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the professional Master's degree**

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Entitled

**Confronting the food waste crisis in
M'sila city**

Supported in front of the jury composed of :

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Dedication

To my great wing... my father... to my sparkling paradise... my mother

Strong arm of mine... My brother and sisters

My friends and all who have aided me in this worldly struggle

You're welcome from the depths of my heart

Thanks

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿يَرْفَعُ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ ۗ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ﴾

[المجادلة 11]

{Allah will raise up in ranks those who believed among you and those who have been given knowledge. Allah is Aware of what you do (11)}

Sura 58: AL-MUJADILA

I thank my wonderful teacher Belkassam abdalwahab for all the kindness and support you've shown me, and for all the encouragement and comforting words, a courteous and inspiring teacher.

I would like to extend my gratitude to the members of the discussion committee.

all who participated in this study

List of abbreviations

FLW: food loss and waste

AER: the Algerian Center for Economic Research

FAO: stands for the Food and Agriculture Organization

UNPC: the national consumer protection association

NGO: Non-Governmental Organization

UN: United Nations

EPA: Environmental Protection Agency

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General Introduction

Introduction

Food waste is a global problem. Each year food worth billions of dollars is wasted by the developed economies of the world. When food is wasted, the problem does not end at that point. More than 95% of the food waste ends at landfill sites, where converted into methane, carbon dioxide and other greenhouse gasses by anaerobic digestion. The impact of food waste to climate change is catastrophic. Food waste problem tends to increase in next 25 years due to economic and population growth mainly in Asian countries. In addition, when food wastes buried at landfill sites their energy content is lost. Although food waste is a huge problem, its global size and extent has recently become a hot topic in the academic community. This paper summarises the size of the global food waste problem together with the estimation of the amount of energy lost when food wastes dumped at landfill sites. Calculations in this study also revealed that energy lost at landfill sites equals to 43% of the delivered energy used for the preparation of foods in the US, 37% of the hydroelectric power generation of Japan, and more than 100% of the current annual renewable energy demand of UK industries (**Melikoglu, M., et al (2013)**)

As we know, food waste is one of the most widespread and escalating environmental phenomena and practices, with future consequences that are not far off and could be devastating on both the economic and environmental levels. This thesis is crucial in building sustainable development plans and is considered one of its cornerstone, as food security is the pillar that must be focused on to ensure food reserves that meet the needs of future generations

Therefore, the question arises: How can we address the food crisis in Msila Province? And how can we develop an analytical plan to improve this issue?

Studying the consumption behavior of urban individuals is crucial to identify the gaps through which food waste leaks, evaluating the obtained results to formulate a practical plan that can regulate consumption processes and mitigate this prevailing crisis.

This study aims to

- raise awareness about food waste crisis in the state of Msila.
- analyze the results obtained through a live human sample monitor consumption behavior.
- propose effective solutions and practical techniques to mitigate this widespread crisis.

CHAPTER I

Bibliographic summary of the Food Waste Crisis

1.The global food waste crisis

1.1.1-definition of food waste

Food waste is food that is intended for human consumption that is wasted and lost, and refers not only to food that consumers don't finish at restaurants and are thrown out at home, but also raw materials and produce that are lost in the farming stage, harvesting processes, during transportation, and storage. Food waste can occur anywhere throughout the entire supply chain. (Lai, 2023)

Today, an estimated one-third of all the food produced in the world goes to waste. That's equal to about 1.3 billion tons of fruits, vegetables, meat, dairy, seafood, and grains that either never leave the farm, get lost or spoiled during distribution, or are thrown away in hotels, grocery stores, restaurants, schools, or home kitchens. It could be enough calories to feed every undernourished person on the planet.

As the world's population continues to grow, our challenge should not be how to grow more food, but to feed more people while wasting less of what we already produce. Thankfully, there are plenty of actions we can take at the consumer level to make a significant difference. From delivering leftovers to those in need to freezing food, shopping smarter, and composting to keep inedible scraps out of landfills, we can all take small steps to curb our emissions

(World Wildlife Fund. WWF,2024)

To put it simply, food waste refers to any food products that are thrown away as opposed to being consumed. Typically, this waste can be split into four categories:

- **By-product food waste:** This refers to solid and liquid food by-products created through the manufacturing or production process or agricultural practices. This could include peels and trimmings from fruits & veg.
- **Expired products:** This refers to products that have surpassed their sell-by date in shops and supermarkets and cannot be consumed.
- **Leftovers:** This could refer to leftovers created in your household or leftovers acquired within restaurants and food preparation.

Bakery and packaged food waste: This could refer to unsold food items that could spoil quickly or packaging waste

(BusinessWaste.co.uk and Business Waste, 2024 ,Food Waste 2024 - the Facts)

1.1.2-History of Food Waste

During the late 1800's and early 1900's, industrialization and manufactured products drastically changed how Americans consumed food. **(1. Nunley, M. (2013). From Farm to Fork to Landfill: Food Waste and Consumption in America. Pitzer College)**

Food became commercialized and went from farm to table and from to factory to table. Consequently, families started to waste food because it was less expensive and more accessible . **(Rogers, Heather. (2005). Gone Tomorrow: The Hidden Life of Garbage. New York: The New Press)**

As a result, disposing of food on the streets became a serious health problem. In 1866, New York City's Board of Health issued a war on garbage, "forbidding the "throwing of dead animals, garbage, or ashes into the streets."**(A Garbage Timeline. (1998). Smithsonian Institution Traveling Exhibition Service)**

By 1916, Salt Lake City faced similar challenges with uncovered garbage cans that caused disease, filth, accidents, and ugliness to the city's curb appeal.

It was not until the early 1920's that health officials realized the necessity of proper sanitation and implemented waste removal practices .**(Loco Steve. (2009). Salt Lake City. Flickr).**

During this time, incineration was too expensive; as a result, Salt Lake City actually re-used their waste. To explain, "Using one 'covered nonleakable garbage wagon'... the city transported edible garbage to local animal feed companies; non-edible waste was used as fill in road construction."**(USU Digital Exhibits, 2024)**

1.1.3-Causes of Food Waste

There are a number of factors that can contribute to **food loss and waste (FLW)** at the consumer level:

- **Improper storage** – food not being used before it goes bad. Food spoilage at home occurs due to, lack of visibility in refrigerators, partially used ingredients and misjudged food needs.
- **Over-Preparing** – cooking or serving too much food. Cooking portions have increased over time and large meals often include more food than can be finished. In addition, people often forget to eat leftovers and end up throwing them away.
- **Large Portions** – commonly observed at restaurants, increased portion size largely contributes to waste. Restaurants meals are often left uneaten and edible leftovers are often left at the restaurant. All-you-can-eat buffets are particularly wasteful as extra food can't legally be re-used or donated due to health code restrictions. The common practice of keeping buffets fully stocked during business hours (rather than allowing items to run out near closing) creates waste.
- **Date Label Confusion** – food is prematurely discarded due to confusion over the meaning of date labels (e.g., "sell by," "best by," "use by," etc.).
- **Overbuying** – sales on unusual products and promotions that encourage impulse and bulk food purchases at retail stores often lead consumers to purchase items that don't fit into their regular meal plans and spoil before they can be used.
- **Poor Planning** – Without meal plans and shopping lists, consumers often make inaccurate estimates of what and how many ingredients they will use during the week. Unplanned restaurant meals or food delivery can also lead to food at home going bad before it can be used.
- **Lack of freezing** – confusion about whether a product is suitable for freezing and how best to freeze it to maintain its quality and storage life can lead to food spoilage (FAO, 2024)

1.2-Food safety

Food waste and food security are related in a way that illustrates how social, environmental, and economic variables interact. Food waste has detrimental effects on both individual and community food security once it is consumed.

