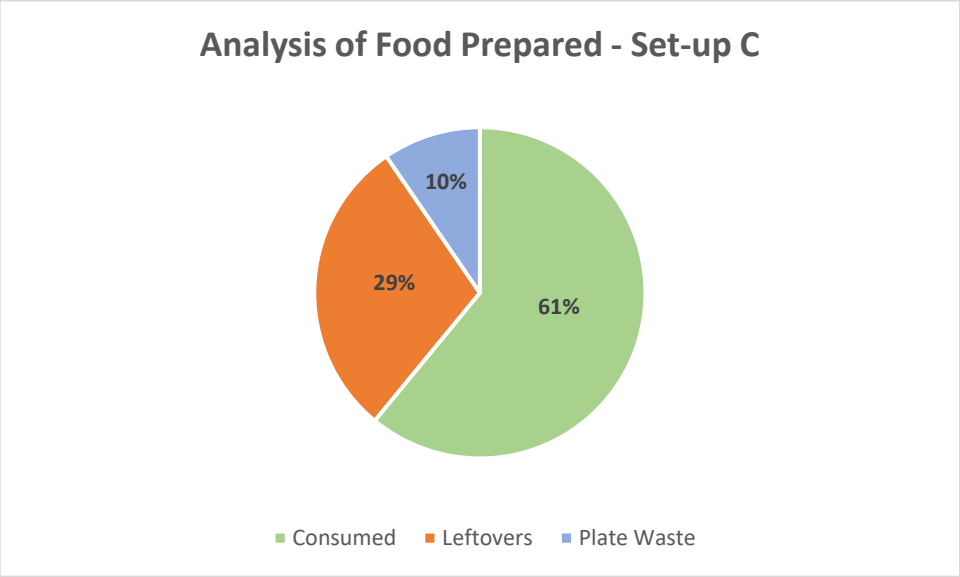

Figure 4.14: Analysis of Food Prepared – Set-up C

4.3.4 Set-Up D – Chef Assisted Buffet

Another set-up in which plate waste was evaluated was that of a lunch buffet where chefs assisted. The sample comprised of a group of 43 local guests aged between 24 and37 years. The buffet was served in a 5-star hotel when Covid-19 was in its peak. Thus, in accordance with the health restrictions in place diners were not able to self-service but were served along the buffet table, by Chefs behind Perspex.

The starter and antipasti station included a selection of potato salad, cold cuts, cheeses, quinoa salad, and natural salads with condiments, as well as a basket of bread. On another station, there was one soup, and pasta with a choice of two sauces: pesto and artichoke, and a simple tomato sauce with a side of parmesan shavings. For the main course, the options were: grilled chicken breast, grilled calamari, warm couscous, roast potatoes, steamed Jasmine rice, and seasonal vegetables. For dessert, diners had carved seasonal fruit, jam crostata and two types of ice-creams. An 8-inch plate was used for starters, 11-inch plates held in a plate warmer were used for mains, and 6-inch plates for dessert.

Due to the Covid-19 restrictions, diners were directed to the buffet stations in groups according to their table. It was noted that because of the social distancing, facemasks and Perspex, communication between the diners and the Chefs assisting was a bit of a struggle at times. This together with the fact that -- having Chefs assisting makes diners somewhat uncomfortable to ask for an extra serving while being attended, or to go again for another helping -- had an effect on the total amount of food consumed. In fact, after weighing in the leftovers and plate waste it was calculated that only 56% of the amount of food prepared was consumed (Figure 4.15). However, the most significant outcome that could be observed, was that only 1% plate waste was generated from this type of set-up. Covid-19 has taught us that one can adopt to these different changes and at the end reduce plate waste.

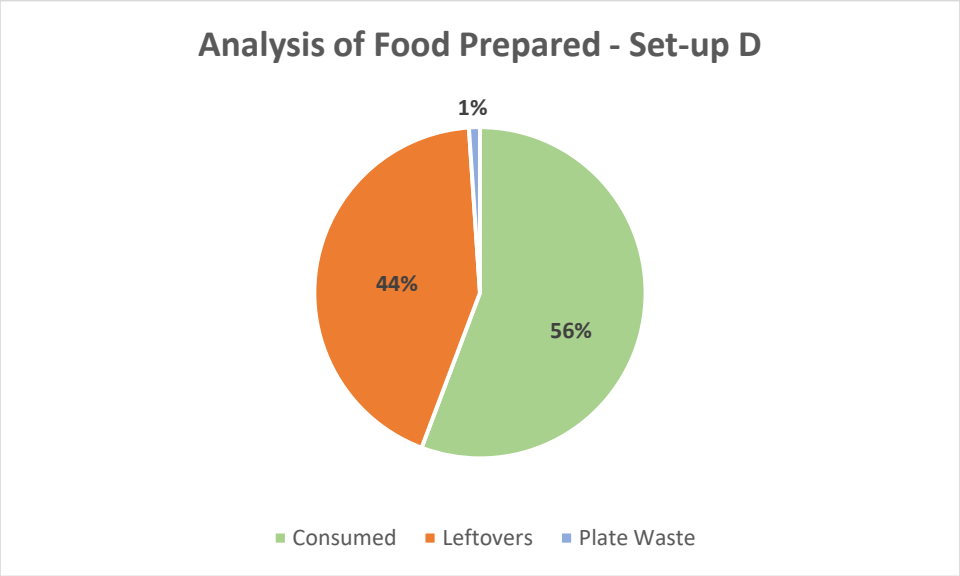

Figure 4.15: Analysis of Food Prepared – Set-up D

4.3.5 Set-Up E – Bowl Food Buffet Starter and Chef Assisted Hot Section

This set-up was prepared for a corporate lunch for seventy people aged between 28 to 47 years in a 5-star hotel. It consisted of individually bowled antipasti placed on the buffet table for guests to self-service. The hot section, which was also buffet style, was however chef assisted.

The buffet set-up had a selection of cold individual bowl food items including aubergine and feta salad with a side of pita; heritage tomatoes with cottage cheese; hummus with vegetable crudities; and bacon and tomato chutney croissants. This style of service was ideal as the guests could take any portion of food that they prefered, and at the same time reducing waiting time. In their efforts to try to avoid over-production and cut down on wastage, the kitchen brigade prepared sixty sets of bowl food for each entrée option; reasoning that not every guest would select from all the options.

