

Hochschule für Angewandte Wissenschaften Hamburg Hamburg University of Applied Sciences

Assessing the knowledge and behaviour of migrants on Food waste and its consequences in Hamburg, Germany

MASTER THESIS Submitted to the Hamburg University of Applied Sciences, Hamburg. Faculty of Life Sciences In Partial Fulfillment of the Requirements For the Degree Master of Public Health (MPH)

Submitted by: Sannia Ali

First Examiner: Prof. Dr. Walter Leal Second Examiner: Dr. ZubiaWaqar Due date: **15.11.2022**

Table of Contents

List of Tables	v
List of Figures	vi
List of Acronyms and Abbreviations	vii
Acknowledgment	viii
Confidentiality Statement	xi
Abstract	x
Chapter 1: Introduction	
1.1 Background	
1.2 Problem statement	
1.3 Rationale of the Study	
1.4 Research objectives	
Chapter 2: Literature review	
2.0 Review of Related Literature:	
2.1 Food wastage: A global challenge	
2.2 Review of existing studies: Consumer knowledge and behavi and its consequences	or on food waste
2.3 Habermas' Theory: Knowledge and Human Interest	
2.4 Reason or factors that cause food waste	
2.5 Factors influencing food waste at the consumer level	
2.5.1 Food-related household practices and routines	
2.5.2 Concern	
2.5.3 Norms and perceived behavioral control	
2.6 Association between socioeconomic factors and food waste	
2.7 Adverse effects of food waste on earth	
2.8 Overview of food waste in Germany	
2.8.1 Overview of food waste in different countries	
2.9 Actions against food waste at the consumer level in Germany	and different
countries	
Chapter 3: Research Methodology	
3.1 Materials and Methods	
3.2 Study design	
3.3 Study population, and setting	
3.4 Study Duration	

3.5	Sample Size estimation (n)	. 48
3.6	Sampling technique	. 49
3.7	Sample Selection	. 49
3.	7.1 Inclusion and exclusion criteria of Migrants	. 49
3.8	Data collection tool	. 50
3.	8.1 Structure of the questionnaire	. 50
3.9	Data collection Procedure:	. 51
3.	9.1 Data Management	. 52
3.10	Statistical Analysis	. 52
3.11	Ethical Considerations	. 53
3.12	Operational definitions	. 53
1.	Food waste	. 53
2.	Migration /Immigrants	. 53
3.	Consumer Behavior	. 53
Chapte	er 4: Results	. 55
4.1	(A) Socio demographic characteristics of the respondents	. 55
4.1	(B) Origin of study Subjects	. 58
4.2	Food shopping behavior of study population	. 59
4.3	Food consumption behavior	. 61
4.4	Consumer's food waste knowledge and behavior	. 63
4.5 soci	Association of Food shopping and consumption behavior of study subjects wi oeconomic parameters.	th . 70
4.6 soci	Association of food waste knowledge and behavior of study participants with o economic parameters	. 71
Chapte	er 5 : Discussion, Conclusion and Recommendation	. 75
Disc	cussion	. 75
5.1	Consumer's food shopping behavior	. 75
5.2	Consumer's Food Consumption Behavior	. 77
5.3	Consumer's Food wastage Knowledge and Behavior to reduce it	. 79
5.4	Conclusion	. 83
5.5	Limitation of the study:	. 84
5.6	Strength of the study:	. 85
5.7	Recommendations	. 85
5.	7.1 Financial instrument and Regulation	. 85
5.	7.2 Awareness and education campaigns	. 86
	$\begin{array}{c} 3.5\\ 3.6\\ 3.7\\ 3.\\ 3.8\\ 3.\\ 3.9\\ 3.\\ 3.9\\ 3.\\ 3.10\\ 3.11\\ 3.12\\ 1.\\ 2.\\ 3.\\ Chapter 4.1\\ 4.1\\ 4.2\\ 4.3\\ 4.4\\ 4.5\\ soci 4.1\\ 4.1\\ 4.2\\ 4.3\\ 4.4\\ 4.5\\ soci 6\\ 5.1\\ 5.2\\ 5.3\\ 5.4\\ 5.5\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.\\ 5.6\\ 5.7\\ 5.\\ 5.\\ 5.\\ 5.\\ 5.\\ 5.\\ 5.\\ 5.\\ 5.\\ 5.$	 3.5 Sample Size estimation (n) 3.6 Sampling technique. 3.7 Sample Selection 3.7.1 Inclusion and exclusion criteria of Migrants 3.8 Data collection tool. 3.8.1 Structure of the questionnaire 3.9 Data collection Procedure: 3.9.1 Data Management. 3.10 Statistical Analysis. 3.11 Ethical Considerations. 3.12 Operational definitions. 1. Food waste 2. Migration /Immigrants. 3. Consumer Behavior Chapter 4: Results. 4.1 (A) Socio demographic characteristics of the respondents. 4.1 (B) Origin of study Subjects. 4.2 Food shopping behavior of study population. 4.3 Food consumption behavior. 4.4 Consumer's food waste knowledge and behavior of study subjects wisocioeconomic parameters. 4.6 Association of Food shopping and consumption behavior of study subjects wisocioeconomic parameters. Chapter 5: Discussion, Conclusion and Recommendation. Discussion 5.1 Consumer's food shopping behavior 5.2 Consumer's Food consumption Behavior. 5.3 Consumer's Food shopping behavior 5.4 Conclusion and Recommendation. 5.5 Limitation of the study: 5.6 Strength of the study: 5.7 Recommendations. 5.7.1 Financial instrument and Regulation. 5.7.2 Awareness and education campaigns.

5.7.3	Further research	
Reference	°S	xi
Annexure		xviii
Annexure	I: The Questionnaire	xviii
Declaration	of Honour	xxiii

List of Tables

Table 1: Overview of studies on socio-demographic characteristics	38
Table 2: Summarizes the efforts and ongoing projects in different countries on	
reducing/preventing food waste	46
Table 3(A): Frequency Distribution of Demographic Variables	55
Table 3(B): Frequency Distribution of Country Origin of Study Subjects	58
Table 4: Frequency distribution of Food Shopping Behavior of study subjects	59
Table 5: Frequency distribution of Food Consumption Behavior of study subjects	62
Table 6: Frequency distribution of Food wastage Knowledge and Behavior of study subjects.	64
Table 7: Association of Food shopping and consumption behavior of study subjects with	
socioeconomic parameters	70
Table 8: Association of Food waste Knowledge and behavior of study subjects with	
socioeconomic parameters	71
Table 9: Correlation of Food shopping and consumption behavior of study subjects with	
socioeconomic parameter	73
Table 10: Correlation of Food Waste Knowledge and behavior of study subjects with	
socioeconomic parameters	74

List of Figures

Figure 1: Food waste (2015) and avoidable shares in Germany (1,000 t /)	15
Figure 2: Food losses and waste definition along with the FSC	19
Figure 3: Impact of food waste	21
Figure 4: Causes of food waste at different phases of the food supply chain	27
Figure 5: Food-related household practices and routines	30
Figure 6: food waste Hierarchy	34
Figure 7: Impact of food consumption on the environment	39
Figure 8: Consequences of food waste	41
Figure 9: Percentages of food waste in Germany in different areas of the food value chain	42
Figure 10: Annual per capita household food waste of selected countries worldwide	44
Figure11: Research design flow chart	54
Figure12: Age distribution of respondents	56
Figure13: Gender distribution of respondents	56
Figure14: Qualification Distribution of Respondents	57
Figure15: Household Composition Distribution of Respondents	57
Figure 16: Income Distribution of Respondents	58
Figure 17: Distribution of checking what is already in-house	61
Figure 18: Distribution of use of shopping list while shopping	61
Figure 19: Distribution of eating leftover meals	63
Figure 20: Distribution of type of food wasted	67
Figure 21: Distribution of food wastage reasons among migrants	67
Figure 22: Distribution of uneaten food disposal	68
Figure 23: Distribution of differences in behavior regarding food waste	68
Figure 24: Distribution of migrants' behavior regarding impact of food waste on world	69
Figure 25: Distribution of behavior regarding minimization of food waste	69

List of Acronyms and Abbreviations

BMEL	Bundesministerium für Ernährung und Landwirtschaft
BVE	Bundesvereinigung der Deutschen Ernährungsindustrie
CO2	Carbon dioxide
EC	European Commission
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FL	Food Loss
FSC	Food Supply Chain
FW	Food waste
GHG	Greenhouse Gas
GWPP	German Waste Prevention Program
IPCC	Intergovernmental Panel on Climate Change
NGO	Non-Governmental Organization
REWE	Revisionsverband der Westkaufgenossenschaften.
SDGs	Sustainable Development Goals.
UK	United Kingdom
UNEP	United Nations Environment Program
USA	United States of America
WHO	World Health Organization
WRAP	Waste and Resources Action Programme

Acknowledgment

First and foremost, I would like to express the sincerest gratitude to the One, the Almighty, and the Merciful Lord for blessing me with the mental faculties and the strength to write this thesis.

It gives me immense pleasure to express that I was allowed to be mentored, coached, and guided through the entire process of my thesis by such an excellent and inspirational individual Prof. Dr. Walter Leal (Head, Research and Transfer Centre "Sustainable Development and Climate Change Management) as he agrees to become my first supervisor. His guidance and throughout support imparted such great confidence in me through and I appreciate all of the time he gave to me during this process.

I want to particularly appreciate and express my respect for Dr. Zubia Waqar, given her level of unwavering support and guidance. I appreciate the number of hours she put in, despite how busy her schedule has been, to answer every question and help me with even the minutest of problems. Her role as my second supervisor was unforgettable and I owe her my wholehearted appreciation.

I would like to express my gratitude to my MPH Coordinators, Ms. Wiebke Bendtand Mr. Gunnar Paetzelt for being supportive throughout my MPH course journey. My heartfelt thanks to Ms. Wiebke Bendt, for her constant encouragement and all-around support. My sincere thanks to my fellow mates of the MPH course for simply being there whenever I needed any kind of assistance.

Last but not least I would like to thank my family, friends, and particularly my husband, S.M.Ali for being supportive all along with my career. Without your support and the support of the rest of the family, I would never have found the perseverance or drive to accomplish these goals.

Confidentiality Statement

I, SANNIA ALI, hereby agree to

• Maintain the strictest silence on any confidential information I receive for my Master's Thesis.

• Use confidential information only for the preparation and implementation of activities in this project and not disclose it to a third party without the explicit permission of the supervisor or the company/institution.

• Return all confidential information upon request by the supervisor or the company/institution and erase all information on all electronic media, whereas the above obligations of confidentiality remain valid.

• Ensure that no confidential information and documents can be read by third parties. Confidential information and documents in this sense are all managerial, technical, financial, or other information that the company/institution has revealed on whatever way.

The information which is already common knowledge, are generally known without violation of the above items or made known by a third party without breach of any confidentiality obligation are not regarded as confidential.

This declaration is effective for a period of two years upon delivery of the Master Thesis.

(Date) (Signature of declarant)

Part I:

Abstract

Background and aims: Food waste has gained attention due to its adverse effect on environment, economic and social implication on the globe. Surprisingly, around the globe and within Germany, household are the major contributor in generating food waste. Beside that the phenomena of food waste at consumer level is complex and multi factorial thus requires in-depth analysis. The study is aimed at analyzing migrants' knowledge and behavior regarding food waste based on the practices of food consumption, food wastage, and individual food shopping behavior and how far individuals are aware of the problem associated with food waste. Moreover, the proposed study will also point out the association of socioeconomic factors with the knowledge and behavior of migrants.

Materials and Method: An online survey based cross-sectional study was conducted from March 2022 to April 2022 among the migrants residing in Hamburg, Germany. A structured questionnaire was delivered to different migrants. The data was analyzed using SPSS version 20. Mann whitney U and Kruskalwallis test were used to find an association between study variables. p-value ≤ 0.05 was kept significant. Spearman correlation was used to find correlation between variables.

Results: Majority of the participants showed a positive behavior of food shopping/consumption and close to good practice for reducing food waste. 94% showed concern about food wastage and tried to avoid it. However, regarding awareness on food waste consequences most of them acknowledged financial losses, rather than environmental and social loss. More than half of the respondents reported a lack of appropriate planning and purchasing as a main reason of food waste. Regarding food shopping and consumption behavior statistically significant association established between different categories of country and frequency of food grocery (p=0.048) as well as income and frequency of checking what is already in house before shopping (p=0.042).

Conclusion: Despite the different nationalities of participants, majority of them indicated positive and similar behaviour of food shopping, consumption and food wastage. Food waste should strongly be discussed on different public platforms. Awareness campaigns with other supplementary activities should be carried out that provide deeper information regarding food waste impact, particularly on the environment and social aspects.

Keywords: Food waste, Migrants, Consumer behavior, Knowledge, Environment, socioeconomic factors.

Part II:

Chapter 1: Introduction

1.1 Background

The substantial spike in the amount of food wastage in the past few years has become a major challenging and sustainability issue all over the globe. Food wastage is gaining concern not only in terms of economic and societal losses. The growing evidence reveals that it has gained more attention due to its adverse environmental consequences which include loss of natural resources, pollution, and additional greenhouse gas emission(Aschemann-Witzel, de Hooge, Amani, Bech-Larsen, & Oostindjer, 2015). Globally 30 % or 1.3 billion tons of food produced for human consumption is wasted every year, according to an estimate calculated by the Food and Agricultural Organization of the United Nation (FAO, 2013, p.6). Food waste occurs at every stage of the food supply chain but in developing countries majority of the wastage occurs at the post-harvest and processing level while in industrialized countries more than 40 % of losses take place at the retail and consumer phase (FAO, 2013, p14). The reason for food waste in the middle and high-income nations is mainly due to socio-economic and cultural decisions made by producers and consumers. Additionally, it also depends upon the consumer's behavior which includes impulsive buying, lack of planning of meals, overcooked or food left in the fridge for too long, improper knowledge of food storage, etc. Whereas, in developing countries, food loss occurs due to unfavorable climatic conditions, poor harvesting techniques, insufficient storage, and cooling facilities, and lack of infrastructure for food transport and marketing (Leal Filho et al., 2021).

Due to different methods of measuring food waste across countries, consistent and transparent data on the actual amount of food waste is still lacking. Although a broad estimate according to the UNEP Food Waste Index report suggests that annually almost 931 million tons of food is wasted, out of which 570 million tones is produced at the household level which is more predominantly seen in developed nations. The same report further reveals that 74kg per capita is the average recorded food waste (United Nations Environment Programme, 2021,p.4). However, in Europe, each year approximately 88 million tones corresponding to 179 kg per capita cost of food get wasted costing

approximately 143 billion Euros. Surprisingly two-thirds of the food waste cost associated with household food waste estimates 98 billion euro's (Stenmarck et al., 2016,p.5-8). The amount of food waste, as reported by the Danish Environmental Protection Agency provides astonishing data. A typical Danish family annually produces 304 kg of food waste out of which 168 kg can be edible by the consumers (Gjerris & Gaiani, 2013). As per the common assumption, US household food waste should be high but surprisingly the data estimates below an average 94 kg/capita/year (United Nations Environment Programme, 2021, p.20).

As stated by the Scientific Advisory Boards on Agricultural Policy, Food, and Consumer Health Protection, the occurrence of food waste affect various dimensions, from environmental and economic to moral aspects. For example, the process of food production uses many valuable resources such as soil, water, energy, and fuel. The energy required for the production, harvesting, packaging, and distribution of food generates 3.3 billion metric tons of carbon dioxide ('National Strategy for Food Waste Reduction', n.d.).Furthermore, food waste contributes to high costs for collection, transport, separation, and treatment in waste management facilities leading to national financial loss. Besides that, 815 million people do not have enough food to live a healthy life. Nearly 25% of individuals in developing countries are undernourished (United Nations Environment Programme, 2021, p.20).

There is still an ongoing debate that which phase of the food supply chain contributes largely toward food waste. This is mainly due to non-presence of a harmonized universal method to measure food waste. Surprisingly many countries are still not obliged to report their national data (Giordano & Franco, 2021., Leverenz et al., 2021). But according to((Farr-Wharton et al., 2014) analysis, the most considerable quantities of food are being wasted at the consumer level. Although two-thirds of food waste produced at the consumption stage can be possibly avoidable. Besides that the same author further stress that food waste is mainly influenced by consumer knowledge and behaviour. However, it is also noted that consideration of edible and suitable food for human consumption varies

from person to person based on their cultural and religious factors and as well as on social norms(Leal Filho et al., 2021).