First of all, food waste can put more strain on the land and water resources in the environment. Large-scale food waste results in the loss of the resources needed to generate the food, which implies more resources are needed to produce more food to meet nutritional needs.

Second, food waste has the potential to pollute the environment. Food, for instance, breaks down and releases methane gas into landfills, which is bad for the environment. Furthermore, food waste contamination can worsen the state of the soil, water, and Food waste pollution can harm ecosystems and public health by degrading the quality of the air, water, and soil.

Thirdly, there may be social and financial unrest as a result of food waste. Food waste is the equivalent of wasting money on resources that were used to produce and buy the food. Furthermore, food waste can exacerbate hunger and poverty, particularly in nations with limited resources and unstable economies.

Overall, reducing food waste contributes to achieving food security by improving the sustainability of food production, preserving natural resources, reducing pressure on the environment, and promoting social and economic stability. The four main dimensions of food security are as follows:

1. Physical availability of food: Food availability concerns the "supply side" of food security and is determined by the level of food production, stocks, and net external balance.
2. Economic and physical access to food: Adequate levels of food stocks at the national or international level do not guarantee household food security in themselves. Due to concerns about access to sufficient quantities of food, policies aimed at food security objectives place greater emphasis on income, expenditure, markets, and prices.
3. Utilization of food: Utilization generally refers to how the body optimizes the various nutrients present in food. Adequate intake of energy and nutrients depends on good care and feeding practices, food preparation, dietary diversity, and food distribution within the

household. These factors, combined with good biological utilization of consumed food, determine an individual's nutritional status.

4. Stability of the other three dimensions over time: Even if an individual's food intake is sufficient at a given time, they are still considered at risk of food insecurity if they do not have regular access to sufficient food and are therefore exposed to a deterioration in their nutritional status. Unfavorable climatic conditions (droughts, floods), political instability (social unrest), or economic factors (unemployment, rising food prices) can influence an individual's level of food security. **(la banque Mondiale, 2023)**

1.2.1-Impact of food waste on the environment

What you might not realize is just how much food waste endangers the planet. The environmental effects go beyond overflowing landfills; there are countless other ramifications, all of which underscore the severity of the organic waste problem.

We're going to share just a few of the dangers of food waste, not to shame or demoralize anyone but simply to arrive at an understanding of just how massive this problem is.

Why is Food Waste Such a Problem?

1) Food waste = water waste

Water is essential to life, and it's essential to food production. When we waste food, we're also wasting untold quantities of water, used for things like irrigation, feeding animals, and more. To put this issue into perspective, consider that about 70 percent of the world's water use is in agriculture... and around a quarter of that water ultimately goes to waste.

2) Food waste means methane production

Food waste ends up in a landfill, where it eventually begins to rot and to excrete methane gas. And methane gas is one of the leading culprits in climate change. If we wasted less food then we'd have less methane in the atmosphere... and that would benefit the environment in more ways than one.

3) Food waste is linked with oil waste

Fossil fuels, including oil and diesel, are essential for producing and transporting food. So, when we waste food, we're also wasting a lot of non-renewable energy sources.

4) Wasting food means wasting land

There's a lot of land required to produce food, including the land used to grow crops, to raise livestock, and to retain the food that's discarded. Needless to say, the more food we waste, the more we squander valuable physical space.

5) Food waste can also harm biodiversity

There are countless ways in which food waste affects biodiversity. Creating more land to grow food (and to store waste) means deforesting. It means clearing more land to be used as pasture space, which can destroy the habitats of native creatures. And that's to say nothing of the marine life that's destroyed due to irresponsible commercial fishing

(wasteXperts.feb 19.2024)

1.3-Food waste in Algeria

Mubarak Ghobazi, director of the AER Office for Studies in Hawari, said: “This figure reveals a real waste that occurs in light of the financial crisis and inflation, and reflects the extent of the phenomenon of waste in the behavior of consumer citizens.”

“The crisis in Algeria and the decline in citizens’ purchasing power after the collapse of the dinar are good opportunities for Algerians to change their behavior and improve their way of life,” Ghobazi said.

“Bakeries produce more than 27 million bread daily, of which about 7.2 million bread remains daily, part of which goes to recycling networks, while the rest is received in the dumpsters,” said Youssef Galfat, president of the National Federation of Bakers.

Employee Mohamed Maatouk stressed that this phenomenon is undeniable, as many families exceed their daily needs and buy unnecessary materials, while Riyad Shaaban, a seller of vegetables and fruits, pointed out that customers buy larger quantities than they need and get rid of them later.

Experts and social associations warned of the seriousness of this consumption behavior, especially with regard to subsidized items from the state treasury and basic materials.

Experts attribute this phenomenon to the psychological, social and economic factors that Algerian society is going through, stressing the need to change this consumption pattern in light of the current economic challenges. **(Nassim, H. A. 2024, April 19. Report reveals 30% of food waste in Algeria)**

1.3.1-Impact of the food waste on urbain city in the long term

Today, an estimated one-third of all the food produced in the world goes to waste. That’s equal to about 1.3 billion tons of fruits, vegetables, meat, dairy, seafood, and grains that either never leave the „,farm, get lost or spoiled during distribution, or are thrown away in hotels, grocery stores, restaurants, schools, or home kitchens. It could be enough calories to feed every undernourished person on the planet.

But wasted food isn't just a social or humanitarian concern—it's an environmental one. When we waste food, we also waste all the energy and water it takes to grow, harvest, transport, and

package it. And if food goes to the landfill and rots, it produces methane—a greenhouse gas even more potent than carbon dioxide. About 6%-8% of all human-caused greenhouse gas emissions could be reduced if we stop wasting food. In the US alone, the production of lost or wasted food generates the equivalent of 32.6 million cars' worth of greenhouse gas emissions **(World Wildlife Fund. WWF,2024)**

While some of the short-term and immediate impacts of food waste are well known and talked about often, it is worth exploring the more long-term consequences of this wastage. The demand for food is increasing every year, and it is estimated by the UN that food production will have to increase by half by 2050 to meet the needs of a growing population. With this growth will come significant food wastage unless solutions can be found to alleviate the situation. Globally, nearly a third of all food produced is wasted or lost for one reason or another. One of the many reasons for this is that a large proportion of food doesn't meet the cosmetic standards expected by supermarkets **(Pokornyi, 2018, The long-term impacts of food waste: can we have a waste-free 2050?)**

1.3.2-Sustainable Management of Food

Sustainable Management of Food is an approach that seeks to reduce wasted food and its associated impacts over the entire life cycle, starting with the use of natural resources, manufacturing, sales, consumption, and ending with decisions on recovery or final disposal.

