biology and life sciences forum

MDPI

*Proceeding Paper*

# Preliminary Study on Plate Waste from "Daily Dish" in Restaurants †

**Miguel Castro [1,*], Kamila Soares [1,2], Carlos Ribeiro [3,4,5] and Alexandra Esteves [1,2,6]**

1 Department of Veterinary Science, School of Agrarian and Veterinary Science (ECAV), University of Trás-os-Montes e Alto Douro (UTAD), 5000-801 Vila Real, Portugal; kamilacgsoares@gmail.com (K.S.); alexe@utad.pt (A.E.)
2 Veterinary and Animal Research Center (CECAV), University of Trás-os-Montes e Alto Douro (UTAD), 5000-801 Vila Real, Portugal
3 Department of Agronomy, School of Agrarian and Veterinary Science (ECAV), University of Trás-os-Montes e Alto Douro (UTAD), 5000-801 Vila Real, Portugal; cribeiro@utad.pt
4 Centre for the Research and Technology of Agro-Environmental and Biological Sciences (CITAB), 5000-801 Vila Real, Portugal
5 Inov4Agro Associated Laboratory, 5000-801 Vila Real, Portugal
6 Al4AnimalS Associated Laboratory for Animal and Veterinary Science, 5000-801 Vila Real, Portugal
* Correspondence: miguelcastro505@gmail.com
† Presented at the 5th International Electronic Conference on Foods, 28–30 October 2024; Available online: https://sciforum.net/event/Foods2024.

**Abstract:** Food waste (FW) is a pressing global challenge, with food service establishments playing a significant role in exacerbating the issue. Efforts to tackle food waste are driven by growing concerns over its far-reaching impacts, including resource depletion, food security risks, and environmental, social, and economic costs. Our study aimed to quantify and analyze plate waste (PW) in three Portuguese restaurants, focusing on waste composition and reduction strategies. Data was collected over 10 days in each restaurant, categorizing waste into carbohydrate-based foods, protein-based foods, and vegetables. Statistical analyses were used to compare waste patterns. Results showed that carbohydrate-based foods, such as rice and potatoes, were the most wasted (16.3% to 21.9% of total waste). Despite serving portions 43% smaller than those in comparable studies, the percentage of PW (10–13%) was similar, indicating higher relative waste. Significant differences were found among food categories ($p < 0.05$) but not between restaurants or dish types (meat vs. fish). In conclusion, menu optimization and portion control are essential to reduce PW, particularly for less popular dishes. This study highlights the challenges of implementing food waste reduction measures in restaurants and provides insights for aligning with global sustainability goals.

**Keywords:** food waste; plate waste; restaurants; sustainability



Academic Editor: Theodoros Varzakas

Published: 11 March 2025

**Citation:** Castro, M.; Soares, K.; Ribeiro, C.; Esteves, A. Preliminary Study on Plate Waste from "Daily Dish" in Restaurants. *Biol. Life Sci. Forum* **2025**, *40*, 45. https://doi.org/10.3390/blsf2024040045



## 1. Introduction

Food loss (FL) and food waste (FW) have become increasingly important topics over the last decade [1]. These issues represent a critical global challenge, with approximately 1.3 billion tons of food wasted annually, accounting for one-third of all food produced for human consumption [2]. Wasting edible food instead of consuming it is both ecologically and economically unsustainable, as the environmental impacts of producing raw materials and processing them into food are substantial. In Finland, for example, food accounts for more than one-third of the environmental impact of overall consumption and about one-quarter of the climate impact of consumption [3]. The drive to address food waste stems

from concerns about its impact on resource conservation, food security, and environmental, social, and economic costs [4].

In 2022, 1.05 billion tons of food waste (including inedible parts) were generated, totaling 132 kg per capita and representing almost one-fifth of all food available to consumers. According to UNEP, 60% of the total food wasted in 2022 occurred at the household level, with food services responsible for 28% and retail for 12% [5]. In Europe alone, 88 million tons of food are wasted annually, of which 11 million tons originate from food service establishments, such as restaurants and cafeterias [2]. This sector is the third-largest contributor to food waste, accounting for 20% of the total food handled and prepared [6]. Recognizing the urgency of this issue, the United Nations has included food waste reduction in the Sustainable Development Goals (SDGs), with a target to halve global food waste by 2030 [7].

