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Household Food Waste in Morocco: An Exploratory Survey in the Province of Kenitra

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Abstract: The data from the United Nations Food Waste Index 2021 suggest that food losses and waste represent a pressing challenge, even in developing countries. This study investigates food waste in Morocco, specifically focusing on Kenitra province (northwestern Morocco). It quantifies the food waste types and quantities in Kenitra households and explores the underlying causes. Conducted in 2022, the research involved 442 respondents aged 18 and above, utilizing both face-to-face and online surveys. The findings reveal bread as the most wasted item, with minimal waste of meat and cereals. On average, households discard 361 g of bread per week, 98 g of fresh produce, and 9 g of cheese. The primary causes of food waste are difficulties in reusing small leftovers (32%), followed by challenges in meal preparation with available ingredients (34%). This study underscores the urgent need for targeted interventions to address food waste effectively in Kenitra. By shedding light on waste dynamics and causes, it contributes to understanding this critical issue and offers valuable insights for policymakers and stakeholders working to implement strategies for reducing food waste and promoting sustainable consumption practices.

Keywords: survey; household food waste; food security; sustainability; Kenitra; Morocco; SysOrg

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1. Introduction

In recent years, the issue of food loss and waste (FLW) has attracted international attention and become a major priority in global and national policy agendas. The incorporation of Target 12.3 into the United Nations Sustainable Development Goals underscores a global commitment to sustainable practices in food consumption and production [1]. Specifically, this goal aims to halve the global per capita food waste at the retail and consumer level by 2030 while addressing food losses along production and supply chains, including post-harvest losses [2]. This initiative is in line with the broader goal of responsible production and consumption by reducing food waste by 50% to protect the environment, ensure resource efficiency and reduce food insecurity. The United Nations highlights the urgent

need to control food waste [2–4]. FLW prevention and reduction processes are considered key factors for improving food system sustainability and food and nutritional security [5] and have received significant attention among policymakers and researchers around the world [1,6–8]. According to the Food and Agriculture Organization [9], approximately one-third of the world's food supply is lost or wasted through the food chain, amounting to 1.3 billion tons of food lost or wasted annually. The UNEP Food Waste Index 2021 shows that 61% of food waste takes place at the household level, 26% in catering and food services, and 13% in retail. Even in Morocco, a country with a rich food tradition [10], the amount of food waste is enormous. The United Nations Food Waste Index 2021 estimates that there are over 3.3 tons of food wasted annually in Morocco. According to the United Nations Environment Program [11], Moroccans annually throw away about 91 kg of food per person. Morocco experiences food losses across various stages of the food supply chain, including those related to consumer behavior, inadequate labeling, and smallholder farmer constraints exacerbated by factors such as production costs, climate change, and social customs [12,13].

The impacts extend beyond mere environmental concerns; food waste significantly contributes to climate change through the emission of methane during its decomposition, a greenhouse gas much more potent than carbon dioxide [14]. Methane, which is 34 times more potent than a comparable mass of carbon dioxide over a 100-year period, has a significant climate impact [15,16]. The fact that only 25% of landfill methane is effectively captured and converted into electricity highlights the concerning environmental effects of food waste [17]. As more food is produced, there is a greater chance of food waste, which when dumped in landfills contributes significantly to greenhouse gas emissions [18]. Food waste not only squanders valuable resources such as water, soil, energy, and fertilizers in its production but also contributes substantially to environmental degradation. The extensive agricultural practices required to produce food put enormous strain on ecosystems, leading to deforestation, habitat destruction, and loss of biodiversity [19]. Moreover, the use of fertilizers and pesticides contaminates soils and waterways, posing threats to both human health and wildlife [20]. Additionally, the transportation and processing of food generate greenhouse gas emissions, further exacerbating climate change [21]. When this already resource-intensive and environmentally degrading food ends up being wasted, the negative impacts are compounded, creating a vicious cycle of inefficiency and environmental harm. Efforts to reduce food waste are crucial not only to mitigate these environmental pressures but also to promote a more sustainable and resilient food system. In addition, social consequences are intertwined with this issue [22]. Currently, 820 million people worldwide suffer from food insecurity, which is exacerbated by the serious problem of food waste, as one-third of all edible food is wasted or lost [23,24].

This problem is pervasive and affects people to differing extents in both developed and developing countries [25]. In some parts of Africa, up to 22.8% of people are undernourished [25]. Furthermore, the production of food that is not consumed puts pressure on the world's food supply chain, making it harder to feed a growing population and possibly exacerbating social inequality [26].

In light of these pressing concerns, it is imperative to delve deeper into the specific dynamics of FLW in Morocco. No previous studies have examined FLW in the province of Kenitra, Morocco. This study, focusing exclusively on food waste in Kenitra province, endeavors to quantify the types and quantities of wasted foods in Kenitra households, categorize disposed items, and investigate the underlying reasons for and repercussions of this phenomenon through the lens of Kenitra's population.

By shedding light on the intricacies of food waste in Kenitra, this study aims to contribute valuable insights that could inform strategies for mitigating this global challenge at a local level.

2. Materials and Methods

This study, which is part of a project entitled Organic Agro-Food Systems as Models for Sustainable Food Systems in Europe and Northern Africa (SysOrg), was conducted in 2022 by Ibn Tofail University Faculty of Sciences (Kenitra, Morocco) in collaboration with partners from Copenhagen University (Copenhagen, Denmark), Warsaw University of Life Sciences (Warsaw, Poland), the Council for Agricultural Research and Economics (CREA; Rome, Italy), FH Münster University of Applied Sciences (Münster, Germany), University of Kassel (Witzenhausen, Germany), and the International Centre for Advanced Mediterranean Agronomic Studies—Mediterranean Agronomic Institute of Bari (CIHEAM-Bari; Valenzano, Italy).

2.1. Survey Questionnaire

The survey was designed to yield in-depth insights into food waste behavior by quantifying household food waste and participants' perceptions regarding the causes and consequences of food waste.

