



Escola Superior de Hotelaria e Turismo do Estoril

Master's Degree in Hotel Management

Master student Joana Daniela Silva Marques

The handling and economic impacts of food waste in the buffet of a hotel unit situated in Lisbon during breakfast

03rd of September of 2019



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Dissertation presented to the Estoril Higher Institute for Tourism and
Hotel Studies Estoril for the attainment of the master's degree in Hotel
Management

Dissertation supervised by PhD Professor Rita Peres and co-supervised by
Master Professor Carlos Ferreira da Costa

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Resumo

Actualmente, devido a um incessante crescimento na geração de desperdícios alimentares, nomeadamente na hotelaria, é possível observar um aumento no aparecimento de diversos impactos económicos. Tais impactos reforçam a importância de um controlo adequado da geração dos desperdícios alimentares, e dos seus custos diretos e indiretos, de modo a criar uma gestão mais sustentável do hotel, através do uso de modelos de gestão adequados. Dada esta realidade, esta investigação visa analisar os principais impactos económicos que resultam da geração dos desperdícios alimentares, juntamente com os impactos económicos provenientes de modelos de gestão e iniciativas quando aplicados a uma unidade hoteleira de quatro estrelas de uma cadeia hoteleira específica.

Corroborado pela revisão literária realizada sobre este tema, o estudo de caso apresentado permite, através da observação directa via método dedutivo, uma melhor compreensão da realidade dos desperdícios alimentares em Portugal e uma aprofundada investigação dos impactos económicos dos desperdícios alimentares num hotel de quatro estrelas situado em Lisboa. Contribui também para um maior aprofundamento desta questão na realidade da hotelaria portuguesa, proporcionando uma abordagem metodológica mais eficaz e prática que permite uma melhor compreensão do seu *food cost*, e uma análise detalhada da origem dos desperdícios alimentares do hotel, através do uso do modelo de análise de Papargyropoulou, Lozano, Steinberger, Wright, & Ujang (2014). Esta análise é limitada às fases de preparação de alimentos até à sua eliminação, bem como é restrita a apenas uma refeição, que é o pequeno-almoço. Devido à restrição do hotel por questões logísticas, não foi possível realizar uma análise superior a sete dias.

Esta investigação permite uma análise inovadora dos desperdícios alimentares, dado o reduzido número de estudos realizados no mundo e em Portugal. Contribui assim positivamente para a sociedade e para o hotel, dada a tentativa em aplicar alternativas mais sustentáveis dos diversos métodos de gestão de desperdícios alimentares. Futuros estudos deverão ser realizados de modo a permitir uma análise mais aprofundada dos impactos económicos dos desperdícios alimentares nas fases de recepção dos produtos alimentares e o seu armazenamento, e noutras refeições, tais como almoços, *snacks*, jantares, banquetes e *coffee breaks*.

Palavras-chave: Desperdícios alimentares; Hotelaria; Sustentabilidade; Impactos económicos; Controlo e Redução

Abstract

Nowadays, as a result of the incessant growth of the generation of food waste, namely in the hospitality sector, it is possible to observe an increase in the creation of various economic impacts. Such impacts support the importance to an adequate control of not only this type of waste but also of its direct and indirect costs, so as to create a more sustainable management of the hotel, through the use of suitable food waste management models. Taking into consideration this reality, this investigation aims to analyse the main economic impacts that result from the generation of food waste alongside the economic impacts that are caused when specific management models and initiatives are applied to a four-star hotel unit from a known hotel chain.

Corroborated by the literature review made on this issue, the case study presented allows, through a direct observation via a deductive method, a better understanding of the reality of food waste in Portugal, and an extensive investigation of the economic impacts of food waste in a four-stars hotel unit situated in Lisbon. It also contributes to a further deepening of this matter in the Portuguese hospitality reality, while providing a more effective and practical methodological approach, which allows a better understanding of its food cost, and a detailed analysis of the origin of the hotel's food waste, through the use of Papargyropoulou, Lozano, Steinberger, Wright, & Ujang (2014) analysis framework. This analysis is limited to the phases of preparation of food to its disposal, as well as is restricted in only one meal, which is breakfast. Due to the hotel's restriction and logistic reasons, it was not possible to analyse the food waste for more than seven days.

This research allows an innovative analysis of food waste, given the reduced number of studies carried out worldwide and in Portugal. It also makes a positive contribution to society, and to the hotel by trying to apply more sustainable alternatives to the food waste management methods. Future studies should be carried out so as to allow a more in-depth analysis of the economic impacts of food waste regarding the receiving and storing food phase, and other meals such as lunch, snacks, dinner, banquets, and coffee breaks.

Keywords: Food Waste; Hospitality; Sustainability; Economic Impacts; Control and Reduction

List of Abbreviations

ABC – Activity-Based Costing

AD – Anaerobic Digestion

APHORT – Associação Portuguesa de Hotelaria Restauração e Turismo

ASAE – Autoridade de Segurança Alimentar e Económica

CAC – Codex Alimentarius Commission

CCP – Critical Control Points

CML – Câmara Municipal de Lisboa

DL – Decree-Law

EBF – Portuguese Tax Incentives Statute

EC – European Commission Regulation

EU – European Union

EU-28 – Assembly of The Twenty-Eight Countries of The European Union

F&B – Food & Beverage

FAO – Food and Agriculture Organization

FIFO – First In – First Out

FW – Food Waste

GDP – Gross Domestic Product

HACCP – Hazard Analysis and Critical Control Point

HR – Human Resources

IPSS – Social Solidarity Institutions

IRC – Imposto sobre o Rendimento de Pessoas Colectivas (Portuguese Corporate Income Tax)

WRAP – Waste and Resource Action Programme

WWF – World Wildlife Fund

Chapter I – Introduction

Nowadays, due to the continuous growth of society and its needs, alongside the tourism industry, it is possible to observe an increase in food waste, leading to the creation of several economic impacts. Globally, around 1.3 billion tonnes of food waste are generated every year (FAO, 2018), while in Europe according to the European Commission (2018), every year about 88 million tons of food waste is created, bringing forth nearly 143 billion euros of economic impacts (FUSIONS 2016, cited by European Commission, 2018). In this way and given the importance that the hotel industry has today, it is possible to observe the crucial role of an adequate control of this type of waste thus enabling not only a significant reduction of the costs, but also allowing for a more sustainable management of a hotel (Pirani & Arafat, 2016).

In this manner, the investigation made in this internship report will first examine in the literature review the approaches of management of food waste in a hotel by explaining the definition of food waste, its categorisation, causes and quantification. Furthermore, it will also be analysed certain food waste management initiatives with an interconnect to the waste hierarchy. Lastly, it will be discussed the legislation applicable nowadays to food waste which impacts on certain possible initiatives for the management of food waste, such as HACCP and the Portuguese Tax Incentives Statute (EBF), inter alia.

Due to the significance of the issue in question in the reality of the hotels, and considering the request of anonymity from the hotel, the central and structuring objective is to **identify the economic impact of food waste during breakfast in the buffet of a four-stars hotel unit situated in Lisbon**, therefore combining itself with the starting question: “What are the economic impacts of food waste during breakfast in the buffet at a hotel unit from a known hotel chain situated in Lisbon?”. With the purpose of attaining the central objective, it was set forth four secondary objectives that allow a better understanding and response to the central objective. In this way, the first secondary objective aims to **define and quantify the various types of food waste observed at the buffet of the hotel during breakfast**, the second secondary objective purpose is to **list the causes of said food waste observed in the hotel**, and the third and fourth secondary objectives are to **specify the types of handling of food waste practised in the hotel unit**, and **enumerate methods and initiatives to minimize the negative economic impacts observed during the analysis to the hotel**.

Chapter II – Literature Review

1. Food Waste

Currently, despite the exponential growth of society and its food needs, there has been an upsurge in the generation of food waste not only in Portugal but also on a global scale. Such a creation of food waste has an extremely significant impact not only on the environment and society but also on the economy. For instance, according to Martín-Rios, Demen-Meier, Gössling & Cornuz (2018), it is estimated that around 842 million individuals in underdeveloped countries suffer from chronic hunger.

In this way, and considering that the hospitality industry is to be considered one of the industries that generate a high volume of food waste during the end of the food supply chain, more precisely in the foodservice sector due to the specificity of the business, food waste reaches approximately 46.2% of the total of waste generated by a hotel (Sandaruwani & Gnanapala, 2016), becoming imperative that there are a proper management and sustainable control of the production and generation of costs created by food waste. In other words, according to Martín-Rios *et al.* (2018), in view of the unsustainability of the food supply chain when producing food waste, it becomes vital to prevent, reduce or recycle the various types of food waste observed throughout a hotel production process.

However, scarce control actions or plans can be discerned for the control of this type of waste. According to the World Wildlife Fund (2016), the number of hotels applying management strategies for food waste is still reduced, thus illustrating the great need to train the industry directors and staff in properly quantifying food waste and its various management and control methods.

1.1. Definition and categorisation of types of food waste

In this way, and so that there is a better perception of the importance of the issue regarding food waste in the food supply chain, more specifically in the hotel sector, it is crucial to have an understanding of the meaning of the concept of food waste and of the elements that comprise this notion.

There are many definitions concerning the concept of food waste which vary according to the stage of the food supply chain in which this type of waste is generated. According to Okazaki, Turn, & Flachsbart (2008 *op cit.* Pirani & Arafat, 2014), food waste is any type of food that is not consumed by humans and that can be generated at any level within the food supply chain. However, according to Pirani & Arafat (2014), which focus on the concept of food waste in the hospitality sector, state that food waste is all and any type of food that was thrown away due to the process of food production of the hotel units, whether due to food spoilage regarding expiry dates, food preparation technique or from the plate scrapings or plate waste left by guests.

Food waste, according to these authors, can still be subdivided in avoidable food waste – that consists of any type of food which was edible to humans before being thrown away –, possibly avoidable food waste, that relates to all foods that are considered edible by certain individuals and not edible for others, or that may or may not be considered food waste depending on it is prepared, or not avoidable food waste. It should be noted that these authors still define avoidable and possibly avoidable waste as being edible, making waste not avoidable as being inedible.

Alternatively, Papargyropoulou, Lozano, Steinberger, Wright, & Ujang (2014) mention three major definitions of the concept of food waste, the first definition refers to and quotes the Food and Agriculture Organization (FAO, 1981) that establishes food waste as being consumable and healthy resources that, instead of being used for human consumption were discarded, lost, degraded or consumed by pests. It is important to mention that this definition encompasses the entire food supply chain. The second definition quoted by Papargyropoulou *et al.* (2014) is from Stuart (2009), which, in light of the first definition adds the idea that the notion of food waste should also include all edible resources that aim to feed animals or whose initial goal was not to feed the animal, but that for some reason was redirected to that effect. Lastly, Papargyropoulou *et al.* (2014) mentions the Smil's (2004) definition that is complementary to the two definitions above adding the idea that food waste is also associated with the idea of over-nutrition, that is the difference between the energy value of food consumed per capita and the energy value of food needed to meet the needs of the individual.

In a different perspective, FAO (2014 op cit. Papargyropoulou, Lozano, Steinberger, Wright & Ujang, 2016: 328) defines the concept of food waste as being:

“Food which was originally produced for human consumption but was not consumed by humans, instead it was directed into a non–food use (for humans), feed for animals or waste disposal (e.g. feedstock to an anaerobic digestion plant or incinerator, disposal at a landfill)”.

The authors Papargyropoulou *et al.* (2016), to also complement the definition provided by the FAO, categorise food waste into three different types similar to Pirani & Arafat (2014):

- Avoidable (and consumable) food waste (FW) which regards food that could have been consumed at any time before being discarded, even if they were no longer proper for consumption at the time of elimination of this waste;
- Non–avoidable food waste which includes parts of food which are not generally consumed, such as bones, banana peel, eggshells, amongst others;
- Possibly avoidable food waste relates to food which is considered consumable at certain times and not consumable in other circumstances, such as potato skins.

Under a different interpretation, Eriksson, Osowski, Björkman, Hansson, Malefors, Eriksson & Ghosh (2018), which cited Östergren *et al.* (2014), affirm that food waste is any food type, including its inedible parts, that have been diverted from the food supply chain in order to be disposed of or recovered, therefore covering composting, anaerobic digestion and the elimination through landfills, amongst other methods of recovery or disposal. In a similar perspective, the authors Juvan, Grün & Dolnicar (2018) point out that food waste is all varieties of food that was not consumed and can be generated at both the production and consumption stages of the food supply chain. These authors also define the concept of plate waste as being all types of food that were not eaten by the customer after the food being served to the client, categorising this type of waste inedible, not edible or possibly edible.

Garcia (2017: 90), after analysing the diverse range of connotations concerning the meaning of food waste, attempted to agglomerate different definitions and refers that “food waste is any food material (including its inedible parts) originally intended to be used to feed humans and not ultimately sold as planned for human consumption by the food business under consideration.” Therefore, and considering the numerous definitions discussed previously, the definition of food waste proposed and that will be used throughout the investigation so as to allow a better application of the hierarchy of food waste referred by the authors Papargyropoulou *et al.* (2014) and its food waste management strategies will be:

Food waste is any and every food produced in a hotel unit, including its inedible parts, which was intended to feed customers or guests, but ultimately culminated in not having this purpose, and can be further subdivided into avoidable and unavoidable.

This definition excludes, for future data collecting and processing to be obtained during the internship, other consumables such as drinks other than water, juices, and milk, the excessive energy consumption of food and all types of food which its initial objective is not for human nutrition/consumption. Sauces, oils and fats generated are also excluded. Included in this definition is the food waste that is redirected to disposal or reuse, whether using landfills, anaerobic digestion, donations to social solidary institutions, recycling via animal feed, composting, or reuse of food waste through the staff’s cafeteria of the hotel unit.

Regarding the categorisation of food waste, and based on the classification already established by the various authors referred above, food waste may be subdivided into four types:

- **Edible food waste** – This kind of food waste is still fit for consumption and will, therefore, be considered avoidable.
- **Inedible food waste** – This type of food waste will be based not only on the scraps of food from customers’ dishes but also will include any and every food

waste that can no longer be reused for human consumption, which can be then categorised into avoidable and unavoidable.

- **Avoidable food waste** – This category of food waste is linked to food waste from customers' dishes, kitchen errors and safety margins in food production, and can have the edible and part of the inedible food waste in this type.
- **Unavoidable food waste** – This sort of food waste relates to trimmings and cuts of food, like meat and other food products, including others.

However, it is relevant to emphasize that Garcia (2017: 94) also categorises certain types of food that tend to become food waste in hotels, such as “raw foods, unprepared and prepared ingredients, incomplete food, and final products (or meals)”. **Raw food** becomes food waste when it is damaged or expires, although it can also become food waste when it is transported, stored or does not meet the quality requirements of the hotel unit. Food waste relating to **unprepared ingredients** – such as trimmings and excessive cuts in ingredients – and **prepared ingredients** – ready to be mixed, used and cooked – is usually observed when these ingredients are damaged during the time of preparation. Food waste related to **incomplete food** is usually generated during food confection (e.g. cooking errors – burnt food), or during storage. Concerning food waste generated from **final products**, these are generally observed in the customers' dishes after consumption (plate scrapes) or during storage of these products (e.g. pre-consumption due to an incorrect temperature in refrigerators, among other factors).

1.2. Causes and factors related to food waste

Given that food waste occurs at various levels of the food supply chain, from food production to food consumption, it is possible to observe different causes that can lead to the creation of food waste (Linh, 2018). Therefore, and considering the various factors highlighted by the different authors reviewed, as well as to provide a better understanding, below are the enumeration of these causes subdivided between pre-consumer and post-consumer, to provide an awareness of the stages of food production present in a hotel unit that require a better control and management of food waste.

Causes interrelated to the pre-consumer stage:

- Cooking errors (ACM Environmental, 2018; Green Hotelier, 2018; Ortiga, 2017; Schneider, 2013) or use of incorrect food preparation techniques leading to the creation of food waste (Linh, 2018; Martin–Rios et al., 2018; Ortiga, 2017; Papargyropoulou et al., 2014; Parfitt, Barthel & Macnaughton, 2010; Pirani & Arafat, 2014; Pirani & Arafat, 2016; WRAP, Responsible Hospitality Partnership & Hollins, 2013);

There are several causes of food waste at the pre-consumer stage, one of these causes relates to the use of incorrect food preparation techniques or kitchen errors. According to Pirani & Arafat (2016), food waste tends to occur mainly at the preparation level when dealing with fresh and raw foods rather than products such as pasta or rice. On the other hand, certain errors in the kitchen, such as burnt food, also lead to the generation of food waste.

- Existence of unavoidable food waste (ACM Environmental, 2018; Green Hotelier, 2018; Martin–Rios et al., 2018), trimmings and excessive cuts brought about by the reduced experience or knowledge of the workers responsible for food production (ACM Environmental, 2018; Green Hotelier, 2018; Linh, 2018; Martin–Rios et al., 2018; Pirani & Arafat, 2016);

Even if certain food waste is not avoidable, such as bones, banana shells, eggshells, and so forth, it is sometimes possible to detect an additional cause to food waste that relates to the workers, which is based on excessive trimmings and cuts due to the limited experience of the workers responsible for this stage of food production. Therefore, it will be important to train the staff of the hotel so as to reduce the generation of this type of waste.

- Purchase and/or production of an excessive amount of food with the aim of satisfying customers and to convey an idea of quality, ranging from, according to certain authors, 3% to 30% of overproduction, or due to the difficulty that hotel units have in estimating with certainty the number of customers that will be served

(Pearson & McBride, 2017; Papargyropoulou et al., 2016; Martin–Rios et al., 2018; Linh, 2018; WRAP, Responsible Hospitality Partnership & Hollins, 2013; Pirani & Arafat, 2014; Pirani & Arafat, 2016);

Because of the difficulty in estimating the exact number of clients being served and to satisfy the customer as well as to convey an idea of quality, various hotels tend to pre-establish a percentage of safety margin that consists on the preparation of more meals than what is necessary, thus leading to the creation of food waste.

- Shortcomings in communication and coordination between the front office and back office may sometimes lead to incorrect information exchange between departments (Linh, 2018; Papargyropoulou et al., 2016);

Every so often, due to issues such as the time limitation for the accurate sharing of information, cultural gaps, language differences between staff, or different priorities/objectives amongst departments, certain inaccuracies may be generated in the exchange of information and coordination between departments, which may lead to a creation of food waste which revolves around misunderstandings in the regulation of food production, as seen exemplified by Papargyropoulou *et al.* (2016) when the authors mention the difficulty felt by the kitchen staff when important adjustments of previous information concerning changes made to existing booked tables, number of clients or to choice of menu made by the client and the sales department is not received in advance.

- Incorrect food storage (Martin–Rios et al., 2018; Ortiga, 2017; Papargyropoulou et al., 2014; Parfitt, Barthel & Macnaughton, 2010; Pirani & Arafat, 2014)

Occasionally, certain hotel units tend to incorrectly storage prepared food as well as raw ingredients leading to an increase in food waste.

- Food discarded due to confusion over expiry date (Papargyropoulou et al., 2014; Parfitt, Barthel & Macnaughton, 2010; Schneider, 2013), incorrect stock management or lack of quality audits to the food products received by suppliers (ACM Environmental, 2018; Green Hotelier, 2018; Martin–Rios et al., 2018; Ortiga, 2017; Papargyropoulou et al., 2014);

On a different perspective regarding inventory management, it is crucial that there is a verification of the quality conditions all food products received in a hotel unit, being also important to follow the method of stock control FIFO (*first in – first out*) and catalogue and labelling of all food products with its expiry date. In this way, it will be possible to reduce food waste generated from poor stock management, such as the existence of expired foods. On the other hand, following this method of stock control could possibly allow an easier way to reduce the likelihood of a misunderstanding behind the meaning of an expiry-date (e.g. best before or use by).

- Food safety practices (Linh, 2018);

Occasionally, due to public health issues and the legislation on the Hazard Analysis and Critical Control Points System (HACCP), it is possible to observe the creation of food waste in hotels. Such food waste is sometimes correlated with the need to control biological, physical or chemical hazards, which in turn can be originated from improper food storage or preparation mistakes, the incorrect temperature before, during and after meals production, or the poor handling of certain food products.

Causes interrelated to the post-consumer stage:

- Leftovers from customer plates, which may be linked to the customer beliefs or their culture, to the portions made available to the customer or the foodservice organization or type of service of the hotel (ACM Environmental, 2018; Green Hotelier, 2018; Linh, 2018; Martin–Rios et al., 2018; Ortiga, 2017; Parfitt, Barthel & Macnaughton, 2010; Papargyropoulou et al., 2014; Pirani & Arafat, 2016; WRAP, Responsible Hospitality Partnership & Hollins, 2013);

It should be noted that the availability of smaller dishes in buffets or the reduction of the portions presented to customers may allow a smaller generation of food waste. However, also regarding buffets, if customers are able to use several small dishes at the buffet, the strategy of reducing the size of the dishes may not be as effective. As for the a la carte service, it should be taken into consideration not only the needs of the client, so that the hotel does not produce portions higher than the amount that the customer truly consumes, but it is also advised for the hotel to weight the plate scrapes left by the clients in order to analyse and quantify which meal is generating more waste and correct

the food quantities to more appropriate portions considering the data collected (Linh, 2018; Pirani & Arafat, 2016).

- If a guest does not like a specific food product or ingredient used in a meal, it may lead to an unacceptance of the menu by the customer which in turn may bring about an equal increase in food waste (Linh, 2018; WRAP, Responsible Hospitality Partnership & Hollins, 2013);

In the case of food waste being generated by the unacceptance of the menu by the client, it is essential that guests are informed of the ingredients that make up the meal that they may intend to purchase, thus choosing a menu that is more suited to their tastes, therefore allowing for the possibility of reduction of food waste. On the other hand, the idea of the customer's perceived quality of the food served can also lead to the generation of food waste.

- The inefficiency of the type of service used – buffet or a la carte – may lead to an equal increase in the generation of food waste (Linh, 2018; Pirani & Arafat, 2014; Pirani & Arafat, 2016);

As stated by Pirani & Arafat (2016), a la carte service tends to produce less food waste than a buffet service. However, it should be noted that depending on the different types of buffet service, the amount of food waste will also tend to vary, leading to the creation food waste to be correlated with the excessive preparation of food products. So as to attract and satisfy their customers, certain hotels tend to increase the diversity of their food, which tends to generate more food waste.

1.3. Quantification of food waste

To attain a better perception of the reality and the issue related to food waste, Koh (2017) states that about 25% of the purchased food by the hotel units turns into food waste. Examples of case studies related to hotel chains and their generation of food waste are, for example, the Accor Hotel Group. The Luxury segment of this hotel group, which includes Sofitel and Pullman, generates about forty–seven tonnes of food waste every year, in its segment Midscale, as is the example of Mercure, one can detect a

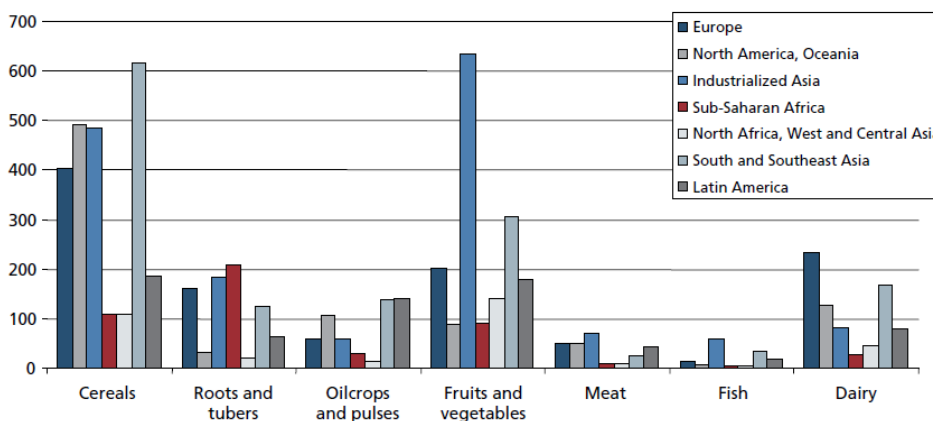
creation of thirty–five tonnes of food waste per year, followed by the segment Economy that generates a lower food waste volume, with Ibis producing about seventeen tonnes per year.

Hence, and in view of the above examples, food waste will be quantified at three different levels, so that one can get a real sense of the existing reality and its impact not only on society but also on the hotel industry.

1.3.1. Global food waste

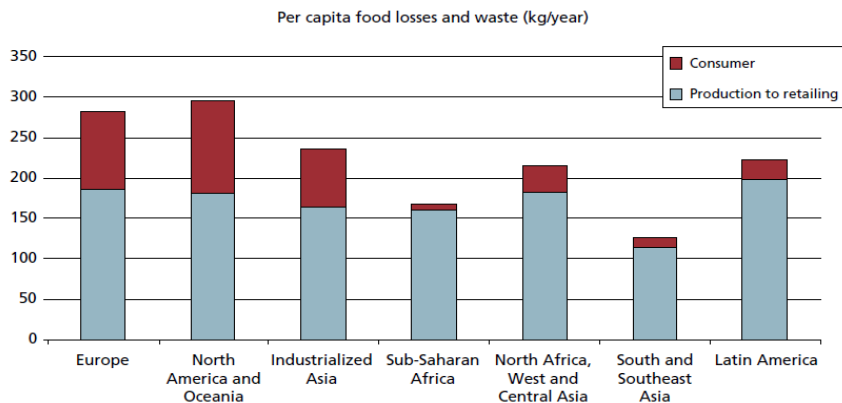
According to FAO (2011), about 1.3 billion tonnes of food is wasted every year, which denotes that about a third of the food produced for human’s consumption is wasted or lost along the food supply chain. In this way, it is crucial to point out that food waste can occur at all stages of the food supply chain – from production to consumption of food, with percentages rounding 24% of food waste in the production phase, 24% in the handling and storage phase, and 35% in the consumption stage (Lipinski, Hanson, Lomax, Kitinoja, Waite, & Searchinger, 2013). Food waste may be generated both in developed countries where food waste may reach a percentage of more than about 40% in the stages of distribution and consumption of the food supply chain (FAO, 2011) [about 56% of the total food waste generated worldwide comes from developed countries (Lipinski *et al.*, 2013)], as in developing countries where food waste may reach a percentage of more than 40% in the phases of production and harvest of food products (FAO, 2011).

As can be seen from Graphic 1 each is referred by FAO (2011), the commodity groups with most food waste are cereals and fruit and vegetables.



Graphic 1 – Production volumes of food waste of each commodity group, per region in the world (million tonnes) (FAO, 2011)

In another perspective, FAO (2011) also refers the food waste weight variations in weight by stages of the food supply chain and by region in the world. According to Graphic 2, the regions that generate the most food waste are Europe and North America, with about 280 to 300 kilos of food lost or wasted each year per person, respectively. In contrast, the regions that produce the least food waste are South and Southeast Asia and Sub-Saharan Africa with food waste ranging from 120 to 170 kilos of food per year and per person, respectively.



Graphic 2 – Food waste volume at consumption and pre-consumption stages per region in the world, per capita (FAO, 2011)

As far as the cereals commodity group (see Graphic 43 in the Annexes), more specifically in developed countries, food waste caused in the consumption stage represents a percentage between 40% to 50% of the total food waste generated in the food supply chain (FAO, 2011). Relatively to developing countries for the same commodity group, food waste is mainly generated during the production, harvesting and storage stages with percentages also above 40% (FAO, 2011).

In the commodity group of roots and tubers (see Graphic 44 in the Annexes), in developed countries, it is possible to observe a high volume of food waste at the agricultural production stage, due to the quality standards defined by the distribution industry, more specifically the retailers, and in the phase of consumption (FAO, 2011). In developing countries for this commodity group, observable food waste is mainly created in the production, harvesting and storage phases (FAO, 2011).

For the commodity group of pulses and oilseeds (see Graphic 45 in the Annexes), a higher generation of food waste can be observed in developed countries during agricultural production, with about 6 to 12% during the harvest phase (FAO, 2011). For developing countries in this commodity group, observable food waste is mainly created at the stages of agricultural production, post-harvest handling and storage (FAO, 2011).

Relatively to the fruit and vegetable commodity group (see Graphic 46 in the Annexes), higher levels of food waste can be seen in developed countries during agricultural production due to the quality standards defined by retailers in the distribution industry and at the consumption stage (with values ranging from 15% to 30% of food waste in relation to consumer purchases) (FAO, 2011). In developing countries, this commodity group has a superior volume of food waste during the food production stage which can be justified by the deterioration of crops caused by the tropical and warm climate of many developing countries (FAO, 2011).

In the case of the commodity group relative to meat products (see Graphic 47 in the Annexes), the largest volumes of food waste observed in developed countries occur at the consumption stage of the food supply chain, due to the high per capita meat intake in Europe and in the United States of America. (FAO, 2011). As far as developing countries are concerned, there is an even distribution of the volume of food waste through the various stages of the food supply chain (FAO, 2011).

For the fish and seafood commodity group (see Graphic 48 in the Annexes), a higher percentage of food waste can be found in developed countries at the production stage due to an observation of discard rates between 9% and 15% of fish caught and also at the consumption stage (FAO, 2011). In developing countries, this food waste is most observable in primary production due to discard rates between 6% and 8% of the fish and seafood caught and at the distribution stage taking into account the high levels of deterioration of fresh fish and seafood supply (FAO, 2011).

Lastly, the dairy products commodity group (see Graphic 49 in the Annexes) shows food waste percentages between 40% and 65% of the total food waste observed in developed countries at the consumption stage. On the other hand, losses during the milk production phase also show substantial values in these countries due to dairy cow infections (FAO, 2011). In developing countries, this type of waste is mostly observed in the post-harvest handling, storage and distribution phases (FAO, 2011).

1.3.2. Food waste in Europe

According to Stenmarck, Jensen, Quested & Moates (2016), it is estimated that food waste in the whole of the twenty-eight countries of the European Union (EU) – the EU-28 (see Table 49 in the Annexes for values of food waste per country) – have

reached in 2012 a volume of eighty–eight million tonnes, including both edible and inedible food waste. Moreover, the authors estimate that the sector of the food supply chain that contributes the most with food waste are households, with around forty–seven million tonnes every year (53%), followed by the processing sector, with approximately seventeen million (19%), the foodservice sector with eleven million (12%), the sector of primary production with nine million (11%) and the wholesale and retail sector with five million (5%) (see Table 1).

Sector	Food waste (million tonnes) with 95% CI*	Food waste (kg per person) with 95% CI*
Primary production	9.1 ± 1.5	18 ± 3
Processing	16.9 ± 12.7	33 ± 25
Wholesale and retail	4.6 ± 1.2	9 ± 2
Food service	10.5 ± 1.5	21 ± 3
Households	46.5 ± 4.4	92 ± 9
Total food waste	87.6 ± 13.7	173 ± 27

*Confidence interval

Table 1 – Estimates of food waste in UE–28 in 2012; including edible and inedible parts of food waste (Stenmarck *et al.* 2016).

Nevertheless, it should be noted that these estimates, present a confidence interval of 95%, which lead to a variation of food waste in the EU–28 from 74 million tonnes to 101 million tonnes (Stenmarck *et al.* 2016). At the level of the food production sector, where the total estimated food waste in 2012 was approximately nine million tonnes, the authors Stenmarck *et al.* (2016) affirmed that this figure corresponds to an estimation of eighteen kilos of food waste per capita, per year. On average, for every tonne of food produced, ten kilos of food is wasted at this stage in the food supply chain (Stenmarck *et al.* 2016).

In relation to the processing sector, where the total amount of food waste projected in 2012 was about seventeen million tonnes, it was also estimated also that this volume corresponds to thirty–three pounds of food waste per person per year, and that for each tonne of food produced there are an average of twenty–two kilos of food being wasted in this sector (Stenmarck *et al.* 2016). Regarding the distribution sector (wholesale and retail), the total estimated food waste in 2012 was about five million tonnes, corresponding to nine kilos of food waste per person per year (Stenmarck *et al.* 2016). As far as the foodservice sector is concerned, the authors Stenmarck *et al.* (2016)

estimated that the food waste generated in 2012 reached eleven million tonnes, corresponding to twenty-one kilos of food waste per person, per year (Stenmarck *et al.* 2016).

Lastly, in the household sector, Stenmarck *et al.* (2016) projected that in 2012 the creation of food waste would reach an approximate volume of forty–seven million tonnes, equivalent to ninety–two kilos per person, per year.

Sector	Household food waste			
	Total (tonnes)	Approximate 95% CI	Per person (kg / year)	Approximate 95% CI
Municipal waste streams*	35 000 000		69.2	
Sewer (mostly liquid)	7 800 000		15.4	
Home composting	3 800 000		7.4	
Total	46 600 000	±4 400 000	91.0	±8.8

* includes food waste in residual, separate food waste collections, mixed organics collections

Table 2 – Estimates of household food waste in 2012 in the UE–28 split by waste stream (Stenmarck *et al.* 2016)

1.3.3. Food waste in Portugal

According to Baptista, Campos, Pires & Vaz (2012: 24), and as is observed in Figure 1 “*cerca de 17% das partes comestíveis dos alimentos produzidos para consumo humano, são perdidas ou desperdiçadas em Portugal, correspondendo a cerca de 1 milhão de toneladas por ano*”. This value originates from the sum of all food waste or losses throughout the different stages of the food supply chain. Therefore, it is estimated that there is a food wastage per capita of ninety–seven kilos per year, and thus allows to observe that the more efficient phase is referent to food processing, and the stages that produce the most food waste are those related to production and consumption of food, with approximately 32% and 31% of the total food waste, respectively. It is equally possible to highlight the commodity groups: cereals, fruits, vegetables and dairy products, as the groups with the most food waste generation (almost 75% of total food losses) (Baptista *et al.*, 2012).



Figure 1 – Food waste in the food supply chain in Portugal, per year (Baptista et al., 2012)

Concerning the total composition of food waste in the food supply chain in Portugal, it can be observed that the commodity groups with the highest percentages in the food supply chain are vegetables with about 27%, cereals with 17%, fruits with 15% and dairy products with 14% (Baptista *et al.*, 2012).

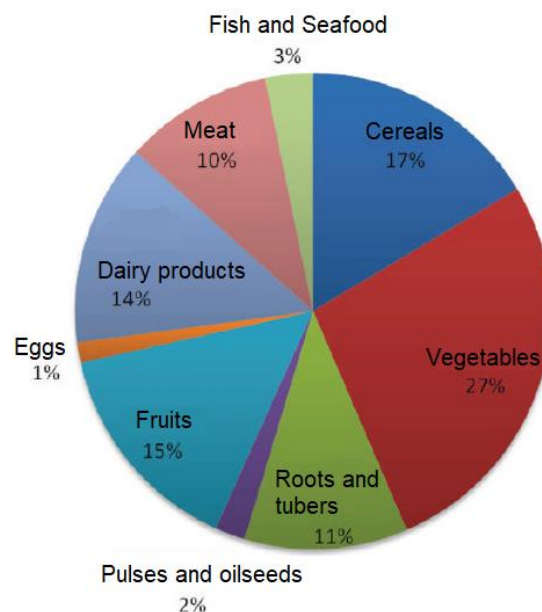


Figure 2 – Composition, in percentage, of the total of food waste in the food supply chain per commodity group (Baptista *et al.*, 2012).

In terms of the cereal commodity group in Portugal (see Graphic 50 in the Annexes), this commodity group has the highest volume of food waste – more than 150 thousand tonnes per year or 37% – compared to what is produced in Portugal to be consumed by humans, with a main emphasis on the distribution and consumption phases. This percentage may be justified by the need of certain products due to cultural reasons, such as bread, which is a product which is normally for consumption in the very day on which it is obtained (Baptista *et al.*, 2012).

For the vegetable commodity group in Portugal (see Graphic 51 in the Annexes), food waste illustrates a value of more than 250 thousand tonnes per year, which is mainly generated at the production stage which results of the harvesting regime used – use of machinery at the time of harvesting instead of manual harvesting which causes less food loss/waste. On the other hand, the phases of distribution and consumption also have high volumes of food waste due to the perishability of the products thus leading to a difficulty in the stock management (Baptista *et al.*, 2012).

As to the commodity group related to roots and tubers (see Graphic 52 in the Annexes), it is possible to observe that about 1/5 of what is produced in Portugal turns into food waste, which mainly focuses on the distribution and consumption stages due to the perishability of these products and quality standards defined by retailers leading to more than 100 thousand tons per year. It should be noted that the low values of waste at the processing stage are because of the underdevelopment of this industry, which can be consequently justified by the number of imported products and the low production of these crops in Portugal (Baptista *et al.*, 2012).

Concerning the commodity group of pulses and oilseeds (see Graphic 53 in the Annexes), given the low volume of these products in the Portuguese diet and the reduced volume of production of this commodity group in the country, the food waste present in this group is mostly from the production and consumption of olive oil and sunflower oil thus generating less than 50 thousand tons of waste per year. Nevertheless, food waste is mainly found in the consumption and production phases. Low food waste is present in the processing, and distribution stages considering the high expiry date of these products. It is important to note that food waste in the early stages of the food supply chain is due to the use of machinery during production (Baptista *et al.*, 2012).

In the fruit commodity group (see Graphic 54 in the Annexes), with a total of more than 150 thousand tonnes per year, there is a small volume of food waste at the processing stage due to the utilisation of fruit in the juice concentrates industry. On the other hand, the food waste observed at the production stage is due to external causes such as climatic conditions. Taking these aspects into consideration, the food waste related to this commodity group is observed with greater volume in the consumption and distribution phase for its perishability and the difficulty of stock management (Baptista *et al.*, 2012).

In the eggs commodity group (see Graphic 55 in the Annexes), food waste is considerably reduced due to the low presence of this commodity group in the Portuguese diet (less than 50,000 tonnes of waste per year). However, observable food waste is mainly at the production stage due to quality standards requirements (Baptista *et al.*, 2012).

In regards to the dairy products (see Graphic 56 in the Annexes), this commodity group has a total of food waste between 100 and 150 thousand tonnes per year, with the largest amount of food waste at the production and consumption stages, the former

having approximately a volume of 47 thousand tonnes per year, mainly due to dairy cow diseases or even animal mortality (Baptista *et al.*, 2012).

As to the commodity group for meat and its derivatives (see Graphic 57 in the Annexes), this group has a low volume of food waste in the processing phase due to the use of animal remains for the production of food, with a total waste of just over 100,000 tonnes per year in this stage. At the production stage, the losses are mainly due to mortality or diseases experienced by the animals, as well as poor transport conditions or poor conditions at the slaughterhouse. Thus, the losses of this commodity group are mostly in the final stages of the food supply chain with around 70% (Baptista *et al.*, 2012).

Lastly, the commodity group for fish and seafood (see graphic 58 in the annexes) has a volume of 33 thousand tonnes of food waste per year. However, despite the low volume of this waste, the production phase presents itself with the greatest amount of food losses, mainly due to the discards rates, and fish arriving at the fish auction house with no commercial value. On the other hand, the processing phase brings forward a small volume of food waste with 8 thousand tonnes per year. Regarding the distribution and consumption phases, these have similar values of food waste to the processing stage, thus making these stages equally significant when generating food waste volumes for this commodity group, mainly due to the perishability of the fresh fish (Baptista *et al.*, 2012).

1.4. Determination of impacts associated with the food waste issue

Food waste, no matter the stage of the food supply chain, has various economic, social and environmental impacts. According to Garcia (2017: 25), who cites FAO (2014c), “these costs have been estimated to be U.S \$2.6 trillion annually, roughly equivalent to the GDP of France.” Alternatively, Linh (2018) states that on average a restaurant in London produces about twenty-one tonnes of food waste per year, with about only 1.4% of the food waste produced being donated, 14.3% recycled, and 84.3% were disposed of, which creates numerous economic, social and environmental impacts.

1.4.1. Environmental Impacts

Regarding the environmental impacts, Linh (2018) states that these impacts caused by food waste can occur both before and after reaching the foodservice operation (upstream and downstream impacts, respectively) and can be further subdivided into soil and water waste, greenhouse gas air pollution, energy waste caused by the transportation of food waste to landfills, as well as the toxicity from pesticides and leachate. This author while quoting FAO (2013) also points out that food waste occurring before reaching the foodservice operation, that is, occurring during the stages of production, harvesting, and storage of food comprises about 54% of the total of the food waste produced (Linh, 2018).

With reference to the food waste that occurs before reaching the foodservice operation, every time food is wasted all the resources that have been used to create the same food are also wasted. These resources include soil, water, fertilisers, pesticides, and diesel used for tractors during the production phase, amongst others (Linh, 2018). Likewise, the food waste that occurs after the foodservice operation stage tends to have equally strong environmental impact, which is attributable to the disposal of food waste via landfills or incinerators, thus causing high levels of greenhouse gas emissions – for example, emissions of methane, carbon dioxide, and nitrous oxide – due to the decomposition of the food, and the transportation of these foods to landfills. In this way, it is possible to illustrate the importance of preventing and reducing the generation of food waste (Linh, 2018).

For illustrative purposes of the real environmental impact of food waste, if food waste were to be considered a country, it would be the third-largest emitter of greenhouse gas emissions, following China and the United States as illustrated in Figure 3 (Linh, 2018).

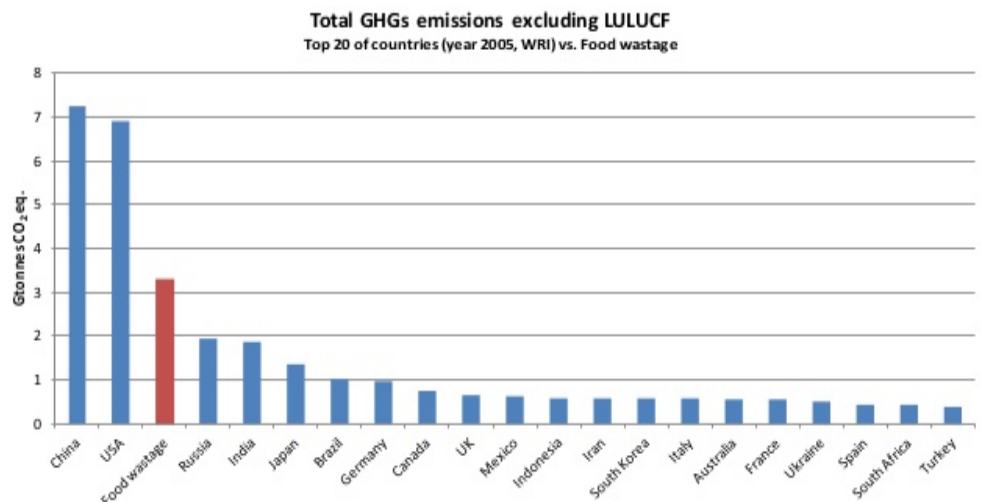


Figure 3 – Top 20 greenhouse gases emitting countries vs. food waste (Linh, 2018)

1.4.2. Social Impacts

However, it should be taken into consideration that the generation of food waste also causes impacts which emphasis on the ethical and moral degrees of the inequality of food accessibility within society (Papargyropoulou *et al.* 2014). Such issues tend to create a high volume of social impacts, due to the fact that by producing food waste, part of this waste is eliminated when it is used to feed individuals and/or families with financial needs. According to Linh (2018), the overall global amount of food waste is 1.6 gigatonnes per year. However, despite this alarming figure, there are still families that do not have enough food at their disposal to satisfy their basic survival needs.

In a different perspective, if wasted food in Latin America were to be donated, it would be possible to feed around 300 million people. On the other hand, if 1/4 of the 1.3 Gigatonnes of the edible food wasted in the world were to be recovered, it would be possible to feed about 870 million individuals in the world (Linh, 2018), which would lead to a consumption of approximately 370 kilos per year per person. Nevertheless, it should be noted that the food waste generated could also feed animals, and, if prevented, could reduce the water waste used for domestic use (Linh, 2018). Garcia (2017) also refers other social impacts generated by food waste as is the case of the creation and aggravation of conflicts within society, the deterioration of public health, loss of livelihoods, an increase in unemployment, and an increase food prices, among others.

1.4.3. Economic Impacts

Pertaining to the economic impacts, Linh (2018) notes that there are four types of economic impacts/indicators upon the generation of food waste in a hotel unit, these being the cost of acquisition of food products, the cost relative to the disposal of food waste, the cost related to the labour costs during the preparation of food and the costs related to the energy used to prepare and store food. However, Costa (2018) states that when using food waste control strategies, the human resources costs were not significantly altered or reduced. Taking this argument into account and given that food production or storage always leads to energy consumption, whatever the amount of food being produced or stored is, whether if it is then proceeded to generate food waste or not, it could be assumed that the energy costs will not present any significant changes or reductions. However, this premise is refuted when connecting Costa's article with Lee, Parfitt & Fryer's (2013) technical report due to the percentages of each cost to the total

of the food waste to the hotel sector, since this report mentions the high percentage of the human resources and energy costs in the economic impact of food waste. Thus, it is conceivable to corroborate the information found in the dissertation from Linh (2018).

In the foodservice sector, one of the economic impacts directly caused once the food is waste is the misuse of the food cost. For this reason, it is estimated that about 4% to 10% of the investment made in the food industry in food purchases is lost as a result of the generation of food waste, thus emphasizing the essential role of correct management and reduction of food waste (Linh, 2018).

However, as has been mentioned above, other costs may occur in addition to the cost of purchasing food, this is because, in order to serve meals, food must first be trimmed and prepared, as well as chilled and stored. Such needs lead to a greater creation of cost which is ultimately correlated with the production of unavoidable food waste during the production of meals (Linh, 2018).

On a different level, to handle or dispose of food waste, it is necessary for a hotel unit to pay for garbage hauling companies to come and collect the food waste generated depending on the contract established (according to weight or trips to hotels), among others, which generates additional costs once producing food waste (Linh, 2018) like the HR costs and energy costs. In this manner, if there are effective management and reduction of food waste, not only will be possible a reduction of wasted resources but also a reduction of costs to the hotel, thus leading to greater competitiveness of the establishment in the industry (Papargyropoulou *et al.*, 2014).

According to Lipinski *et al.* (2013), food waste in the consumption phase reaches an average of \$1,600 per year for a household of 4 people in the United States and £680 per year for a typical household in the United Kingdom. On the other hand, according to the same author, about 32 billion dollars of food are wasted every year in the world, with 4 billion dollars belonging to the region of sub-Saharan Africa in the post-harvest stage, which contrasts with the incomes acquired by the farmers in that same region (less than \$2 per day).

In relation to the ratio of food waste costs versus profit, RedFED (2018) affirms that FW costs can reach up to 28% to 35% of a restaurant's profit, thus illustrating the importance of food waste management and reduction.

2. Food waste management solutions

Considering the high volume of food waste and the impacts caused by it, appropriate management and control of food waste is crucial. Some examples of food waste management are food donation, the use of technologies which allow a better understanding of the causes and areas where the food waste is created, providing an opportunity to make changes to the production of meals and correction of food portions, thus assisting with the weighing of the various types of food waste (Costa, 2018). On the other hand, the same author refers that menu planning with products which have reduced amounts of food waste, training employee and client engagement strategies to this problem, among other strategies, allow better control and management of food waste.

On a different perspective, Lephilibert (2016) states that the implementation of a system of food waste monitoring, through a clear categorization of types of food waste per each cause analysed, for example, if food waste comes from the preparation of food, or due to its expiry date, or even if FW is derived by the type of service in the hotel, among others, it will allow the hotels to pinpoint its source which will consequently permit a reduction of this type of waste by about 45%. Furthermore, to reduce food waste, Troitino (2017) mentions the importance of the quantification and analysis of the causes related to food waste in order to control this type of waste, either through management of quantities served, size of food portions, or reduction of plate sizes (according to the author reducing a dish of 24cm to 21cm can result in a reduction of waste in almost 20%), amongst other strategies.

According to Sandaruwani & Gnanapala (2016), certain hotels with the aim of controlling the costs of food waste set cost limits when purchasing raw food, thus leading to a restriction of food purchasing of the kitchen department to a specific percentage of the total food cost in the hotel unit. It may also make forecasts regarding the exact number of customers per mealtime, or even opting to do live cooking.

2.1. The food waste hierarchy

However, other aspects should be taken into consideration when minimizing food waste. Depending on the situation and type of food waste observed, accommodation units may use the waste hierarchy to use or implement the most suitable food waste management strategy possible. Although the food waste hierarchy is merely the initial

stage in food waste management and there may be certain legislative restrictions regarding specific food waste management strategies, this hierarchy may be a starting point to a good food waste management. However, it must be considered that this hierarchy had its initial application and focus on the environmental impacts of the various existing types of waste, such as food waste.

According to Papargyropoulou *et al.* (2014), the intrinsic principles of the food waste hierarchy, as seen in Figure 4, were derived from European policies since the 1970s, as well as the 1975 Directive on Waste and the European Union’s Second Environment Action Programme in 1977. Thus, the aim of the waste hierarchy is to identify the most environmentally sustainable options that will have the least environmental impact. However, according to the same author, although the primary focus of this hierarchy is the choice of a sustainable environmental strategy, the European Waste Framework Directive recommends the Member States that there should be an equal concern and focus on the social and economic impacts.