EPA works to promote innovation and highlight the value and efficient management of food as a resource. Through the sustainable management of food, we can conserve resources for future generations, reduce greenhouse gas emissions that contribute to climate change, help businesses and consumers save money, and provide access to food for those who do not have enough to eat. To build a circular economy for all, EPA seeks to highlight opportunities to use raw materials more efficiently, enable those resources to be used for their highest value, and recover valuable resources from discarded materials in ways that address climate change, are inclusive of all communities, address environmental justice concerns, and help spur new innovation and economic growth. **(EPA.OCTOBER 19, 2023)**

1.3.3 The Importance of Sustainable Food Management

Conserving Resources and Reducing Greenhouse Gas Emissions Reducing wasted food does great things for the environment:

- Saves Resources – When food is wasted, it also wastes the resources – such as the land, water, energy, and labor – that go into growing, storing, processing, distributing, and preparing that food. Each year, food loss and waste take up an area of agricultural land the size of California and New York combined. This is enough energy to power 50 million U.S. homes for a year, and generate emissions (excluding landfill emissions) equal to the annual carbon dioxide emissions of 42 coal-fired power plants. United States Environmental Protection Agency, **(EPA, From Farm to Kitchen: The Environmental Impacts of Food Waste , 2021)**.
- Reduces Greenhouse Gas Emissions – The majority of greenhouse gas emissions from wasted food results from activities prior to disposal, including production, transport, processing, and distribution. Once food goes uneaten, it must be managed through one of various pathways, such as donation, upcycling, composting, anaerobic digestion, or landfilling – all of which also produce greenhouse gas emissions. To reduce these emissions, we need to prevent food from being wasted in the first place and sustainably manage what wasted food cannot be prevented.
- Reduces Methane from Landfills – When wasted food goes to a landfill, the nutrients in the food never return to the soil. The wasted food rots and produces methane, a greenhouse gas 25 times as potent as CO₂ at trapping heat in the atmosphere. EPA estimates that wasted food is responsible for 58% of landfill methane emissions to the atmosphere. **(United States Environmental Protection Agency, Quantifying Methane Emissions from Landfilled Food Waste, 2023)**
- Returns Nutrients to the Soil – Even when we take all actions to use wasted food, certain inedible parts remain and can be turned into compost to feed and nourish the soil. Composting these wastes creates a product that can be used to help improve soils, grow the next generation of crops, and improve water quality.
- Supports a Circular Economy – Preventing food from being wasted, using food for its highest value which is to nourish humans, and recovering valuable nutrients from wasted food are all activities that support a circular economy by reducing stress on natural resources, empowering communities, growing local economies, and spurring innovation.

In 2021, the EPA released the first of two reports in a series on the environmental impacts of wasted food to inform domestic policymakers, researchers, and the public about the environmental benefits that can be achieved by reducing U.S. food loss and waste

(EPA, OCTOBER 19, 2023)

a-Helping People

Preventing and sustainably managing wasted food and recovering wholesome, nutritious food can help you make a difference in your community:

- Feed Children – The U.S. Department of Agriculture estimates that five million children lived in food-insecure households in 2021. **(United States Department of Agriculture Economic Research Service, Food Security in the U.S.: Key Statistics & Graphs).**
- By redirecting food that would otherwise be wasted to homes and schools, we can help feed our country's children.
- Build Cleaner Communities – Reducing waste and improving waste management can help create cleaner communities. Equitable access to food and processing wasted food into soil amendments can improve soil health, generate renewable energy, and keep economic and job benefits of organics recycling in those communities.
- Create Job Opportunities – Recovering and recycling wasted food through donation, salvaging, processing, anaerobic digestion, and composting strengthens infrastructure and creates jobs. Food recycling in these sectors employs more than 36,000 people, supporting local economies and promoting innovation. **United States Environmental Protection Agency (Advancing Sustainable Materials Management: Recycling Economic Information Report Methodology, 2016)**
- Feed the World – According to the Food and Agriculture Organization of the United Nations, from between 702 and 828 million people were affected by hunger in 2021.

(International Fund for Agriculture The State of Food Security and Nutrition in the World 2022).

They predict that by eliminating food loss and wasted food we would have enough food to feed all the chronically undernourished. They also expect that we would not have to increase food production or put additional pressure on our natural resources to

do so. (**The State of Food Insecurity in the World 2014. Strengthening the enabling environment for food security and nutrition, 2014**).

b-Saving Money

When we waste food, we're not just creating a problem, we're also missing an opportunity to save businesses and consumers money:

- **Waste Less and Spend Less** – You or your organization can spend less and waste less by buying only the food you will use. Preventing wasted food can also reduce energy and labor costs associated with throwing away good food.
- **Pay Less for Trash Pickup** – Organizations might pay less for trash pickup by keeping wasted food out of the garbage. Some haulers lower fees if wasted food is separated from the trash and sent to an organic recycling facility instead of the landfill.
- **Receive Tax Benefits by Donating** – If you donate healthy, safe, and edible food to hungry people, your organization can claim tax benefits. The Bill Emerson Good Samaritan Act protects food donors from legal liability.

(EPA, OCTOBER 19,2023)

CHAPTER II

material and Methods

study of the food waste crisis in Msila city

1-Study Objectives

The study aims to achieve the following:

- raising awareness about the issue of food waste in Msila City and assessing it to gain control over it.
- managing individual behavioral gaps before and after consumption
- finding practical, effective solutions to alleviate the crisis

2-Survey Characteristics

- **Random:** We distributed the survey randomly among a group of individuals at the level of Msila City to include all age groups and both genders, aiming to identify behavioral gaps and understand the underlying reasons for food waste in urban areas.
- **Comprehensive:** Various age groups, wide areas of Msila City, urban areas
- **Thematic:** All behavioral aspects in the consumption process, both pre-consumption and post-consumption, were studied comprehensively to understand the problem's details accurately for effective remediation.

3-material and Methods

3.1-material

Google forms to create the survey

Google sheets to organize the database

M'sila city map

3.2-Methods

We created a survey using Google Forms, covering various aspects including behavioral, psychological, and social aspects. We then randomly distributed it to residents of urban areas in Msila City on a wide scale and in random areas. Afterward, we compiled the database and organized it using Google Sheets, to present us with a set of impartial results in the form of

charts that illustrate the study's findings in a clear, understandable, and easy-to-read manner, in order to find practical solutions.

As for the study's objectives, we focused on the purchasing, consumption, and wastage stages, believing that the primary cause of waste is a lack of consumption awareness.

CHAPTER III

Presentation, Analysis, and Discussion of Study Results

1-Studying discription

Within the framework of this study, a diverse group of individuals in the state of Msila and its neighborhoods were interviewed, and their votes were collected regarding questions that carry the right to choose one possibility and other questions that carry the right to choose more than one possibility, regarding their perceptions of the phenomenon of food waste, its common causes, and their behaviors towards food consumption. A questionnaire was randomly sent to 64 individuals in urban areas, including 42 males and 22 females, during the period from February 11 to April 20 of the current year. The paragraphs below allow presenting a summary of the obtained results.

2- Analysis and Discussion

2.1- gender

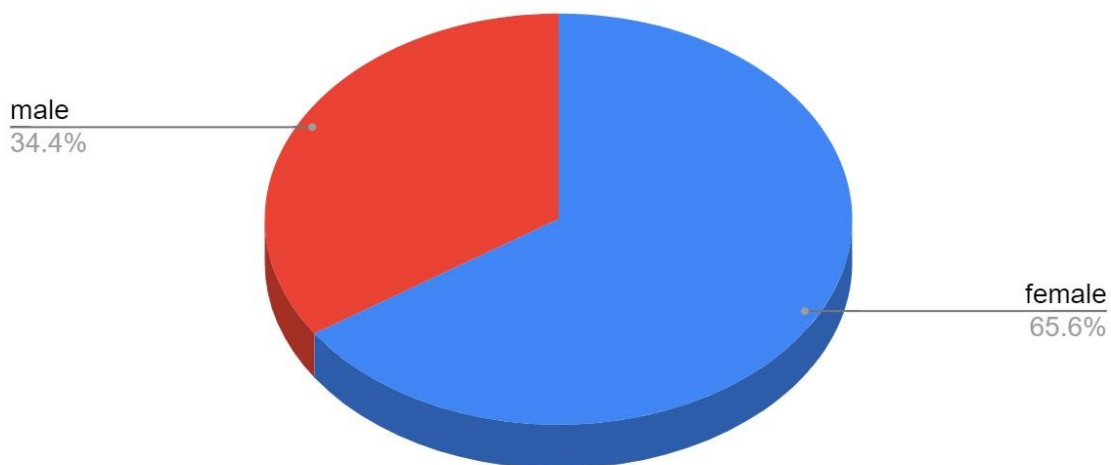


Figure 01: a graph showing the percentages obtained by gender of individuals who were subjected to a food waste study in Msila city (**table 01**)

The pie chart below illustrates the results of a study conducted on a sample of individuals from Msila city province, displaying the percentage distribution of genders among the participants. The percentage of females represents 65.6%, and the percentage of males

represents 34.4%. In a similar French study in May 2022, the results showed the following: 48% for men and 52% for women. This may be because women, It is noteworthy that the percentage of females is higher than that of males. This phenomenon could be analyzed as suggesting that housewives exert greater control over household food wastage, such as cooked food, food storage methods, and post-consumption waste, being homemakers, are more involved in food items and homecooked dishes...