It is pertinent to acknowledge that the questionnaire encompassed multiple dimensions of consumer behavior, including sections dedicated to exploring food preferences and organic consumption habits, aside from food waste behavior. However, for the purpose of the current analysis, in this context, the focus is specifically on two key aspects—waste data and sociodemographic information. It is noteworthy that findings related to waste and sociodemographic are presented here, as other researchers have examined sociodemographic data in conjunction with food intake or organic consumption data in separate studies, underscoring the multifaceted nature of the questionnaire data and its relevance to broader research inquiries in the fields of diet, food waste, and organic consumption. The structured questionnaire used in the study was divided into two parts. In part 2, sociodemographic information was collected, including on gender, age, education level, household income in Moroccan dirhams, the number of household members, and the monthly household net income allocated to food expenditure. In part 4, the respondents were asked about the types and amounts of food that was thrown away in their households and the predominant category of food that was thrown away (completely unused food, partially used food, meal leftovers, and stored leftovers). The participants responded to structured questions that provided both quantitative and qualitative data. Collectively, these questions aimed to provide valuable insights into food waste patterns, food-waste-related behaviors, and demographic descriptors that may contribute to variations in food waste behaviors.

A recall method was used to gather self-reported data covering the week preceding the survey. There were 24 food groups in the closed-ended inquiry. The quantitative section of the questionnaire was complemented via a series of questions exploring the consequences of food waste and another set probing into the causes of waste generation in households. A Likert scale with five points from "strongly disagree" to "strongly agree" was employed to gauge the participants' responses. This methodical approach ensured a nuanced understanding of food waste patterns and attitudes among the surveyed individuals.

The questionnaire underwent a thorough validation process to ensure reliability and validity in measuring the intended variables. These were peer reviews, in which the questionnaires were evaluated by experts in the field to ensure their alignment with the research objectives. A pilot study was then conducted with a small group of participants to test the clarity, understandability, and relevance of the questions.

The questionnaire was developed in English and was then translated into Arabic to ensure precision and cultural appropriateness. However, the translation was back-translated from Arabic to English to check for mistranslation or loss of meaning in the translation. Hence, a pilot study was conducted in which the questionnaire was distributed to a target group of 10 to 20 consumers and the participants' responses were evaluated.

2.2. Data Collection

A multichannel approach was utilized as the survey approach, involving both face-to-face and online surveys to comprehensively investigate food waste behavior in Kenitra. The data collection was conducted in a variety of environments including supermarkets, streets, beaches, parks, and online platforms, as well as via email, telephone, and social media. This approach allowed us to obtain different perspectives on food waste through different research channels.

Participation in the study was voluntary and anonymous, and the participants were allowed to withdraw from the survey without giving reasons. Prior to the beginning, the participants were informed about the project's goals and purpose, as well as the substance and purpose of the study, and asked for consent to publish the aggregated data and results following the statistical analysis. The data collection took place from January to June 2022 and used cross-sectional assessment techniques.

In this study, out of the initial sample of 614 responses from participants, 172 responses were excluded due to incomplete information, resulting in a final sample size of 442 valid responses. These exclusions were made to ensure the reliability and accuracy of the data analysis, including only participants who met the eligibility criteria of residing in Kenitra province and being 18 years of age or older.

2.3. Data Analysis

The data analysis process included careful coding and systematic organization of the collected information into an Excel spreadsheet. To conduct a thorough investigation, the Statistical Package for the Social Sciences (SPSS) was used as the primary analytical tool. Descriptive analysis techniques, including the use of frequencies and percentages, were used to decipher the complexity of the dataset. This method allowed for a holistic investigation and provided valuable insight into the unique patterns and characteristics embedded in the collected data. Additionally, a statistical analysis was performed to demonstrate the impact and association between food waste data and demographic trends.

The mean value served as a pivotal measure of central tendency in the analysis. To calculate the mean, the following formula was applied:

$$\text{mean} = \text{sum of all individual data points} / \text{total count of data points.}$$

This research was carried out under the appropriate authorization from the Regional Directorate of Health in the Rabat-Sale-Kenitra region and received approval from the regional Ethics Committee (CERB05/22). The participants willingly provided their consent and were fully informed about the study's specifics.

3. Results

The sample comprised a total of 442 adults from Kenitra, of which 50% of the respondents were women and 50% were men. Regarding the age groups, the participants in the survey aged from 18 to 34 years accounted for 52% of the total. Regarding the levels of education, only 5% had no formal education, while 29% had a bachelor's degree or equivalent level (3 years at university). In terms of the annual household income, approximately 21% of the respondents earned between 36,000 and 60,000 MAD (MAD—Moroccan dirhams; 10 MAD $\approx$ 1 USD). Meanwhile, about 43% of the respondents spent 30–40% of their monthly household net income on buying food (Table 1).

The distribution of household sizes in the dataset provides valuable insight into the demographic composition of the sample. Two-person households accounted for the majority, with a share of 6%, followed closely by single-person households at 1%. Three-person households represented 13%, four-person households represented 22%, and more than five persons represented 58% of the total. This distribution indicates the diversity of the family structure in this study.

Table 1. Sociodemographic characteristics of the respondents (n = 442).

Variable	Characteristics	Percentage (%)
Gender	Men	50
	Women	50
Age (y)	18–34	52
	35–44	26
	45–54	16
	55–64	4
	≥65	11
Level of education	No formal education	5
	Primary education (1–4 years)	9
	Lower secondary education (5–10 years)	7
	Upper secondary education (10–13 years)	16
	Apprenticeship (2–3 years)	9
	Bachelor's degree or equivalent level (3 years)	29
	Master's degree or equivalent level (3 + 2 years)	18
	Doctoral studies (PhD) or higher	7
Household income (MAD/y)	Up to 36,000	11
	36,000–60,000	21
	60,001–90,000	11
	90,001–120,000	4
	120,001–150,000	2
	150,001–180,000	1
	More than 180,000	2
	I prefer not to answer	48
Amount of monthly household net income spent on food (%)	<10%	5
	10–30%	31
	30–40%	43
	>40%	21
Household size (no. of members)	1	1
	2	6
	3	13
	4	22
	≥5	58

The data presented in Table 2 highlight a clear trend; as the household size increases, so does the average food waste per household. This suggests that larger households tend to generate more food waste compared to smaller ones. The substantial jump in food waste observed in households with five or more members, with an average of 3364 g per household, underscores the impact of the household size on food consumption and waste generation.