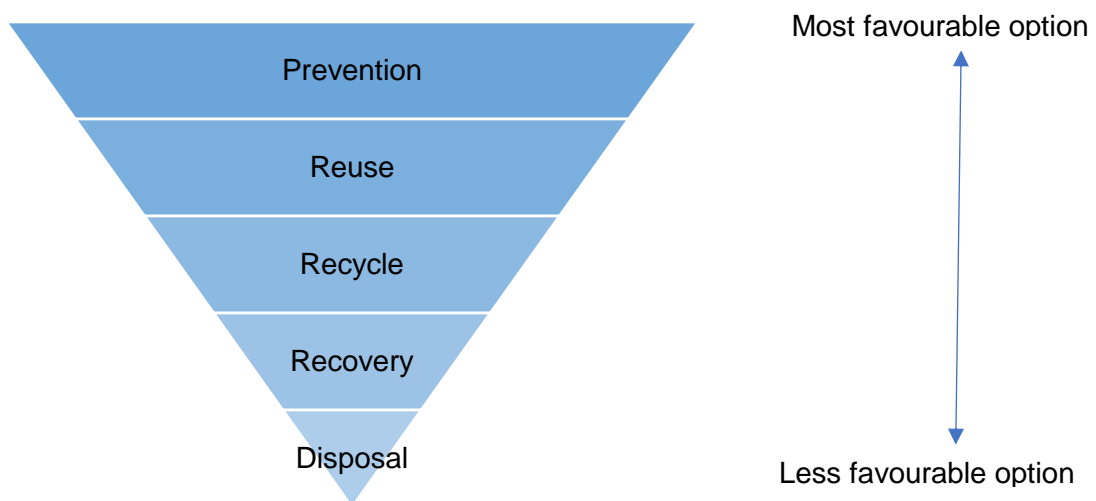


Figure 4 – Food waste hierarchy (Papargyropoulou *et al.*, 2014)

Therefore, since the hierarchy of waste is based on the selection of sustainable food waste management strategies, it will be of interest to apply this hierarchy when analysing the economic impacts of food waste, thus applying the same idea of sustainability – preventing food waste will have lower negative economic impacts and will be more sustainable for a hotel unit rather than the disposal of such waste, which will

not only bring about costs related to the waste of food but also related to its disposal via landfills.

Taking these aspects into account, the **phase of the food waste hierarchy related to prevention** can only be applied to avoidable food waste, such as leftover food from customers' dishes thus relating to inedible food waste, and to edible food waste. In this way, it will be important to emphasise that the prevention phase will be the most advantageous for a hotel unit due to its cost reduction (food costs) when avoiding wasted food, including other costs such as energy spent to cook and store food, labour costs, and the averted monetary value for not disposing food waste via landfills (Garcia, 2017). According to Papargyropoulou *et al.* (2014), this phase focuses on preventing the creation of food excesses (edible food waste) as well as preventing the generation of avoidable food waste through the food supply chain.

The **phase regarding the reuse of food waste** is based on the consumption or reuse of food waste for purposes other than its original aim, as is the case of food redistribution through food donations to social solidarity institutions or food banks, the reuse of certain edible foods to feed the staff or the reuse of food waste for animal feed. It should be noted that this phase ought to give priority to inedible food waste which can be avoidable, and edible food waste, thus allowing not only positive social impacts but also allowing the generation of tax benefits for hotel facilities that proceeded to donate food (Garcia, 2017). However, it should be taken into consideration that certain authors such as Papargyropoulou *et al.* (2014) solely mention in this phase the reuse of excess food to be consumed by people affected by poverty, whether via food banks or by social solidarity institutions, and not its use for food animals (the authors, in this case, redirect this initiative to the next stage – recycling).

With reference to the recycling phase, every time a wasted food product cannot be reused, the most sustainable alternative that follows is recycling. According to Papargyropoulou *et al.* (2014), food recycling can be carried out in two ways – recycling of food waste through animal feed or recycling of food waste via composting. It should be noted that the method of composting involves turning food waste into an organic compound using oxygen.

According to Garcia (2017: 46) who cites Schaub & Leonard (1996):

“Composting as a waste management solution shows clear advantages: it is cheap to undertake and eliminates the payment of tipping fees, it produces a product that can generate revenue, and it can reduce the volume of waste by up to 40%, whilst killing most pathogens during the thermophilic phase.”

Concerning the recovery phase, this phase is based on an attempt to maximise the retrieval of the monetary value lost in the generation of unavoidable food waste. At this stage, food waste management initiatives presented are, for example, the anaerobic digestion (AD), which focus on energy recovery via the production of heat or electricity. The anaerobic digestion is a process that involves the use of food waste as a substrate for the growth of bacteria that in the absence of oxygen produces biogas which can, consequently, not only be used to generate heat or electricity, but also be used to produce fuel for vehicles (Garcia, 2017). According to the same author, AD is a process considered to be more environmentally sustainable than composting.

Lastly, **the disposal phase** is considered the least sustainable phase and should be avoided when possible due to its strong environmental impacts and lack of socio-economic benefits (Garcia, 2017).

2.2. Possible initiatives and types of food waste (FW) handling correlated with each food hierarchy stage

Taken into observation what was mentioned previously, and in view of the several phases of the hierarchy of waste, there are several initiatives that can be applied for each moment of this hierarchy when handling food waste. **In the phase relative to prevention**, according to Pirani & Arafat's article (2014), there are a number of strategies that can be applied to the management and reduction of food waste, such as the use of Menu Engineering, and the use of the Activity-Based Costing (ABC) method, for a more rigorous and improved costs measurement of each menu, as well as a better understanding of how the resources are being used. The use of a computer system for the tracking and managing food waste, the reduction of the plate sizes and decreasing of portion sizes served to customers, the attempt to make customers socially aware of

the problems of food waste, either through social cues or even by applying a payment fee to waste produced by customers, despite the latter initiative not being well accepted by the hotel industry are other types of initiatives and ways of reducing the generation of FW. In another perspective, the authors also refer to the change of type of service – from buffet to la carte – as a strategy to reduce food waste.

Similarly, in order to manage and reduce food waste, Garcia (2017) refers in this phase, the need to measure the several types of food waste, the importance of involving and raising awareness of both customers and staff for this issue, the use of menus, products, processes and packaging that aim to minimise food waste, as well as the importance of a correct forecasting of customers and meals to cook, among others initiatives.

Under the same line of thought, the authors Lasaridi, Abeliotis, Manios, Chroni & Terzis (2017) refer to the relevance of food waste mapping to analyse, record and reduce the quantities of food waste produced as well as understand their causes and the sources where food waste is generated.

Other initiatives for food waste prevention regard the use of the inventory management method FIFO (first-in-first-out), the need to control and reduce the portions served to customers, the provision and possibility of the client choosing from different size portions, and the training of employees of various departments besides the kitchen department so as to create a synergy within the hotel thus enabling a better management and control of the generation of food waste. To carry out a correct food items storage in proper refrigerators and adequate temperatures, as well as correctly tagging the expiry dates and cooking instructions allows the prevention of the creation of food waste. Reducing the acquisition of food items that are not frequently consumed, the decreasing of the use of food products that easily deteriorate during the preparation of meals, to check all food items purchased by the hotel to ensure that it is in good conditions, as well as taking into consideration their expiry dates are also initiatives to be considered in this phase (British Hospitality Associations, BIFM & WRAP, 2013; Clowes, Mitchell & Hanson, 2018; Food Wise Hong Kong, 2013; Kasavan, Mohamed & Halim, 2017; Linh, 2018; Lipinski *et al.*, 2013; Marthinsen, Sundt, Kaysen & Kirkevaag, 2012; Martin-Rios *et al.*, 2018; Pearson & McBride, 2017; Pirani & Arafat, 2016; Singh & Amandeep, 2018; World Wildlife Fund, 2016; WRAP, Responsible Hospitality Partnership & Hollins, 2013; WRAP, 2015).

In the **phase corresponding to the reuse of food waste**, some of the strategies observed in this step of the hierarchy of food waste and types of FW handling are the donations of surplus food or edible food waste to food banks or social solidarity institutions (IPSS), such as ReFood or Cáritas. The offer of doggy bags with the customers' plate scrapes when appropriate, due to the restriction that this initiative has on the concept of a hotel unit, and the reuse and maximisation of food products that weren't served but are already prepared and accordingly stored can be used for the cooking of new meals. The use of surplus food for staff meals, as is the case of the use of vegetables to cook soup, amongst other meals, and the reuse of food products that were not consumed and are still adequate for consumption, can be used for the next meal or for the next breakfast in cases of breakfast analysis. (British Hospitality Associations, BIFM & WRAP, 2013; Clowes, Mitchell & Hanson, 2018; Food Wise Hong Kong, 2013; Kasavan, Mohamed & Halim, 2017; Linh, 2018; Lipinski *et al.*, 2013; Marthinsen, Sundt, Kaysen & Kirkevaag, 2012; Ortiga, 2017; Pearson & McBride, 2017; Pirani & Arafat, 2014; Pirani & Arafat, 2016; Singh & Amandeep, 2018; WRAP, 2015).

It is relevant to highlight that in order to estimate the economic impacts of the donations, it is necessary to consider not only the economic value of the tax benefits, as well as the fees related to the storage and transportation logistics of food surplus to social solidarity institutions.

In the **stages of the recycling and recovery of food waste**, the different strategies observed during the analysis of the various authors regarded the use of composting – which can be used depending on the amount of food waste generated, the existence of available area in the hotel unit to install a composter and the cost associated with the purchase of the composter –, the use of anaerobic digestion (AD) and the redirection of food waste to animal feed, the latter depending on the applicable law of a specific country which may lead to other logistic costs. (Food Wise Hong Kong, 2013; Kasavan, Mohamed & Halim, 2017; Pearson & McBride, 2017; Pirani & Arafat, 2014; Pirani & Arafat, 2016; Singh & Amandeep, 2018).

Finally, in the phase of **disposal of food waste hierarchy**, the strategies observed are the throwing away of food waste through the use of landfills, which are sometimes the type of strategy normally used by the hotel units (Marthinsen, Sundt, Kaysen & Kirkevaag, 2012; Martin-Rios *et al.*, 2018; WRAP, 2011).

3. Food waste and its relevant legislation

Although there are several possible initiatives to implement which allow a better management and control of food waste, it should be considered that there may be legislative restrictions or tax benefits in the application of certain strategies in a hotel unit, such as the application of the HACCP system and the tax benefits relating to the Portuguese corporate income tax (IRC – Imposto sobre o Rendimento de Pessoas Colectivas).

3.1. HACCP and its implications for food waste

3.1.1. Characterisation of HACCP and its importance

Currently, as a result of the different obstacles that exist due to food safety control and the need to ensure the public health in a hotel unit and in society, all establishments that produce or commercialise food must be legally regulated. In this way, these companies must follow the hazard analysis and critical control points system (HACCP). This leads to the fact that certain initiatives related to the handling and management of food waste generated by the hotels must also follow this system, with a special focus on the initiatives correlated to the donation of food or reuse of edible food waste to employees or clients.

The HACCP system is therefore based on a system of identification, analysis and elimination of hazards – physical, microbiological or chemical – during food preparation, and identification of critical control points where these may occur, thus having the objective of ensuring that all food products sold to the client are appropriate for consumption, therefore not putting in jeopardy the public health. This system also aims to adequately characterise every food product that may lead to a creation of a hazard, and to specify the various food production stages where it is more likely for a critical control point to occur, thus allowing to prevent, control or eliminate the possible hazards observed. On the other hand, it also makes it possible for certain foods to be reused and recycled under certain conditions. It is important to emphasise that this system has its start during the stage of food products reception moving to meals preparation and ending in the delivery of the finished meal to the customer (Marques, 2018).

However, depending on the assessment of the risk level of the hazards associated with a specific food or a specific stage of the food production process, its control will vary between the use of pre-requirements, which are related to good hygiene

practices (not significant risk or risk associated with the surrounding environment) or the use of the HACCP system (significant risk). It is relevant to emphasise that, for a correct application of the HACCP system, hotel units should implement in advance, and adequately good hygiene practices, thus allowing equal prevention of food waste (Amorim & Novais, 2006).

According to Amorim & Novais (2006) and APHORT (2018), the good hygiene practices focus on a set of overall hygiene requirements that must be carried out, such as the location and the structure of the establishment conditions – walls, floors, ceilings, ventilation, among others –, the cleaning and disinfection of the facilities and equipment that a given establishment displays, and the hygiene and training of the employees during the food preparation and cooking so that there is a perception of the importance of food security. Other requirements are the control of the water supplied to the hotel unit, pest control, allergens control, food transportation and storage – not only for the hotel unit but also upon food donations to charities – the hygiene plan of the various food preparation areas as well as the kitchen utensils, the identification and retrieval of contaminated food products, as well as their food waste and other waste present in the establishment, and finally the control of the suppliers and the quality of the food for these provided, for they must be adequately certified and the control of the food reception must be verified when delivered to hotels.

3.1.2. HACCP and its applicable legislation and regulation

The HACCP plan to be correctly implemented must be in line with a set of legal statutes that establish a minimum of hygiene and food safety conditions as well as hygiene guidelines for food products. Therefore, the legal regulations governing the HACCP system are the European Regulation EC no. 852/2004 and no. 853/2004 referent to the general and specific rules for food business establishments on the hygiene of food products, respectively, with the latter being referent to food of animal origin, the Decree-Law (DL) no. 113/2006 which regards the regulation of the sanctions applicable to possible breaches of the sanitary requirements on the hygiene of food both plant and animal origin, the Codex Alimentarius (CAC/RCP 39–1993 – Code of Hygienic Practice for Precooked and Cooked Foods in Mass Catering), the food safety management system regarding the quality standards requirements for any establishment in the food supply chain, in other words, the ISO 22000: 2018, the guide to food safety control in

European restaurants, the Decree-Law DL no. 433/82 and the Decree-Law (DL) no. 28/84 (ISO, 2018; Marques, 2018). It is equally applicable according to the ASAE (2017a) the EC regulations no. 178/2002, no. 1019/2008, and no. 219/2009, as well as the Decree-Law no. 223/2008 that alters the DL no. 113/2006.

The European regulations (EC) no. 852/2004 and no. 853/2004 lay down general food hygiene standards for all food establishments throughout the food supply chain, including the application of procedures related to the seven HACCP principles in order to ensure food safety and public health (EC Regulation no. 852, 2004), and to establish specific rules for the various establishments along the food supply chain concerning the hygiene of food products of animal origin (EC Regulation no. 853, 2004).

As far as the Codex Alimentarius is concerned and given that this code was the origin of the HACCP system, it mentions all the norms regulating the various stages of food preparation for future consumption in food business establishments (CAC, 2003).

As for the Food Safety Management System, in terms of ISO 22000: 2018, it targets all stages of the food supply chain basing itself on the seven principles of the HACCP system to propose a methodology of use for this system that raises awareness to consumers to ethical issues such as the issue of food waste (APCER, 2018; ISO, 2018).

The purpose of the guide to food safety control in European restaurants is to provide food safety guidance for food establishments to control the various observable hazards in purchased or produced food products. (Marques, 2018).

The Decree-Law no. 28 (DL no.28, 1984: article no. 23) has as its object the “ (...) *infracções antieconómicas e contra a saúde pública*” more specifically in the sanction of criminal practices observed in subsection II which refers to fraud against merchandise, activities “(...) *contra a genuinidade, qualidade ou composição de géneros alimentícios e aditivos alimentares*” as is the case of the donations (DL no.28, 1984: article no. 24) and “*contra a qualidade ou composição de alimentos destinados a animais,*” as is the case with the recycling of food waste for animal feeding (DL no.28, 1984: article no. 25).

In relation to Decree-Law no. 113/2006, it establishes the rules relating to food hygiene, as well as the infringements and penalties regime to the transgression of the rules extensible to the production and preparation of food (DL no. 113, 2006), being later

changed in some of the dispositions, in 2008, by the Decree-Law no. 223/2008 (ASAE, 2017a). Referring to Decree-Law no. 433/82, this prescribes the offence proceeding regime, thus connecting with the Decree–Laws no. 28/84 and no. 113/2006 (DL no. 433, 1982).

As far as the European Regulation (EC) no. 178/2002 is concerned, this regulation refers to the need for all food production establishments to ensure compliance with the abovementioned requirements throughout the various stages of the food supply chain (ASAE, 2017a). On the other hand, European Regulations (EC) no. 1019/2008 and no. 219/2009, which also regard the hygiene conditions of food products, amend to a certain extent the legislation established by European Regulation (EC) no. 852/2004 (ASAE, 2017a).

It should be noted that, according to the ASAE (2017b), all donations of food products, in addition to the following hygiene requirements specified by the European Regulation (EC) no. 852/2004 and Regulation (EC) no. 853/2004, should also follow the subsequent rules:

- Food transportation must be carried out bearing in mind the appropriate hygiene and temperature requirements, so as to avoid contamination and modification of the quality of food, thus ensuring that the transportation vehicles are in good condition, disinfected, and cleaned when used;
- Non–perishable food products must be stored in fresh, dry and odour–free places which have no direct contact with sunlight. For perishable foodstuffs, these need to be properly stored and refrigerated at an appropriate temperature;
- Products should be properly identified and catalogued with the origin and quantity of donated food, expiry date, name and delivery date.

3.1.3. HACCP's methodology and the implementation of the seven principles to be applied amid food donation

For the HACCP system to be correctly implemented during the donation of edible food waste, it is necessary that a hotel unit follows a set of fourteen steps that support the application of the seven principles of the HACCP system (Amorim & Novais, 2006; APHORT, 2018; Marques, 2009; Marques, 2018).

The **first phase** of the HACCP system aims to define the scope of analysis of the HACCP plan. In other words, it consists of identifying the food products and the stages of the food production process that will be analysed by the HACCP system, as well as the hazards that may be associated with these food products. The **second phase** of this plan is based on the creation of a multidisciplinary team that will be responsible for the implementation, development and management of the HACCP plan. The **third phase** focuses on the characterization of all food products (what they are, what type of food product and its characteristics, type of packaging, shelf life, instructions of consumption, mode of preparation and cooking, ingredients used and the conditions of distribution/transportation). In the **fourth phase** of the HACCP plan, it is intended to specify the purpose that each food product will have (sale/donation).

Relatively to the **fifth and sixth phase** of the HACCP plan, the establishment must develop a flowchart and confirm on-site its veracity so that it details all the steps related to the food production process of the hotel unit, in other words, from the reception of the product to its consumption by the customer. In the **seventh phase** referent to principle no. 1, the aim is to carry out a HACCP plan and a risk analysis to detect all food hazards and stages in the production process where they may occur, so as to avoid, reduce to acceptable levels or eliminate such hazards. In the **eighth phase** concerning principle no. 2, it is intended to determine the critical control points (CCP) where food hazards may arise. In the **ninth phase**, linked to principle no. 3, the aim is to establish minimum and maximum limits for all hazards in each CCP so that corrections can be made if these critical limits are exceeded.

Regarding the **tenth phase** that relates to principle no. 4, monitoring procedures should be imposed in each CCP so that if deviations to the limits that were set in the 9th phase are observed, corrective actions may be made during the **eleventh phase** (principle no. 5). In the **twelfth phase** and based on principle no. 6, hotel units should establish verification actions to check the degree of efficiency of the implementation of

the HACCP system, so as to develop in the **thirteenth phase** (principle no. 7) documents and records to “*demonstrar a aplicação eficaz das medidas referidas nos princípios anteriores*” (APHORT, 2018: 28). Finally, in the **fourteenth phase**, hotels must often revise the HACCP plan to adjust the methodology and the HACCP system to any change in the reality of the hotel unit.

3.2. Taxation – Corporate Income Tax (IRC) and Tax Benefits

3.2.1. Tax Benefits whilst development of partnerships with social solidarity institutions: Food Donation

On the other hand, given the importance of edible food waste donations to social solidarity institutions (IPSS), as Refood or Cáritas, and the level of social and economic sustainability that these pose not only to society but also for the hotel units, it is crucial that these food production establishments have a perception of the tax benefits that this type of donation can provide, thus making the company itself feel more motivated to donate food.

Being tax benefits the, “(...) *medidas de carácter excepcional instituídas para tutela de interesses públicos extrafiscais relevantes que sejam superiores aos da própria tributação que impedem*” (Autoridade Tributária e Aduaneira, 2018: 40), that is, non-tax measures that in the light of the deductions to determine the taxable income of a company for the calculation of the Corporate Income Tax (IRC), allow an establishment to increase the deduction of the expense connected to a donation of the company’s revenue. This legislation on donations and their tax benefits is thus contained in Chapter X –Tax benefits related to benefaction –9 Article 61 and 62 of the Portuguese Tax Incentives Statute (EBF)

It will be considered as a donation, all:

“(...) *entregas em dinheiro ou em espécie, concedidos, sem contrapartidas que configurem obrigações de carácter pecuniário ou comercial, às entidades públicas ou privadas (...) cuja atividade consista (...) na realização de iniciativas nas áreas social, cultural, ambiental, desportiva ou educacional*” (Autoridade Tributária e Aduaneira, 2018: 102).

In this way, and from the perspective of the donations of edible food waste to private social solidarity institutions, as is the case of Cáritas or of ReFood, it will be classified as costs or losses of a hotel unit the monetary value of donated food up to a maximum of 8/1000 of the sales or services revenue of the hotel [Art. 62 no. 3, paragraph a) and no. 12 of the EBF]. The same cost relative to the monetary value of donated food may be deducted as a tax cost by a mark-up of 130% of its value (Article 62 no. 4 of the EBF) although it may never exceed the 8/1000 of the sales or services revenue.

It should be noted that no legislation was found regarding the EBF and animal feed, thus being possible to affirm that this solution will not bring about any tax benefits and positive economic impacts regarding a deduction of costs as seen for donations.

3.3. Other regulations and legislation

On the other hand, it will also be relevant to mention that in order to reuse and recycle food waste for animal feed, the European Commission has established in the statement 2018/C133 a plan of “*orientações para a utilização na alimentação animal de géneros alimentícios que já não se destinam ao consumo humano*” (Jornal Oficial da União Europeia, 2018: 2), being important to emphasise that this initiative should be applied to the HACCP plan to ensure the safety and use of food for animal feeding.

In this way, the laws which regulate the general conditions for the introduction of food waste into food for animals and the “*regras para os subprodutos animais não destinados a consumo humano*” (Jornal Oficial da União Europeia, 2018: 3) are the European Regulation (EC) no. 178/2002 (referred in the HACCP legislation), the European Regulation (EC) no. 183/2005, which has in view the precepts of wholesomeness of animal feed, the European Regulation (EC) no. 767/2009¹ which establishes the regulations related to the “placing on the market and use of animal feed” (Jornal Oficial da União Europeia, 2018: 3), and European Regulation (EC) no.

¹ This legislation amends the regulation (EC) no. 1831/2003, the directives no. 79/373/EEC, no. 80/511/EEC, no. 82/471/EEC, no. 83/228/EEC, no. 93/74/EEC, no. 93/113/EC and no. 96/25/EC, as well as the decision no. 2004/217/EC (Official Journal of the European Union, 2018).

1069/2009² on hygiene rules concerning “*subprodutos animais e produtos derivados não destinados ao consumo humano*” (Jornal Oficial da União Europeia, 2018: 3).

According to the same announcement, the food waste “*que não contém, não são constituídos nem estão contaminados por produtos de origem animal*” (Jornal Oficial da União Europeia, 2018: 5) can be processed directly into animal feed, “*desde que sejam subprodutos resultantes do processo de fabrico de géneros alimentícios*” (Jornal Oficial da União Europeia, 2018: 5), or they may be considered waste prior to processing into animal feed in the light of the Waste Framework Directive. Food waste that “*contém, são constituídos ou estão contaminados por produtos de origem animal*” (Jornal Oficial da União Europeia, 2018: 5) will have to become animal by-products before being processed into animal feed under the Animal By-Products Regulation.

² This regulation repeals the legislation established by the legislation no. 1774/2002 (Official Journal of the European Union, 2018).

Chapter III – Methodology

1. Applied methodology

This chapter explains the methodology used to determine the types of food waste handling and economic impacts of food waste during its application to the case study of this hotel unit. In order to develop this research, several steps related to Campenhoudt & Quivy's (2005) scientific process were regarded, more specifically the elaboration of the three steps or moments. These are the **rupture**, which relates to the elaboration of the literature review which will allow a backbone to the creation of an analysis model as well as will serve as a justification for the established starting question and main and secondary objectives, the **construction** of the theoretical framework while using specific observation instruments, and the **verification** through the analysis of data collected through the theoretical framework and drawing of conclusions related to the pre-established objectives as well as presentation of limitations and future suggestions for future investigations.

In this way and taking into consideration that the objective of this research project is to test the theory reviewed in the first chapter through a qualitative–intensive data analysis (deductive approach – testing of analysed theory), so as to search new empirical results, the analysis framework model for this dissertation was adapted from the Papargyropoulou *et al.* (2014) developed framework while dividing food waste into four categories and commodity groups observed in the literature review in the food waste quantification subchapter, and taking into consideration the food waste hierarchy. In this way, regarding the applied approach of the methodology and the reviewed theory in the first chapter, the analysis dimension will be the economic impacts, with food cost, the costs of the Human Resources allocated to FW, the energy costs allocated to FW, and the logistics cost referent to the transportation and disposal of food waste as being the analysis indicators, as well as the tax benefits from the possible donation of the edible food waste.

The instruments used for the observation during the development of this dissertation for the collection of the necessary data were direct observation during the internship, any necessary meetings made to the F&B (Food and Beverage) director, the kitchen chef, and the representative of the IPSS “Refood” so as to allow a better understanding of the buffet's operation, and the undertaking of donations to IPSS and its possible logistic costs. In this way, it was intended to record and analyse data referent

to the breakfast, such as the food available for consumption, the food waste generated and its economic impact depending on the type of FW observed and the total of food waste in general, amongst other direct costs. It was also analysed the indirect costs which regard the cost relative to the disposal of food waste and its logistics, the human resources cost allocated to FW and energy costs equally allocated to food waste. The monetary value allusive to the several stages of the food waste hierarchy, such as the reuse of food waste to staff and social solidarity institutions (IPSS) were also analysed. This includes its possible tax benefits concerning the donation of food, thus allowing an application of the framework modules and evaluation of the economic impacts of each possible solution present in the waste hierarchy.

The investigation hypothesis made for this dissertation and that will be analysed during the data collection will be:

- The food waste generated in the hotel is mainly caused by the plate scrapes of the clients and the excess food production and display on the buffet;
- The economic impacts of food waste in the hotel regard the food waste's direct costs and the cost related to the disposal logistic of food, the costs of the Human Resources allocated to FW and the energy costs allocated to FW;
- The hotel uses management solutions present in the food waste hierarchy.

1.1. Theoretical Framework

As explained above, the developed theoretical framework is based in Papargyropoulou *et al.* (2014)'s framework model to provide a more in-depth analysis but also to study its validity of the framework to the reality of a Portuguese hotel. This model was applied to the case study and was conditioned to the research and analysis of only the breakfast presented in the buffet due to the time restriction of the internship and complexity of the analysis, as well as the conditioning of it to the stages of preparation stage to the stage of disposal/handling of food waste generated from the breakfast. In this way, the phases regarding the receiving of food products and its storage were not be analysed. Its aim is to complete this framework not only with a practical and efficient data collection model of food waste for a hotel but to verify the applicability of the theoretical model to the hotel being studied.

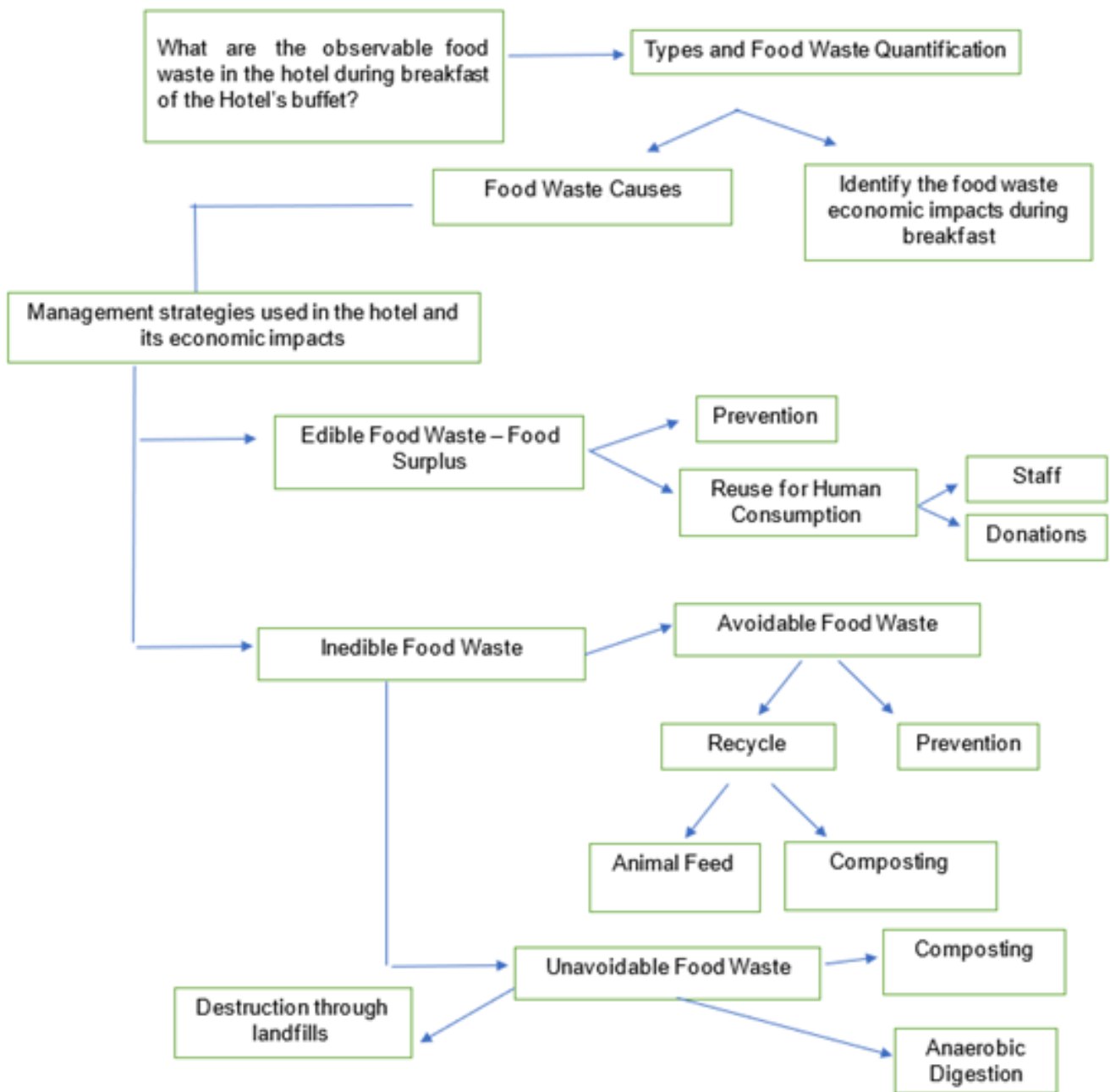


Figure 5 – Analysis framework adapted from Papargyropoulou *et al.* (2014)

1.2. Data collection method

The analysis sample was collected amidst a non-probabilistic and convenient selection of the days of analysis by weighing the food waste generated by all the products present during breakfast between 6h and 12h in the hotel during the 18th, 21st, 22nd, 28th and 29th of January, as well as the 6th and the 7th of February which were when the analysis occurred as well as days prior to the analysed days. The data collection was restricted to an analysis of seven days during the internship due to the hotel's imposition based on logistic reasons. As a result, those days were chosen based on the days where the hotel presented the biggest occupancy rate, with a total of 694 breakfasts during these days. It should be noted that considering the period when the internship occurred, the tourism present in Lisbon was in the midseason of tourism which presents slightly lower occupancy rates than the high season.

The analysis procedures regarded the subsequent steps:

1. Listing of every item present during breakfast and its respective costs;
2. Weighting and recording of the food waste coefficients for unavoidable food waste (observe table 41 in the Appendices);
3. Weighting and recording of the kitchenware for the buffet's presentation (see table 40 in the Appendices);
4. Weighting and recording of every food product placed for consumption before its colocation in the buffet tables;
5. Weighting and recording of every accrual placed for consumption during breakfast;
6. Weighting and recording of the food waste related to the plate scrapes;
7. Weighting and recording of the inventory of each product after the breakfast, in other words, the buffet's leftovers;
8. Recording of the cause for the food waste recorded;
9. Definition and recording of the way of handling the food waste (elimination versus reuse);
10. Calculation of the buffet's food cost during breakfast for each day;
11. Calculation and extrapolation of the results for an active year based on occupation rates and breakfast sales;
12. Allocation of the calculated costs to each of the hotel's practised food waste management solutions.

In order to understand which products were analysed during the investigation, an enumeration of such products was made below which can be subdivided into yogurts, various types of cheese, tofu, milk, butters, fruit and fruit salad, meat derivatives, vegetables, bread, pastries, jams, eggs, dry fruits, cereals, juice, and water. In this way, it was possible to observe that the hotel served thus serving an English type of breakfast (see Tables 11 to 39 for FW analysis during breakfast of the 18th of January to the 7th of February).

Commodity Group Dairy Products:

- 5 Kgs Bucket Yogurt; Natural Vanilla Adagio Glass Yogurt; Strawberry Adagio Glass Yogurt; Lemon Adagio Glass Yogurt; Natural with Sugar Adagio Glass Yogurt;
- National Sliced Edam Cheese; National Fresh Cheese; National Cream Cheese; Goat Cheese Rolls; Biological Tofu; Sheep Manchego Cheese; National Ilha Cheese; Half Skimmed Milk Agros 1L; Butter with Salt Mimosa; Butter Without Salt Mimosa;

Commodity Group Fruits:

- Rocha Pear; Muesli with Coconut; Fruit Salad 2,5 Kgs; Granny Smith Apple; Starking Apple; Cantaloupe; Grapes; Papaya; Kiwi; Melon; Banana; Oranges; Pineapple;

Commodity Group Meat:

- Turkey Ham; Bacon with Cocktail Sausages; Pork Ham; Smoked Ham; York Paio; Sliced Bacon; Chorizo (*Chouriço*); Sliced Salami;

Commodity Group Vegetables:

- Black Olives; Paris Mushrooms; Cherry Tomatoes; Roasted Vegetables; Cucumber; Carrots; Roasted Tomatoes with Pesto; Batata Rosti; Lettuce; Salad Tomatoes; Baked Beans with Tomato Sauce;

Commodity Group Pastries:

- Mini Donuts; Chocolate Napolitans; Brioche with Coconut; Mini Pancakes; Mini Egg Custard; Sponge Cake with Egg Creams; Scones; Apple *Chausson*; Traditional Pastry – *Trança com Creme Ovos*; Traditional Pastry – *Parra com doce de ovos*; Mini Muffins; Traditional Pastry – *Caracol com Frutas Cristalizadas*; Mini Croissant; Mini Palmier; Traditional Pastry – *Bola de Berlim*;

Commodity Group Bread:

- Sliced White Bread; Mini Navettes; Bread with Seeds; Chapata Bread with Poppy; Sliced Corn Bread; Large White Bread Rolls; Bread Rolls with Raisins; Small White Bread Rolls; Sliced Bread with Raisins; Bread Rolls with Olives;

Commodity Group Cereals:

- Muesli; Granola; Oats; Sunflower Seeds; Nuts; Linseed; White Sesame Seeds; Red Quinoa; Chocapic;

Commodity Group Jams:

- Raspberry Jam; Orange Jam; Honey; Strawberry Jam; Peach Jam;

Commodity Group Eggs:

- Cheese Tortillas; Scrambled Eggs; Boiled Eggs;

Commodity Group Dry Fruits:

- Plums; Raisins;

Commodity Group Juices (includes water):

- Mango Juice; Apple Juice; Forest Fruits Juice; Orange Juice;
- Sparkling Water; Still Water.

Relatively to the costs referent to the disposal of food waste as well as its logistics and transportation, these costs are included in the payment made to the *Câmara Municipal de Lisboa* (CML) which regard the costs related to the disposal of food waste, as well as the collection, transportation, storage, sorting, handling, elimination and recuperation of this waste through anaerobic digestion and composting, which were then allocated to the F&B department and then to breakfast.

In relation to the allocation of the cost of Human Resources and Energy to food waste, these costs were obtained from the hotel. After a meeting with the Refood representative, it was possible to observe that this solidary institution had no logistic costs. Pertaining the possible logistic costs for animal feed, it was not possible to obtain these or any information or scientific article which could be included in the literature review, therefore the analysis for this management model will be based on the premise that there are no logistical costs, so as to solely get an understanding of the costs relative to this strategy.

Chapter IV – Case Study – Hotel in Lisbon

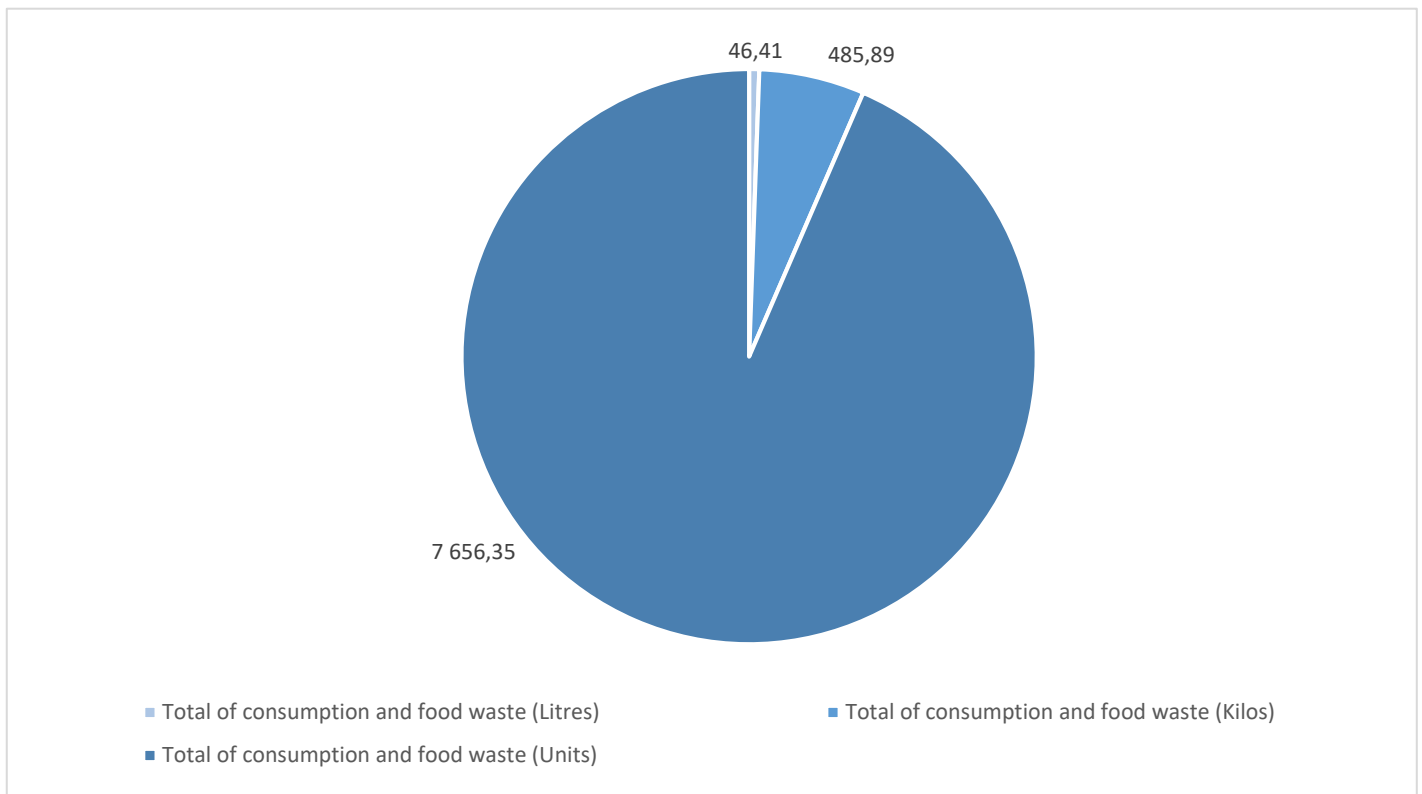
1. Development of the case study during breakfast

This chapter's aim is to correlate the literature review with the case study, thus analysing and explaining the results obtained during the monitoring of the food waste generated during the hotel's breakfast as well as the meetings held with the F&B director, the kitchen chef, and the Refood representative. It is important to clarify that because of the hotel's request of anonymity some of the data collected in order to do an estimation for the year's extrapolation and the complete analysis of the economic impact of this type of waste, such as the net revenue, will be transformed into percentages to protect that same data. In this way and due to the exceptional location of the hotel in Lisbon, which allows a high inflow of guests and walk-ins in the hotel during breakfast, it is intended to comprehend and identify the different types of observable food waste to correctly quantify them. Furthermore, after obtaining the initial economic impact of FW (direct costs), it is planned to observe secondary costs (indirect costs) which correlate to the production of food waste.

1.1. Types of observable food waste and its quantification

Based on the analysis and the total of the data collected during the seven days it is possible to affirm and corroborate the research made during the literature review, thus allowing a categorisation and an accurate quantification of the FW observed. It should be noted that within the inedible food waste observed in the hotel which was thrown away, the hotel unit did not solely discard food waste for not being able to be reused for human consumption, but also considered inedible FW the food scraps which could not be reintroduced again in a new breakfast cycle due to food safety practices but were still technically edible, therefore this definition differs from the literature review. In other words, of the observable food waste during the data collection, it was possible to observe both avoidable and unavoidable as well as edible and inedible food waste within the avoidable type. The inedible food waste had both the total of the unavoidable and part of the avoidable FW. The **unavoidable food waste** was accounted when analysing the food waste sourced from the trimming of fruit and some types of vegetables available in the buffet providing a total of 18,37 kilos, and 0,06 units, therefore supporting the theory that affirms that this type of food waste cannot be avoided, while the **avoidable food waste**

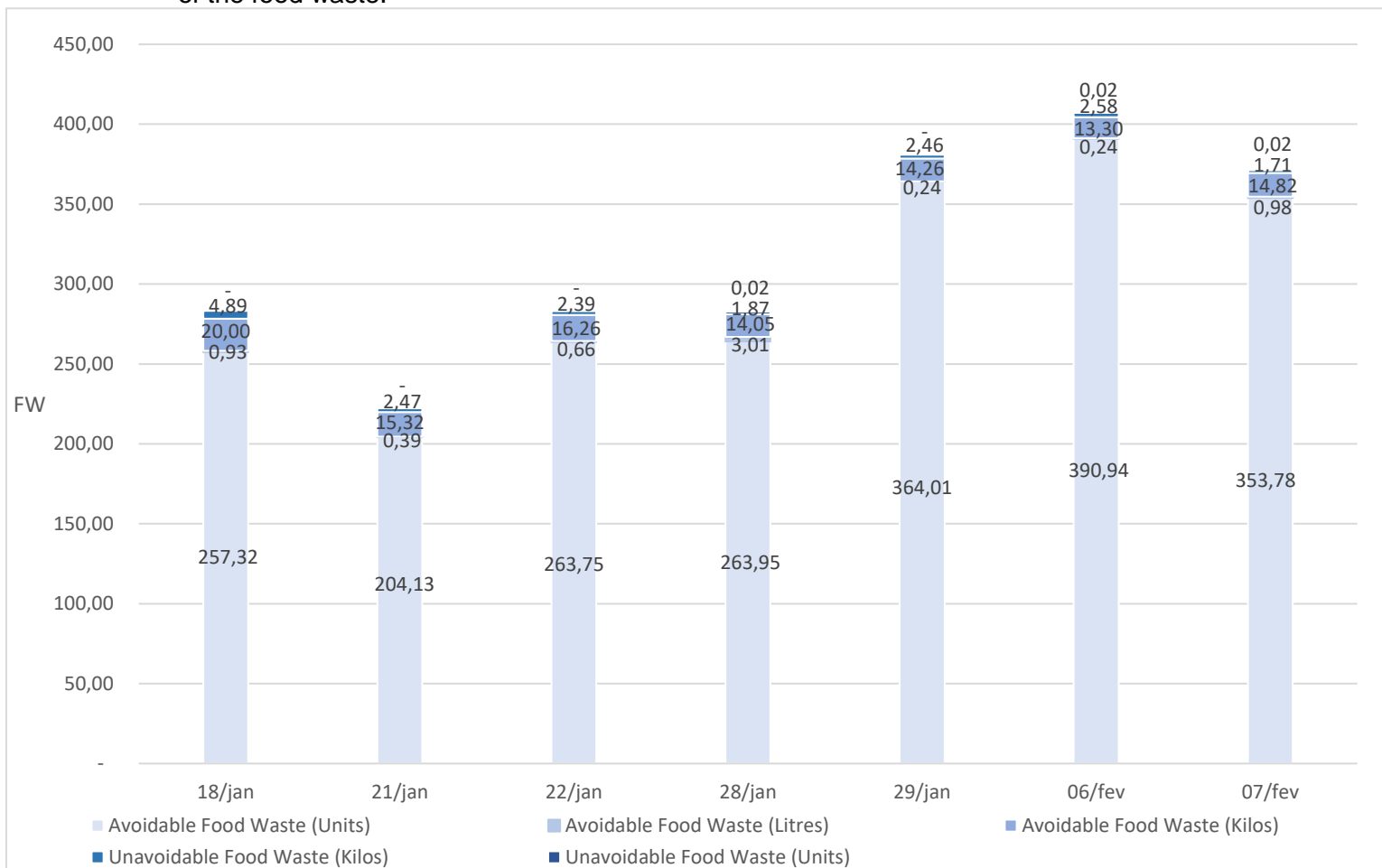
had a total of 2.097,69 units, 6,44 litres and 108,02 kilos correlated to overproduction of bakery and pastry products, plate scrapes and food safety practices, thus supporting the idea that this type of food waste can be prevented. Regarding the **inedible and edible food waste**, the total observed during the analysis was of 427,67 units, 6,44 litres and 32,30 kilos for the inedible FW, and 1.670,28 units and 94,09 kilos for the edible FW, respectively which related to the way of handling of food waste after each breakfast, in other words, whether the food could be consumed after being prepared for the breakfast and after the breakfast itself. In relation to the total amount of food consumed and wasted during the seven days of analysis observable in Graphic 3, it is possible to affirm that the total amount was of 7.656,35 units, 485,89 kilos and 46,41 litres.



Graphic 3 – Total amount of food consumed and food waste during the seven days of analysis

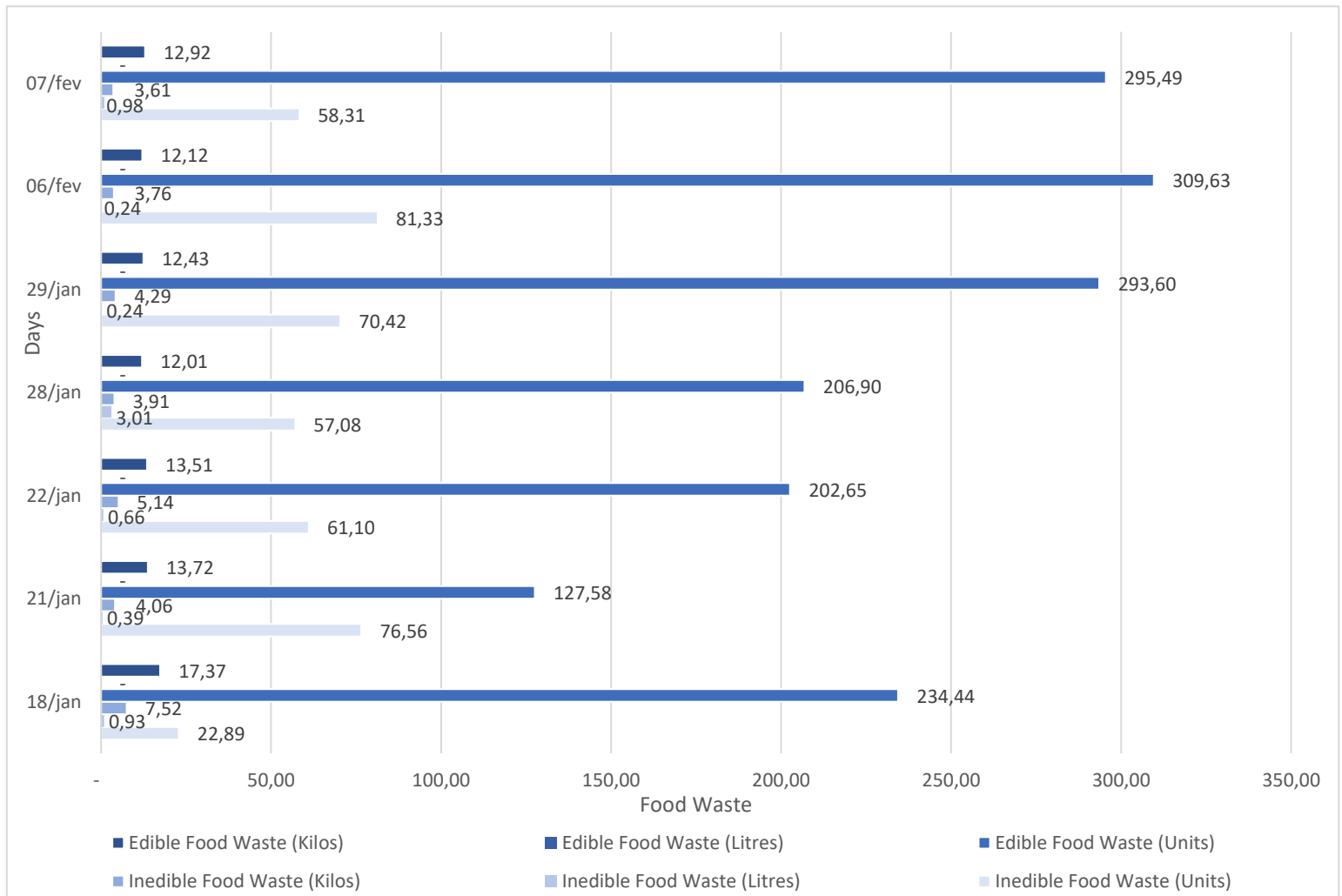
To better illustrate the reality of food waste in this case study, the total value of each type of observable food waste was compared to each other, thus allowing a more in-depth analysis and comparison of the seven days studied in this investigation. As it is observable in Graphic 4, there is a high discrepancy between these two types of FW which can be explained by the great amount of food that returns from the buffet and also

from the overproduction of food in the kitchen, which leads to a high total of avoidable food waste. In this way, as can be seen in Graphic 4, it is possible to observe during these seven days that **avoidable food waste** varied between 204,13 units, 0,39 litres and 15,32 kilos during the 21st of January (day with lowest values), and 390,94 units, 0,24 litres and 13,30 kilos present in the 6th of February (day with highest values) which can be explained by an overproduction of pastries and bread during the 6th of February. In terms of **unavoidable food waste**, this FW has its highest value on the first day of 4,89 kilos and its lowest of 1,71 kilos, and 0,02 units on the last day, which can be explained by the high initial quantity and reposition of fruit (mainly melon) in the buffet during the 18th of January, and a low initial quantity and reposition of fruit during the 7th of February. Regarding the percentage of unavoidable food waste when compared to the total of the food waste it is possible to affirm that, on average, the unavoidable food waste represents around 0,83% of total of the food waste generated during the seven days of analysis while the avoidable food waste represents around 99,17% of the total of the food waste.