FW can be categorized into edible and inedible parts. Edible parts refer to portions of food intended for human consumption, while inedible parts include components associated with food that are not meant to be consumed by humans, such as bones, peels, and pits [5]. The inedible parts removed from the human food supply chain often end up in final destinations such as anaerobic digestion, aerobic composting, land application, controlled combustion, sewage, waste disposal, or landfills. According to the European Parliament's Committee on Agriculture, up to 50% of edible and safe food is needlessly discarded in households, supermarkets, restaurants, and throughout the entire food chain annually [8].

Restaurants offer various types of services; therefore, the amount of food waste generated by each type of service may vary. Within the restaurant, there are several processes, such as food purchasing, preparation, cooking, storage, and distribution, and each of these stages contributes significantly to FW production. Each of these stages plays a significant role in the generation of FW [7]. In this context, the concepts of leftovers, plate waste or scraps, and ingestion leftovers are frequently applied, each with distinct meanings. Leftovers refer to prepared or cooked foods that are not distributed to consumers [9]. These may include foods that were initially intended for consumption but were later deemed unsuitable due to quality or hygiene restrictions, as well as consumption rules and requirements [10]. This category also encompasses foods displayed on buffet counters that remain unconsumed at the end of the service. On the other hand, plate waste or scraps describe food that has been served to consumers but remains uneaten and is subsequently discarded [11]. Finally, ingestion leftovers represent the ratio of unconsumed food to the total amount of food served, providing a quantitative measure of waste relative to the portions offered [11]. These distinctions are crucial for understanding the different sources and types of food waste in restaurant operations.

Plate waste is one of the main factors contributing to food waste in many restaurants, especially in those that offer buffet-style service [6]. However, PW holds the greatest potential for reducing food waste, both in general and at the business level. Researchers assert that most of the PW is indeed avoidable [10,12,13].

The Waste Framework Directive [14], transposed into national law in Portugal (Decree-Law No 102-D/2020 of 10 December), introduces rules on the prevention of food waste, setting objectives and reduction targets at the production level, as well as measures to promote its prevention and the reduction of food waste at various stages of the supply chain. From 2020 onward, the measurement of food waste at different stages of the food supply chain became mandatory, as did the reporting to the European Commission within 18 months of the end of each year, in accordance with the established model for data communication and the submission of quality control reports. This framework underscores Portugal's commitment to addressing food waste in alignment with broader European Union goals.

In Portugal, measures have been introduced to reduce food waste in catering, production, and supply chains, including the agri-food industry, catering companies, supermarkets, and hypermarkets. Specific targets have been established to address this issue: by 2025, the aim is to reduce food waste by 25% compared to 2020 levels in mass caterers, production, and supply chains. Furthermore, by 2030, the goal is to achieve a 50% reduction in food waste in these same sectors compared to 2020 levels. Despite growing awareness and regulatory efforts, there remains a significant gap in the implementation of practical interventions tested in real-world restaurant settings, particularly in Portugal [15]. This highlights the need for more actionable strategies and on-the-ground solutions to effectively tackle food waste. This study aims to address this gap by quantifying PW in three Portuguese restaurants, analysing its composition, and identifying patterns across different food categories (carbohydrate-based, protein-based, and vegetables). These analyses provide essential data for implementing effective corrective measures in various areas. Employee motivation is a key factor, which can be encouraged through financial incentives to achieve targets [16] or awareness initiatives highlighting the importance of reducing food waste [17]. Menu planning also plays a crucial role, ensuring that meals are designed based on the resources available in the establishment to maximize the use of leftovers and products nearing expiration [18].

Efficient stock management is another fundamental strategy, relying on the organization of food items using a "first in, first out" system [10], regular monitoring of expiration dates, and proper handling under appropriate working conditions. Additionally, staff training is essential for improving food handling and preparation skills and minimizing losses, especially in processes such as cutting and preparing raw meats [19]. Assessing PW can help determine whether portion sizes need to be adjusted, either by reducing quantities [20] or offering different portion options so customers can choose according to their needs [21]. Finally, donating surplus food to employees or charitable organizations [22] presents a viable and socially responsible solution, helping to reduce food waste while benefiting those in need.