To assess the consumer food wastage behaviour, (Ahmed et al., 2021) conducted a study on food waste at the household level in the United States. In summary, the study found that the majority of the study participants underestimated their food waste and many of them are unaware of the associated problems that arise due to food waste. On the other hand, the author of the study also noticed that the participant's decision to dispose off food, vary and its truly based upon socio-economic and contextual factors which include saving money, easy access to food, price, the smell of food, handling of leftover, and setting a positive example, particularly for children. Surprisingly, saving the environment is the least reported cause. The author found a gap between consumers knowing that food waste has huge negative environment, economic and social implications Another study was conducted by (Schmidt et al., 2019) in Germany to estimate the amount of food waste occurring at the household level. The study was able to analyze the general estimate of the food waste volumes but was unable to identify how individuals perceive food wastage and how far they are aware of the magnitude of the problem associated with food-waste.

The growing awareness called many nations to work and take incite action on this global issue. The European Commission has also shown its concern towards food waste reduction. The federal government has also shown its concern and they have set the goal to reduce the per capita of food waste by 2023 by half at both retail and consumer level (European Commission & Report, 2010, p.90). According to the Scientific Advisory Boards on Food, Agricultural, and Forest Policies, reducing fifty % of food waste, could limit the greenhouse gas emission in Germany by 6 million tonnes of CO2 equivalents('National Strategy for Food Waste Reduction', n.d. p.7). Consequently, many unnecessary resources will also be saved that are used to produce and transport food, and billions of people can be easily fed that are dying due to hunger.

1.2 Problem statement

According to Thunen Baseline Survey Report, Germany alone is responsible to generate around 11 million tons of food waste every year. Approximately on average 6.14 million tons of edible food is wasted in German households with a monetary value of 234 euros per person (Schmidt et al., 2019). Conversely, almost 2.6 hectors of agricultural land also get wasted causing the additional release of unnecessarily greenhouse gas emissions (4%) (Noleppa, 2012,p.8). Whereas, 2.6 million tonnes of food wastage can be theoretically avoidable or can be used for human consumption. A recent report by the Food and Agriculture Organization of the United Nations (FAO, 2019) claims that the prevalence of hunger in comparison to other counties is not so severe in Germany but the fear of food insecurity has increased in recent years. While, 4.3 % of the German population consider themselves moderately and severely food insecure and out of which mostly are below the age of 18(Depa et al., 2018). However (Leverenz et al., 2021) argue that in the last five years many food waste reduction initiatives have been taken within Germany but the country has not made any substantial improvement in comparison to other countries. For example, British households report a 24 % of waste reduction since 2007. Besides that Danish Environmental Protection Agency also claims that Danish households reduce 247000 tons of food waste over the last six years and almost more than 80 % of the people become aware of the impact of food waste(United Nations Environment Programme, 2021, p.90). Considering these facts, Germany requires an intense strategic approach and further comprehensive investigation in order to understand the consumer behavior related to household food wastage. As the majority of the food waste (52%) comes to Germany after the point of sale(Herzberg et al., 2020). Moreover, a limited number of studies have been conducted in Germany that analyze consumer level of awareness on the impact of food waste.



Fig 1: Food waste (2015) and avoidable shares in Germany (1,000 t / a) (Summary Thünen Report 71)

1.3 Rationale of the Study

(Richter, 2017) conducted a study to assess the knowledge and behaviour of food waste among German consumers but to date, no such studies have been conducted which analyze the migrant's knowledge and behaviour on this global concern specifically in Hamburg. Additionally, the significance of food waste at the consumer level has only recently been acknowledged, which also results in the existence of literature gaps.

The current total population of Germany is nearly 83.2 million, out of which 11.4 million people hold a migrant background, representing 26.0% of the German population. Moreover, Germany population is growing due to the continued influx of immigrants. Unexpectedly, Asian ethnicity represents the largest group of the total foreign population(European Commission (EC), 2019). Nevertheless, Germany is one of the most diversified countries in the European Union and it is home to many different cultural, religious, and traditional environments. The diversity of nationalities gives a unique dimension to perform our research. Besides that, it can be assumed urbanization, detachment of consumers from their engraved culture who taught about food value or

attachment with the new modern lifestyle, and ease of access to food might result in generating food wastage(European Commission & Report, 2010, p.35).

The primary aim of this thesis is to assess the level of knowledge and behaviour of migrants on food waste and its consequences in Germany at the household level. The author will perform a detailed analysis on migrant's behavior based on the practices of food consumption, food wastage, and individual food shopping behavior. Moreover, the proposed study will also point out the association of socioeconomic factors with the knowledge and behaviour of migrants. Additionally, the results of this survey will help with the identification of measures and instruments to reduce food waste and to increase the consumers' awareness on this global issue.

1.4 Research objectives

The following research objective has been finalized by the author to investigate the level of knowledge and behaviour of migrants on food waste and its consequences in Germany at the household level.

-To determine the level of knowledge of food waste and its consequences among migrants of Hamburg, Germany.

-To evaluate the behaviour of migrants from their country of origin regarding food consumption, shopping, and food wastage.

-To find the association of socio-economic factors with the knowledge and behavior of migrants.

Chapter 2: Literature review

In this section, the author aims to explore the different literature that has truly focused on consumer food wastage in households. This report will also identify and analyze the knowledge regarding the causes of food waste generation at the individual level and how far they are aware of problems resulting from food waste.

2.0 Review of Related Literature:

2.1 Food wastage: A global challenge

According to (Rohm et al., 2017), the population is expected to rise in near future and extreme global environmental changes will surely result in a shortage of food. To reduce the global fear of food scarcity thus it is important to carefully use the produced without being discarded nor used as a lower-value secondary resource (e.g., as animal feed, or as an energy source). However, many factors are involved which can result in the devaluation of food. This devaluation can occur at any stage of the food supply chain including at the consumer level. Additionally, the immense waste of food makes it impossible for the higher agencies to meet the hunger demands of the increasing population.

(Rohm et al., 2017) further stress that many food manufacturers these days use technological innovation to reduce food waste and also introduce newer sustainable packaging for ensuring longer shelf life. All these strategies will only be successful in the prevention of food waste when the final consumer acknowledges these steps and decide which food is actually kept in food supermarkets and consumed instead of being discarded.

Visually suboptimal products are a major factor that promotes the habit of wasting food throughout the food supply chain. People usually discard such products, not only at the household stage but at other stages as well, either due to appearance or due to closeness to the best before date (European Commission & Report, 2010, p.11). Although it is

observed that the appearance and best before date do not affect the food quality. As a consequence, these products that are still suitable for human consumption are neither bought nor consumed but discarded or, in the best case, processed into other (lower value) products. Aesthetic imperfections usually lead to the discard of almost 30% of vegetables and fruit by producers. Such types of waste can be avoided by giving adequate knowledge to the manufacturer and end-users. Many countries have aimed to reduce food waste by half, particularly in the retail and consumption phases, by 2030 (Rohm et al., 2017). Some countries have already made a remarkable reduction in food waste generation, such as France, the UK, and Denmark. Due to its strict food policies such as the ban on wastage of edible food and promoting food donation, France has already retained its lead in the Food Sustainability Index (United Nations Environment Programme, 2021,p.52-54).

To promote sustainable food choices by consumers, we need to understand consumerrelated internal and external factors that serve as the major obstacles in the path of sustainable food choices. The internal factors that influence consumers include motives, sensory perceptions, attitudes, etc., while the external factors that affect consumer food choices include social influence, gatherings, etc (FAO,2013,p.27).

2.2 Review of existing studies: Consumer knowledge and behavior on food waste and its consequences

In this section, we are going to analyze different existing literature that has the sole focus on consumer behavior on food waste and how far individuals are aware of the negative consequences resulting from food waste. Further, the author of the study would like to clarify the key element of this topic, which is food loss and food waste. The majority of the literature uses these two terminologies interchangeably. There has been no harmonized definition of food waste and food loss until now, but few studies have meaningfully defined this terminology.

According to the European (EU) legislative framework, food waste is mainly recognized as "any product or substance either unprocessed, partially processed, or processed that was actually produced for human consumption but has not been consumed and has become waste." (Kayıkcı et al.,2021).

Within the FAO's definitional framework, food loss refers to a food that was initially intended to be produced for human consumption but ultimately not consumed by humans. Food loss mostly happens at the upstream level of the food chain, such as production, post-harvesting, transport, storage, and processing. A reduction in food quality and quantity at an initial stage of the food supply chain due to insufficient harvesting techniques, deficient storage facilities, lack of appropriate infrastructure, poor packaging, and transport leads to product damage, over-ripeness, and unsanitary conditions. According to existing food standards, these quality limitations prevent human consumption. Whereas, food waste is characterized by a reduction in either the quality or quantity of food because of the decisions and actions by food services, retailers, and consumers. Food wastage at the household level is "the food brought home or prepared at home but not consumed," whether or not the food is kept beyond its expiry date or left to spoil. This occurs mainly due to oversupply in markets or individual consumer shopping or eating habits. Food waste mostly relates to an individual's behavior issues. In this study, the authors more frequently use the terms "food waste" or "food wastage" as both of these terms have the same meaning. (FAO,2013, p.8).



Fig 2:Food losses and waste definition along the FSC (FAO,2013,p.8)

For various reasons, tons of food waste are generated every year over the globe, almost at every stage of the food supply chain. Based on the evidence, it might increase in the future as population growth increases (European Commission & Report, 2010)(Schanes, Dobernig, & Gözet, 2018). It concluded that food production, consumption, and wastage directly or indirectly are interlinked and attributed to many globalized challenges (malnutrition, financial loss, climate change, pollution via inorganic packaging, and biodiversity loss). However, private household consumers are identified as the chief contributors to generating food waste, followed by processing, catering, agriculture, and the commercial sector. Although many studies highlight that consumer food wastage at the household stage mostly depends upon their age, income, level of knowledge, household composition, consumer behavior, perceived societal norms, and culture(Herzberg et al., 2020) (Bozdag&Cakiroglu, 2021). But many authors believe that consumer perception regarding food wastage and their understanding of associated problems that arise due to food waste is still unclear and require further research (Richter, 2017). Furthermore, a lot of consumers argue that they generate a very small quantity of food waste, which can be acceptable within society and will not cause much harm to the environment. Those consumers who are unaware of the magnitude of the problem consider food waste more of an economic or social issue and less of an environmental issue. A positive change in consumer behavior might have a positive impact on the amount of food wastage. Although numerous consumers show some positive attitudes, such as using a shopping list, planning a meal before cooking, storing, and eating less out of the home, somehow they manage to reduce their household food waste (Charbel et al., 2016). However, at some point, they still failed to act according to the recommendations, as the latter required every single member of the household to follow the same behavior. In general, well-defined guidelines and strict strategies can lower household food waste.

Every year, Germany alone generates 11 to 12 million tones of food waste out of which 5.05 million tones are generated from private households. The literature further reveals that 2.37 million tons of food waste can be avoidable (Noleppa, 2012). Although it is tough to analyze the reasons for food wastage at the household level, as it varies from individual to individual. However, a large comparative analysis has been conducted in

July 2021 between Germany, Austria, and Switzerland to assess the consumer level of awareness regarding food waste, how consumers do their food shopping, and how they manage their food waste ('FOOD', 2021,p.2). The study concluded that, in almost all the three countries where respondents considered food waste to be a severe issue, women were more concerned than men. Approximately two-thirds of respondents in Germany and Austria believe food waste has a greater environmental impact than forty percent believe it is ethically unacceptable and a waste of valuable resources. However, the amount of food thrown per week estimates that German individuals generate more food waste, which could be avoided in comparison to the other two countries. In terms of shopping behavior, Germans pay more attention to food brands, while in Austria and Switzerland, the quality and country of origin of the product play a much greater role. On the other hand, regarding food prevention, all consumers believe that eating leftovers, planning meals, and correct storage techniques are the most common factors that minimize food waste at the household level. However, the majority of the respondents in all three countries suggest that they want some more specific information on the subject of food wastage ('FOOD', 2021).



Fig 3 : Impact of food waste('FOOD', 2021)

Another study was conducted by (Richter, 2017) in Germany in order to analyze the German consumer knowledge and perception of food waste at Humboldt University Berlin under the department of Economics of Horticultural Production. The key focus of the study was to analyze how much consumer knows about the topic of food waste and how far they are aware of problems arising directly or indirectly from food waste like financial, environmental, and societal. However, an online survey was conducted. More than 1000 German citizens participated in the study, and most of them were females (52.4%). The result of the study suggests that many consumers assume that they waste little quantities of food and that many show careless handling of food and food waste. Additionally, regarding the food waste consequences, numerous participants consider that food waste is not a big problem and the amount they are wasting is socially acceptable. A lot of consumers also show negative emotions of guilt while wasting food. Although only few participants demonstrated increased awareness of the consequences of food waste and regularly followed food purchase planning. Besides, the study was unable to identify any significant differences in socio-demographic characteristics between the study participants. However, the author believes that overall consumers need to be informed indepth regarding food waste's economic, societal, and environmental consequences, and this can be achieved in the form of a group campaign. The author also emphasized the need to do further research on how consumer purchasing-planning behavior influences the amount of food waste and also investigate the consumer level of awareness, particularly in terms of environmental aspects, as many consumers don't realize any association between food waste and the environment.

In comparison, (Pocol et al., 2020) conducted a study on the Romanian consumer. The author identified a similar finding to the one concluded by (Richter, 2017) that several respondents did not consider food waste as a major issue due to less awareness of the topic of food waste. Interestingly, those respondents who hold a high level of awareness and live in urban areas did not consider themselves responsible for generating food waste. However, an interesting element of the study was that cultural background has more influence in comparison to the level of education and income in generating food waste (Pocol et al., 2020).

Several studies argue that a considerable quantity of food waste occurs at the household level, and their knowledge regarding the seriousness of the problem might help in combating the issue (Osail et al., 2022). However, some studies indicate that a majority of the respondents understood the effect of food waste on the earth, while in some studies, a number of participants did not consider food waste a serious problem. According to the survey, nearly 70% of the study population considers food waste to be a serious problem, and half of the respondents are taking more meaningful action to reduce their waste. Most of the respondents felt uncomfortable while disposing of food. Furthermore, individuals who are more concerned about food waste generate a lower quantity of food waste in comparison to those who are less concerned. The author further concludes that being aware of the issue of food waste is the key step toward food waste reduction. In terms of food handling habits, more than 40% of the population uses a shopping list and purchases only the ingredients they require. However, the author suggests that there is a strong need to educate people about the impact of food waste. Continued active campaigns informing about the consequences of food waste lead to further reductions in food waste (Osail et al., 2022).

According to the FAO (2013) report, the growing food waste concern also creates a challenging environment in terms of food safety and security. For many developing countries, wastage of food has become a serious issue for optimizing sustainable development. Furthermore, household food waste accounts for 30% of total food waste. Many studies in the past have argued that household food waste is influenced by many different factors, which include psychosocial factors (personal choice, lifestyle, food habits) and household food management practice. In 2020, during the lockdown, an online survey was conducted using a structured questionnaire to investigate consumer awareness, attitudes, and behaviors related to food wastage among Tunisians (Jribi et al.,2020). Almost 89 percent of those polled were aware of their food waste and its consequences. However, most of them do not want to change their current practice, and a few stated that they are willing to take some deeper information regarding the problem that arises due to food waste. Some consider food waste is not a major problem, and 0.7%

had no opinion on this issue. Despite the fact that 85 percent of respondents claim that nothing from their grocery shopping is wasted. Many respondents also report positive behavior towards eating leftovers and properly managing their food storage. The study further investigates that to reduce the food waste and maintain the positive behavior among consumers' an education and communication movement should be established and generalized awareness should be provided on food waste consequences as well as on the benefits of preventing food waste. At the legislative level, certain policies should be implemented at the consumer level, and the government should impose penalties (Jribi et al., 2020).

The number of organizations working together in order to combat food waste in different parts of the world is increasing. But the prevalence of food waste is still high in many middle and high-income countries (S.Berjan et al., 2019). On top of that, many responsible authorities of different countries' projects limited data on actual food waste and did not give much attention to waste generated at the household level. Therefore, to overcome this gap, a study was conducted in Montenegro in 2019. The aim of the study was to analyze household food waste. A voluntary self-administered survey was conducted. Most of the respondents were young and female. In terms of the extent of food waste generated, the result of the survey revealed that 48 percent of the respondents report no food waste, while others report a limited amount of food waste, which is between 250 and 500 grams per week. In terms of monetary loss, more than half of the respondents report a monthly loss of 25 euros. Those participants who know the reason for their own food waste are more willing to know the methods that reduce food waste. Interestingly, the number of participants suggests if they are better informed about the negative impact of food waste on the environment or on the economy, they will minimize their food waste. The result of the study further reports that most of the participants show immense concern related to food waste (S.Berjan et al., 2019). Therefore, raising awareness at the consumer level with the goal of improving individual practices and behavior towards handling food and leftovers. Additionally, if all the actors in the food chain work collectively, the results of food waste reduction will be more valuable and sustainable.