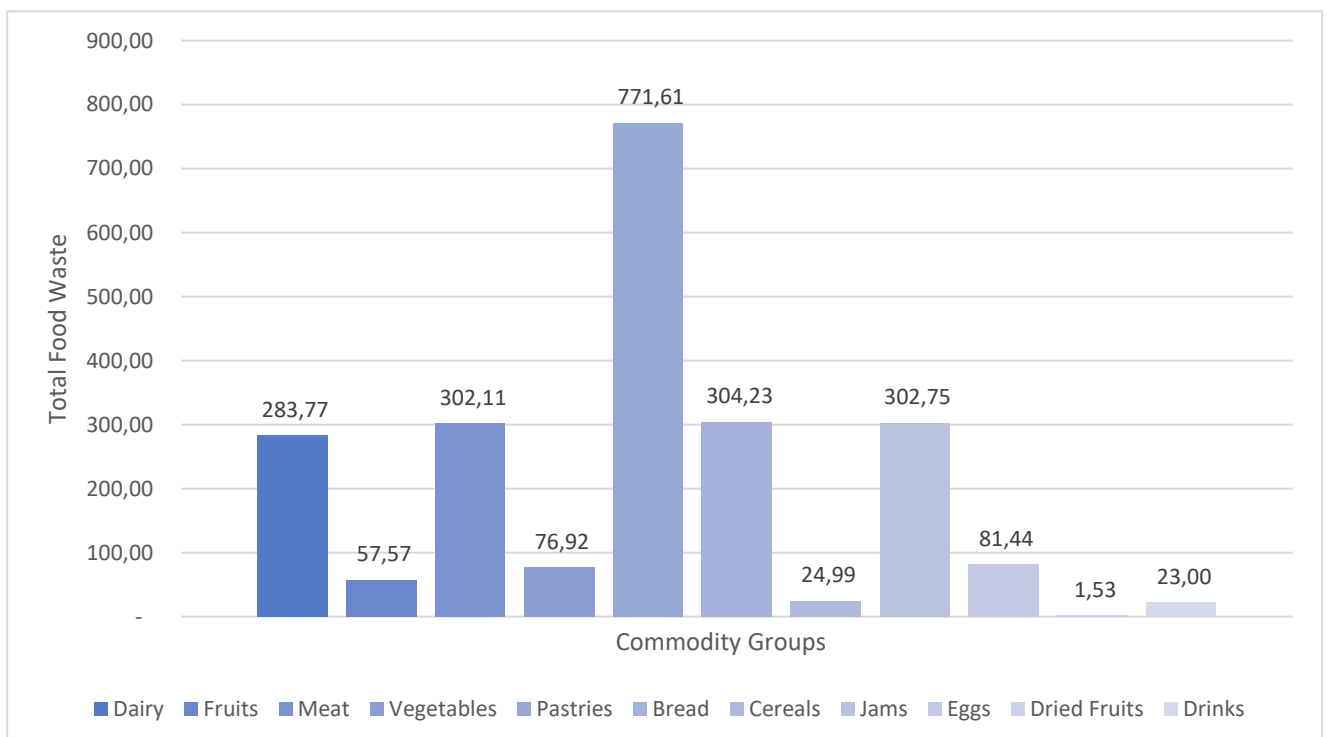
Graphic 4 – Comparison between avoidable and unavoidable food waste during the seven days of analysis

In relation to the comparison between edible and inedible food waste, it is possible to observe from this analysis that the main type of FW generated is edible food waste, which relates to the food that is redirected to the cafeteria, is used for the juice of the day or will be used on the next breakfast, whereas the inedible food waste is referent to the food that is discarded or thrown away. Thus, as it is possible to examine in Graphic 5, during these seven days it was possible to observe that the **edible food waste** presented its highest value during the 6th of February with 309,63 units and 12,12 kilos, and its lowest value during the 21st of January with 127,58 units and 13,72 kilos. **Inedible food waste** had its lowest amount of 22,89 units, 0,93 litres and 7,52 kilos on the 18th of January and its highest on the 6th of February with a total of 81,33 units, 0,24 litres and 3,76 kilos. These values can be explained by the correlation of the overproduction of pastries and bread during the 6th of February (edible food waste) with the overproduction of vegetables, eggs, and certain meat products (inedible FW).



Graphic 5 – Comparison between edible and inedible food waste during the seven days of analysis

Regarding the total of food waste per commodity group during the seven days of analysis – see Graphic 6 and Table 3, and Graphics 27 to 33 in the Appendices –, and taking into consideration the research made during the chapter of the literature review, it is possible to affirm that the primary commodity groups that generated the most food waste were pastries and bread, although jams, dairy, and meat equally expressed a high amount of food waste even though not as high as the first two commodity groups that were mentioned. It should be noted that although the commodity group related to jams had the third highest value of food waste, it was mostly related to the leftovers from the buffet which could be used for the next breakfast considering the long expiry date and characteristics of the products (for individual use), thus not entirely transforming itself in waste. On the other hand, the commodity groups that presented the least amount of food waste during the analysis were dried fruits and cereals although when analysing the commodity groups themselves, it is possible to affirm that the food consumed of these groups was low, which represents a high amount of leftovers from the buffet compared to the initial food available in the buffet for consumption, even though this value of food waste was used for the next breakfast.



Graphic 6 – Total amount of food waste per commodity group during the analysed days

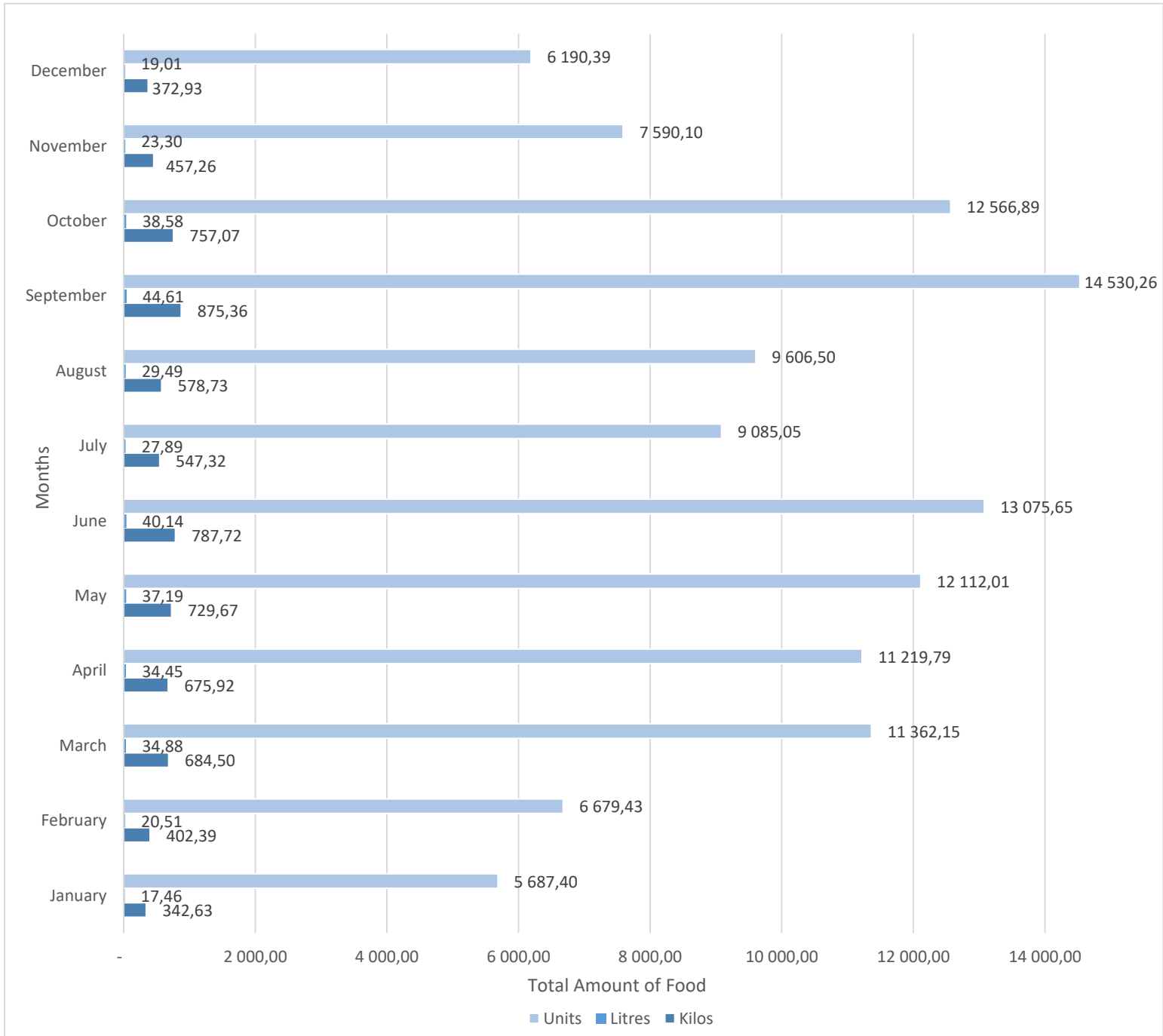
It should be noted that during the analysis of the buffet although it was possible to match some of the commodity groups observed during the literature review chapter – such as: Dairy Products, Eggs, Fruits, Vegetables, Cereals, and Meat – some products during breakfast had no representative commodity group that was mentioned in this chapter, thus making it necessary to create such groups in order to effectively and efficiently analyse the products as a whole.

Total of the days				
Commodity Groups	Food Waste (Kilos)	Food Waste (Units)	Food Waste (Litres)	Total
Dairy	6,18	277,59	–	283,77
Fruits	51,92	5,65	–	57,57
Meat	12,11	290,00	–	302,11
Vegetables	28,53	48,39	–	76,92
Pastries	0,74	770,87	–	771,61
Bread	–	304,23	–	304,23
Cereals	24,99	–	–	24,99
Jams	–	302,75	–	302,75
Eggs	–	75,00	6,44	81,44
Dried Fruits	1,07	0,46	–	1,53
Drinks	–	23,00	–	23,00
Total	125,54	2 097,94	6,44	2 229,92

Table 3 – Total amount of food waste per commodity group during the analysed days separated by kilos, litres, and units

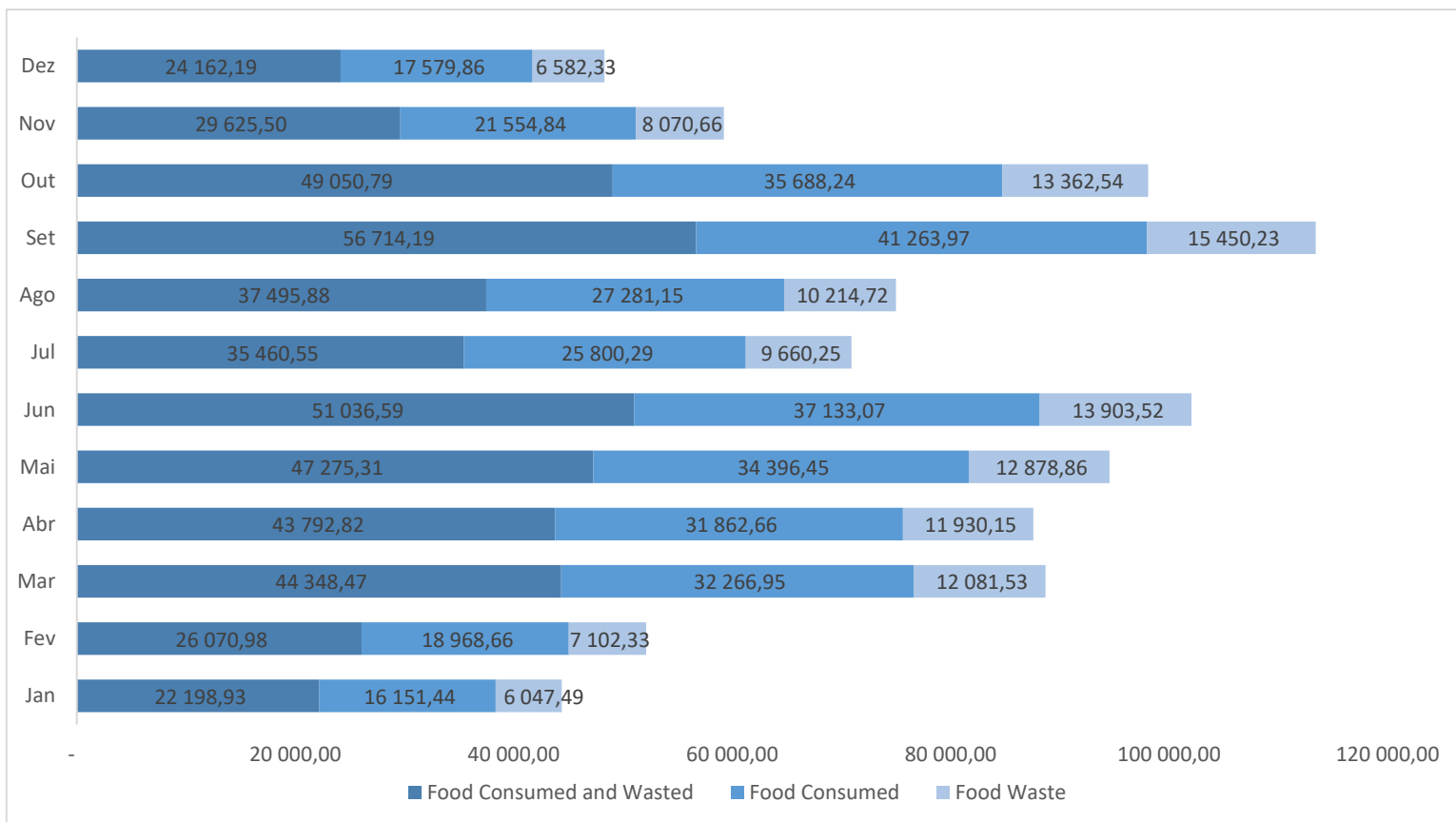
Extrapolating the FW quantities on a year perspective using the hotel's net breakfast revenue of 2018 and the total quantities of FW of the days analysed in this investigation, the total amount of **avoidable FW**, as observable in Graphic 34 in the Appendices through a month to month analysis, is of 119.702,22 units, 367.51 litres and 6.163,25 kilos, while the **unavoidable FW**, represented in Graphic 35 in the Appendices equally via a month to month analysis, has an extrapolation of 1.048,25 kilos and 3,37 units. In relation to the amount of **edible FW** on a year perspective, it presented a total of 95.303,47 units, and 5.368,43 kilos as accounted throughout the months' analysis presented in Graphic 36 seen in the Appendices, whereas **inedible FW** had a total of 24.402,12 units, 367,51 litres and 1.843,07 kilos (referred to Graphic 37 in the

Appendices). Based on that analysis and taking into consideration the various types of food waste, it is possible to affirm that based on the year extrapolation, the total amount of FW generated is 127.284,61 which is divided into 7.211,50 kilos, 367,51 litres and 119.705,59 units, as seen in Graphic 7 which represents the subdivision of the food waste extrapolation in kilos, units, and litres throughout the twelve months of the year.



Graphic 7 – Food Waste analysis based on a year extrapolation (subdivision of kilos, units, and litres)

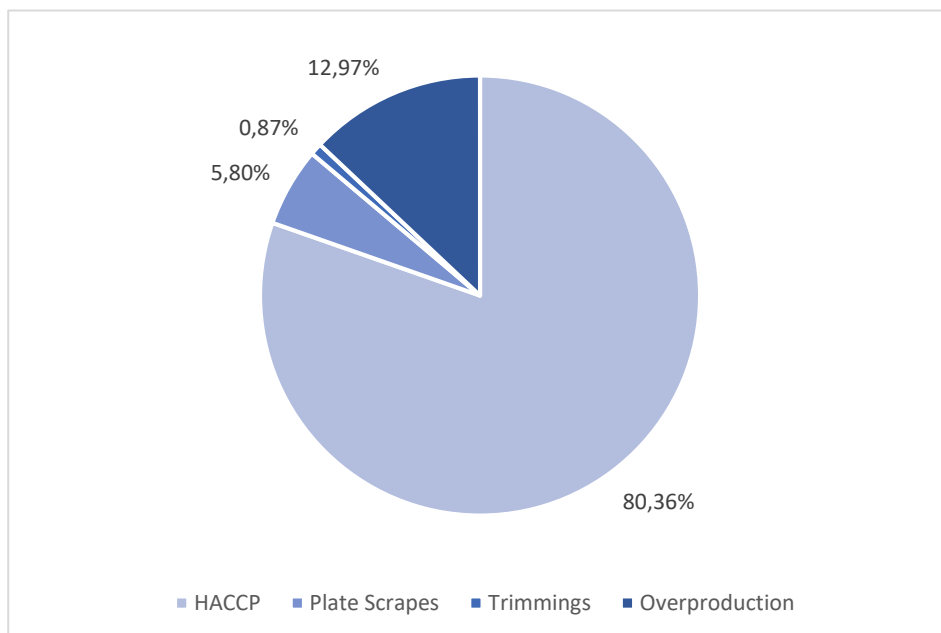
Concerning the comparison between the total of consumed and wasted food, the total consumed food, and the total food waste observed through the year extrapolation, it is possible to affirm that, as shown in Graphic 8 and in more detail in Graphic 38 in the Appendices, from the 439.411,40 units, 26.471,74 kilos, and 1.349,06 litres of consumed and wasted food, 319.705,81 units, 19.260,24 kilos, and 981,54 litres were consumed, while 119.705,59 units, 7.211,50 kilos, and 367,51 litres were inferred as wasted food, with the month of September having the highest amount of food consumed and wasted food, and January as being the month with the lowest amount of food wasted and food consumed. In relation to the FW, it is possible to affirm that as mentioned in the chapter of literature review, the **avoidable food waste** which accounts for 119.702,22 units, 6.163,25 kilos, and 367,51 litres in total of the year extrapolation corresponds to the sum of the 95.303,47 units, and 5.368,43 kilos of the **edible food waste** (which is considered to be fully avoidable FW) with the 24.398,75 units, and 794,83 kilos related to the avoidable part of the **inedible food waste**, thus leaving 1.048,25 kilos, and 3,37 units of **unavoidable food waste**, which accounts with a total of 24.402,12 units, 1.843,07 kilos, and 367,51 litres of inedible food waste.



Graphic 8 – Extrapolation and comparison of the consumed and waste food, FW, and consumed food

1.2. Causes of food waste in the hotel

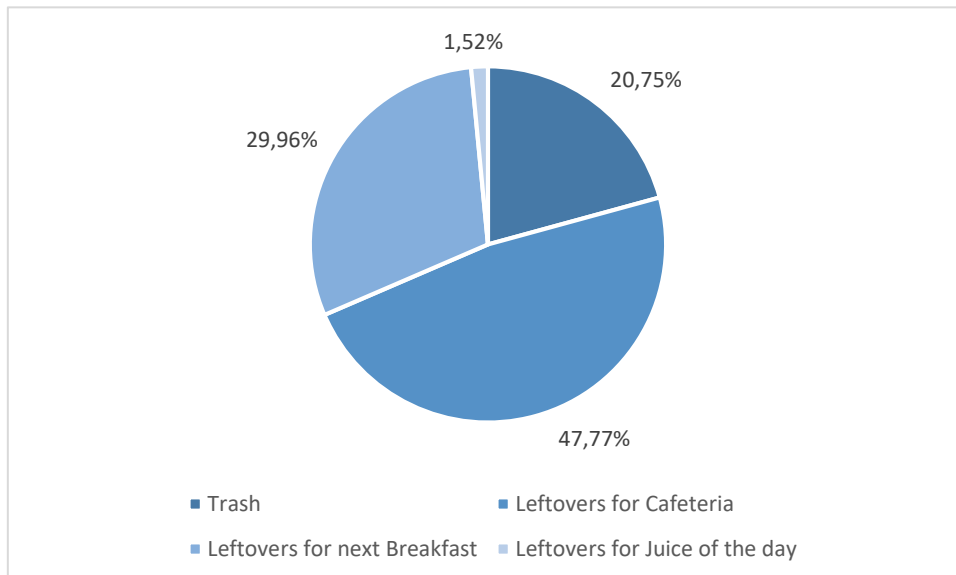
Regarding the causes related to the several types of food waste observed in the hotel during breakfast, it is possible to identify and validate some of the causes mentioned in the theories studied throughout the chapter of the literature review. In this way it is possible to affirm that the food waste generated during the seven days of analysis was primarily derivative from the buffet leftovers, related with the **production of a disproportionate amount of food (12,97%)** with the aim of satisfying customers and conveying an idea of quality, which was within the interval of percentages mentioned in the chapter of the literature review (3% to 30% of overproduction), and **food safety practices (80,36%)**. Food waste also originated from the **plate scrapes (5,80%)** from the customers – these three causes can be found during the **post-consumer stage** –, and from **trimmings of fruit and vegetables (0,87%)** during the **pre-consumer stage**, as is possible to observe from Graphic 9. It should be taken into consideration once again that this analysis was focused during and after the preparation stage. If taken into contemplation an analysis prior to the preparation stage of the breakfast, such as the food storage and purchase, it may be possible to observe different causes for the types of food waste found during those stages.



Graphic 9 – Food waste causes during the seven days of analysis

1.3. The handling of food waste in the hotel

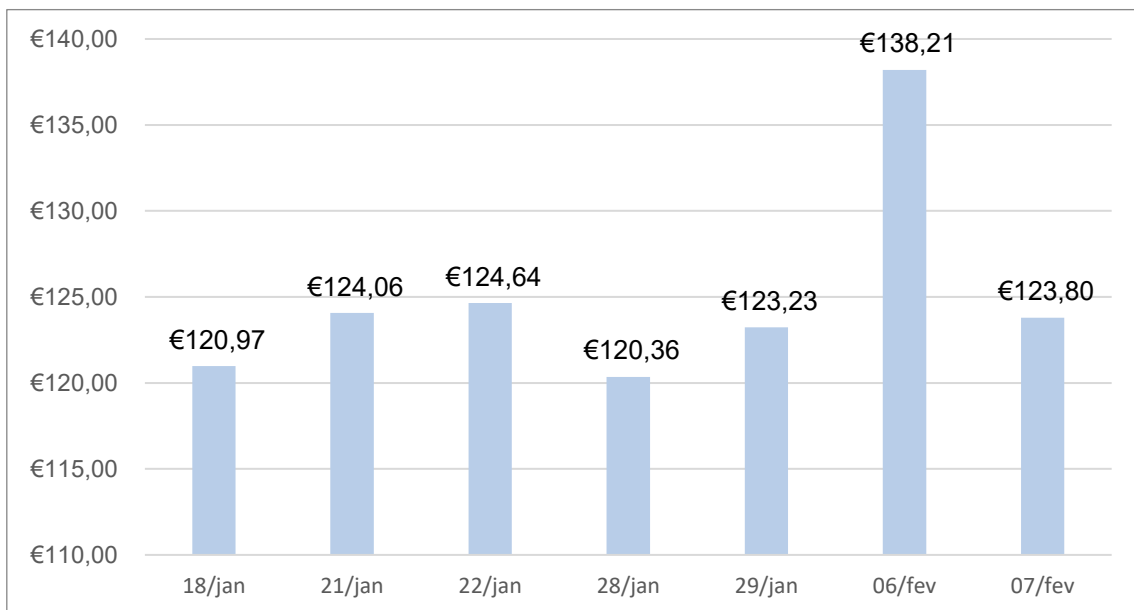
In relation to the form of how the hotel handles the food waste generated during breakfast, it is also feasible to identify and validate some of the methods of handling food waste stated in the theories studied throughout the chapter of the literature review. Although there was no food waste monitoring system being used in the hotel, it was possible to match some of the management solutions found during the phases regarding the reuse and disposal of food waste present in the chapter of the literature review related to the Food Hierarchy mentioned by Papargyropoulou *et al.* (2014). On the other hand, prior to and during the analysis, there was no observation of initiatives or solutions which allowed prevention of the food waste, besides the use of FIFO and expiry date tagging. It should be taken into consideration that, although some types of food waste were thrown away, it does not go to landfills due to the CML's policy of collecting the urban residues such as FW and redirecting it to companies which then proceed to use anaerobic digestion and composting to reduce the ecological footprint. In this way it is possible to affirm that the food waste generated during the seven days of analysis was primarily handled and redirected as either: Trash (20,75%); Leftovers for Cafeteria (47,77%); Leftovers for next breakfast (29,96%); or Leftovers for Juice of the Day (1,52%), as seen in the following Graphic 10.



Graphic 10 – Types of Food Waste handling in the hotel during the seven days analysis

1.4. Economic impacts of food waste

In relation to the starting question which correlates with **identifying the economic impact of food waste during breakfast in the buffet of the hotel studied**, it is possible to observe that the **direct economic impact of food waste** during the seven days analysis, with a total of 694 breakfasts, had a **total of 875,27€, subdivided into avoidable (852,46€), and unavoidable (22,81€), but also edible (524,24€), and inedible (333,03€)**, with the 6th of February presenting the highest economic impact of the seven days due to the higher generation of food waste more specifically the overproduction of the pastries and bread, whereas the 28th of January had the lowest economic impact mostly related to a lower percentage of food waste in that same commodity groups (pastries, and bread) as well as the commodity group related to the fruit (use of less fruit in the buffet during this day), as regarded in the following Graphic 11.

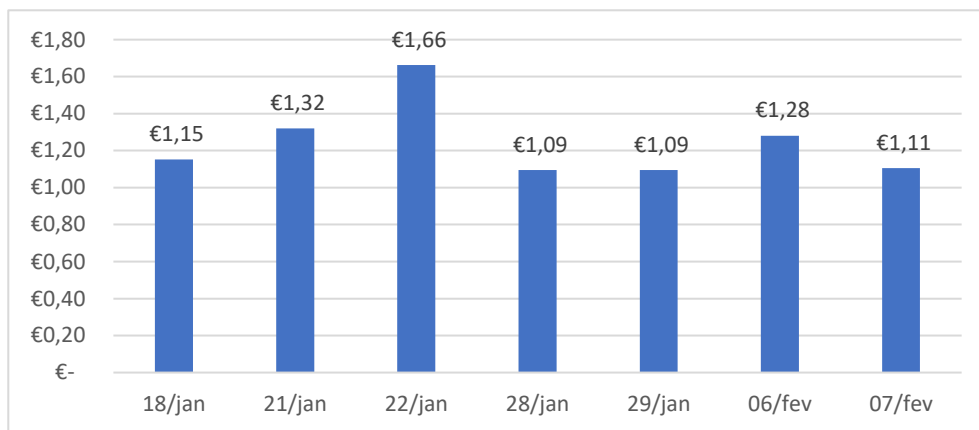


Graphic 11 – Direct economic impact of food waste during the seven days analysis

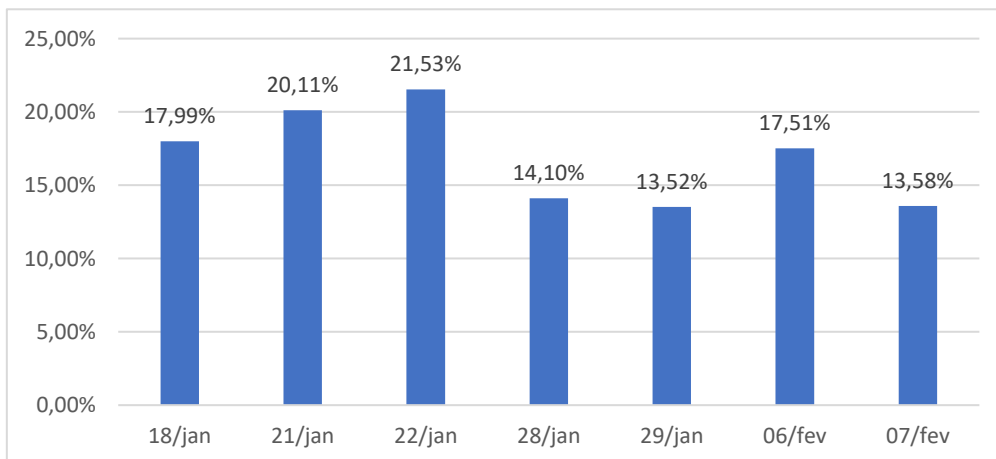
It is also viable to affirm that, on average, the **food waste cost per client** was of **1,24€** (analysis of the seven days present in Graphic 12), with an average **ratio of FW cost versus Profit** during the seven days of analysis of **16,91%** (study of the seven days present in Graphic 13). In other words, for every euro of profit there is a cost of almost

0,17€ just in food waste. On the other hand, it is possible to state from this analysis that a client on average generates a FW cost of 1,24€ per breakfast. In this way, and taking into consideration what was mentioned in the literature review which affirms that this ratio varies from 28% to 35% a year in restaurants, it is possible to affirm the importance of a more adequate food waste control and choice of FW management models. This information was corroborated after a meeting with the F&B director, which affirmed that this percentage should be between 20% and 30%.

It should be taken into consideration that due to the hotel's request of anonymity the calculation of the ratio resulted on the average of the ratios of the seven days and not from the calculation of total costs of food waste divided by the total revenue of the hotel during those days.

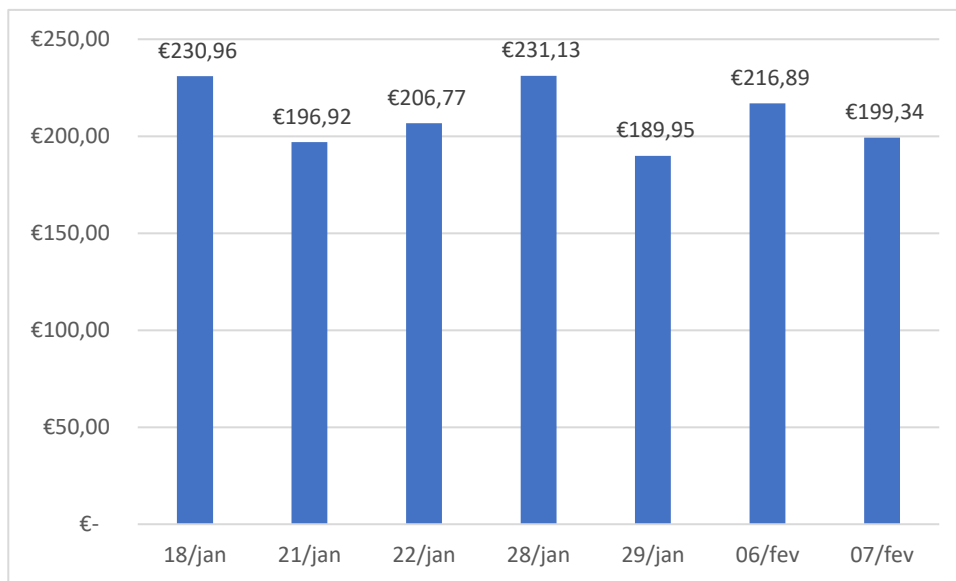


Graphic 12 – Food Waste cost per client during the seven days analysis



Graphic 13 – Analysis during the seven days of the ratio between the food waste cost and the breakfast profit

On the other hand, **the economic impact of the breakfast which correlates to the initial food at disposal on the buffet during the seven days had a total of 1.471,66€**, with the 28th and 18th of January with the highest economic impact, which can be explained by a higher amount of food of the commodity groups Meat, Vegetables, and Pastries put at disposal during these days rather than on the 29th of January. There was equally the observation of a certain amount of more expensive products in these commodity groups which portrait a higher amount in the 28th and 18th of January in comparison with the 29th of January, which leads to a higher cost and economic impact that is able to be greater than the costs generated by a higher number of cheaper products also displayed in the buffet, as observed in the following Graphic 14.

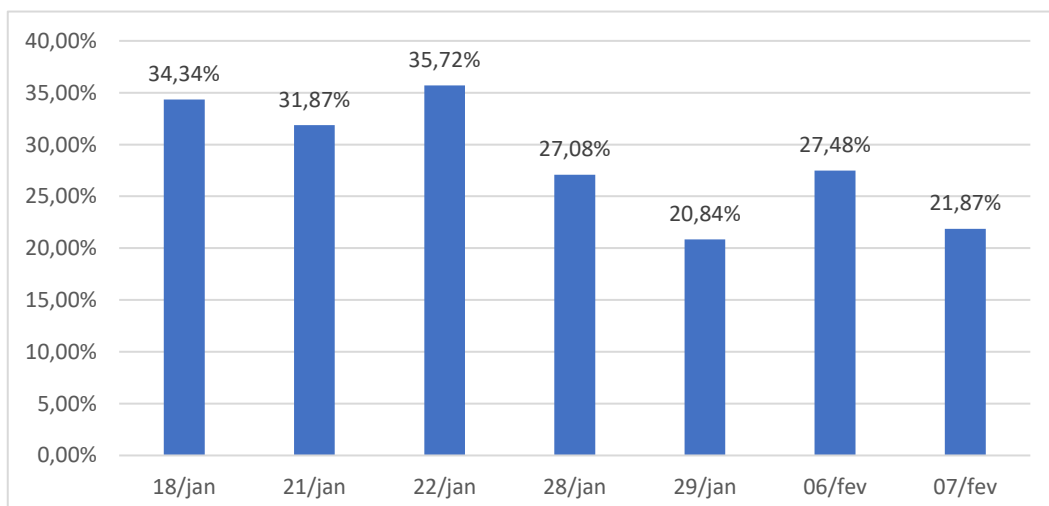


Graphic 14 – Initial economic impact of breakfast during the seven days analysis

In a different perspective, it can also be stated that on average the **initial cost per client** was of **2,09€** (evolution of the seven days of analysis present in Graphic 15) with an average **ratio of Initial Cost versus Profit** during the seven days of analysis of **28,46%** (findings of the seven days present in Graphic 16). Thus, for every euro of profit, there is a cost of almost 0,29€ just in initial food put at disposal on the buffet. Alternatively, it is possible to state from this analysis that a client on average generates an initial cost of 2,09€ per breakfast. It should be reiterated that due to the hotel's request of anonymity the calculation of the ratio resulted on the average of the ratios of the seven days and not from the calculation of total costs of food waste divided by the total revenue of the hotel during those days.

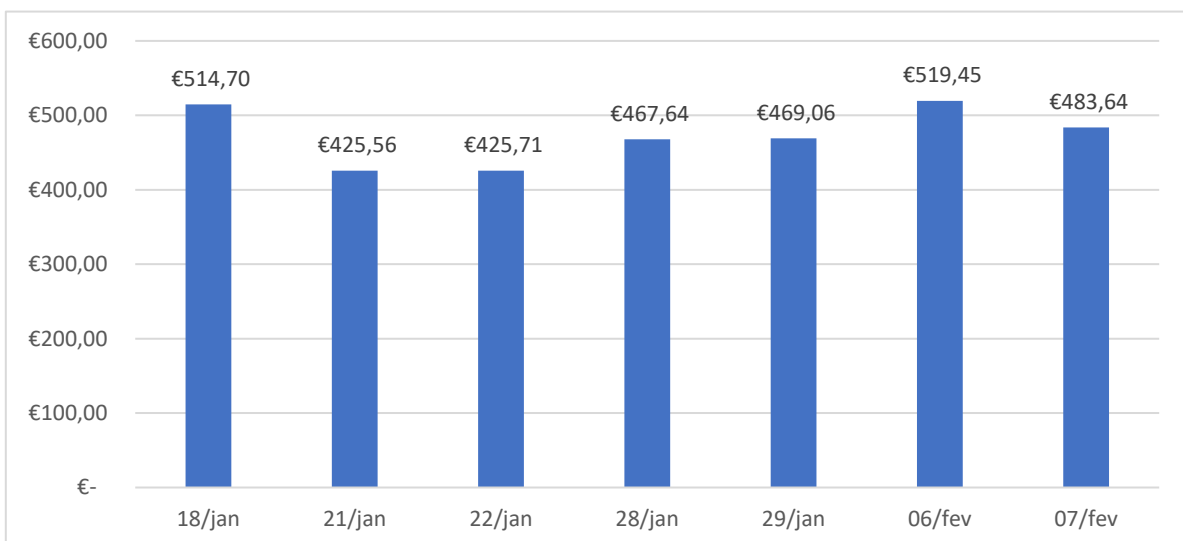


Graphic 15 – Initial cost per client during the seven days analysis



Graphic 16 – Analysis during the seven days of the ratio between the initial cost and the breakfast profit

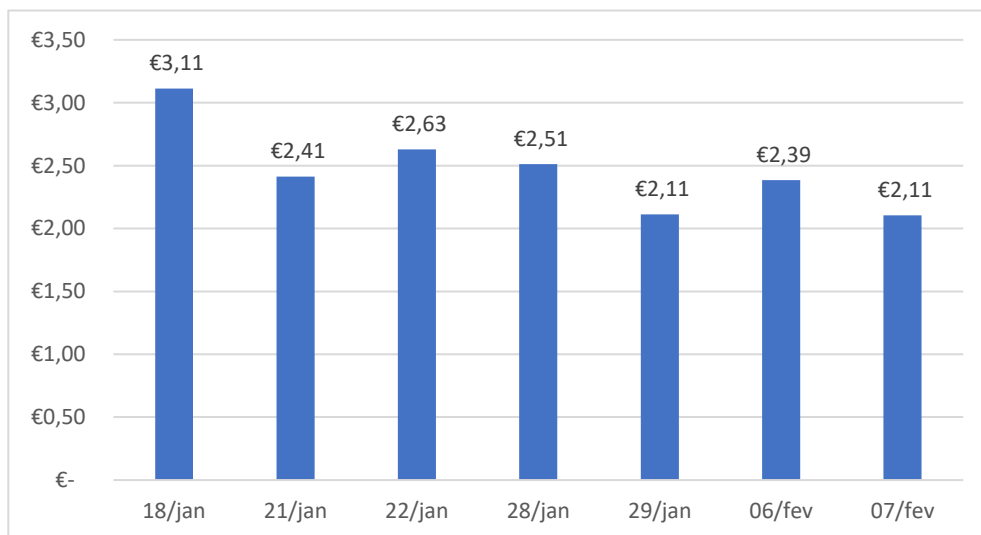
Regarding **the economic impact of the total of the sum of the consumption with the FW**, it is possible to affirm that there was a total **economic impact had a total of 3.305,76€** during the seven days analysis, with the highest values present during the 18th of January (514,70€), and the 6th of February (519,45€), which are mainly explained by the higher amount of accruals in the buffet during breakfast and lead to an increase in the costs even though the food itself was consumed by the client and not thrown away. On the other hand, the 21st and the 22nd of January were the days that presented the lowest values due to the lower amounts of consumed accruals, which can be corroborated by the graphic of the economic impact of food waste. In other words, these mentioned days, although presenting a smaller initial economic impact of breakfast and a smaller economic impact of the total of the consumption and the food waste, clearly show that the accruals made to the buffet lead led to a higher food waste and not to a higher consumption, as discerned in the following Graphic 14.



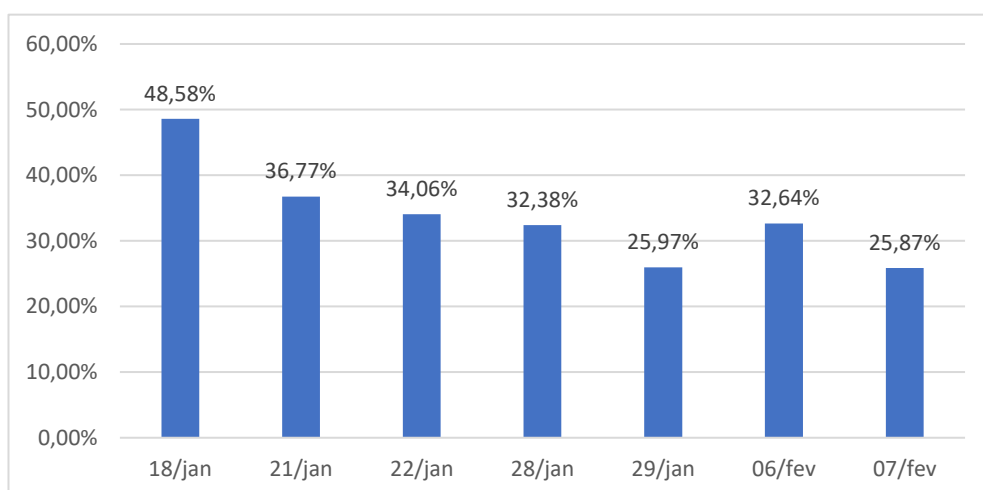
Graphic 17 – Economic impact of the total consumption and food waste during the seven days analysis

In a separate standpoint, it can also be affirmed that on average the **total breakfast cost per client** was of **2,47€** (results of the seven days present in Graphic 18)., with an average **ratio of total Breakfast Cost versus Profit** during the seven days of analysis of **33,75%** (conclusions of the seven days present in Graphic 19). Hence, for every euro of profit there is a cost of almost 0,34€ when accounting the sum of the consumption and the FW, which should be taken into consideration since almost half of

the profit is to be taken as cost. Alternatively, it is possible to state from this analysis that a client on average generates an initial cost of 2,47€ per breakfast. **It should be noted that due to the agreements and/or contracts established with travel agencies, the percentages present on day 18, 21, and 22 have a pre-established breakfast price which is to be considered preferential to the travel agencies, thus leading to a smaller profit than the profit usually generated with the regular price.** The following days – 28th, 29th, 6th, and the 7th – no longer presented any form of agreements and/or contracts with travel agencies, in this way leading to a higher profit and more economically viable ratios. It should be noted that this ratio does not exceed the maximum percentage mentioned in the literature review.

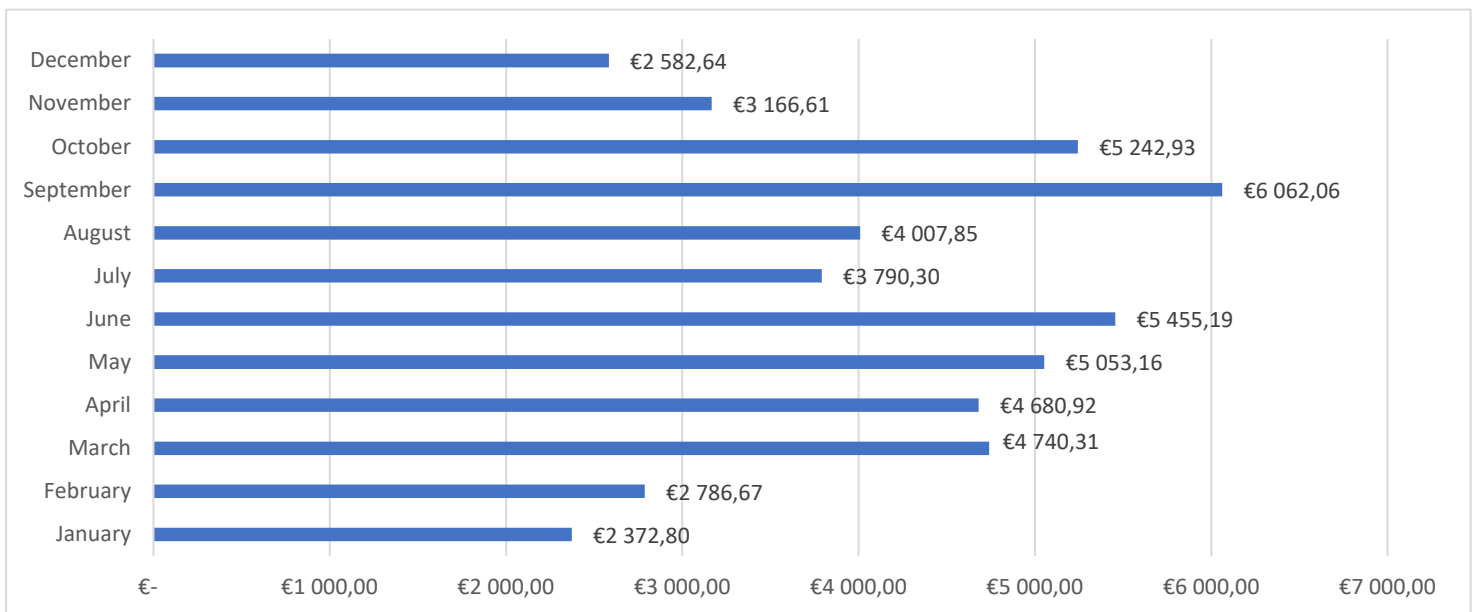


Graphic 18 – Total breakfast cost per client during the seven days analysis



Graphic 19 – Analysis during the seven days of the ratio between the total breakfast cost and the breakfast profit

Concerning the estimation of the food waste costs for the whole year, it is possible to affirm that, through the division of the product of the extrapolation of food waste, in quantities, of the month in analysis and the economic impact of the seven days of analysis with the total quantity of food waste observed during the seven days of analysis, as observable through the Graphic 20 , **the average direct economic impact per month on total food waste is of 4.161,79€ with a total of 49.941,44€ per year**. It can also be observed through this analysis, that taking into consideration the different types of the food waste detected, **the average economic impact per month of the edible food waste is of 2.551,62€ with a total of 30.618,44€ per year** (see Graphic 39 in the Appendices), while the average economic impact per month of **the inedible food waste accounted a cost of 1.648,66€ with a total of 19.783,92€** in the forecasted year (see Graphic 40 in the Appendices). On the other hand, it was conceivable to detect an **average economic impact per month of the avoidable food waste of 4.053,33€ with a total per year of 48.639,99€** as seen in Graphic 41 in the Appendices, and a **mean economic impact per month of the unavoidable food waste of 108,80€ with a total of 1.305,63 in the extrapolated year** (see Graphic 42 in the Appendices).



Graphic 20 – Extrapolation of food waste direct economic impact throughout the months of the year

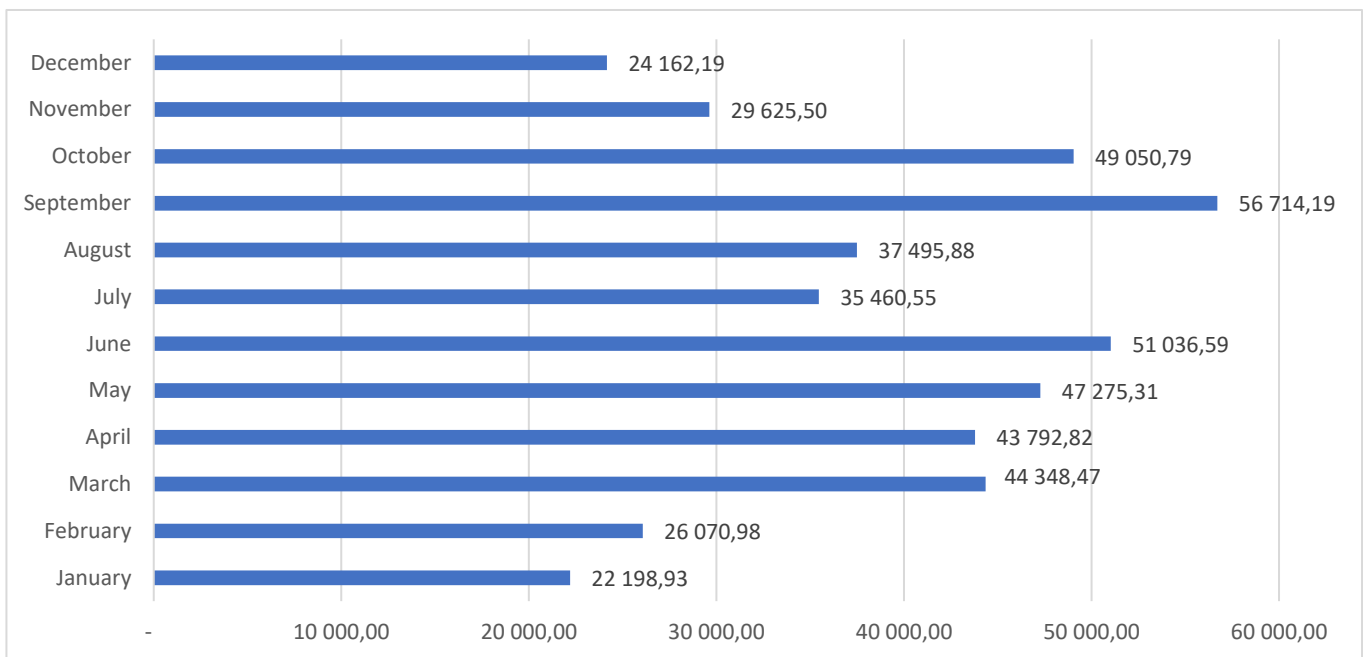
In correlation with the direct cost, it was also possible to observe indirect costs which are also influenced by the generation of food waste, such as the EBF tax benefits, the human resources (HR) costs apportioned to food waste, the food waste disposal costs, and the energy costs related to the preparation and cooking of food allocated to food waste. In this way, it was possible to validate the different types of economic impacts of food waste stated in the theories studied throughout the chapter of the literature review. It should be noted that after the meeting with the IPSS “Refood”, it was possible to conclude that there are no logistical costs correlated with the donation of food, thus leading to a cost-free initiative in terms of specific costs derivate from this solution. In this way, and to adequately calculate the cost referent to human resources but allocated to food waste, it was felt the need to divide the product of the extrapolation of the month’s food waste and its total HR cost with the total consumed and wasted food referent to the month’s extrapolation.

Since the number of hours referent to the preparation of the breakfast and its service is 6,5 hours, and a 2nd class cook in the hotel analysed earns, in average, 792€ per month, which divided by the workdays (an average of 22 days) and the number of hours worked (8 hours) leads to a cost to the hotel per hour of 4,50€. This alongside with the fact that for each breakfast there are two cooks in the kitchen preparing breakfast and doing the breakfast service, it is possible to say that for each hour of service there is a cost of 9€, thus leading to a cost of 58,50€ per 6,5 hours of breakfast service per day. In this way, it is possible to say that in a month, the total cost of the human resources is of 1.638€ which is referent to the production of both consumed and wasted food (see Table 4).