2.2- Age

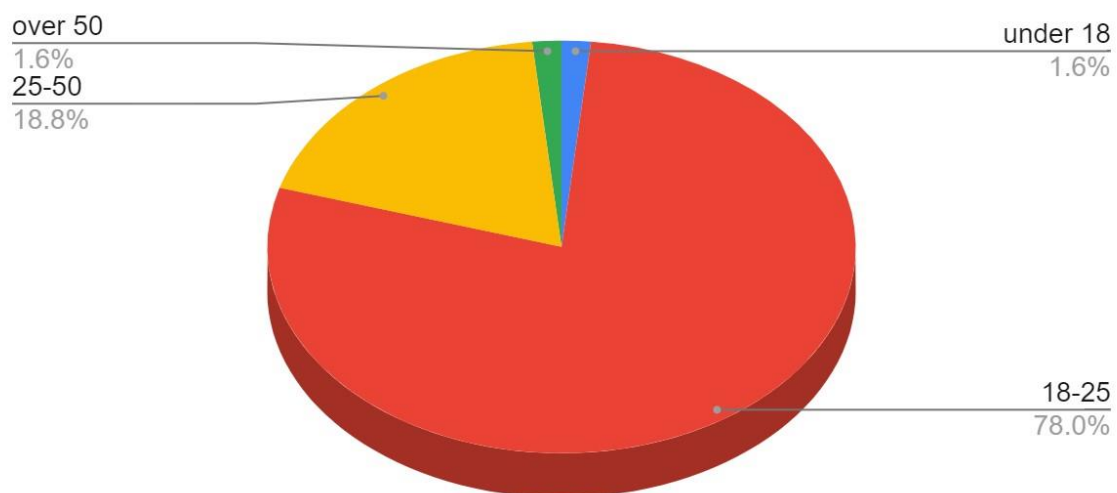


Figure 02: a graph showing the percentages obtained for the age of individuals who were subjected to a study of food waste in Msila city (**table 02**)

The chart illustrates the findings, indicating that the age of the sampled population ranges from 18 to 50 years old, with the uppermost value falling within the 18 to 25 age bracket. 78.1% for the age group between 18-25, 18.8% for the age group between 25-50, while the percentage for those under 18 and over 50 years old was lower, at 1.6%. In a similar French study in May 2022, the findings indicated the following: And the highest value was for the age group of 65 years and older, at 24%. For the age group 18-24 years, it was 10%, This may be because the age group of 18-24 consists mostly of university students who spend most of their time outside and consume fast food and street food. On the other hand, the

age group above 65 years consists of retirees who spend most of their time at home. However, in Msila City, the situation is entirely different due to the cultural factors we mentioned earlier. Elderly individuals may not prepare meals themselves, and consumption is determined by the younger age group

2.3- Awareness the problem

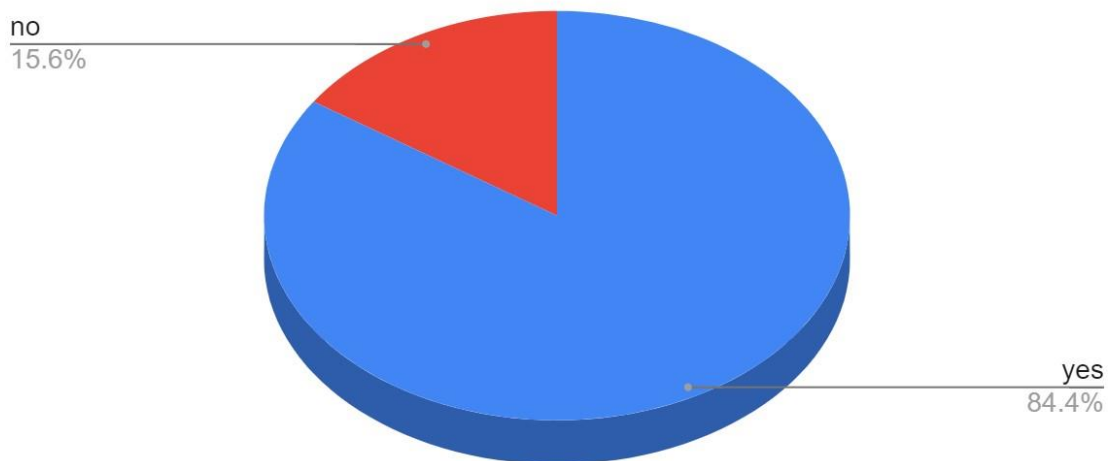


Figure 03: a graph showing the percentages of awareness of individuals subject to the study about the problem of food waste in Msila city (**table 03**)

The pie chart illustrates the percentage distribution of the results of a study on food waste awareness in Msila City. The results indicated that 84.4% are adequately informed and aware of the food waste crisis in their city, while the remaining 15.6% answered "no." In a similar French study, the results showed 65% of the surveyed professionals believe that the potential volumes of food losses and waste in direct-to-consumer sectors are not low (65%, respectively 23% strongly disagree and 42% disagree), but emphasize the lack of precise knowledge of the wasted volumes (65%, respectively 22% strongly agree and 43% agree). These results are satisfactory compared to the study they were compared to, which may be due to a lack of societal awareness regarding the importance of preserving food and valuing its nutritional value, as well as its impact on food security

2.4 -Assessment of the problem's magnitude

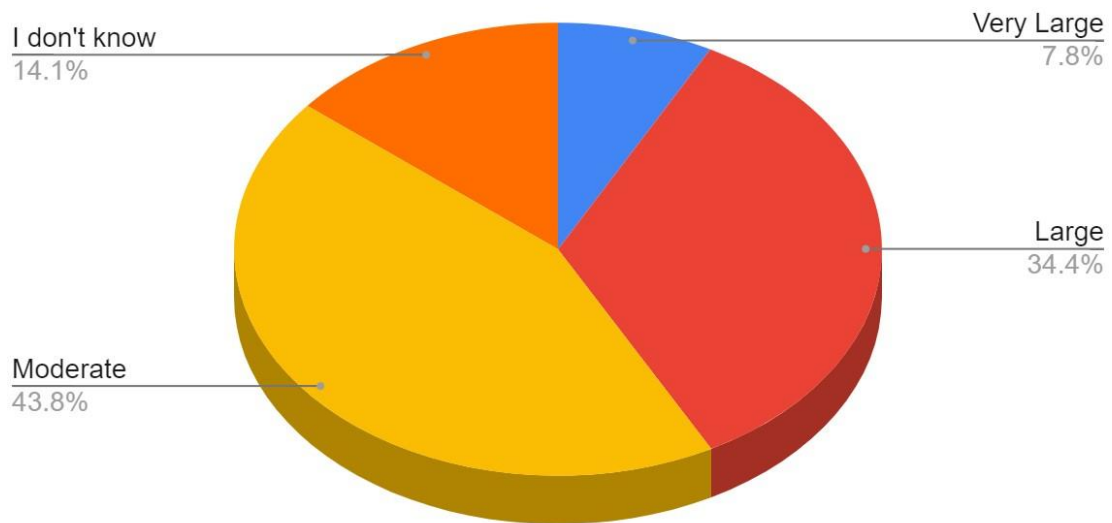


Figure 04: a graph showing the percentage to assess the extent of the problem for individuals who underwent a food waste study in Msila City (**table 04**)

The pie chart illustrates the percentage breakdown of individuals' perceptions regarding the issue of food waste among those who participated in the study. It revealed that 7.8% perceive food waste as a very significant problem in their city, while 34.4% consider it significant, and 43.8% view it as moderate. Additionally, 14.1% indicated that they have no idea about the extent of the problem.