The main course was a chef assisted buffet with a selection of two protein dishes: baked salmon and breaded turkey breast with a cherry tomato compote, accompanied with seasonal panache of vegetable and roast potatoes. An assortment of bread was also presented. For the entrée, 8-inch plates were provided to place the bowls on, whilst 10-inch plates were placed near the hot section. For dessert, a selection of two French pastries were prepared. These were placed on a 6-inch side plate and served by waiters to every individual sitting at the tables.

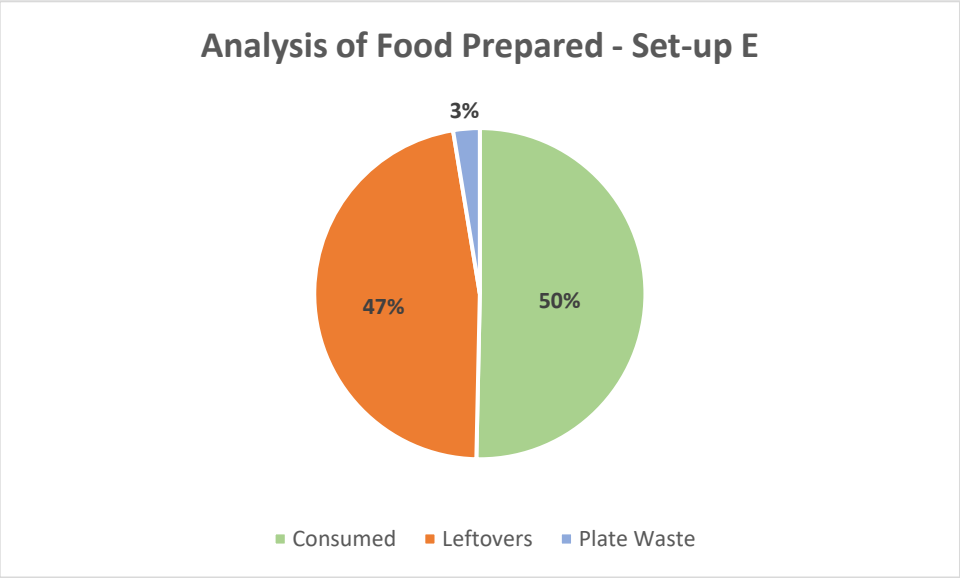

Figure 4.16: Analysis of Food Prepared – Set-up E

As shown in Figure 4.16, from the data gathered during this buffet lunch, plate waste was minimal. Only 2.15Kg (3%) of the total food prepared was discarded as waste from unconsumed food left in guest plates. However, there was 39.04Kg (47%) of leftovers most of which was then placed in the staff canteen not to go to waste.

4.3.6 Set-Up F – Pre-order Event

The study also analysed plate waste not in a buffet setting. The researcher attended a plated 4-course wedding event where all the guests invited had to provide their choice of food from a set-menu prior to the event. The seated wedding took place in a 5-star hotel with forty-one guests, ranging from 21 to 68 years of age. Covid-19 health restrictions were followed to minimise the health risk.

The menu consisted of a selection of vegetarian and meat-based canapes, followed by the starter, which was a choice between quinoa and carrot salad, or poached chicken with almonds. Most of the guests (34 persons) opted for the chicken, whereas the remaining seven guests opted for the vegetarian starter. For the intermediate, guests had the choice between tomato risotto or lobster bisque: twenty-two guests chose the lobster bisque while nineteen preferred the risotto. For the main course, the choice was between pan seared wild sea bass or beef rib-eye. Since the guests at the table were from the same bubble, the main dishes were accompanied by potatoes and vegetables to share. Beef was the preferred choice for twenty-six guests, ten chose fish and five guests opted for a vegan dish. The main course was served on a 12-inch show plate. There was no choice for dessert, and everyone was served Crème Brûlée in small 6.25-inch soup bowls.

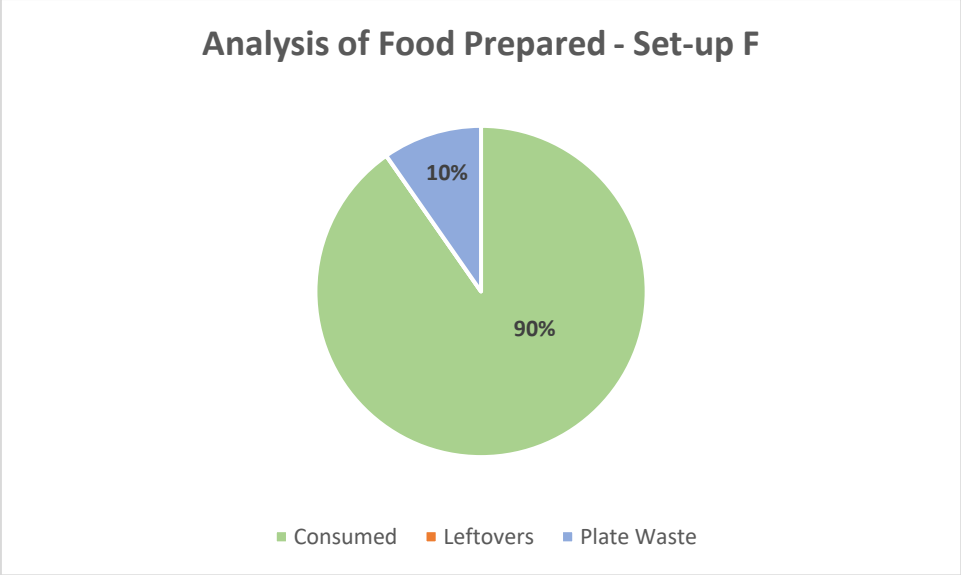

Figure 4.17: Analysis of Food Prepared – Set-up F

In total, the food prepared and served amounted to 43.29 kilos (refer to Table 4.1), including bread rolls, and excluding the wedding cake, which was not part of the data analysis. Out of this amount, 10% ended up as plate waste. The researcher noticed that most of the waste generated was from meat. Upon further investigation it was discovered that a number of elderly guests had returned their meat dishes and requested for the meat to be cooked more, however in the end there was still some meat leftover. The meat portion was of 200 grams per person and was cooked medium for everyone.

4.3.7 Set-Up G – Family Service Starter, Choice for Intermediate and Main

The final type of set-up that was analysed used a mixed concept whereby the antipasti were served family-style, and the intermediate and main courses consisted of a choice from a set menu of dishes which were then plated and served individually. This service took place in a 5-star hotel, during lunch hours, with an attendance of forty-two people aged between 18 to 58.

This hotel wanted to do something different based on the knowledge that Maltese people like to sample a variety of different dishes and they love their food. The concept was that of a fixed price menu which one would normally pay for at a Sunday lunch buffet but instead it was plated.