Preparation and Service (Work Hours)	Costs	Staff	(1 Service)
6,5	4,50 €	2	9,00
NOTE: 3 preparation hours are 3 service hours			58,50 €
7 days per week and 4 weeks per month			409,50 €
			1 638,00 €

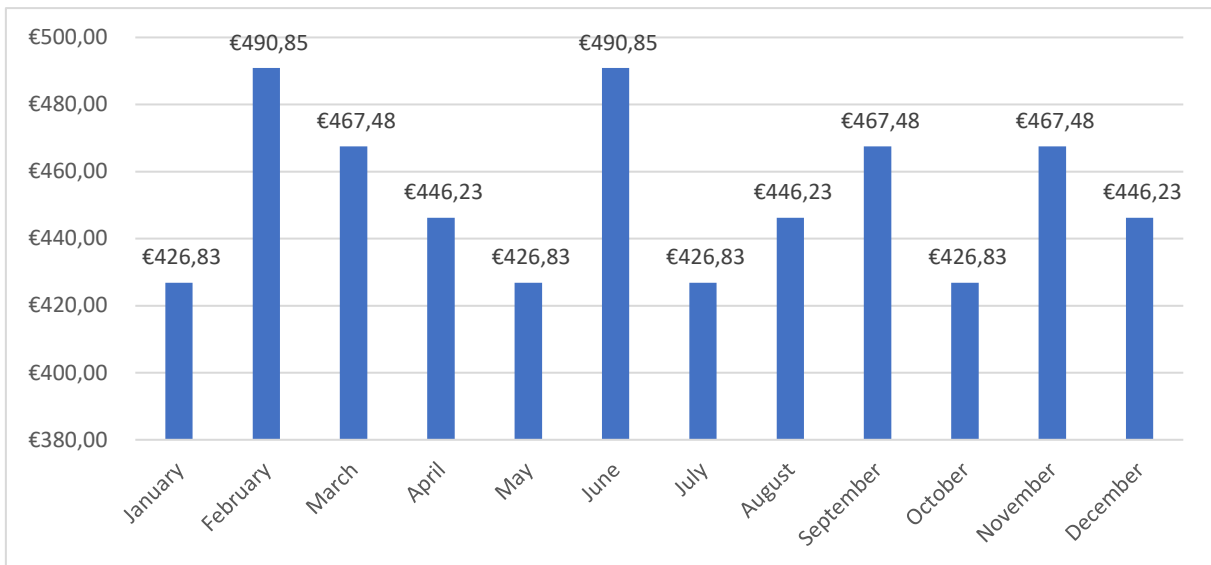
Table 4 – Human resources costs referent to the production of consumed and wasted food during breakfast

On the other hand, taking into consideration the total of food wasted, and food consumed and wasted during the seven days analysis and using the hotel's net breakfast revenue of 2018 so as to adequately extrapolate the values for each month of 2019, it is possible to infer a total of 439.411,40 units, 26.471,74 kilos, and 1.349,06 litres on a year basis of food consumed and wasted, with the months varying according with the Graphic 21 presented below. It should be noted that the values present in the graphic are representative of the sum of the kilos, units, and litres of each month.



Graphic 21 – Year's extrapolation of the consumed and wasted food during buffet at breakfast in quantities

In this way, and in view of the values of the food waste analysis on a year extrapolation, which was presented previously during the quantification of food waste, it is possible to affirm that the **human resources cost related to the food waste generated** are, on average, 452,51€ per month, which **represents an estimation of a total of 5.430,13€ a year, as seen in Graphic 22.**



Graphic 22 – Human Resources costs allocated to food waste during food preparation for breakfast on a year's extrapolation

Concerning the energy costs allocated to food waste, these costs were obtained through the division of the product of the food waste and the costs relative to the energy consumption during food preparation, of both consumed and wasted food for breakfast, with the extrapolation of the total of consumed and wasted food. Based on the fact that the kWh consumption of the stoves of the hotel is of 13,8 kWh, and that these stoves are switched on for 24 hours which is powered by only electricity for the food preparation, it leads to a consumption of 331,20 kWh per day. This alongside with the fact that the cost of energy observable on EDP's website is of 0,1559€³ per kWh (EDP, 2019) during simple schedule⁴, it is possible to affirm that the cost of the kWh consumption for the production of food for breakfast both consumed and wasted, is predicted to reach during the months that have 30 days a value of 1.549,02€, during the months that have 31 days a cost of 1.600,66€, and during the month of February a cost of 1.445,75€ (see Table 5).

³ The exact price paid by the hotel per kWh was not permitted to be used

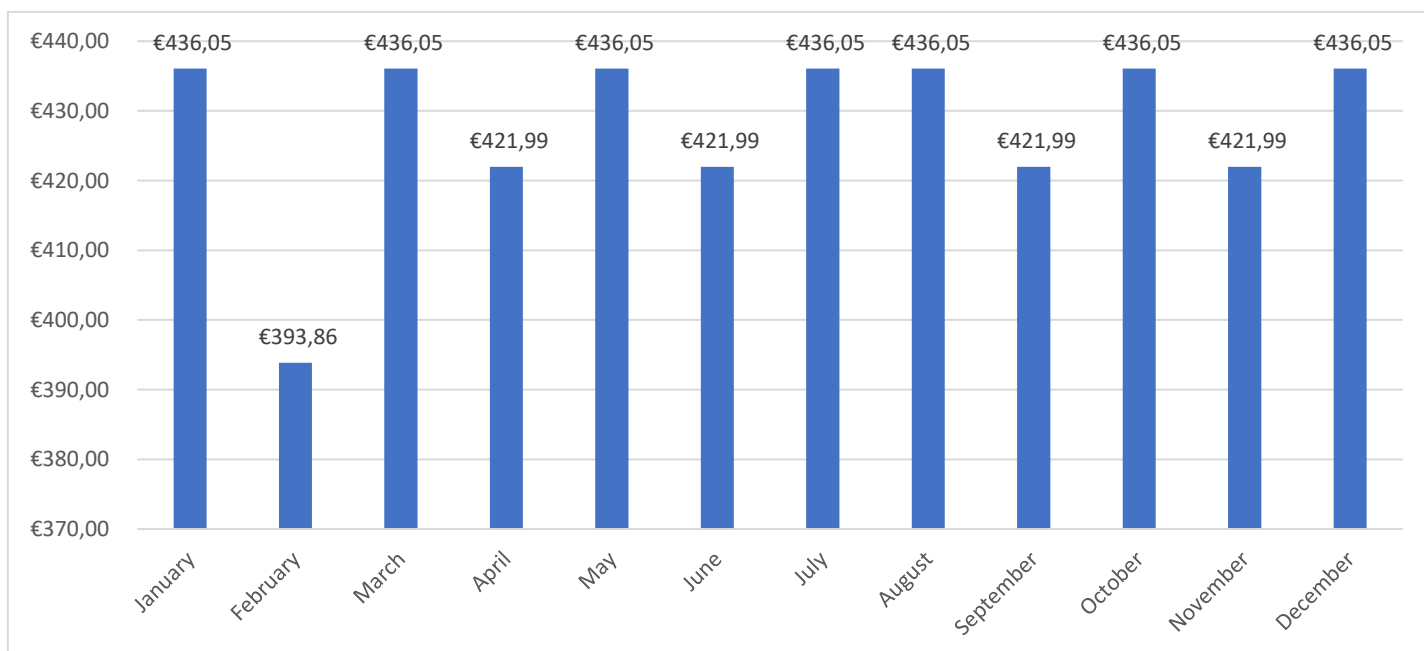
⁴ Price per kWh stays the same throughout the hours of the day

Costs related to energy consumption for food preparation (simple schedule)	kWh Cost	kWh Consumption	kWh Consumption per 24 hours
kWh	0,1559 €	13,80	331,20
kWh cost per day (potency)	0,6917 €		

kWh consumption per 24 hours during 30 days	kWh consumption per 24 hours during 31 days	kWh consumption per 24 hours during 28 days	Cost of kWh consumption per 24 hours during 30 days	Cost of kWh consumption per 24 hours during 31 days	Cost of kWh consumption per 24 hours during 28 days
9 936,00	10 267,20	9 273,60	1 549,02 €	1 600,66 €	1 445,75 €

Table 5 – Forecast of cost of kWh consumption per 24 hours during each month of the year.

Given the values mentioned previously of the total of food waste per month during the year extrapolation, and the total of consumed and wasted food projected also for a year, it is possible to affirm that, on **average, the cost per month of energy for the preparation of food waste during breakfast is of 427,85€**, with a **total cost of 4.698,14€ a year**, with the month with the lowest value being presented in February (393,86€) and the highest value being observable during the months with 31 days (436,05€) **as seen in Graphic 23**.



Graphic 23 – Energy costs referent to food waste during food preparation for breakfast on a year's forecast

Pertaining to the remaining primary indirect cost mentioned during the literature review, which is the costs referent to the disposal of food waste as well as its logistics and transportation, these expenses were also supplied by the hotel unit and are related to the payment made to the *Câmara Municipal de Lisboa* (CML). This payment pertains to the costs related to the disposal of food waste, as well as the collection, transportation, storage, sorting, handling, elimination and recuperation of this waste through anaerobic digestion and composting. Since the objective is to isolate the cost of disposal of the food waste during the breakfast's buffet from the cost of the disposal of the total of food waste, it is important to firstly obtain the cost of the latter, which was made available by the hotel being studied, as observable in Table 6, therefore leading to a cost of the disposal of the total food waste (considered urban residues during disposal) of 581,75€.

Costs relative to the elimination of food waste – Lisbon Municipal Council – Urban Residues			
		€	Costs
Availability Tarif for Urban Residues (Fixed)	29 days	0,2632	7,63 €
Variable Tarif for Urban Residues	708 m3	0,8023	568,03 €
Management Fee for Urban Residues	708 m3	0,0086	6,09 €
			581,75 €

Table 6 – Costs relative to the elimination of food waste/urban residues by the Lisbon Municipal Council during December 2018

To accordingly predict the costs of disposal of the food waste solely during the breakfast's buffet throughout the months of 2019, it was felt the need to use not only the occupancy rate of 2018, but also the net breakfast revenue and total net F&B revenue as showed in Table 7 into percentages to protect the data obtained by the hotel. In this way, the calculation of the wanted cost is generated through the multiplication of the two following divisions:

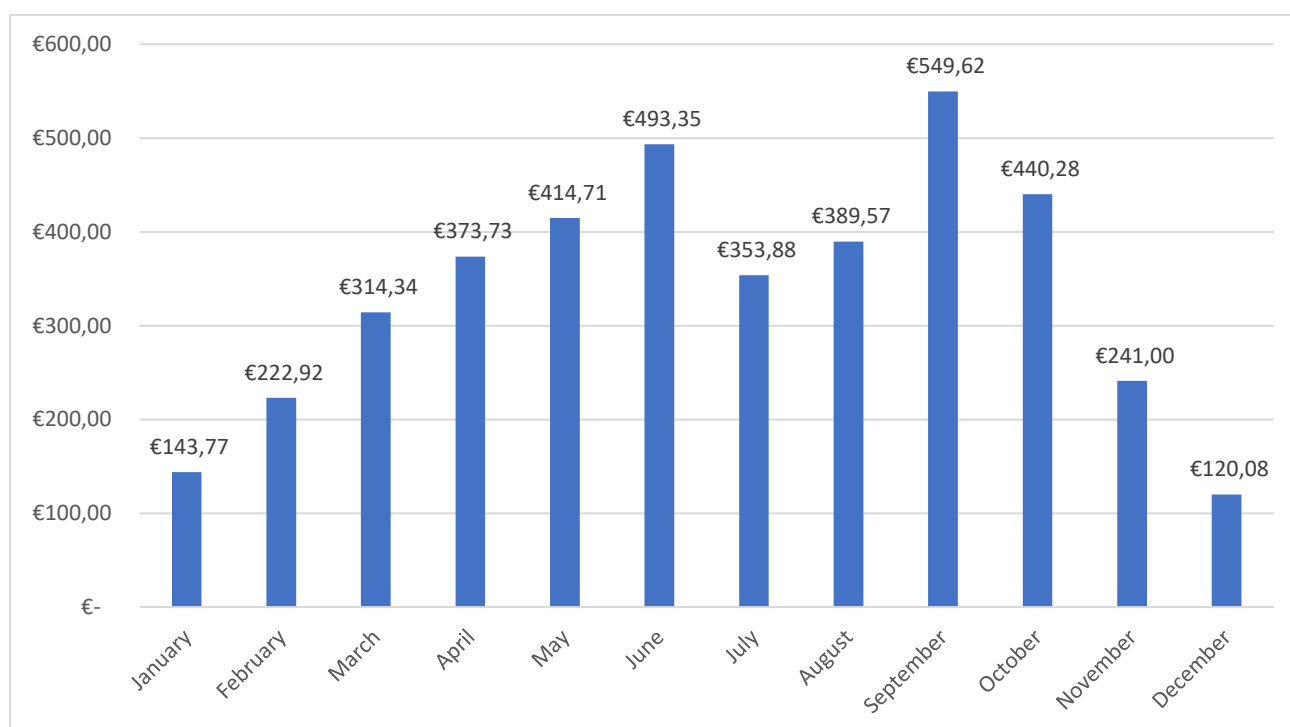
1^o – (Cost of the disposal of the total food waste of the F&B department referent to December × Occupancy rate of the month in analysis) / (Occupancy rate of the month of December)

2^o – (Net breakfast revenue of the month in analysis) / (Total net F&B revenue of the month in analysis)

Months	Occupancy Rates	% Net breakfast revenue of the year's total	% of Net F&B revenue of the year's total
January	49,58%	4,75%	6,90%
February	68,71%	5,58%	7,25%
March	81,99%	9,49%	10,43%
April	89,01%	9,37%	9,41%
May	89,22%	10,12%	9,17%
June	93,00%	10,92%	8,68%
July	76,15%	7,59%	6,88%
August	84,69%	8,03%	7,35%
September	94,36%	12,14%	8,78%
October	91,89%	10,50%	9,23%
November	69,08%	6,34%	7,66%
December	45,49%	5,17%	8,26%

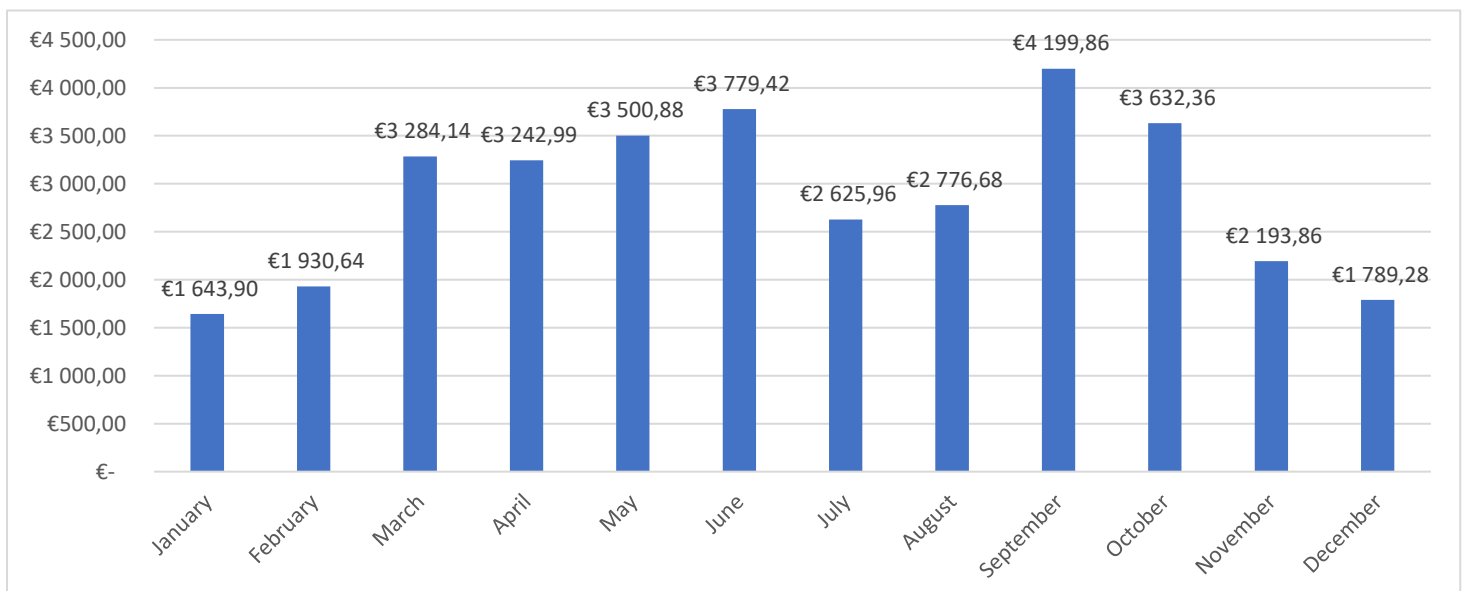
Table 7 – Percentages of data used for forecasting of disposal costs and tax benefits referent to food waste

As mentioned in the Methodology chapter, the cost of the disposal of food waste is agglomerated in the payment made to the *Câmara Municipal de Lisboa* (CML). Therefore, even though this cost has also the consideration of the disposal of other types of waste since it was not possible to separate these costs, these will be taken as a whole and it will be considered as the total costs of the disposal of food waste. The first division allows to estimate the total food waste cost of the F&B department for each month, except for December which was a value given by the hotel, while the second division permits to obtain the percentage of the net breakfast revenue of the total net F&B revenue, thus allowing through the multiplication of both divisions to obtain the parcel of the **cost of disposal of the food waste exclusively referent to the FW generated during the breakfast's buffet**, as shown through Graphic 24, **with an average of 338,10€, and a total of 4.057,25€ during the year** for all food waste generated in that year.



Graphic 24 – Estimation of the disposal costs of food waste generated during breakfast on a year basis

On the other hand, and regarding the literature review chapter and what was mentioned related to the **EBF and the possible tax benefits** of food waste, when a hotel unit proceeds to donate food to a social solidarity institution (IPSS) and when a hotel unit adequately implements the HACCP system, it allows the possibility for tax benefits. In this manner, the **estimation of the food waste tax benefits for the whole year were based on Table 7** which were calculated based on the value of the breakfast revenue that was multiplied by an 8/1000, in order to observe the monetary limit where the food waste costs were able to be deducted from the calculation of the IRC. It was then proceeded to calculate the **130% mark-up of the cost food waste donated to these institutions, through the product of the 130% with the edible food waste costs**. Since the food waste adequate for donation must be considered edible, and to correctly extrapolate the tax benefits, that is where the estimation had its incidence. It should be noted that after a meeting with the representative of the IPSS intitled “Refood”, it was possible to observe that this institution had no logistic costs for the hotel, thus allowing the possibility of a partnership and a higher positive economic impact for the hotel. No mark-up of the edible food waste costs surpassed the 8/1000 limit of the hotel’s breakfast revenue. In this way, and as observable through the Graphic 25, the **average tax benefit and positive economic impact per month on food waste, is of 2.883,33€ with a total of 34.599,97€ in a year-based analysis.**



Graphic 25 – Mark-up of the edible food waste costs for tax benefits

In this way, and taking into the consideration the analysis framework modified from Papargyropoulou *et al.* (2014) of the management models, it was **possible to observe a negative economic impact related to the management model used in the hotel to handle their food waste of 60.918,00€**, which allowed a corroboration of the research made during the literature review. By subdividing these negative impacts in direct and indirect costs, it was possible to observe a direct cost of 49.941,44€ referent to the cost of food waste, in conjunction with several indirect costs of 5.430,13€ related to the allocated costs of Human Resources, of 4.698,14€ relative to the allocation of the energy consumption for the generation of food waste, and a cost of 848,29€ which correlates to the part of the total cost of disposal of food waste during the year analysis related to the unavoidable food waste. On the other hand, the **positive economic impact generated by the management models** used in the hotel should also be taken into consideration due to the capability that the hotel has in directing the avoidable food waste to the staff cafeteria thus allowing a reduction in the possible costs related to the disposal of food waste during the year analysis **of 3.208,96€**. **In conclusion, with the management model used in the hotel, it is possible to affirm that in a total negative economic impact of 57.709,04€.**

Concerning the several food waste management models mentioned during the chapter of the literature review that could be used by the hotel during the handling of their food waste, an analysis was made to observe the positive and negative economic impacts of each model to verify the validity of the analysis framework of Papargyropoulou *et al.* (2014) and the theory studied in the literature review chapter regarding the food waste hierarchy. Taking into consideration that the FW hierarchy has into consideration the food waste management models, which are prevention, reuse (through donations, production of new recipes, and use of the leftover for the staff), recycling (anaerobic digestion – AD, animal feed, and composting), and disposal, these are going to be analysed and have its impact evaluated based on the direct and indirect costs analysed in the literature review and consequently corroborated in this chapter. **It should be noted that, since the hotel solely follows the HACCP system regarding human consumption and not the additional legislation referent to animal feed as mentioned in the chapter of the literature review, this management model should not be applied in this case study but will be mentioned for understanding purposes.**

Furthermore, it is important to mention that in Portugal, more specifically in Lisbon, the *Câmara Municipal de Lisboa* (CML) proceeds to do the disposal of food waste, as well as its collection, transportation, storage, sorting, handling, elimination and recuperation through AD and composting. Therefore, the costs related to the recycling and disposal solutions present an equal amount which is included in the payment made to the CML.

In this way, and taking into account the already mentioned costs, the **stage of prevention** presented an **estimated positive impact of 62.708,31€**, which derives from the prevention of the generation of the avoidable food waste (48.639,99€), and the costs correlated to the disposal costs, the human resources, and energy used allocated to the amount of avoidable food waste (4.023,73€, 5.385,26€, and 4.659,33€ respectively). On the other hand, this stage also has a **negative impact of – 1.422,84€**, which is solely restricted to the costs applicable to the unavoidable food waste (– 1305,63€ from the costs of the unavoidable food waste, – 33,52€ of the disposal costs, – 44,86€ referent to the human resources, and – 38,82€ of energy usage costs) (as mentioned in Table 8).

Relatively to the **stage of reuse through donations**, it presented an **estimated positive impact of 37.808,93€**, which arises from the maximum value of tax benefits related to the donation of the edible food waste (34.599,97€), and the costs correlated to the disposal costs allocated to the sum of the edible food waste (3.208,96€). In contrast, this stage also has a **negative impact of – 60.918,00€**, which relates to the costs applicable to the generation of the total food waste (– 49.941,44€) plus the disposal costs of the inedible food waste (– 848,29€) and total costs allocated to the human resources (– 5.430,13€) and the energy usage (– 4.698,14€) (referent to Table 8).

Concerning the **stage of reuse of edible food waste for new recipes or for the staff's cafeteria, as well as the stage of FW recycling for animal feed**, it presented an **estimated positive impact of 3.208,96€**, which arises from the costs correlated to the disposal costs allocated to the sum of the edible food waste. Oppositely, these stages also have a **negative impact of – 60.918,00€**, which equally is associated to the costs applicable to the production of the total food waste (– 49.941,44€) combined with the disposal costs of the inedible food waste (– 848,29€) and total costs allocated to the HR (– 5.430,13€) and energy usage (– 4.698,14€). It should be noted that edible food, when used for animal feed, will not bring about any economic benefits in relation to tax benefits as mentioned during the chapter of the literature review (consult Table 8).

Lastly, pertaining to the **stage of recycling using AD or composting, as well as the stage of disposal through landfills**, it was projected **no positive impact**. Oppositely, these stages had the **highest negative impact of – 64.126,96€**, which equally is associated to the costs applicable to the production of the total food waste (– 49.941,44€) combined with the total disposal costs (– 4.057,25€) and total costs allocated to the HR (– 5.430,13€) and energy usage (– 4.698,14€) (see Table 8).

Usable management models for the hotel		Economic Impacts
Prevention		
FIFO; expiry date tagging, etc.	62 708,31 €	= Food cost + logistical cost for landfilling + HR and energy related costs
	– 1 422,84 €	
Reutilization		
Donations	37 808,93 €	Food cost (negative) Tax benefits (positive) + logistical cost for landfilling (positive and negative) + HR and energy related costs (negative)
	– 60 918,00 €	
Staff	3 208,96 €	Food cost (negative) + logistical cost for landfilling (negative and positive depending on type of FW) + HR and energy-related costs (negative)
	– 60 918,00 €	
Reuse for new recipes	3 208,96 €	Food cost (negative) + logistical cost for landfilling (negative and positive depending on type of FW) + HR and energy-related costs (negative)
	– 60 918,00 €	
Recycling		
Animal Feed	3 208,96 €	Food cost (negative) + logistical cost for landfilling (negative and positive depending on type of FW) + HR and energy-related costs (negative)
	– 60 918,00 €	
Composting	– €	Food cost + logistical cost for landfilling + HR and energy-related costs (negative)
	– 64 126,96 €	
Anaerobic Digestion	– €	Food cost + logistical cost for landfilling + HR and energy-related costs (negative)
	– 64 126,96 €	
Disposal		
Landfills	– €	Food cost + logistical cost for landfilling + HR and energy-related costs (negative)
	– 64 126,96 €	

Table 8 – Possible management models and solutions for Food Waste in the hotel

1.5. Ways of minimizing the negative economic impacts of the hotel – Suggestions of initiatives

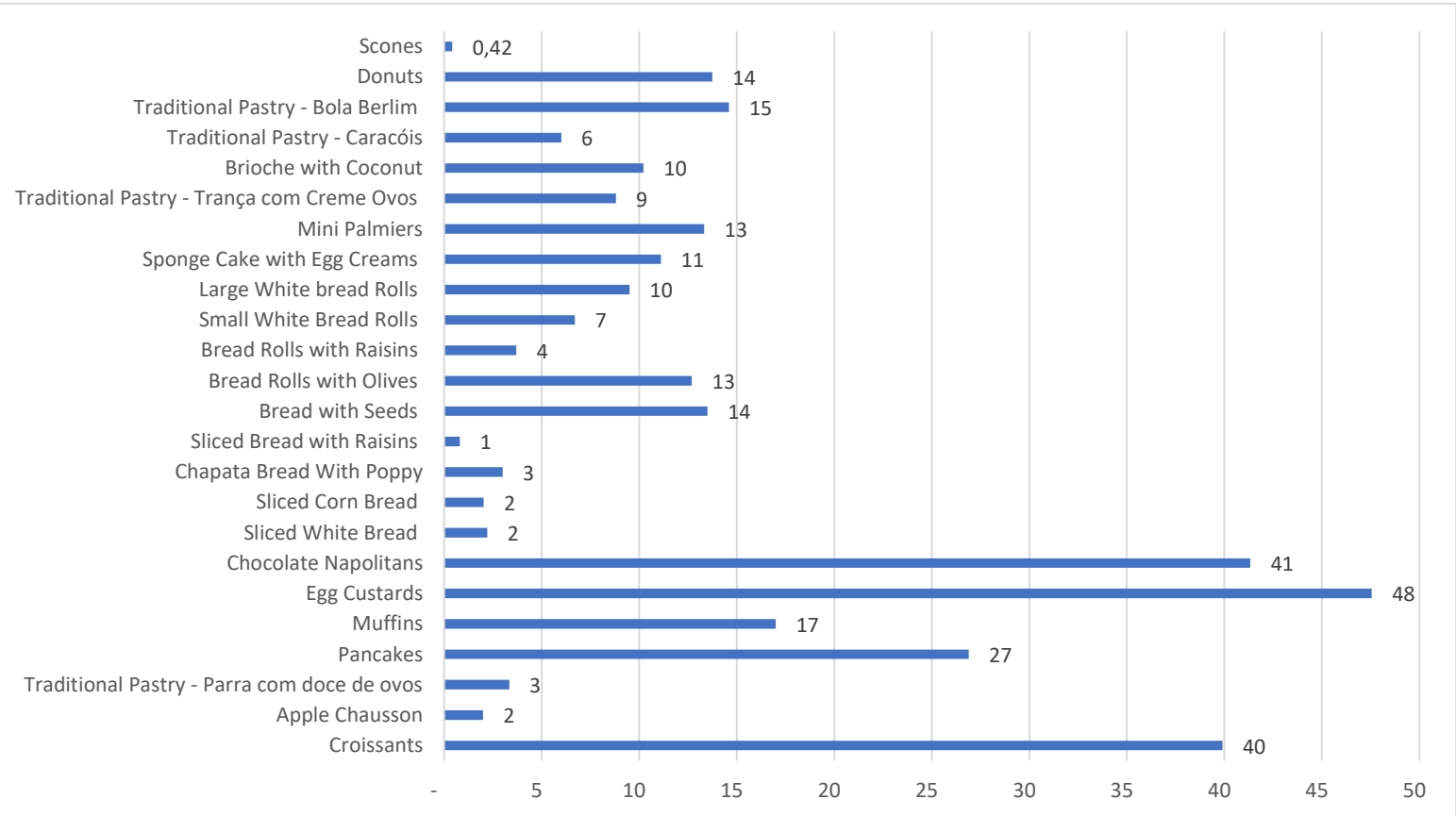
Lastly, to reduce some of the negative economic impacts observed during the hotel analysis and its food waste management models, this investigation proposes certain techniques and initiatives which have the objective of minimizing the negative economic impacts of the FW management models practised by the hotel unit. In this way, and grounding these suggestions on the theory studied in the literature review chapter, it is recommended – **for the Prevention stage** – that certain food products displayed during the buffet have a **reduction of the quantity made available to the customer, whether through a reduction of portion sizes or through a change of the kitchenware made available for use in the buffet**, such products suggested for this reduction are the cream cheese, quinoa, tomatoes with pesto, baked beans with tomato sauce, the scrambled eggs, and the yogurt derivate from the 5kg bucket which can be presented to the customers as individual portions.

If after deeper analysis and change of portion sizes it is observed that certain breakfast **products displayed in the buffet still create a high percentage of food waste** and have a low consumption percentage, it is also **suggested that these products are eliminated from the buffet and are no longer put for consumption**, as was observable, for example, in the pastries commodity groups for scones and the traditional pastries *Caracóis*. If the hotel implements such suggestions, it is extrapolated through the same calculations as mentioned during the economic impacts of direct and indirect costs that it may lead to a positive economic impact of 4.565,84€ for the first initiative, and 325,02€ for the second initiative. If the hotel unit is able to fully implement these mentioned initiatives to all avoidable food waste, its positive economic impact may be able to reach up to 62 708,31 € as mentioned in Table 8.

Regarding the stage of Reuse, it is advised that **food is reused for the creation and preparation of new dishes** from the reuse of certain edible food waste either for the guests or the staff, such as the cream cheese, bacon, yoghurt derivate from the 5kg bucket, sautéed mushrooms, milk (e.g. desserts), roasted vegetables (e.g. mini quiche). It is also **proposed an establishment of a partnership with an IPSS such as “Refood”** since the hotel unit does not have any form of affiliation with an IPSS and follows the HACCP system adequately, thus outputting the food waste considered to be adequate for consumption (edible and some inedible FW), such as the pastries, bread, milk, bacon with sausages, quinoa, cherry tomatoes, scrambled eggs, tortillas, yogurt derivate from the 5kg bucket. Lastly, in this stage, it is **propositioned the redirecting of the other edible food waste** that is thrown away for not being able to be used for the next breakfast **to the staff’s cafeteria**, such as the bacon with sausages or fruit salad. On the other hand, if the hotel implements the suggestions mentioned above for this stage, it is induced through the same calculations as mentioned previously that it may have a positive economic impact of 2,74€ for the first initiative, 603,21€ for the second initiative, and a positive economic impact of 32,95€ for the third initiative.

If the hotel is capable of fully implementing the mentioned initiatives to all its edible and part of the inedible food waste that is still adequate for consumption, its positive economic impact may be able to reach up to 3.208,96€, or 37.808,93€ if the hotel unit proceeds to donate all of the avoidable food waste as mentioned in Table 8. It should be noted that the reduced positive economic benefit for this stage is mainly derivate from the still generation of food waste and the indirect costs except for the disposal costs that are interconnected with the production of FW.

In order to try and implement one of the initiatives proposed so as to make the supply of the hotel more adequate to the demand of the guests, it was analysed for 10 days the food waste for the commodity groups Pastries and Bread, and the food put at disposal at the buffet of these groups (see Table 9 in the Appendices). In this manner, it was possible to create a prevision map of the interval of correct quantity of pastry and bread depending on the number of clients having breakfast that day with margin accruals, so as to guarantee the satisfaction of the clients during breakfast (see Table 10 in the Appendices) and taking into consideration the average real consumption of these days for an average 85 guest, as seen in Graphic 26. It was possible to observe that after implementing such prevision map, during the first two weeks there was a visible reduction of food waste from these commodity groups mainly from the apple *chaussons*, egg custards, chocolate Neapolitans, and croissants, although afterwards the food waste generation increased again which may be able to be explained by the discrepancy of objectives and worries between the kitchen staff, since the chef's objective is to reduce costs, and the cooks are to be practical and aren't worried about whether or not the costs are high. It is important to note that scones were the only pastry that was quantified through kilos and not through units, therefore the value of 0,42 on the Graphic.



Graphic 26 – Real Consumption of the Bread and Pastries Commodity Group

Chapter V – Conclusions, limitations and future research

1. Conclusions

Although food waste has been an issue that has been recurrently mentioned throughout the various stages of the food supply chain due to the continuous growth of society and its needs, only a small amount of academic studies has been made which relates food waste to the consumption phase regarding the foodservice sector, with special attention to the tourism industry and how to correctly quantify FW and its several economic impacts. Despite this, if a hotel unit has as an objective to reduce its food waste, according to the literature reviewed, it should follow a series of steps which are mentioned in the adaptation of the analysis framework of Papargyropoulou *et al.* (2014). This analysis framework adequately explains these management models and interconnects them with the food waste hierarchy, and also correlates the phases of food waste that should be analysed first before proceeding to analyse the way that the hotel handles its FW. This investigation had its focus on the food waste presented in the buffet during breakfast in a hotel situated in Lisbon which served a total of 694 breakfasts during the analysis period, whose name won't be disclosed for confidentiality reasons.

The conclusions of this investigation centre themselves in the observation of edible and inedible food waste, as well as avoidable and unavoidable food waste, with the inedible food waste observed in the hotel having somewhat of a different definition from the literature review. In other words, of the **observed food waste during the data collection were both avoidable (with 2.097,89 units, 6,44 litres, and 108,02 kilos), unavoidable (18,45 kilos, and 0,06 units), edible (1.670,28 units, and 94,09 kilos), and inedible food waste (427,67 units, 6,44 litres, and 32,30 kilos)**. Regarding the **quantification** of these types of food waste for the **year extrapolation** it was possible to estimate the subsequent values: **avoidable (with 119.702,22 units, 367,51 litres, and 6.163,25 kilos), unavoidable (1.048,25 kilos, and 3,37 units), edible (95.303,47 units, and 5.368,43 kilos), and inedible food waste (24.402,12 units, 367,51 litres, and 1.843,07 kilos)**.

Relatively to the food waste causes, these types of FW are derivative from **HACCP control (80,36%), overproduction (12,97%), plate scrapes (5,80%), and trimmings (0,87%)**. Furthermore, in relation to the types of food waste handling performed by the hotel, it was possible to detect that **these types of handling were**

redirecting FW as leftovers for the staff's cafeteria (47,77%), leftovers for next breakfast (29,96%), trash (20,75%), and leftovers for juice of the day (1,52%).

Additionally, and regarding the main objective of this investigation, which was to identify the economic impacts of food waste, in this case, study, it was possible to perceive **a total food waste cost of 875,27€ during the seven days analysis**, which could be subdivided into **edible FW with 524,24€**, and **inedible FW with 333,03€**, as well as **avoidable FW (852,46€)**, and **unavoidable FW (22,81€)**. It is also possible to detect that the **food waste cost per client is of 1,24€**, with a **ratio of FW vs Profit of 16,91%**. If an estimation for a year analysis is made, it is **possible to extrapolate that the direct costs of the food waste may reach an average of 4.161,79€ per month**, and **49.941,44€ in a year**, which can then be subdivided into an economic impact of an **average of 2.551,62€ per month of edible food waste and 30.619,44€ of the same FW type in a year**, and an **economic impact of an average of 1.648,66€ per month of inedible food waste with 19.783,92€ in a year**. In relation to **avoidable food waste**, according to this prevision, it may reach an **average of 4.053,33€ per month**, and a **total of 48.639,99€ in a year**. Unavoidable food waste, on the other hand, may reach an **average of 108,80€ per month and a total of 1.305,63€ in a year**.

In terms of the **indirect costs**, the economic impact of the **allocation of the human resources to the generation of food waste** was projected to reach an **average of 452,41€ per month**, and a **total of 5.430,13€ in a year–basis extrapolation**. The **allocation of the indirect costs of energy consumption to the production of food waste** was expected to reach an **average of 427,85€ per month**, and a **total of 4.698,14€ in a year**. For the **disposal costs of the food waste in the hotel**, it was observable an **average of 338,10€ per month**, with a **total of 4.057,25€ in a year estimation**. Lastly, regarding the indirect costs, the **estimated tax benefits derivate from the EBF**, which cause a positive economic impact for the hotel unit when proceeding to donate its edible food waste, were an **average of 2.883,33€ per month**, and a **total of 34.599,97€ in a year**.

Concerning the economic impacts of the various **food waste management models** mentioned during the chapter of the literature review, it was possible to observe that **the management model used in the hotel presented a total negative economic impact of 57.709,04€**, thus including the direct and indirect costs associated with the generation of food waste. However, **if the hotel were to prevent all its avoidable food waste** it would be able to reach a total **positive economic impact of 61.285,47€**.

Additionally, **if the hotel were to proceed to donate all its edible food waste** it would be able to reach a **total negative economic impact of 23.109,07€**, thus including the EBF tax benefits. Moreover, **if the hotel were to reuse all its edible food waste for new recipes, for the staff cafeteria or for animal feed**, it would be able to reach a **total negative economic impact of 57.709,04€**. Lastly, if the hotel were to do **composting, AD, or landfilling** which were mentioned to have the same costs, the **total negative economic impact would be of 64.126,96€**, thus partly confirming the food waste hierarchy and its implications towards sustainability.

As the final secondary objective, and to reduce some of the negative economic impacts observed during the food waste analysis and the FW management models practised by the hotel, it was proposed certain initiatives within the stages of Prevention, and Reuse. Such as the **a reduction of portion sizes or kitchenware made available for use in the buffet** which allows a **positive economic impact of 4.565,84€**, the elimination of **products with continuous high FW percentages** which may lead to a **positive economic impact of 325,02€**, the **reuse of food for the creation and preparation of new dishes** which permits a **positive economic impact of 2,74€**, the **establishment of a partnership with an IPSS such as “Refood”** which can bring about a **positive economic impact of 603,21€**, and lastly the **redirecting of edible food waste to the staff’s cafeteria**, which can bring a **positive economic impact of 32,95€**. In this way, this study corroborates most of the investigation hypothesis for this dissertation except for the first hypothesis, since FW was not mainly generated by the plate scrapes of the clients and the excess food production and display on the buffet, but by the HACCP and overproduction.

On the other hand, and taking into consideration the information regarding the social impacts of food waste which mention that approximately an individual consumes 370kgs per year of food (Lihn, 2018), and since according to Bingham, McNeil & Cummings (1981) the average weight of food eaten per day (excluding drinks) was of 1277 grams, which in turn is approximately 466 kgs of food per year, it is interesting to note that although in need of a deeper analysis, the total of food waste generated in the hotel could feed up to an average of fifteen people, without taking into consideration the products which are quantified through units and litres. Considering the environmental impacts, according to WRAP (2011), for every tonne of FW being disposed of, there is a production of 0,5 tonnes of CO₂e emissions, which could be prevented if the FW were to be diverted into reuse or AD. Therefore, and taking into consideration solely the

products which are quantified through kilos, the minimum generation of CO₂e emissions is of 3,21 kilos. The same report mentions that for each tonne of food waste thrown away, there is a total release of 4,2 tonnes of CO₂e into the atmosphere, so if the avoidable food waste in the hotel was to be totally prevented and regarding exclusively the products which are measured through kilos, there would be a carbon saving of approximately 26 kilos of CO₂e.

2. Limitations regarding the developed study and suggestions for future studies

As a result of the time restriction of the internship and complexity of the analysis, the investigation was restricted to one of the meals of the hotel, which was the breakfast, as well as conditioned to the stages of preparation to the handling of FW produced from the breakfast. Therefore, it is suggested that the stages of receiving the food products and its storage, as well as other meals such as lunch, dinner, snacks, room services, and banquets are analysed for a more understanding of the reality of the generation of food waste. Due to the hotel's time restriction for the investigation, it was only possible to perform the analysis for seven days. Consequently, a bigger study should be made to investigate the long-term effects of food waste and its economic impacts. Other important issues regarding this study were that there was an observation of a different categorisation of inedible food waste, and a variance in the quantification of the costs which related to the disposal of FW from what was observed in the literature review.

In this way, it is suggested that additional studies should be carried out to understand if there is a possible need to create a new subgroup within this type of food waste, or if the logistical cost of the disposal of FW observed in this case study is uniquely restricted to Lisbon, and if they can be accurately separated solely to the parcel of FW and not. Moreover, the results are only based on a specific hotel unit, therefore it is also suggested that more analysis should be done to other hotels to fully understand the bigger picture of the FW economic impacts on the Portuguese hospitality industry. Lastly, as a limitation some products had no representative commodity group that was mentioned in this literature review, therefore it was necessary to create such groups in order to effectively and efficiently analyse the products as a whole.

Since it wasn't possible to obtain the possible logistical or additional costs of donating FW as animal feed, it is also suggested for the next studies to analyse the

potential companies and its related economic impacts for the hotels. As a supplementary recommendation, the hotel should implement specific software to better control the generation of food waste and more effectively apply prevention or corrective initiatives based on the purchased food and food necessary for the creation of technical datasheets of the hotel's menu. It is advised that other IPSS and their logistical costs are analysed to check their economic impacts and its difference comparing to Refood regarding the donation of edible food waste.

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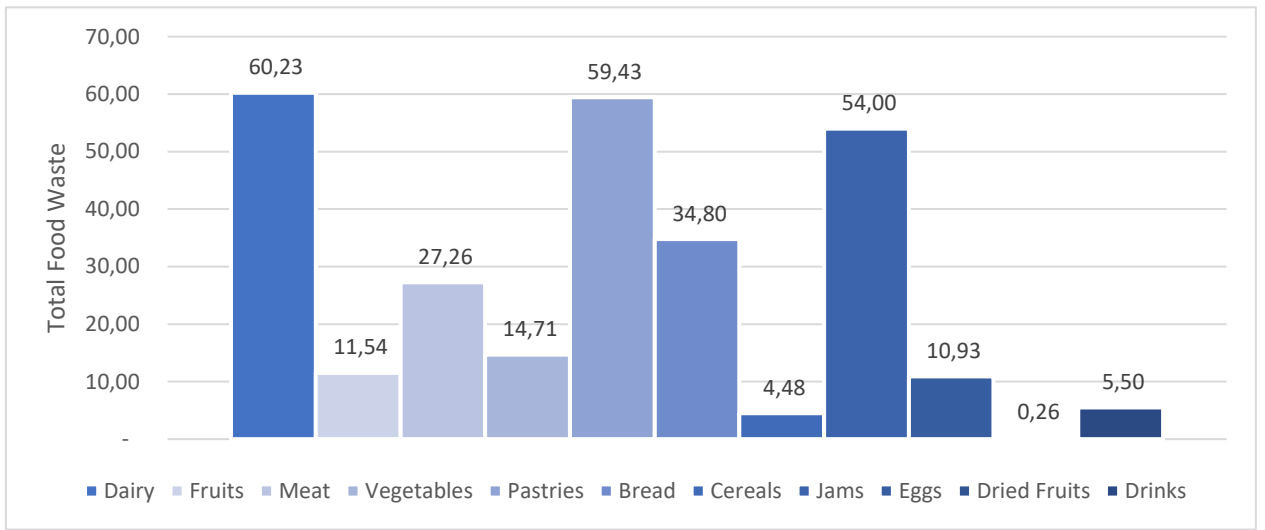
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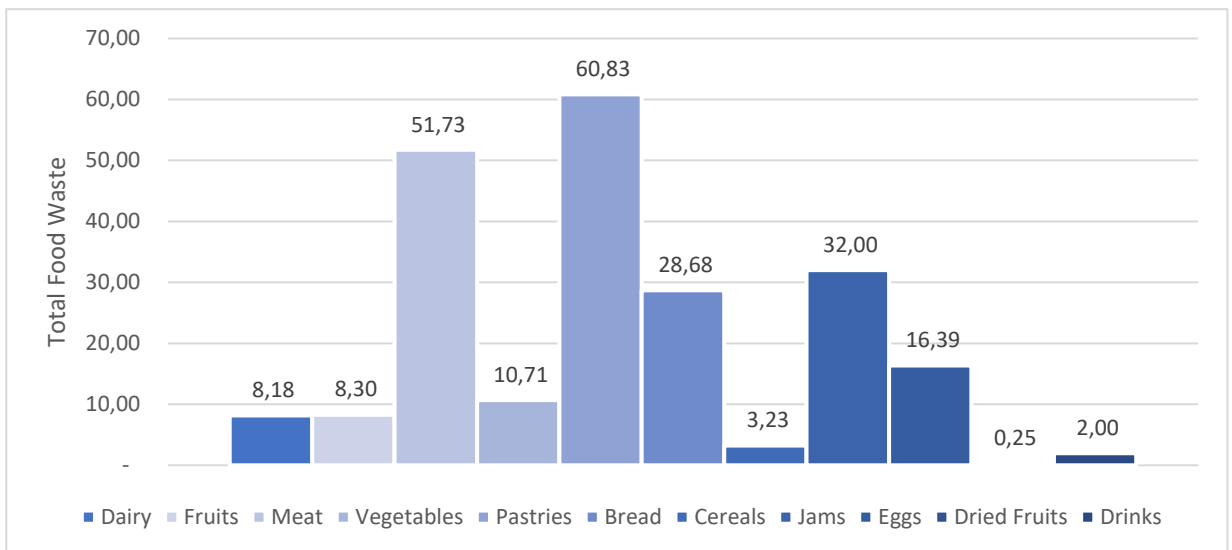
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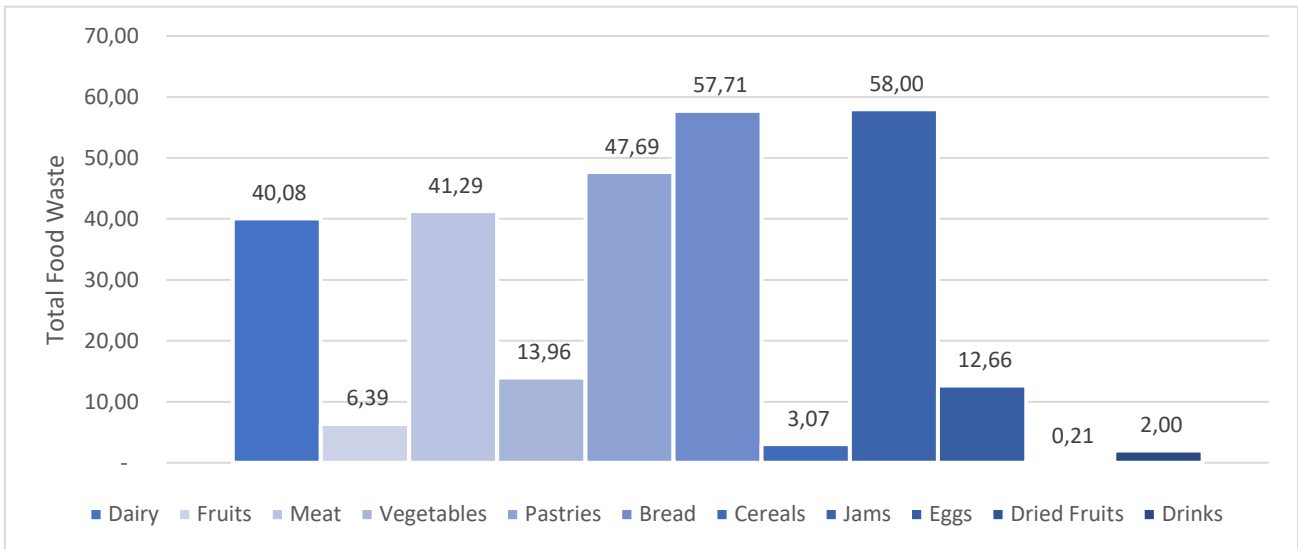
Appendices



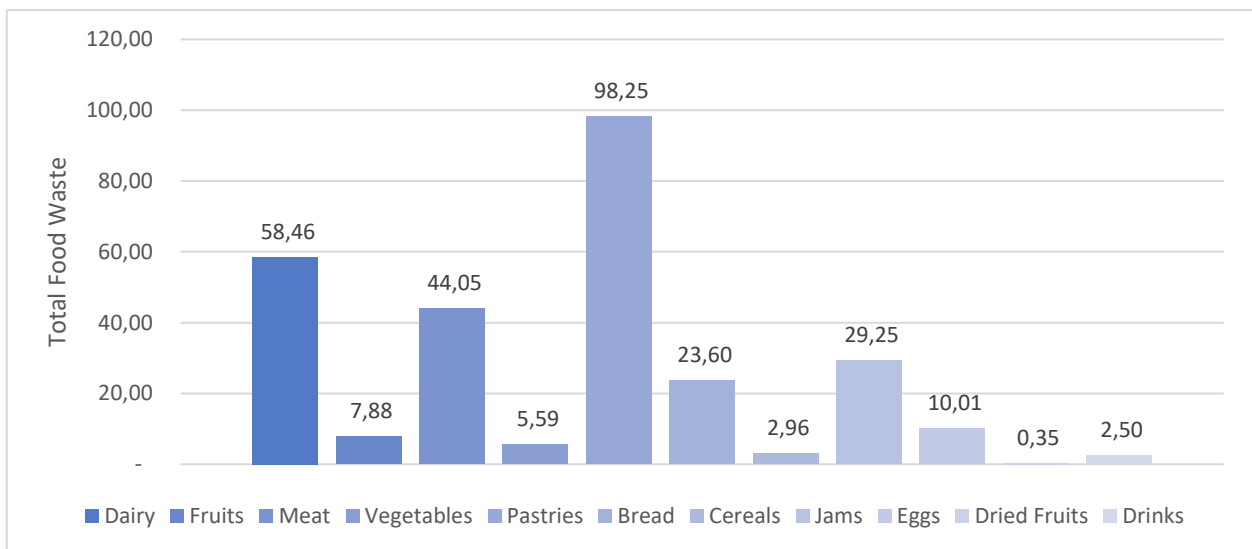
Graphic 27 – Food waste generated per commodity group on the 18th of January



