

## FOOD WASTE IN THE EUROPEAN UNION BY SECTOR OF ACTIVITY

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**Abstract:** *Food waste is one of the most critical concerns of our time, is an alarming and deeply unacceptable issue. Unfortunately, food waste is a global problem that affects both developed and developing economies. It is not only a loss of valuable resources, but also a threat to the environment. This issue brings to the fore a number of critical questions about how we manage food resources, agricultural production and our responsibility to the environment. This paper assesses the situation of food waste in the European Union by sector of activity and by households, relating different aspects that are necessary to be known in order to combat this phenomenon.*

**Key words:** *food waste, households, food supply chain, consumption*

### INTRODUCTION

Food waste is the total amount of food produced for human consumption that is wasted before it even reaches the plate. [1] Production, storage, processing, distribution, retail and food services and finally consumption in consumers' homes make up the value chain. Every stage has problems that are specific to that stage's sector, and the longer the supply chain, the more waste there is likely to be. [13]

Food waste in primary production refers to the quantities of food that are lost or discarded during the agricultural production process and this can take place for several reasons: [18]

- *Excess production:* Farmers can produce more food than is needed to meet demand, and this extra amount can be allowed to deteriorate or be dumped.
- *Improper production:* Factors such as inappropriate weather conditions, plant or animal diseases and management errors can lead to significant food losses.
- *Quality standard:* Foods that do not meet quality standards (for example, unconventional shape or size) may be left in the field or not harvested at all.
- *Losses during harvesting and handling:* During the harvesting and handling process, certain foods may be damaged or lost due to improper handling. [5]

Food waste in storage refers to the quantities of food that are lost or damaged during storage and handling in warehouses, cold storage facilities or other similar locations. This problem can occur for several reasons: [11]

- *Inadequate temperature manager:* Food may be damaged if the storage temperature is not managed correctly. For example, temperature-sensitive foods, such as dairy products or frozen products, can be affected if they are not stored at the right temperatures.
- *Humidity exposure:* Food can be affected by excessive moisture in deposits, which can lead to their premature damage.
- *Improper handling:* If food is not handled with care during storage, it may be damaged or damaged.

- *Technical problems of the warehouse:* Technical failures of the storage facility, such as malfunctions of refrigeration equipment or temperature control systems, can contribute to food loss.

- *Labeling or identification issues:* If food is not properly labeled or is not correctly identified in the warehouse, there is a risk of it being forgotten or stored improperly. [4]

Food waste in processing refers to the quantities of food that are lost or discarded during the food processing phase in factories or food production facilities and can occur for several reasons: [17]

- *Sorting and selecting deficient:* During the sorting and selection process, certain foods can be removed from production due to their non-standard appearance or quality.

- *Cutting and preparation:* During cutting, cleaning and preparation, edible parts of food can be removed due to quality standards or consumer preferences.

- *Losses in the technological process:* Some foods may be lost during technological processes, such as oil extraction, fermentation or other chemical or physical processes.

- *Technical equipment problems:* Technical failures of equipment used in processing can lead to food loss.

- *Improper storage during trial:* If food is not stored properly during the production process, it may be damaged.

- *Packaging losses:* Packaging can be damaged or defective during the packaging process, leading to loss of food. [12]

Food waste in the retail and food services industry refers to the amounts of food that is lost or thrown in shops, restaurants, canteens, cafes and other retail outlets or food services. This can take place for various reasons: [9]

In retail:

- *Raft oversupply:* Stores often offer a rich variety of products to meet customer preferences. However, this strategy can lead to the supply of excess food, which can reach the shelf life before it is bought.

- *Deterioration of products:* Frequent handling of products during storage and exposure on the shelf can lead to damage to food.

- *Inefficient inventory management:* Lack of proper stock planning and refill processes can lead to overproduction and waste. [15]

In food services:

- *Too large portions:* Restaurants and catering services can offer larger portions than customers can consume, which can lead to waste.

- *Inefficient menu planning:* Lack of proper menu planning can lead to excessive food production, which will not be consumed.

- *Inadequate storage of prepared foods:* If the prepared foods are not stored at appropriate temperatures or for too long, they may be discarded. [19]

Food waste in households is the amount of food that is thrown or wasted inside homes or at the family level. This is a serious problem, having a significant impact on individual economies, the environment and society as a whole and this happens because of various reasons, meaningly: [8]

- *Expiry date or shelf life:* Sometimes food is discarded before it expires due to food safety concerns.

- *Excess purchase:* Buying too much food than necessary can lead to its expiration before it is consumed.

- *Lack of planning*: Inadequate planning of meals and shopping can lead to unnecessary storage of food and then waste. [14]

## MATERIALS AND METHODS

The study presents a research based on external data, related to the amount of food waste in the European Union by sector of activity and by households excluding food losses (food not harvested or food that wasn't allowed to be marketed for safety reasons), related to the NACE rev. 2 classification for the year 2021, provided by Eurostat.

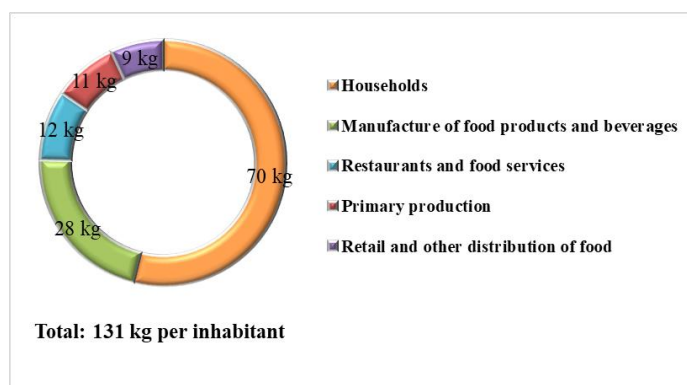
Those secondary and tertiary external data were analyzed and interpreted by the authors, using established methods of analysis and interpretation.