Table 2. Food waste behaviors across household sizes.

Household Size (Number of Persons)	Number of Households	Average Food Waste per Household (Grams)
1	1	300
2	6	600
3	13	1000
4	22	1446
≥5	58	3364

Figure 1 illustrates the average amount of food waste per household in grams categorized by household income level. It reveals a noticeable trend, whereby higher-income

households tend to waste more bread compared to lower-income households. This suggests a potential association between income and food waste behavior, with economic factors playing a role in influencing consumption patterns and waste generation.

Figure 1. Average food waste per household categorized by household income category.

Table 3 illustrates the average food waste per household categorized by education level. It indicates a notable trend, whereby households headed by individuals with higher education levels tend to exhibit higher levels of food waste compared to those with lower education levels. This observation suggests a potential correlation between education and food waste behavior, implying that factors such as socioeconomic status and lifestyle choices may influence waste practices differently across the education strata.

Table 3. Average food waste per household categorized by the level of education.

Levels of Education	Average Food Waste per Household (Grams)
No formal education	2206
Apprenticeship	2222
Primary education	
Lower secondary education	7185
Upper secondary education	
Bachelor's degree	
Master's degree	7545
Doctoral studies	

Table 4 presents data on the weekly food waste quantities, measured in grams (g) per capita and per household, across various food categories in Kenitra (n = 442). The table provides insights into the amounts of food wasted at both the individual and household levels, contributing to the understanding of food waste trends within households.

The table data highlight bread as the most wasted food category in Kenitra, with an average of 362 g per family per week and 88 g per capita per week. Alcoholic beverages and soup also contribute significantly to household waste, at 202 g and 152 g per household per week, respectively. Interestingly, non-alcoholic beverages are the third most frequently discarded food category at the individual level, with an average of 38 g per person per week. It is worth noting that although alcoholic beverages feature prominently in the household waste results, they do not appear prominently at the individual level. These

insights highlight the different patterns of food waste across different categories and levels of consumption in Kenitra.

Table 4. Weekly food waste quantities (g) per capita and per household for various food categories in Kenitra (n = 442).

Food Category	Quantities (g/Capita/Week)	Quantities (g/Household/Week)
Bread	88	362
Alcoholic beverages	39	202
Non-alcoholic beverages	38	147
Soups	37	152
Fish	32	149
Potato products	31	133
Yogurt	28	141
Meat	27	132
Rice and remaining Grains	23	95
Fresh vegetables and Salads	22	98
Meat substitutes	22	117
Pasta	22	82
Non-fresh vegetables	21	89
Non-fresh fruit	21	82
Fresh fruit	19	85
Legumes	18	75
Potatoes	16	66
Eggs	12	61
Cereals	11	61
Bread toppings	7	32
Sauces	6	29
Crisps and nuts	5	19
Sweet snacks	3	15
Cheese	2	9
		2433

Table 5 provides insights into the household food waste trends across different food categories, showcasing the average weekly waste per household and estimated annual expenditure in MAD (Moroccan dirhams). The cost of wasted food was calculated based on the prices at the time of the survey. The table highlights significant variations in food waste levels among the food categories, with meat products exhibiting the highest amount of waste per household, followed by alcoholic beverages and fish. Conversely, cheese and sweet snacks show lower levels of food waste. It is worth noting that bread is subsidized in Morocco, which is one of the reasons why bread is wasted more.

The results depicted in Figure 2 provide valuable insights into the distribution of food waste among households in Kenitra. The data reveal that bread constitutes the highest percentage of food waste, accounting for more than 38% of the total waste. This is followed closely by fresh vegetables and salads, which constitute 22% of the waste, as well as non-fresh vegetables, which constitute 13%. Conversely, yogurt emerges as the food category with the least waste, comprising only 2% of the total waste. These findings underscore the significant variation in waste rates across different types of foods and highlight bread as the most commonly wasted item in this context.

When categorizing the waste into "unused food", "partly used food", "meal leftovers", and "leftovers after storage", bread emerged as the most commonly wasted product in the "meal leftovers that are disposed of" category, fresh vegetables and salads ranked second in this category, and pasta had the lowest rate of wastage among the "partly used foods—food that is disposed of after it is partly used" category (Table 6).

The survey results, as summarized in Table 7, reveal valuable insights into participants' attitudes toward food waste in their households. It is worth noting that the mean values

associated with each statement highlight the average levels of agreement or disagreement. More than 30% of the participants strongly disagreed with the reasons given. Specifically, 32% found it difficult to reuse leftovers when the quantity was small, 34% had difficulty preparing meals with foods typically available at home, and 35% reported difficulty cooking anything beyond familiar recipes. In addition, 38% admitted their preference for wasting food scraps to avoid spoilage, while 41% cited insufficient kitchen capacity as an obstacle to storing food leftovers. Furthermore, 47% admitted to leaving food in the refrigerator for a long time due to a lack of cooking knowledge. On the positive side, 48% of the participants strongly agreed that they do not experience difficulties and avoid food waste whenever possible, as evidenced by the high mean value of ≈ 4 for this statement. Conversely, 24% expressed uncertainty about their ability to reduce food waste and 7% strongly disagreed with this assertion, displaying diverse viewpoints within the population surveyed (Table 7).

Table 5. Average weekly food waste per household and estimated annual expenditure by food category in Kenitra.