2.5- Possible reasons contributing to food waste in your city

Multiple answers were selected

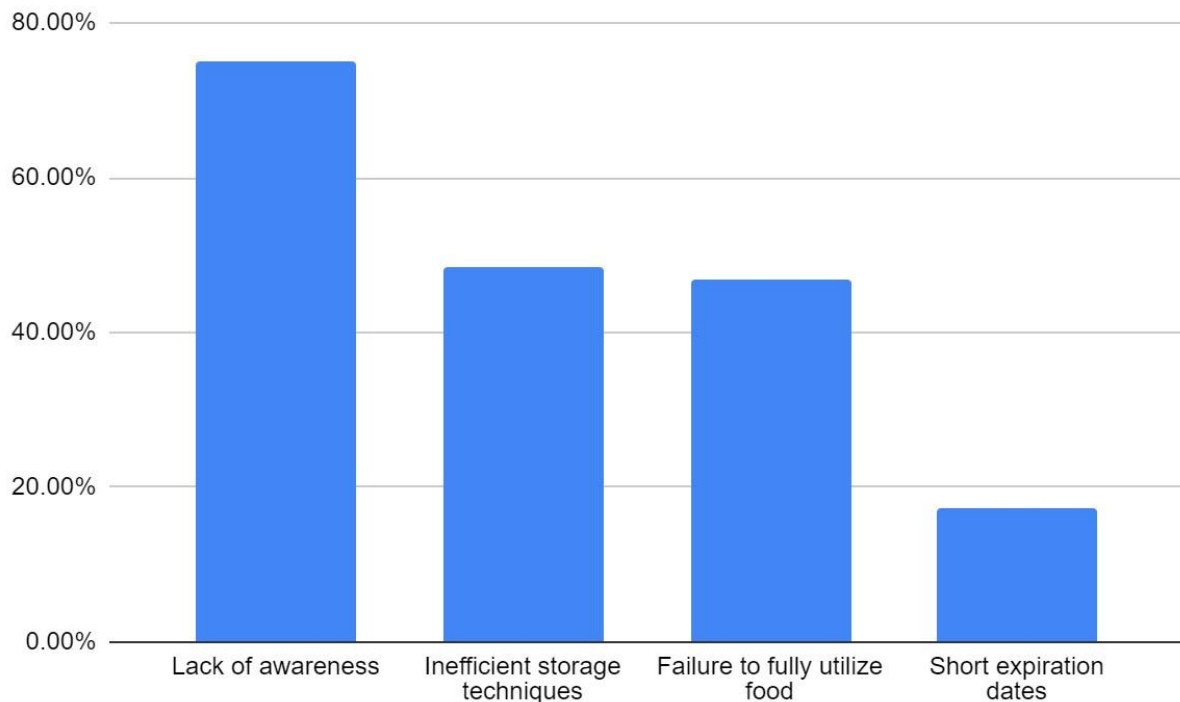


Figure 05: a chart showing the percentage breakdown of possible reasons for food waste in Msila city for the individuals under study (table 05)

The chart illustrates the percentage distribution of potential causes of food waste among the individuals under study. The results indicated that lack of awareness is the most significant reason and almost a primary cause of the crisis, with a voting percentage of 75%. Ineffective storage techniques accounted for 48.4%, while short expiration dates and failure to utilize leftovers represented a lower percentage compared to other possibilities. In a similar French study, with results showing :Among the potential causes of food losses and waste, uncertainties in trade (e.g., estimating sales, inability to serve from a dish or self-service container) hold a significant place for the majority of the panel (90%, respectively 47% strongly agree and 43% agree). Some regulations regarding food hygiene would also represent a potential cause for 84% of the respondents (respectively 37% strongly agree and 45% agree).The results may vary somewhat, but awareness is the

primary cause of the necessity to combat food waste, as it is the gateway to consumer awareness in maintaining food safety, storage methods, and preserving it beyond consumption. The results are highly varied, possibly due to individuals being unaware of the risks of food waste and shifting full responsibility, especially at the consumption stage, onto other parties, thus denying their responsibility in preserving and valuing food, especially post-consumption and food surpluses.

2.6- The food waste is an individual responsibility

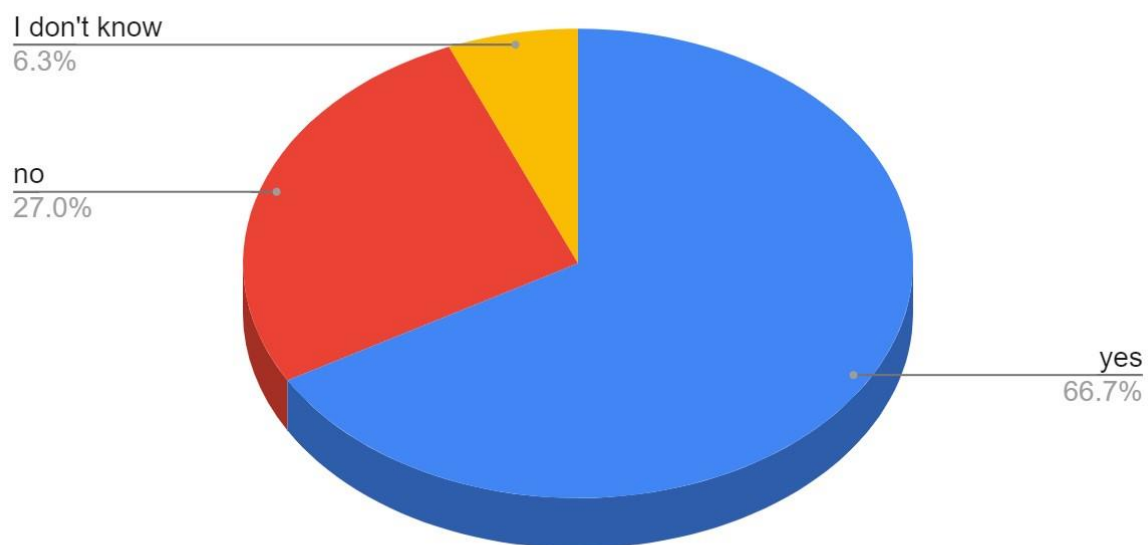


Figure 06: a graph showing the percentage of individuals who studied their belief in their responsibility for wasting food in Msila City (**table 06**)

The pie chart illustrates the voting of individuals under study about their full individual responsibility in the food waste crisis in their city. The results showed that 66.7% agreed, 27% disagreed, and 6.3% were unsure. A Similar french study results demonstrated the following:

According to the panel, the main causes of food losses and waste in direct-to-consumer sectors are not specifically located upstream of the distribution phase (67%, respectively 17% strongly disagree and 50% disagree), nor at households (85%, respectively 48%

strongly disagree and 37% disagree), but occur throughout production chains, during distribution, preparation, and consumption (88%, respectively 5% strongly agree and 33% agree).