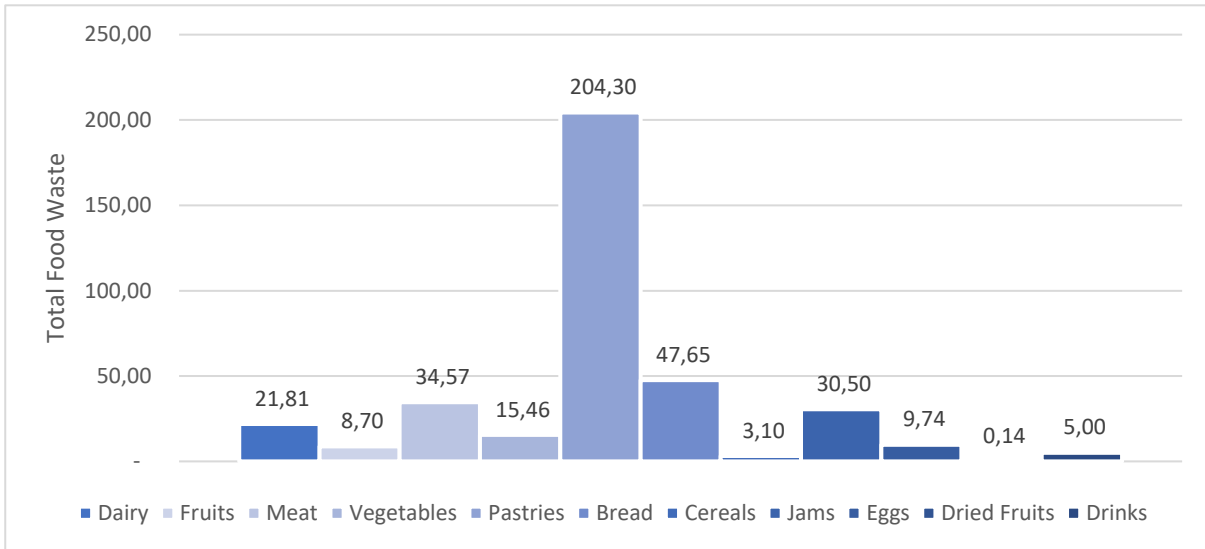
Graphic 28 – Food waste generated per commodity group on the 21st of January



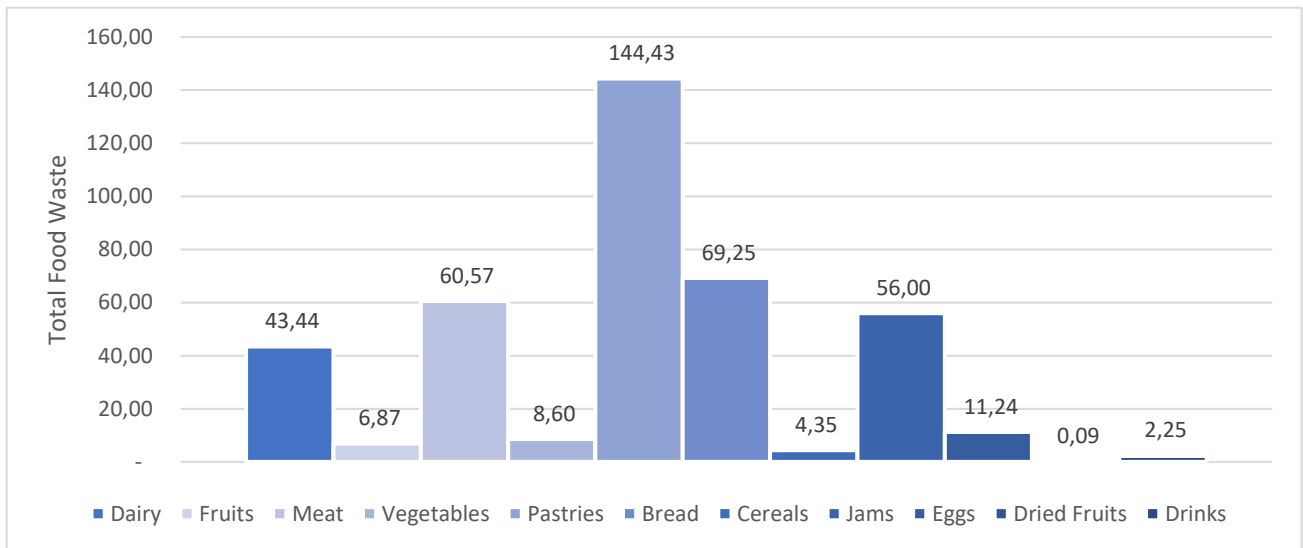
Graphic 29 – Food waste generated per commodity group on the 22nd of January



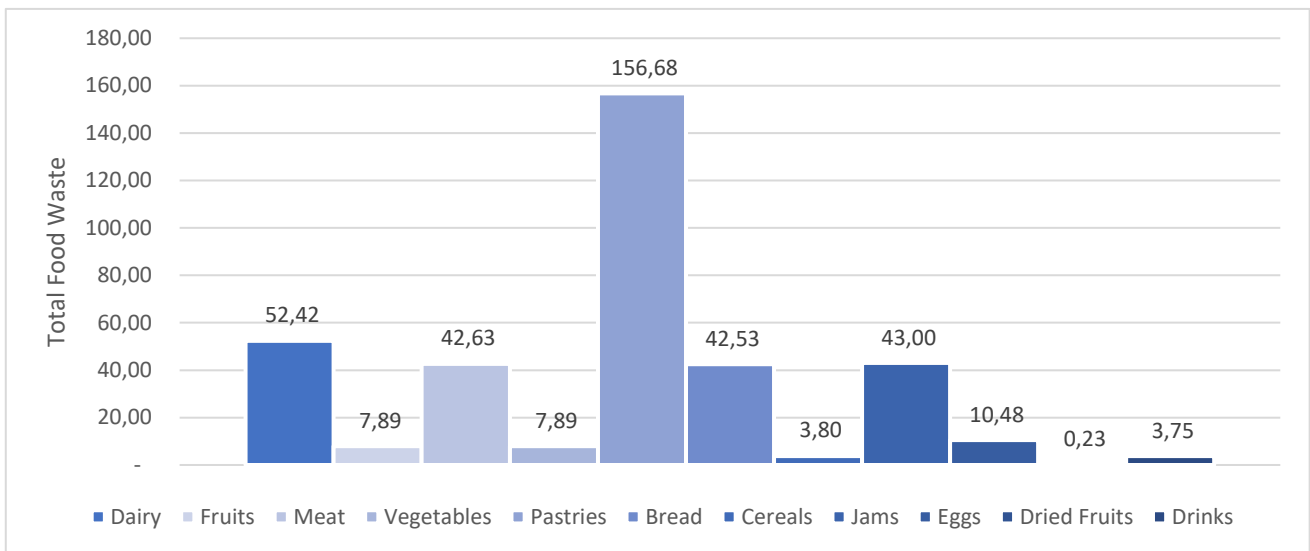
Graphic 30 – Food waste generated per commodity group on the 28th of January



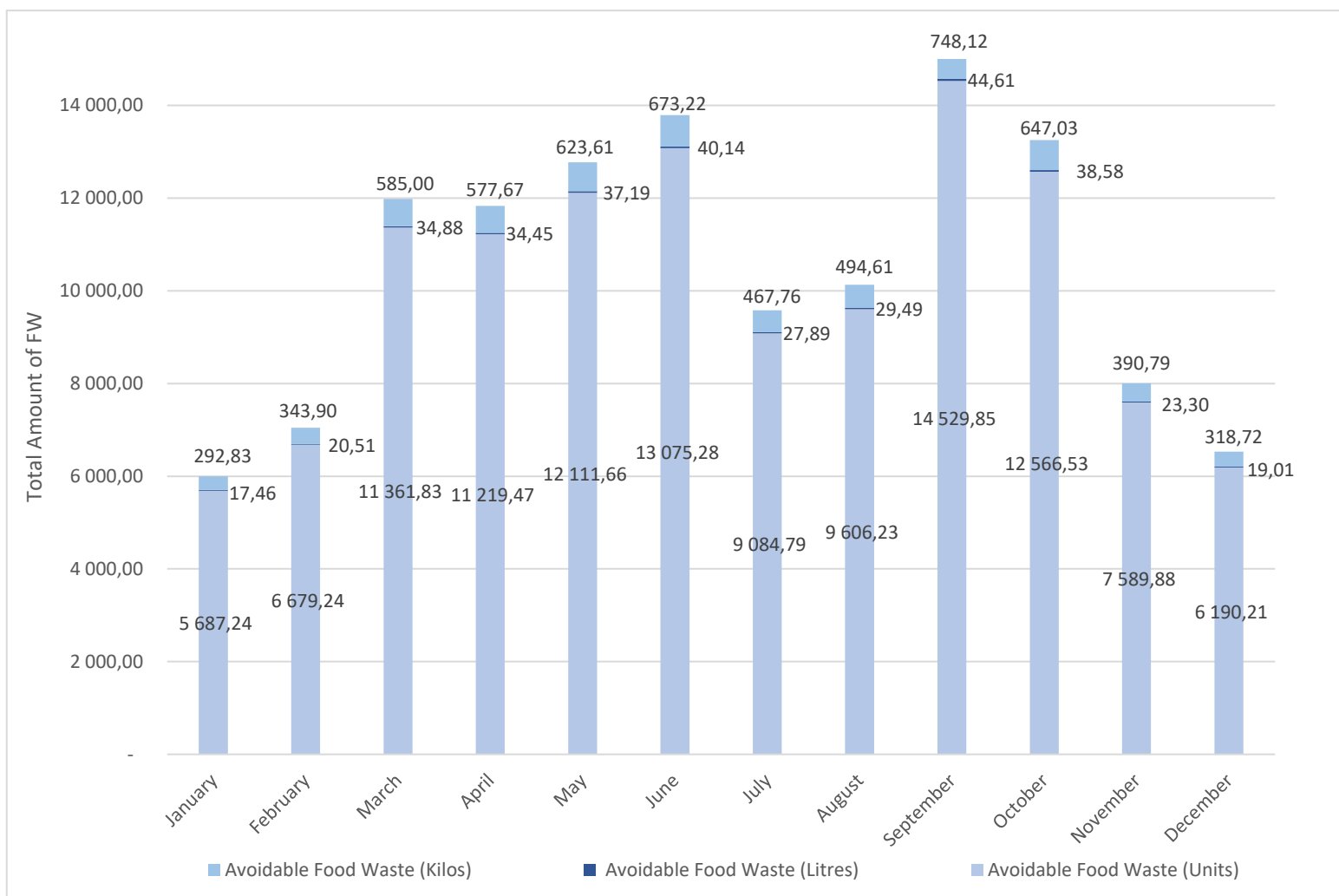
Graphic 31 – Food waste generated per commodity group on the 29th of January



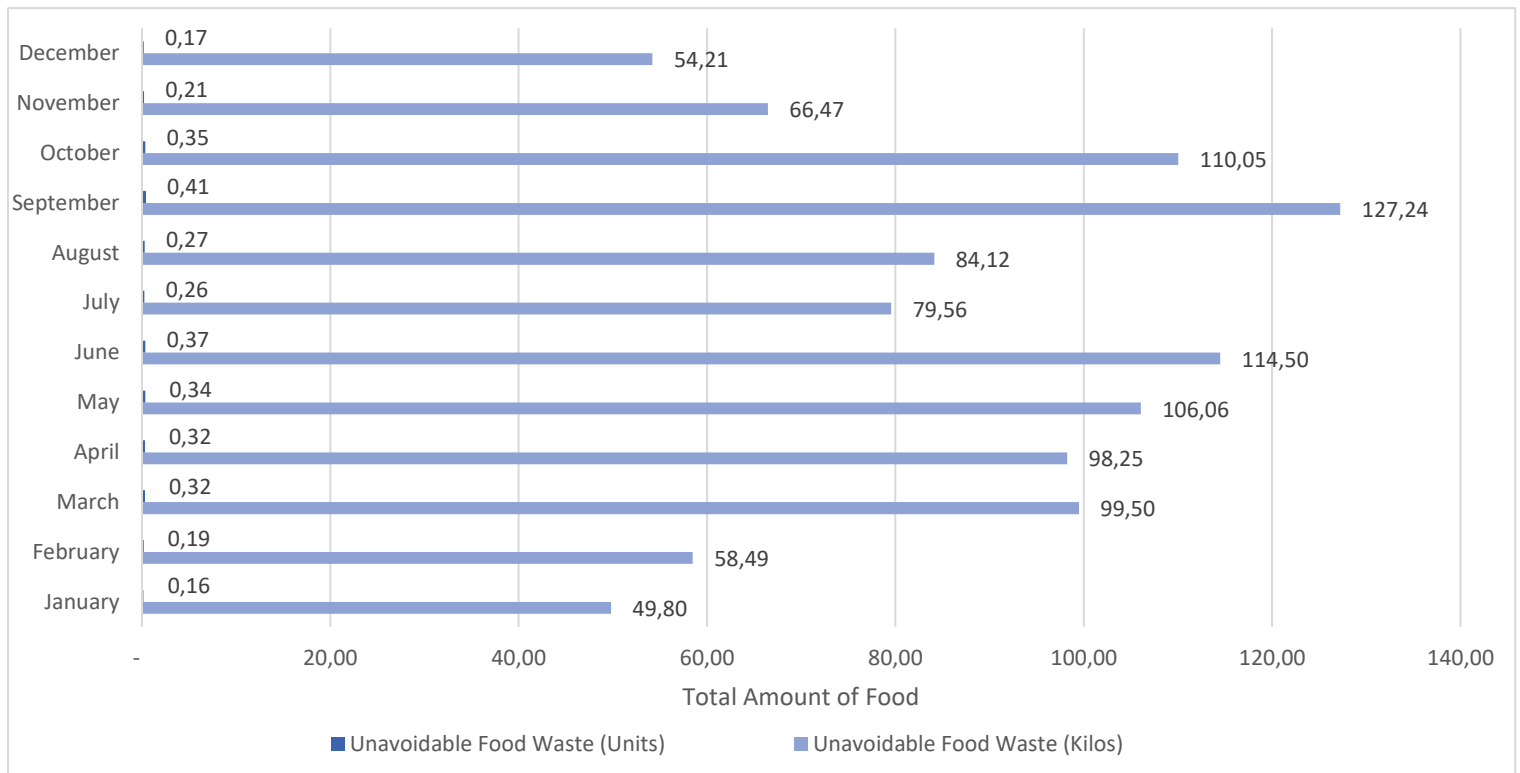
Graphic 32 – Food waste generated per commodity group on the 6th of February



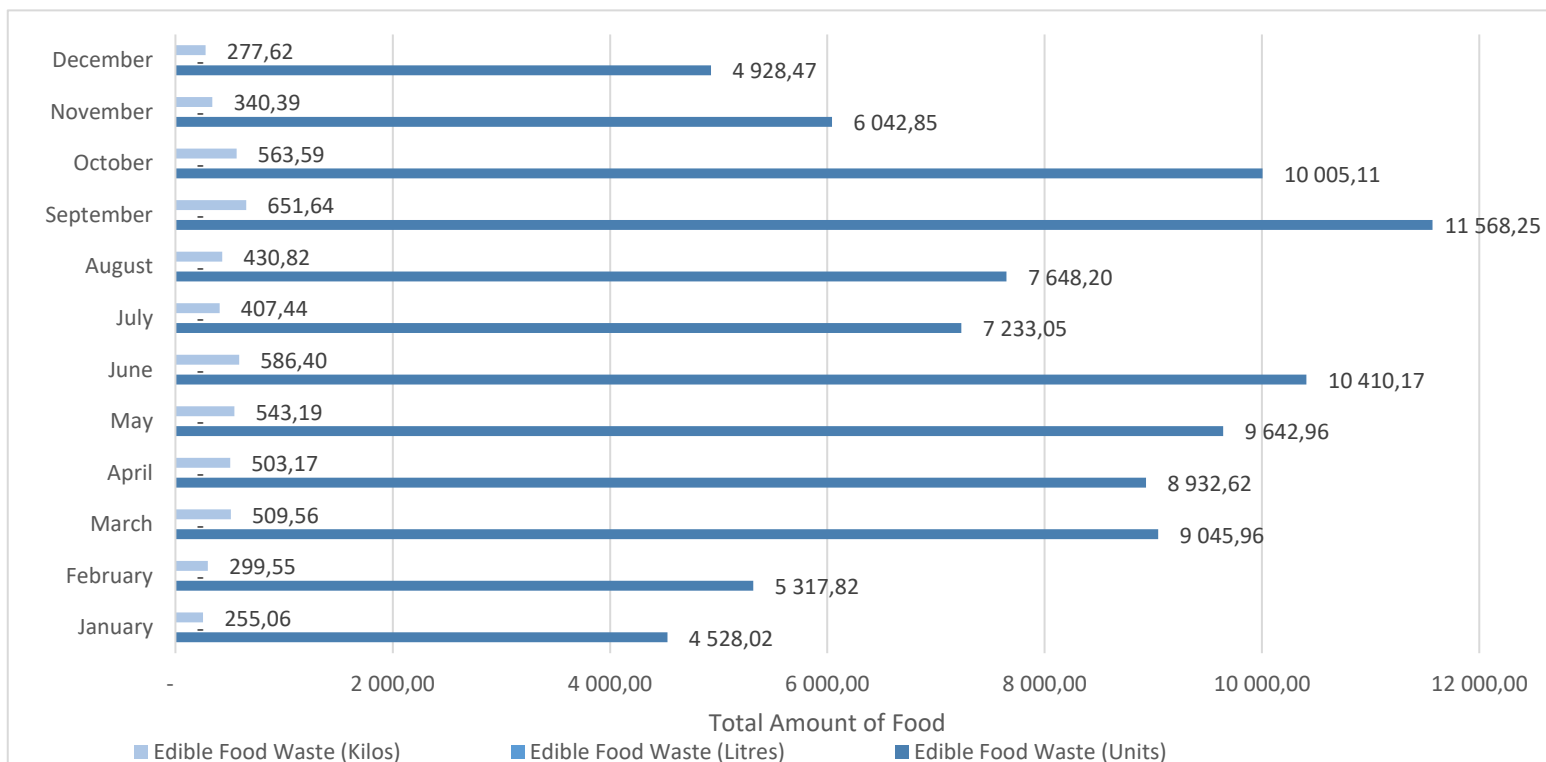
Graphic 33 – Food waste generated per commodity group on the 7th of February



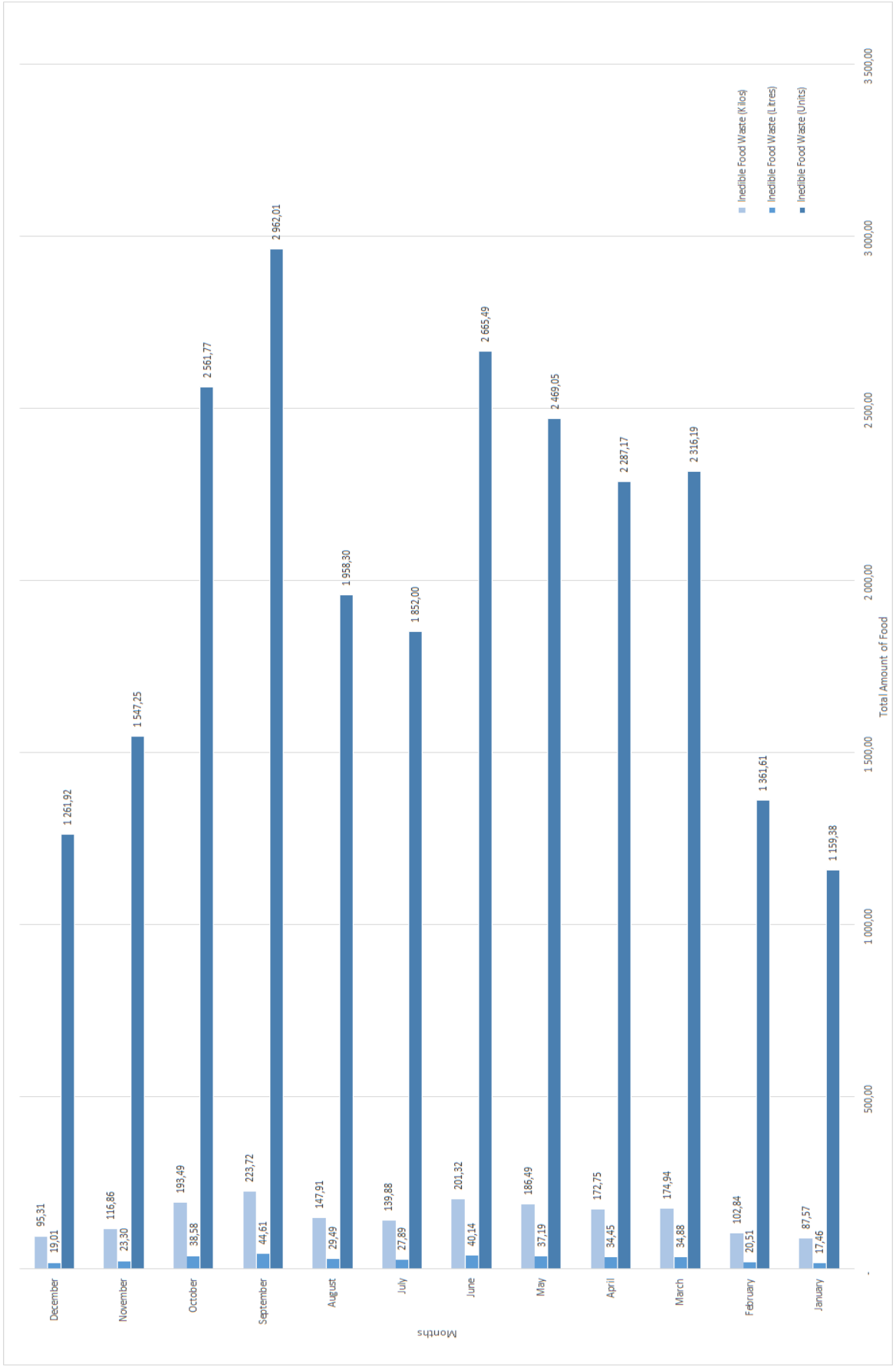
Graphic 34 – Extrapolation of avoidable food waste on a yearly basis



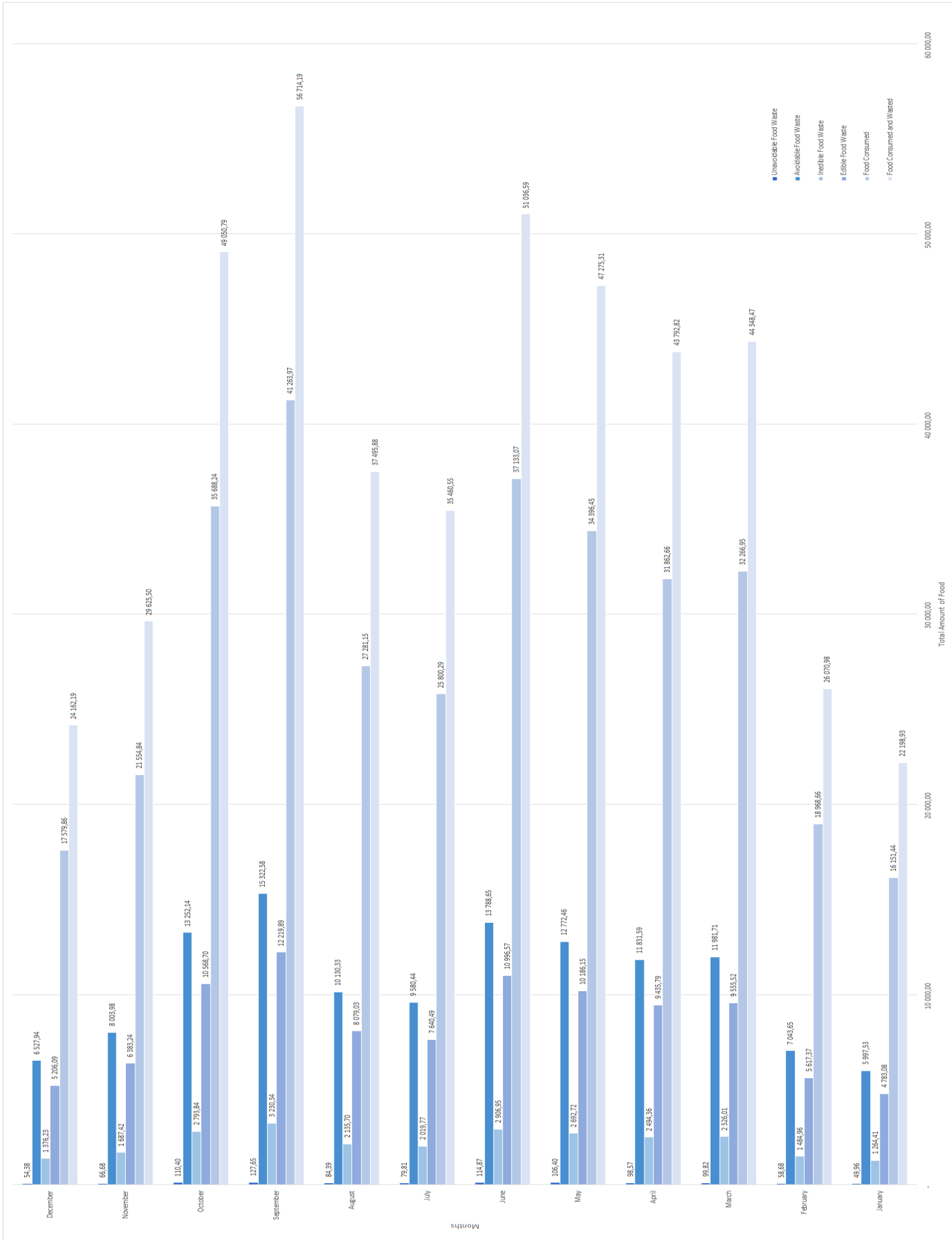
Graphic 35 – Extrapolation of unavoidable food waste on a yearly basis



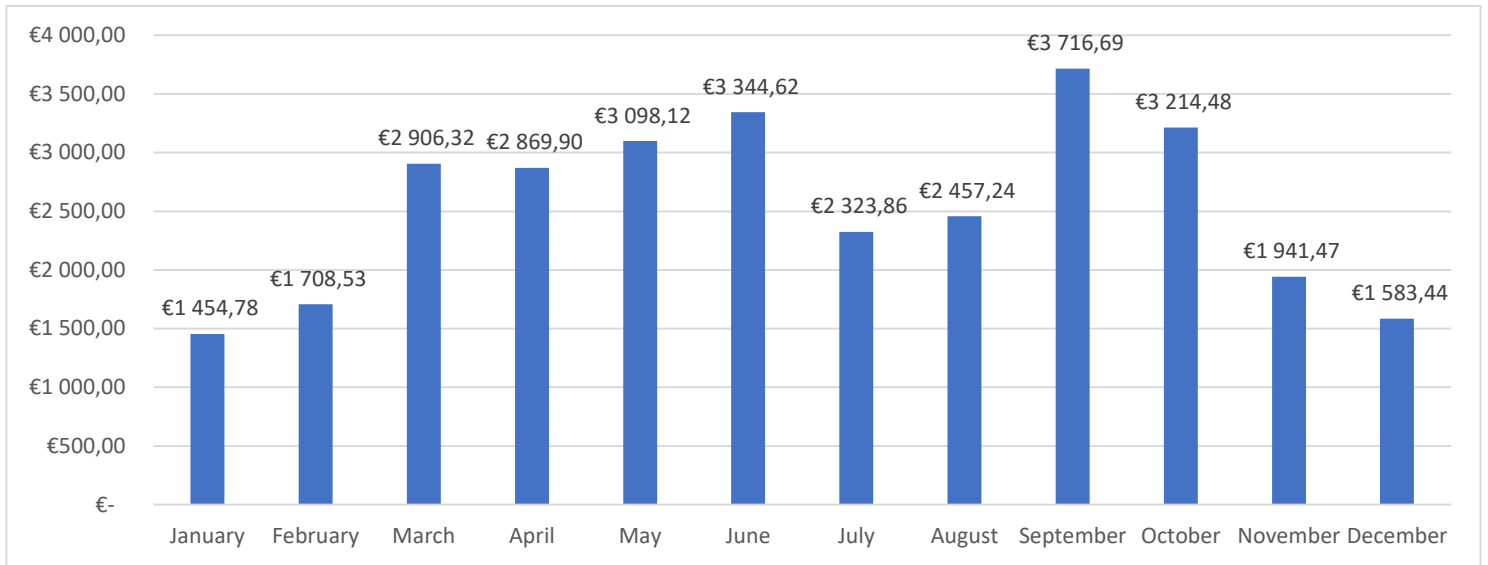
Graphic 36 – Extrapolation of edible food waste on a yearly basis



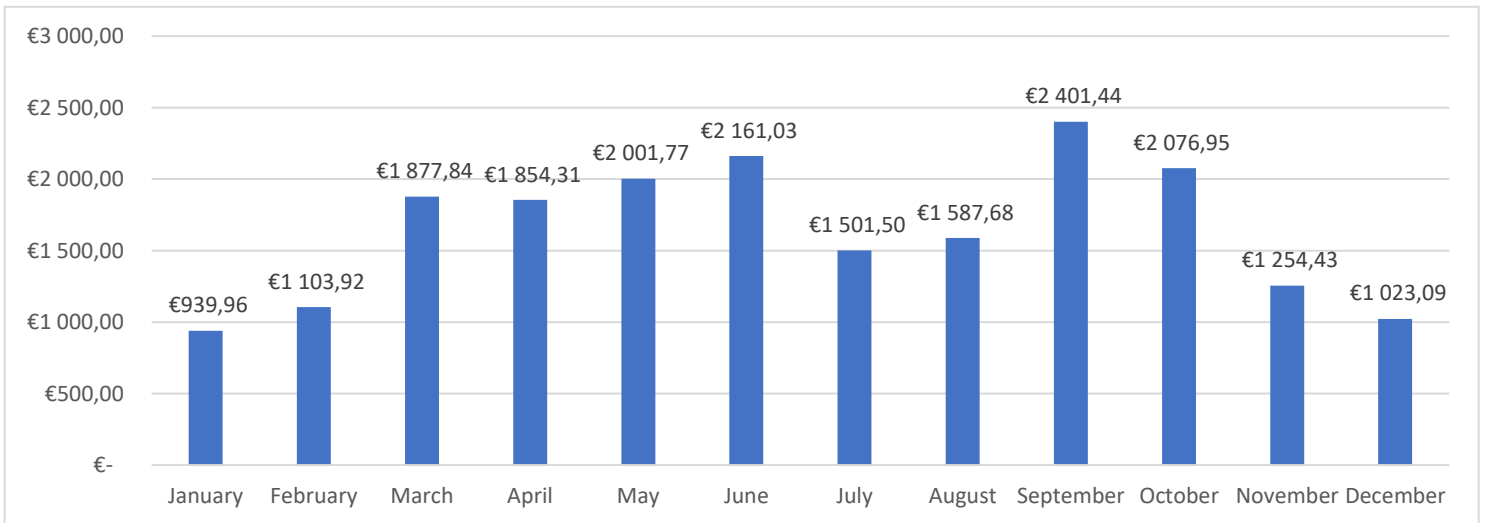
Graphic 37 – Extrapolation of inedible food waste on a yearly basis



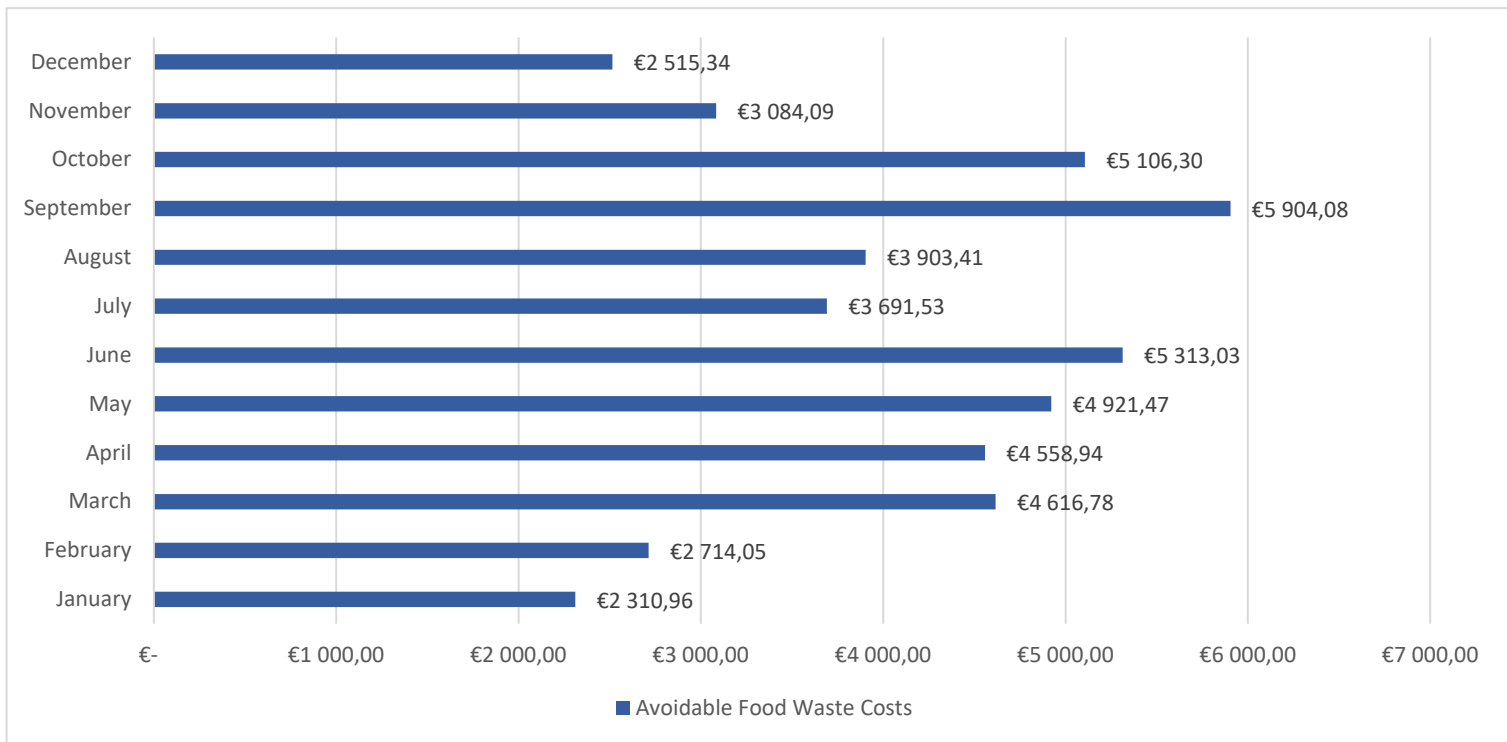
Graphic 38 – Year extrapolation and comparison between total of consumed food, FW, and Food consumed and wasted



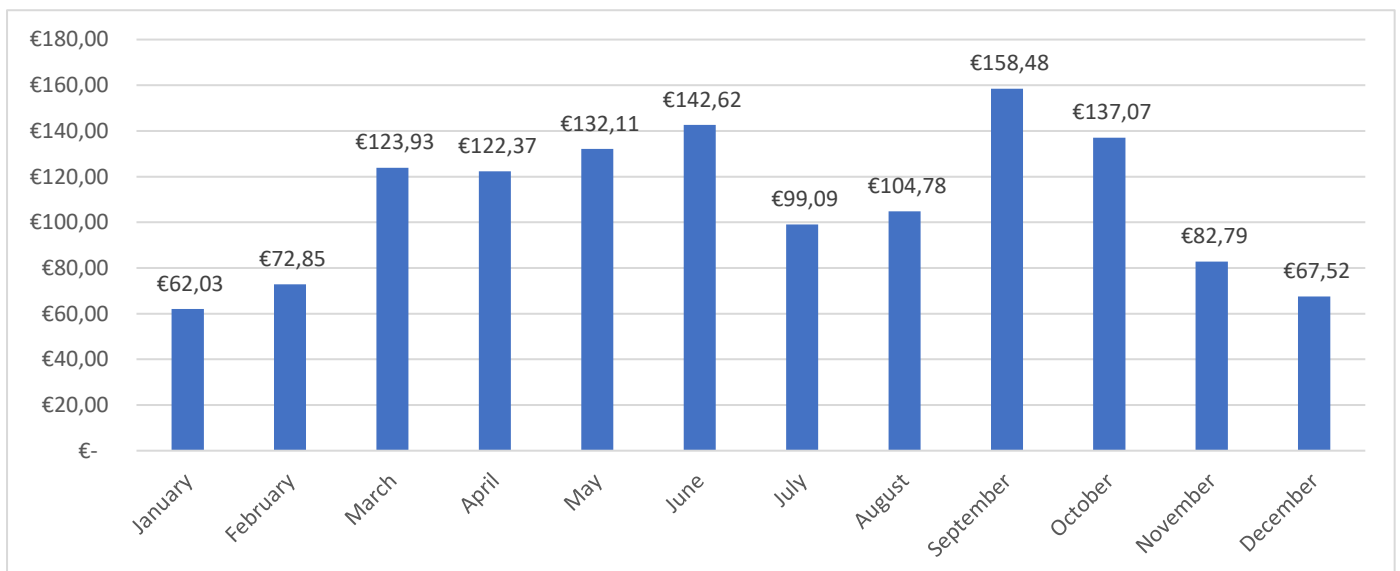
Graphic 39 – Extrapolation of edible food waste direct economic impact throughout the months of the year



Graphic 40 – Extrapolation of inedible food waste direct economic impact throughout the months of the year



Graphic 41 – Extrapolation of avoidable food waste direct economic impact throughout the months of the year



Graphic 42 – Extrapolation of unavoidable food waste direct economic impact throughout the months of the year

		Nº Pax	Croissants	Apple Chausson	Traditional Pastry - Parras com doce de leites	Pancakes	Muffins	Egg Custards	Chocolate Napolitans	Sliced White Bread	Sliced Corn Bread	Chapati Bread With Poppy	Sliced Bread with Raisins	Bread with Seeds	Bread Rolls with Olives	Bread Rolls with Raisins	Small White Bread Rolls	Large White bread Rolls	Sponge Cake with Egg Creams	Mini Palmiers	Traditional Pastry - Frango com Creme Ovos	Brioche with Coconut	Traditional Pastry - Caracolis	Traditional Pastry - Bola Berlim	Donuts	Scones	
04/Feb (Monday)	Initial Buffet	71	76,00	-	-	32,00	20,00	83,00	55,00	4,00	-	-	3,00	42,00	81,00	31,00	42,00	6,00	20,00	20,00	20,00	20,00	20,00	20,00	-	-	
	Accruals		13,00	-	-	-	-	14,00	-	2,00	-	-	-	-	-	-	-	7,00	-	-	-	-	-	-	-	-	
	Available for consumption		91,00	-	-	32,00	20,00	97,00	55,00	6,00	-	-	3,00	42,00	81,00	31,00	42,00	13,00	20,00	20,00	20,00	20,00	20,00	20,00	-	-	
	Final Buffet + Tray from Pantry (leftovers)		47,00	-	-	18,00	10,00	32,00	1,00	2,00	-	-	2,00	3,00	1,00	19,00	23,00	10,00	18,00	13,00	9,00	16,00	14,00	6,00	-	-	
	Real Consumption		44,00	-	-	14,00	10,00	32,00	5,00	4,00	-	-	1,00	39,00	80,00	31,00	42,00	3,00	2,00	17,00	13,00	9,00	6,00	14,00	6,00	-	-
% Food Waste		52%	No Commercialization	No Commercialization	56%	50%	33%	6%	2%	33%	No Commercialization	No Commercialization	67%	74%	15%	61%	12,00	30%	65%	70%	45%	60%	70%	20%	30%	No Commercialization	No Commercialization
05/Feb (Tuesday)	Initial Buffet	78	75,00	-	-	30,00	20,00	60,00	72,00	1,00	2,00	-	3,00	20,00	15,00	23,00	16,00	36,00	20,00	20,00	20,00	20,00	20,00	20,00	-	-	
	Accruals		15,00	-	-	-	-	18,00	18,00	-	-	-	2,00	-	-	-	-	-	-	-	-	-	-	-	-	-	
	Available for consumption		90,00	-	-	30,00	20,00	78,00	90,00	1,00	2,00	-	5,00	20,00	15,00	23,00	16,00	36,00	20,00	20,00	20,00	20,00	20,00	20,00	-	-	
	Final Buffet + Tray from Pantry (leftovers)		38,00	-	-	13,00	3,00	27,00	25,00	-	0,50	-	1,50	17,00	11,00	23,00	15,00	11,00	14,00	14,00	11,00	14,00	12,00	14,00	14,00	-	-
	Real Consumption		52,00	-	-	17,00	17,00	51,00	65,00	1,00	1,50	-	3,50	3,00	4,00	-	1,00	25,00	6,00	9,00	7,00	6,00	8,00	6,00	6,00	-	-
% Food Waste		42%	0%	0%	43%	33%	35%	28%	0%	25%	0%	30%	85%	23%	100%	94%	31%	70%	53%	70%	60%	70%	70%	70%	0%	0%	
06/Feb (Wednesday)	108	38,00	15,00	12,00	36,00	16,00	42,00	28,00	1,00	2,00	1,00	13,00	13,00	16,00	-	12,00	10,00	21,00	20,00	16,00	14,00	-	20,00	-	-		
07/Feb (Thursday)	90	36,00	30,00	20,00	34,00	-	42,00	28,00	-	-	2,00	2,00	13,00	18,00	-	13,00	8,00	19,00	20,00	12,00	20,00	-	20,00	-	-		
08/Feb (Friday)	87	38,00	15,00	20,00	30,00	-	39,00	25,00	-	-	8,00	1,00	13,00	14,00	-	15,00	-	9,00	19,00	17,00	19,00	-	20,00	-	-		
18/Jan (Friday)	105	35,00	18,00	-	12,00	24,00	28,00	20,00	2,00	1,00	-	-	13,00	-	-	8,00	13,00	20,00	19,00	-	19,00	-	20,00	20,00	-	-	
21/Jan (Monday)	94	51,00	22,00	-	18,00	14,00	-	29,00	2,00	2,00	-	-	15,00	-	10,00	-	10,00	13,00	19,00	-	20,00	-	20,00	20,00	0,60		
22/Jan (Tuesday)	75	38,00	-	-	32,00	16,00	41,00	-	2,00	2,50	-	-	15,00	-	-	-	15,00	44,00	19,00	-	19,00	-	20,00	20,00	0,63		
28/Jan (Monday)	110	62,00	26,00	-	-	20,00	35,00	50,00	2,00	2,00	-	-	20,00	15,00	15,00	-	15,00	18,00	19,00	-	17,00	-	20,00	20,00	0,60		
29/Jan (Tuesday)	112	56,00	20,00	-	14,00	23,00	35,00	29,00	2,00	2,00	-	-	10,00	15,00	15,00	-	10,00	-	-	-	-	-	22,00	-	-		

Table 9 – Analysis for Commodity Groups of Pastries and Bread

	Nº Pax	Croissants	Apple Chausson	Traditional Pastry - Pain com doce de leite	Pancakes	Muffins	Egg Custards	Chocolate Napoleons	Sliced White Bread	Sliced Corn Bread	Chapata Bread With Poppy	Sliced Bread with Raisins	Bread with Seeds	Bread Rolls with Olives	Bread Rolls with Raisins	Small White Bread Rolls	Large White bread Rolls	Sponge Cake with Egg Creams	Mini Palmiers	Traditional Pastry - Trança com Creme Duros	Brioche with Coconut	Traditional Pastry - Caracóis	Traditional Pastry - Bola Berlim	Donuts	Scores	
Consumption Extrapolation	50	24	1	2	16	10	28	24	1	1	2	0	8	8	2	4	6	7	8	5	6	4	9	8	0,25	
	60	28	1	2	19	12	34	29	2	1	2	1	10	9	3	5	7	8	9	6	7	4	10	10	0,30	
	70	33	2	3	22	14	39	34	2	2	2	1	11	11	3	6	8	9	11	7	8	5	12	11	0,35	
	80	38	2	3	25	16	45	39	2	2	3	1	13	12	4	6	9	11	13	8	10	6	14	13	0,40	
	90	42	2	4	29	18	51	44	2	2	3	1	14	14	4	7	10	12	14	9	11	6	16	15	0,45	
	100	47	2	4	32	20	56	49	3	2	4	1	16	15	4	8	11	13	16	10	12	7	17	16	0,50	
	110	52	3	4	35	22	62	54	3	3	4	1	18	17	5	9	12	14	17	11	13	8	19	18	0,55	
	120	57	3	5	38	24	67	59	3	3	4	1	19	18	5	10	13	16	19	12	15	9	21	20	0,60	
	130	61	3	5	41	26	73	64	3	3	5	1	21	20	6	10	15	17	21	14	16	9	22	21	0,65	
	140	66	3	6	45	28	79	68	4	3	5	1	22	21	6	11	16	18	22	15	17	10	24	23	0,70	
Consumption Extrapolation with Margin Accruals	50	30	10	10	25	15	35	35	3	3	4	2	20	15	5	10	20	15	15	10	15		15	15		
	60	35	10	10	25	20	40	40	4	3	4	3	20	15	10	10	20	15	14	10	20		15	15		
	70	40	10	12	30	20	45	45	4	4	4	3	25	20	10	15	20	15	19	10	20		15	20		
	80	45	10	12	35	25	50	50	4	4	5	3	25	20	10	15	20	20	20	15	20		20	20		
	90	50	10	12	40	25	60	60	4	4	5	3	30	20	10	15	20	20	20	19	15	20		20	25	
	100	55	10	12	40	25	60	60	5	4	6	3	30	20	10	20	25	20	20	24	15	25		25	25	
	110	60	10	15	45	30	70	65	5	5	6	3	30	25	10	20	25	20	24	15	25		25	25		
	120	65	10	15	50	30	75	70	5	5	6	3	30	25	10	20	25	25	29	15	25		25	30		
	130	70	10	15	50	35	80	75	5	5	7	3	30	25	15	20	25	25	29	20	25		30	30		
	140	70	10	15	55	35	85	80	6	5	7	3	35	30	15	20	30	25	29	20	30		30	30		

Table 10 – Prevision Map for Commodity Groups of Pastries and Bread

Number of Clients															
105															
Type of Food	Unit	Cost (WAC - Weighted Average Cost)	Data collection date	Initial Quantities in buffet	Initial cut quantities (fruits & vegetables)	Initial Whole Quantities (without cut) (fruits & vegetables)	Accruals	Total Weight	Available for consumption	Buffet Leftovers (reusable/trash)	Plate Scrapes/Unavoidable food waste (For trash)	Only unavoidable food waste	Food Waste	Food Waste %	Notes
Yogurt 5 Kg Bucket	UN	5,99 €	17 e 18 Jan 19	0,50			0,23		0,73	0,58	-	-	0,58	78,83%	Trash
Natural Vanilla Adagio Glass Yogurt	UN	0,46 €	17 e 18 Jan 19	2,00			-		2,00	2,00	-	-	2,00	100,00%	Leftovers for next Breakfast
Strawberry Adagio Glass Yogurt	UN	0,58 €	17 e 18 Jan 19	2,00			6,00		8,00	-	-	-	-	0,00%	Leftovers for next Breakfast
Lemon Adagio Glass Yogurt	UN	0,58 €	17 e 18 Jan 19	2,00			-		2,00	1,00	-	-	1,00	50,00%	Leftovers for next Breakfast
Natural with Sugar Adagio Glass Yogurt	UN	0,58 €	17 e 18 Jan 19	2,00			3,00		5,00	2,00	-	-	2,00	40,00%	Leftovers for next Breakfast
National Sliced Edam Cheese	KG	3,08 €	17 e 18 Jan 19	0,40			1,09		1,49	0,31	0,013	-	0,32	21,71%	Leftovers for next Breakfast
National Fresh Cheese	UN	1,88 €	17 e 18 Jan 19	1,03			0,39		1,42	0,30	-	-	0,30	21,39%	Leftovers for next Breakfast
National Cream Cheese	KG	4,42 €	17 e 18 Jan 19	0,37			-		0,37	0,17	0,02	-	0,19	50,94%	Leftovers for next Breakfast
Goat Cheese Rolls	UN	0,01 €	17 e 18 Jan 19	0,33			0,24		0,57	-	-	-	-	0,00%	Leftovers for next Breakfast
Sheep Manchego Cheese	KG	6,50 €	17 e 18 Jan 19	1,20			-		1,20	0,34	-	-	0,34	28,31%	Leftovers for next Breakfast
National Ilha Cheese	KG	7,63 €	17 e 18 Jan 19	0,29			0,46		0,75	0,08	0,020	-	0,10	12,88%	Leftovers for next Breakfast
Half Skimmed Milk Agros 1L	UN	0,41 €	17 e 18 Jan 19	2,00			5,00		7,00	-	2,00	-	2,00	28,57%	Trash
Butter With Salt Mimosa	UN	0,07 €	17 e 18 Jan 19	40,00			-		40,00	25,00	0,50	-	25,50	63,75%	Leftovers for next Breakfast
Butter Without Salt Mimosa	UN	0,07 €	17 e 18 Jan 19	40,00			-		40,00	25,00	0,90	-	25,90	64,75%	Leftovers for next Breakfast
Total Dairy Food Waste	--	32,26 €	--	94,13	-	-	16,41	-	110,54	56,78	3,45	-	60,23	40,08%	--
Rocha Pear	KG	1,29 €	17 e 18 Jan 19		0,95	1,19	-	1,19		0,59	0,24	0,12	0,83	69,87%	Leftovers for Cafeteria
Muesli with Coconut	KG	3,66 €	17 e 18 Jan 19	0,19			-		0,19	-	-	-	-	0,00%	Leftovers for next Breakfast
Cristalized Forest Fruits	KG	5,15 €	17 e 18 Jan 19	-			-		-	-	-	-	-	0,00%	-
Fruit Salad 2,5 Kgs	UN	12,08 €	17 e 18 Jan 19	1,21			2,96		4,17	0,81	0,47	-	1,28	30,65%	Trash
Granny Smith Apple	KG	1,48 €	17 e 18 Jan 19		0,47	0,58	0,19	0,77		0,77	-	-	0,77	100,00%	Leftovers for next Breakfast
Starking Apple	KG	1,68 €	17 e 18 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for next Breakfast
Cantaloupe	KG	1,49 €	17 e 18 Jan 19		1,45	2,80		2,80		-	1,35	1,35	1,35	48,15%	Leftovers for Juice of the day
Grapes	KG	0,89 €	17 e 18 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Papaya	KG	2,89 €	17 e 18 Jan 19		0,32	0,88	0,32	1,20		0,16	0,56	0,56	0,72	60,00%	Leftovers for Juice of the day
Melon	KG	0,78 €	17 e 18 Jan 19		2,23	3,65	2,78	6,43		1,62	1,44	1,41	3,06	47,66%	Leftovers for Juice of the day
Banana	KG	0,78 €	18 e 18 Jan 19		1,13	1,66	-	1,66		0,30	0,53	0,44	0,83	50,07%	Leftovers for Cafeteria
Oranges	KG	0,78 €	17 e 18 Jan 19		2,00	2,65	3,28	5,94		1,60	0,71	0,65	2,32	39,02%	Leftovers for Juice of the day
Pineapple	KG	0,78 €	17 e 18 Jan 19		2,18	2,53		2,53		-	0,39	0,35	0,39	15,29%	Leftovers for Juice of the day
Total Fruit Food Waste	--	33,73 €	--	1,40	10,74	15,93	9,53	25,47	4,35	5,86	5,68	4,88	11,54	35,44%	--