Food Category	Average Weekly Waste per Household (g)	Estimated Annual Expenditure (MAD)
Bread	362	188.24-376.48
Alcoholic beverages	202	420.16
Non-alcoholic beverages	147	76.440
Soups	152	263.46
Fish	149	116.220–387.400
Potato products	133	69.160
Yogurt	141	219.96
Meat	132	686.400
Rice and remaining Grains	95	74.100
Fresh vegetables and Salads	98	254.80
Meat substitutes	117	182.520
Pasta	82	170.56
Non-fresh vegetables	89	46.280
Non-fresh fruit	82	63.960
Fresh fruit	85	53.040
Legumes	75	78.000
Potatoes	66	17.160
Eggs	61	211.46
Cereals	61	31.720
Bread toppings	32	16.640
Sauces	29	150.8
Crisps and nuts	19	98.800
Sweet snacks	15	15.60
Cheese	9	93.60

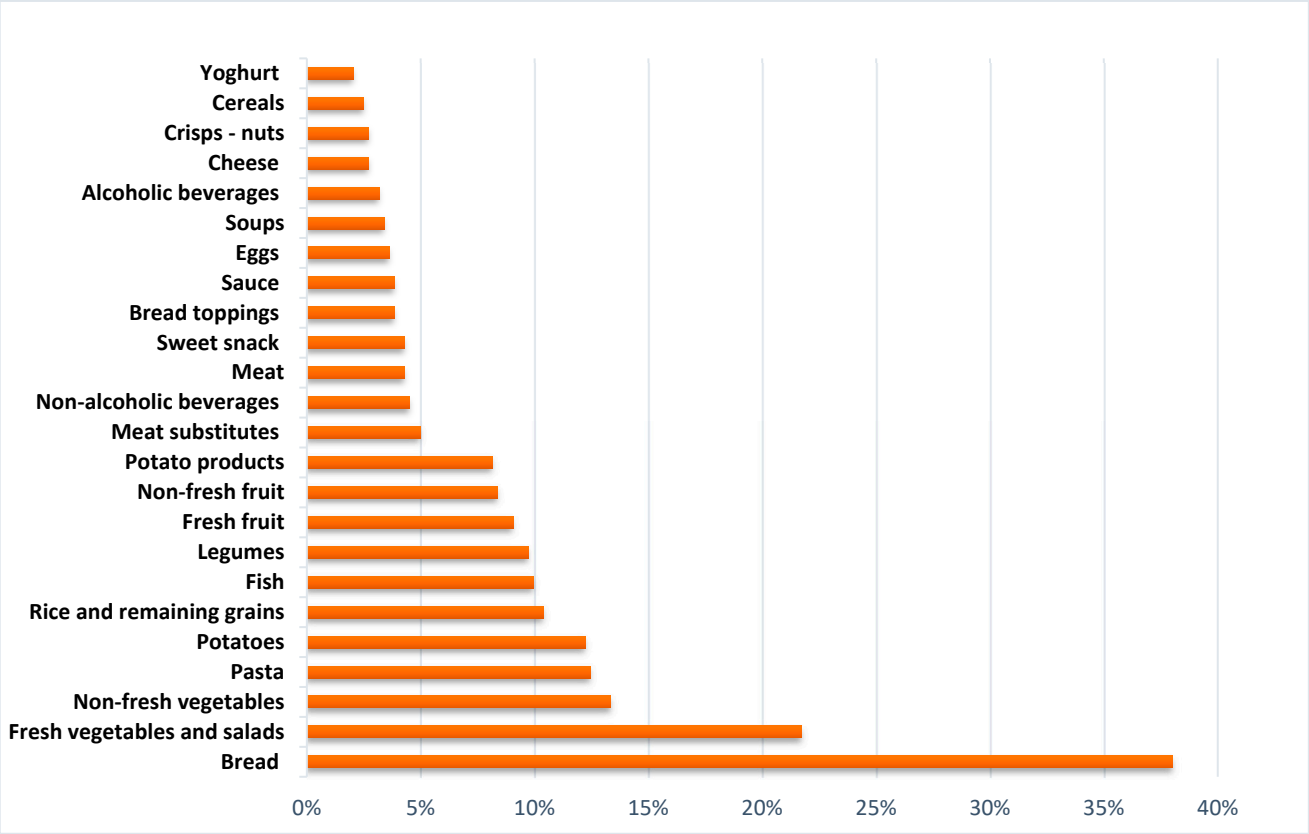

Figure 2. Percentages of food products wasted per household in Kenitra (n = 442).

Figure 3 shows that the majority of the respondents (60% and above) strongly agree that wasting food has consequences for the environment (65%), the economic well-being of their family (79%), future generations (72%), food availability around the world (74%), and poor and vulnerable people (74.2%), while 58% of the respondents strongly disagree and believe that food waste from their household has no major consequences.