In 2020, (Flanagan & Priyadarshini, 2021) also conducted a study on consumer behavior towards food wastage in Ireland. The study participants were divided into two clusters; one was the caring group and the other was the uncaring group. The study reported that the majority of the participants were guilty of wasting food and also concerned about the cost of the food they threw away. Although both groups are aware of the environmental effects of food waste, the caring group is much more focused on minimizing food waste. In terms of behavior, the study also stated that the uncaring respondents do not use shopping lists or plan meals before cooking. On the other hand, the caring group uses shopping lists and plans meals in order to minimize food waste. Furthermore, both groups eat leftovers on a regular basis, but the amount of waste estimated is nearly equal to the average food waste.

From the above literature review, the author of the present study concluded that consumers waste food due to a lack of planning, misconception about the need for food items, improper storage techniques, marketing strategies (product packaging, labeling), and a lack of awareness of the negative implication of food waste on a various aspect such as (environment). Moreover, many socio-economic factors such as education, income, household composition, and age along with social, cultural, and psychological factors influence consumers' food waste at the household level. Besides that research carried out on the subject of food waste and its impact at the consumer level within Germany is limited and requires further analysis.

2.3 Habermas'Theory: Knowledge and Human Interest

The body of the literature and the present study survey questionnaire are primarily based on the theoretical framework of Habermas's theory, which is based on the knowledge and interests of humans, as well as the idea that knowledge refers to people's awareness and understanding of information, facts, or abilities. Knowledge can be either practical or theoretical, and it is typically gained through experience or education (Habermas, 2015). Exploring and comprehending the physical and social environment as well as putting this information into reality is a necessity that permits humans to develop knowledge. Developing technical knowledge necessitates an interest in causal and instrumental explanations. People with technical skills can exert control over their physical or social environments. Practical knowledge necessitates an interest in practical understanding and enables better communication in one's daily life. The pursuit of emancipatory knowledge necessitates a desire to reflect. This kind of knowledge leads to autonomy, rationality, and freedom. Each type of interest is essentially a learning and practice-centered orientation (Gabriel et al., 2021).

Investigating people's food dumping necessitates an understanding of people and their lives, which is achieved by including socio-demographic characteristics into the framework. Understanding causes and effects, control mechanisms, and communication are all important aspects of learning about food waste and waste generation. Self-critical appraisal of food waste accumulation is required for self-liberatory knowledge. People with a strong sense of ethics and an interest in pondering ethical issues in a particular setting are required for emancipatory knowledge (Delany et al., 2020). However, ethical and personal reflections are frequently skewed. Due to social desirability bias, negative activities are rarely reported truthfully in surveys. A common example of potential social desirability bias is reporting on the amount of food waste (Fisher, 1993). According to (Schanes et al, 2018), food waste creation is regarded as bad behavior. Recognizing bad behavior goes against people's natural instincts to protect themselves and portray themselves in a positive way (Fisher, 1993). Food waste production disclosure can be viewed as a social issue in which people are concerned about how they are perceived by others. Food waste generation is a problem where people are prone to providing socially desirable responses. According to(Gabriel et al., 2021) and(Schanes et al., 2018), people either produce very little garbage or produce it at a lower rate than others. Bias in reporting applies to discarded products and quantities discarded, as well as purchasing and household activities. People, who honestly answer, acknowledge being concerned about their actions (Delany et al., 2020).

2.4 Reason or factors that cause food waste

Food wastage occurs at all levels of the food supply chain. Technical limitations in harvesting, storage, processing, packaging, and distribution along the food chain are the

main causes of food wastage in low-income countries. Meanwhile, in developed countries, a significant quantity of food waste is produced at the retail and consumer level. The causes of food waste in medium and high-income countries include appearance quality standards, meaning edibles may be rejected by retailers due to items not being favorable in terms of weight, size, or shape(United Nations Environment Programme, 2021, p.8). Another consideration is that food waste at the consumer level is driven primarily by individual values, attitudes, and behavior toward food. Additionally, the food gets wasted during the post-harvest and processing stages, causing losses in both economic and nutritional value(Leal Filho et al., 2021).



Fig 4: Causes of food waste at different phases of the FSC (own elaboration from UNEP, p.8 2021)

However, limited technology cannot be considered a major determinant of food wastage for a country like Germany. But inadequate harvesting and storage techniques might result in food wastage. Another significant reason that often leads to post-harvest losses is the discrepancies between supply and demand. Oversupply of foodstuffs in order to meet market demand often results in wastage (Kranert et al., 2012, p.10). Additionally, natural causes are also the reason for food wastage, as this affects the product's quality, weight, and appearance. According to (FAO, 2019) report, products are rejected by supermarkets if they find a beauty error that results in food waste. Although the product lost during the harvesting stage is mostly utilized to feed animals or make compost. In fact, 30 percent of animal feed worldwide comes from the food supply chain, but the food is diverted from what is actually intended for human consumption. The report further states that disposing off is often considered cheaper than using or re-using. This attitude of consumers in developed countries leads to additional food waste. Although reuse is considered a better option instead of recycling, as it is much more favorable for the environment as well. But within Germany, a grocery market named REWE took the initiative of buying the products with "beauty errors" that provided some relief to the farmers, but we could not find other German supermarkets following this initiative (FAO, 2019, p.53).

(Véronique et al., 2010, p.24) suggest that food waste at the processing and manufacturing level is usually unavoidable due to mechanical failures such as packaging defects, over-production due to poor anticipation, and legal restrictions. However, according to (Kranert et al., 2012, p.16) report, some food wastage can be prevented if appropriate packaging, and correct batch/labeling, which creates less confusion, spillage of products, and other product quality issues will be well analyzed.

Moreover, in some industrialized countries, the availability of a wide range of products at a supermarket leads to food wastage. The accessible and abundant amount of food available at a reasonable price in supermarkets determines how food is valued and wasted in developed countries (Secondi et al., 2015). Food waste is also influenced by the legislative restrictions and food regulations that are fully coherent with the European Union's regulations Véronique and colleagues, 2010. Manufacturers, who are often bound by exclusive contracts, are forced to over-produce to ensure they can meet lastminute orders. The same binding contracts then prevent them from selling the discarded produce to other buyers. According to (Aschmann-Witzel et al.,2015), inconsistent availability of products, rising food prices at an optimal level, and little ease in legislation could inevitably reduce food waste.

2.5 Factors influencing food waste at the consumer level

It is of prime importance to prevent food waste at the consumer level. Different behaviors have been shown to influence food waste generation at the consumer level. Although the reasons behind consumer food waste generation at the household level are complex and varied across countries (UNEP, 2021, p.14). However, the key factors that are attributed to household food wastage include household composition, income, the pattern of food consumption, shopping behavior, knowledge, managing food waste and leftovers, moral values, and cultural beliefs. Besides, consumer habits and perceptions were shaped and taught during their upbringing according to their cultural beliefs and social norms, and the majority of individuals follow what they have been taught in any given environment. These factors might need some additional effort in order to achieve the goal (Pelau et al., 2020).

Working on this deeply ingrained consumer perception and the complex interaction of different households requires higher consideration and adjustments in order to avoid food wastage at the household level. Additionally, those households who are more concerned and give more value to food reported less food wastage (Schanes et al., 2018).

Detailed analyses of factors that influence consumer decisions in generating food waste are as follows.

2.5.1 Food-related household practices and routines

Food waste at the household level is greatly influenced by individual practices and behavior of shopping, planning, storing, meal preparation, consumption habit, and managing leftovers.



Fig 5. Food-related household practices and routines (K. Schanes et al. / Journal of Cleaner Production p. 182 (2018).

2.5.1.1 Shopping

(Schanes et al., 2018) observed those individuals who do careful food shopping, which includes shopping lists, meal plans, or checking inventories before shopping, as a good measure for reducing food wastage. The same study also highlighted that consumers' behavior in-store (e.g., impulsiveness, compulsive buying) needs to be analyzed as it plays a major role in causing food waste. The frequency of shopping also plays a part in the amount of food wastage. (Jörissen et al., 2015)conducted a study in Germany and found that as shopping frequency increases, the amount of food wastage slightly decreases. Besides that, consumers who normally purchase a smaller quantity of food each time they go for a food item purchase often result in reduced food wastage.

2.5.1.2 Place of shopping

The place of shopping also plays a crucial role in generating food waste. Many studies show that consumers who shop at large or discounted supermarkets waste more food than those who shop at local farmers' markets or smaller shops. (Véronique et al.2010) emphasize that the marketing strategy of large discount supermarkets, for example, Buy One, Get One Free, and other heavy discounts, particularly on perishable

items, influences consumers to purchase more than they actually need or even not need, and thus promotes food waste.(Ganglbauer et al., 2013) conducted a qualitative study in Austria and observed that food waste is lower when people grow their own food, as people are aware of the time and energy required to harvest the food

2.5.1.3 Planning meals

Planning meals encompasses the inclusion of a shopping list, meal planning before cooking, and checking inventory before going shopping can also contribute to minimizing food wastage. Those individuals who regularly check inventory, use a shopping list and do meal planning in advance report less food waste. Although(Visschers et al., 2016)were unable to find a significant association between proper meal planning and reduced food waste. However regular planning routines correlate with lower reporting of buying unplanned or overbuying items (Ganglbauer et al., 2013)

2.5.1.4 Storage and Leftovers

Knowledge about the proper storage of food can also reduce the wastage of food. Food spoilage at the household level generally occurs due to inappropriate storage and lack of visibility of food in refrigerators due to space constraints. According to(Farr-Wharton et al., 2014) the majority of consumers are not aware of the method of prolonging the food and leftover shelf life and the majority of consumers at the household level set their fridge temperature (lower or higher) than recommended, which can speed up the decay process of a food product. On the other hand,(Visschers et al., 2016) did not find a direct relationship between knowledge about storage and the amount of food wasted. Parallel to storage, reusing the leftovers is one of the most effective strategies to prevent food waste. (Ganglbauer et al., 2013)believe that those who regularly eat leftovers produce less food waste. In certain communities, serving leftovers is less acceptable, especially when guests are invited on any occasion, as it is considered a sign of hospitality and wealth. Food is frequently wasted as a result of such practices. Whereas across Europe for instance in France it is not acceptable to take leftover food to home from restaurants (European Commission & Report, 2010, p.11).

2.5.1.5 Cooking

The role of cooking has several influencing factors that create wastage of food. Firstly, the quantity in which the food is prepared. The amount of food prepared is thought to be sufficient, but it frequently ends up being discarded (Flanagan & Priyadarshini, 2021). Whereas (Sinisa Berjan et al., 2022) investigated that control or estimated portion size is one of the reliable solutions that help in minimizing food waste generation at the household level. In some cases, due to their cultural practice, intentionally or unintentionally, the individual has to cook a large quantity of food, especially when the individual has to show their great generosity to their guest or sometimes has to match every household member's wish for a meal. Indeed, large serving portions are more than needed and may end up in wastage (Pelau et al., 2020).

In order to minimize the food going into the bin, it is recommended to cook from the ingredients which are already available at home. However, cooking from the stored ingredients requires deeper knowledge, cooking skills, and time (Jörissen et al., 2015). Furthermore, consumers who have a strong tradition of cooking at home and eating leftovers exhibit positive waste-reduction behavior. Although a few studies have found that consumers who primarily rely on processed or ready-made foods waste more edible food than others(Pelau et al., 2020)(Osail et al., 2022).

2.5.1.6 Food Consumption or Eating out

(Schanes et al., 2018)found that individuals who frequently eat out in restaurants, small cafés, or coffee shops produce food waste because the food items they have purchased from the market, if not eaten within a certain time frame, resulting in their disposal. (Thyberg & Tonjes, 2016) conducted a study on the drivers of food wastage and found that nearly half of the food budget of the USA, i.e., \$630 billion, was spent on eating out. The same study also highlights that in recent years, the trend of eating out has increased because more than one individual is earning from a single household and, due to the modern lifestyle, most individuals do not have enough time to cook at home. This

convenient and time-saving option mostly ends up in increased food wastage. According to (Schanes et al., 2018) those individuals who ate more often in restaurants felt a lower level of guilt for food waste. The study also found that consumers who eat leftovers on a regular basis did not find it difficult to take leftovers home, indicating a positive attitude toward food waste. This implies that concerned authorities in terms of social aspects should create more awareness of this positive attitude toward leftover usage.

2.5.1.7 Assessing edibility

The edibility of food is assessed and varies from consumer to consumer or from country to country (UNEP, 2021). Individuals use different strategies in assessing food edibility. For example, few people rely on their own sense of taste and smell, while others rely on the best before or expiry date. People who check food safety with their own senses waste less food. But in most situations, food that is still suitable for human consumption is discarded due to the factor of fear, resulting in food wastage (Osail et al., 2022). Many studies show that people who are more concerned about their health or who eat fresh food on a regular basis waste a significant amount of food. Confusion on labels, such as "best before" or "use by" dates, on the other hand, frequently creates a barrier to the full utilization of food. (Göbel et al., 2015) in Germany conducted a study on the causes of food waste among the consumers of Nordrhein-Westfalen and found that the misinterpretation of dates often results in the waste of food without inspecting any signs of spoilage. However, the research also suggests that the chances of the right interpretation also depend on the participant's age. On the contrary (Visschers et al., 2016) did not find a strong correlation between knowledge about labels on a date and the quantity of food wasted.

2.5.1.8 Food disposal /redistribution

Food disposal is the least preferable alternative in the hierarchy of giving priority to prevention over recycling and final disposal. The practice of disposing of food in the form of recycling or composting usually lowers the motivation level for waste prevention. According to (Catlin & Wang, 2013), leftover food that is fed to animals or

used to make compost is not considered food waste. Besides that, the concept of recycling may sometimes reduce the quantity of waste by lowering the factor of guilt (Gabriel et al., 2021). Additionally, studies on the redistribution of food are scarce. Whereas in most countries, donating extra cooked food to a needy person seems like a very common practice. People are mostly afraid of being liable if someone gets ill from their donated food. Although in many EU countries, redistribution of food is a growing phenomenon. For example, in Belgium, the Mayor instructs all the supermarkets to donate their surplus food in order to receive their environmental permit. However, the amount of food distributed was reported as a small fraction and required some extra effort. Besides that, in most Asian countries, donating food is considered a normative act. Interestingly many local authorities encourage this positive behavior thus resulting in less food wastage (Stenmarck et al., 2016)(UNEP, 2021)(Osail et al., 2022).



Fig 6: Food waste Hierarchy (Adapted from European Parliament Council, 2008).

2.5.2 Concern

The subject of food waste has become a great concern for many nations, but at the consumer level, the situation is different. Many authors believe that consumer personal concern shows a strong motivation towards minimizing food waste in comparison to global concern and how the consumer is emotionally attached to food waste and its consequences(Schanes et al., 2018)(Richter, 2017). Recently, a survey conducted by the

International Food Information Council Foundation found that more than 70 percent of the respondents occasionally thought about food waste while eating at home, but more than forty percent said they never gave a thought about food waste, especially when dining out. Interestingly, younger respondents show more concern about food waste.(Food & Council, 2021).

However, financial concern generally elicits a strong motivation in terms of reducing food wastage as it is associated with the individual loss of money(Flanagan & Priyadarshini, 2021). Another study found that those consumers who express concern about global warming and the use of natural resources, although their concern about the environmental impact of food waste appears to be less motivated than economic concern(Aitsidou et al., 2019).(Ahmed et al., 2021) conducted a study on household food waste and analyzed the awareness and attitude among US consumers. The author found that only half of the respondents showed a modest environmental concern in response to food waste, and for others, it is not an important concern. The same study also analyzes the degree of environmental concern found associated with the level of education and age with regards to food disposal. The older generation shows more concern for environmental and social effects, while the younger generation focuses more on the economic aspect. According to(S.Berjan et al., 2019), the reason for this lack of environmental concern is due to a lack of knowledge and awareness regarding the environmental problems associated with food wastage.

2.5.3 Norms and perceived behavioral control

Many scholars have carried out studies on food waste from various perspectives, but (Wang, Li, Li, & Chen, 2022) suggests it is equally important to analyze food waste reduction through extended norms. According to(Agri- & Marketing, 2017) analysis, social norms have a strong influence on consumer preference and behavior. This type of behavior often becomes an important reason for food wastage. For example, due to social norms, people in many countries resist purchasing sub-optimal products, even if they are half the price, and end up in the garbage. However, due to a lack of awareness of the food waste consequences, the effect of the social norm can be mediated.