A selection of bread was placed on the tables with different nibbles to sample, before the antipasti were presented. The antipasti consisted of calamari fritti, burrata with oranges and grapefruit, nduja arancini, a small plate of charcuterie and cheese, beetroot hummus and leeks, roasted butternut, and apples. Each item was served in small 6-inch diameter side plates with each plate to be shared between two guests. This selection was placed in the middle of the table for sharing and if guests had any requirements, these were dealt with accordingly. For the intermediate course, guests had a choice between pasta with tomato ragu and olives, or a celeriac soup. For the main course there was a selection of five dishes to choose from: beef striploin, duck leg confit, lamb dish, wild seabass, and a vegan mushroom dish. All mains were individually plated on a show plate and accompanied with roasted vegetables and potatoes to share. Dessert for sharing consisted of a pear crumble and a pavlova with fruit and custard and was presented in such a way that guests could assemble their own dessert according to their specific taste.

It was observed that the restaurant was receiving good reviews from guests who liked this concept as it satisfied the local market, especially at a time when buffets were not allowed due to Covid-19 restrictions. It was also noticed that not too much food was being wasted during preparation since most of the food being prepared, was in the form of a set menu but cooked a la carte. For the intermediate and the main, the researcher weighed the portion of pasta, soup and main courses that were chosen on the day by the guest. Most of the guests opted for the beef striploin.

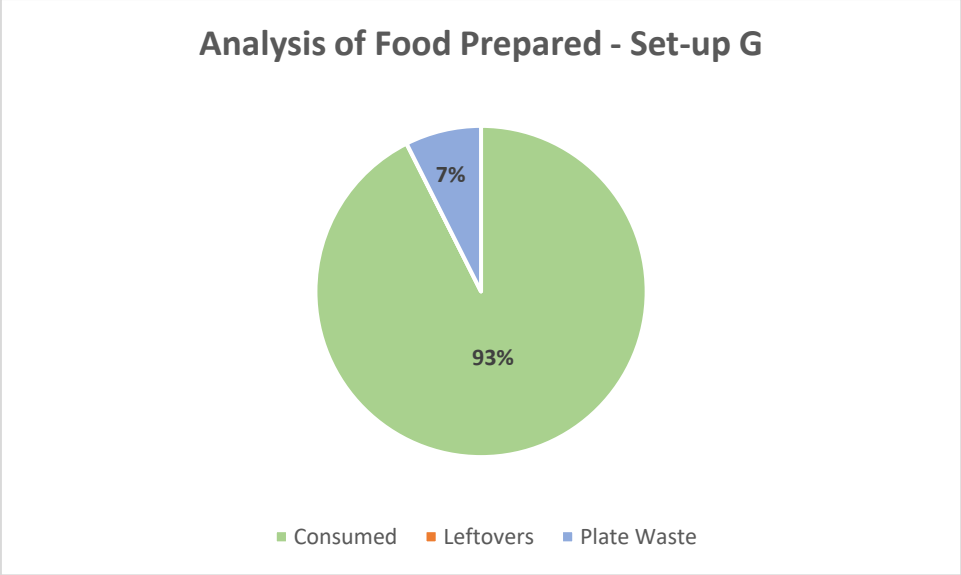

Figure 4.18: Analysis of Food Prepared – Set-up G

This hybrid concept allows the kitchen staff to prepare the starter platters and dessert according to the number of guest reservations and the main course according to the customer orders, thus avoiding having leftover. Plate waste amounted to 7% of the amount of prepared which is in line with other percentages obtained for plated set-ups. Consumption of 93% was the highest from all set-ups which is very encouraging compared to 34% consumption in Set-up B – Half-board Buffet Self-Service. From the feedback received guests seemed satisfied with the variety of choice and value for money.

CHAPTER 5 DISCUSSION OF FINDINGS

5.1 Overview

The primary aim of this research study is to analyse whether by changing the buffet setup or reinventing new concepts, this would eventually result in the reduction of plate waste. This may not just have a positive impact on the environment but would also result in the reduction of related costs. This chapter focuses on the main results collected from primary data, including key discoveries that were presented in Chapter 4. The discussion is based on structured interviews on food surplus, waste prevention, and waste management. It also includes a number of recommendations which may help the catering industry save money on food waste and decrease its carbon footprint.

5.2 Key Findings

As illustrated in Chapter 4 (Section 4.4), on average 42% of the food prepared for buffet services in the case studies presented was returned to the kitchen untouched, and an average of 6% was plate waste. This is a significant amount of food waste considering that only an average of 53% of the food prepared was actually consumed. This contrasts substantially with the two other non-buffet set-ups investigated during the study, in which there were no leftovers and an average of 9% of the food prepared was plate waste.

The primary causes of buffet leftovers observed whilst conducting the case studies as well as those gathered during the literature review are summarised as follows:

(i) Customers' appetite is low
(ii) Food selection does not match customers' tastes and preferences
(iii) Customers' attitude towards food is to eat healthy nutritious food not 'all you can eat'

(iv) Over-production of food due to inaccurate/lack of information on the expected number of guests attending, shortage in kitchen staff to prepare additional food if necessary, overstocking the chafing dishes

(v) Elaborate presentation of food without appropriate food labels might prevent customers to try it out especially if they have dietary restrictions

(vi) Customer reluctance to ask for a larger portion or a second helping in chef-assisted buffets

(vii) Large variety of side dishes and condiments

In a buffet service setting, the main reasons noted for plate waste include:

(i) Overfilling the plate to try a bit of everything

(ii) Overindulgence in customer's attempt to optimise 'value for money' especially if the buffet is part of a half-board or an all-inclusive package

(iii) Food selected by customer is not cooked to their taste or liking

(iv) Filling up the plate with bread and various side dishes which tend to remain unfinished as customers prefer to finish off the protein first

(v) Overfilling the plate when fewer guests are around to judge

5.3 Recommendations

5.3.1 Plan Menus and Food Preparation

Food establishments and caterers need to examine leftover food and plate waste to determine customer preferences and tastes. Food menus and buffet selections should then reflect these findings and offer food dishes enjoyed by most diners, especially if one has a rotation menu, to try to limit food waste.

This was clearly noted during the self-service half-board, where most of the guests were mainly Maltese and British. One of the main dishes was braised rabbit, which the Maltese love since it is a traditional dish, but this was cooked by a Philippine chef, and it was cooked in "adobo style" which was enhanced with soy sauce and vinegar. Unfortunately, it did not go well with the Maltese palate, and most of it ended being thrown away. In fact, average plate waste was high compared to the other set-ups even though all the plates were reduced in size.