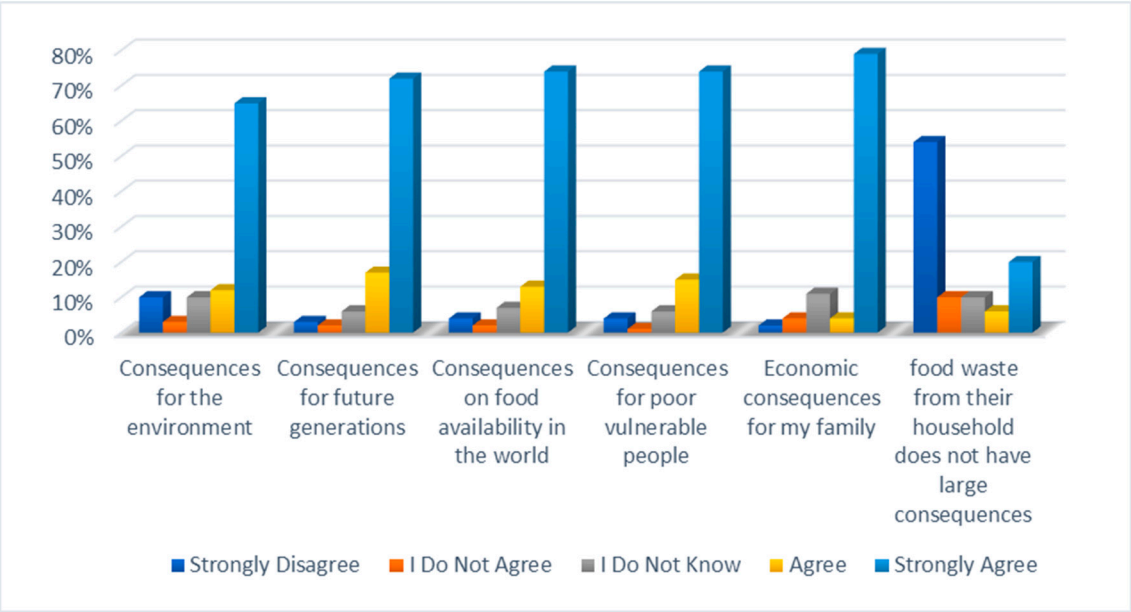

Figure 3. Evaluating household views on the consequences of food waste (n = 442).

Table 6. Disposal patterns of food products per week in household consumption.

Food Products	To Which Category Did the (Majority of) Disposed Food Belong			
	Completely Unused Foods: Food That Is Disposed of Which Is Not Used at All	**Partly Used Foods: Food That Is Disposed of after It Is Partly Used**	**Meal Leftovers: Meal Leftovers That Are Disposed of**	**Leftovers after Storage: Meal Leftovers That Are Disposed of**
	If YES			
Fresh vegetables and salads	21 (4.7%)	40 (9%)	78 (17.5%)	29(6.5%)
Non-fresh vegetables	18 (4%)	28 (6.5%)	51 (11.4%)	17 (3.8%)
Fresh fruit	22 (4.9%)	13 (2.9%)	32 (7.2%)	24 (5.4%)
Potatoes	12 (2.7%)	14 (3.1%)	53 (11.9%)	20 (4.5%)
Potatoes products	7 (1.6%)	9 (2%)	20 (4.5%)	9 (2%)
Pasta	3 (0.7%)	1 (0.2%)	2 (4.5%)	7 (1.6%)
Non-fresh fruit	15 (3.4%)	19 (4.3%)	30 (6.7%)	17 (3.8%)
Legumes	7 (1.6%)	23 (5.2%)	40 (9%)	24 (5.4%)
Rice	8 (1.8%)	23 (5.2%)	44 (9.9%)	20 (4.5%)
Meat	11 (2.5%)	29 (6.5%)	11 (2.5%)	24 (5.4%)
Meat substitutes	9 (2%)	9 (2%)	8 (1.8%)	6 (1.3%)
Non-Alcoholic beverages	6 (1.3%)	16 (3.6%)	31 (7%)	13 (2.9%)
Alcoholic beverages	21 (4.7%)	8 (4.7%)	14 (3.1%)	6 (1.3%)
Fish	19 (4.3%)	39 (8.7%)	21 (4.7%)	46 (10.3%)
Bread toppings	7 (1.6%)	14 (3.1%)	29 (6.5%)	16 (3.6%)
Candy/cookies/granola bars/chocolate bars	4 (0.9%)	15 (3.4%)	31 (7%)	10 (2.2%)
Crisps/nuts	6 (1.3%)	7 (1.6%)	22 (4.9%)	11 (2.5%)
Sauces	13 (2.9%)	10 (2.2%)	26 (5.8%)	15 (3.4%)
Cheese	9 (2%)	15 (3.4%)	17 (3.8%)	11 (2.5%)
Bread	21 (4.7%)	70 (15.7%)	45 (32.5%)	39 (8.7%)
Cereals	8 (1.8%)	8 (1.8%)	23 (5.2%)	9 (2%)
Curry/soup	6 (1.3%)	14 (3.1%)	22 (4.9%)	9 (2%)
Yogurt /custard	7 (1.6%)	6 (1.3%)	17 (3.8%)	8 (1.8%)
Eggs	5 (1.1%)	12 (2.7%)	25 (5.6%)	10 (2.2%)

Table 7. Respondents' opinions on the reasons for food waste in households (n = 442).

Rate the Reasons Listed below That Cause Food Waste in Your Household	Strongly Disagree	I Do Not Agree	I Do Not Know	Agree	Strongly Agree	Mean Value
For me, it is difficult to prepare a meal with the food I usually have at home (i.e., fridge, pantry/storage room, garden)	34%	22%	23%	7%	15%	2.455
For me, it is difficult to use leftovers to prepare new dishes	30%	18%	19%	12%	21%	2.769
For me, it is difficult to cook anything other than the recipes I know	35%	18%	21%	8%	18%	2.558
I usually leave food in the fridge for too long because I don't know how to cook it	47%	19%	16%	7%	11%	2.188
For me, it is difficult to reuse leftovers from meals when their quantity is small	32%	22%	21%	9%	17%	2.579
My household members do not like to eat the same kind of food in a row	21%	11%	24%	14%	29%	3.199
I rather waste leftovers from meals in order to avoid spoilage	38%	18%	21%	9%	15%	2.458

Table 7. *Cont.*

Rate the Reasons Listed below That Cause Food Waste in Your Household	Strongly Disagree	I Do Not Agree	I Do Not Know	Agree	Strongly Agree	Mean Value
I like to prepare meals of fresh food instead of leftovers for taste reasons	21%	13%	25%	15%	26%	3.132
I do not have enough capacity in my kitchen (e.g., fridge) to store food leftovers	41%	16%	22%	7%	13%	2.348
I avoid storing food leftovers in my fridge because it ends up as waste anyway in a while	26%	17%	24%	9%	24%	2.875
I do not have difficulties and avoid food waste whenever possible	7%	9%	24%	13%	48%	3.86
		100%				