Moving forward, several authors believe that personal norms (individual internal values) are an important predictor of food waste reduction. in their own ability and consider reducing waste under their control are more likely to produce less waste(Aschemann-Witzel et al., 2015) (Visschers et al., 2016). The major reason that triggers this positive behavior is mainly due to the involvement of emotional factors in comparison to cognitive factors. Many researchers concluded that providing awareness about the consequences of food waste might affect personal norms if consumers consider the responsibility of reducing food waste as a code of conduct. According to(Schanes et al., 2018) (Visschers et al., 2016), households that firmly believe and give strong value to the food, waste less food as they strive for motivated and positive emotions instead of feeling the expression of guilt and shame. In some developing countries, such as Turkey, individuals are obliged to finish all the food that is served on their plates. This kind of cultural practice indicates how much food is valued. In addition, (Yildirim et al., 2016) suggests that when personal norms are deeply incorporated or integrated into individual concepts, those individuals make enough motivation and perform well in any given environment.

The growing evidence specifies that consumers are the major contributors to food wastage, but its losses at the household level are neglected or underestimated(Ganglbauer et al., 2013). However, the observation indicates that ethically, individuals realize throwing food is wrong irrespective of other individuals' perceptions, as this act doesn't match with their self-image, resulting in less wastage of food. Based on the norm theory,(Wang et al., 2022) believe that subjective norms have very little influence on food waste behavior, while personal norms hold a stronger influence. The author further argues that individuals will not decrease or avoid food waste if they are not motivated to do so. Thus, in order to overcome waste generation at the household level, the social norms and individual internal values residing within need to be addressed simultaneously.
2.6 Association between socioeconomic factors and food waste

Many past studies identified that the amount of food waste generated at the household level is a complex issue and can be influenced by several factors (Leal Filho et al., 2021) (Althumiri et al., 2021). However, many authors believe that socioeconomic factors also play a significant role in food waste generation at the household level (Schanes et al., 2018)(Osail et al., 2022). A study conducted by(Jribi et al., 2020) found that women aged over 40 produce less food waste than men as they are more concerned about food budget than men, while men tends to waste more food. The author further reveals that the factor of feeling guilty is more in females as this indicate the sign that they are not managing the household well. Whereas according to (Osail et al., 2022) (Richter, 2017), women's produce more food wastage as they are more involved with food shopping, cooking and managing leftover. Subject to age, (Farr-Wharton et al., 2014) (Flanagan & Priyadarshini, 2021) identified that people aged above 65 were producing less wastage. Older people might have a better understanding of the consequences of food waste or they might eat less in comparison to the population of young people. On the other hand a study conducted by (Aitsidou et al., 2019) found that the age group above 65 throw more food. Although many authors report that the younger generation aged between 18 to 34 creates larger quantity of food waste. Generally, people with this age group might have little experience of food managing skills (Visschers et al., 2016) (Charbel et al., 2016).

According to (Pocol et al., 2020) food wastage and education level does not seem to be a important predictor in reducing food wastage. The result of his study concluded that those individual who have high level of education consume and waste high-quality of food. Whereas (Jribi et al.,2020) reported opposite, those households where the education level is high report less wastage and more significant efforts has been made to control the food waste. Surprisingly (Jungowska et al., 2021) reveals those individuals who left school under the age of 15 reported less food waste. Regarding standards of living, various studies state that higher-income households waste more than poorer households. In other words, high-income households are less concerned about food wastage. These consumers

frequently purchase promotional products, which may result in waste due to quality concerns. Apart from affordability, higher-income households eat more often in restaurants than people with low income, which can further be attributed to food waste(Gabriel et al., 2021)(Pocol et al., 2020).

Another socio-demographic factor that shows a link to household food generation is household composition, a qualitative study conducted in Australia among five different cultural communities. The finding of the study concludes that households with children tend to produce more food wastage due to over-purchasing of food in response to children's pressure and frequently changing eating behaviors(SinisaBerjan et al., 2022). But in some studies, a single individual is also responsible for generating food waste because of their lifestyle (Schanes et al. 2018),(Visschers et al. 2016) (Gabriel et al., 2021). An overview of studies investigating the relationships between socio-demographic characteristics and food wastage is listed below (Table.1).

Socio-demographic characteristics	Relationship to food waste	Studies
Gender	Women's are more likely to reduce waste than males	(Jribi et al.,2020) (Schanes et al. (2018)
	Females waste more food than men	(Osail et al., 2022)(Richter, 2017)
Age	The young generation produces more food waste in comparison to elderly people due to their lifestyle.	Visschers <i>et al.</i> , 2016)(Charbel et al., 2016)(Sinisa Berjan et al., 2022) (Farr-Wharton et al., 2104), (Richter, 2017)(Flamener, & Pring derrichter)
	concerned about food waste	2017)(Flanagan & Priyadarshini, 2021)
	People more than sixty-five aged waste throw more food	(Aitsidou et al., 2019)
Income	Higher-income individuals are less concerned about food wastage.	(Gabriel et al., 2021) (Pocol et al., 2020)

 Table 1: Overview of studies on socio-demographic characteristics.

Household composition	Households with children tend to produce higher quantities of food waste	(SinisaBerjan et al., 2022) (Herzberg et al., 2020)
	Households with a younger generation throw more food waste	(Schanes <i>et al.</i> 2018),(Visschers <i>et al.</i> 2016) (Gabriel et al., 2021)(Farooq & Ahmad, 2020)
Education level	A significant association was found between food waste and education level.	(Jribi et al.,2020)(Koivupuro et al., 2012)
	Those individuals who left school early report less wastage of food.	(Jungowska et al., 2021)

2.7 Adverse effects of food waste on the earth

Many negative effects have been reported in studies regarding food wastage on the environment. According to(Stenmarck et al., 2016,p.32)(Noleppa, 2012), global food waste is estimated to account for 8 to 10% of greenhouse gas emissions. Food waste accounts for approximately 4% of total greenhouse gas emissions in Germany. The food production and processing sectors release nearly 177 million tonnes of CO2 equivalent, causing high stress on the environment. (Schmidt et al., n.d.)



Fig 7: Impact of food consumption on the environment (Summary Thunen report 2019).

Natural resources are severely exploited because of the increased demand for food, which results in environmental degradation. For annual food production, Germany uses almost 38 hectares of agricultural land. Furthermore, natural resources are not only consumed for the production of food but are also required for transportation, storage, retailing, and preparation. Besides that, the considerable threat of biodiversity loss is more pronounced in Latin America and Asia than in Europe(Secondi et al., 2015).

Moreover, the largest material stream that is sent to landfills by municipalities is food waste, which has the lowest recovery rate. The limited landfill space is greatly occupied by food waste as compared to other organic waste. Besides that, when the food waste gets decomposed in the landfill, it releases carbon dioxide and methane gas, contributing to global warming. Methane is reported to be twenty-five times more potent than carbon dioxide(Stenmarck et al., 2016). Thus, reducing organic matter in landfills can considerably reduce GHG emissions.

In addition to that, food waste has not only affected the environment and biodiversity but has also given rise to food security issues and contributed to global hunger. Throughout the world, 3 billion people cannot get proper food and are facing the issues of hunger. If such a huge amount of food keeps on wasting around the world, then the food security concerns will be increased and more and more deaths will occur worldwide due to malnutrition or under nutrition (UNFCCC, 2020). This food loss and food waste has many moral implications for society.

Food waste causes counterproductive effects in social, economic, and environmental spheres. This phenomenon is intrinsic to the increase in hunger, the emission of greenhouse gases, the degradation of the biosphere, and the scarcity of natural resources, particularly water. It also limits the production of certain foods for future generations (FAO, 2013, p.15).



Fig 8: Consequences of food waste (own elaboration from FAO, 2013)

According to the Food and Agriculture Organization of the United Nations (FAO,2019) estimate one-third of all food that is produced is wasted at some point in the production and consumption chain. This causes a substantial financial loss of over USD 1 trillion per year and minimizes household food security, thus increasing food market inflation and decreasing consumer purchasing power. To minimize food waste, it is important to do an in-depth analysis of which phases of the food chain and in which regions of the world the wastage is highest.

2.8 Overview of food waste in Germany

The average amount of food waste in Germany in 2015 was between 10.27 and 13.43 million tons(Schmidt et al., 2019). Most of the food waste is generated with 52% (6.14 million t) in private households, which corresponds to about 75 kg per capita per year 2015. Primary production accounts for 12 %(1.36 million t), processing 18% (2.17 million t), retailers 4% (0.49 million t) and the Out-of-home catering of 14% (1.69 million t). According to the projections available, about half would be across all sectors of waste is theoretically avoidable (Schmidt et al., n.d.).



Fig 9: Percentages of food waste in Germany in different areas of food value chain (Thünen Report 71, 2015).

In the private households of Germany, different kinds of food waste have different shares. For example, fruits and vegetables account for 34% of wasted food, while home-cooked food accounts for about 16% of waste. Bread and pastries account for 14% of waste, drinks for 11%, dairy products for 9%, fish and meat for 4% of waste, etc. (Pelau et al., 2020)

2.8.1 Overview of food waste in different countries

Every single year, developed and developing nations generate tonnes of food waste. While many assume food waste is more of a concern for developed nations, many recent studies indicate the situation is nearly similar in both nations(United Nations Environment Programme, 2021,p.8). However, in the low-income region, the waste occurs at the upstream level, while in the high-income region it takes place at the consumer level. According to the United Nations Environment Programme food waste index report of 2021, the highest levels of food waste have been registered in the Netherlands (541 kg/capita/year) and Belgium (345 kg/capita/year) throughout the entire supply chain, that is, from agriculture level to final consumption. However, in a country

like Ghana, the food waste generation among all income groups was recorded as between 80 and 86 kg/capita/year, respectively. The amount of food wastage estimated in a country like Ghana was a bit surprising. According to the previous studies, household food waste seems to be an industrialized country's concern, but the condition is not less in comparison to countries like Europe and North America(Stenmarck et al., 2016). Although, in comparison to Ghana, Romania and Slovenia have the lowest (70 kg/capita/year). Along with this, Pakistan, which is positioned eleventh at extreme risk on the food security checklist, also generates 74 kg/capita/year of food waste in the urban area, which is close to German household food waste, which is 75 kg/capita/year(Farooq & Ahmad, 2020).

According to (Ahmed et al., 2021) assumption, the United States household food waste records must be very high, but unexpectedly, they are below the global average. However, in combination with food services (123 kg/capita/year) food waste estimates are much higher than in countries with the same economic development. For example, the people of Australia generate 102 kg of food waste annually, and the United Kingdom produces on average 94 kg/capita/year.



Fig 10: Annual per capita household food waste of selected countries worldwide(UNEP food waste index report,2021).

2.9 Actions against food waste at the consumer level in Germany and different countries

Globally, the amount of food waste is huge. In Europe, more than 80 million tonnes of food are wasted annually, costing 143 billion euros (FAO, 2019). Although many countries are working at the local and national level and making progress Recently, many public and private awareness campaigns have been organized all over, and many research institutes around the world are conducting a greater amount of research on the amount of food waste and how consumers are influenced by different factors(Secondi et al., 2015). But some studies suggest that those interventions that target consumer attitudes and

behavior at all levels of the food supply chain with the help of informative campaigns have shown great achievements in food waste reduction (FAO, 13, p.10)

Noticeably, at the consumer level, food waste is an outcome of the way households deal with these different stages. For instance, not making a shopping list before going shopping may result in buying food that is already in the pantry or fridge during the shopping stage, which subsequently may result in failure to consume food before its expiry date. Alternatively, poor planning may imply that the consumption of food present in the household is not adequately stored, and as a consequence, this food runs past its expiry date(Herzberg et al., 2020). In Germany, the Federal Ministry of Food and Agriculture (BMEL) launched a campaign called "To Good to the Bin." This initiative aims to educate consumers about the value of food, the causes of food waste, and the best options for reducing food waste. Additionally, the federal government has also made an initiative against the disposal of food waste. A filter function can be used to find out whether projects are taking place nearby that you can participate in('National Strategy for Food Waste Reduction', n.d.).

Different research projects have been funded by the government and a few educational institutions have also recognized their ability to encourage food waste reduction and improve their measures of institutional sustainability through campus food diversion programming(Leal Filho et al., 2021) (Gabriel et al., 2021). Another digital solution has also been implicated by the government. For example, the mobile app allows the user to enter leftover ingredients, which will then be used to produce a simple recipe containing the leftover ingredient. In 2019, the National strategy of food waste has also adopted by the German government. The strategy also focused to work on the private household. The core element of this project is to test different intervention which includes Food-related household practices and routines and also aim at awareness-raising and providing information on the consequences of food waste('National Strategy for Food Waste Reduction', n.d.). Although the Too Good for the Bin program was also unique compared to other food waste policies because it is an educational policy tool found at the

governmental level, which is not a common trend among countries' food waste policies. However, no measurement tools have been used to evaluate whether or not food waste has decreased since the onset of the initiative(Leverenz et al., 2021). Based on (UNEP, 2021) and (FAO, 2013) report, the ongoing few efforts and projects in different countries on food waste reduction has been summarized in Table 2.

Country	Name	Goal/Achievements
Saudi Arabia	Saudi Food Bank	Raise awareness through education campaigns on food waste and its global consequences. Providing recipes on the conversion of leftover meals into edible food and how to store food properly.
Lebanon	Food Blessed	Reduce food waste by collecting excess Edible food from various partners and donating it to people in need.
United Arab Emirates	Winnow	Over 1 million meals were saved in 2018 and members of the pledge receive benefits such as logo promotion and invitations to events. Incorporates artificial intelligence into the professional kitchen through technology that analyses data to identify wasted food items
Sweden	Schools Competing to Reduce Food Waste in Canteens	Decrease food wastage in school canteens and herby reduce the environmental impact of CO2 emission. At the end of the project, schools reduced their waste by 13 %. With this given result 7 tones of CO2 can be saved annually
France	Coaching household against food wastage"	Coached 30 French families over 2 months by giving basic tips to reduce food wastage at the household level for example: writing and sticking to a shopping list, using leftovers for tomorrow, serving in small portions, etc. The managed group was able to reduce 70 percent of food waste

	1 <u>66</u> / 1	•				e 1	
Table 7. Summarized f	ha attarte and	ongoing nr	Mante in di	ttoront countria	as on roducu	na tood	WOGTO
	пс споть апо	011201112101	// כנוא ווו עו			12 1000	I WASLE

Belgium	Don't bite more than you can chew	Introduce ideas about food waste among school teachers including measurement of food consumption, discussion of consequences, and measures for improvement.
Korea	Volume-based Radio Frequency Identification System	Installing the Volume-based Radio Frequency Identification (RFID) system on collecting containers which charge fees following the weight of organic waste bags.
		The country was able to receive an average 25 percent reduction in household food waste

Chapter 3: Research Methodology

3.1 Materials and Methods

The following chapter elaborates on the methodology chosen for this research. The chapter further highlights the sample description and variable used in this research along with the tool used to collect data.

3.2 Study design

Descriptive cross-sectional online survey was the selected study design (Althumiri et al.,2021)(Farooq & Ahmad, 2020).

3.3 Study population, and setting

In Germany the percentage of migrants is at rise and according to current statistics, more than twenty percent of the population holds a migrant background. Based on the target population, the study site Hamburg was chosen. Hamburg is the second-largest city in Germany. The city has a population of more than 1.7 million inhabitants out of which 26.9 percent population have a migrant background. Whereas approximately 5.2 % of the city's population comes from west and south Asia.

3.4 Study Duration

After ethical approval the study was conducted between February 2022 till July 2022.

3.5 Sample Size estimation (n)

For the present study objectives, the sample size was calculated from a study conducted in Saudi Arabia (cross-sectional study) by Althumiri et al., in 2021 reported the prevalence of cooked and uncooked food waste was 63.3 percent. The sample size for the present study was calculated on this basis using the Open Epi tool Version 3.01 by using the formula.

Sample size $n = [DEFF*Np(1-p)]/[(d^2/Z^2_{1-\alpha/2}*(N-1)+p*(1-p)]]$.

ConfidenceLevel (%)	Sample Size
95%	182
80%	78
90%	128
97%	223

Sample Size(*n*) for Various Confidence Levels

Keeping a confidence interval of 95% and a margin of error of 5% calculated sample size was 182. Therefore, the study has aimed to collect 182 responses from the target population.

3.6 Sampling technique

In order to reach the estimated sample size for the present study, the non-random convenience sample technique was used (Yildirim et al., 2016) (Sinisa Berjan et al., 2022). Convenience sampling is defined as the method of sampling in which the study population is conveniently accessed by the researcher. By using this technique, the researcher easily and economically observed the behavior, habits, and opinion of the study precipitants. Due to the convenience of access to the respondents within a limited time frame, the non-probability sampling technique is widely used among researchers. Despite the enormous advantage, the convenience sample technique has a low ability to draw generalized results.

3.7 Sample Selection:

3.7.1 Inclusion and exclusion criteria of Migrants:

1. Male and female genders were included in the study.

2. Those respondents who are living in Germany for more than six months were included in the survey. The reason behind this is that a person must be used to the new buying, consuming, and wasting habits. 3. The male and females aging less than eighteen years and above sixty-five years were excluded from the study.