Front of house should also assist in creating guest profiles so chefs can plan accordingly to their requirements. Also, when possible, guests should be asked whether they are going to dine in or not so that the kitchen staff would have a better idea of the amount of food to prepare for the buffet.

Food waste management software is available to help businesses track, measure, control and transform food wastage using AI technology.

5.3.2 Do Not Make Any Assumptions

Most of the waste could be avoided if one just asks the customer what they want rather than presuming. The data in section 4.4.6 Set-Up F – Pre-order Event shows that most of the waste returned on that occasion was meat, which was cooked medium for all guests who opted for this main course item. Since guests were not asked by the organisers to specify their preference in how they would like their meat to be cooked with their pre-order of food, the older generation who are not keen on consuming medium cooked "bloody" meat, either requested for it to be returned to the kitchen to be cooked to their liking or discarded it on their plates.

The Food and Beverage Department needs to research and discuss with their clients to determine the guests' preferences. This will allow Chefs to adapt and create a buffet menu, a set menu or a hybrid menu which will minimise waste and use sustainable ingredients where possible.

5.3.3 Involve Employees in Waste Management

By involving employees, one can train them and have the same aim to reduce plate waste. Once they adopt this role, they will encourage others to less wasteful behaviour. Servers and food assistants need to be well prepared in helping diners make an informed meal choice. They should know what they are serving so they can assist in dietary requirements, taste preferences, spice levels, and portion size. They are the customers' first point of reference and should seek to build a relationship with their customers to meet their expectations and obtain feedback. The higher the degree of customer satisfaction the less plate waste.

5.3.4 Recruit the Right Team

Even prior to the pandemic, the hospitality industry faced staff shortages, however as indicated by the Chefs interviewed in this study, recruiting the right team with the required level of confidence and experience in the kitchen is currently a challenge. This affects operational efficiency particularly food preparation and waste management.

As observed in Set-Up B during the self-service, given that there was only one chef available to manage the buffet during the dinner service, extra food was prepared to ensure that there would be enough readily available food in case of walk-in guests. This resulted in over than 60% of the total amount of food prepared being returned to the kitchen at the end of the service as leftovers; the highest percentage of leftovers measured during this study.

Upon further enquiry, the chef stated that if this problem of staff manning persists, the Food and Beverage department would have to opt to an alternative catering solution, such as outsourcing food from companies which operate in a ghost kitchen. In this case the hotel will just employ service staff and the role of the chefs would be just to reheat and refill the buffet. This could keep food cost at a steady level but would diminish the quality of the food.

5.3.5 Minimise Leftover Waste

When possible, one should store leftovers immediately as per food safety regulations and procedures before they spoil and go to waste. These can be taken out again the next day if the quality is unchanged or repurposed in other dishes. Also, as noted from the evaluation of the research data and the case studies, most of the hotels in Malta place any adequate leftovers in the staff canteen if available. Alternatively, leftover food that is safe for human consumption can be donated to charities or soup kitchens for immediate consumption. The remaining leftovers can be passed through an anaerobic digestor or composting operation to turn it into compost and sold to farmers.

(Ludovica Principato, 2018) suggested in his research that one should adopt and promote the doggy bag system, when possible, where one could enjoy the rest of their meal at home, instead of being thrown away by the food establishment. However, this measure should be accompanied by simple food safety instructions to the customer, such as ‘consume within X hours and do not reheat.’ Though it is debatable whether the doggy food bag will be really eaten at home after all, or just forgotten in the fridge and thrown away anyway, generating more waste due to the packaging.

5.3.6 Explore and Try Out New Food Service Set-ups

An evaluation of food waste data gathered from seven case studies, detailed in Chapter 4, indicates that various food service set-ups produce different levels of food waste. A set-up which worked well with local guests, especially with COVID-19 restrictions, was a par plated buffet or hybrid buffet (Section4.4.5 Set-up E). With this concept, one can adjust the number of pre-plated bowl food or small plates issued on the buffet display according to the flow of guests arriving, whilst keeping the remaining food well stored and having the buffet always looking fresh. The second part of the buffet was chef-assisted allowing better control of food portions, minimising plate waste. In fact, from this set-up only 3% of the amount of food prepared was discarded by customers.

Research results also show that hybrid meals – combining several types of food service such as family-style starters with a la carte mains and desserts. Whilst still offering guests the liberty of choosing what food they prefer, with meal sharing food portions are controlled, and having plated courses enables food to be prepared per order, thus saving on food waste.

Another constructive approach to serving food is having a pre order menu. This enables the kitchen brigade to prepare food according to client requests, in the correct amount and without having excessive preparation. This can be seen from data collected in Set-Up F – Pre-order Event, where there were no leftovers from prepared food in contrast with Set-up A – Buffet Self-Service, where 31 kilos of leftover food remained untouched (27% of prepared food).

5.3.7 Other Techniques

Whilst conducting the case studies, it was noted that when bread was being placed in a breadbasket in the middle of the table, the guests took the edge off their appetite before the proper meal had reached the table. Bread should ideally be served by a waiter, where each guest at the table is presented a selection of bread to choose from, and only offered more bread at the guest's request.

Using smaller plates and serving utensils at buffets is another measure proven to prevent guests from over-serving themselves. Also 'nudging' techniques can be used to promote food waste reduction, such as displaying signs encouraging customers to come back to the buffet and help themselves more than one time rather than over filling their plate in one helping (Kallbekken, S. and Sælen, H., 2013).

5.4 Way Forward

Hotels and other food establishments have a vital role in reducing food waste. When we waste food, we waste the labour, effort, investment, and precious resources (like water, seeds, feed, etc.) that go into producing it, transporting it and processing it.

Changes need to be introduced gradually, giving time for customers to adjust to new concepts such as reducing the spread of food, focusing more on par plated or plated and finding the ideal plate size. We need to educate the consumer and trigger behavioural changes and patterns to reduce waste. Plate waste analysis and data should be accessible to consumers. This awareness could change consumers behaviour and at the same time management could adapt to these audits.

CHAPTER 6 CONCLUSION

6.1 Conclusion

This study provides an understanding of the type of plate waste generated in buffets in hotels on the Maltese Islands. The approach was supported by literature which was found online and through books as well as questionnaires and data which was collected particularly for this research study.

An average of 6% plate waste was generated from the various food service set-ups analysed in this study. This is encouraging compared to Europe's plate waste average of 34%. The study showed in certain set-ups the amount of plate waste was deducted dramatically, from an average of 7.2 kilos to 460 grams. This number can be demonstrated in per customer basis where each customer produced an average of 91 grams per meal. When comparing this study with previous research, this number is lower, especially when one compares different buffet and plating setups.