4. Discussion

Tackling food waste remains a pressing issue in developing countries such as Morocco. Understanding the complex interplay between societal, economic, and cultural factors is critical in addressing this challenge. The survey results, as shown in Table 1, provide valuable insights into the demographic and economic characteristics of the respondents. First, it is important to delve into the fundamental issue of food waste. By discussing different aspects of food waste, such as its environmental and economic impacts, it is possible to come to a comprehensive understanding of the problem. The study reveals a balanced distribution between genders, with both genders making up 50% of participants, indicating a broad representation of the population. Furthermore, the majority of participants fell within the 18 to 34 age range, which is consistent with broader demographic trends. It is worth noting that the data indicate a relationship between an individual's education level and food waste behavior. Although 29% of participants with a bachelor's degree showed a greater tendency to reduce food waste, education appears to be an important influencing factor in shaping attitudes toward food waste. Furthermore, the disparity in income levels, ranging from 36,000 MAD to 180,000 MAD, highlights the socioeconomic differences that influence food spending patterns. This discrepancy highlights the importance of considering broader influences such as the economic situation and institutional support in tackling food waste.

The observed relationship between household size and food waste (Table 2) has important implications for efforts to address food waste at the household level. Interventions aimed at reducing food waste should consider the unique challenges faced by larger households, such as meal planning, portion control, and storage practices. Educational initiatives targeting larger households could focus on strategies for optimizing food utilization, reducing over-purchasing, and creatively repurposing leftovers. By tailoring interventions to address the specific needs of different household sizes, stakeholders can effectively mitigate food waste and promote more sustainable consumption patterns. This finding is consistent with previous research indicating that household size plays a significant role in shaping food waste behavior [27].

The data on the average food waste per household across different income levels (Figure 1) reveal interesting insights into the consumption behaviors and economic factors influencing food waste. Individuals from higher-income households tend to waste more food, such as bread, compared to those from lower-income households. This observation could be attributed to various factors such as affordability, lifestyle choices, and consumption patterns. The studies by Quested et al. [27] and Stenmarck et al. [28]. corroborate these findings, highlighting the complex interplay between socioeconomic status and food waste behavior. Additionally, policy interventions and educational campaigns aimed at promoting responsible consumption practices and reducing food waste may benefit from targeting specific income groups to address disparities in waste generation.

Table 3 presents a striking pattern of food waste distribution across various levels of education. It reveals that households led by individuals with higher education levels, such as bachelor's, master's, or doctoral degrees, exhibit significantly higher levels of food waste compared to those with lower educational attainment [29]. These findings challenge the conventional assumptions that higher education correlates with a greater awareness of sustainable practices. Instead, it suggests that factors beyond education, such as income, lifestyle, and cultural norms, may play pivotal roles in shaping food waste behaviors [30]. These insights underscore the need for nuanced approaches to address food waste, taking into account diverse socioeconomic and cultural factors. Tailored interventions and educational campaigns should be designed to target specific demographic groups, considering their unique contexts and behavioral drivers.

The findings presented in Table 4 shed light on the significant food wastage trends observed in Kenitra. It is evident that bread emerges as the predominant food category prone to wastage, maintaining this status across both per household and per capita measurements. This aligns with the findings of previous studies that highlight bread as a commonly discarded food item due to factors such as surplus purchasing and inadequate storage practices [27,31]. This is also consistent with widespread observations in Arab Mediterranean countries, where studies in Algeria, Egypt, Lebanon, Morocco, and Tunisia found that cereals and baked goods, especially bread, were being wasted on a large scale; some households waste up to 20% of their baked goods, highlighting the significant loss of valuable food resources [32].

Importantly, the data show that other perishable foods, such as fruits and vegetables, are also included among the most discarded items. This suggests that despite being highly nutritious, some of these essential foods are still wasted. These findings highlight the need for the prudent use of fresh produce [33–35]. Additionally, the analysis shows high levels of soup waste, ranking it as the third most wasted food category at the household level. This finding indicates the challenge of managing soup waste due to factors such as portion sizes, cooking methods, and leftovers. This trend is consistent with the conclusions of Stenmarck [28], which highlight the importance of portion control and meal planning to reduce cooked food waste. Furthermore, the observation that soft drinks rank third in terms of per capita waste indicates a worrisome trend. These drinks are often packaged and bottled, and have a significant environmental impact when disposed of. A study conducted by Parizeau et al. [33] pointed to the need to pay attention to beverage waste due to the associated resource consumption.

Table 5 highlights the need for effective measures to reduce food waste, considering the economic implications for households, as emphasized by Quested et al. [27]. The high estimated annual expenditure rates, such as those for meat, alcoholic beverages, and fish, indicate significant financial losses associated with food waste. These losses not only affect household budgets but also contribute to broader economic inefficiencies and environmental impacts, as noted by Stenmarck et al. [28].

Efforts to reduce food waste can benefit from targeted interventions at multiple levels, including consumer education, the improvement of food storage and preservation techniques, and policy initiatives aimed at reducing waste throughout the supply chain. As demonstrated by a study by WRAP in 2019 [31], reducing food waste can enable households to save money, alleviate financial burdens, and contribute to more sustainable consumption patterns.

The data illustrated in Figure 2 underscore bread as the primary food category susceptible to waste in Kenitra, maintaining this status across both household and individual levels. This observation echoes recent global research identifying bread as a commonly wasted food [36]. Additionally, grain prices have increased in the post-pandemic period, raising concerns about bread wastage [37]. Using effective storage methods can play an important role in reducing avoidable bread waste [38]. Post-pandemic grain price increases have increased production costs and bread prices, further exacerbating the issue [39]. Correct storage techniques are believed to enable reductions in preventable food waste [40].

Edible bread is also wasted during the manufacturing process, often due to the production of substandard products or manufacturing agents. Consumer preferences also contribute to bakery product waste, such as the strong demand for crustless sandwich loaves [41].

Some studies advocate for alternative packaging solutions for consumers to increase bread freshness and reduce waste [42], while others emphasize the importance of consumer preferences and behaviors in bread disposal [43]. Therefore, any reduction strategy must consider these various factors [42].