3.8 Data collection tool

The self-administered structured survey tool was prepared based on previously validated studies on food waste at the consumer level. The bank of the question was developed using the past surveys which include a national survey of Australia coupled with other studies which were conducted by the Environment Protection Authority (EPA), and the University of Bologna. However, a couple of additional question was also added based on the existing literature to meet the overall objectives(Fight Food Waste CRC, 2020)(Charbel et al., 2016)(EPA, 2012)(Farooq & Ahmad, 2020).

By focusing on the study participant, the survey questionnaire was developed in Google form in January and administered in the English language. Initially, thirty-two questions were finalized to assess the knowledge and behavior of immigrants at the household level. For further validation of the questionnaire, the pilot study was also conducted on twenty participants (N = 20) so that the clarity of the question was assessed and simultaneously the author can evaluate the maximum response time. At the end of the pilot study, a few suggestions were given in the feedback section and according to that, some necessary adjustment has been made. For example initially for the entire questionnaire single-choice option was designed but after the feedback single and multiple-choice options were included in the questionnaire.

3.8.1 Structure of the Questionnaire

The final version of the questionnaire consists of 29 structured close-ended questions. In the introductory part of the questionnaire, the purpose of the study, approximate time to fill the survey, and inclusion criteria of study participant was defined. To avoid consistency bias, the questionnaire was divided into four different sections which are explained below. The first section was designed to collect demographic information from the respondents. These demographic characteristics include age, gender, educational level, income, household composition, and country of origin.

The second section was formulated to investigate the food shopping behavior of the study participant which includes place of food shopping, frequency, monthly economic estimation, use of shopping list, and attraction to offers. This section of the questionnaire comprises eight questions.

The third section of the questionnaire comprised of questions related to consumer food consumption habits. Four questions are added in this section which included frequency of cooking from raw ingredients, eating leftovers, eating out of home, and frozen meal consumption.

The final section of the questionnaire seeks information knowledge and behaviors of migrants regarding the extent, type, reason for generating food waste, how they manage the leftovers and most importantly the level of awareness of the impact of food waste and their willingness to minimize food waste by using a multiple-choice question.

3.9 Data collection Procedure:

After taking ethical approval from The Hamburg University of Applied Sciences, this online cross sectional survey was conducted among the migrants residing in Germany for more than six months. Both males and females aged 18 years to 65 years were enrolled in the study. The reason behind this is that a person must be used to the new buying, consuming, and wasting habits.

The study subjects were ensured about the confidentiality of information they provided to Principal investigator (PI). Moreover, a prior informed consent was taken from each of them. A structured Questionnaire was used for data collection by the PI. The questionnaire was filled anonymously, and respondents joined on a voluntary basis. This study has used the self-administered survey method for data collection as they are relatively inexpensive and time-saving. Besides that, the data is easily transferable into statistical software and spreadsheet for data analysis. The potential study participants were contacted through social media platforms which include, Facebook, WhatsApp, and LinkedIn.

Initially, the pilot study was conducted on a small sample of study participants n (30). Afterwards the questionnaire was made available in different Facebook group where many different nationalities of people are available in order to support or interact with each other such as Recommend Deutschland, Nochmal Deutschland, International students in Germany, HAW Hamburg Internationale studierende. The response rate of study participants was surprising. Within a span of 15 days more than half of the required sample size was achieved. Additionally, few respondents were also contacted directly by Email. The response rate on email was not encouraging. After gentle reminders, only 25 survey forms were filled by the participants. In order to give diversity to the sample, survey link was posted on different whats app group and the respondents were politely requested to further pass the survey within their circle. The process of data collection was started in the mid of February 2022 after pre-testing the questionnaire and ended in the mid of April 2022. Although the calculated sample size was 182 but 201 respondents were included in the study.

3.9.1 Data Management

The raw data were entered into Microsoft Excel and analyzed using the Statistical software version SPSS version 20. The entire data was stored on password-protected computer to which only the principal investigator and supervisors had access.

3.10 Statistical Analysis

Data was analyzed by using SPSS version 20. . For qualitative variables frequency and percentages were computed whereas for quantitative mean and standard deviation were calculated. Normality of data was assessed by using Shapiro-wilk test, the data was found to be non normal hence non parametric test were used. Mann whitney U and Kruskalwallis test were used to find association between the study variables. Spearman

correlation was used to find correlation between variables. P-value of ≤ 0.05 was taken as significant.

3.11 Ethical Considerations:

The ethical considerations for the present study were based on the principle that the research "does not cause harm, allow harm to be inflicted, or otherwise damaged the interests of any involved parties" (University of West London, 2008). The confidentiality and anonymity of subjects include in the study were ensured. The standardized research protocol had been followed. For constructing validity the respondents of the study were also given the opportunity to review their responses and were given full autonomy to alter, modify or change what they deemed necessary

3.12 Operational definitions

1. Food waste

Food waste refers to food appropriate for human consumption being discarded at the household level, whether or not after it is kept beyond its expiry date or left to spoil.

2. Migration /Immigrants

In Germany, a person is considered to have a "migration background" (Migrationshintergrund) if they, or at least one of their parents, were born without German citizenship.

3. Consumer Behavior

Consumer behavior can be defined as 'those activities directly involved in obtaining, consuming and disposing of products and services, including the decision processes that precede and follow these actions' (Joseph & Sharma, 2022).

4. Socio-demographic characteristics:

The socio-demographic characteristics such as age, gender, income, education, household composition, and country of origin were used to assess the influencing factor and extent of food waste among the migrants with the help of their food consumption, shopping, and wastage behavior. Country of origin might tell us how different cultural backgrounds shape and influence food waste behavior. To determine how far migrants know about the subject of food waste and the problems resulting from food waste which is the main focus of the research therefore based on the Habermas' theory of knowledge and human interest the group of questions related to consumer general knowledge on food waste and its consequences was designed. Answers generated from each respondent were calculated and summarized in percentages.



Fig 11: Research design flow chart (Authors own research and edition, 2022)

Chapter 4: Results

The purpose of this chapter is to account for the findings of the research, its presentation, interpretation, discussions and analysis. The analysis of the data was done using the quantitative method and presented in the form of tables, bar graphs and pie charts. All the findings are entirely based on the responses obtained from the study participants.

4.1(A) Socio-demographic characteristics of the respondents:

Table 3(A & B) shows distribution of demographic variables and it was seen that out of total 201 study subjects 124(61.7%) were 26 to 35 years of age and among them 135(67.2%) were females. 110(54.7%) were Master's Degree holder and 111(55.2%) were married with children. 69(34.3%) earned between $1500 - 3000 \notin$ monthly.

Table 3(A): Frequency Distribution of Demographic Variables			
Parameters		Ν	%
Age	16-25 Years	10	5%
	26-35 years	124	61.7%
	36-45 years	51	25.4%
	46-55 years	16	8%
Gender	Male	66	32.8%
	Female	135	67.2%
Qualification	Secondary	12	6%
-	school		
	Bachelor's	61	30.3%
	degree		
	Master's degree	110	54.7%
	Doctoral degree	18	9%
Household	Living in shared	12	6%
Composition	house/apartment		
	Living with parents	5	2.5%
	Living with partner	30	14.9%
	Married and Children	111	55.2%
	Single person	43	21.4%

Income	450€	3	1.5%
	451 - 800 €	19	9.5%
	800 -1500 €	30	14.9%
	1500 - 3000 €	69	34.3%
	3000- 4500€	51	25.4%
	More than 4500	29	14.4%
	€		
	Total	201	100%



Fig12: Age Distribution of Respondents



Fig 13: Gender Distribution of Respondents



Fig 14: Qualification Distribution of Respondents



Fig15: Household Composition Distribution of Respondents



Fig16: Income Distribution of Respondents

4.1(B) Origin of study Subjects

Table 3(B) shows frequency distribution of Origin of study Subjects and it was reported that majority of them were Pakistanis 116(57.7%) followed by India 33(16.4%).

Table 3 (B): Frequency Distribution of Country Origin of Study Subjects				
Parameters	arameters N %		%	
	Pakistan	116	57.7%	
	Germany	11	5.5%	
	Albania	1	0.5%	
Country Origin	Bangladesh	6	3%	
	Bhutan	1	0.5%	
	Cameroon	1	0.5%	
	Egypt	3	1.5%	
	England	1	0.5%	
	France	1	0.5%	
	Ghana	2	1%	
	India	33	16.4%	
	Ireland	1	0.5%	

Lebanon	2	1%
Nepal	6	3%
Nigeria	7	3.5%
Russia	2	1%
Sri Lanka	1	0.5%
Turkey	1	0.5%
Ukraine	2	1%
USA	3	1.5%
Total	201	100%

4.2 Food shopping behavior of study population

Table 4 shows frequency distribution of Consumers food shopping behavior and it was found that 111(55.2%) study subjects buy food grocery once a week and among them 109(54.2%) buy it from discounted market; 48(23.9%) spent 100 - 200 on food grocery monthly;92(45.8%) agreed that they got attracted towards discount offers. 122(60.7%) said they prefer quality; 174(86.6%) check before shopping what is already in stock; 105(52.2%) used shopping list while shopping and 101(50.2%) agreed they plan meals to be cooked in the house.

Table 4: Frequency distribution of Food Shopping Behavior ofstudy subjects				
Parameters		Ν	%	
How often do you	Every day	2	1%	
buy food grocery?	Every alternate	69	34.3%	
	day			
	Once a week	111	55.2%	
	Every 2 week	14	7%	
	Once a month	5	2.5%	
Often buy your	Discount Super	109	54.2%	
food grocery from?	market (Aldi,			
	Lidl, Penny			
	,Netto			

	Grocery store (Real, Rewe, Edeka, Kaufland)	78	38.8%
	Turkish, Asian, Chinese, Sri lanka and African Markets	14	7%
Monthly on average	100 - 200€	48	23.9%
spent on food	200 - 300€	43	21.4%
grocery?	300 - 400€	38	18.9%
	50 -100€	25	12.4%
	Less than 50 €	4	2%
	more than 400€	43	21.4%
Do you get attracted	Yes	92	45.8%
to the discount offer	No	26	12.9%
while grocery shopping?	Sometimes	83	41.3%
Things important to	Best before date	11	5.5%
for you while	Brand name	4	2%
buying a food item?	Country of origin	1	0.5%
	Price	63	31.3%
	Quality	122	60.7%
Do you check what	Yes	174	86.6%
is already in the	No	3	1.5%
house before shopping?	Sometimes	24	11.9%
Do you use a	Yes	105	52.2%
shopping list while	No	30	14.9%
shopping?	Sometimes	66	32.8%
Do you plan the	Yes	101	50.2%
meals to be cooked?	No	39	19.4%
	Sometimes	61	30.3%
	Total	201	100%



Fig17: Distribution of checking what is already in house



Fig18: Distribution of use of shopping list while shopping

4.3 Food consumption behavior

Table 5 shows frequency distribution of Food Consumption Behavior and it was seen that 104(51.7%) agreed that they always use raw ingredients for cooking their meal;

71(35.3%) always eat their leftover meal. However 145(72.1%) report they occasionally eat out in restaurants and about 134(66.7%) agree they occasionally eat a readymade frozen meal.

Table 5: Frequency distribution	of Food Consumpti	on Behavio	r of study subjects
Parameters	Ν	%	
Cook a meal from raw	Always	104	51.7%
ingredients	Frequently	66	32.8%
	Sometimes (Only on occasions)	28	13.9%
	Never	3	1.5%
Eat a leftover meal from a	Always	71	35.3%
previous day	Frequently	64	31.8%
	Sometimes (Only on occasions)	62	30.8%
	Never	4	2%
Eat out in a Restaurant/cafes or	Often	42	20.9%
order takeaway (as a main meal)	Occasionally	145	72.1%
	Never	14	7%
Eat readymade meal e.g. frozen	Often	17	8.5%
meal	Occasionally	134	66.7%
	Never	50	24.9%
	Total	201	100%



Fig 19: Distribution of eating left over meal

4.4 Consumer's food waste knowledge and behavior

Table 6 shows Frequency distribution of food waste knowledge and behavior of study subjects and it was reported that for statement regarding food wastage behavior describing study subject 189(94%) responded positively as they are concerned about food wastage and try to avoid it; 110(54.7%) responded that never dispose off food that can be consumed; 102(50.7%) disagree that in festivals season food wastage is increased. The survey also found that most common type of food waste which is generated from individuals' household are 91(45.2%) answered Fruits and Vegetables followed by 70(34.8%) Cereals and Bakery products.

Table 6: Frequency dis	stribution of Food wastage Knowle	edge and Beh	avior of study
Parameters		Ν	%
Statement regarding food wastage behavior describing study subject	I am aware about the food waste and its associated problem, but I don't think I will change my behavior	9	4.5%
	I am concerned about food wastage and try to avoid whenever it is possible.	189	94%
	a major problem.	3	1.5%
How often you dispose	Always	10	5%
food that you still think it can be	More than twice a week	14	7%
consume?	Never	110	54.7%
	once a week	56	27.9%
	twice a week	11	5.5%
Do you think during	Yes	47	23.4%
festival more food is	No	102	50.7%
wasted?	May be	52	25.9%
Food generally wasted	Cereals and Bakery products	70	34.8%
from study subjects	Fruits and Vegetables	91	45.2%
household	Meat and other meat products	2	1%
	Dairy products	25	12.4%
	Fish and other sea food	4	2%
	Pulses and oil seeds (peas, chickpeas, olives etc.)	9	4.4%
Most common reasons of generating food	Food does not have a good taste or smell	9	4.5%
waste from households	Food is left in the fridge for too long	11	5.5%
	Food has fungus.	20	10%
	Food does not look good	17	8.5%
	Food is expired	16	8%
	Lack of appropriate planning and purchasing	117	58.2%
	Incorrectly preservation of food	11	5.4%
Uneaten food disposal	Dispose in a recycle bin	155	77.1%
by study subjects	Dispose off in restmüll or biomüll if its fruits etc	1	0.5%
	Give it as a donation	9	4.5%

	Give it to a needy person	1	0.5%
	I feed it to the animals	15	7.5%
	I freeze it or consume it on next	6	3%
	day		
	I make compost	11	5.5%
	Mostly we eat on the next day	1	0.5%
	but if the uneaten foods are		
	already have fungus or due to		
	temperature		
	Throw it out if it has gone bad	2	1%
Difference in study	I am less concerned in order to	10	5%
subjects behavior	avoid food waste in Germany as		
regarding food	compared to my country of		
wastage practice with	origin		
respect to country	I am more concerned in order to	75	37.3%
origin	avoid food waste in Germany as		
	compared to my country of		
	origin		
	I waste less food in my country	87	43.3%
	of origin as compared to		
	Germany	20	1.4.40/
	I waste more food in my	29	14.4%
	country of origin as compared to		
How door food wasta	L and to waste as of world fortile	20	100/
affect the world?	land area	20	1070
	Generates methane – a more	49	24 4%
	notent green house gas	77	27.770
	contributes to climate change		
	Harms the biodiversity	36	17.9%
	Leads to economic losses	64	31.8%
	Leads to wastage of fresh water	31	15.4%
	used for the production of food	01	1011/0
	Not offorting the world	1	0.50/
Vou will minimize the	Labels will be closer	1	69/
food waste if?	Labels will be clearer	12	070
	The package of food is more	26	12.9%
	suitable	20	12.970
			10.40/
	You had to pay taxes on the	27	13.4%
	basis of what you throw away	1	20/
	Y ou were better informed about	6	5%
	use negative impact of food		
	Vou wore better informed about	70	21.00/
	r ou were better informed about	/0	34.8%

	the negative impact of food waste on the environment.		
	You were better informed about the number of people dying due to hunger	60	29.9%
Seen/read/heard	Yes	73	36.3%
anything from	No	74	36.8%
Print/electronic media regarding food wastage/avoid food wastage in last 12 months	Don't Know/not sure/don't remember	54	26.9%
	Never heard/saw/read	49	24.4%
Where did you see, read, or hear about food waste and/or how to avoid it?	Newspaper	15	7.5%
	Social media	115	57.2%
	TV	22	10.9%
	Total	201	100%

Majority of participants 117 (58.2%) responded Lack of appropriate planning and purchasing as main reason of food waste; 155(77.1%) responded they dispose uneaten food in recycling bin. Interestingly some respondents also 87(43.3%) showed negative behavior as they said they waste less food in their origin country as compared to Germany; To analyze the level of awareness on the effect of food waste on world, 64(31.8%) responded report that it leads to economic losses. Although 70(34.8%) of respondents said they will minimize the food waste if they will be informed about the negative impact of food waste on the environment, almost equal number of study participants responded in favor and against (74 and 73 respectively) that they have seen anything from Print media regarding food wastage and its avoidance in last 12 months and 115(57.2%) responded social media as their source of information about food waste.