The result of this analysis has indicated that most food waste generated at buffets was mainly due to the number of customers, style of food and even fixed practices by the Hotel. This study demonstrates that the volume of waste can be reduced by adjusting the buffet set-ups, involving, and training employees when serving and where possible using smaller crockery (plates and bowls). This approach could be a potential learning curve in the hotel industry, although one must analyse the pros and cons particularly when discussing with management. The only issue mentioned when setting these buffets would be, that crockery such as glass ware might increase due to breakages or theft by customers, as well as the need to add more staff, especially now a days where labour costs are sky high, and it has become impossible to find suitable staff.

During the seven different meals set-ups, one could notice a substantial decrease of plate waste from one set-up to another. Therefore, the researcher strongly suggests that by introducing bowl food and a chef or waiter service in a buffet set-up, this can prove to be a useful way in reducing solid plate waste. This reduction would significantly decrease food waste, but energy required for storage and transportation. The researcher can also see and

understand the different strategies from the managerial responses to plate waste and customers perspective which will also reflect the hotels margins.

In this study, the researcher assessed food leftover on the buffet counter that mostly had to be discarded to understand the relationship between different buffet layouts, sources of food waste and overall food service wastage. The weight of guests' leftovers and buffet counter leftovers from the 7 set-ups were analysed in order to expand the potential impact of such events. Data shows that set up that involved a chef assisting and buffet that included bowl food had a consistent wastage. The speculations are that chefs are directly monitoring the food consumed and therefore effectively control the portion control. By contributing to these changes, the hotel industry can help to reduce the gap between on how much food is being produced and at the same time how much our clients are consuming. Future work is required to support and understand of what type of serve ware may influence perceptions and expectations for fulfilment. In contrast within the research done, one should explore alternatives to wasting food and if in any scenario one should be given alternatives to save their food for later or packed to be taken home. The researcher current view was to identify one driver of food waste, but encourages the expansion of a more focused, rational, and appropriate mechanisms that impact food waste.

6.2 Environmental Impacts

This problem can be a great opportunity to understand why studies like these should be taken into consideration. Now a days one should invest in digital tools that can help measure and manage waste which can reliably cut food waste by half reducing the gap from 15% to 3.5%. The hotel sector should be more aware of addressing food waste especially in the era where consumers are attached to more ethical brands and are willing to travel to more eco-friendly destination and hotels that offer these practices. Moreover, introducing sustainable habits such as recycling, buying local and seasonal ingredients and composting, gives you an opportunity to be ahead of others and can give the hotel a reputation amongst clienteles. This magnitude of the food waste problem should be a wakeup call for all the consumers and that there is a direct connection between food waste and negative environmental impact. Malta should introduce the Green Restaurant recognition where one will be awarded with points and certification if they met the criteria and terms of being sustainable, eco-friendly, and renewable.

References

Alexandra Betz, J. B. C. G. C. M., 2015. Food waste in the Swiss food service industry - Magnitude and potential for reduction. *Waste Management,* Volume 35, pp. 218-226.

Andrew Parry, B. H. K. F. a. H. F., 2019. *The Global Goals For Sustainable Development,* UK: WRAP.

Austin Clowes, P. M. C. H., 2017. *Champions 12.3.* [Online]
Available at: https://champions123.org/sites/default/files/2020-07/business-case-reducing-food-loss-waste-catering.pdf
[Accessed 17 November 2020].

B Wansink, K. J., 2014. The Clean plate club. *International Journal of Obesity,* 39(2), pp. 371-374.

Brian Wansink, K. v. I., 2013. Portion Size Me: Plate-Size Induced Consumption norms and win-win solutions for reducing food intake and waste. *Journal of Experimental Psychology,* 19(4), pp. 320-332.

Carol S. Saunders, K. E. P. D. F. G., 2019. A Strategic Approach. In: L. Johnson, ed. *Managing and Uisng Information Systems.* s.l.:John Wiley & Sons, p. 368.

ChenFeng Kuo, Yahui Shih, 2016. Genfer differences in the effects of education and coercion on reducing buffet plate waste. *Journal of Foodservice Business Research,* 19(3), pp. 223-235.

David Pace, i., 2020. *Futouristic Food Waste.* [Online]
Available at: https://issuu.com/instituteoftourismstudies/docs/futouristic_1st_issue
[Accessed 1 March 2021].

Dhiman, A., Sen, A. & Bhardwaj, P., 2018. Effect of Self-Accountability on Self-Regulatory Behaviour. *Journal of Business Ethics,* 148(1), pp. 79-97.

Edmund Goh, F. J., 2019. To waste or not to waste: Exploring motivational factors of Generation Z hospitality employees towards food wastage in the hospitality industry. *International Journal of Hospitality Management,* Volume 80, pp. 126-135.

Effie Papargyropoulou, J. K. S. N. W. R. L., 2019. Patterns and causes of Food Waste in the Hospitality and Food Service Sector. *Sustainability,* 11(21).

Effie Papargyropoulou, N. W. R. L. J. S., 2016. Conceptual framework for the study of food waste generation and prevention in the hospitality sector. *Waste Management,* Volume 49, pp. 326-336.

Emil Juvan, B. G. S. D., 2017. Biting Off More Than They Can Chew: Foof waste at Hotel Breakfast Buffets. *SAGE journals,* 57(2), pp. 232-242.

European Commision Food Safety, 2019. *European Commission.* [Online]
Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52020DC0381
[Accessed 14 November 2020].

European Platform on Life Cycle Assessment, 2011. *European Commission.* [Online]
Available at:
https://eplca.jrc.ec.europa.eu/FoodSystem.html#:~:text=Regarding%20food%20waste%20accounting%2C%20the%20EU%20food%20system,to%29%20the%20food%20waste%20generated%20in%20the%20EU.
[Accessed 11 2 2022].

FAO, 2014. *Food wastage footprint,* s.l.: FAO.

Forbes, 2018. *Forbes.* [Online]
Available at: https://www.forbes.com/sites/quora/2018/07/18/what-environmental-problems-does-wasting-food-cause/?sh=7aba915b2f7a
[Accessed 7 November 2020].

FUSION, 2016. *Estimates of European food waste levels,* Stockholm: FUSION.

Hargreaves, T., 2011. Practice-ing behaviour change: Applying social practice theory to prp-environmental behaviour change. *Journal of Consumer Culture,* 11(1), pp. 79-99.