2.7- The personal steps to reduce food waste in your daily life

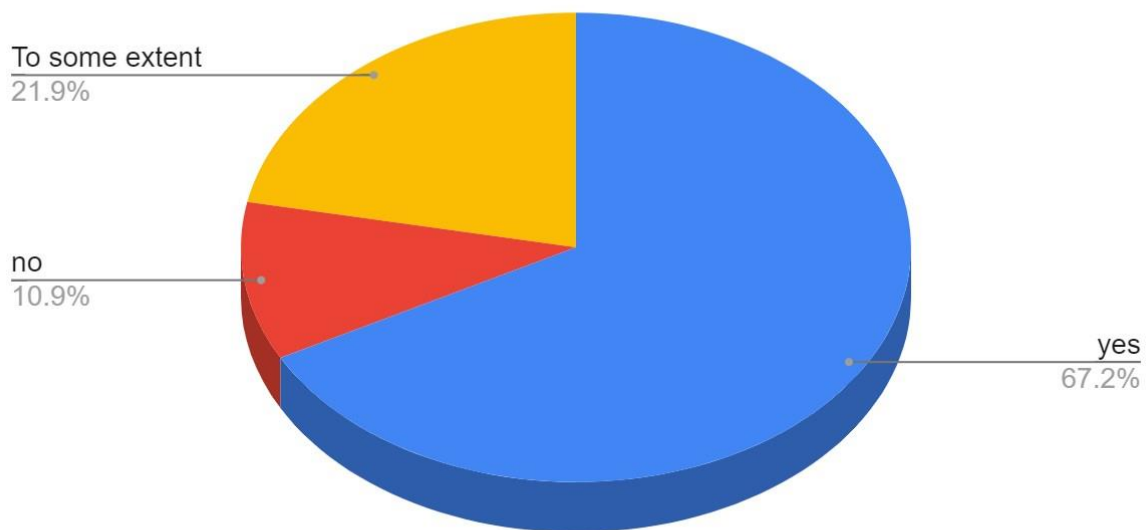


Figure 07: a graph showing the percentage probability of individuals taking personal steps to reduce food waste in Msila City (**table 07**)

The pie chart depicts the percentage breakdown of personal actions taken to reduce food waste in daily life among individuals surveyed in Msila City. The results show that 67.2% of participants agreed positively, 10.9% disagreed, and 21.9% responded with "somewhat."

2.8- Types of food items disposed of regularly without control over consumption ratios

Multiple answers were selected

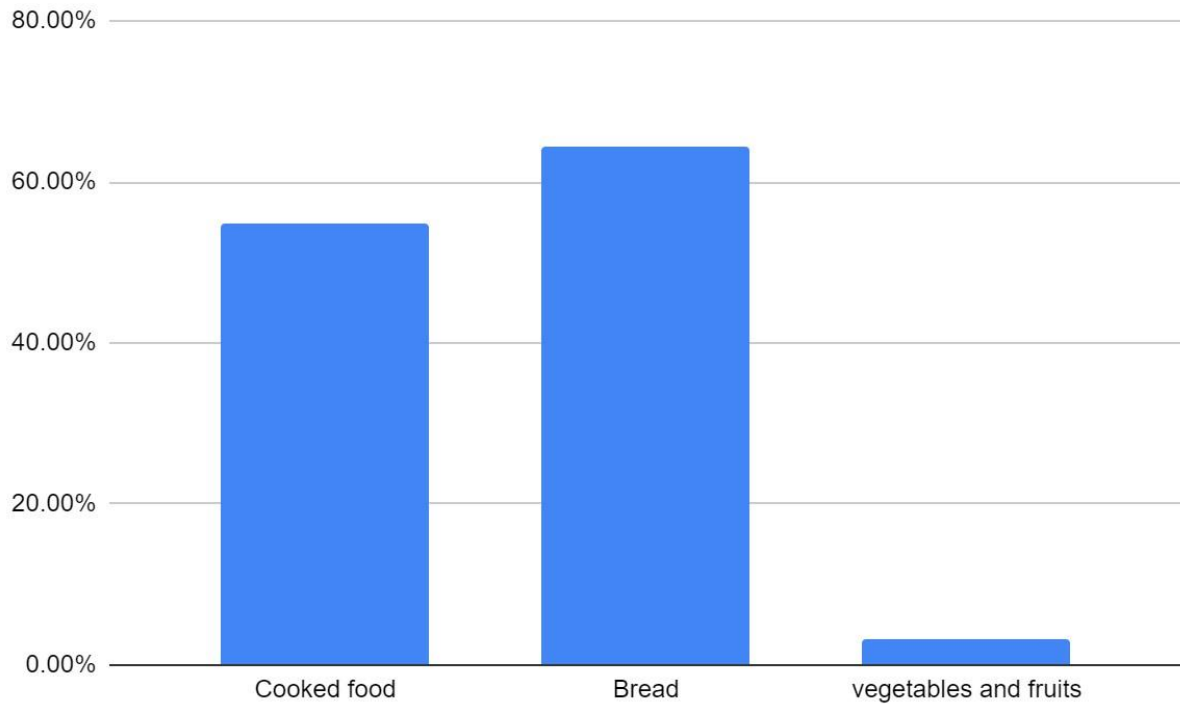


Figure 08: a chart showing the percentage breakdown of wasted food types for individuals who participated in the food waste study for the M'sila city (**table 08**)

The following chart illustrates the results of a study conducted on individuals in Msila City regarding continuously wasted food types. The results indicated that bread is the highest wasted food item at 64.5%, followed by cooked food at 54.8%, and vegetables and fruits at a lower percentage of 3.2%. In a similar French study in May 2022, it was found that That bread has the highest percentage at 13%For other multiple options, followed by vegetables and fruits at 10% and 11%, respectively. Incomplete dishes stand at 12%...The results may initially be similar for bread, Because it is a cheap and readily available food item,which is one of the most controlled food items. This could be attributed to changes in appetite. As for cooked food, it is subject to cultural habits and traditions that govern the value of meals and individuals' appetites due to the diversity of cultures and international

cuisines. People's culture of consuming readymade dishes, excessive consumption of fruits and vegetables may vary.