Table 11 – FW analysis during breakfast on the 18th of January

Turkey Ham	KG	3,82 €	17 e 18 Jan 19	0,68			-	0,68	0,39	-	-	0,39	56,66%	Leftovers for next Breakfast
Bacon With Cocktail Sausages	UN	0,50 €	17 e 18 Jan 19	45,00			30,00	75,00	26,00	-	-	26,00	34,67%	Leftovers for Cafeteria
Pork Ham	KG	3,92 €	17 e 18 Jan 19	0,28			1,27	1,55	0,08	-	-	0,08	5,10%	Leftovers for next Breakfast
Smoked Ham	KG	8,26 €	17 e 18 Jan 19	0,84			0,69	1,53	0,36	-	-	0,36	23,53%	Leftovers for next Breakfast
York Paio	KG	4,34 €	17 e 18 Jan 19	0,31			0,34	0,65	-	-	-	-	0,00%	Leftovers for next Breakfast
Sliced Bacon	KG	3,95 €	17 e 18 Jan 19	2,10			1,29	3,39	0,08	0,02	-	0,10	2,92%	Trash
Chourizo (Chouriço)	KG	2,59 €	17 e 18 Jan 19	0,18			0,07	0,25	0,21	-	-	0,21	83,13%	Leftovers for next Breakfast
Sliced Salami	KG	2,91 €	17 e 18 Jan 19	0,16			0,16	0,32	0,13	-	-	0,13	41,59%	Leftovers for next Breakfast
Total Meat Food Waste	--	30,29 €	--	49,55	-	-	33,81	83,36	27,24	0,02	-	27,26	30,95%	0
Black Olives	KG	1,19 €	17 e 18 Jan 19	0,46			-	0,46	0,23	-	-	0,23	49,46%	Leftovers for next Breakfast
Paris Mushrooms	KG	1,46 €	17 e 18 Jan 19	0,48			1,66	2,13	0,69	-	-	0,69	32,52%	Trash
Cherry Tomatoes	KG	1,90 €	17 e 18 Jan 19	1,48			0,62	2,10	-	0,54	-	0,54	25,69%	Trash
Roasted Vegetables	KG	0,14 €	17 e 18 Jan 19	1,11			2,58	3,68	1,30	-	-	1,30	35,16%	Trash
Cucumber	KG	0,69 €	17 e 18 Jan 19	1,34			-	1,34	0,92	0,03	-	0,94	70,24%	Leftovers for Cafeteria
Carrots	KG	0,48 €	17 e 18 Jan 19	0,40			-	0,40	0,19	0,02	0,02	0,21	53,57%	Leftovers for Cafeteria
Roasted Tomatoes with Pesto	UN	1,34 €	17 e 18 Jan 19	14,00			14,00	28,00	-	5,00	-	5,00	17,86%	Trash
Lettuce	KG	2,08 €	17 e 18 Jan 19	1,49			-	1,49	1,39	-	-	1,39	93,56%	Leftovers for Cafeteria
Salad Tomatoes	KG	1,19 €	17 e 18 Jan 19	2,52			-	2,52	2,17	0,20	-	2,37	94,12%	Leftovers for Cafeteria
Baked Beans with Tomato Sauce	UN	2,05 €	17 e 18 Jan 19	1,69			1,00	2,69	2,03	0,006	-	2,03	75,50%	Trash
Total Vegetables Food Waste	--	12,52 €	--	24,97	-	-	19,86	44,82	8,92	5,79	0,02	14,71	54,77%	--
Mini Donuts	UN	0,16 €	17 e 18 Jan 19	20,00			-	20,00	7,00	0,90	-	7,90	39,50%	Leftovers for Cafeteria
Chocolate Napolitans	UN	0,13 €	17 e 18 Jan 19	20,00			14,00	34,00	9,00	1,43	-	10,43	30,69%	Leftovers for Cafeteria
Brioche with Coconut	UN	0,18 €	17 e 18 Jan 19	19,00			-	19,00	1,00	1,60	-	2,60	13,68%	Leftovers for Cafeteria
Mini Pancakes	UN	0,13 €	17 e 18 Jan 19	12,00			13,00	25,00	16,00	-	-	16,00	64,00%	Leftovers for Cafeteria
Mini Egg Custard	UN	0,12 €	17 e 18 Jan 19	28,00			32,00	60,00	-	1,00	-	1,00	1,67%	Leftovers for Cafeteria
Sponge Cake with Egg Creams	UN	0,18 €	17 e 18 Jan 19	20,00			-	20,00	3,00	1,50	-	4,50	22,50%	Leftovers for Cafeteria
Scones	KG	7,67 €	17 e 18 Jan 19	-			-	-	-	-	-	-	0,00%	-
Apple Chausson	UN	0,22 €	17 e 18 Jan 19	18,00			-	18,00	10,00	-	-	10,00	55,56%	Leftovers for Cafeteria
Mini Muffins	UN	0,22 €	17 e 18 Jan 19	24,00			-	24,00	-	-	-	-	0,00%	Leftovers for Cafeteria
Mini Croissant	UN	0,08 €	17 e 18 Jan 19	35,00			31,00	66,00	5,00	-	-	5,00	7,58%	Leftovers for Cafeteria
Mini Palmier with Egg Creams	UN	0,20 €	17 e 18 Jan 19	19,00			-	19,00	-	1,00	-	1,00	5,26%	Leftovers for Cafeteria
Traditional Pastry - Bola de Berlim	UN	0,15 €	17 e 18 Jan 19	20,00			-	20,00	1,00	-	-	1,00	5,00%	Leftovers for Cafeteria
Total Pastries Food Waste	--	9,44 €	--	235,00	-	-	90,00	325,00	52,00	7,43	-	59,43	20,45%	--

Table 12 – Continuation of FW analysis during breakfast on the 18th of January

Sliced White Bread	UN	0,84 €	17 e 18 Jan 19	2,00			3,00		5,00	0,61	0,42	-	1,03	20,55%	Leftovers for Cafeteria
Mini Navettes	UN	0,18 €	17 e 18 Jan 19	12,00			18,00		30,00	-	4,00	-	4,00	13,33%	Trash
Bread with Seeds	UN	0,09 €	17 e 18 Jan 19	13,00			-		13,00	1,00	0,79	-	1,79	13,74%	Leftovers for Cafeteria
Bread Rolls with Raisins	UN	0,06 €	17 e 18 Jan 19	8,00			2,00		10,00	1,00	0,27	-	1,27	12,67%	Leftovers for Cafeteria
Sliced Corn Bread	UN	0,95 €	17 e 18 Jan 19	1,00			2,00		3,00	0,29	0,20	-	0,49	16,25%	Leftovers for Cafeteria
Large White bread Rolls	UN	0,16 €	17 e 18 Jan 19	13,00			22,00		35,00	26,00	0,23	-	26,23	74,95%	Leftovers for Cafeteria
Total Bread Food Waste	--	2,28 €	--	49,00 €	-	-	47,00	-	96,00	28,90	5,90	-	34,80	25,25%	--
Sunflower Seeds	KG	1,32 €	17 e 18 Jan 19	-			-		-	-	-	-	-	0,00%	-
Oats	KG	0,87 €	17 e 18 Jan 19	0,45			-		0,45	0,35	-	-	0,35	78,17%	Leftovers for next Breakfast
White Sesame Seeds	KG	2,41 €	17 e 18 Jan 19	0,12			0,13		0,26	0,07	-	-	0,07	26,17%	Leftovers for next Breakfast
Red Quinoa	KG	3,08 €	17 e 18 Jan 19	2,88			-		2,88	-	0,07	-	0,07	2,30%	Leftovers for next Breakfast
Chocapic	KG	0,92 €	17 e 18 Jan 19	1,00			1,00		2,00	1,21	-	-	1,21	60,35%	Leftovers for next Breakfast
Muesli	KG	2,00 €	17 e 18 Jan 19	1,00			1,00		2,00	1,40	-	-	1,40	70,00%	Leftovers for next Breakfast
Granola	KG	2,00 €	17 e 18 Jan 19	1,17			0,28		1,44	1,17	-	-	1,17	80,87%	Leftovers for next Breakfast
Nuts	KG	14,49 €	17 e 18 Jan 19	1,25			-		1,25	-	-	-	-	0,00%	Leftovers for next Breakfast
Linseed	KG	0,93 €	17 e 18 Jan 19	0,29			-		0,29	0,22	-	-	0,22	76,11%	Leftovers for next Breakfast
Total Cereals Food Waste	--	28,02 €	--	8,15	-	-	2,41	-	10,56	4,42	0,07	-	4,48	43,77%	--
Raspberry Jam	UN	0,23 €	17 e 18 Jan 19	-			-		-	-	-	-	-	0,00%	-
Orange Jam	UN	0,21 €	17 e 18 Jan 19	16,00			7,00		23,00	14,00	-	-	14,00	60,87%	Leftovers for next Breakfast
Honey	UN	0,31 €	17 e 18 Jan 19	16,00			6,00		22,00	13,00	-	-	13,00	59,09%	Leftovers for next Breakfast
Strawberry Jam	UN	0,21 €	17 e 18 Jan 19	16,00			1,00		17,00	11,00	-	-	11,00	64,71%	Leftovers for next Breakfast
Peach Jam	UN	0,21 €	17 e 18 Jan 19	16,00			6,00		22,00	16,00	-	-	16,00	72,73%	Leftovers for next Breakfast
Total Jam Food Waste	--	1,17 €	--	64,00	-	-	20,00	-	84,00	54,00	-	-	54,00	51,48%	--
Cheese Tortillas	UN	0,38 €	17 e 18 Jan 19	6,00			18,00		24,00	-	6,00	-	6,00	25,00%	Trash
Scrabbled Eggs	L	0,33 €	17 e 18 Jan 19	4,00			3,50		7,50	-	0,93	-	0,93	12,40%	Trash
Boiled Eggs	UN	0,15 €	17 e 18 Jan 19	5,00			3,00		8,00	4,00	-	-	4,00	50,00%	Leftovers for next Breakfast
Total Eggs Food Waste	--	0,86 €	--	15,00	-	-	24,50	-	39,50	4,00	6,93	-	10,93	29,13%	--
Plums	KG	3,59 €	17 e 18 Jan 19	-			-		-	-	-	-	-	0,00%	-
Raisins	KG	1,91 €	17 e 18 Jan 19	0,15			0,35		0,50	0,26	-	-	0,26	51,90%	Leftovers for next Breakfast
Total Dry Fruits Food Waste	--	1,91 €	--	0,15	-	-	0,35	-	0,50	0,26	-	-	0,26	25,95%	--

Table 13 – Continuation of FW analysis during breakfast on the 18th of January

Mango Juice	UN	0,01 €	17 e 18 Jan 19	2,00			4,00		6,00	1,00	1,50	-	2,50	41,67%	Leftovers for Cafeteria
Apple Juice	UN	0,01 €	17 e 18 Jan 19	-			-		-	-	-	-	-	0,00%	-
Orange Juice	UN	0,01 €	17 e 18 Jan 19	2,00			3,00		5,00	1,00	-	-	1,00	20,00%	Leftovers for Cafeteria
Sparkling Water	UN	0,57 €	17 e 18 Jan 19	1,00			2,00		3,00	-	-	-	-	0,00%	-
Still Water	UN	0,15 €	17 e 18 Jan 19	1,00			5,00		6,00	-	2,00	-	2,00	33,33%	Trash
Total Soft Drinks Waste	--	0,75 €	--	6,00	-	-	14,00	-	20,00	2,00	3,50	-	5,50	19%	--
Total	--	153,23	-	547,34	10,74	15,93	277,87	25,47	818,64	244,37	38,78	4,89	283,15	34,21%	--

Table 14 – Continuation of FW analysis during breakfast on the 18th of January

Number of Clients		94															
Type of Food	Unit	Cost (WAC - Weighted Average Cost)	Data collection date	Initial Quantities in buffet	Initial cut quantities (fruits & vegetables)	Initial Whole Quantities (without cut) (fruits & vegetables)	Accruals	Total Weight	Available for consumption	Buffet Leftovers (reusable/trash)	Plate Scrapes/Unavoidable food waste (For trash)	Only unavoidable food waste	Food Waste	Food Waste %	Notes		
Yogurt 5 Kg Bucket	UN	5,99 €	20 e 21 Jan 19	0,40			0,40		0,80	0,20	-	-	0,20	25,00%	Trash		
Natural Vanilla Adagio Glass Yogurt	UN	0,46 €	20 e 21 Jan 19	2,00			-		2,00	-	-	-	-	0,00%	Leftovers for next Breakfast		
Strawberry Adagio Glass Yogurt	UN	0,58 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast		
Lemon Adagio Glass Yogurt	UN	0,58 €	20 e 21 Jan 19	3,00			3,00		6,00	2,00	-	-	2,00	33,33%	Leftovers for next Breakfast		
Natural with Sugar Adagio Glass Yogurt	UN	0,58 €	20 e 21 Jan 19	6,00			-		6,00	4,00	-	-	4,00	66,67%	Leftovers for next Breakfast		
National Sliced Edam Cheese	KG	3,08 €	20 e 21 Jan 19	0,57			0,62		1,20	0,44	-	-	0,44	36,37%	Leftovers for next Breakfast		
National Fresh Cheese	UN	1,88 €	20 e 21 Jan 19	0,49			0,86		1,35	0,36	-	-	0,36	26,73%	Leftovers for next Breakfast		
National Cream Cheese	KG	4,42 €	20 e 21 Jan 19	0,22			-		0,22	0,18	-	-	0,18	80,00%	Leftovers for next Breakfast		
Goat Cheese Rolls	UN	0,01 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast		
Biological Tofu	KG	5,98 €	21 e 21 Jan 19	0,42			-		0,42	0,31	-	-	0,31	72,41%	Leftovers for next Breakfast		
Sheep Manchego Cheese	KG	6,50 €	20 e 21 Jan 19	0,24			0,06		0,30	0,04	0,02	-	0,06	20,00%	Leftovers for next Breakfast		
National Iiha Cheese	KG	7,63 €	20 e 21 Jan 19	0,22			0,42		0,64	0,10	0,04	-	0,14	21,88%	Leftovers for next Breakfast		
Half Skimmed Milk Agros 1L	UN	0,41 €	20 e 21 Jan 19	2,00			-		2,00	-	-	-	-	0,00%	Trash		
Butter With Salt Mimosa	UN	0,07 €	20 e 21 Jan 19	20,00			4,00		24,00	-	0,50	-	0,50	2,08%	Leftovers for next Breakfast		
Butter Without Salt Mimosa	UN	0,07 €	20 e 21 Jan 19	20,00			4,00		24,00	-	-	-	-	0,00%	Leftovers for next Breakfast		
Total Dairy Food Waste	--	38,24 €	--	55,57	-	-	13,36	-	68,93	7,61	0,56	-	8,18	25,63%	--		
Rocha Pear	KG	1,29 €	20 e 21 Jan 19				-		-	-	-	-	-	0,00%	Leftovers for Cafeteria		
Muesli with Coconut	KG	3,66 €	20 e 21 Jan 19	1,29			-		1,29	1,23	-	-	1,23	95,50%	Leftovers for next Breakfast		
Cristalized Forest Fruits	KG	5,15 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast		
Fruit Salad 2,5 Kgs	UN	12,08 €	20 e 21 Jan 19	2,00			2,00		4,00	0,67	0,67	-	1,34	33,60%	Trash		
Granny Smith Apple	KG	1,48 €	20 e 21 Jan 19		0,79	0,97	-	0,97		0,77	0,17	0,03	0,95	98,03%	Leftovers for next Breakfast		
Starking Apple	KG	1,68 €	20 e 21 Jan 19		0,27	0,33	-	0,33		0,19	0,06	0,02	0,25	75,93%	Leftovers for next Breakfast		
Cantaloupe	KG	1,49 €	20 e 21 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day		
Grapes	KG	0,89 €	20 e 21 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria		
Papaya	KG	2,89 €	20 e 21 Jan 19		0,65	1,77	-	1,77		-	1,12	1,12	1,12	63,36%	Leftovers for Juice of the day		
Melon	KG	0,78 €	20 e 21 Jan 19		0,98	1,59	0,55	2,14		0,80	0,62	0,62	1,42	66,10%	Leftovers for Juice of the day		
Banana	KG	0,78 €	20 e 21 Jan 19		0,69	1,02	-	1,02		0,41	0,33	0,19	0,74	72,31%	Leftovers for Cafeteria		
Oranges	KG	0,78 €	20 e 21 Jan 19		0,93	1,23	0,84	2,07		0,33	0,30	0,30	0,63	30,34%	Leftovers for Juice of the day		
Pineapple	KG	0,78 €	20 e 21 Jan 19		0,96	1,11	0,94	2,05		0,47	0,15	0,15	0,62	30,36%	Leftovers for Juice of the day		
Total Fruit Food Waste	--	33,73 €	--	3,29	5,26	8,01	4,34	12,35	5,29	4,87	3,42	2,45	8,30	43,50%	--		

Table 15 – FW analysis during breakfast on the 21st of January

Turkey Ham	KG	3,82 €	20 e 21 Jan 19	0,35			0,39		0,74	0,44	-	-	0,44	59,43%	Leftovers for next Breakfast
Bacon With Cocktail Sausages	UN	0,50 €	20 e 21 Jan 19	48,00			48,00		96,00	50,00	-	-	50,00	52,08%	Trash
Pork Ham	KG	3,92 €	20 e 21 Jan 19	0,60			-		0,60	0,39	-	-	0,39	65,00%	Leftovers for next Breakfast
Smoked Ham	KG	8,26 €	20 e 21 Jan 19	0,34			0,43		0,77	0,20	-	-	0,20	26,24%	Leftovers for next Breakfast
York Paio	KG	4,34 €	20 e 21 Jan 19	0,40			-		0,40	0,11	-	-	0,11	28,18%	Leftovers for next Breakfast
Sliced Bacon	KG	3,95 €	20 e 21 Jan 19	0,40			0,43		0,83	0,11	0,01	-	0,11	13,58%	Trash
Chourizo (Chouriço)	KG	2,59 €	20 e 21 Jan 19	0,39			-		0,39	0,27	-	-	0,27	69,07%	Leftovers for next Breakfast
Sliced Salami	KG	2,91 €	20 e 21 Jan 19	0,29			-		0,29	0,21	-	-	0,21	71,78%	Leftovers for next Breakfast
Total Meat Food Waste	--	30,29 €	--	50,77	-	-	49,24	-	100,01	51,73	0,01	-	51,73	48,17%	0
Black Olives	KG	1,19 €	20 e 21 Jan 19	0,42			-		0,42	0,32	-	-	0,32	76,60%	Leftovers for next Breakfast
Paris Mushrooms	KG	1,46 €	20 e 21 Jan 19	0,80			-		0,80	0,16	-	-	0,16	20,32%	Trash
Cherry Tomatoes	KG	1,90 €	20 e 21 Jan 19	1,05			-		1,05	0,80	-	-	0,80	76,50%	Trash
Roasted Vegetables	KG	0,14 €	20 e 21 Jan 19	0,99			-		0,99	0,52	-	-	0,52	52,58%	Trash
Cucumber	KG	0,69 €	20 e 21 Jan 19	0,58			-		0,58	0,38	-	-	0,38	65,75%	Leftovers for Cafeteria
Carrots	KG	0,48 €	20 e 21 Jan 19	0,47			-		0,47	0,28	0,02	0,02	0,30	62,68%	Leftovers for Cafeteria
Roasted Tomatoes with Pesto	UN	1,34 €	20 e 21 Jan 19	6,00			10,00		16,00	5,00	0,50	-	5,50	34,38%	Trash
Lettuce	KG	2,08 €	20 e 21 Jan 19	1,48			-		1,48	0,35	-	-	0,35	23,31%	Leftovers for Cafeteria
Salad Tomatoes	KG	1,19 €	20 e 21 Jan 19	2,32			-		2,32	1,37	-	-	1,37	59,35%	Leftovers for Cafeteria
Baked Beans with Tomato Sauce	UN	2,05 €	20 e 21 Jan 19	1,50			-		1,50	1,01	-	-	1,01	67,40%	Trash
Total Vegetables Food Waste	--	12,52 €	--	15,61	-	-	10,00	-	25,61	10,20	0,52	0,02	10,71	53,89%	--
Mini Donuts	UN	0,16 €	20 e 21 Jan 19	20,00			-		20,00	8,00	-	-	8,00	40,00%	Leftovers for Cafeteria
Chocolate Napolitans	UN	0,13 €	20 e 21 Jan 19	29,00			13,00		42,00	-	-	-	-	0,00%	Leftovers for Cafeteria
Brioche with Coconut	UN	0,18 €	20 e 21 Jan 19	20,00			-		20,00	4,00	1,80	-	5,80	29,00%	Leftovers for Cafeteria
Mini Pancakes	UN	0,13 €	20 e 21 Jan 19	18,00			-		18,00	-	-	-	-	0,00%	Leftovers for Cafeteria
Mini Egg Custard	UN	0,12 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Sponge Cake with Egg Creams	UN	0,18 €	20 e 21 Jan 19	13,00			5,00		18,00	-	-	-	-	0,00%	Leftovers for Cafeteria
Scones	KG	7,67 €	20 e 21 Jan 19	0,60			-		0,60	0,24	0,06	-	0,30	50,00%	Leftovers for Cafeteria
Apple Chausson	UN	0,22 €	20 e 21 Jan 19	22,00			-		22,00	5,00	1,00	-	6,00	27,27%	Leftovers for Cafeteria
Mini Muffins	UN	0,22 €	20 e 21 Jan 19	14,00			10,00		24,00	3,00	1,00	-	4,00	16,67%	Leftovers for Cafeteria
Mini Croissant	UN	0,08 €	20 e 21 Jan 19	51,00			10,00		61,00	29,00	0,73	-	29,73	48,74%	Leftovers for Cafeteria
Mini Palmier with Egg Creams	UN	0,20 €	20 e 21 Jan 19	19,00			-		19,00	-	1,00	-	1,00	5,26%	Leftovers for Cafeteria
Traditional Pastry - Bola de Berlim	UN	0,15 €	20 e 21 Jan 19	20,00			-		20,00	6,00	-	0,02	6,00	30,00%	Leftovers for Cafeteria
Total Pastries Food Waste	--	9,44 €	--	226,60	-	-	38,00	-	264,60	55,24	5,59	0,02	60,83	20,58%	--

Table 16 – Continuation of FW analysis during breakfast on the 21st of January

Sliced White Bread	UN	0,84 €	20 e 21 Jan 19	2,00			1,00		3,00	0,50	0,20	-	0,70	23,25%	Leftovers for Cafeteria
Mini Navettes	UN	0,18 €	20 e 21 Jan 19	11,00			18,00		29,00	8,00	0,50	-	8,50	29,31%	Trash
Bread with Seeds	UN	0,95 €	20 e 21 Jan 19	10,00			3,00		13,00	5,00	0,37	-	5,37	41,31%	Leftovers for Cafeteria
Bread Rolls with Raisins	UN	0,16 €	20 e 21 Jan 19	10,00			5,00		15,00	4,00	2,62	-	6,62	44,10%	Leftovers for Cafeteria
Sliced Corn Bread	UN	0,09 €	20 e 21 Jan 19	2,00			-		2,00	0,50	-	-	0,50	25,00%	Leftovers for Cafeteria
Large White bread Rolls	UN	0,06 €	20 e 21 Jan 19	10,00			5,00		15,00	6,00	1,00	-	7,00	46,67%	Leftovers for Cafeteria
Total Bread Food Waste	--	2,28 €	--	45,00	-	-	32,00	-	77,00	24,00	4,68	-	28,68	34,94%	--
Chocapic	KG	0,92 €	20 e 21 Jan 19	0,48			-		0,48	0,30	-	-	0,30	62,11%	Leftovers for next Breakfast
White Sesame Seeds	KG	2,41 €	20 e 21 Jan 19	0,26			-		0,26	0,21	-	-	0,21	79,92%	Leftovers for next Breakfast
Oats	KG	0,87 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Sunflower Seeds	KG	1,32 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Muesli	KG	2,00 €	20 e 21 Jan 19	1,52			-		1,52	1,25	-	-	1,25	81,80%	Leftovers for next Breakfast
Granola	KG	2,00 €	20 e 21 Jan 19	1,39			2,29		3,68	1,25	-	-	1,25	33,97%	Leftovers for next Breakfast
Nuts	KG	14,49 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Linseed	KG	0,93 €	20 e 21 Jan 19	0,15			-		0,15	0,09	-	-	0,09	56,67%	Leftovers for next Breakfast
Red Quinoa	KG	3,08 €	20 e 21 Jan 19	0,25			-		0,25	0,14	-	-	0,14	57,83%	Leftovers for next Breakfast
Total Cereals Food Waste	--	39,37 €	--	4,06	-	-	2,29	-	6,34	3,23	-	-	3,23	41,37%	--
Raspberry Jam	UN	0,23 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Orange Jam	UN	0,21 €	20 e 21 Jan 19	16,00			5,00		21,00	6,00	-	-	6,00	28,57%	Leftovers for next Breakfast
Honey	UN	0,31 €	20 e 21 Jan 19	16,00			6,00		22,00	9,00	-	-	9,00	40,91%	Leftovers for next Breakfast
Strawberry Jam	UN	0,21 €	20 e 21 Jan 19	16,00			7,00		23,00	12,00	-	-	12,00	52,17%	Leftovers for next Breakfast
Peach Jam	UN	0,21 €	20 e 21 Jan 19	16,00			4,00		20,00	5,00	-	-	5,00	25,00%	Leftovers for next Breakfast
Total Jam Food Waste	--	1,17 €	--	64,00	-	-	22,00	-	86,00	32,00	-	-	32,00	29,33%	--
Cheese Tortillas	UN	0,38 €	20 e 21 Jan 19	8,00			12,00		20,00	9,00	1,00	-	10,00	50,00%	Trash
Scrabbled Eggs	L	0,33 €	20 e 21 Jan 19	2,00			4,00		6,00	0,37	0,01	-	0,39	6,43%	Trash
Boiled Eggs	UN	0,15 €	20 e 21 Jan 19	5,00			4,00		9,00	5,00	1,00	-	6,00	66,67%	Leftovers for next Breakfast
Total Eggs Food Waste	--	0,86 €	--	15,00	-	-	20,00	-	35,00	14,37	2,01	-	16,39	41,03%	--
Plums	KG	3,59 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	-
Raisins	KG	1,91 €	20 e 21 Jan 19	0,32			-		0,32	0,25	-	-	0,25	78,80%	Leftovers for next Breakfast
Total Dry Fruits Food Waste	--	1,91 €	--	0,32	-	-	-	-	0,32	0,25	-	-	0,25	78,80%	--

Table 17 – Continuation of FW analysis during breakfast on the 21st of January

Mango Juice	UN	0,01 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Apple Juice	UN	0,01 €	20 e 21 Jan 19	-			-		-	-	-	-	-	0,00%	-
Forest Fruits Juice	UN	0,01 €	21 e 21 Jan 19	3,00			1,00		4,00	1,00	-	-	1,00	25,00%	Leftovers for Cafeteria
Orange Juice	UN	0,01 €	20 e 21 Jan 19	3,00			7,00		10,00	1,00	-	-	1,00	10,00%	Leftovers for Cafeteria
Sparkling Water	UN	0,57 €	20 e 21 Jan 19	1,00			1,00		2,00	-	-	-	-	0,00%	Trash
Still Water	UN	0,15 €	20 e 21 Jan 19	1,00			3,00		4,00	-	-	-	-	0,00%	Trash
Total Soft Drinks Waste	--	0,76 €	--	8,00	-	-	12,00	-	20,00	2,00	-	-	2,00	6%	--
Total	--	170,57 €	-	488,20	5,26	8,01	203,23	12,35	689,09	205,50	16,80	2,49	222,30	38%	--
Net Price to Client	€	5,88 €	--	--	--	--	--	--	--	--	--	--	--	--	--
Food Cost	€	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 18 – Continuation of FW analysis during breakfast on the 21st of January

Number of Clients		75															
Type of Food	Unit	Cost (WAC - Weighted Average Cost)	Data collection date	Initial Quantities in buffet	Initial cut quantities (fruits & vegetables)	Initial Whole Quantities (without cut) (fruits & vegetables)	Accruals	Total Weight	Available for consumption	Buffet Leftovers (reusable/trash)	Plate Scrapes/Unavoidable food waste (For trash)	Only unavoidable food waste	Food Waste	Food Waste %	Notes		
Yogurt 5 Kg Bucket	UN	5,99 €	21 e 22 Jan 19	0,60			0,30		0,90	0,40	-	-	0,40	44,44%	Trash		
Natural Vanilla Adagio Glass Yogurt	UN	0,46 €	21 e 22 Jan 19	8,00			-		8,00	4,00	-	-	4,00	50,00%	Leftovers for next Breakfast		
Strawberry Adagio Glass Yogurt	UN	0,58 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast		
Lemon Adagio Glass Yogurt	UN	0,58 €	21 e 22 Jan 19	4,00			-		4,00	1,00	-	-	1,00	25,00%	Leftovers for next Breakfast		
Natural with Sugar Adagio Glass Yogurt	UN	0,58 €	21 e 22 Jan 19	4,00			-		4,00	1,00	-	-	1,00	25,00%	Leftovers for next Breakfast		
National Sliced Edam Cheese	KG	3,08 €	21 e 22 Jan 19	0,54			-		0,54	0,16	0,02	-	0,17	31,68%	Leftovers for next Breakfast		
National Fresh Cheese	UN	1,88 €	21 e 22 Jan 19	0,63			0,65		1,28	0,50	-	-	0,50	38,92%	Leftovers for next Breakfast		
National Cream Cheese	KG	4,42 €	21 e 22 Jan 19	0,36			-		0,36	0,27	-	-	0,27	73,20%	Leftovers for next Breakfast		
Goat Cheese Rolls	UN	0,01 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast		
Biological Tofu	KG	5,98 €	21 e 22 Jan 19	0,52			-		0,52	0,50	-	-	0,50	96,33%	Leftovers for next Breakfast		
Sheep Manchego Cheese	KG	6,50 €	21 e 22 Jan 19	0,05			0,17		0,22	0,11	-	-	0,11	50,00%	Leftovers for next Breakfast		
National Iiha Cheese	KG	7,63 €	21 e 22 Jan 19	0,16			0,32		0,48	0,14	-	-	0,14	29,17%	Leftovers for next Breakfast		
Half Skimmed Milk Agros 1L	UN	0,41 €	21 e 22 Jan 19	2,00			2,00		4,00	2,00	-	-	2,00	50,00%	Trash		
Butter With Salt Mimosa	UN	0,07 €	21 e 22 Jan 19	20,00			12,00		32,00	16,00	-	-	16,00	50,00%	Leftovers for next Breakfast		
Butter Without Salt Mimosa	UN	0,07 €	21 e 22 Jan 19	20,00			6,00		26,00	14,00	-	-	14,00	53,85%	Leftovers for next Breakfast		
Total Dairy Food Waste	--	38,24 €	--	60,86	-	-	21,44	-	82,30	40,07	0,02	-	40,08	41,17%	--		
Rocha Pear	KG	1,29 €	21 e 22 Jan 19				-			-	-	-	-	0,00%	Leftovers for Cafeteria		
Muesli with Coconut	KG	3,66 €	21 e 22 Jan 19	1,27			-		1,27	1,12	-	-	1,12	88,35%	Leftovers for next Breakfast		
Cristalized Forest Fruits	KG	5,15 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast		
Fruit Salad 2,5 Kgs	UN	12,08 €	21 e 22 Jan 19	1,60			1,30		2,90	-	-	-	-	0,00%	Trash		
Granny Smith Apple	KG	1,48 €	21 e 22 Jan 19		0,79	0,97	-	0,97		0,58	0,17	0,07	0,75	78,03%	Leftovers for next Breakfast		
Starking Apple	KG	1,68 €	21 e 22 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for next Breakfast		
Cantaloupe	KG	1,49 €	21 e 22 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day		
Grapes	KG	0,89 €	21 e 22 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria		
Papaya	KG	2,89 €	21 e 22 Jan 19		0,21	0,58	-	0,58		-	0,37	0,37	0,37	63,36%	Leftovers for Juice of the day		
Kiwi	KG	1,58 €	22 e 22 Jan 19		0,07	0,09	-	0,09		-	0,01	0,01	0,01	14,52%	Leftovers for Juice of the day		
Melon	KG	0,78 €	21 e 22 Jan 19		1,69	2,76	0,41	3,17		0,54	1,07	1,07	1,61	50,75%	Leftovers for Juice of the day		
Banana	KG	0,78 €	21 e 22 Jan 19		0,69	1,02	-	1,02		0,51	0,33	0,16	0,83	82,00%	Leftovers for Cafeteria		
Oranges	KG	0,78 €	21 e 22 Jan 19		1,16	1,54	0,65	2,18		0,62	0,38	0,38	1,00	45,63%	Leftovers for Juice of the day		
Pineapple	KG	0,78 €	21 e 22 Jan 19		1,91	2,22	0,94	3,16		0,39	0,31	0,31	0,70	22,02%	Leftovers for Juice of the day		
Total Fruit Food Waste	--	35,31 €	--	2,87	6,53	9,17	3,29	12,46	4,17	3,75	2,64	2,37	6,39	31,76%	--		

Table 19 – FW analysis during breakfast on the 22nd of January

Turkey Ham	KG	3,82 €	21 e 22 Jan 19	0,51		1,00		1,51	0,63	-	-	0,63	41,80%	Leftovers for next Breakfast
Bacon With Cocktail Sausages	UN	0,50 €	21 e 22 Jan 19	52,00		56,00		108,00	39,00	-	-	39,00	36,11%	Trash
Pork Ham	KG	3,92 €	21 e 22 Jan 19	0,46		-		0,46	0,25	0,02	-	0,27	58,70%	Leftovers for next Breakfast
Smoked Ham	KG	8,26 €	21 e 22 Jan 19	0,22		0,43		0,65	0,29	0,02	-	0,31	47,54%	Leftovers for next Breakfast
York Paio	KG	4,34 €	21 e 22 Jan 19	0,64		-		0,64	0,58	-	-	0,58	89,98%	Leftovers for next Breakfast
Sliced Bacon	KG	3,95 €	21 e 22 Jan 19	0,51		-		0,51	0,19	-	-	0,19	37,74%	Trash
Chourizo (Chouriço)	KG	2,59 €	21 e 22 Jan 19	0,37		-		0,37	0,29	-	-	0,29	78,71%	Leftovers for next Breakfast
Sliced Salami	KG	2,91 €	21 e 22 Jan 19	0,24		-		0,24	0,02	-	-	0,02	8,40%	Leftovers for next Breakfast
Total Meat Food Waste	--	30,29 €	--	54,96	-	57,43	-	112,38	41,26	0,04	-	41,29	49,87%	0
Black Olives	KG	1,19 €	21 e 22 Jan 19	0,38		-		0,38	0,29	-	-	0,29	77,39%	Leftovers for next Breakfast
Paris Mushrooms	KG	1,46 €	21 e 22 Jan 19	0,85		1,17		2,02	1,04	-	-	1,04	51,41%	Trash
Cherry Tomatoes	KG	1,90 €	21 e 22 Jan 19	0,82		-		0,82	0,73	-	-	0,73	88,69%	Trash
Roasted Vegetables	KG	0,14 €	21 e 22 Jan 19	1,17		-		1,17	0,80	-	-	0,80	68,18%	Trash
Cucumber	KG	0,69 €	21 e 22 Jan 19	1,25		-		1,25	0,98	0,04	-	1,02	81,40%	Leftovers for Cafeteria
Carrots	KG	0,48 €	21 e 22 Jan 19	0,40		-		0,40	0,25	0,02	0,02	0,27	68,39%	Leftovers for Cafeteria
Roasted Tomatoes with Pesto	UN	1,34 €	21 e 22 Jan 19	10,00		13,00		23,00	8,00	-	-	8,00	34,78%	Trash
Lettuce	KG	2,08 €	21 e 22 Jan 19	1,46		-		1,46	0,29	-	-	0,29	19,66%	Leftovers for Cafeteria
Salad Tomatoes	KG	1,19 €	21 e 22 Jan 19	1,02		-		1,02	0,77	0,06	-	0,83	81,24%	Leftovers for Cafeteria
Baked Beans with Tomato Sauce	UN	2,05 €	21 e 22 Jan 19	1,00		-		1,00	0,70	-	-	0,70	70,00%	Trash
Total Vegetables Food Waste	--	12,52 €	--	18,34	-	14,17	-	32,51	13,84	0,12	0,02	13,96	64,11%	--
Mini Donuts	UN	0,16 €	21 e 22 Jan 19	20,00		-		20,00	7,00	0,47	-	7,47	37,33%	Leftovers for Cafeteria
Chocolate Napolitans	UN	0,13 €	21 e 22 Jan 19	-		-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Brioche with Coconut	UN	0,18 €	21 e 22 Jan 19	19,00		-		19,00	10,00	0,53	-	10,53	55,44%	Leftovers for Cafeteria
Mini Pancakes	UN	0,13 €	21 e 22 Jan 19	32,00		-		32,00	19,00	-	-	19,00	59,38%	Leftovers for Cafeteria
Mini Egg Custard	UN	0,12 €	21 e 22 Jan 19	20,00		21,00		41,00	-	1,00	-	1,00	2,44%	Leftovers for Cafeteria
Sponge Cake with Egg Creams	UN	0,18 €	21 e 22 Jan 19	19,00		-		19,00	-	-	-	-	0,00%	Leftovers for Cafeteria
Scones	KG	7,67 €	21 e 22 Jan 19	0,63		-		0,63	0,24	0,01	-	0,25	40,00%	Leftovers for Cafeteria
Apple Chausson	UN	0,22 €	21 e 22 Jan 19	-		-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Mini Muffins	UN	0,22 €	21 e 22 Jan 19	16,00		-		16,00	5,00	-	-	5,00	31,25%	Leftovers for Cafeteria
Mini Croissant	UN	0,08 €	21 e 22 Jan 19	38,00		-		38,00	-	0,43	-	0,43	1,14%	Leftovers for Cafeteria
Mini Palmier with Egg Creams	UN	0,20 €	21 e 22 Jan 19	20,00		-		20,00	3,00	-	-	3,00	15,00%	Leftovers for Cafeteria
Traditional Pastry - Bola de Berlim	UN	0,15 €	21 e 22 Jan 19	20,00		-		20,00	1,00	-	-	1,00	5,00%	Leftovers for Cafeteria
Total Pastries Food Waste	--	9,44 €	--	204,63	-	21,00	-	225,63	45,24	2,45	-	47,69	20,58%	--

Table 20 – Continuation of FW analysis during breakfast on the 22nd of January

Sliced White Bread	UN	0,84 €	21 e 22 Jan 19	2,00			1,00		3,00	1,50	0,14	-	1,64	54,50%	Leftovers for Cafeteria
Mini Navettes	UN	0,18 €	21 e 22 Jan 19	10,00			12,00		22,00	3,00	-	-	3,00	13,64%	Trash
Bread with Seeds	UN	0,95 €	21 e 22 Jan 19	15,00			-		15,00	12,00	0,83	-	12,83	85,56%	Leftovers for Cafeteria
Bread Rolls with Raisins	UN	0,16 €	21 e 22 Jan 19	30,00			14,00		44,00	26,00	2,26	-	28,26	64,23%	Leftovers for Cafeteria
Sliced Corn Bread	UN	0,09 €	21 e 22 Jan 19	2,00			0,50		2,50	0,50	0,05	-	0,55	21,80%	Leftovers for Cafeteria
Large White Bread Rolls	UN	0,06 €	21 e 22 Jan 19	15,00			-		15,00	11,00	0,43	-	11,43	76,22%	Leftovers for Cafeteria
Total Bread Food Waste	--	2,28 €	--	74,00 €	-	-	27,50 €	-	101,50 €	54,00 €	3,71 €	-	57,71 €	52,66%	--
Red Quinoa	KG	3,08 €	21 e 22 Jan 19	0,38			-		0,38	0,27	-	-	0,27	70,48%	Leftovers for next Breakfast
Chocapic	KG	0,92 €	21 e 22 Jan 19	0,38			-		0,38	0,37	-	-	0,37	97,62%	Leftovers for next Breakfast
Muesli	KG	2,00 €	21 e 22 Jan 19	1,29			-		1,29	0,71	-	-	0,71	55,36%	Leftovers for next Breakfast
Granola	KG	2,00 €	21 e 22 Jan 19	1,26			-		1,26	0,91	-	-	0,91	72,13%	Leftovers for next Breakfast
Sunflower Seeds	KG	1,32 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Oats	KG	0,87 €	21 e 22 Jan 19	1,21			-		1,21	0,45	-	-	0,45	37,33%	Leftovers for next Breakfast
Nuts	KG	14,49 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Linseed	KG	0,93 €	21 e 22 Jan 19	0,21			-		0,21	0,18	-	-	0,18	83,18%	Leftovers for next Breakfast
White Sesame Seeds	KG	2,41 €	21 e 22 Jan 19	0,24			-		0,24	0,19	-	-	0,19	79,75%	Leftovers for next Breakfast
Total Cereals Food Waste	--	28,02 €	--	4,96 €	-	-	- €	-	4,96 €	3,07 €	- €	- €	3,07 €	55,09%	--
Raspberry Jam	UN	0,23 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Orange Jam	UN	0,21 €	21 e 22 Jan 19	16,00			4,00		20,00	16,00	-	-	16,00	80,00%	Leftovers for next Breakfast
Honey	UN	0,31 €	21 e 22 Jan 19	16,00			14,00		30,00	12,00	-	-	12,00	40,00%	Leftovers for next Breakfast
Strawberry Jam	UN	0,21 €	21 e 22 Jan 19	16,00			7,00		23,00	16,00	-	-	16,00	69,57%	Leftovers for next Breakfast
Peach Jam	UN	0,21 €	21 e 22 Jan 19	16,00			2,00		18,00	14,00	-	-	14,00	77,78%	Leftovers for next Breakfast
Total Jam Food Waste	--	1,17 €	--	64,00	-	-	27,00	-	91,00	58,00	-	-	58,00	53,47%	--
Cheese Tortillas	UN	0,38 €	21 e 22 Jan 19	13,00			15,00		28,00	8,00	-	-	8,00	28,57%	Trash
Scrabbled Eggs	L	0,33 €	21 e 22 Jan 19	1,97			0,50		2,47	0,66	-	-	0,66	26,82%	Trash
Boiled Eggs	UN	0,15 €	21 e 22 Jan 19	6,00			-		6,00	4,00	-	-	4,00	66,67%	Leftovers for next Breakfast
Total Eggs Food Waste	--	0,86 €	--	20,97	-	-	15,50	-	36,47	12,66	-	-	12,66	40,69%	--
Plums	KG	3,59 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	-
Raisins	KG	1,91 €	21 e 22 Jan 19	0,28			-		0,28	0,21	-	-	0,21	73,21%	Leftovers for next Breakfast
Total Dry Fruits Food Waste	--	1,91 €	--	0,28	-	-	-	-	0,28	0,21	-	-	0,21	36,61%	--

Table 21 – Continuation of FW analysis during breakfast on the 22nd of January

Mango Juice	UN	0,01 €	21 e 22 Jan 19	2,00			4,00		6,00	1,00	-	-	1,00	16,67%	Leftovers for Cafeteria
Apple Juice	UN	0,01 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	-
Forest Fruits Juice	UN	0,01 €	21 e 22 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Orange Juice	UN	0,01 €	21 e 22 Jan 19	2,00			8,00		10,00	1,00	-	-	1,00	10,00%	Leftovers for Cafeteria
Sparkling Water	UN	0,57 €	21 e 22 Jan 19	1,00			1,00		2,00	-	-	-	-	0,00%	Trash
Still Water	UN	0,15 €	21 e 22 Jan 19	1,00			1,00		2,00	-	-	-	-	0,00%	Trash
Total Soft Drinks Waste	--	0,76 €	--	6,00	-	-	14,00	-	20,00	2,00	-	-	2,00	4%	--
Total	--	160,80 €	-	511,86	6,53	9,17	201,33	12,46	711,20	274,09	8,96	2,39	283,06	41%	--

Table 22 – Continuation of FW analysis during breakfast on the 22nd of January

Number of Clients															
110															
Type of Food	Unit	Cost (WAC - Weighted Average Cost)	Data collection date	Initial Quantities in buffet	Initial cut quantities (fruits & vegetables)	Initial Whole Quantities (without cut) (fruits & vegetables)	Accruals	Total Weight	Available for consumption	Buffet Leftovers (reusable/trash)	Plate Scrapes/Unavoidable food waste (For trash)	Only unavoidable food waste	Food Waste	Food Waste %	Notes
Yogurt 5 Kg Bucket	UN	5,99 €	27 e 28 Jan 19	0,60			-		0,60	0,09	-	-	0,09	15,00%	Trash
Natural Vanilla Adagio Glass Yogurt	UN	0,46 €	27 e 28 Jan 19	14,00			-		14,00	6,00	-	-	6,00	42,86%	Leftovers for next Breakfast
Strawberry Adagio Glass Yogurt	UN	0,58 €	27 e 28 Jan 19	-			3,00		3,00	-	-	-	-	0,00%	Leftovers for next Breakfast
Lemon Adagio Glass Yogurt	UN	0,58 €	27 e 28 Jan 19	3,00			-		3,00	-	-	-	-	0,00%	Leftovers for next Breakfast
Natural with Sugar Adagio Glass Yogurt	UN	0,58 €	27 e 28 Jan 19	3,00			-		3,00	-	-	-	-	0,00%	Leftovers for next Breakfast
National Sliced Edam Cheese	KG	3,08 €	27 e 28 Jan 19	0,35			0,54		0,89	0,20	-	-	0,20	21,89%	Leftovers for next Breakfast
National Fresh Cheese	UN	1,88 €	27 e 28 Jan 19	0,39			-		0,39	-	0,01	-	0,01	1,54%	Leftovers for next Breakfast
National Cream Cheese	KG	4,42 €	27 e 28 Jan 19	0,40			-		0,40	0,35	-	-	0,35	88,72%	Leftovers for next Breakfast
Goat Cheese Rolls	UN	0,01 €	27 e 28 Jan 19	0,14			-		0,14	-	-	-	-	0,00%	Leftovers for next Breakfast
Biological Tofu	KG	5,98 €	27 e 28 Jan 19	0,32			-		0,32	0,26	-	-	0,26	81,27%	Leftovers for next Breakfast
Sheep Manchego Cheese	KG	6,50 €	27 e 28 Jan 19	0,13			0,26		0,40	-	-	-	-	0,00%	Leftovers for next Breakfast
National Ilha Cheese	KG	7,63 €	27 e 28 Jan 19	0,12			0,20		0,32	0,06	-	-	0,06	18,75%	Leftovers for next Breakfast
Half Skimmed Milk Agros 1L	UN	0,41 €	27 e 28 Jan 19	2,00			1,00		3,00	1,50	-	-	1,50	50,00%	Trash
Butter With Salt Mimosa	UN	0,07 €	27 e 28 Jan 19	40,00			-		40,00	27,00	-	-	27,00	67,50%	Leftovers for next Breakfast
Butter Without Salt Mimosa	UN	0,07 €	27 e 28 Jan 19	40,00			-		40,00	23,00	-	-	23,00	57,50%	Leftovers for next Breakfast
Total Dairy Food Waste	--	38,24 €	--	104,45	-	-	5,01	-	109,45	58,46	0,01	-	58,46	29,67%	--
Rocha Pear	KG	1,29 €	27 e 28 Jan 19		0,63	0,79	-	0,79		0,40	0,16	0,08	0,55	69,87%	Leftovers for Cafeteria
Muesli with Coconut	KG	3,66 €	27 e 28 Jan 19	1,09			-		1,09	0,93	-	-	0,93	85,74%	Leftovers for next Breakfast
Cristalized Forest Fruits	KG	5,15 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Fruit Salad 2,5 Kgs	UN	12,08 €	27 e 28 Jan 19	0,81			2,15		2,96	0,81	1,01	-	1,82	61,55%	Trash
Granny Smith Apple	KG	1,48 €	27 e 28 Jan 19		1,42	1,74	-	1,74		1,16	0,31	0,10	1,47	84,70%	Leftovers for next Breakfast
Starking Apple	KG	1,68 €	27 e 28 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for next Breakfast
Cantaloupe	KG	1,49 €	27 e 28 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day
Grapes	KG	0,89 €	27 e 28 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Papaya	KG	2,89 €	27 e 28 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day
Kiwi	KG	1,58 €	27 e 28 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day
Melon	KG	0,78 €	27 e 28 Jan 19		1,50	2,45	1,00	3,45		0,15	1,00	0,95	1,16	33,46%	Leftovers for Juice of the day
Banana	KG	0,78 €	27 e 28 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Oranges	KG	0,78 €	27 e 28 Jan 19		1,62	2,15	1,03	3,18		0,60	0,54	0,53	1,15	36,02%	Leftovers for Juice of the day
Pineapple	KG	0,78 €	27 e 28 Jan 19		1,27	1,48	0,82	2,30		0,60	0,21	0,21	0,81	35,13%	Leftovers for Juice of the day
Total Fruit Food Waste	--	35,31 €	--	1,89	6,46	8,61	5,00	13,61	4,04	4,65	3,24	1,87	7,88	29,03%	--