Hennchen, B., 2019. Knowing the Kitchen: Applying practice theory to issues of food waste in the food service sector. *Journal of Cleaner Production,* Volume 225, pp. 675-683.

Hennchen, B., 2019. Knowing the Kitchen: Applying practice theory to issues of food waste in the food service sector. *Journal of Cleaner Production.*

Hyatt, 2022. *Hyatt.* [Online]
Available at: https://about.hyatt.com/en/world-of-care.html
[Accessed 4 2 2022].

IDEO, 2017. [Online]
Available at: https://www.ideo.com/news/hotel-buffets-a-culprit-of-food-waste-get-downsized

Juha-Matti Katajajuuri, H. L. J., 2014. Food waste in the Finnish food chain. *Journal of Cleaner Production,* Volume 73, pp. 322-329.

Kahn, B. E., 2004. The Influence of Assortment Structure on Perceived Variety and Consumption Qualities. *Journal od Consumer Research,* 30(4), pp. 519-533.

Kirsi Silvennoinen, L. H. J.-M. K. A. R., 2015. Food waste volume and origin: case studies in the Finnish food service sector. *Waste managment,* Volume 46, pp. 140-145.

Klein, S. D. W. C. S. B. F. W. J. E. C. a. N. L., 2008. *Dirty Dinning report.* [Online]
Available at: http://www.cspinet.org/dirtydining/DirtyDinningReport.pdf.
[Accessed 23 January 2022].

Knezevic, B., Kurnoga, N. & Anic, I.-D., 2019. Typology of university students regarding attitudes towards food waste. *Bristish Food Journal,* 121(11), pp. 2578-2591.

Leanpath, 2019. *Leanpath.* [Online]
Available at: https://www.leanpath.com/wp-content/uploads/2018/10/WP_BuffetFoodWaste_US_EN.pdf
[Accessed 2 February 2022].

Life FOSTER, 2019. *Life FOSTER.* [Online]
Available at: https://www.lifefoster.eu/wp-content/uploads/2020/02/2.-Food-waste-in-the-restaurant-sector.pdf
[Accessed 14 November 2020].

Lin, S. S., 2016. Waste stream Analysis of All-You-Can-Eat Buffet. *European Journal of Hospitality and Tourism Research,* 4(3), pp. 1-27.

Lipinski Brian, H. C. L. J. K. L., 2013. *Creating a sustainable food future: Reducing food losses and waste,* Washington: WRI.

Ludovica Principato, C. A. P. L. S., 2018. Towards Zero Waste: an Exploratory Study on Restaurant managers. *International Journal of Hospitality Management,* pp. 130-137.

Magda Wilewska-Bien, L. G. K. A., 2020. Pathways to reduction and efficinet handling of food waste on passenger ships. *Enviroment, Development and Sustainability,* Volume 22, pp. 217-230.

Majorie R. Freedman, C. B., 2009. Reducing Portion Size Reduces Food Intake and Plate Waste. *Obestity,* 18(9), pp. 1864-1866.

Martin-Rios, D. C., 2021. *EHL Hospitality Business School.* [Online]
Available at: https://hospitalityinsights.ehl.edu/sustainable-gastronomy-an-opportunity-for-a-green-recovery?_ga=2.143251061.1971602884.1601886230-460734372.1576662809
[Accessed 28 January 2022].

Michaelson, A., 2018. *Sciencing.* [Online]
Available at: Ethics are norms or standards of behaviour that guide moral choices about our behaviour and our relationships with others. The goals of ethics in research is to ensure that no one is harmed or suffers adverse consequences from research activities.
[Accessed 29 September 2020].

Micheal S. McCarthy, E. H. F., 2000. An exploratory investigation of customer penalties: assessment of efficacy, consequences and fairness perceptions. *Journal of Services Marketing,* 14(6), pp. 479-501.

Mike Von Massow, B. M., 2015. Table Scraps: An Evaluation of Plate waste in Restaurants. *Journal of Foodservice Business Research,* 18(5), pp. 437-453.

Mirosa Miranda, M. H. M.-W. E. P. D., 2016. Reducing waste of food left on plates. *British Food Journal,* 118(9), pp. 2326-2343.

Nils-Gerrit Wunsch, 2021. *Statista.* [Online]
Available at: https://www.statista.com/statistics/237215/average-away-from-home-food-expenditures-of-united-states-households/
[Accessed 28 January 2022].

Oxfam, 2021. *Oxfam.* [Online]
Available at: https://www.oxfam.org/en/world-midst-hunger-pandemic-conflict-coronavirus-and-climate-crisis-threaten-push-millions
[Accessed 28 January 2022].

Rockefellerfoudation, 2021. *Rockefellerfoudation.* [Online]
Available at: https://www.rockefellerfoundation.org/wp-content/uploads/2021/07/True-Cost-of-Food-Full-Report-Final.pdf
[Accessed 28 January 2022].

Sanaa I. Pirani, H. A., 2016. Reduction of food waste generation in the hospitality industry. *Journal of Cleaner Production,* Volume 132, pp. 129-145.

Sara Dolnicar, E. J. B. G., 2019. A sharing-based approach to enticing tourists to behave more enviromentally friendly. *Journal of Travel Research,* 29(1), pp. 241-252.

Sara Dolnicar, E. J. B. G., 2020. Reducing the plate waste of families at hotel Buffets. *Tourism Management,* Volume 80.

Silvia Scherhaufer, G. M. H. H. K. W. G. O., 2018. Environmental impacts of food waste in Europe. *Waste Management,* Volume 77, pp. 98-113.

Somerville, S., 1995. Short cuts- 20 quick ways to slash kitchen costs.. *Restaurant Hospitality,* 79(4), p. 46.

Steffen Kallbekken, H. S., 2013. 'Nudging' hotel guest to reduce food waste as a win- win environmental measure. *Economics Letters,* 119(3), pp. 325-327.

Tim Searchinger, R. W., 2018. *Creating a sustainable food future,* Washington: World Resources Institute .

Troitino, C., 2017. *Forbes.* [Online]
Available at: https://www.forbes.com/sites/christinatroitino/2017/09/14/the-tragedy-of-the-buffet-commons-reducing-food-waste-at-hotels/?sh=1d6b49a617dc
[Accessed 7 November 2020].

Unilever Food Solutions, 2011. *Unilever Food Solutions.* [Online]
[Accessed 23 January 2022].

Unilever Food Solutions, 2011. *World Menu Report- Global research findings,* London: Unilever Food Solutions.

W Bender, M. s., 2002. Population, Food and Nutrition. *Population Bulletin,* 51(1).