2.9- Reasons for Purchasing Excess Quantities Beyond Needs

Multiple answers were selected

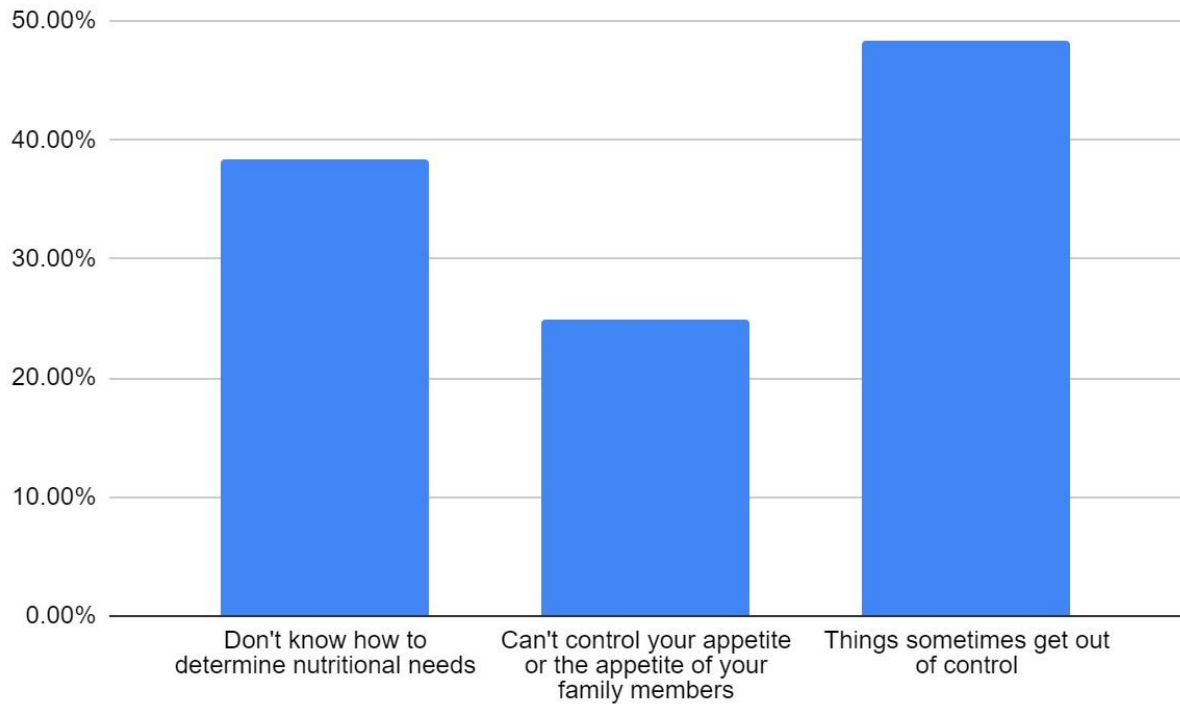


Figure 09: a chart showing the percentage breakdown of possible reasons for purchasing larger quantities than necessary for individuals who participated in the food waste study for Msila city (table 09)

The chart illustrates the percentage distribution of individual reasons for purchasing surplus quantities of food beyond necessity for individuals who participated in a study on food waste issue in Msila City. The results indicate that occasional lack of control is the most common reason at 48.3%, followed by people who don't know how to define their dietary needs at 38.3%, and the possibility that they cannot control their own or their family members' appetites at 25%.

2.10- Random suggestions for reasons why individuals may consume more than their needs

based on the study:

1. Preparing for unexpected guests.
2. Mismanagement.
3. Lack of awareness about the risks of extravagance and its future consequences on society.
4. Lack of diversity in prepared dishes at home. In Algerian households, there's often a weekly cooking routine. Deviating from this routine can lead to waste, especially when buying larger quantities of ingredients than necessary, which end up unused and eventually spoiled in the fridge.
5. Often, there's insufficient knowledge about proper fridge storage. Vegetables are stored directly after purchase without cleaning or sorting, leading to some vegetables rotting and contaminating others.
6. Difficulty in deciding what to cook leads to last-minute decisions and over-purchasing ingredients. Leftover ingredients from unplanned meals are often wasted if not used promptly.
7. The dish determines the ingredients rather than the ingredients determining the dish. Families buy ingredients after deciding on a dish rather than determining the dish based on available ingredients, resulting in unnecessary waste.

3-Suggestions and recommendations

3.1- Suggestions and Solutions for Reducing Food Waste in Msila City

Insights from Study Participants

- Awareness: Understanding Needs and Avoiding Over-Purchasing of Food Items, Especially Those Nearing Expiry
- Efforts to Educate People on Dietary Needs for Each Age Group, Utilizing Signage in Supermarkets and Along Roads, and Providing Alerts on Product Packaging Serve the Purpose
- Redirecting Excess Food to Charitable Organizations.

- Promoting Rational Behavior
- Food Waste Recycling: Reusing Edible Materials, Donating Surplus
- Raising Awareness about the Dangers of Food Waste on Food Security, Establishing Associations to Collect Surplus Food and Distribute It to the Needy, and Increasing Prices of Wasted Products like Bread
- Purchasing Only the Amount of Food Needed, Regularly Checking Expiry Dates, Utilizing Food Waste
- Practicing Contentment and Avoiding Greed
- Collecting Food Scraps for Animal Feed
- Sharing Food with Neighbors, Some of Whom May Be in Need of Bread or Other Items
- Surplus Food Packaging: Setting Up a Specialized Unit for Collection and Distribution to Needy Areas
- Assessing Daily and Weekly Needs for Each Family

3.2- A sustainable developmental analysis plan to reduce and mitigate the global food waste crisis

Here is a sequential pyramid of sustainable development proposals to combat food waste crisis:

1. Education and Awareness:

-Spreading knowledge about the value of minimizing food waste and its effects on the environment and the economy.

-Offering public education campaigns and materials on how to properly store and handle food.

2. Improving Infrastructure and Technology:

- Creating novel methods to preserve food and increase its shelf life.

- Increasing the infrastructure for the safe and effective movement and storage of food.

3. Financial and Economic Incentives:

- Providing financial rewards to businesses and individuals in order to enhance inventory control and cut down on waste.
- Encouraging financial investments in environmentally friendly infrastructure and technology for food management.

4. Innovation and Research:

- Fostering innovation and research in fields such creating methods for food preservation and efficient use of food.
- Promoting innovation in recyclable and biodegradable packaging.

5. Partnerships and Collaboration:

- Improving cooperation to accomplish shared objectives in improved food management across governmental, commercial, and non-governmental entities.
- Forming alliances with farmers and the food sector in order to enhance supply chains and lower waste during the production to consumption stages.

These suggestions provide a thorough framework for creating long-term plans that will efficiently and sustainably address the problem of food waste.

General Conclusion

General Conclusion

Food waste presents a critical issue that needs constant attention and work. Your poll, which illuminated the viewpoints and difficulties encountered by people and communities in tackling this issue, is a crucial component of our comprehension of this topic. The results' critical analysis emphasizes the significance of promoting sustainable consumption practices, creating public policies that support effective resource usage, and raising public knowledge of the causes and impacts of food waste. Our continued efforts ought to serve as the cornerstone for accomplishing our shared objectives of ensuring global food security and building a sustainable future for all.

Food waste is a global issue with significant consequences for the environment, not just a local or regional one.

economic growth as well as social justice. Your survey is an invaluable resource for identifying the complexity of this issue and directing our group's approach to solving it.

To further emphasize the need of education and awareness, it's critical to understand that combating food waste necessitates a dramatic change in the way society views and consumes food. Education efforts ought to emphasize developing a greater understanding of the worth of food and the resources used in its production in addition to bringing attention to the negative effects of food waste.

Furthermore, sustainable consumption practices include not just cutting back on food waste but also choosing food production, transportation, and packaging in a way that is more environmentally friendly. A more sustainable food system can be achieved by enticing customers to embrace plant-based diets, support seasonal and local food sources, and use less single-use plastics.

In the end, combating food waste is about creating a more just, sustainable, and resilient food system for coming generations, not only about mitigating its effects. Through focusing education, behavior modification, policy reform, and cooperative efforts, we may make progress toward actualizing this vision and guaranteeing universal access to food while preserving the health of our world

Reference List

Theoretical chapter

1. Melikoglu, M., Lin, C. S. K., & Webb, C. (2013). *Analysing global food waste problem: pinpointing the facts and estimating the energy content*. *Central European Journal of Engineering*, 3, 157-164.
2. (Lai, 2023)
3. (World Wildlife Fund. WWF,2024)
4. (BusinessWaste.co.uk and Business Waste , ,2024 ,Food Waste 2024 - the Facts, 2024)
5. Nunley, M. (2013). *From Farm to Fork to Landfill: Food Waste and Consumption in America*. Pitzer College)
6. (Rogers, Heather. (2005). *Gone Tomorrow: The Hidden Life of Garbage*. New York: The New Press)
7. (A Garbage Timeline. (1998). Smithsonian Institution Traveling Exhibition Service)
8. (Loco Steve. (2009). Salt Lake City. Flickr).
9. (USU Digital Exhibits,2024)
10. (FAO, 2024)
11. (la banque Mondiale, 2023)
12. (wasteXperts.feb 19.2024)
13. (Nassim, H. A. 2024, April 19, Report reveals 30% of food waste in Algeria)
14. (World Wildlife Fund. WWF,2024)
15. (Pokornyi, 2018, *The long-term impacts of food waste: can we have a waste-free 2050?*)
16. (EPA.OCTOBER 19, 2023)
17. (EPA,From Farm to Kitchen: The Environmental Impacts of Food Waste , 2021).