Fig 20: Distribution of type of wasted food



Fig 21: Distribution of food wastage reasons among migrants



Fig 22: Distribution of Uneaten food disposal



Fig 23: Distribution of Difference in behavior regarding food waste



Fig 24: Distribution of migrant's behavior regarding Impact of food waste on world



Fig 25: Distribution of behavior regarding Minimization of food waste if?

4.5 Association of Food shopping and consumption behavior of study subjects with socioeconomic parameters.

Table 7 shows association of food shopping and consumption behavior of study participants with socio-economic parameters and it was reported that statistically significant association was observed between different categories of country and frequency of buying food grocery (p=0.048) as well as income and different categories of frequency of checking what is already in house before shopping(p=0.042). No more significant findings were observed for other parameters.

Table 7: Association of Food shopping and consumption behavior of study subjects									
with socioeconomic Parameters									
Food shopping and		Socioeconomic Parameters							
consumption behavior									
of study subjects									
					Household				
		Gende	Countr	Qualificatio	compositio	Incom			
Parameters	Age	r	у	n	n	e			
	р	р	р	р	р	р			
How often do you buy									
food grocery	0.77	0.667	0.048*	0.275	0.615	0.888			
Often buy your food	0.25								
grocery from?	5	0.998	0.185	0.866	0.745	0.559			
Monthly on average	0.67								
spent on food grocery?	7	0.384	0.631	0.659	0.463	0.65			
Do you get attracted to									
the discount offer while	0.40								
grocery shopping?	8	0.726	0.476	0.17	0.677	0.219			

Things important to for						
you while buying a	0.66					
food item?	7	0.84	0.366	0.948	0.125	0.664
Do you check what is						
already in the house	0.26					
before shopping?	8	0.573	0.963	0.066	0.504	0.042*
Do you use a shopping						
list while shopping?	0.81	0.426	0.742	0.195	0.338	0.24
Do you plan the meals	0.93					
to be cooked?	2	0.185	0.56	0.972	0.685	0.14
Cook a meal from raw	0.99					
ingredients	1	0.849	0.248	0.939	0.865	0.458
Eat a leftover meal	0.51					
from a previous day	7	0.486	0.262	0.157	0.077	0.981
Eat out in a						
Restaurant/cafes or						
order takeaway (as a	0.74					
main meal)	2	0.63	0.112	0.858	0.336	0.717
Eat readymade meal	0.17					
e.g. frozen meal	5	0.945	0.689	0.482	0.411	0.595

4.6 Association of food waste knowledge and behavior of study participants with socio-economic parameters

Table 8 shows Association of food waste knowledge and behavior of study participants with socio-economic parameters and it was reported that no significant association exists between different categories of socioeconomic parameters and food waste knowledge and behavior of study subjects.

Table 8: Association of Food waste Knowledge and behavior of study subjects with socioeconomic Parameters							
Food waste Knowledge and behavior of study subjects	Socio-economic Parameters						
					Househol		
		Gend	Countr	Qualificati	u compositi	Inco	
Parameters	Age	er	у	on	on	me	
	р	p	р	р	р	р	

Statement regarding food						
wastage behavior						
describing study subject						
behavior	0.256	0.199	0.755	0.568	0.097	0.177
How often you dispose						
food that you still think it						
can be consume?	0.563	0.462	0.297	0.499	0.666	0.771
Do you think during						
festival more food is						
wasted?	0.411	0.781	0.143	0.348	0.581	0.204
Food generally wasted						
from study subjects						
household	0.618	0.862	0.553	0.693	0.847	0.381
Most common reasons of						
generating food waste						
from study subjects						
households	0.454	0.057	0.46	0.456	0.62	0.106
Uneaten food disposal by						
study subjects						
	0.582	0.305	0.569	0.518	0.191	0.312
Difference in study						
subjects behavior						
regarding food wastage						
practice with respect to						
country origin	0.521	0.109	0.349	0.317	0.785	0.825
How does food waste						
affect the world?	0.823	0.628	0.26	0.066	0.454	0.096
You will minimize the						
food waste if?	0.513	0.738	0.791	0.786	0.319	0.353
Seen/read/heard anything						
from Print/electronic						
media regarding food						
wastage/avoid food						
wastage in last 12 months	0.742	0.508	0.246	0.486	0.108	0.185
Where did you see, read,						
or hear about food waste						
and/or how to avoid it?	0.835	0.77	0.817	0.241	0.344	0.222

Table 9 shows a bivariate correlation analysis and it was observed a negligible correlation exists among majority of the food shopping and consumption behavior of study subjects and socioeconomic parameters age, Qualification, Household composition and income i.e. 0.00 to ± 0.30 .
Table 9: Correlation of Food shopping and consumption behavior of study subjects with socioeconomic Parameters				
Food shanning and consumption behavior of study subjects				
			Household	
Socioeconomic Parameters	Age	Qualification	composition	Income
Spearmen correlation	rho(p)	rho(p)	rho(p)	rho(p)
How often do you buy food grocery?	053	.074	.052	.018
Do you often buy your food grocery from?	0.032	0.046	0.059	033
How much monthly on average do you approximately spend on food grocery?	0.026	0.064	118	0.009
Do you get attracted to the special offer while doing food grocery shopping?	007	115	019	0.018
Which things are important to you while buying a food item?	014	0.010	0.019	003
When buying food items, do you check what is already in the house?	018	146*	0.068	121
When buying food items, do you use a shopping list	0.008	029	109	076
When buying food items, do you or your household plan the meals to be cooked?	0.033	004	029	095
Cook a meal from raw ingredients	022	011	0.044	0.007
Eat a leftover meal from a previous day	065	0.008	0.123	009
Eat out in a Restaurant/cafes or order takeaway (as a main meal)	0.004	059	0.086	031
Eat readymade meal e.g. frozen meal	079	028	120	0.068

Table 10 shows a bivariate correlation analysis and it was observed a negligible correlation exists among the majority of the food wastage knowledge and behavior of study subjects and socioeconomic parameters age, Qualification, Household composition and income i.e 0.00 to \pm 0.30.

Table 10: Correlation of Food waste Knowledge and behavior of study subjects with socioeconomic Parameters Food waste Knowledge and behavior of study subjects				
Socioeconomic Parameters	Age	n	n	e
Spearmen correlation	rho(p)	rho(p)	rho(p)	rho(p)
Statement regarding food wastage behavior describing study subject	0.10	0.07	0.110	100
behavior	6	0.06	0.113	190
How often you dispose food that you still think it can be consume?	0.005	051	091	078
Do you think during festival more food is wasted?	082	012	086	021
Food generally wasted from study subjects household	082	.060	009	073
Most common reasons of generating food waste from study subjects households	0.028	079	046	0.124
Uneaten food disposal by study subjects	056	.047	041	091
Difference in study subjects behavior regarding food wastage practice with respect to country origin	.008	018	003	030
How does food waste affect the world?	043	153	0.067	097
You will minimize the food waste if?	064	012	089	038
Seen/read/heard anything from Print/electronic media regarding food wastage/avoid food wastage in last 12 months	073	0.043	0.040	062
Where did you see, read, or hear about food waste and/or how to avoid it?	009	071	079	042

Chapter 5: Discussion, Conclusion and Recommendation

Discussion

Even as people become more concerned about environmental issues and sustainability, the issue of food waste is becoming more prominent. However, it is unknown how consumers view the situation and how much they are aware of the issues that occur from food waste(Richter, 2017). A significant amount of food is wasted and discarded, and much of this waste is avoidable. Individuals make the greatest contribution to food waste generation(Farooq & Ahmad, 2020).

5.1 Consumer's food shopping behavior

According to the current survey, nearly half of the study participants (55.2%) said they go grocery shopping once a week, and nearly a third (34.3%) said they do grocery shopping every other day.(S. Berjan et al., 2019) found slightly more than quarter 36.9% by food once a week, contrary to present study findings. According to(Charbel et al., 2016), 55% of respondents said they go grocery shopping once a week. A survey by(Farooq & Ahmad, 2020) found that in Lahore, little less than half of the study subjects said they go grocery shopping once a month, while a quarter 25% said they only buy it when they need it. In line with the current study,(Farooq & Ahmad, 2020)discovered that slightly more than a third of Gujranwala participants (37.5%) buy food once a week, while just a minority (28%) do so once a month. Moreover, this study found a significant difference between different categories of countries of origin of study subjects and food shopping behavior of going for grocery daily/weekly ; this may be due to the fact that majority of the study subjects (57.7%) belong to Pakistan.

The current findings revealed that slightly more than half of the respondents (54.2%) buy their groceries from a discount supermarket; this finding is consistent with a previous study conducted in Turkey by Yildirim et al., 2016, which found a slightly higher percentage of people (63.3%) buying groceries from supermarkets. Similarly, the current research According to a 2019 study by S. Berjan et al., the majority of respondents

(77.4%) buy groceries from a supermarket. (Charbel et al., 2016), conducted a similar survey and discovered that the majority of respondents buy at supermarkets.

Our research discovered that 48 (23.9%) of subjects spent between 100 and 200 euros per month on groceries; a Turkish study found that 79.3% of respondents spent more than 200 euros per month on groceries. Turkish Lira is a currency used in Turkey (Yildirim et al., 2016) According to a survey by(S. Berjan et al., 2019) the majority of people spent more than 150 EUR per month on food in 2019. According to a similar study conducted by (Charbel et al. in 2016), respondents agreed that their monthly grocery expenditure was USD 300.

In the current study, nearly half of the respondents (45.8%) said they were always attracted to discounted offers, while slightly less (41.3%) said they were attracted to them occasionally. In contrast, an older study found that only half of their study participants (51%) were attracted to such offers (Yildirim and colleagues, 2016). In concordance with the current study(S. Berjan et al., 2019), also showed 53.4% of respondents agreed that they were drawn to cheap offers. In a study by Charbel et al. (2016), nearly half of the study participants said they are drawn to discount offers. Another finding of our study infers that 60.7% study subjects reported that they prefer quality followed by price 31.3% while grocery shopping; A previous study by (Jungowska et al., 2021) found similar percentage in favor of quality followed by price.

In the present research, more than two-thirds of the study participants (86.6%) acknowledged they examine what is currently in stock before going grocery shopping; Moreover 60.7% participants said they prefer quality while grocery shopping; in contrast, (Ahmed et al., 2021) stated that less than two-thirds of their respondents (65%) check it before grocery shopping. Furthermore, present study found a statistically significant difference in shopping behavior among different categories of income. This might be due to the fact that income is the main resource and it can directly influence the food shopping behavior of study subjects. No difference was seen among male and female shopping behavior.

Over half of the study respondents (52.2 percent) utilized a shopping list while grocery shopping in the current study; a previous study (Ahmed et al., 2021) found that 65 percent of their study subjects used a shopping list while shopping, which is consistent with the current study. (Yildirim et al., 2016)observed comparable results in another survey, with 44% of respondents saying they always write food shopping lists. In keeping with these findings, the New South Wales Environmental Protection Authority (NSW-EPA) conducted an Australian survey on home food waste and found that significantly less than half of study respondents (42%) indicated they closely follow to a shopping list while shopping. Similar findings were discovered by(Farooq & Ahmad, 2020) with nearly half of study participants in Lahore (48%) and slightly more than half of study participants in Gujranwala (57%) utilizing a shopping list. This behavior has a positive impact because it eliminates excessive and needless purchases, which result in food waste due to expiration and rotting, leading to an increase in food waste. In contrast to our findings, a recent study published in 2019 by S. Berjan et al., indicated that only 1/3 of study participants use a shopping list, which contradicts our findings.

In our poll, half of the participants (50.2 percent) stated that they plan to make meals at home. In a similar study, (Ahmed et al., 2021) discovered that half of the participants (50 percent) always plan to cook food. Similarly, according to an Australian survey (NSW-EPA), 42% of respondents agree that they plan meals to be cooked before going shopping.

5.2 Consumer's Food Consumption Behavior

Food Consumption Behavior of study subjects revealed that half of the study subjects 51.7% responded that they always use raw ingredients for cooking their meal 32.8% answered they frequently use raw ingredients and only 1.5% said they never use raw ingredients. In concordance with our study, a previous study by (Yildirim et al., 2016) showed similar results as per their respondents a majority 63.9% agreed they use raw ingredients for making food and only 0.7% said they never did this. NSW-EPA, 2012 survey found that 40% agreed to using raw ingredients for making food. This is in line to

current study. Alike the present study another study by (S. Berjan et al., 2019) found that 60.9% of respondents cook their food from raw ingredients. More than a quarter of study participants (35.3%) said they always consume leftover meals, according to the findings. Almost a third of the study participants indicated they eat leftover meals frequently or occasionally. In contrast to the findings of our study, (Yildirim et al., 2016) found that almost half of the study subjects (53.3%) agree they eat leftover meals once a week, and slightly less than half (43.3%) agree they eat leftover meals from the previous day. Whereas, (S. Berjan et al., 2019) found opposing results to our study, reporting that almost two-thirds (73%) of study subjects ate meal from the previous day.

According to the current findings, nearly two-thirds of study participants (72.1%) said they occasionally eat out in restaurants, 20.9 percent said they frequently go to restaurants, and only 7% said they never eat out. A previous study by (Ahmed et al. 2021) found that only 1/3rd of respondents (36%) said they eat out in restaurants occasionally, one-quarter said they eat out once a week, and only 7% said they never eat out. This disparity in study results could be attributed to financial disparities between the target populations in these investigations. Contradictory findings were observed in another study by (Yildirim et al., 2016) they found that approximately half of the study subjects eat out or eat takeaway once or twice a week whereas almost 1/3rd of the study subjects 34.7% replied they never do it. NSW-EPA survey found that 53% of respondents eat out regularly this s again an opposing statement to current study findings moreover a minority 14% agreed to; they never dine out which is in concordance with our study. Alike present study (Farooq & Ahmad, 2020) also found that only 14 % responded said they never dine out. Contrary to our study (Farooq & Ahmad, 2020) reported that 44.1% study subjects eat out once a week in Lahore and for Gujranwala, its value was 36.5%. Another study by S. Barjan et al., published in 2019, found that almost half of the study subjects (56.9%) eat out once or twice a week, which is a significant difference from the current study's 20.9%; nevertheless, 9% said they never eat out, which supports our findings.

In our survey, 2/3rds of respondents (66.7%) indicated they eat prepackaged frozen meals on occasion. Only 8.5 percent of survey participants admitted to eat frozen meals frequently, while 24.9 percent stated they never ate ready-made frozen meals. In contrast, (Yildirim et al., 2016) reported that more than two-thirds of respondents said they never eat ready-made frozen meals.

On the other side, (Ahmed et al., 2021) discovered that 34.5 percent of people disapprove with using processed food since it takes longer to expire, which is in line with our findings. In a study conducted by(Farooq & Ahmad, 2020), 55.9% of Lahoris and 64% of Gujranwala participants said they prefer fresh food over packaged food, while 0% said they favor packaged food.

5.3 Consumer's Food wastage Knowledge and Behavior to reduce it

The knowledge and behavior of study subjects on food wastage and its consequences/impact on the world involved many factors; A majority 94% of the respondents responded positively regarding food wastage behavior and they agree that they are concerned about food wastage and trying to avoid it and only a minor percentage of study subjects 4.5% said they are aware but not interested in changing their lifestyles. In line with the current study (S. Berjan et al., 2019) explored a majority of 90.8% replied that they worry about food waste and try to avoid it and only 6.5% said they are not going to change their habits to reduce food waste. Another similar study by(Yildirim et al., 2016), found that 80% of the respondents were concerned about food wastage and how they can minimize it.

In the current study, more than half of the participants (54.7%) claimed they never throw away edible food, while a quarter said they do it once a week, and only 7% said they do it twice a week. In line with the findings of the current study,(Yildirim et al., 2016)discovered that 44% of survey participants never throw away edible leftover food. Only 1/3 of respondents (38%) said they throw away very little food that can be consumed. In contrast to the current study,(S. Berjan et al., 2019) stated that 56.1% of their respondents said they toss food out once a week, and 48.8 percent said they never throw food away that can be consumed. Our study found that almost half of study subjects 50.7% disagree that in festivals season food wastage is increased whereas almost a quarter replied in favor of it. On the contrary (Yildirim et al., 2016) observed that a big

number of study subjects i.e. 90% of respondents answered food wastage is increased during the fasting month of Ramadan. This huge variation in findings may be due to differences in the origin of study subjects.

In a recent study, nearly half of the study participants (45.2%) answered that fruits and vegetables are food waste from their homes, followed by cereals and bakery products (34.8%) and dairy items (12.5%). In contrast(Ahmed et al., 2021) found that only 11 percent of respondents said fruits and vegetables are food wasted from their homes, with milk and packaged food each accounting for 8%. (S. Berjan et al., 2019), found cereals and bread items to be the most wasted foods, followed by fruits, vegetables, and milk/dairy products in a different study. (Charbel et al., 2016) found that vegetables were wasted 10% of the time, cereals and bread items were wasted 7%, and fruits were wasted 6% of the time.