Working to Reduce Food Waste, 2020. Working to reduce food waste: Investigating determinants of food waste amongs taiwanese workers cafeteria settings. *Sustainabiliy,* 12(22).

Wrap, 2013. *Wrap.* [Online]
Available at: https://wrap.org.uk/sites/default/files/2020-08/WRAP-hhfdw-2012-main.pdf

WRAP, 2016. *The True Cost of Waste in Hospitality and Food Service.* [Online]
Available at: https://wrap.org.uk/content/true-cost-waste-hospitality-and-food-service
[Accessed 7 November 2020].

WRAP, 2020. *WRAP*. [Online]
Available at: https://wrap.org.uk/content/overview-waste-hospitality-and-food-service-sector
[Accessed 14 November 2020].

Zeeshan Ali, H. E. A. C., 2017. All you can eat Buffets, Obesity, mindfulness, and mindful eating. *Journal of Psychology and Psychiatry*, 1(1), pp. 1-5.

Appendix A Questionnaire

Dear Sir/Madame,

My name is Jonathan Zammit and I am currently reading for an MBA in International Hospitality Management at the Institute of Tourism Studies. As part of my final year research study, I am conducting a research analysis on the Hospitality Industry. The title of my research project is 'Tackling Plate Waste and Customers behaviour on Buffets in Hotels on the Maltese Islands'.

The scope of this research study is to delve into the way forward on plate waste and customer behaviour in hotels during a self-service Buffet. The researcher wants to test if the changing of buffet setups will reduce plate waste. As Chefs, our main interest when preparing a buffet is to have a broad selection of nutritional wholesome foods, provided in a sustainable manner and as a researcher the scope is to identify, determine the customers perception and behaviour to avoid having plate waste.

To conduct the research effectively, several interviews will be carried out. These will be aimed at experienced personnel within the industry. I am kindly inviting you to take part in my research study as an experienced individual within this multifaceted industry. A consent form is attached to this email for you to kindly complete and return should you accept to take part in this research study. Should you request it, your responses will remain anonymous. Please inform me whether you would like to respond to these questions via email, or through a face-to-face appointment at your earliest convenience.

Should you require any further information feel free to contact me.

Thank you for your time.

Kind Regards,

Jonathan Zammit

1. In your opinion why and how does plate waste occur?

2. Do you keep in mind seasonality and sustainability when menu planning?

3. When menu designing, do you research your guests target market and preferences so not to have any wastages and dislike of food?

4. Do you look at technical skill and competency level when employing chefs, keeping in mind preparation and wastage?

5. Do you see a difference in food disposal during an a la carte service and a self-serving buffet service?

6. Do you think it is important to take note of hotel occupancy or walk-ins, not to over prep?

7. What strategy do you follow, to have the buffet bulked up or have a wide variety of different options?

8. Does the staff engage to prevent food waste?

9. Do you explore guests' eating behaviour and expectations, which further contribute to the capacity of waste generated?

10. Which food categories would you remove from the buffet to reduce plate waste?

11. Which part of the food cycle do you think that one can find a lot of wastage?

12. After Covid restriction are over, do you consider leaving half of the buffet platted and a waiter serving, or return to the self-service system that most of the clients are used to?

13. Do you consider composting food waste in your establishment?

14. What do you do with any leftovers? Are they reused or given to the staff in the canteen for example?

Appendix B Raw Data

Plated Event with Pre Order - Wedding 41 pax			
Dish	**No Pax**	**Individual Plate**	**Total**
Canapes- 2types	41	20gr	820gr
Bread- 2 types	41	70gr	2870kl
Starter Qunioa and carrot	7	240gr	1680kl
Starter Poached chicken and almond	34	140gr	4760kl
Intermediate- Tomato risotto	19	340gr	6460kl
Intermediate- Lobster bisque	22	170ml	3740kl
Main -Fish	10	190gr	1900kl
Main- Beef	26	245gr	6370kl
Main- Vegan	5	190gr	950kl
Potatoes- portion by3	13	350gr	4500kl
Veg- portion by 3	13	269gr	3500kl
Dessert- Crème Brulee	41	140gr	5740kl
		Food prepared	**43.290 Kl**
		Average consumed per person	**1.055kl**
		Total plate waste	**5.3kl**
		Average waste per person	**129gr**

Buffet Half Board 4 Star Hotel Self service- 15 pax			
Dish	**Amount before**	**After**	**Consumed**
Salads- tomatoes, lettuce, cucumber, artichoke	9kl	6kl	3kl
Vegetable soup-	8.4ltrs	6.2ltrs	2.2
Pasta sauce with sausage	6.8kl	5.1kl	1.7
Pasta	2kl	500gr	1.5
Chicken with mushroom sauce	5.15kl	2.1	3.05
Noodles with vegetable	2.9kl	1.4	1.5
Cottage pie	8kl	6.4	1.6
swordfish with shrimp sauce	4.3kl	2.1	2.2
Cauliflower with mornay sauce	4.3kl	1.1	3.2
	50.85kl	**30.9kl**	**19.95kl**
	Produced Food	**50.85kl**	
	Consumed food	**19.95kl**	
	Average consumed per person	**1.33kl**	
	Plate waste	**2.57kl**	
	Avg plate waste per person	**171gr**	

	Lunch Function 70 pax- Plated starters & chef assited buffet 5 Star Hotel					
		Placed on Buffet	**Left over**	**Consumed**		
Starters Plated:						
Bacon and tomato chutney croissants		90*60gr=5.4kl	36*60=2.1kl	3.3kl		
Aubergine and feta salad with toasted pita		60*95gr=5.7kl	36*95=3.4	2.3kl		
Heritage tomatoes and cottage cheese		70*82gr=5.75kl	48*82=3.9kl	1.85kl		
Hummus with vegetable crudities		70*87= 6.09kl	44*87=3.8kl	2.29kl		
Bread rolls		140*35=4.9kl	86*35=3.01kl	1.89kl		
Main:						
Potatoes		14.9kl	8.9kl	6kl		
Fresh local vegetables		16.2kl	6.8kl	9.4kl		
Baked salmon with sauce		8.1kl	2.6kl	5.5kl		
Breaded Turkey breast		9.9kl	1.4kl	8.5kl		
Tomato Ragu for turkey		6kl	3.13kl	2.87kl		
	Prepared food	**82.94kl**				
	Left over	**39.04kl**				
	Consumed	**43.9kl**				
	Average consumption per person	**487gr**				
	Plate waste	**2.15kl**				
	Average plate waste	**23gr**				