By providing detailed insights into PW generation, this study seeks to contribute to the development of actionable strategies for reducing food waste in the food service sector, aligning with the SDGs, and promoting sustainability.

## 2. Materials and Methods

### *2.1. Experimental Delineament*

This study lasted for 1 month and 2 weeks, being conducted over 2 weeks (10 days) in each restaurant ($N$ = 3), during the lunch period for the "daily dishes". Whenever possible, on each day, a "daily dish" of meat and fish was evaluated. The "daily dish" refers to a dish served during weekdays at lunchtime with a more affordable price and different each day. In total, the waste of 152 dishes (76 meat and 76 fish) was evaluated for Restaurant 1, the waste of 175 dishes (99 meat and 76 fish) was evaluated for Restaurant 2, and the waste of 244 dishes (189 meat and 55 fish) was evaluated for the restaurant.

### *2.2. Material Used in This Study*

For this study, the following materials were used:

- Scales with a capacity of up to 3 kg, and scales with a capacity of up to 30 kg.
- Colored Bags to separate the different types of food waste.
- Data-menu recording sheets.
- Food waste data recording sheets.

### 2.3. Procedure

For the assessment of PW in the restaurants under study, the experimental procedure was based on the study by Pontes [6]. For this purpose, an assessment of the served dishes and portions placed on the plates of different food categories was conducted.

Collection of the list of ingredients and weights used in the preparation of the "daily dish" were recorded in the datasheet, along with the number of expected meals.

Weighing of the "model dish"—weighing of 3 meals ("daily") plated before or at the beginning of distribution for the evaluation of the served portion. The plate weight was measured before adding the food.

All edible PW from the consumer's table is separated into different garbage bags (categories):

- Potatoes, grains, and derivatives (carbohydrate-based foods);
- Meat, fish, and eggs (protein-based foods);
- Salads and vegetables (vegetables).

At the end of the service, each bag was weighed and recorded in the log sheet. The actual number of dishes sold/served was also recorded.

Non-consumable plate waste, such as bones, fish bones, fruit and vegetable peels, and pits, are considered and, therefore, will not be included in the weighing of the mass of consumable leftovers.

### 2.4. Data Analysis

The percentage of plate waste was calculated after determining the mass of consumable plate waste using the following formula:

$$\%\text{Plate Waste} = \frac{\text{Plate Waste Weight} \times 100}{\text{Weight of the Produced Meal}}$$

Data were used to assess the amount of food waste in the three restaurants under study. The descriptive data were first organized into tables containing the total number of meals, the average meal weight per person, the average plate waste per person, and the corresponding percentage of plate waste.

Statistical analyses were performed using Statistica® 12.0 software (StatSoft, Tulsa, OK, USA). Results were expressed as means and standard deviations, with all tests conducted at a 5% significance level. The statistical comparisons among restaurants and food categories were performed using the Friedman and Nemenyi tests. To compare the proportion of waste among different food categories (carbohydrate-based foods, protein-based foods, and vegetables), the Friedman test was applied, as the data did not meet normality assumptions. Statistical significance was set at $p < 0.05$.

Additionally, differences in total food waste among the restaurants were evaluated using the Nemenyi test for multiple group comparisons. The comparison of waste between meat-based and fish-based dishes was conducted using the Kruskal–Wallis test, analyzing potential differences in waste proportions for each food category across the three restaurants.

## 3. Results and Discussion

In total, the waste of the "daily dish" accounted for 152 dishes (76 meat and fish) for Restaurant 1, 175 dishes (99 meat and 76 fish) for Restaurant 2, and 244 dishes (189 meat and 55 fish) for Restaurant 3.

Figure 1 demonstrates that restaurant 3 experienced a peak in PW on Monday much larger compared to restaurants 1 and 2, suggesting that on this day, the dish was not

well-received or not properly portioned, resulting in significant waste on the plate by the customers.