18. *(States Environmental Protection Agency, Quantifying Methane Emissions from Landfilled Food Waste, 2023)*
19. *(United States Department of Agriculture Economic Research Service, Food Security in the U.S.: Key Statistics & Graphs)*
20. *(Advancing Sustainable Materials Management: Recycling Economic Information Report Methodology, 2016)*
21. *(United States Environmental Protection Agency, Food and Agriculture Organization of the United Nations, International Fund for Agriculture Development, the World Food Programme, and the World Health Organization, The State of Food Security and Nutrition in the World 2022. Repurposing food and agricultural policies to make healthy diets more affordable).*
22. *(Food and Agriculture Organization of the United Nations, International Fund for Agriculture Development and the World Food Programme, The State of Food Insecurity in the World 2014. Strengthening the enabling environment for food security and nutrition, 2014)*
23. *(EPA, OCTOBER 19, 2023)*

Practical chapter

1. *Pertes et gaspillages dans les métiers de la remise directe (restauration et distribution), MAAPRAT, 2011*
2. *Étude OpinionWay - Smartway « Les Français & le gaspillage alimentaire » - Juin 2023*

Obstacles

Accessing a large human sample across a wide range of a small city may pose some challenges and obstacles, such as random and dishonest responses from individuals, ignoring certain questions. Additionally, consumer behavior is subject to numerous changes, from appetite to price increases that may limit purchasing power, to psychological and economic shifts that may disrupt the study's progress smoothly. Therefore, the results obtained may vary after a certain period of time. It is essential to consider the general reasons for building sustainable future plans accordingly.

List of Appendices

Appendix 1: Survey on Food Waste Crisis in the Msila City

Gender: Female / Male

Age: Under 18 / 18-25 / 25-50 / Over 50

1- Are you aware of the issue of food waste in your city?

- Yes
- No

2- How do you assess the magnitude of the food waste problem in your city?

- Very Large
- Large
- Moderate
- Small
- I don't know

3- What are the possible reasons contributing to food waste in your city? (You can choose more than one answer)

- Lack of awareness
- Inefficient storage techniques
- Short expiration dates
- Failure to fully utilize food

4- Do you think that food waste is an individual responsibility?

- Yes
- No

- I don't know

5- Have you taken personal steps to reduce food waste in your daily life?

- Yes
- No
- To some extent

6- What types of food do you consistently dispose of and cannot control the consumption rate?

- Cooked food
- Bread
- vegetables and fruits

7- What are the reasons for purchasing larger quantities than needed? (You can choose more than one answer)

- Don't know how to determine nutritional needs
- Can't control your appetite or the appetite of your family members
- Things sometimes get out of control
- Other reasons: _____

8- Do you have any suggestions or ideas on how to reduce food waste in your city?

Appendix 3: The study results and data tables

Table 01: a table showing the percentages obtained by gender of individuals who were subjected to a food waste study in Msila city

female	65.60%
male	34.40%

Table 02: a table showing the percentages obtained for the age of individuals who were subjected to a study of food waste in Msila city

under 18	1.60%
18-25	78.10%
25-50	18.80%
over 50	1.60%

Table 03: a table showing the percentages of awareness of individuals subject to the study regarding the problem of food waste in Msila city

Yes	84.40%
No	15.60%

Table 04 : a table showing the percentage to assess the extent of the problem for individuals who underwent a food waste study in Msila City

Very Large	7.80%
Large	34.40%
Moderate	43.80%

Small	0.00%
I don't know	14.10%

Table 05 : A table showing the percentage of possible causes of food waste for individuals studied in Msila City

Lack of awareness	75.00%
Inefficient storage techniques	48.40%
Short expiration dates	17.20%
Failure to fully utilize food	46.90%

Table 06: a table showing the percentage of individuals who studied their belief in their responsibility for wasting food in Msila City

Yes	66.70%
No	27.00%
I don't know	6.30%

Table 07: a table showing the percentage probability of individuals taking personal steps to reduce food waste in Msila City

yes	67.20%
no	10.90%
To some extent	21.90%

Table 08 : a table showing the percentage breakdown of wasted food types for individuals who participated in the food waste study for Msila city

Cooked food	54.80%
Bread	64.50%
vegetables and fruits	3.20%

Table 09: a table showing the percentage breakdown of possible reasons for purchasing larger quantities than necessary for individuals who participated in the food waste study for Msila city

Don't know how to determine nutritional needs	38.30%
Can't control your appetite or the appetite of your family members	25%
Things sometimes get out of control	48.30%

The summary

The food waste crisis is a global issue, affecting the environment, economy, society, and health on a deep level. Its primary cause is human behavior, and it has numerous reasons, with the most important being a lack of consumption awareness. The resulting consequences jeopardize global food security and may lead to several humanitarian problems, such as famine. To study this phenomenon more comprehensively, we created a survey consisting of several objective questions and distributed it to a group of individuals residing in urban areas in Msila City. We obtained some tangible results, and after devising an analytical plan comprising practical and realistic elements, we proposed measures to mitigate the food waste crisis in Msila City.

Keyword : Food waste, food security, consumption awareness, famine.

Résumé

La crise du gaspillage alimentaire est un problème mondial, affectant profondément l'environnement, l'économie, la société et la santé. Sa principale cause est l'activité humaine, et elle a de nombreuses raisons, la plus importante étant le manque de sensibilisation à la consommation. Les conséquences qui en découlent mettent en péril la sécurité alimentaire mondiale et peuvent entraîner plusieurs problèmes humanitaires, tels que la famine. Pour étudier ce phénomène de manière plus approfondie, nous avons créé un sondage composé de plusieurs questions objectives et l'avons distribué à un groupe de personnes résidant dans des zones urbaines de la ville de M'sila. Nous avons obtenu des résultats tangibles, et après avoir élaboré un plan analytique comprenant des éléments pratiques et réalistes, nous avons proposé des mesures pour atténuer la crise du gaspillage alimentaire à M'sila.

Mots-clés: Gaspillage alimentaire, sécurité alimentaire, sensibilisation à la consommation, famine.

الملخص

أزمة هدر الطعام هي مشكلة عالمية تؤثر بعمق على البيئة والاقتصاد والمجتمع والصحة. السبب الرئيسي لها هو النشاط البشري، ولها العديد من الأسباب، أهمها نقص الوعي بالاستهلاك. النتائج المترتبة على ذلك تهدد الأمن الغذائي العالمي ويمكن أن تؤدي إلى عدة مشاكل إنسانية، مثل المجاعة. لدراسة هذه الظاهرة بشكل أعمق، أنشأنا استبيانًا مكونًا من عدة أسئلة موضوعية ووزعناه على مجموعة من الأشخاص المقيمين في المناطق الحضرية بمدينة المسيلة. حصلنا على نتائج ملموسة، وبعد وضع خطة تحليلية شاملة تتضمن عناصر عملية وواقعية، قدمنا تدابير لتخفيف أزمة هدر الطعام في المسيلة.

كلمات مفتاحية: هدر الطعام، الأمن الغذائي، الوعي بالاستهلاك، المجاعة.