Regarding the most common cause of generating food waste, nearly half of the current study respondents (58.2%) reported insufficient planning and purchase as the primary cause of food waste. Other reasons for food waste the study subjects reported were food being kept in the fridge for too long (5.5%), 8.5 percent claimed food does not look good, 8 percent said the food was expired and a minority (4.5%) said food doesn't have a good taste or smell. Contradicting findings were noticed by (S. Berjan et al. 2019). They found almost half of respondents 43.7% mentioned that food was left in the fridge for too long time, nearly half 45.6% replied food was expired, and 30.2% said food does not look eatable/good. Another study by (Charbel et al., 2016) showed dissimilar findings to the current study as 34.4% marked food does not look good and 40.9% said the food was expired.

Our study findings revealed that almost $2/3^{rd}$ of study subjects 77.1% responded they dispose of uneaten food in recycle bin whereas a minority feed it to the animals (7.5%) and only 5.5% reported that they make compost from disposal food. The previous study by (Ahmed et al., 2021) found the same findings as they reported that 69% of study subjects dispose off wasted household food in recycling bins. Besides that dissimilar findings were also observed in (Ahmed et al., 2021) study such as almost a quarter 26%

study subjects fed excess food to pets and nearly half 47% of their study participants said they compost food to be wasted. Another dissimilar finding was observed by(Yildirim et al., 2016) as they reported 48% of their study subjects fed animals whereas in current study three-quarters of study participants thrown away uneaten food recycle trash. Contrary to the current study only 20% dispose off uneaten food in garbage reported by an Australian survey (NSW-EPA). On the contrary to our study(Farooq & Ahmad, 2020) also found that more than half of study subjects 62.9% in Lahore and slightly less than half 48% in Gujranwala fed their animals the food to be wasted and only a quarter replied they throw it in a bin. Another study by (Yildirim et al., 2016) showed unlike the present study that almost half study subjects fed their animals and the other half throw leftover food in the garbage (49.9% and 44.7% respectively).

This study mentioned almost half of the study subjects 43.3% showed negative behavior as they said they waste less food in their country of origin as compared to Germany. According to(Pelau et al., 2020) the issue of food insecurity is more in developing countries. Besides that, the quantity of food waste also varies depending on the region. Additionally, the influence of national culture, values, beliefs, and individual life approach behavior also plays a crucial role in the amount of food waste. However, the topic of cultural value and its association with food waste is still under debate. No difference was seen between male and female FW behavior. Furthermore regarding the affect of food waste on the world almost 1/3rd study subjects 31.8% responded that it leads to economic losses, nearly a quarter replied it generates methane gas contributing to climate change 24.4% and a minority 17.9% marked it harms biodiversity. Almost one guarter 34.8% of respondents said they will minimize food waste if they will be informed about the negative impact of food waste on the environment, slightly more than a quarter 29.9% answered they will minimize FW if they are better informed about the number of people dying due to hunger 12.9% marked package of food is more suitable. Only a minority 6% respondents replied labels will be clearer and only 3% agreed to reduce FW if they were informed about its impact on economy. In similarity with our study (Charbel et al, 2016) revealed 43% respondents marked they will reduce FW if they are better informed about its affect on environment this is in line with our study. Alike our study (Yildirim et al., 2016) found 53.7% respondents agree to reduce FW if informed about impact on environment followed by 45.6% economic losses. Contradictory to current findings a research by (Richter, 2017) stated that the consumer felt guilty on FW because of poverty but not because of environmental issues. Moreover, reduced food waste due to environmental or economic impact turn out to be minor motive as majority consider the food waste is a social problem. The reason of this weak motive might be due to lack of awareness about the link between food waste and global warming (Schanes et al., 2018).

(S. Berjan et al., 2019) on the other hand, reported data that were not consistent with the current study as according to them 39.4 % respondents said food waste can be reduced if the packaging is more appropriate, another 39.6% of study participants said it can be reduced if they are better informed about the negative effects of food waste on the environment, and nearly a quarter 21.3 % said it can be reduced if the effects on the economy are addressed. According to (Charbel et al., 2016) research, 37% believe that better food packaging can reduce FW, whereas a quarter 25 % believe that labels will be clearer. (Yildirim et al., 2016) found that 35% of respondents support better packaging, which contradicts current study findings.

An equal number of study participants responded in favor and against (36.3% and 36.8% respectively) that they got information from Print media regarding food wastage and its avoidance in the last 12 months. Over half of the study participants (57.2%) cited social media as their main source of information regarding food waste, while a quarter (24.4%) said they had never heard of it, seen it, or read about it. In a study similar to ours, (Ahmed et al., 2021) found that 63% of study participants had heard or learned about the problem of food waste in the previous year through the news, social media, or elsewhere. In our study, only 28% of participants had not recently heard of the problem of food waste.

In the current study, 24.4% of respondents said they did not seek information to avoid food waste, while 57.2% said they did. However,(Ahmed et al., 2021) found the opposite: more than half of the study participants, 61% said they did not seek information about household food waste reduction strategies, while only 39%said they did. This difference

may occur because of the geographic and cultural differences between target populations of both studies. As our study encountered study subjects from multiple origins throughout the world though residing in Germany.

The present study and the studies from literature concluded that the food waste varies from individual to individual and from country to country due to different influences such as highly urbanized society, cultural and socio-demographic factor, ease of food availability with lower price, regional preferences that might affect individual food shopping, consumption and wastage behavior (Principato L et al., 2015, koivupuro et al., 2012, Hamilton et al., 2005). Besides that dumping of consumable food has huge impact on country national economy and environment. Furthermore, the precious resources that are used to make food: land, water and the work of our farmers, plus the energy used to process, package and transport the food from farm to fork also get wasted. The wasting of food waste indicate that the consumers are not fully aware regarding the consequences of food waste.

5.4 Conclusion

The present study concluded that despite having different nationalities of participants, majority of them indicates positive and similar behavior of food shopping, consumption and food wastage. For instance, more than fifty percent of the participants always check what food item is already stocked at home and use a shopping list and allow the respondents to buy what actually needed thus resulting in less food wastage. Additionally, many respondents reported that they buy food items from the discounted market despite that majority of them do not get attracted to the discounted food and purchased what exactly is needed. Moreover, almost a third of respondents report that they eat or use leftover meals instead of throwing them in a recycling bin. Regarding edible food disposal, more than half of the participants claimed they never throw away edible food. Regardless of living in a modern high economic growth society considerable part of respondents show a positive attitude towards food waste reduction. The study further concludes that despite having different national cultures, the moral values and cultural practices which were taught during the upbringing might play a key role in minimizing food waste. As majority of the respondents were from South Asia, a society

that holds a strong food culture. Regarding the knowledge of the impact of food waste majority of the respondents were aware of the financial aspect but their knowledge regarding the environment and social perspective was low. The participants further highlight that they are interested in-depth information and wants to know more about the negative impact of food waste on the environment and thus they will further try to minimize the food waste as the majority of the individuals are more concerned about the climate change

Furthermore, the result of the study could not find any strong association between food waste and socio-demographic characteristics. Thus, the present survey on migrants residing in Germany showed that behaviors in dealing with food do not depend much on exact knowledge regarding food waste issues or socio-demographic characteristics, but rather on general involvement in issues related to food waste and the migrant's general awareness of food waste as a problem.

5.5 Limitation of the study

-First and foremost the present study was a cross-sectional study and the data was collected at one point of time, therefore, the study cannot establish causality.

-The study was not able to capture any differentiating results due to the overrepresentation of a population from one country of origin.

-The convenience sampling technique was used to recruit the study participants therefore the results of survey cannot be generalized to the whole population.

-The online questionnaire tool was used to collect the data as a result limited to reach those individual who have partial access to technology or not well literate to use the web technology.

-Moreover, the probability of recall bias cannot be ignored as the respondents might imperfectly remember the past event.

-The self-reported questionnaires regarding food wastage might be subject of social desirability-bias, by making participants to respond in a manner to be agreed by those reading the answers, rather than telling the truth. Additionally, a self-reported questionnaire may overrate or underrate the frequency of food wastage.

5.6 Strength of the study

- Despite using the descriptive approach, the study was able to capture precise information on migrant's food consumption, purchasing and disposing self-reported behavior without altering and manipulating the variables.

- The study used a structured questionnaire so that more factual information can be gathered from different respondents.

- The findings/conclusions derived from the present studies are supported by theory and intuition thus the study can be repeated at a later point in time.

- Although the accuracy of figures is lower. However, a general understanding of the subject of food waste can be drawn and the results of the survey can be useful in designing an effective intervention that minimizes food waste.

5.7 Recommendations

The author has done a comprehensive study on consumer food wastage knowledge and behavior. By analyzing the complexity of the topic it is difficult to suggest any tangible action that will minimize food waste at consumer level. However the author has developed the following recommendation based on the practice, factors and hierarchy of food waste which was described in earlier chapter.

5.7.1 Financial instrument and Regulation

Policy makers should adopt a holistic framework that empowers all the actors of the food supply. The financial instrument always consider a powerful tool in shifting individuals

attitude from negative to positive. The implementation of reward system might be the potential tool in minimizing the food waste at every stage of food supply chain.

Beside that remove or minimize the overzealous quality standards which might reduce the unnecessary discard of food. This will indirectly lower the environment impact which occurs during the post-harvesting level.

Quarterly food waste data should be collected, food waste minimizing goal should be set and timely monitor in order to track the progress. Moreover, certain strict penalties should me imposed who don't follow the regulatory provision.

Legally emphasis retailers to engage with food banks and charity organization so that extra stock or nearby expiry food should be donated instead to throwing in a bin.

5.7.2 Awareness and education campaigns

Education and awareness campaigns always believe one of the influential tool in food waste prevention. In order to achieve meaningful results, there is a need to re-educate and assist the population in building a knowledge regarding their shopping habits (e.g. make shopping list, buying needed and less aesthetically attractive items, etc) food consumption and storage practice (store food can be reuse later).

Communication campaign should be formed that promote wasting food is immoral and it is not socially acceptable.

Encourage citizens to learn some new habits and unlearned old habits. For instance, educate citizen to donate safe leftover and untouched food to nearby food bank instead of discarding in a recycling bin. Furthermore, community-based initiatives can be taken that educate individual to make compost from their household food waste. This will help in mitigate the environment and finical impact of food waste by avoiding the food ending up in landfill.

Different activities and awareness campaign should be conducted in education institutes as well either (Primary or secondary) that could help and raise awareness among students. The curriculum should offer a subject that provides information on food handling.

Provision of information on single platform (social media) platform might unable to make a huge difference on consumer food waste behavior. Different audiovisual platforms are required that deliver significant amount of information by highlighting the scale of the problem, challenges associated with food waste and how this can be overcome just by doing small effort at individual level.

5.7.3 Further research

The present study highlights that the food waste generation at the household level is a highly complex and multifaceted issue driven by a variety of reasons and types of behavior. However, further comparative studies with a random sample technique between different regions should be conducted so that different reason of food waste and many possible reduction actions by revealing differences in waste amount that is not much related to the product but more to differences in agronomical practices, organizational issues, economy and cultural and social issues can be investigated. Besides that, there is a huge gap which allows further investigation on the effectiveness and impact of different policy measures and other interventions on food waste practices that used to evaluate whether or not food waste has decreased since the onset of the initiative.

References:

Agri-, G., & amp; Marketing, F. (2017). International food marketing research. https://www.lume.ufrgs.br/bitstream/handle/10183/219298/001114450.pdf?sequence=1

Ahmed, S., Stewart, A., Smith, E., Warne, T., & Byker Shanks, C. (2021). ConsumerPerceptions, Behaviors, and Knowledge of Food Waste in a Rural American State.Frontiers in Sustainable Food Systems, 5(September), 1–12. Retrieved from https://doi.org/10.3389/fsufs.2021.734785.

Aitsidou, V., Michailidis, A., Partalidou, M., & Iakovidou, O. (2019). Household food waste management: socio-ecological dimensions. British Food Journal, 121(9), 2163–2178. Retrieved from <u>https://doi.org/10.1108/BFJ-02-2019-0111.</u>

Althumiri, N. A., Almousa, N., Aljuwaysim, M. F., & amp; Bindhim, N. F. (2021). Understanding Food Waste, Food Insecurity, and the Gap, (March). Retrieved from <u>https://doi.org/10.3390/foods10030681.</u>

Aschemann-Witzel, J., de Hooge, I., Amani, P., Bech-Larsen, T., & amp; Oostindjer, M. (2015). Consumer-related food waste: Causes and potential for action. Sustainability (Switzerland), 7(6), 6457–6477. Retrieved from https://doi.org/10.3390/su7066457.

Berjan, S., Mrdalj, V., Bilali, H. E. L., Velimirovic, A., Blagojevic, Z., Bottalico, F., Capone, R. (2019). Household food waste in Montenegro. Italian Journal of Food Science, 31(2), 274–287.

Berjan, Sinisa, Vaško, Ž., Ben Hassen, T., El Bilali, H., Allahyari, M. S., Tomić, V., &Radosavac, A. (2022). Assessment of household food waste management during the COVID-19 pandemic in Serbia: a cross-sectional online survey. Environmental Science and Pollution Research, 29(8), 11130–11141. Retrieved from https://doi.org/10.1007/s11356-021-16485-8.

Bozdag, A. N. S., & Cakiroglu, F. P. (2021). Determination of the factors affecting the amount of food waste generated from households in Turkey. Future of Food: Journal on Food, Agriculture and Society, 9(2), 1–20. Retrieved from https://doi.org/10.17170/kobra-202011192214.

Catlin, J. R., & amp; Wang, Y. (2013). Recycling gone bad: When the option to recycle increases resource consumption. Journal of Consumer Psychology, 23(1), 122–127. Retrieved from <u>https://doi.org/10.1016/j.jcps.2012.04.001.</u>

Charbel, L., Capone, R., Grizi, L., Debs, P., Khalife, D., El Bilali, H., & amp; Bottalico, F. (2016). Preliminary Insights on Household Food Wastage in Lebanon. Journal of Food Security, 4(6), 131–137. Retrieved from https://doi.org/10.12691/jfs-4-6-2.

Depa, J., Gyngell, F., Müller, A., Eleraky, L., Hilzendegen, C., & amp; Stroebele-Benschop, N.(2018). Prevalence of food insecurity among food bank users in Germany and its association with population characteristics. Preventive Medicine Reports, 9(August

2017), 96–101. Retrieved from https://doi.org/10.1016/j.pmedr.2018.01.005.

Delany, C., B. Kameniar, J. Lysk and B. Vaughan. 2020. Starting from a higher place: linking Habermas to teaching and learning clinical reasoning in the emergency medicine context. Advances in Health Sciences Education 25: 809-824. <u>https://doi.org/10.1007/s10459-020-09958-x</u>

EPA. (2012). NSW State of the Environment 2012. Sydney: Environment Protection Authority NSW, 302. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:NSW+State+

of+the+Environment#0.

European Commission (EC). (2019). Demographic situation: Turkey, (December), 3–7. Retrieved from <u>https://eacea.ec.europa.eu/national-policies/eurydice/content/population-demographic-situation-languages-and-religions-103 en.</u>

European Commission, & Report, T. (2010). Preparatory Study on Food Waste Across Eu 27. October (Vol. 33). Retrieved from http://ec.europa.eu/environment/eussd/pdf/bio_foodwaste_report.pdf

FAO. 2013. " Food Wastage Footprint". no. 978-92-5-107743-6. https://www.fao.org/3/i3347e/i3347e.pdf.

FAO. 2019. The State of Food and Agriculture 2019. Moving forward on food loss and waste reduction. Rome. <u>https://www.fao.org/state-of-food-agriculture/2019/en/</u>

Farooq, S., & amp; Ahmad, M. Z. (2020). An Investigation into Consumer's Behaviour and Attitude towards Food Waste Generation: The Case of Pakistan. Journal of Xi'anUniversity of Architecture & amp; Technology, XII(X), 592–603.

Farr-Wharton, G., Foth, M., & amp; Choi, J. H. J. (2014). Identifying factors that promote consumer behaviors causing expired domestic food waste. Journal of Consumer

Behaviour, 13(6), 393–402. Retrieved from <u>https://doi.org/10.1002/cb.1488</u> Fight Food Waste CRC. (2020). Food waste Australian household attitudes and behaviours. Retrieved from

https://fightfoodwastecrc.com.au/wpcontent/uploads/2020/05/NationalBenchmarkingSurvey-Final.pdf.