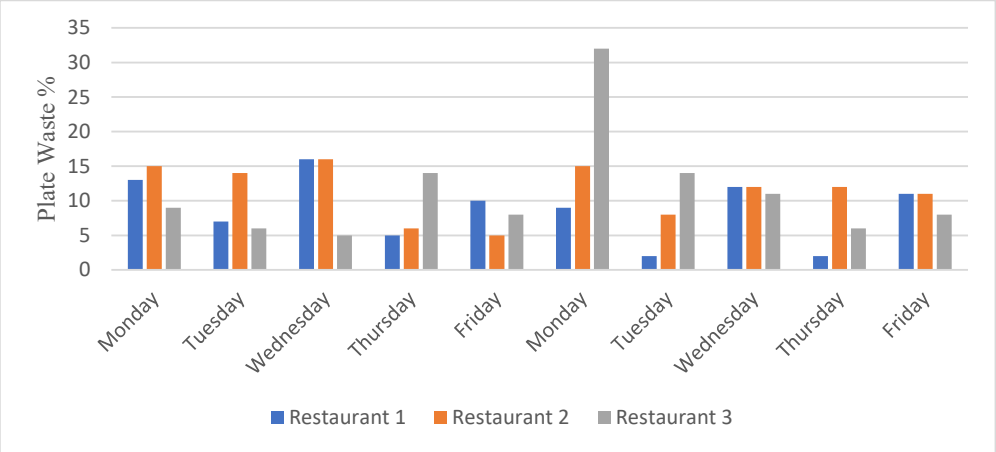


**Figure 1.** Total waste of consumable plate waste (%/day) for the 3 restaurants in study.

To enable comparison of our results with other articles, Table 1 was prepared, representing the number of study days, the number of meals, the mass of meals per capita, plate waste per capita, and the percentage of plate waste for each restaurant.

**Table 1.** Number of meals, meal weight (MW) per capita, plate waste (PW) per capita, and percentage of plate waste (PW) obtained for each of the three restaurants over 10 working days at lunchtime.

| Rest. | NDays | N Meals | MW Per Capita (g) | PW Per Capita (g) | PW (%) |
|---|---|---|---|---|---|
| 1 | 10 | 152 | 468 | 43 | 10 |
| 2 | | 175 | 473 | 58 | 13 |
| 3 | | 244 | 564 | 73 | 13 |

Table 1 shows that the percentage of PW was reduced in all restaurants. In our study, we found PW per capita ranging from 43 to 73 g, with PW percentages between 10% and 13%. These values are consistent with studies such as Pontes [10] who reported average PW per capita ranging from 52 g to 78 g in Brazil. However, our results are lower than those of Xu [23], who found an average PW of 172.3 g per person, and Wang [24], who reported PW values from 77 g to 103 g in Chinese cities (Beijing, Shanghai, Lhasa, and Chengdu). Additionally, Williams and Walton [25] found that plate leftovers in hospitals accounted for 30% of the meals served, significantly higher than the values observed in our study; however, in hospitals, people are most often sick and are not hungry enough to consume a full meal.

These results can be explained by two factors: considerably reduced portion sizes and the type of customer. Each meal served has an average mass of 468 g for Restaurant 1, 473 g for Restaurant 2, and 564 g for Restaurant 3. When compared to the average mass of each dish served in 15 restaurants (791 g) in the study by Pontes [10], we found that the portions served in our study are, on average, 43% smaller. Furthermore, customers who choose the daily special for lunchtime in these restaurants are mostly workers subjected to physical exertion in their professions during their lunch break, contributing to a low percentage of PW. However, even with this low percentage, we obtained the same PW as some of the restaurants compared to even though the food portions in our restaurants were smaller which means our restaurants produced greater PW relative to the initial portion served.

Based on the average values presented in Table 1 and illustrated in Figure 2, it is evident that carbohydrate-based foods, such as rice and potatoes, were the most frequently wasted leftovers across all restaurants, with waste percentages of 16.3%, 16.7%, and 21.9%, respectively. These findings align with previous research. For instance, Dagiliūte and Musteikyte [26] also identified carbohydrates as the most wasted food category, while meat and its products were the least wasted. Similarly, Jones [27] found that, after sauces and condiments, carbohydrate-based foods were the most wasted items on plates. Vizzoto [28], through a survey, reported that employees identified carbohydrates as the most wasted food type. Additionally, Betz et al. (2015) [11] observed a higher proportion of plate waste (PW) for carbohydrate-based foods compared to other food types in Swiss catering facilities, which is consistent with the results of our study.