The survey results in Table 6 show a significant trend in terms of food wastage patterns, with bread emerging as the most commonly discarded food item among leftovers, as reported by 33% of the respondents (n = 145). This finding is particularly noteworthy, as bread is a staple food in many households and is often regarded as a basic necessity. The high percentage of bread wastage may be attributed to factors such as its perishable nature, the potential for mold growth, and consumer purchasing habits.

Fresh vegetables and salads ranked second in the "meal leftovers that are disposed" category, with 18% of respondents (n = 78) mentioning them. This result underscores the challenges associated with disposing of meal leftovers, which may not be significantly addressed by simply focusing on maintaining the freshness of perishable items for longer periods and suggests that efforts to reduce food waste should focus on strategies such as educating consumers about the proper storage (e.g., in a cooled environment) of these products or encouraging more mindful consumption.

A striking and perhaps unexpected result is the remarkably low rate of wastage for pasta in the "partly used foods—food that is disposed of after it is partly used" category, with only 0.2% of respondents (n = 1) indicating it was a discarded item. This finding suggests that pasta, with its longer shelf life and versatility in preparation, may be perceived as a more sustainable and less wasteful option compared to other food items. It could be valuable for policymakers and food industry stakeholders to explore the factors contributing to this low wastage rate for pasta and consider promoting similar practices for other food items.

Regarding the food waste reasons (Table 7), they are complex and multifaceted; they vary from person to person, from culture to culture, and from one country to another. The majority of respondents strongly agreed that they do not have difficulties and avoid food waste, although this contrasts with the relatively high wastage rates of bread, vegetables, and fruits [44]. In Tunisia, the reasons for food waste include items being in the fridge or cupboard for too long [45].

The results shown in Figure 3 provide insight into households' perceptions of the impact of food waste in Kenitra. The participants indicated a strong understanding of the multiple impacts of food waste on environmental, economic, social, and ethical dimensions. The majority of the participants (over 60%) strongly agreed that various aspects of the environment and society are significantly affected by food waste. While 65% of the participants expressed their awareness of the environmental impact of food waste, it is essential to clarify that this study did not directly measure or confirm this impact. Therefore, the study cannot conclusively state that the results are consistent with previous studies that have confirmed the environmental impact of food waste. However, the high level of awareness among the participants does highlight a growing global concern about the environmental consequences of wasteful consumption practices [46,47]. In addition, the majority of the respondents (79%) were aware of the impact of food waste on their household budget. This perspective focuses on the economic burden that food waste imposes on households and understanding the economic costs of wasteful behavior. Similar findings have been reported in previous studies investigating the economic impact of food waste in households. However, it is important to note that the study did not directly measure the economic impact of food waste. Therefore, while parallels can be drawn with the existing research, this study cannot make direct comparisons or conclusions regarding the economic impact. The impact on the household economy is notable, likely influenced by the average annual household income range of 36,000–60,000 MAD [48]. Concerns about future generations

and global food availability are also evident in the survey results, with 72% and 74% of respondents, respectively, strongly agreeing that these aspects are negatively affected by food waste. This shows that the respondents realize that waste today has a long-term impact on the well-being and livelihoods of future generations. The recognition of these implications is consistent with broader discussions about sustainability and intergenerational equity in relation to food waste [7].

At the same time, 74% of the respondents strongly agreed with the idea that food waste negatively impacts vulnerable people and expressed sympathetic concern about the impact of wasteful practices on society. This empathetic perspective aligns with broader societal discourses on social justice and food security [49]. In contrast, 58% of the respondents expressed a strong disagreement with the notion that wasting food at home has serious consequences. This divergence in opinions presents a compelling contrast to the overall agreement observed in responses to previous statements. To delve into this intriguing contrast, it is worth considering potential factors influencing individuals' attitudes towards food waste. It is possible that social desirability bias played a role in shaping responses to the previous statements, where individuals may have been inclined to align their answers with perceived societal norms. Additionally, an interesting avenue for exploration is whether respondents differentiate between 'general' statements and personal issues. Notably, the last statement directly addresses actions within their own homes, introducing a more personal dimension. Understanding whether respondents make such distinctions could offer valuable insights into the nuanced dynamics shaping individuals' perspectives on food waste and its perceived impacts.

Consumers generally consider discarding food to be an inappropriate behavior [50], and consumers may or may not produce (more) food waste than other consumers. Consumer food waste levels can vary depending on factors such as shopping habits, meal planning, portion control, awareness of expiration dates, and attitudes toward leftovers. Some consumers actively minimize waste through careful planning and storage, while others may discard items more readily. Socioeconomic status, lifestyle, and cultural influences also impact food waste habits. The majority of households in other studies reported having at least some concern about throwing away food [51–56]. Concern about food waste is an important predictor of food waste reductions [53,56] and plays an important role in intentions to reduce food waste [42,57,58].

In some Arabic countries, such as Morocco, the disposal of purchased and prepared meals significantly escalates during traditional events, including weddings and religious ceremonies such as Ramadan, leading to substantial food wastage [59]. The fasting month of Ramadan, marked by religious significance, shows a notable surge in food waste due to the practice of cooking excessive amounts, surpassing actual needs, resulting in leftover disposal [60–62]. While this cultural pattern persists, the COVID-19 pandemic has brought attention to vulnerabilities in production and consumption systems. Interestingly, it has also induced a reduction in household food waste in many countries, although the extent of this trend varies based on factors such as local lockdowns, supply chain disruptions, and individual circumstances [63,64].

Turning to the drivers of and concerns for food waste reductions, personal financial motivation emerges as a predominant force [44,48,49]. Studies reveal a nuanced perspective, indicating that environmental concerns hold a modest place in the minds of respondents compared to financial considerations. Various factors influence environmental concern, with sociodemographic factors such as education and age playing significant roles. While global warming and resource use rank lower in relation to this concern, an individual's education level appears to moderately influence their attitudes toward environmental issues. However, the correlation between an individual's education level and food waste behavior is complex, with mixed results observed in studies. Some studies suggest that higher education is associated with reduced food waste, while others indicate an increase. This complexity may stem from cultural factors and the effectiveness of educational campaigns.