Fisher, R.J. 1993. Social desirability bias and the validity of indirect questioning. Journal of Consumer Research 20(2): 303-315. <u>https://doi.org/10.1086/</u>

Flanagan, A., & Priyadarshini, A. (2021). A study of consumer behaviour towards food-waste in Ireland: Attitudes, quantities and global warming potentials. Journal of Environmental Management, 284(October 2020), 112046. Retrieved from https://doi.org/10.1016/j.jenvman.2021.112046.

FOOD.(2021),(July).<u>https://www.danone.de/content/dam/danone-corp/danone-</u> <u>dach/bilder-en/danone-weltweit/danone-und-too-good-to-go-food-waste-studie-</u> <u>chart-report-eng.pdf</u>

Food, I., & amp; Council, I. (2021). About IFIC Our Mission. Retrieved from https://foodinsight.org/2021-food-

Gabriel, A., Rombach, M., Wieser, H., & Bitsch, V. (2021). Got waste: Knowledge, behavior and self-assessment on food waste of university students in Germany. International Food and Agribusiness Management Review, 24(6), 951–970. Retrieved from <u>https://doi.org/10.22434/IFAMR2020.0145.</u>

Ganglbauer, E., Fitzpatrick, G., & Comber, R. (2013). Negotiating food waste: Using a practice lens to inform design. ACM Transactions on Computer-Human Interaction,20(2), 1–25. Retrieved from <u>https://doi.org/10.1145/2463579.2463582.</u>

Giordano, C., & amp; Franco, S. (2021). Household food waste from an international perspective. Sustainability (Switzerland), 13(9), 1–9. Retrieved from https://doi.org/10.3390/su13095122

Gjerris, M., & Gaiani, S. (2013). Household food waste in Nordic countries: Estimationsand ethical implications. EtikkiPraksis, 7(1), 6–23. Retrieved from https://doi.org/10.5324/eip.v7i1.1786

Göbel, C., Langen, N., Blumenthal, A., Teitscheid, P., & amp; Ritter, G. (2015). Cutting food waste through cooperation along the food supply chain. Sustainability (Switzerland),

7(2), 1429–1445. Retrieved from <u>https://doi.org/10.3390/su7021429.</u> Habermas, J. 2015. Knowledge and human interests. John Wiley and Sons, New York, NY, USA.

Hamilton, C., Denniss, R., & amp; Baker, D. (2005). Wasteful consumption in Australia.DiscussionPaper,(77),1–46.Retrievedfromhttps://australiainstitute.org.au/wp-content/uploads/2020/12/DP77_8.pdf.8.pdf.

Herzberg, R., Schmidt, T. G., & amp; Schneider, F. (2020). Characteristics and determinants of domestic food waste: A representative diary study across Germany. Sustainability(Switzerland), 12(11), 1–17. Retrieved from https://doi.org/10.3390/su12114702.

Jörissen, J., Priefer, C., & Bräutigam, K. R. (2015). Food waste generation at household level: Results of a survey among employees of two European research centers in Italy and Germany. Sustainability (Switzerland), 7(3), 2695–2715. Retrieved from https://doi.org/10.3390/su7032695.

Joseph, M. V., & amp; Sharma, C. (2022). Food Product Development. Shelf Life and FoodSafety, 93–112. Retrieved from <u>https://doi.org/10.1201/9781003091677-6.</u>

Jribi, S., Ben Ismail, H., Doggui, D., & Debbabi, H. (2020). COVID-19 virus outbreaklockdown: What impacts on household food wastage? Environment, Development and Sustainability, 22(5), 3939–3955. Retrieved from https://doi.org/10.1007/s10668-020-00740-y.

Jungowska, J., Kulczyński, B., Sidor, A., & Gramza-Michałowska, A. (2021). Assessment of factors affecting the amount of food waste in households run by polish women aware of well-being. Sustainability (Switzerland), 13(2), 1–16. Retrieved from <u>https://doi.org/10.3390/su13020976.</u>

Kayıkcı, Y., Gözaçan, N., Lafcı, Ç., & Kazançoğlu, Y. (2021). A Conceptual Framework for Food Loss and Waste in Agri-Food Supply Chains: Circular Economy Perspective. Environmental Footprints and Eco-Design of Products and Processes, 41–53. Retrieved from https://doi.org/10.1007/978-981-16-3791-9_3.

Koivupuro, H. K., Hartikainen, H., Silvennoinen, K., Katajajuuri, J. M., Heikintalo, N., Reinikainen, A., & amp; Jalkanen, L. (2012). Influence of socio-demographical, behavioral and attitudinal factors on the amount of avoidable food waste generated in Finnish households. International Journal of Consumer Studies, 36(2), 183–191. Retrieved from <u>https://doi.org/10.1111/j.1470-6431.2011.01080.x</u>

Kranert, M.; Hafner, G.; Barabosz, J.; Schneider, F.; Lebersorger, S.; Scherhaufer, S.; Schuller, H.; Leverenz, D. 2012. "Determination of Discarded Food and Proposals for a Minimization of Food Wastage in Germany: Abridged Version". University Stuttgart Institute for Sanitary Engineering: Stuttgart, Germany, 2012. https://www.researchgate.net/publication/262728113_Determination_of_discarded_food_

Leal Filho, W., Lange Salvia, A., Davis, B., Will, M., & amp; Moggi, S. (2021). Higher education and food waste: assessing current trends. International Journal of Sustainable Development and World Ecology, 28(5), 440–450. Retrieved from https://doi.org/10.1080/13504509.2020.1865474.

Leverenz, D., Schneider, F., Schmidt, T., Hafner, G., Nevárez, Z., & amp; Kranert, M. (2021). Food waste generation in Germany in the scope of European legal requirements for

monitoring and reporting. Sustainability (Switzerland), 13(12), 1–23. Retrieved from <u>https://doi.org/10.3390/su13126616.</u>

National Strategy for Food Waste Reduction. (n.d.). https://www.bmel.de/EN/topics/food-and-nutrition/food-waste/national-strategy-forfood-waste-reduction.html.

Noleppa, S. (2012). Climate change on your plate. World Wild Fund for Nature Germany..<u>https://www.wwf.de/fileadmin/fm-wwf/Publikationen-</u>PDF/Climate change on your plate WWF 2012.pdf

Monier, Véronique, et al. 2010. "Preparatory Study on Food Waste Across EU 27". *European Commission (DG ENV) Directorate C-Industry*. 2010. Final report. Contract #: 07.0307/2009/540024/SER/G4. ISBN: 978-92-79-22138-5.

Osail, T. M., Obaid, R. S., Alqutub, R., Akkila, R., Habil, A., Dawoud, A., ... Taha, S. (2022). Food Wastage Attitudes among the United Arab Emirates Population: The Role of Social Media. Sustainability (Switzerland), 14(3), 1–13. Retrieved from https://doi.org/10.3390/su14031870

Pelau, C., Sarbu, R., & amp; Serban, D. (2020). Cultural influences on fruit and vegetable food-wasting behavior in the European Union. Sustainability (Switzerland), 12(22), 1–15. Retrieved from https://doi.org/10.3390/su12229685.

Pocol, C. B., Pinoteau, M., Amuza, A., Burlea-Schiopoiu, A., & Glogovețan, A. I. (2020). Food waste behavior among Romanian consumers: A cluster analysis. Sustainability (Switzerland), 12(22), 1–17. Retrieved from https://doi.org/10.3390/su12229708

Principato, L., Secondi, L., & amp; Pratesi, C. A. (2015). Reducing food waste: An investigation on the behavior of Italian youths. British Food Journal, 117(2), 731–748. Retrieved from <u>https://doi.org/10.1108/BFJ-10-2013-0314.</u>

Richter, B. (2017). Knowledge and perception of food waste among German consumers. Journal of Cleaner Production, 166, 641–648. Retrieved from https://doi.org/10.1016/j.jclepro.2017.08.009

Rohm, H., Oostindjer, M., Aschemann-Witzel, J., Symmank, C., Almli, V. L., de Hooge, I. E., ... Karantininis, K. (2017). Consumers in a sustainable food supply chain (COSUS): Understanding consumer behavior to encourage food waste reduction. Foods, 6(12), 1–21. Retrieved from <u>https://doi.org/10.3390/foods6120104.</u>

Schanes, K., Dobernig, K., & Gözet, B. (2018). Food waste matters - A systematic review of household food waste practices and their policy implications. Journal of Cleaner Production, 182, 978–991. Retrieved from https://doi.org/10.1016/j.jclepro.2018.02.030.

Schmidt, T., Baumgardt, S., Blumenthal, A., Burdick, B., Claupein, E., Dirksmeyer, W., ... Waskow, F. (n.d.). Thünen Report 73 (Vol. 1). Retrieved from https://doi.org/10.3220/REP1569247044000.

Schmidt, T., Schneider, F., & amp; Claupein, E. (2019). Food waste in private households in Germany – Analysis of findings of a representative survey conducted by GfK SE in 2016/2017 –. Retrieved from https://literatur.thuenen.de/digbib_extern/dn059788.pdf

Secondi, L., Principato, L., & amp; Laureti, T. (2015). Household food waste behavior in EU-27 countries: A multilevel analysis. Food Policy, 56, 25–40. Retrieved from https://doi.org/10.1016/j.foodpol.2015.07.007

Stenmarck, Å., Jensen, C., Quested, T., Moates, G., Cseh, B., Juul, S., ... Östergren, K.

(2016). FUSIONS - Estimates of European food waste levels. IVL-report C 186. Fusions.

Thyberg, K. L., & amp; Tonjes, D. J. (2016). Drivers of food waste and their implications for sustainable policy development. Resources, Conservation and Recycling, 106, 110–123. Retrieved from https://doi.org/10.1016/j.resconrec.2015.11.016.

Tobergte, D. R., & amp; Curtis, S. (2013). Reducing the Food Wastage Footprint. Journal of chemical Information and Modeling (Vol. 53).

UNEP. (2021). The state of food waste in West Asia. https://www.unep.org/resources/report/state-food-waste-west-asia.

UNFCCC. (2020). Fighting Food Waste Means Fighting Climate Change |UNFCCC.<u>https://unfccc.int/news/fighting-food-waste-means-fighting-climate-change.</u>

United Nations Environment Programme. (2021). Food Waste Index Report 2021. Unep. https://www.unep.org/resources/report/unep-food-waste-index-report-2021.

Visschers, V. H. M., Wickli, N., & Siegrist, M. (2016). Sorting out food waste behavior: A survey on the motivators and barriers of self-reported amounts of food waste in households. Journal of Environmental Psychology, 45, 66–78. Retrieved from https://doi.org/10.1016/j.jenvp.2015.11.007

Wang, J., Li, M., Li, S., & amp; Chen, K. (2022). Understanding Consumers' Food Waste Reduction Behavior—A Study Based on Extended Norm Activation Theory. International Journal of Environmental Research and Public Health, 19(7). Retrieved from <u>https://doi.org/10.3390/ijerph19074187.</u>

Yildirim, H., Capone, R., Karanlik, A., Bottalico, F., Debs, P., & amp; El Bilali, H. (2016).Food Wastage in Turkey: An Exploratory Survey on Household Food Waste. Journal of Food and Nutrition Research, 4(8), 483–489. Retrieved from https://doi.org/10.12691/jfnr-4-8-1.

Annexure

Annexure I: The Questionnaire

Section 1: Socio-demographic Factors:

Q1. What age group	are you in	?		
16-25	26-35	36-45	46-55	56-65
Q2. What is your ge Female	ender?		Male	
Q3. What is your co	ountry of Or	igin?		
Q4. What is your ec	lucational b	ackground?		
No formal schooling	g l	Primary school Secondary sch		
Bachelor's degree	1	Master's degree		Doctoral Degree
Q5. What is your ho	ousehold co	mposition?		
Single]	Living with parents		Living with partner
Married and Childre	en	Living in shared apa	artment	
Q6. Which of the fo	llowing bes	st describe your hou	sehold income?	
450€	2	151 to 800 €		800 to 1500 €
1500 to 3000 €	-	3000- 4500 €		More than 4500 €
Section 2: Cons	umer food	ł shopping beha	vior	
Q7. How often do	you buy foo	d grocery?		
Every day Every 2 week		Every alternate da Once a month	iy	Once a week
Q8. Do you often b Discount Super ma Grocery store (Rea Organic supermark Turkish, Asian, Ch	uy your foc rket (Aldi, l, Rewe,Ede et inese, Sri la	od from? Lidl, Penny, Netto) eka, Kaufland) nka & African Marl	kets	Farm shop

Q9. How much monthl	y on average do you approximately s	spend on food grocery?
Less than 50 Euros	50 to 100 Euros	100 - 200 Euros
200 - 300 Euros	300 – 400Euros	More than 400Euros
Q10. Do you get attrac one get one free, half	ted to the special offer while doing for price, etc)	ood grocery shopping? (Buy
Yes	No	Sometimes
Q11. Which things are Brand name Best before date	important to you while buying a foo Quality Country of origin	d item? Price
Q12. When buying foo Yes	d items, do you check what food is a No	lready in the house? Sometimes
Q13. When buying foo Yes	d items, do you use a shopping list? No	Sometimes
Q14. When buying foo Yes	d items, do you plan the meals to be No	cooked? Sometimes

Section 3: Food consumption behavior

How many times in a week does your household do the following?

ions)
ions)
ıl)
i

Q18. Eat readymade meal e.g. frozen m	eal
Never	Occasionally
Often	Always

Section 4 Consumer's food waste knowledge and behavior:

Q19. Which of the following statement regarding food wastage describes you better - I am concerned about food wastage and try to avoid whenever it is possible.

- I am aware about the food waste and its associated problem, but I don't think I will change my behaviour

- I don't consider food wastage as a major problem.

Q20. How often you dispose food that you	still think it can be consume?	
Always	Once a week	Twice a week
More than twice a week	Never	

Q21. Do you think during the period of festivals (Religious or cultural) your households generates more food waste?

Yes	No	Maybe
-----	----	-------

Q22. What variety of food is generally wasted from your household?

-Cereals and Bakery products	-Pulses and oil seeds (peas, chickpeas,	
olives etc)		
-Fruits	-Vegetables -Diary products	
-Meat and meat products	-Fish and other sea food.	

Q23. In your opinion, the most common reasons of generating food waste you're your households is? (Choose one or more answer)

- Food is expired
- Food does not look good
- Food has fungus.
- Food does not have a good taste or smell
- Food labels creates confusion.
- Food is left in the fridge for too long
- Lack of appropriate planning and purchasing
- Poor cooking skills
- Packaging was not in proper size
- Incorrectly preservation of food

- Food served proportion

- I don't like the food or ingredients

Q24. How you deal with uneaten food? (Choose one answer)Dispose in a recycle binGive it as a donationI feed it to the animalsI make compost

Q25. What difference in your behavior have you noticed regarding food wastage practice between your country of origin and current residing place?

I waste less food in my country of origin as compared to Germany I waste more food in my country of origin as compared to Germany I am more concerned in order to avoid food waste in Germany as compared to my country of origin

I am less concerned in order to avoid food waste in Germany as compared to my country of origin

Q26. In your opinion, how does food waste affect the world?

It generates methane – a more potent greenhouse gas that contributes to climate change It harms the biodiversity It leads to wastage of world fertile land area It leads to wastage of fresh water used for the production of food It leads to economic losses It's not affecting the world.

Q27. You will minimize the food waste if?

- You were better informed about the negative impact of food waste on the environment.
- You were better informed about the negative impact of food waste on the Economy.
- You were better informed about the number of people dying due to hunger
- Labels will be clearer
- The package of food is more suitable
- You had to pay taxes on the basis of what you throw away.

Q28. In the past 12 months, have you seen, read, or heard anything about food waste and/ or how to avoid food? For example, newspapers, articles, TV or ads, radio, etc.

Yes No Don't know/not sure

Q29. Where did you see, read, or hear about food waste and/or how to avoid it?TVNewspaperRadioSocial MediaNever heard/saw/read

Declaration of Honour

I herewith declare that I am the sole author of the current master thesis according to the regulation of Hamburg University of Applied Sciences and that I have conducted all works connected with the master thesis on my own.

Furthermore, I declare that I only used those resources that are referenced in the work. All formulations and concepts are taken from printed, verbal or online sources be they word-forward quotations or corresponding in their meaning are quoted according to the rules of good scientific conduct and are indicated by footnotes, in the text or other forms of detailed references. Support during the work including significant supervision is indicated accordingly.

The master thesis has not been presented to any other examination authority. The work has been submitted in printed and electronic form.

I am aware of the legal consequences of a false declaration of honor.

Date Signature

Serial no:-----

CONSENT TO TAKE PART IN RESEARCH

- I..... voluntarily agree to participate in this research study.
- ➢ I understand that even if I agree to participate now, I can withdraw at any time or refuse to answer any question without any consequences of any kind.
- > I understand that I will not benefit directly from participating in this research.
- I understand that all information I provide for this study will be treated confidentially.

Signature of participant or Thumb impression Date:

Signature of researcher

Date