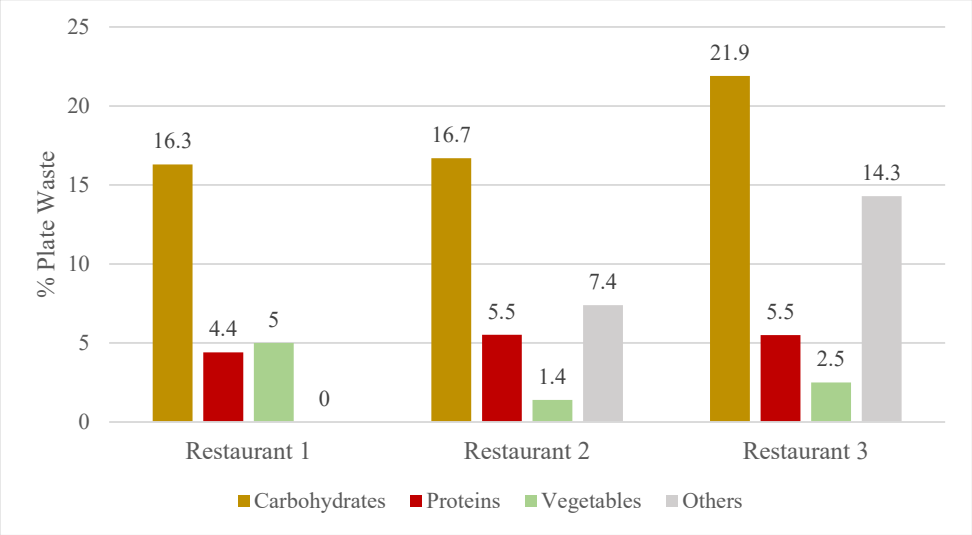


**Figure 2.** Percentage of PW separated into different food categories (carbohydrate-based foods, protein-based foods, and vegetables) in the 3 restaurants.

In our study, we encountered meals whose contents were difficult or impossible to separate by categories. These meals were grouped into a different category ("others") and refer to dishes where it is impossible to separate the foods into carbohydrate-based foods, protein-based foods, and vegetables, such as the dish "duck rice". With this, we found that Restaurant 3 had a higher percentage of PW in this type of dish compared to Restaurant 2 (14.28% and 7.4%, respectively). Restaurant 1 did not produce any dishes where it was impossible to separate the foods into categories and, therefore, did not have PW of this type.

The statistical analyses are summarized in Table 2, which presents the results of the Friedman statistical test, confirming significant differences in the quantity of PW generated for each food category.

The data in Table 2 demonstrate significant differences in the PW of carbohydrate-based foods, protein-based foods, and vegetables generated, with $p$-value lower than $p < 0.05$.

To further compare the restaurants, the Nemenyi test was applied. The results can be observed in Table 3.

As shown in Table 3, through the multiple comparisons of the means of the percentages of PW produced by the three restaurants, there were no significant differences among the restaurants ($p$-value > 0.05), indicating that the quantity of PW generated was consistent across all restaurants. Next, this study also compared edible PW from both meat and fish dishes served in the restaurants to compare if the type of meal, fish or meat, would

significantly impact the amount of plate waste. The statistical results were analysed using the Kruskal–Wallis test, as presented in Table 4.