Table 23 – FW analysis during breakfast on the 28th of January

Turkey Ham	KG	3,82 €	27 e 28 Jan 19	0,36			0,43		0,79	0,28	-	-	0,28	35,44%	Leftovers for next Breakfast
Bacon With Cocktail Sausages	UN	0,50 €	27 e 28 Jan 19	45,00			65,00		110,00	42,00	-	-	42,00	38,18%	Trash
Pork Ham	KG	3,92 €	27 e 28 Jan 19	0,48			-		0,48	0,33	-	-	0,33	67,78%	Leftovers for next Breakfast
Smoked Ham	KG	8,26 €	27 e 28 Jan 19	0,52			-		0,52	0,32	-	-	0,32	61,00%	Leftovers for next Breakfast
York Paio	KG	4,34 €	27 e 28 Jan 19	0,42			-		0,42	0,37	-	-	0,37	87,97%	Leftovers for next Breakfast
Sliced Bacon	KG	3,95 €	27 e 28 Jan 19	0,41			0,55		0,95	0,14	0,01	-	0,15	16,04%	Trash
Chourizo (Chourição)	KG	2,59 €	27 e 28 Jan 19	0,21			-		0,21	0,15	-	-	0,15	73,68%	Leftovers for next Breakfast
Sliced Salami	KG	2,91 €	27 e 28 Jan 19	0,48			-		0,48	0,45	-	-	0,45	92,72%	Leftovers for next Breakfast
Total Meat Food Waste	--	30,29 €	--	47,88	-	-	65,98	-	113,86	44,04	0,01	-	44,05	59,10%	0
Black Olives	KG	1,19 €	27 e 28 Jan 19	0,45			-		0,45	0,42	-	-	0,42	93,51%	Leftovers for next Breakfast
Paris Mushrooms	KG	1,46 €	27 e 28 Jan 19	0,71			1,67		2,38	0,28	0,01	-	0,29	12,11%	Trash
Cherry Tomatoes	KG	1,90 €	27 e 28 Jan 19	0,79			-		0,79	0,66	-	-	0,66	83,29%	Trash
Roasted Vegetables	KG	0,14 €	27 e 28 Jan 19	1,53			-		1,53	0,94	-	-	0,94	61,53%	Trash
Cucumber	KG	0,69 €	27 e 28 Jan 19	0,49			-		0,49	0,09	-	-	0,09	17,83%	Leftovers for Cafeteria
Carrots	KG	0,48 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Roasted Tomatoes with Pesto	UN	1,34 €	27 e 28 Jan 19	12,00			10,00		22,00	-	-	-	-	0,00%	Trash
Batata Rosti	UN	1,88 €	27 e 28 Jan 19	8,00			1,00		9,00	1,00	0,50	0,02	1,50	16,67%	Trash
Lettuce	KG	2,08 €	27 e 28 Jan 19	0,31			-		0,31	0,22	-	-	0,22	69,45%	Leftovers for Cafeteria
Salad Tomatoes	KG	1,19 €	27 e 28 Jan 19	1,07			-		1,07	0,81	0,03	-	0,84	78,52%	Leftovers for Cafeteria
Baked Beans with Tomato Sauce	UN	2,05 €	27 e 28 Jan 19	1,00			-		1,00	0,65	-	-	0,65	64,63%	Trash
Total Vegetables Food Waste	--	14,40 €	--	26,34	-	-	12,67	-	39,01	5,04	0,55	0,02	5,59	45,23%	--
Mini Donuts	UN	0,16 €	27 e 28 Jan 19	20,00			-		20,00	3,00	-	-	3,00	15,00%	Leftovers for Cafeteria
Chocolate Napolitans	UN	0,13 €	27 e 28 Jan 19	50,00			20,00		70,00	15,00	2,50	-	17,50	25,00%	Leftovers for Cafeteria
Brioche with Coconut	UN	0,18 €	27 e 28 Jan 19	17,00			-		17,00	3,00	1,66	-	4,66	27,41%	Leftovers for Cafeteria
Mini Pancakes	UN	0,13 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Mini Egg Custard	UN	0,12 €	27 e 28 Jan 19	35,00			29,00		64,00	-	-	-	-	0,00%	Leftovers for Cafeteria
Sponge Cake with Egg Creams	UN	0,18 €	27 e 28 Jan 19	18,00			-		18,00	2,00	-	-	2,00	11,11%	Leftovers for Cafeteria
Scones	KG	7,67 €	27 e 28 Jan 19	0,60			-		0,60	0,09	0,10	-	0,19	31,33%	Leftovers for Cafeteria
Apple Chausson	UN	0,22 €	27 e 28 Jan 19	26,00			-		26,00	12,00	-	-	12,00	46,15%	Leftovers for Cafeteria
Mini Muffins	UN	0,22 €	27 e 28 Jan 19	20,00			10,00		30,00	10,00	1,63	-	11,63	38,78%	Leftovers for Cafeteria
Mini Croissant	UN	0,08 €	27 e 28 Jan 19	62,00			25,00		87,00	40,00	1,87	-	41,87	48,12%	Leftovers for Cafeteria
Mini Palmier with Egg Creams	UN	0,20 €	27 e 28 Jan 19	19,00			-		19,00	2,00	1,40	-	3,40	17,89%	Leftovers for Cafeteria
Traditional Pastry - Bola de Berlim	UN	0,15 €	27 e 28 Jan 19	20,00			-		20,00	2,00	-	-	2,00	10,00%	Leftovers for Cafeteria
Total Pastries Food Waste	--	9,44 €	--	287,60	-	-	84,00	-	371,60	89,09	9,16	-	98,25	22,57%	--

Table 24 – Continuation of FW analysis during breakfast on the 28th of January

Sliced White Bread	UN	0,84 €	27 e 28 Jan 19	2,00			1,00		3,00	1,00	0,19	-	1,19	39,58%	Leftovers for Cafeteria
Mini Navettes	UN	0,18 €	27 e 28 Jan 19	8,00			23,00		31,00	-	2,50	-	2,50	8,06%	Trash
Bread with Seeds	UN	0,09 €	27 e 28 Jan 19	20,00			10,00		30,00	9,00	-	-	9,00	30,00%	Leftovers for Cafeteria
Bread Rolls with Raisins	UN	0,95 €	27 e 28 Jan 19	30,00			6,00		36,00	6,00	-	-	6,00	16,67%	Leftovers for Cafeteria
Sliced Corn Bread	UN	0,06 €	27 e 28 Jan 19	2,00			1,00		3,00	0,50	0,14	-	0,64	21,42%	Leftovers for Cafeteria
Large White bread Rolls	UN	0,16 €	27 e 28 Jan 19	15,00			-		15,00	3,00	1,27	-	4,27	28,48%	Leftovers for Cafeteria
Total Bread Food Waste	--	2,28 €	--	77,00	-	-	41,00	-	118,00	19,50	4,10	-	23,60	24,03%	--
Red Quinoa	KG	3,08 €	27 e 28 Jan 19	0,33			-		0,33	0,20	-	-	0,20	59,70%	Leftovers for next Breakfast
Chocapic	KG	0,92 €	27 e 28 Jan 19	0,40			-		0,40	0,19	-	-	0,19	48,01%	Leftovers for next Breakfast
Muesli	KG	2,00 €	27 e 28 Jan 19	1,77			-		1,77	1,39	-	-	1,39	78,52%	Leftovers for next Breakfast
Granola	KG	2,00 €	27 e 28 Jan 19	1,41			-		1,41	0,94	-	-	0,94	66,53%	Leftovers for next Breakfast
Oats	KG	0,87 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
White Sesame Seeds	KG	2,41 €	27 e 28 Jan 19	0,15			-		0,15	0,11	-	-	0,11	71,33%	Leftovers for next Breakfast
Nuts	KG	14,49 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Linseed	KG	0,93 €	27 e 28 Jan 19	0,17			-		0,17	0,13	-	-	0,13	73,41%	Leftovers for next Breakfast
Sunflower Seeds	KG	1,32 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Total Cereals Food Waste	--	28,02 €	--	4,24 €	-	-	- €	-	4,24 €	2,96 €	- €	- €	2,96 €	44,17%	--
Raspberry Jam	UN	0,23 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Orange Jam	UN	0,21 €	27 e 28 Jan 19	16,00			7,00		23,00	6,00	-	-	6,00	26,09%	Leftovers for next Breakfast
Honey	UN	0,31 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Strawberry Jam	UN	0,21 €	27 e 28 Jan 19	16,00			-		16,00	5,00	3,00	-	8,00	50,00%	Leftovers for next Breakfast
Peach Jam	UN	0,21 €	27 e 28 Jan 19	16,00			13,00		29,00	13,00	2,25	-	15,25	52,59%	Leftovers for next Breakfast
Total Jam Food Waste	--	1,17 €	--	48,00	-	-	20,00	-	68,00	24,00	5,25	-	29,25	25,73%	--
Cheese Tortillas	UN	0,38 €	27 e 28 Jan 19	15,00			12,00		27,00	6,00	-	-	6,00	22,22%	Trash
Scrabbled Eggs	L	0,33 €	27 e 28 Jan 19	2,00			6,00		8,00	2,99	0,02	-	3,01	37,60%	Trash
Boiled Eggs	UN	0,15 €	27 e 28 Jan 19	5,00			4,00		9,00	1,00	-	-	1,00	11,11%	Leftovers for next Breakfast
Total Eggs Food Waste	--	0,86 €	--	22,00	-	-	22,00	-	44,00	9,99	0,02	-	10,01	23,64%	--
Plums	KG	3,59 €	27 e 28 Jan 19	0,13			0,16		0,30	0,13	-	-	0,13	42,91%	Leftovers for next Breakfast
Raisins	KG	1,91 €	27 e 28 Jan 19	0,28			-		0,28	0,23	-	-	0,23	80,94%	Leftovers for next Breakfast
Total Dry Fruits Food Waste	--	1,91 €	--	0,28	-	-	-	-	0,28	0,35	-	-	0,35	61,92%	--

Table 25 – Continuation of FW analysis during breakfast on the 28th of January

Mango Juice	UN	0,01 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Apple Juice	UN	0,01 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Peach Juice	UN	0,01 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Forest Fruits Juice	UN	0,01 €	27 e 28 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Pineapple Juice	UN	0,01 €	27 e 28 Jan 19	2,00			-		2,00	0,50	-	-	0,50	25,00%	Leftovers for Cafeteria
Orange Juice	UN	0,01 €	27 e 28 Jan 19	2,00			10,00		12,00	1,00	-	-	1,00	8,33%	Leftovers for Cafeteria
Sparkling Water	UN	0,57 €	27 e 28 Jan 19	1,00			1,00		2,00	0,50	-	-	0,50	25,00%	Trash
Still Water	UN	0,15 €	27 e 28 Jan 19	1,00			6,00		7,00	0,50	-	-	0,50	7,14%	Trash
Total Soft Drinks Waste	--	0,78 €	--	6,00	-	-	17,00	-	23,00	2,50	-	-	2,50	8%	--
Total	--	162,70 €	-	625,68	6,46	8,61	272,65	13,61	895,48	260,57	22,33	1,89	282,90	34%	--

Table 26 – Continuation of FW analysis during breakfast on the 28th of January

Number of Clients															
112															
Type of Food	Unit	Cost (WAC - Weighted Average Cost)	Data collection date	Initial Quantities in buffet	Initial cut quantities (fruits & vegetables)	Initial Whole Quantities (without cut) (fruits & vegetables)	Accruals	Total Weight	Available for consumption	Buffet Leftovers (reusable/trash)	Plate Scrapes/Unavoidable food waste (For trash)	Only unavoidable food waste	Food Waste	Food Waste %	Notes
Yogurt 5 Kg Bucket	UN	5,99 €	28 e 29 Jan 19	2,50			-		2,50	0,75	-	-	0,75	30,00%	Trash
Natural Vanilla Adagio Glass Yogurt	UN	0,46 €	28 e 29 Jan 19	6,00			3,00		9,00	-	-	-	-	0,00%	Leftovers for next Breakfast
Strawberry Adagio Glass Yogurt	UN	0,58 €	28 e 29 Jan 19	2,00			-		2,00	-	-	-	-	0,00%	Leftovers for next Breakfast
Lemon Adagio Glass Yogurt	UN	0,58 €	28 e 29 Jan 19	5,00			-		5,00	-	-	-	-	0,00%	Leftovers for next Breakfast
Natural with Sugar Adagio Glass Yogurt	UN	0,58 €	28 e 29 Jan 19	6,00			2,00		8,00	3,00	-	-	3,00	37,50%	Leftovers for next Breakfast
National Sliced Edam Cheese	KG	3,08 €	28 e 29 Jan 19	0,54			0,17		0,71	0,46	0,03	-	0,49	68,21%	Leftovers for next Breakfast
National Fresh Cheese	UN	1,88 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
National Cream Cheese	KG	4,42 €	28 e 29 Jan 19	0,33			-		0,33	0,18	-	-	0,18	53,78%	Leftovers for next Breakfast
Goat Cheese Rolls	UN	0,01 €	28 e 29 Jan 19	0,02			-		0,02	-	-	-	-	0,00%	Leftovers for next Breakfast
Biological Tofu	KG	5,98 €	28 e 29 Jan 19	0,40			-		0,40	0,28	-	-	0,28	70,38%	Leftovers for next Breakfast
Sheep Manchego Cheese	KG	6,50 €	28 e 29 Jan 19	0,05			0,19		0,24	0,01	0,02	-	0,04	15,00%	Leftovers for next Breakfast
National Ilha Cheese	KG	7,63 €	28 e 29 Jan 19	0,24			0,72		0,96	0,08	-	-	0,08	8,33%	Leftovers for next Breakfast
Half Skimmed Milk Agros 1L	UN	0,41 €	28 e 29 Jan 19	2,00			2,00		4,00	2,00	-	-	2,00	50,00%	Trash
Butter With Salt Mimosa	UN	0,07 €	28 e 29 Jan 19	40,00			-		40,00	10,00	-	-	10,00	25,00%	Leftovers for next Breakfast
Butter Without Salt Mimosa	UN	0,07 €	28 e 29 Jan 19	40,00			-		40,00	5,00	-	-	5,00	12,50%	Leftovers for next Breakfast
Total Dairy Food Waste	--	38,24 €	--	105,08	-	-	8,09	-	113,16	21,75	0,06	-	21,81	24,71%	--
Rocha Pear	KG	1,29 €	28 e 29 Jan 19		1,11	1,39	-	1,39		0,99	0,28	0,08	1,27	91,30%	Leftovers for Cafeteria
Muesli with Coconut	KG	3,66 €	28 e 29 Jan 19	0,96			1,50		2,46	1,33	-	-	1,33	54,11%	Leftovers for next Breakfast
Cristalized Forest Fruits	KG	5,15 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Fruit Salad 2,5 Kgs	UN	12,08 €	28 e 29 Jan 19	1,21			3,36		4,57	0,54	-	-	0,54	11,76%	Trash
Granny Smith Apple	KG	1,48 €	28 e 29 Jan 19		0,95	1,16	-	1,16		0,39	0,34	0,14	0,73	62,76%	Leftovers for next Breakfast
Starking Apple	KG	1,68 €	28 e 29 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for next Breakfast
Cantaloupe	KG	1,49 €	28 e 29 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day
Grapes	KG	0,89 €	28 e 29 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Papaya	KG	2,89 €	28 e 29 Jan 19		0,19	0,52	0,62	1,14		-	0,33	0,33	0,33	29,07%	Leftovers for Juice of the day
Kiwi	KG	1,58 €	28 e 29 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day
Melon	KG	0,78 €	28 e 29 Jan 19		1,54	2,52	-	2,52		-	0,97	0,97	0,97	38,70%	Leftovers for Juice of the day
Banana	KG	0,78 €	28 e 29 Jan 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Oranges	KG	0,78 €	28 e 29 Jan 19		1,85	2,46	5,38	7,84		2,46	0,74	0,61	3,20	40,80%	Leftovers for Juice of the day
Pineapple	KG	0,78 €	28 e 29 Jan 19		2,06	2,40	0,38	2,78		-	0,33	0,33	0,33	12,01%	Leftovers for Juice of the day
Total Fruit Food Waste	--	35,31 €	--	2,17	7,71	10,44	11,74	21,68	7,03	5,70	3,00	2,46	8,70	24,32%	--

Table 27 – FW analysis during breakfast on the 29th of January

Turkey Ham	KG	3,82 €	28 e 29 Jan 19	0,37			0,37		0,74	0,17	-	-	0,17	23,39%	Leftovers for next Breakfast
Bacon With Cocktail Sausages	UN	0,50 €	28 e 29 Jan 19	56,00			56,00		112,00	33,00	-	-	33,00	29,46%	Trash
Pork Ham	KG	3,92 €	28 e 29 Jan 19	0,54			-		0,54	0,30	-	-	0,30	55,39%	Leftovers for next Breakfast
Smoked Ham	KG	8,26 €	28 e 29 Jan 19	0,35			-		0,35	0,26	-	-	0,26	75,86%	Leftovers for next Breakfast
York Palo	KG	4,34 €	28 e 29 Jan 19	0,32			-		0,32	0,14	0,02	-	0,16	50,47%	Leftovers for next Breakfast
Sliced Bacon	KG	3,95 €	28 e 29 Jan 19	0,36			1,08		1,43	0,16	0,01	-	0,17	12,13%	Trash
Chourizo (Chouriço)	KG	2,59 €	28 e 29 Jan 19	0,26			-		0,26	0,24	-	-	0,24	92,31%	Leftovers for next Breakfast
Sliced Salami	KG	2,91 €	28 e 29 Jan 19	0,35			-		0,35	0,26	-	-	0,26	75,86%	Leftovers for next Breakfast
Total Meat Food Waste	--	30,29 €	--	58,54	-	-	57,45	-	115,99	34,54	0,04	-	34,57	51,86%	0
Black Olives	KG	1,19 €	28 e 29 Jan 19	0,42			-		0,42	0,35	-	-	0,35	84,34%	Leftovers for next Breakfast
Paris Mushrooms	KG	1,46 €	28 e 29 Jan 19	1,03			0,72		1,75	0,23	0,01	-	0,24	13,68%	Trash
Cherry Tomatoes	KG	1,90 €	28 e 29 Jan 19	0,95			-		0,95	0,78	-	-	0,78	82,09%	Trash
Roasted Vegetables	KG	0,14 €	28 e 29 Jan 19	1,38			-		1,38	0,62	0,02	-	0,64	46,24%	Trash
Cucumber	KG	0,69 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Carrots	KG	0,48 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Roasted Tomatoes with Pesto	UN	1,34 €	28 e 29 Jan 19	11,00			20,00		31,00	12,00	0,25	-	12,25	39,52%	Trash
Lettuce	KG	2,08 €	28 e 29 Jan 19	0,30			-		0,30	0,13	-	-	0,13	43,39%	Leftovers for Cafeteria
Salad Tomatoes	KG	1,19 €	28 e 29 Jan 19	0,99			-		0,99	0,69	-	-	0,69	70,31%	Leftovers for Cafeteria
Baked Beans with Tomato Sauce	UN	2,05 €	28 e 29 Jan 19	1,00			-		1,00	0,38	-	-	0,38	37,83%	Trash
Total Vegetables Food Waste	--	12,52 €	--	17,06	-	-	20,72	-	37,78	15,18	0,28	-	15,46	41,74%	--
Mini Donuts	UN	0,16 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Chocolate Napolitans	UN	0,13 €	28 e 29 Jan 19	29,00			43,00		72,00	60,00	-	-	60,00	83,33%	Leftovers for Cafeteria
Brioche with Coconut	UN	0,18 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Mini Pancakes	UN	0,13 €	28 e 29 Jan 19	14,00			45,00		59,00	-	2,00	-	2,00	3,39%	Leftovers for Cafeteria
Mini Egg Custard	UN	0,12 €	28 e 29 Jan 19	35,00			35,00		70,00	85,00	1,00	-	86,00	122,86%	Leftovers for Cafeteria
Sponge Cake with Egg Creams	UN	0,18 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Scones	KG	7,67 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Apple Chausson	UN	0,22 €	28 e 29 Jan 19	20,00			-		20,00	3,00	-	-	3,00	15,00%	Leftovers for Cafeteria
Mini Muffins	UN	0,22 €	28 e 29 Jan 19	23,00			-		23,00	5,00	-	-	5,00	21,74%	Leftovers for Cafeteria
Mini Croissant	UN	0,08 €	28 e 29 Jan 19	56,00			21,00		77,00	48,00	0,30	-	48,30	62,73%	Leftovers for Cafeteria
Mini Palmier with Egg Creams	UN	0,20 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Traditional Pastry - Bola de Berlin	UN	0,15 €	28 e 29 Jan 19	22,00			4,00		26,00	-	-	-	-	0,00%	Leftovers for Cafeteria
Total Pastries Food Waste	--	9,44 €	--	199,00	-	-	148,00	-	347,00	201,00	3,30	-	204,30	25,75%	--

Table 28 – Continuation of FW analysis during breakfast on the 29th of January

Sliced White Bread	UN	0,84 €	28 e 29 Jan 19	2,00			2,00		4,00	1,00	0,24	-	1,24	31,05%	Leftovers for Cafeteria
Mini Navettes	UN	0,18 €	28 e 29 Jan 19	11,00			23,00		34,00	10,00	2,00	-	12,00	35,29%	Trash
Bread with Seeds	UN	0,09 €	28 e 29 Jan 19	10,00			-		10,00	4,00	2,67	-	6,67	66,67%	Leftovers for Cafeteria
Chapata Bread With Poppy	UN	0,27 €	28 e 29 Jan 19	-			-		-	5,00	-	-	5,00	100,00%	Leftovers for Cafeteria
Sliced Corn Bread	UN	0,95 €	28 e 29 Jan 19	2,00			-		2,00	-	0,14	-	0,14	7,13%	Leftovers for Cafeteria
Large White bread Rolls	UN	0,16 €	28 e 29 Jan 19	10,00			18,00		28,00	8,00	-	-	8,00	28,57%	Leftovers for Cafeteria
Bread Rolls with Raisins	UN	0,09 €	28 e 29 Jan 19	15,00			7,00		22,00	7,00	-	-	7,00	31,82%	Leftovers for Cafeteria
Bread Rolls with Olives	UN	0,06 €	28 e 29 Jan 19	15,00			7,00		22,00	1,00	6,60	-	7,60	34,55%	Leftovers for Cafeteria
Total Bread Food Waste	--	2,04 €	--	65,00	-	-	57,00	-	122,00	36,00	11,65	-	47,65	41,88%	--
Muesli	KG	2,00 €	28 e 29 Jan 19	1,43			0,19		1,61	1,33	-	-	1,33	82,70%	Leftovers for next Breakfast
Granola	KG	2,00 €	28 e 29 Jan 19	0,20			1,53		1,73	0,98	-	-	0,98	56,38%	Leftovers for next Breakfast
Oats	KG	0,87 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Sunflower Seeds	KG	1,32 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Nuts	KG	14,49 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Linseed	KG	0,93 €	28 e 29 Jan 19	0,16			-		0,16	0,11	-	-	0,11	65,84%	Leftovers for next Breakfast
White Sesame Seeds	KG	2,41 €	28 e 29 Jan 19	0,14			-		0,14	0,09	-	-	0,09	63,97%	Leftovers for next Breakfast
Red Quinoa	KG	3,08 €	28 e 29 Jan 19	0,32			-		0,32	0,15	-	-	0,15	46,89%	Leftovers for next Breakfast
Chocapic	KG	0,92 €	28 e 29 Jan 19	0,29			1,00		1,29	0,45	-	-	0,45	34,73%	Leftovers for next Breakfast
Total Cereals Food Waste	--	28,02 €	--	2,53	-	-	2,72	-	5,25	3,10	-	-	3,10	38,95%	--
Raspberry Jam	UN	0,23 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Orange Jam	UN	0,21 €	28 e 29 Jan 19	16,00			-		16,00	7,00	-	-	7,00	43,75%	Leftovers for next Breakfast
Honey	UN	0,31 €	28 e 29 Jan 19	-			-		-	-	0,50	-	0,50	0,00%	Leftovers for next Breakfast
Strawberry Jam	UN	0,21 €	28 e 29 Jan 19	16,00			16,00		32,00	11,00	-	-	11,00	34,38%	Leftovers for next Breakfast
Peach Jam	UN	0,21 €	28 e 29 Jan 19	32,00			-		32,00	12,00	-	-	12,00	37,50%	Leftovers for next Breakfast
Total Jam Food Waste	--	1,17 €	--	64,00	-	-	16,00	-	80,00	30,00	0,50	-	30,50	23,13%	--
Cheese Tortillas	UN	0,38 €	28 e 29 Jan 19	13,00			21,00		34,00	6,00	2,50	-	8,50	25,00%	Trash
Scrabbled Eggs	L	0,33 €	28 e 29 Jan 19	2,00			2,00		4,00	0,21	0,03	-	0,24	6,03%	Trash
Boiled Eggs	UN	0,15 €	28 e 29 Jan 19	5,00			-		5,00	1,00	-	-	1,00	20,00%	Leftovers for next Breakfast
Total Eggs Food Waste	--	0,86 €	--	20,00	-	-	23,00	-	43,00	7,21	2,53	-	9,74	17,01%	--
Plums	UN	3,59 €	-	-			-		-	-	-	-	-	0,00%	-
Raisins	UN	1,91 €	28 e 29 Jan 19	0,25			-		0,25	0,14	-	-	0,14	57,37%	Leftovers for next Breakfast
Total Dry Fruits Food Waste	--	1,91 €	--	0,25	-	-	-	-	0,25	0,14	-	-	0,14	28,69%	--

Table 29 – Continuation of FW analysis during breakfast on the 29th of January

Mango Juice	UN	0,01 €	28 e 29 Jan 19	2,00			7,00		9,00	2,00	-	-	2,00	22,22%	Leftovers for Cafeteria
Apple Juice	UN	0,01 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	-
Forest Fruits Juice	UN	0,01 €	28 e 29 Jan 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Orange Juice	UN	0,01 €	28 e 29 Jan 19	2,00			12,00		14,00	2,00	-	-	2,00	14,29%	Leftovers for Cafeteria
Sparkling Water	UN	0,57 €	28 e 29 Jan 19	1,00			1,00		2,00	-	-	-	-	0,00%	Trash
Still Water	UN	0,15 €	28 e 29 Jan 19	1,00			3,00		4,00	1,00	-	-	1,00	25,00%	Trash
Total Soft Drinks Waste	--	0,76 €	--	6,00	-	-	23,00	-	29,00	5,00	-	-	5,00	10%	--
Total	--	161,16 €	-	539,63	7,71	10,44	367,22	21,68	900,47	359,63	21,35	2,46	380,98	30%	--

Table 30 – Continuation of FW analysis during breakfast on the 29th of January

Number of Clients		108													
Type of Food	Unit	Cost (WAC - Weighted Average Cost)	Data collection date	Initial Quantities in buffet	Initial cut quantities (fruits & vegetables)	Initial Whole Quantities (without cut) (fruits & vegetables)	Accruals	Total Weight	Available for consumption	Buffet Leftovers (reusable/trash)	Plate Scrapes/Unavoidable food waste (For trash)	Only unavoidable food waste	Food Waste	Food Waste %	Notes
Yogurt 5 Kg Bucket	UN	5,99 €	05 e 06 Feb 19	0,40			-		0,40	0,09	-	-	0,09	22,50%	Trash
Natural Vanilla Adagio Glass Yogurt	UN	0,46 €	05 e 06 Feb 19	2,00			-		2,00	-	-	-	-	0,00%	Leftovers for next Breakfast
Strawberry Adagio Glass Yogurt	UN	0,58 €	05 e 06 Feb 19	5,00			3,00		8,00	2,00	-	-	2,00	25,00%	Leftovers for next Breakfast
Lemon Adagio Glass Yogurt	UN	0,58 €	05 e 06 Feb 19	5,00			3,00		8,00	2,00	-	-	2,00	25,00%	Leftovers for next Breakfast
Natural with Sugar Adagio Glass Yogurt	UN	0,58 €	05 e 06 Feb 19	4,00			-		4,00	1,00	-	-	1,00	25,00%	Leftovers for next Breakfast
National Sliced Edam Cheese	KG	3,08 €	05 e 06 Feb 19	0,56			0,36		0,92	0,29	0,08	-	0,37	39,59%	Leftovers for next Breakfast
National Fresh Cheese	UN	1,88 €	05 e 06 Feb 19	0,33			0,70		1,03	0,32	-	-	0,32	30,91%	Leftovers for next Breakfast
National Cream Cheese	KG	4,42 €	05 e 06 Feb 19	0,28			-		0,28	0,20	-	-	0,20	71,83%	Leftovers for next Breakfast
Goat Cheese Rolls	UN	0,01 €	05 e 06 Feb 19	-			0,06		0,06	0,02	-	-	0,02	40,00%	Leftovers for next Breakfast
Biological Tofu	KG	5,98 €	05 e 06 Feb 19	0,41			-		0,41	0,30	-	-	0,30	72,51%	Leftovers for next Breakfast
Sheep Manchego Cheese	KG	6,50 €	05 e 06 Feb 19	0,14			0,26		0,41	0,05	0,01	-	0,06	14,71%	Leftovers for next Breakfast
National Iiha Cheese	KG	7,63 €	05 e 06 Feb 19	0,16			0,28		0,44	0,08	-	-	0,08	18,18%	Leftovers for next Breakfast
Half Skimmed Milk Agros 1L	UN	0,41 €	05 e 06 Feb 19	2,00			2,00		4,00	0,50	-	-	0,50	12,50%	Trash
Butter With Salt Mimosa	UN	0,07 €	05 e 06 Feb 19	40,00			-		40,00	16,00	-	-	16,00	40,00%	Leftovers for next Breakfast
Butter Without Salt Mimosa	UN	0,07 €	05 e 06 Feb 19	40,00			-		40,00	20,00	0,50	-	20,50	51,25%	Leftovers for next Breakfast
Total Dairy Food Waste	--	38,24 €	--	100,30	-	-	9,66	-	109,96	42,85	0,59	-	43,44	32,60%	--
Rocha Pear	KG	1,29 €	05 e 06 Feb 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Muesli with Coconut	KG	3,66 €	05 e 06 Feb 19	1,07			-		1,07	-	-	-	-	0,00%	Leftovers for next Breakfast
Cristalized Forest Fruits	KG	5,15 €	05 e 06 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Fruit Salad 2,5 Kgs	UN	12,08 €	05 e 06 Feb 19	1,61			0,54		2,15	0,40	-	-	0,40	18,75%	Trash
Granny Smith Apple	KG	1,48 €	05 e 06 Feb 19		0,79	0,97	1,16	2,12		1,16	0,17	0,17	1,33	62,74%	Leftovers for next Breakfast
Starking Apple	KG	1,68 €	05 e 06 Feb 19		0,27	0,33	-	0,33		-	0,06	0,06	0,06	17,80%	Leftovers for next Breakfast
Cantaloupe	KG	1,49 €	05 e 06 Feb 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day
Grapes	KG	0,89 €	05 e 06 Feb 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Papaya	KG	2,89 €	05 e 06 Feb 19		0,21	0,59	0,23	0,82		-	0,39	0,39	0,39	48,18%	Leftovers for Juice of the day
Kiwi	KG	1,58 €	05 e 06 Feb 19		0,42	0,50	0,66	1,16		0,58	0,07	0,07	0,65	56,22%	Leftovers for Juice of the day
Melon	KG	0,78 €	05 e 06 Feb 19		1,71	2,78	2,10	4,88		0,53	1,13	1,08	1,66	34,04%	Leftovers for Juice of the day
Banana	KG	0,78 €	05 e 06 Feb 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Oranges	KG	0,78 €	05 e 06 Feb 19		1,77	2,35	1,96	4,31		0,66	0,63	0,58	1,29	29,94%	Leftovers for Juice of the day
Pineapple	KG	0,78 €	05 e 06 Feb 19		1,26	1,47	3,07	4,54		0,87	0,20	0,20	1,07	23,66%	Leftovers for Juice of the day
Total Fruit Food Waste	--	35,31 €	--	2,69	6,44	8,98	9,72	18,70	3,22	4,20	2,67	2,56	6,87	20,81%	--

Table 31 – FW analysis during breakfast on the 6th of February

Turkey Ham	KG	3,82 €	05 e 06 Fev 19	0,54			0,41		0,95	0,29	-	-	0,29	31,05%	Leftovers for next Breakfast
Bacon With Cocktail Sausages	UN	0,50 €	05 e 06 Fev 19	50,00			105,00		155,00	58,00	1,00	-	59,00	38,06%	Trash
Pork Ham	KG	3,92 €	05 e 06 Fev 19	0,52			-		0,52	0,24	0,01	-	0,25	48,94%	Leftovers for next Breakfast
Smoked Ham	KG	8,26 €	05 e 06 Fev 19	0,75			0,47		1,21	0,33	0,05	-	0,39	31,85%	Leftovers for next Breakfast
York Paio	KG	4,34 €	05 e 06 Fev 19	0,42			-		0,42	0,21	0,04	-	0,25	59,52%	Leftovers for next Breakfast
Sliced Bacon	KG	3,95 €	05 e 06 Fev 19	0,28			-		0,28	0,12	-	-	0,12	42,18%	Trash
Chourizo (Chouriço)	KG	2,59 €	05 e 06 Fev 19	0,13			-		0,13	0,07	0,02	-	0,09	65,67%	Leftovers for next Breakfast
Sliced Salami	KG	2,91 €	05 e 06 Fev 19	0,22			-		0,22	0,16	0,02	-	0,18	81,57%	Leftovers for next Breakfast
Total Meat Food Waste	--	30,29 €	--	52,85	-	-	105,88	-	158,72	59,44	1,13	-	60,57	49,86%	0
Black Olives	KG	1,19 €	05 e 06 Fev 19	0,31			-		0,31	0,24	-	-	0,24	77,92%	Leftovers for next Breakfast
Paris Mushrooms	KG	1,46 €	05 e 06 Fev 19	0,68			2,48		3,17	0,43	-	-	0,43	13,71%	Trash
Cherry Tomatoes	KG	1,90 €	05 e 06 Fev 19	-			-		-	-	-	-	-	0,00%	Trash
Roasted Vegetables	KG	0,14 €	05 e 06 Fev 19	1,44			-		1,44	0,61	0,02	-	0,63	44,08%	Trash
Cucumber	KG	0,69 €	05 e 06 Fev 19	0,45			-		0,45	0,27	-	-	0,27	61,21%	Leftovers for Cafeteria
Carrots	KG	0,48 €	05 e 06 Fev 19	0,36			-		0,36	0,18	0,02	0,02	0,19	53,80%	Leftovers for Cafeteria
Roasted Tomatoes with Pesto	UN	1,34 €	05 e 06 Fev 19	10,00			11,00		21,00	5,00	-	-	5,00	23,81%	Trash
Batata Rosti	KG	2,08 €	05 e 06 Fev 19	8,00			8,00		16,00	-	0,20	0,02	0,20	1,25%	Leftovers for Cafeteria
Lettuce	UN	0,96 €	05 e 06 Fev 19	0,41			-		0,41	0,34	-	-	0,34	83,46%	Leftovers for Cafeteria
Salad Tomatoes	KG	1,19 €	05 e 06 Fev 19	0,89			-		0,89	0,72	-	-	0,72	81,29%	Leftovers for Cafeteria
Baked Beans with Tomato Sauce	UN	2,05 €	05 e 06 Fev 19	0,82			-		0,82	0,57	-	-	0,57	69,13%	Trash
Total Vegetables Food Waste	--	13,48 €	--	23,35	-	-	21,48	-	44,83	8,36	0,24	0,04	8,60	46,33%	--

Table 32 – Continuation of FW analysis during breakfast on the 6th of February

Mini Donuts	UN	0,16 €	05 e 06 Fev 19	-	-	-	-	-	-	-	-	-	0,00%	Leftovers for Cafeteria
Chocolate Napolitans	UN	0,13 €	05 e 06 Fev 19	28,00	-	31,00	-	59,00	4,00	1,50	-	5,50	9,32%	Leftovers for Cafeteria
Brioche with Coconut	UN	0,18 €	05 e 06 Fev 19	14,00	-	-	-	14,00	9,00	0,50	-	9,50	67,86%	Leftovers for Cafeteria
Mini Pancakes	UN	0,13 €	05 e 06 Fev 19	36,00	-	-	-	36,00	-	1,00	-	1,00	2,78%	Leftovers for Cafeteria
Mini Egg Custard	UN	0,12 €	05 e 06 Fev 19	42,00	-	40,00	-	82,00	24,00	1,50	-	25,50	31,10%	Leftovers for Cafeteria
Sponge Cake with Egg Creams	UN	0,18 €	05 e 06 Fev 19	21,00	-	-	-	21,00	12,00	1,50	-	13,50	64,29%	Leftovers for Cafeteria
Scones	KG	7,67 €	05 e 06 Fev 19	-	-	-	-	-	-	-	-	-	0,00%	Leftovers for Cafeteria
Apple Chausson	UN	0,22 €	05 e 06 Fev 19	15,00	-	-	-	15,00	33,00	1,43	-	34,43	229,56%	Leftovers for Cafeteria
Mini Muffins	UN	0,22 €	05 e 06 Fev 19	16,00	-	-	-	16,00	1,00	-	-	1,00	6,25%	Leftovers for Cafeteria
Mini Croissant	UN	0,08 €	05 e 06 Fev 19	38,00	-	18,00	-	56,00	18,00	-	-	18,00	32,14%	Leftovers for Cafeteria
Traditional Pastry - Traça com Creme Ovos	UN	0,22 €	05 e 06 Fev 19	16,00	-	-	-	16,00	5,00	-	-	5,00	31,25%	Leftovers for Cafeteria
Traditional Pastry - Parra com doce de ovos	UN	0,22 €	05 e 06 Fev 19	12,00	-	-	-	12,00	13,00	0,50	-	13,50	112,50%	Leftovers for Cafeteria
Traditional Pastry - Caracóis	UN	0,22 €	05 e 06 Fev 19	-	-	-	-	-	-	-	-	-	0,00%	Leftovers for Cafeteria
Mini Palmier	UN	0,20 €	05 e 06 Fev 19	20,00	-	-	-	20,00	8,00	-	-	8,00	40,00%	Leftovers for Cafeteria
Traditional Pastry - Bola Berlim	UN	0,22 €	05 e 06 Fev 19	20,00	-	-	-	20,00	9,00	0,50	-	9,50	47,50%	Leftovers for Cafeteria
Total Pastry Food Waste	--	10,17 €	--	278,00	-	89,00	-	367,00	136,00	8,43	-	144,43	44,97%	--
Sliced White Bread	UN	0,84 €	05 e 06 Fev 19	1,00	-	-	-	1,00	-	0,01	-	0,01	1,25%	Leftovers for Cafeteria
Mini Navettes	UN	0,18 €	05 e 06 Fev 19	8,00	-	9,00	-	17,00	7,00	-	-	7,00	41,18%	Trash
Bread with Seeds	UN	0,09 €	05 e 06 Fev 19	13,00	-	-	-	13,00	13,00	-	-	13,00	100,00%	Leftovers for Cafeteria
Sliced Corn Bread	UN	0,95 €	05 e 06 Fev 19	1,00	-	-	-	1,00	-	-	-	-	0,00%	Leftovers for Cafeteria
Large White bread Rolls	UN	0,16 €	05 e 06 Fev 19	22,00	-	13,00	-	35,00	20,00	2,28	-	22,28	63,65%	Leftovers for Cafeteria
Chapata Bread With Poppy	UN	0,27 €	05 e 06 Fev 19	2,00	-	5,00	-	7,00	2,00	0,01	-	2,01	28,74%	Leftovers for Cafeteria
Sliced Bread with Raisins	UN	1,20 €	05 e 06 Fev 19	1,00	-	1,50	-	2,50	6,50	0,05	-	6,55	261,80%	Leftovers for Cafeteria
Small White bread Rolls	UN	0,06 €	05 e 06 Fev 19	-	-	-	-	-	-	-	-	-	0,00%	Leftovers for Cafeteria
Bread Rolls with Raisins	UN	0,09 €	05 e 06 Fev 19	-	-	-	-	-	-	-	-	-	0,00%	Leftovers for Cafeteria
Bread Rolls with Olives	UN	0,06 €	05 e 06 Fev 19	16,00	-	-	-	16,00	17,00	1,40	-	18,40	115,00%	Leftovers for Cafeteria
Total Bread Food Waste	--	3,90 €	- €	64,00 €	-	28,50	-	92,50	65,50	3,75	-	69,25	61,16%	- €

Table 33 – Continuation of FW analysis during breakfast on the 6th of February

Sunflower Seeds	KG	1,32 €	05 e 06 Fev 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Nuts	KG	14,49 €	05 e 06 Fev 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Linseed	KG	0,93 €	05 e 06 Fev 19	0,16			-		0,16	0,08	-	-	0,08	50,00%	Leftovers for next Breakfast
Oats	KG	0,87 €	05 e 06 Fev 19	0,17			-		0,17	0,11	0,01	-	0,12	73,35%	Leftovers for next Breakfast
White Sesame Seeds	KG	2,41 €	05 e 06 Fev 19	0,23			-		0,23	0,15	-	-	0,15	64,76%	Leftovers for next Breakfast
Red Quinoa	KG	3,08 €	05 e 06 Fev 19	0,37			-		0,37	0,23	-	-	0,23	61,76%	Leftovers for next Breakfast
Chocapic	KG	0,92 €	05 e 06 Fev 19	0,56			-		0,56	0,28	-	-	0,28	49,11%	Leftovers for next Breakfast
Muesli	KG	2,00 €	05 e 06 Fev 19	1,74			-		1,74	1,49	-	-	1,49	85,63%	Leftovers for next Breakfast
Granola	KG	2,00 €	05 e 06 Fev 19	1,83			2,33		4,16	2,00	-	-	2,00	48,15%	Leftovers for next Breakfast
Total Cereals Food Waste	--	28,02 €	--	5,06 €	-	-	2,33	-	7,39	4,34	0,01	-	4,35	48,09%	--

Raspberry Jam	UN	0,23 €	05 e 06 Fev 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Orange Jam	UN	0,21 €	05 e 06 Fev 19	16,00			8,00		24,00	13,00	-	-	13,00	54,17%	Leftovers for next Breakfast
Honey	UN	0,31 €	05 e 06 Fev 19	16,00			8,00		24,00	16,00	-	-	16,00	66,67%	Leftovers for next Breakfast
Strawberry Jam	UN	0,21 €	05 e 06 Fev 19	16,00			8,00		24,00	16,00	-	-	16,00	66,67%	Leftovers for next Breakfast
Peach Jam	UN	0,21 €	05 e 06 Fev 19	16,00			8,00		24,00	11,00	-	-	11,00	45,83%	Leftovers for next Breakfast
Total Jam Food Waste	--	1,17 €	--	64,00	-	-	32,00	-	96,00	56,00	-	-	56,00	46,67%	--
Cheese Tortillas	UN	0,38 €	05 e 06 Fev 19	12,00			25,00		37,00	8,00	-	-	8,00	21,62%	Trash
Scrabbled Eggs	L	0,33 €	05 e 06 Fev 19	2,00			6,00		8,00	0,24	-	-	0,24	2,94%	Trash
Boiled Eggs	UN	0,15 €	05 e 06 Fev 19	4,00			8,00		12,00	3,00	-	-	3,00	25,00%	Leftovers for next Breakfast
Total Eggs Food Waste	--	0,86 €	--	18,00	-	-	39,00	-	57,00	11,24	-	-	11,24	16,52%	--
Plums	UN	3,59 €	05 e 06 Fev 19	-			-		-	-	-	-	-	0,00%	-
Raisins	UN	1,91 €	05 e 06 Fev 19	0,23			-		0,23	0,09	-	-	0,09	38,53%	Leftovers for next Breakfast
Total Dry Fruits Food Waste	--	1,91 €	--	0,23	-	-	-	-	0,23	0,09	-	-	0,09	19,26%	--

Table 34 – Continuation of FW analysis during breakfast on the 6th of February

Mango Juice	UN	0,01 €	05 e 06 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Apple Juice	UN	0,01 €	05 e 06 Feb 19	-			-		-	-	-	-	-	0,00%	-
Forest Fruits Juice	UN	0,01 €	05 e 06 Feb 19	2,00			2,00		4,00	1,00	-	-	1,00	25,00%	Leftovers for Cafeteria
Orange Juice	UN	0,01 €	05 e 06 Feb 19	2,00			7,00		9,00	0,50	-	-	0,50	5,56%	Leftovers for Cafeteria
Sparkling Water	UN	0,57 €	05 e 06 Feb 19	1,00			-		1,00	0,50	-	-	0,50	50,00%	Trash
Still Water	UN	0,15 €	05 e 06 Feb 19	1,00			5,00		6,00	0,25	-	-	0,25	4,17%	Trash
Total Soft Drinks Waste	--	0,76 €	--	6,00	-	-	14,00	-	20,00	2,25	-	-	2,25	14%	--
Total	--	164,11 €	-	614,47	6,44	8,98	351,57	18,70	956,85	390,25	16,82	2,60	407,07	35%	--

Table 35 – Continuation of FW analysis during breakfast on the 6th of February

Number of Clients															
90															
Type of Food	Unit	Cost (WAC - Weighted Average Cost)	Data collection date	Initial Quantities in buffet	Initial cut quantities (fruits & vegetables)	Initial Whole Quantities (without cut) (fruits & vegetables)	Accruals	Total Weight	Available for consumption	Buffet Leftovers (reusable/trash)	Plate Scrapes/Unavoidable food waste (For trash)	Only unavoidable food waste	Food Waste	Food Waste %	Notes
Yogurt 5 Kg Bucket	UN	5,99 €	6 e 7 Feb 19	0,60			1,25		1,85	0,50	-	-	0,50	27,03%	Trash
Natural Vanilla Adagio Glass Yogurt	UN	0,46 €	6 e 7 Feb 19	6,00			-		6,00	1,00	-	-	1,00	16,67%	Leftovers for next Breakfast
Strawberry Adagio Glass Yogurt	UN	0,58 €	6 e 7 Feb 19	6,00			-		6,00	1,00	-	-	1,00	16,67%	Leftovers for next Breakfast
Lemon Adagio Glass Yogurt	UN	0,58 €	6 e 7 Feb 19	6,00			3,00		9,00	7,00	-	-	7,00	77,78%	Leftovers for next Breakfast
Natural with Sugar Adagio Glass Yogurt	UN	0,58 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
National Sliced Edam Cheese	KG	3,08 €	6 e 7 Feb 19	0,49			0,42		0,91	0,17	0,02	-	0,19	20,75%	Leftovers for next Breakfast
National Fresh Cheese	UN	1,88 €	6 e 7 Feb 19	0,35			0,36		0,70	0,03	0,01	-	0,04	5,13%	Leftovers for next Breakfast
National Cream Cheese	KG	4,42 €	6 e 7 Feb 19	0,29			-		0,29	0,19	0,04	-	0,23	78,69%	Leftovers for next Breakfast
Goat Cheese Rolls	UN	0,01 €	6 e 7 Feb 19	0,07			0,16		0,23	-	0,04	-	0,04	15,79%	Leftovers for next Breakfast
Biological Tofu	KG	5,98 €	6 e 7 Feb 19	0,36			-		0,36	0,29	-	-	0,29	81,41%	Leftovers for next Breakfast
Sheep Manchego Cheese	KG	6,50 €	6 e 7 Feb 19	0,12			0,29		0,41	0,06	0,02	-	0,08	20,59%	Leftovers for next Breakfast
National Ilha Cheese	KG	7,63 €	6 e 7 Feb 19	0,18			0,36		0,54	0,06	-	-	0,06	11,11%	Leftovers for next Breakfast
Half Skimmed Milk Agros 1L	UN	0,41 €	6 e 7 Feb 19	2,00			2,00		4,00	2,00	-	-	2,00	50,00%	Trash
Butter With Salt Mimosa	UN	0,07 €	6 e 7 Feb 19	40,00			7,00		47,00	20,00	-	-	20,00	42,55%	Leftovers for next Breakfast
Butter Without Salt Mimosa	UN	0,07 €	6 e 7 Feb 19	40,00			3,00		43,00	20,00	-	-	20,00	46,51%	Leftovers for next Breakfast
Total Dairy Food Waste	--	38,24 €	--	102,45	-	-	17,83	-	120,28	52,30	0,13	-	52,42	34,04%	--
Rocha Pear	KG	1,29 €	6 e 7 Feb 19		-	-	-	-	-	-	-	-	-	0,00%	Leftovers for Cafeteria
Muesli with Coconut	KG	3,66 €	6 e 7 Feb 19	0,98			1,36		2,34	1,33	-	-	1,33	56,64%	Leftovers for next Breakfast
Cristalized Forest Fruits	KG	5,15 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Fruit Salad 2,5 Kgs	UN	12,08 €	6 e 7 Feb 19	1,48			-		1,48	0,13	0,13	-	0,27	18,18%	Trash
Granny Smith Apple	KG	1,48 €	6 e 7 Feb 19		0,32	0,39	0,77	1,16		0,77	0,07	0,07	0,84	72,68%	Leftovers for next Breakfast
Starking Apple	KG	1,68 €	6 e 7 Feb 19		0,55	0,66	-	0,66		0,17	0,09	0,09	0,25	38,35%	Leftovers for next Breakfast
Cantaloupe	KG	1,49 €	6 e 7 Feb 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Juice of the day
Grapes	KG	0,89 €	6 e 7 Feb 19		0,55	0,55	-	0,55		0,55	-	-	0,55	100,00%	Leftovers for Cafeteria
Papaya	KG	2,89 €	6 e 7 Feb 19		0,22	0,59	-	0,59		-	0,38	0,38	0,38	63,36%	Leftovers for Juice of the day
Kiwi	KG	1,58 €	6 e 7 Feb 19		0,14	0,17	0,58	0,75		0,42	0,05	0,05	0,46	62,01%	Leftovers for Juice of the day
Melon	KG	0,78 €	6 e 7 Feb 19		0,76	1,24	1,36	2,60		0,80	0,48	0,48	1,28	49,36%	Leftovers for Juice of the day
Banana	KG	0,78 €	6 e 7 Feb 19		-	-	-	-		-	-	-	-	0,00%	Leftovers for Cafeteria
Oranges	KG	0,78 €	6 e 7 Feb 19		1,40	1,85	1,30	3,15		0,97	0,46	0,46	1,43	45,26%	Leftovers for Juice of the day
Pineapple	KG	0,78 €	6 e 7 Feb 19		1,09	1,27	1,34	2,61		0,92	0,18	0,18	1,10	42,10%	Leftovers for Juice of the day
Total Fruit Food Waste	--	35,31 €	--	2,46	5,02	6,73	6,71	13,44	3,82	6,06	1,83	1,70	7,89	39,14%	--