Self service buffet 60 pax Half board 4 star Hotel						
Starters:						
		Placed on buffet	**Left over**	**Consumed**		
	Tomatoes	2.3kl	1.07kl	1.23kl		
	Lettuce	1.2kl	547gr	653gr		
	Mixed beans	1.12kl	732gr	388gr		
	Coleslaw	2.2kl	100gr	2.1kl		
	Pickled red cabbage	1.35kl	424gr	926gr		
	Pickled cauliflower	2.06kl	1.34kl	720gr		
	French beans	1.97kl	1.56kl	410gr		
	Deep fried white bait	2kl	300gr	1.7kl		
	Sliced parmaham	1.87kl	80gr	1.8kl		
Main:						
	Fusilli with maltese sausage	7.79kl	2.8kl	4.9kl		
	Warm cous cous	3.5kl	1.5kl	2kl		
	Perch fish	5.4kl	450gr	4.9kl		
	Rabbit Adobo style	8.8kl	3.2kl	5.6kl		
	Curried beef Madras	6.5kl	140gr	6.4kl		
	Mixed vegetables	5.5kl	2.6kl	2.9kl		
	Potatoes gratin	7.5kl	2kl	5.5kl		
	Steamed rice	5.2kl	1.4kl	3.8kl		
Dessert:		9kl	2kl	7kl		
	Total	**75.3kl**	**22.2kl**	**53kl**		
	Food Produced	**75.3kl**				
	Left over food	**22.2kl**				
	Consumed	**47.8kl**				
	Avg Consumption per person	**797gr**				
	Plate waste	**5.2kl**				
	Avg Plate waste	**86gr**				

	Chef assisted buffet 43 pax Dinner Players				
Starters:					
		Placed on Buffet	**Left Over**	**Consumed**	
Tomato		1.06 kl	650gr	359gr	
Mixed quinioa		800gr	560gr	240gr	
Marinated feta		740gr	450gr	290gr	
Rucola		700gr	310gr	390gr	
Potato salad		650gr	440gr	210gr	
Parmesan Shavings		900gr	410gr	490gr	
Avocado halfs		1 kl	310gr	690gr	
Fresh beetroot		830gr	410gr	420gr	
Parma ham		890gr	300gr	590gr	
Hot Items:					
White pasta		2kl	730gr	1.3 kl	
whole meal pasta		2 kl	230gr	1.8 kl	
Jasmine Rice		3kl	2.22kl	800gr	
Tomato sauce		3 ltrs	1.65 ltr	1.3ltrs	
Roast Potatoes		3.37 kl	2.57kl	800gr	
Warm cous cous		3.5kl	2.66 kl	900gr	
Seasonal vegetables		4kl	1.3kl	2.7kl	
Chicken breast		7kl	1.2kl	5.8kl	
Grilled calamari		3kl	1.1kl	1.9kl	
Grated parmesan		230gr	80gr	150gr	
Fresh carved fruit		4kl	1.1 kl	2.9kl	
	Total:	**42.6kl**	**18.6kl**	**24kl**	
	Food Produced		**42.6kl**		
	Left over		**18.6kl**		
	Consumed		**24.1kl**		
	Avg Consumption per person		**558gr**		
	Plate Waste		**460gr**		
	Avg Plate waste		**10gr**		

	Family service starters and plated for 42 pax						
Stater small plates sharing:				**Intermediate:**			
Beetroot and leeks		163*16=2.6kl		Pasta with olive, tomato ragu			70gr*29=2.1
Pumpkin and apple		182*16=2.9kl		Celeriac soup			120*16= 1.9 ltrs
Burrata and orange		187*16=2.9kl					
Capocollo		120*16=1.9kl					
Nduja arancini		50*45= 2.2kl					
Deep fried calamari		160*16=2.5kl					
Main:							
Beef striploin		230*15= 3.4 kl					
Duck leg confit - with out bone -40% 276* 15=4.1 kl							
Fish and aubergine= 240* 12= 2.8kl							
Vegetables and potatoes in bowls to share 470* 16= 7.5kl							
Bread white		41gr* 48 = 1.9kl					
Bread brown		41gr*42=1.7kl					
Dessert:							
Crumble	150*42= 6.3kl						
			Food served		**46.7kl**		
			Average food per pax		**1.1kl**		
			Total Plate waste		**9.2kl**		
		Avg plate waste per person			**220gr**		

Breakfast buffet 60 pax			
Healthy section:	**Placed on buffet**		**Returned**
Oat flakes	220gr		160gr
Bran flakes	420gr		200gr
Sesame seeds	60gr		40gr
Linseeds	90gr		60gr
Pumpkin seeds	70gr		20gr
Sunflower seeds	90gr		60gr
Dried Apricot	310gr		280gr
Prune	320gr		50gr
Cranberries	80gr		20gr
Weetabix	190gr		100gr
Cocopops	240gr		40gr
Muesli	510gr		130gr
Almonds	310gr		200gr
Cashew nuts	280gr		130gr
Pecan nuts	200gr		120gr
	3.4kl		**1.6kl**
Fruit:			
Red Apples whole	3.24kl		1.1kl
Green Apples whole	2.87kl		900gr
Whole oranges	2.7kl		200gr
Sliced oranges	3.7kl		1.2kl
Sliced melon	1.7kl		510gr
Sliced watermelon	2.5kl		670gr
sliced grapefruit	1.24kl		99gr
Black grapes	600gr		200gr
Pineapple sliced	2.2kl		100gr
Fruit Salad	2.25kl		1.4kl
	23kl		**6.4kl**
Hot section:			
Baked beans	3.2kl		500gr
Scrambled eggs	2.9kl		400gr
Poached eggs	900gr		270gr
Fried eggs	765gr		280gr
Mushrooms	3.4kl		700gr
cumberland sausages	4.4kl		1.2kl
Rosti potatoes	1.1kl		20gr
Bacon	3.1kl		30gr
Tomatoes	2.7kl		50gr
	22.5kl		**3.5kl**
Charcuterie:			
Breasola	400gr		120gr
Smoked turkey	370gr		220gr
Cured ham	810gr		310gr
Mozzarella	640gr		180gr
Edam	780gr		43gr
Emmenthal	690gr		57gr
Feta	1.5kl		1kl
cucumber	1.9kl		980gr
Tomatoes	580gr		210gr
Kalamata olives	760gr		710gr
	8.4kl		**3.8kl**
Total food placed on Buffet		**57.3kl**	
Food returned		**15.3kl**	
Total Food consumed		**42kl**	
AVG per person		**700gr**	
Total Plate waste		**4.8kl**	
AVG Plate waste		**80gr**	