**Table 2.** Mean values and standard deviation (SD) of the percentages of PW (PW) from carbohydrate-based foods (Ch), protein-based foods (Pr), and vegetables (Vg) in the 3 restaurants based on the comparison of different percentages of leftovers from different food categories by the Friedman statistical test for each restaurant.

| Restaurant | PW Categories | Mean (Dp) (%) | *p*-Value |
|---|---|---|---|
| 1 | Ch<br>Pr<br>Vg | 16.33 (12.47)<br>4.42 (5.49)<br>5.04 (15.95) | 0.00003 |
| 2 | Ch<br>Pr<br>Vg | 19.67 (12.09)<br>5.52 (4.94)<br>1.37 (4.77) | 0.00001 |
| 3 | Ch<br>Pr<br>Vg | 21.90 (18.51)<br>5.49 (4.95)<br>2.46 (6.78) | 0.00001 |

**Table 3.** Nemenyi statistical test for comparing all pairwise combinations of groups to verify significant differences in the percentage of leftovers on the plate among the 3 restaurants.

| Restaurant | 1<br>(*p*-Value) | 2<br>(*p*-Value) | 3<br>(*p*-Value) |
|---|---|---|---|
| 1 | | 0.632 | 0.781 |
| 2 | 0.632 | | 1.000 |
| 3 | 0.781 | 1.000 | |

**Table 4.** Mean values and standard deviation (SD) of the percentages of PW from carbohydrate-based foods (Ch), protein-based foods (Pr), and vegetables (Vg) in the 3 restaurants based on the comparison of different percentages of leftovers from different food categories in meat and fish dishes.

| Restaurant | Component | Dish Type | Mean (%) | SD | *p*-Value |
|---|---|---|---|---|---|
| 1 | Ch | Meat<br>fish | 16.7<br>16.0 | 12.2<br>13.3 | 0.371 |
| | Pr | Meat<br>fish | 5.5<br>3.3 | 7.2<br>3.1 | 0.371 |
| | Vg | Meat<br>fish | 2.4<br>7.7 | 4.9<br>22.3 | 0.606 |
| 2 | Ch | Meat<br>fish | 26.2<br>14.5 | 13.6<br>8.0 | 0.058 |
| | Pr | Meat<br>fish | 7.3<br>4.1 | 5.9<br>3.7 | 0.343 |
| | Vg | Meat<br>fish | 0.6<br>2.0 | 1.6<br>6.3 | 0.867 |
| 3 | Ch | Meat<br>fish | 16.6<br>30.8 | 11.3<br>25.4 | 0.302 |
| | Pr | Meat<br>fish | 6.4<br>3.9 | 4.4<br>5.8 | 0.302 |
| | Vg | Meat<br>fish | 0<br>6.6 | 0<br>10.3 | 0.051 |

Based on the analysis of Table 4, no significant differences were identified in the amount of PW generated from meat and fish dishes across the different food categories in the restaurants under study ($p$-value > 0.05). This indicates that the quantity of PW produced by the two types of dishes was equivalent across the three restaurants analysed.

This finding suggests that, in terms of food waste, there was no significant difference between the edible PW in meat and fish dishes served in the evaluated restaurants. Therefore, customers wasted a similar amount of food in both meat and fish dishes.

## 4. Conclusions

This was a preliminary study regarding the food waste generated in Portuguese restaurants. With the results of this study, we concluded that even though the portions of the meals served in our restaurants were 43% smaller when compared to other studies, the PW was similar, which indicates that our restaurants produced more PW relative to the initial portion served. Of the PW obtained, carbohydrate-based foods were the most wasted, aligning with other studies in this regard. Also, some of the dishes served are not so welcomed by the clients, therefore generating larger amounts of PW which indicates the necessity of reevaluating the menu. This study is crucial to show the difficulties of performing this kind of work since the restaurant staff are not so welcoming to strange people and largely do not want to comply with the investigators to learn how to measure food waste and how to prevent it, leading to miscommunications.

**Author Contributions:** Conceptualization, M.C., A.E. and C.R.; methodology, M.C., A.E. and C.R.; software, M.C.; validation, M.C., A.E. and C.R.; formal analysis, A.E. and C.R.; investigation, M.C.; resources, A.E. and C.R.; data curation, M.C.; writing—original draft preparation, M.C.; writing—review and editing, M.C.; visualization, A.E., C.R. and K.S.; supervision, A.E. and K.S.; project administration, A.E.; funding acquisition, A.E. All authors have read and agreed to the published version of the manuscript.

**Funding:** This study was supported by the projects UIDB/00772/2020, LA/P/0059/2020, funded by the Portuguese Foundation for Science and Technology (FCT) and WASTELESS (HORIZON-CL6 2022-FARM2FORK-01) under grant agreement 101084222.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Informed consent was obtained from all subjects involved in the study.