Table 36 – FW analysis during breakfast on the 7th of February

Turkey Ham	KG	3,82 €	6 e 7 Fev 19	0,74			0,68		1,42	0,19	-	-	0,19	13,20%	Leftovers for next Breakfast
Bacon With Cocktail Sausages	UN	0,50 €	6 e 7 Fev 19	52,00			90,00		142,00	41,00	-	-	41,00	28,87%	Trash
Pork Ham	KG	3,92 €	6 e 7 Fev 19	0,43			0,44		0,87	0,17	-	-	0,17	19,31%	Leftovers for next Breakfast
Smoked Ham	KG	8,26 €	6 e 7 Fev 19	0,50			0,54		1,04	0,47	0,04	-	0,51	48,65%	Leftovers for next Breakfast
York Palo	KG	4,34 €	6 e 7 Fev 19	0,25			-		0,25	0,17	-	-	0,17	66,94%	Leftovers for next Breakfast
Sliced Bacon	KG	3,95 €	6 e 7 Fev 19	0,25			0,23		0,48	0,17	-	-	0,17	34,66%	Trash
Chourizo (Chouriço)	KG	2,59 €	6 e 7 Fev 19	0,18			-		0,18	0,10	-	-	0,10	58,10%	Leftovers for next Breakfast
Sliced Salami	KG	2,91 €	6 e 7 Fev 19	0,42			-		0,42	0,33	-	-	0,33	78,38%	Leftovers for next Breakfast
Total Meat Food Waste	--	30,29 €	--	54,76	-	-	91,90	-	146,65	42,60	0,04	-	42,63	43,58%	0
Black Olives	KG	1,19 €	6 e 7 Fev 19	0,47			-		0,47	0,36	0,01	-	0,37	79,87%	Leftovers for next Breakfast
Paris Mushrooms	KG	1,46 €	6 e 7 Fev 19	1,21			2,23		3,44	0,67	-	-	0,67	19,58%	Trash
Cherry Tomatoes	KG	1,90 €	6 e 7 Fev 19	-			-		-	-	-	-	-	0,00%	Trash
Roasted Vegetables	KG	0,14 €	6 e 7 Fev 19	1,10			1,41		2,50	1,06	-	-	1,06	42,29%	Trash
Cucumber	KG	0,69 €	6 e 7 Fev 19	0,53			-		0,53	0,32	-	-	0,32	60,46%	Leftovers for next Breakfast
Carrots	KG	0,48 €	6 e 7 Fev 19	0,38			-		0,38	0,16	0,02	0,02	0,18	47,82%	Leftovers for next Breakfast
Roasted Tomatoes with Pesto	UN	1,34 €	6 e 7 Fev 19	10,00			12,00		22,00	2,00	-	-	2,00	9,09%	Trash
Batata Rosti	UN	0,96 €	6 e 7 Fev 19	4,00			8,00		12,00	-	3,00	0,02	3,00	25,00%	Leftovers for next Breakfast
Lettuce	KG	2,08 €	6 e 7 Fev 19	0,29			-		0,29	0,01	-	-	0,01	2,73%	Leftovers for next Breakfast
Salad Tomatoes	KG	1,19 €	6 e 7 Fev 19	0,95			-		0,95	0,01	-	-	0,01	1,26%	Leftovers for next Breakfast
Baked Beans with Tomato Sauce	UN	2,05 €	6 e 7 Fev 19	0,54			-		0,54	0,27	-	-	0,27	49,47%	Trash
Total Vegetables Food Waste	--	13,48 €	--	19,47	-	-	23,64	-	43,10	4,86	3,03	0,04	7,89	30,60%	--
Mini Donuts	UN	0,16 €	6 e 7 Fev 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Chocolate Napolitans	UN	0,13 €	6 e 7 Fev 19	28,00			15,00		43,00	9,00	1,50	-	10,50	24,42%	Leftovers for Cafeteria
Brioche with Coconut	UN	0,18 €	6 e 7 Fev 19	20,00			-		20,00	10,00	0,77	-	10,77	53,83%	Leftovers for Cafeteria
Mini Pancakes	UN	0,13 €	6 e 7 Fev 19	34,00			18,00		52,00	5,00	1,00	-	6,00	11,54%	Leftovers for Cafeteria
Mini Egg Custard	UN	0,12 €	6 e 7 Fev 19	42,00			34,00		76,00	19,00	0,93	-	19,93	26,23%	Leftovers for Cafeteria
Sponge Cake with Egg Creams	UN	0,18 €	6 e 7 Fev 19	19,00			-		19,00	12,00	0,50	-	12,50	65,79%	Leftovers for Cafeteria
Scones	KG	7,67 €	6 e 7 Fev 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Apple Chausson	UN	0,22 €	6 e 7 Fev 19	30,00			-		30,00	31,00	0,75	-	31,75	105,83%	Leftovers for Cafeteria
Traditional Pastry - Trança com Creme Ovos	UN	0,22 €	05 e 06 Fev 19	12,00			-		12,00	4,00	-	-	4,00	33,33%	Leftovers for Cafeteria
Traditional Pastry - Parra com doce de ovos	UN	0,22 €	05 e 06 Fev 19	20,00			-		20,00	15,00	-	-	15,00	75,00%	Leftovers for Cafeteria
Mini Muffins	UN	0,22 €	6 e 7 Fev 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Mini Croissant	UN	0,08 €	6 e 7 Fev 19	36,00			15,00		51,00	19,00	1,50	-	20,50	40,20%	Leftovers for Cafeteria
Mini Palmier	UN	0,20 €	6 e 7 Fev 19	20,00			-		20,00	10,00	1,73	-	11,73	58,64%	Leftovers for Cafeteria
Traditional Pastry - Bola Berlim	UN	0,15 €	6 e 7 Fev 19	20,00			-		20,00	14,00	-	-	14,00	70,00%	Leftovers for Cafeteria
Total desperdícios pastelaria	--	9,88 €	--	281,00	-	-	82,00	-	363,00	148,00	8,68	-	156,68	40,34%	--

Table 37 – Continuation of FW analysis during breakfast on the 7th of February

Sliced White Bread	UN	0,84 €	6 e 7 Feb 19	-			-		-	-	-	-	0,00%	Leftovers for Cafeteria	
Mini Navettes	UN	0,18 €	6 e 7 Feb 19	8,00			9,00		17,00	3,00	1,00	-	4,00	23,53%	Trash
Bread with Seeds	UN	0,09 €	6 e 7 Feb 19	13,00			-		13,00	1,00	0,90	-	1,90	14,62%	Leftovers for Cafeteria
Chapata Bread With Poppy	UN	0,27 €	6 e 7 Feb 19	2,00			-		2,00	0,50	-	-	0,50	25,00%	Leftovers for Cafeteria
Sliced Corn Bread	UN	0,95 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Large White bread Rolls	UN	0,16 €	6 e 7 Feb 19	8,00			8,00		16,00	5,00	-	-	5,00	31,25%	Leftovers for Cafeteria
Bread Rolls with Raisins	UN	0,09 €	6 e 7 Feb 19	-			-		-	18,00	-	-	18,00	0,00%	Leftovers for Cafeteria
Small White bread Rolls	UN	0,06 €	6 e 7 Feb 19	13,00			-		13,00	-	0,73	-	0,73	5,59%	Leftovers for Cafeteria
Sliced Bread with Raisins	UN	1,20 €	05 e 06 Feb 19	2,00			2,00		4,00	3,00	0,41	-	3,41	85,14%	Leftovers for Cafeteria
Bread Rolls with Olives	UN	0,06 €	6 e 7 Feb 19	18,00			-		18,00	9,00	-	-	9,00	50,00%	Leftovers for Cafeteria
Total Pastries Food Waste	--	3,90 €	--	64,00 €	-	-	19,00 €	-	83,00 €	39,50 €	3,03 €	- €	42,53 €	23,51%	--
Muesli	KG	2,00 €	6 e 7 Feb 19	1,58			-		1,58	1,29	-	-	1,29	81,94%	Leftovers for next Breakfast
Granola	KG	2,00 €	6 e 7 Feb 19	2,11			0,02		2,13	1,82	-	-	1,82	85,47%	Leftovers for next Breakfast
Oats	KG	0,87 €	6 e 7 Feb 19	0,16			-		0,16	0,10	-	-	0,10	62,73%	Leftovers for next Breakfast
Sunflower Seeds	KG	1,32 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Nuts	KG	14,49 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Linseed	KG	0,93 €	6 e 7 Feb 19	0,14			-		0,14	0,05	-	-	0,05	38,69%	Leftovers for next Breakfast
White Sesame Seeds	KG	2,41 €	6 e 7 Feb 19	0,20			-		0,20	0,11	-	-	0,11	54,77%	Leftovers for next Breakfast
Red Quinoa	KG	3,08 €	6 e 7 Feb 19	0,25			-		0,25	0,13	-	-	0,13	53,25%	Leftovers for next Breakfast
Chocopic	KG	0,92 €	6 e 7 Feb 19	0,37			-		0,37	0,30	-	-	0,30	80,49%	Leftovers for next Breakfast
Total Bread Food Waste	--	28,02 €	--	4,80	-	-	0,02	-	4,82	3,80	-	-	3,80	50,82%	--
Raspberry Jam	UN	0,23 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for next Breakfast
Orange Jam	UN	0,21 €	6 e 7 Feb 19	16,00			6,00		22,00	16,00	-	-	16,00	72,73%	Leftovers for next Breakfast
Honey	UN	0,31 €	6 e 7 Feb 19	16,00			7,00		23,00	13,00	-	-	13,00	56,52%	Leftovers for next Breakfast
Strawberry Jam	UN	0,21 €	6 e 7 Feb 19	16,00			1,00		17,00	-	-	-	-	0,00%	Leftovers for next Breakfast
Peach Jam	UN	0,21 €	6 e 7 Feb 19	16,00			1,00		17,00	14,00	-	-	14,00	82,35%	Leftovers for next Breakfast
Total Jam Food Waste	--	1,17 €	--	64,00	-	-	15,00	-	79,00	43,00	-	-	43,00	42,32%	--

Table 38 – Continuation of FW analysis during breakfast on the 7th of February

Cheese Tortillas	UN	0,38 €	6 e 7 Feb 19	13,00			21,00		34,00	7,00	0,50	-	7,50	22,06%	Trash
Scrabbled Eggs	L	0,33 €	6 e 7 Feb 19	2,00			2,00		4,00	0,96	0,02	-	0,98	24,48%	Trash
Boiled Eggs	UN	0,15 €	6 e 7 Feb 19	3,00			3,00		6,00	2,00	-	-	2,00	33,33%	Leftovers for next Breakfast
Total Eggs Food Waste	--	0,86 €	--	18,00	-	-	26,00	-	44,00	9,96	0,52	-	10,48	26,62%	--
Plums	UN	1,91 €	6 e 7 Feb 19	0,14			0,31		0,45	0,23	-	-	0,23	50,66%	-
Raisins	UN	3,59 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	-
Total Dry Fruits Food Waste	--	5,50 €	--	0,14	-	-	0,31	-	0,45	0,23	-	-	0,23	50,66%	-
Mango Juice	UN	0,01 €	6 e 7 Feb 19	2,00			1,00		3,00	1,00	-	-	1,00	33,33%	Leftovers for Cafeteria
Apple Juice	UN	0,01 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	-
Forest Fruits Juice	UN	0,01 €	6 e 7 Feb 19	-			-		-	-	-	-	-	0,00%	Leftovers for Cafeteria
Orange Juice	UN	0,01 €	6 e 7 Feb 19	2,00			2,00		4,00	2,00	-	-	2,00	50,00%	Leftovers for Cafeteria
Sparkling Water	UN	0,57 €	6 e 7 Feb 19	1,00			-		1,00	0,25	-	-	0,25	25,00%	Trash
Still Water	UN	0,15 €	6 e 7 Feb 19	1,00			3,00		4,00	0,50	-	-	0,50	12,50%	Trash
Total Soft Drinks Waste	--	0,76 €	--	6,00	-	-	6,00	-	12,00	3,75	-	-	3,75	20,14%	--
Total	--	167,41 €	-	617,07	5,02	6,73	288,40	13,44	900,13	354,06	17,25	1,73	371,31	36,53%	--

Table 39 – Continuation of FW analysis during breakfast on the 7th of February

Equipment Weight			
Equipment	Weight (g)	KG	Notes
Edam	250	0,250	Equal to cream cheese
Granola	500	0,500	
Sheep Cheese	308	0,308	
Bucket Yogurt	1940	1,940	
Cristalized Fruit	178	0,178	Equal to raisins, linseed and sesame
Turkey Ham	285	0,285	Equal to Pork Ham, Paio, Chourizo, Salami, Ilha Cheese, Fresh Cheese and Smoked Ham
Nuts	523	0,523	
Muesli	1413	1,413	
Olives	150	0,150	Equal to tofu
Mushrooms	2670	2,670	Equal to the roasted vegetables, scrabbled eggs and bacon
Cherry Tomatoes	300	0,300	
Lettuce	2100	2,100	= Salad Tomatoes
Oats (except day 6 and 7 where it is equal to linseed)	1300	1,300	Equal to Carrots and Cucumber
Small fruit platter (heaviest)	731	0,731	
Big fruit platter (Lightest)	280	0,280	

Table 40 – Kitchenware and equipment weight

Food Waste Coefficients				
Fruit	Average Fruit Weight (kg)	Real Weight of the fruit cut (and without equipment weight or without seeds/peel) or after client's consumption	Food Coefficients	% Unavoidable Food Waste (Food Waste Coefficients)
Granny Smith Apple	0,193	0,158	82%	18%
Starking Apple	0,166	0,136	82%	18%
Cantaloupe	0,945	0,490	52%	48%
Grapes	0,184	0,184	100%	0%
Papaya	0,453	0,166	37%	63%
Melon	3,184	1,952	61%	39%
Oranges (2 oranges used in each plater)	0,614	0,463	75%	25%
Pineapple	2,220	1,911	86%	14%
Pear	0,198	0,158	80%	20%
Banana	1,017	0,691	68%	32%
Kiwi	0,083	0,071	85%	15%
Carrots	0,096	0,077	80%	20%
Potatoes	0,140	0,120	86%	14%

Table 41 – Food waste coefficients for fruit and vegetables (Unavoidable Food Waste)

Section:						
SHEET no.						
Name: Scrambled Eggs						
RAW MATERIAL	Price/Kilo	Amount	NET COST		CONSERVATION	LIFESPAN
Eggs	€ 1,85	0,15	0,28 €		Cooled Down (<5°C)	3 days
Salt	€ 0,12	0,001	0,00 €		Cooled Down (<5°C)	3 days
Olive Oil	€ 4,39	0,012	0,05 €		Cooled Down (<5°C)	3 days
Black Pepper	€ 4,53	0,001	0,00 €		Cooled Down (<5°C)	3 days
STORAGE AND SHELF LIFE:			NUMBER OF PEOPLE:			
-23 a -18°C			Cereals		Peanuts	
0 a 5°C			Eggs	X	Molluscs	
10 a 25°C			Soy		Lupine	
>65°C	15MIN		Milk		Sulfur dioxide and sulphites	
Cost Price NET	0,33 €		Celery		Sesame Seeds	
			Fish		Nuts	
			Mustard		Crustaceans	
			HAS PIG			
IMAGE			PROCEDURE			

Table 42 – Technical Sheet for Scrambled Eggs

Section:						
SHEET no.						
Name: Rosti Potato						
RAW MATERIAL	Price/Kilo	Amount	NET COST		CONSERVATION	LIFESPAN
White Potatoes	€ 0,45	1	0,45 €		Cooled Down (<5°C)	3 days
Butter	€ 4,75	0,0955	0,45 €			
Salt	€ 0,12	0,001	0,00 €		Cooled Down (<5°C)	3 days
olive oil	€ 4,39	0,012	0,05 €		Cooled Down (<5°C)	3 days
Black Pepper	€ 4,53	0,001	0,00 €		Cooled Down (<5°C)	3 days
STORAGE AND SHELF LIFE:			NUMBER OF PEOPLE:			
-23 a -18°C			Cereals		Peanuts	
0 a 5°C			Eggs		Molluscs	
10 a 25°C			Soy		Lupine	
>65°C	15MIN		Milk	X	Sulfur dioxide and sulphites	
Cost Price NET	0,96 €		Celery		Sesame Seeds	
			Fish		Nuts	
			Mustard		Crustaceans	
			HAS PIG			
IMAGE			PROCEDURE			

Table 43 – Technical Sheet for Rosti Potatoes

Section:						
SHEET no.						
Name: Tortilla with cheese						
RAW MATERIAL	Price/Kilo	Amount	NET COST		CONSERVATION	LIFESPAN
Mozzarella Cheese	€ 3,97	0,015	0,06 €		Cooled Down (<5°C)	3 days
Pasteurized Eggs	€ 1,85	0,15	0,28 €		Cooled Down (<5°C)	3 days
Olive oil	€ 4,75	0,01	0,05 €		Cooled Down (<5°C)	3 days
Salt	€ 0,17	0,001	0,00 €			
STORAGE AND SHELF LIFE:			NUMBER OF PEOPLE:			
-23 a -18°C			Cereals		Peanuts	
0 a 5°C			Eggs	X	Molluscs	
10 a 25°C			Soy		Lupine	
>65°C	15MIN		Milk	X	Sulfur dioxide and sulphites	
Cost Price NET	0,38 €		Celery		Sesame Seeds	
			Fish		Nuts	
			Mustard		Crustaceans	
			HAS PIG			
IMAGE	PROCEDURE					

Table 44 – Technical Sheet for Tortilla with Cheese

Secção:						
ficha nº						
Name: Sautéed Vegetables						
RAW MATERIAL	Price/Kilo	Amount	NET COST		CONSERVATION	LIFESPAN
Carrots	€ 0,60	0,02	0,01 €		Cooled Down (<5°C)	3 days
Zucchini	€ 1,75	0,02	0,04 €		Cooled Down (<5°C)	3 days
Eggplant	€ 1,12	0,02	0,02 €		Cooled Down (<5°C)	3 days
Broccoli	€ 3,58	0,02	0,07 €		Cooled Down (<5°C)	3 days
STORAGE AND SHELF LIFE:			NUMBER OF PEOPLE:			
-23 a -18°C			Cereals		Peanuts	
0 a 5°C			Eggs		Molluscs	
10 a 25°C			Soy		Lupine	
>65°C	15MIN		Milk		Sulfur dioxide and sulphites	
Cost Price NET	0,14 €		Celery		Sesame Seeds	
			Fish		Nuts	
			Mustard		Crustaceans	
			HAS PIG			
IMAGE	PROCEDURE					

Table 45 – Technical Sheet for Sautéed Vegetables

Section:						
Sheet no.						
Name: Roasted Tomatoes						
RAW MATERIAL	Price/Kilo	Amount	NET COST		CONSERVATION	LIFESPAN
Tomatoes	€ 1,19	0,5	0,60 €		Cooled Down (<5°C)	3 days
Salt	€ 0,12	0,001	0,00 €		Cooled Down (<5°C)	3 days
Pesto sauce	€ 3,74	0,2	0,75 €		Cooled Down (<5°C)	3 days
STORAGE AND SHELF LIFE:			NUMBER OF PEOPLE:			
-23 a -18°C			Cereals		Peanuts	
0 a 5°C			Eggs		Molluscs	
10 a 25°C			Soy		Lupine	
>65°C	15MIN		Milk		Sulfur dioxide and sulphites	
Cost Price NET	1,34 €		Celery		Sesame Seeds	
			Fish		Nuts	
			Mustard		Crustaceans	
HAS PIG						
IMAGE		PROCEDURE				

Table 46 – Technical Sheet for Roasted Tomatoes with Pesto

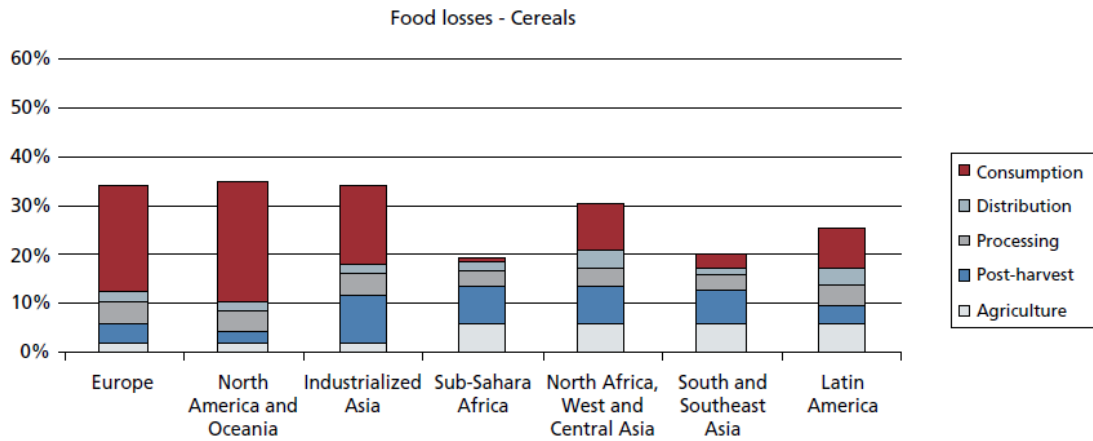
Section:						
Sheet no.						
Name: Bacon with sausages						
RAW MATERIAL	Price/Kilo	Amount	NET COST		CONSERVATION	LIFESPAN
Bacon	€ 4,70	0,015	0,07 €		Cooled Down (<5°C)	3 days
Cocktail Sausages	€ 4,10	0,1	0,41 €		Cooled Down (<5°C)	4 days
Olive Oil	€ 4,75	0,005	0,02 €		Cooled Down (<5°C)	4 days
STORAGE AND SHELF LIFE:			NUMBER OF PEOPLE:			
-23 a -18°C			Cereals		Peanuts	
0 a 5°C			Eggs		Molluscs	
10 a 25°C			Soy		Lupine	
>65°C	15MIN		Milk		Sulfur dioxide and sulphites	
Cost Price NET	0,50 €		Celery		Sesame Seeds	
			Fish		Nuts	
			Mustard		Crustaceans	
HAS PIG x						
IMAGE		PROCEDURE				

Table 47 – Technical Sheet for Bacon with Sausages

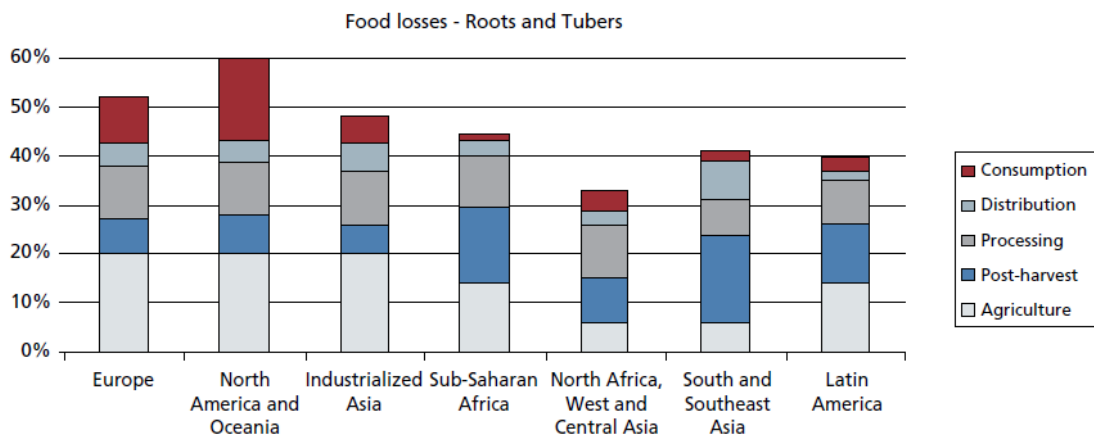
Section:						
SHEET no.						
Name: Boiled Eggs						
RAW MATERIAL	Price/Kilo	Amount	NET COST		CONSERVATION	LIFESPAN
Eggs	€ 0,15	1	0,15 €		Cooled Down (<5°C)	3 days
Salt	€ 0,12	0,001	0,00 €		Room Temperature (<25° C)	3 days
STORAGE AND SHELF LIFE:			NUMBER OF PEOPLE:			
-23 a -18°C			Cereals		Peanuts	
0 a 5°C			Eggs	X	Molluscs	
10 a 25°C			Soy		Lupine	
>65°C	15MIN		Milk		Sulfur dioxide and sulphites	
Cost Price NET	0,15 €		Celery		Sesame Seeds	
			Fish		Nuts	
			Mustard		Crustaceans	
			HAS PIG			
IMAGE	PROCEDURE					

Table 48 – Technical Sheet for Boiled Eggs

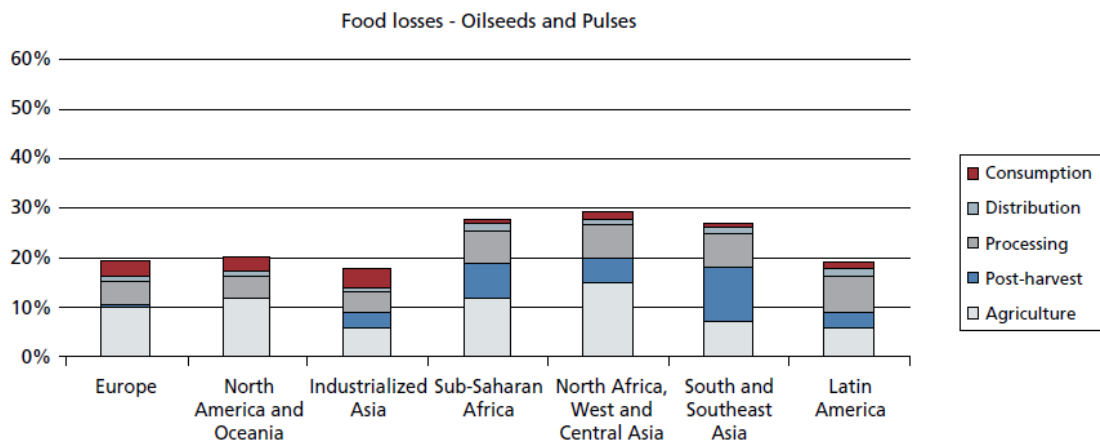
Annexes



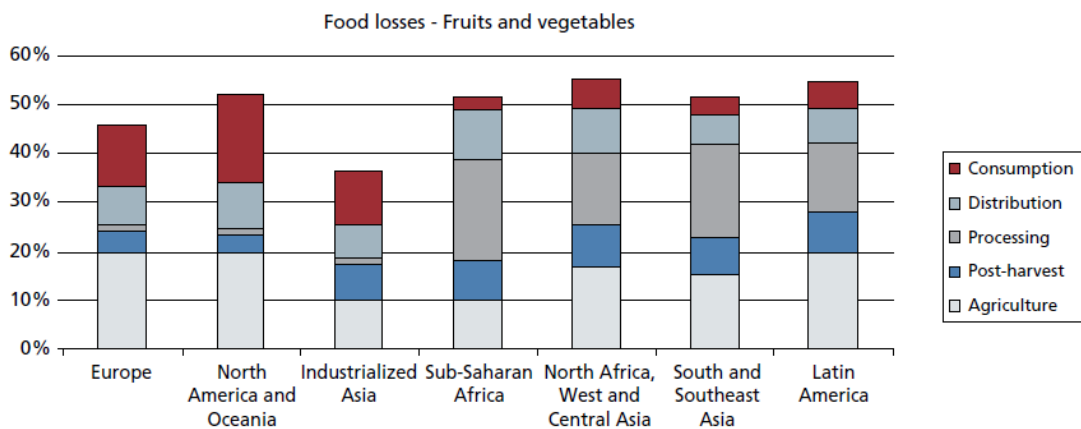
Graphic 43 – Percentage of wasted cereals during the food supply chain per region in the world (FAO, 2011)



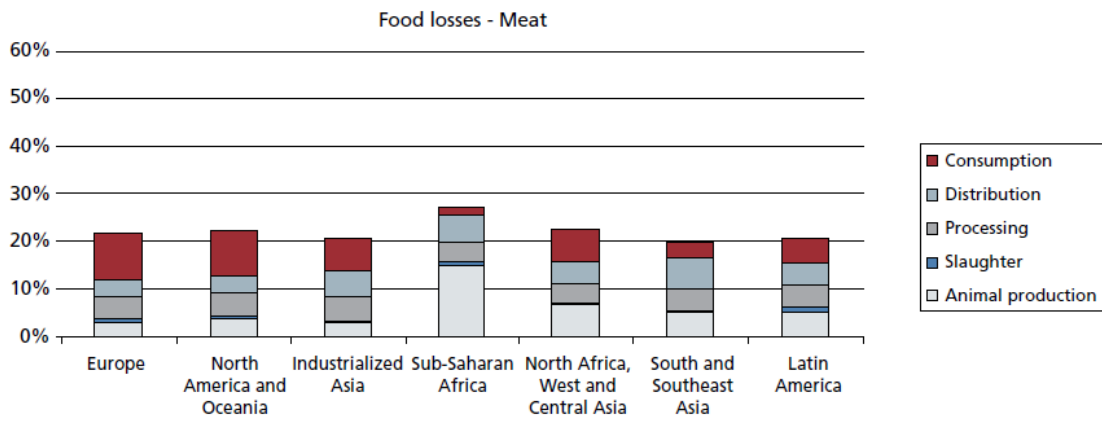
Graphic 44 – Percentage of wasted roots and tubers during the food supply chain per region in the world (FAO, 2011)



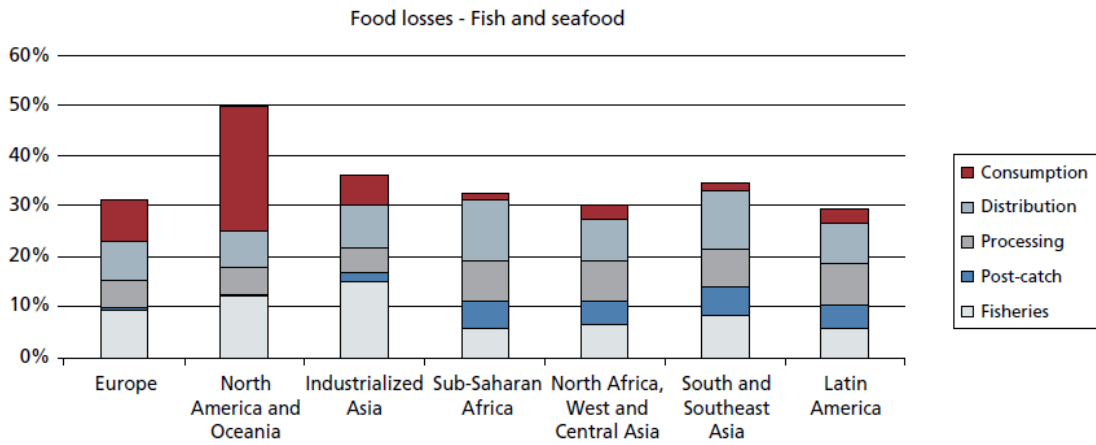
Graphic 45 – Percentage of wasted oilseeds and pulses during the food supply chain per region in the world (FAO, 2011)



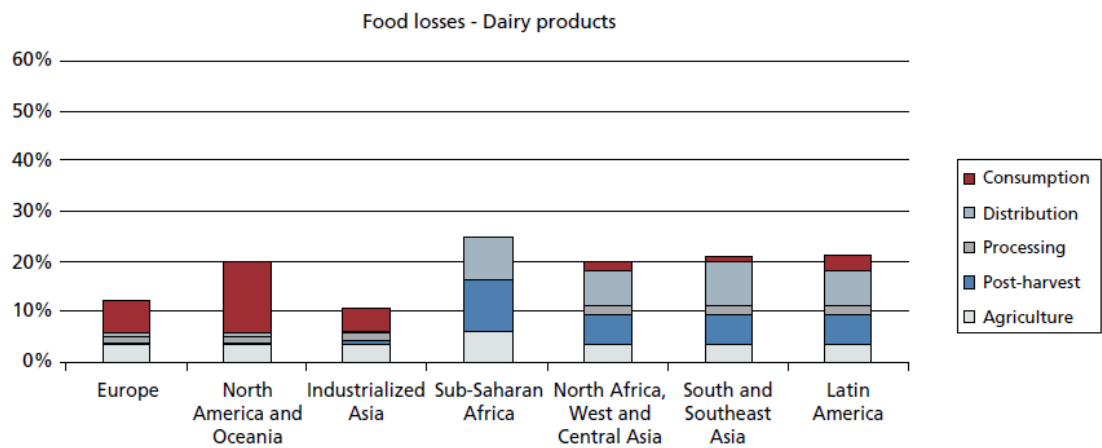
Graphic 46 – Percentage of wasted fruit and vegetables during the food supply chain per region in the world (FAO, 2011)



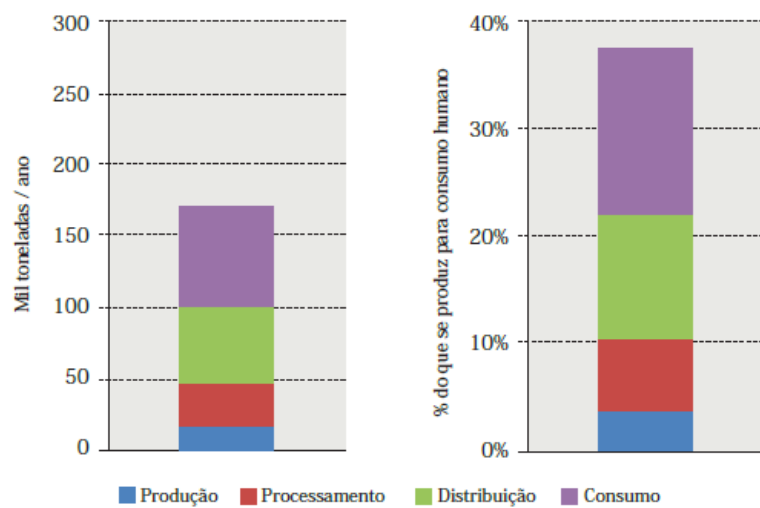
Graphic 47 – Percentage of wasted meat and its derivatives during the food supply chain per region in the world (FAO, 2011)



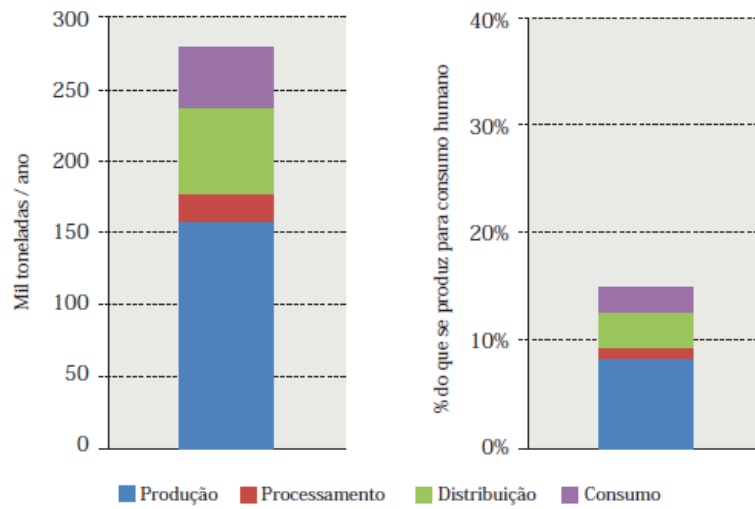
Graphic 48 – Percentage of wasted fish and seafood during the food supply chain per region in the world (FAO, 2011)



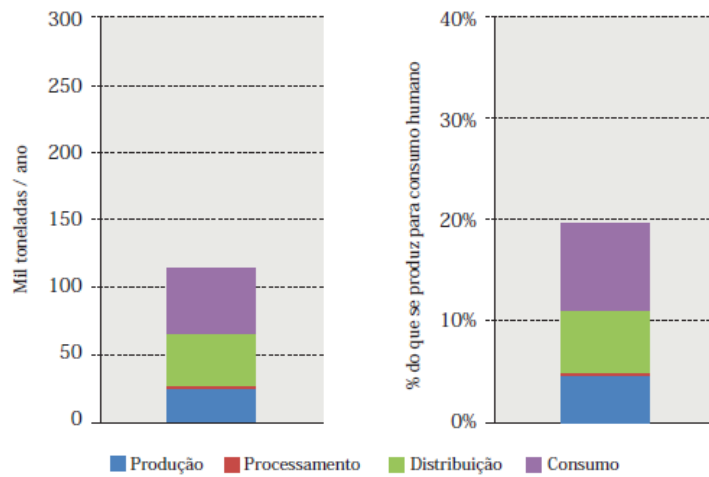
Graphic 49 – Percentage of wasted dairy products during the food supply chain per region in the world (FAO, 2011)



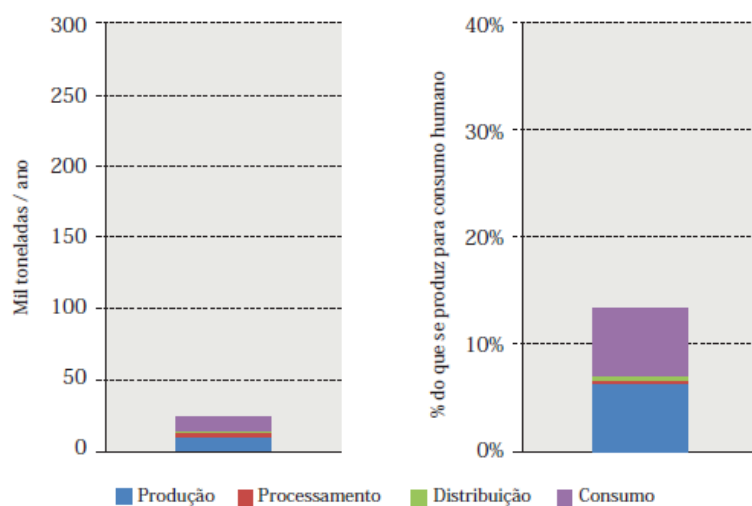
Graphic 50 – Percentage of wasted cereals during the food supply chain in Portugal (Baptista *et al.*, 2012)



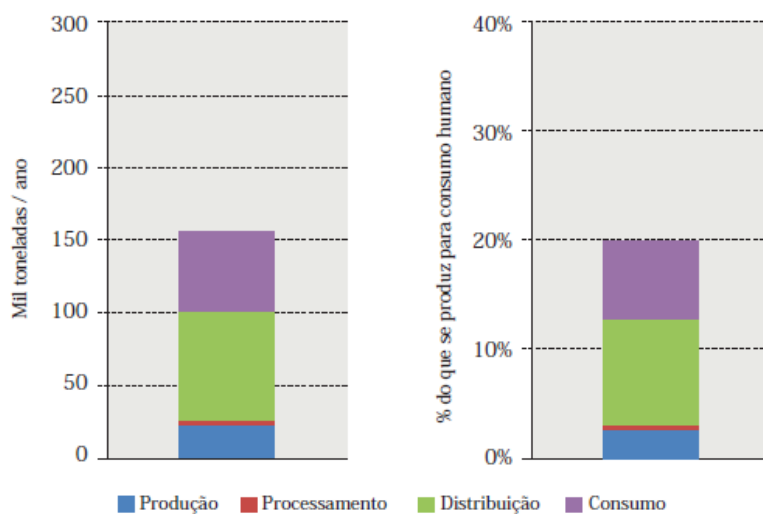
Graphic 51 – Percentage of wasted vegetables during the food supply chain in Portugal (Baptista *et al.*, 2012)



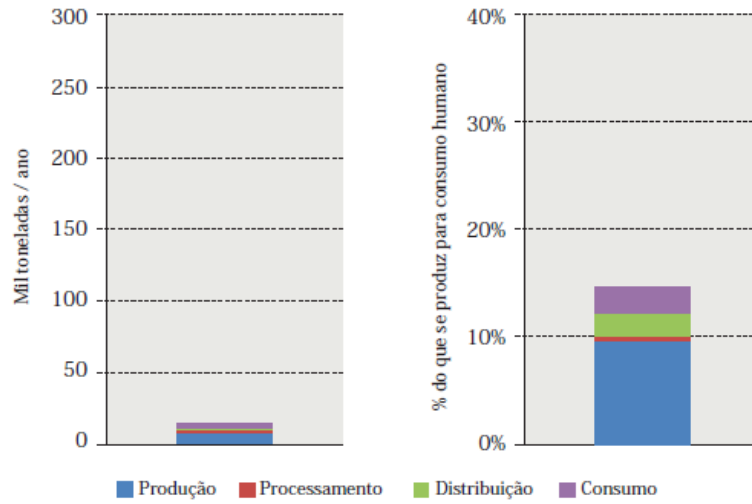
Graphic 52 – Percentage of wasted roots and tubers during the food supply chain in Portugal (Baptista *et al.*, 2012)



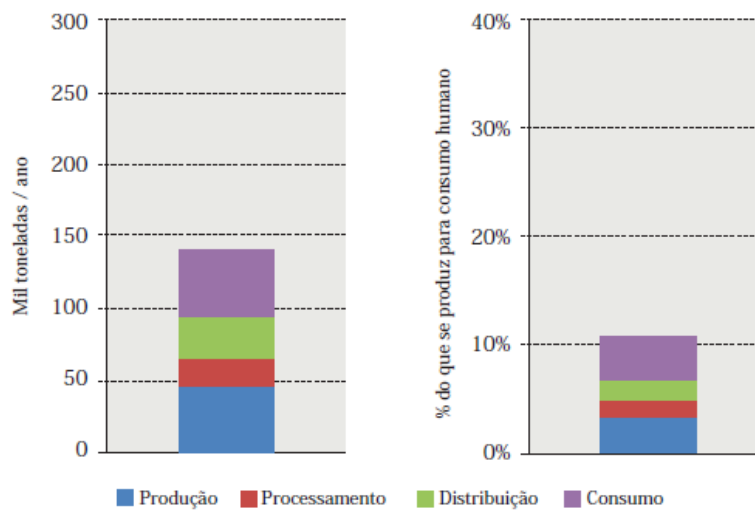
Graphic 53 – Percentage of wasted oilseeds and pulses during the food supply chain in Portugal (Baptista *et al.*, 2012)



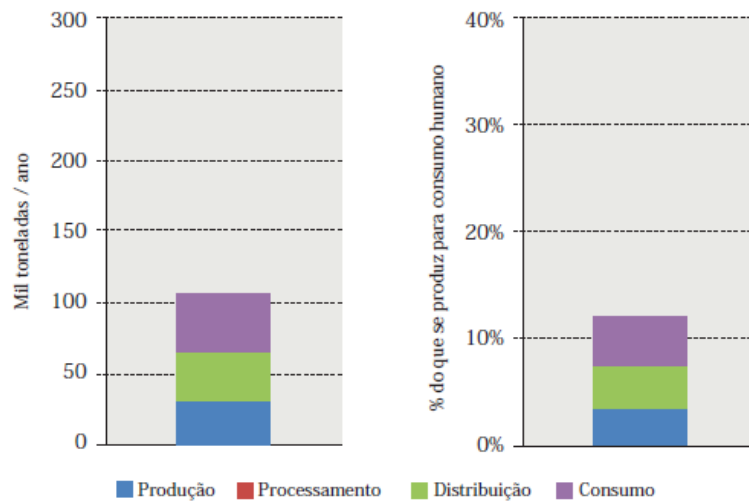
Graphic 54 – Percentage of wasted fruit during the food supply chain in Portugal (Baptista *et al.*, 2012)



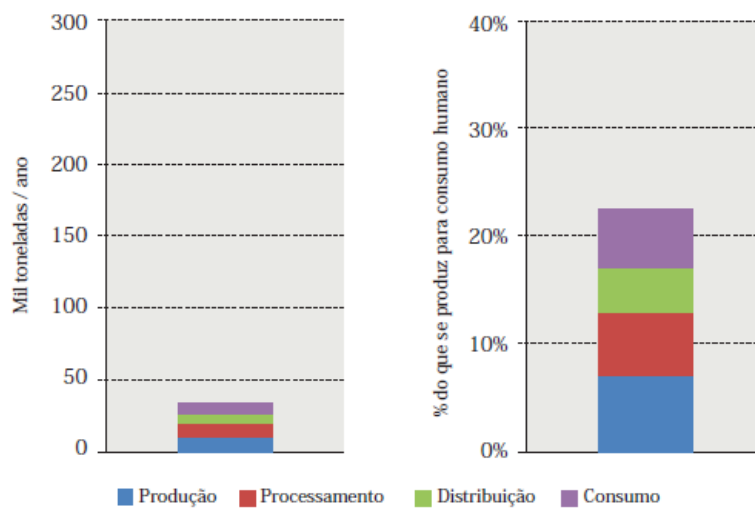
Graphic 55 – Percentage of wasted eggs during the food supply chain in Portugal (Baptista *et al.*, 2012)



Graphic 56 – Percentage of wasted dairy products during the food supply chain in Portugal (Baptista *et al.*, 2012)



Graphic 57 – Percentage of wasted meats and its derivatives during the food supply chain in Portugal (Baptista *et al.*, 2012)



Graphic 58 – Percentage of wasted fish and seafood during the food supply chain in Portugal (Baptista *et al.*, 2012)

Unit	Tonne						
Hazard	Hazardous and non-hazardous – Total						
Waste	Animal and vegetal wastes (subtotal, W091+W092+W093)						
Nace_R2	All NACE activities plus households						
GEO/TIME	2004	2006	2008	2010	2012	2014	2016
European Union (EU-28)	135 550 000	128 740 000	116 580 000	89 460 000	85 830 000	88 670 000	94 070 000
Belgium	6 887 338	4 389 887	4 265 806	4 822 033	4 666 791	5 635 143	6 726 241
Bulgaria	986 073	984 288	976 507	731 091	1 129 778	983 646	972 685
Czechia	844 616	684 100	540 638	449 880	443 134	583 264	771 848
Denmark	165 328	186 907	165 969	973 350	864 494	1 087 281	1 133 905
Germany	8 179 367	12 051 569	12 231 406	12 932 869	14 086 695	15 011 037	15 623 841
Estonia	520 034	299 616	287 052	280 338	83 782	149 633	151 405
Ireland	1 743 390	1 273 962	523 117	2 079 402	1 132 318	554 285	:
Greece	5 519 059	4 779 350	137 599	444 635	491 888	575 225	:
Spain	25 590 376	20 664 875	15 647 005	9 763 484	8 297 358	8 058 640	9 135 749
France	5 533 790	6 225 650	7 590 660	9 405 994	11 281 262	11 304 163	11 812 213
Croatia	321 739	283 868	109 631	119 502	132 580	395 664	614 474
Italy	8 760 488	9 346 007	9 405 736	9 489 613	5 785 758	6 921 585	7 852 188
Cyprus	317 652	180 561	199 867	201 439	220 713	112 018	74 635
Latvia	241 729	203 538	144 507	166 304	137 353	105 480	143 395
Lithuania	1 942 089	900 947	1 061 890	535 615	578 215	551 038	402 693
Luxembourg	96 442	97 113	91 316	88 206	84 575	95 427	146 458
Hungary	5 050 902	3 359 813	1 378 997	808 058	791 369	699 238	734 568
Malta	9 453	12 371	15 108	15 758	16 346	16 605	20 650
Netherlands	11 825 391	12 289 462	13 255 112	14 587 937	14 543 476	14 718 640	15 198 735
Austria	4 013 277	2 017 912	3 711 597	1 661 218	1 892 661	1 887 723	2 064 803
Poland	8 542 155	8 290 718	7 123 817	5 415 948	4 861 199	3 112 616	3 190 746
Portugal	2 939 162	1 187 581	526 116	392 349	203 496	183 064	216 863
Romania	22 130 143	22 654 875	19 837 801	1 151 577	983 593	1 063 964	863 473
Slovenia	108 819	296 747	256 251	264 075	309 839	289 773	267 438
Slovakia	905 810	1 229 045	1 224 526	903 514	863 110	920 338	1 074 418
Finland	699 584	1 074 358	1 242 875	899 527	988 318	1 079 091	1 081 332
Sweden	1 550 975	1 754 330	1 788 043	1 684 156	1 841 839	2 205 186	2 379 137
United Kingdom	10 121 386	12 024 979	12 842 425	9 187 396	9 116 905	10 365 788	10 291 119

Table 49 – Tonnes of food waste between 2004 and 2016 per country in the European Union (Eurostat, 2018 – adapted)