Further research is necessary to understand and address these dynamics for effective food waste reduction strategies.

Recent studies underscore the significant correlation between the education level and food waste behavior in households [49,64]. Porpino [49] found that individuals with higher education levels demonstrate greater awareness and knowledge regarding food waste reduction strategies, leading to more conscious consumption habits and reduced waste generation. Similarly, Schanes et al. [65] observed that higher education levels are linked to more environmentally conscious behaviors, including reduced food waste practices. These findings highlight the pivotal role of education in shaping attitudes and behaviors related to food waste, indicating the potential for educational interventions to mitigate waste at the household level. By fostering awareness and providing practical strategies for waste reduction, educational initiatives have the potential to empower individuals to make informed choices and contribute to sustainable food consumption patterns.

Furthermore, several scholars [27,66–68] highlight demographic differences in attitudes toward food waste. In general, younger individuals prioritizing financial dimensions, while older demographics express greater concern about the social and environmental consequences of food waste [27].

Regarding global efforts and strategies, efforts to combat food waste are challenged by unconscious behavioral factors that vary across consumer groups [69]. Recognized as a significant economic, environmental, and ethical issue, food waste necessitates interventions such as consumer education campaigns promoting responsibility and competence [70,71]. Integrating norm activation theory into reduction strategies can help align personal norms and promote self-efficacy [72]. Acknowledging the potential at the household level, food waste reductions contribute to improvements in food security and advancements in food system sustainability within the framework of circular economy approaches [29,46,47,73]. This comprehensive approach spans various factors, including infrastructure, energy, markets, and education [74].

Based on the findings of this study on food waste behavior in Kenitra, several interventions and solutions can be proposed to mitigate the problem and promote sustainable consumption practices:

- Mobile application development: The development of a mobile app offering creative recipes and meal ideas to utilize leftover bread effectively could help address the high waste rates of bread in Kenitra households. Such an app could provide cost-effective solutions, considering the significant economic implications of wasted bread.
- Online platform for food sharing: The establishment of an online platform facilitating the exchange of surplus produce and prepared meals among community members could help target food categories such as fresh vegetables and salads, fostering social connections while reducing food waste.
- Educational campaigns and workshops: Educational campaigns and workshops to address challenges identified in the survey, such as difficulty in meal preparation, reusing leftovers, and exploring new recipes, could help provide practical tips and waste reduction techniques to Kenitra households.
- Policy advocacy and support: Advocating for policies supporting food recovery, composting, and donation programs could help incentivize waste reduction efforts. Policies addressing challenges such as insufficient kitchen capacity and a lack of cooking knowledge and skills could help encourage businesses and households to minimize waste.
- Community engagement and outreach: The mobilization of collective action through community engagement initiatives involving diverse stakeholders could help support local solutions such as community composting projects, gleaning programs, and neighborhood food exchanges.

Food waste reductions are crucial for achieving the Sustainable Development Goals (SDGs), yet there is a gap in understanding the contributing factors. Morocco's commitment to halving the per capita food waste by 2030 highlights the urgency of addressing this

issue [75]. The study proposes a set of practical recommendations aimed at addressing the food wastage issue and fostering sustainable consumption practices in the Kenitra province and beyond. Educational campaigns should target households across diverse socioeconomic backgrounds to raise awareness about the environmental, economic, and social consequences of food waste and to promote behavior change. Meal planning workshops can help educate individuals on techniques to minimize waste, while community initiatives such as food-sharing programs can redistribute surplus food to those in need. Policy interventions, technology solutions, and school curriculum integration are also essential components of a comprehensive approach to tackling food waste. The Moroccan government should prioritize food loss and waste reductions by implementing targeted strategies for storage and consumption nodes. Initiatives such as replacing bread subsidies with vouchers and raising public awareness could lead to enhanced food security and help conserve resources [76]. The implemented strategies should be gender-sensitive and promote healthier choices while managing stockpiles and supporting sustainable shopping habits [77]. The advised strategies should also take into consideration the lessons learned during the COVID-19 pandemic [78] to foster the resilience of the Moroccan food system. Particular attention should be paid to reducing bread wastage by combining reforms for food support policies, awareness campaigns leveraging cultural significance, and efficient resource management strategies [79].

5. Conclusions

In conclusion, the insights derived from this study shed light on the causes and effects of food waste in Kenitra. The primary objective was to comprehend both the types and quantities of wasted food in the region and to gain insights into individuals' perspectives on this matter in order to suggest solutions and interventions that can address the food waste issue and consequently mitigate its impacts.

The findings indicate that bread is the most wasted food item, closely followed by vegetables and salads. This observation emphasizes the significance of staple foods in Kenitra's culinary practices and highlights the necessity for targeted interventions to address waste in these categories. Furthermore, the analysis links the prevalence of food waste to broader issues such as food insecurity and global grain crises, underscoring the urgency of waste reduction efforts in vulnerable regions.

While there is evidence of growing awareness among households about the consequences of food waste, this study suggests that this awareness has yet to translate into substantive behavioral changes. To foster meaningful change, there is a need to deepen the public understanding of the economic and environmental impacts of food waste. Advocacy for initiatives that promote public awareness and educational programs tailored to local contexts is essential, aiming to instill a more responsible approach to food consumption and waste management.

In summary, this study underscores the critical need for concerted efforts to address food waste in Kenitra. By raising the awareness of the economic, environmental, and social implications of wasteful practices, a shift towards a more sustainable and resilient food system in the region can be catalyzed.

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Informed Consent Statement: All participants received comprehensive information regarding the assurance of their anonymity, the purpose of the research, and the intended use of the data in case of publication. Prior to conducting the study, ethical approval was obtained from the relevant ethics committee, as is customary for all research involving human subjects.

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