**Data Availability Statement:** Data is contained within the article.

**Acknowledgments:** I would like to thank Alexandra Esteves and Carlos Ribeiro for assisting me in the planning and execution of this research project, as without them, this project would not have been possible. I also want to express my gratitude to Ana Leite, Helena Santos, and Kamila Soares for their assistance in the laboratory, reducing the workload, which enabled me to obtain microbiological results in a timely manner.

**Conflicts of Interest:** The authors declare no conflicts of interest.

## References

1. McNeill, L.S.; Hamlin, R.P.; McQueen, R.H.; Degenstein, L.; Wakes, S.; Garrett, T.C.; Dunn, L. Waste not want not: Behavioural intentions toward garment life extension practices, the role of damage, brand and cost on textile disposal. *J. Clean. Prod.* **2020**, *260*, 121026. [CrossRef]
2. Clowes, A.; Hanson, G.; Mitchell, P. The Business Case for Reducing Food Loss and Waste, 2018; pp. 1–24. Available online: https://www.researchgate.net/publication/314261211_THE_BUSINESS_CASE_FOR_REDUCING_FOOD_LOSS_AND_WASTE_A_report_on_behalf_of_SDG_Champions_123 (accessed on 16 February 2025).
3. Silvennoinen, K.; Heikkilä, L.; Katajajuuri, J.-M.; Reinikainen, A. Food waste volume and origin: Case studies in the Finnish food service sector. *Waste Manag.* **2015**, *46*, 140–145. [CrossRef] [PubMed]

4. Eckert Matzembacher, D.; Brancoli, P.; Moltene Maia, L.; Eriksson, M. Consumer's food waste in different restaurants' configuration: A comparison between different levels of incentive and interaction. *Waste Manag.* **2020**, *114*, 263–273. [CrossRef] [PubMed]
5. United Nations Environment Programme (UNEP). Food Waste Index Report 2024. Think Eat Save: Tracking Progress to Halve Global Food Waste. 2024. Available online: https://wedocs.unep.org/20.500.11822/45230 (accessed on 16 February 2025).
6. Giaccherini, M.; Gilli, M.; Mancinelli, S.; Zoli, M. Nudging food waste decisions at restaurants. *Eur. Econ. Rev.* **2021**, *135*, 103722. [CrossRef]
7. Coşkun, A.; Yetkin Özbük, R.M. What influences consumer food waste behavior in restaurants? An application of the extended theory of planned behavior. *Waste Manag.* **2020**, *117*, 170–178. [CrossRef]
8. Kanwal, N.; Zhang, M.; Zeb, M.; Batool, U.; Khan, I.; Rui, L. From plate to palate: Sustainable solutions for upcycling food waste in restaurants and catering. *Trends Food Sci. Technol.* **2024**, *152*, 104687. [CrossRef]
9. Van Herpen, E.; De Hooge, I.E.; De Visser-Amundson, A.; Kleijnen, M. Take it or leave it: How an opt-out strategy for doggy bags affects consumer food waste behavior and restaurant evaluations. *J. Clean. Prod.* **2021**, *325*, 129199. [CrossRef]
10. Pontes, T.; César, A.; Conejero, M.A.; Deliberador, L.; Batalha, M. Food waste measurement in a chain of industrial restaurants in Brazil. *J. Clean. Prod.* **2022**, *369*, 133351. [CrossRef]
11. Betz, A.; Buchli, J.; Göbel, C.; Müller, C. Food waste in the Swiss food service industry—Magnitude and potential for reduction. *Waste Manag.* **2015**, *35*, 218–226. [CrossRef]
12. Henz, G.P.; Porpino, G. Food losses and waste: How Brazil is facing this global challenge? *Hortic. Bras.* **2017**, *35*, 472–482. [CrossRef]
13. Beretta, C.; Stoessel, F.; Baier, U.; Hellweg, S. Quantifying food losses and the potential for reduction in Switzerland. *Waste Manag.* **2012**, *33*, 764–773. [CrossRef] [PubMed]
14. Decree law Nº. 102-D/2020. Publication: Republic Diary No. 239/2020, Series 1 of 2020-12-10 Issuer: Presidency of the Council of Minister. Diploma Type: Decree Law. Number: 102-D/2020 Pages: 25-(2) a 25-(269). Available online: https://diariodarepublica.pt/dr/en/detail/decree-law/102-d-2020-150908012 (accessed on 28 February 2025).
15. Kummu, M.; De Moel, H.; Porkka, M.; Siebert, S.; Varis, O.; Ward, P. Lost food, wasted resources: Global food supply chain losses and their impacts on freshwater, cropland, and fertiliser use. *Sci. Total Environ.* **2012**, *438*, 477–489. [CrossRef] [PubMed]
16. Goh, E.; Jie, F. To waste or not to waste: Exploring motivational factors of Generation Z hospitality employees towards food wastage in the hospitality industry. *Int. J. Hosp. Manag.* **2019**, *80*, 126–135. [CrossRef]
17. Ofei, K.T.; Werther, M.; Thomsen, J.D.; Holst, M.; Rasmussen, H.H.; Mikkelsen, B.E. Reducing food waste in Large-Scale Institutions and Hospitals: Insights from interviews with Danish foodservice professionals. *J. Foodserv. Bus. Res.* **2015**, *18*, 502–519. [CrossRef]
18. Heikkilä, L.; Reinikainen, A.; Katajajuuri, J.; Silvennoinen, K.; Hartikainen, H. Elements affecting food waste in the food service sector. *Waste Manag.* **2016**, *56*, 446–453. [CrossRef]
19. Derqui, B.; Fayos, T.; Fernandez, V. Towards a more sustainable food supply chain: Opening up invisible waste in food service. *Sustainability* **2016**, *8*, 693. [CrossRef]
20. Sakaguchi, L.; Pak, N.; Potts, M.D. Tackling the issue of food waste in restaurants: Options for measurement method, reduction and behavioral change. *J. Clean. Prod.* **2018**, *180*, 430–436. [CrossRef]
21. Berkowitz, S.; Marquart, L.; Mykerezi, E.; Degeneffe, D.; Reicks, M. Reduced-portion entrées in a worksite and restaurant setting impact on food consumption and waste. *Public Health Nutr.* **2016**, *19*, 3048–3054. [CrossRef]
22. Sirieix, L.; Lála, J.; Kocmanová, K. Understanding the antecedents of consumers' attitudes towards doggy bags in restaurants: Concern about food waste, culture, norms and emotions. *J. Retail. Consum. Serv.* **2017**, *34*, 153–158. [CrossRef]
23. Xu, Z.; Zhang, Z.; Liu, H.; Fang, Z.; Bai, J.; Cheng, S. Food-away-from-home plate waste in China: Preference for variety and quantity. *Food Policy* **2020**, *97*, 101918. [CrossRef]
24. Wang, L.; Liu, G.; Liu, X.; Liu, Y.; Gao, J.; Zhou, B.; Gao, S.; Cheng, S. The weight of unfinished plate: A survey-based characterization of restaurant food waste in Chinese cities. *Waste Manag.* **2017**, *66*, 3–12. [CrossRef] [PubMed]
25. Williams, P.; Walton, K. Plate waste in hospitals and strategies for change. *e-SPEN* **2011**, *6*, e235–e241. [CrossRef]
26. Dagiliūtė, R.; Musteikytė, A. Food waste generation: Restaurant data and consumer attitudes. *Environ. Res. Eng. Manag.* **2019**, *75*, 7–14. [CrossRef]
27. Jones, E. *An Investigation into Food Waste Produced in New Zealand Restaurants and Cafes*; University of Otago: Dunedin, New Zealand, 2017. Available online: https://ourarchive.otago.ac.nz/bitstream/handle/10523/7924/JonesEmily2017MDiet.pdf?sequence=1&isAllowed=y (accessed on 16 February 2025).
28. Vizzoto, F.; Tessitore, S.; Testa, F.; Iraldo, F. Plate waste in food service outlets: Revealing customer profiles and their support for potentially contentious measures to reduce it in Italy. *Resour. Conserv. Recycl.* **2021**, *174*, 105771. [CrossRef]