## RESEARCH RESULTS

Around 131 kg of food waste per capita was produced in the EU in 2021, the second year of the COVID-19 pandemic. 54% of the food waste, totaling 70 kg per capita, was produced by households. Waste that was produced upwards in the food supply chain made up the remaining 46%. [3]

The quantity of food waste generated by households is almost double that of the primary production and manufacturing sectors (11 kg and 28 kg per resident, or 9% and 21%, respectively), where waste reduction efforts are in place.

The sector restaurants and food services measured 12 kg of food waste per capita, precisely 9%, meanwhile retail and other food distribution accounted a lower amount, 9 kg, respectively 7%. (Figure 1)

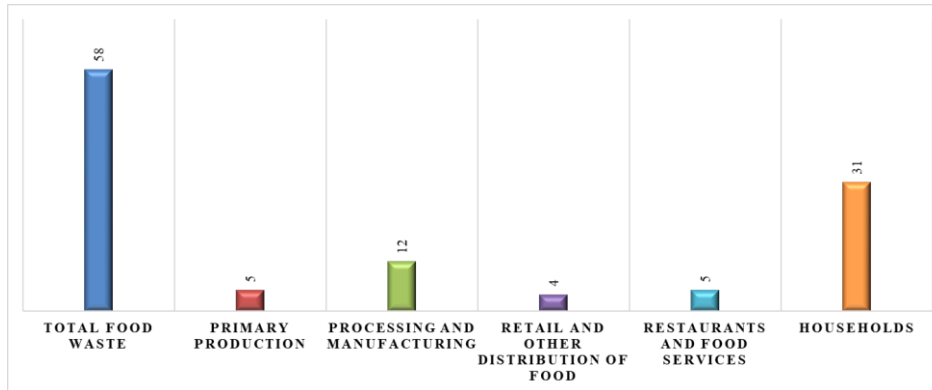


**Figure 1. Food waste in the EU by main economic sectors, 2021 (kg per inhabitant)**

*Source: Authors own adaptation by [10]*

Over 58 million tonnes of fresh mass amount of food was wasted at the EU level in 2021. It is estimated that over 31 million tonnes of fresh mass (54% of the total), came from household food waste. [2]

Processing and manufacturing, with a percentage of 21%, had a measured food waste volume of approximately 12 million tonnes of fresh mass, with 19 million tonnes lower than household food waste. The primary production sector (5 million tonnes, or 9% of the total quantity of food waste), restaurants and food services (an amount exceeding 5 million tonnes, or 9% of the total), and retail and other food distribution sectors (a bit more than 4 million tonnes, or 7% of the entire quantity) made up the rest, or 25% of the total amount of food waste. (Figure 2)

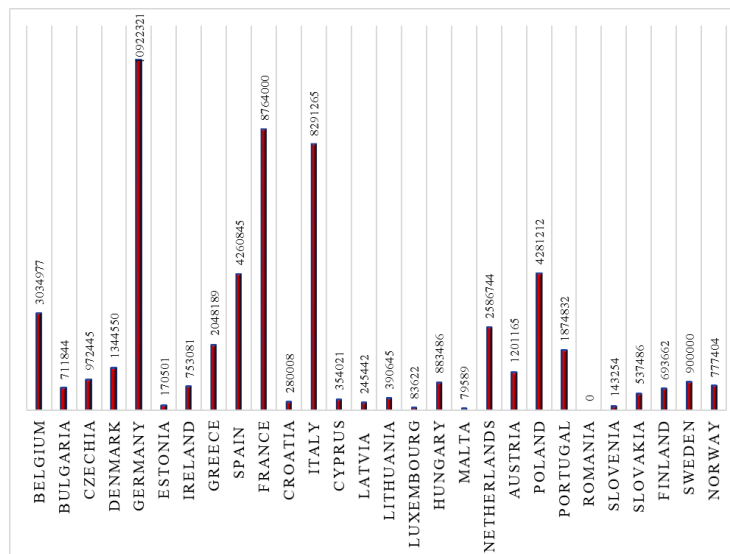


**Figure 2. Food waste estimations in the European Union, 2021 (million tonnes of fresh mass)**

Source: Authors own adaptation by [10]

Regarding the food waste expressed in tonnes of fresh mass Romania does not have data available from 2021, but neither from 2020 like Czechia, Germany, Greece, Spain, Cyprus and Malta have, which did not report the data in 2021, but they presented the data from 2020.

Presenting a ranking of the countries with the largest total amounts of food waste, on the first place we mention Germany, with 10922321 tonnes of fresh mass, followed by France with 8764000 tonnes of fresh mass, the difference between them being 2158321 tonnes. The next country in the ranking, with a smaller difference from France, respectively 472735 tonnes of fresh mass, is Italy, which has a quantity of 8291265 tonnes of fresh mass. These are the three countries with the highest amounts of food waste and as it can be seen, the following ones in the ranking are Poland with 4281212 tonnes of fresh mass, Spain with 4260845 tonnes of fresh mass, Belgium with 3034977 tonnes off fresh mass and Netherlands with 2586744 tonnes of fresh mass and Greece with 2048189 tonnes of fresh mass. The other unmentioned countries measure under 2000000 tonnes of fresh mass. (Figure 3)



**Figure 3. Food waste in EU, 2021 (tonnes of fresh mass)**

Source: Authors own adaptation by [10]

It is important to remember that in 2021 the countries with the highest amounts of food waste are Germany, France, Italy, Poland, Spain, Belgium, Netherlands and Greece,

but it is necessary to study each country, one by one, and the waste produced by it on the entire food chain.

Starting and analyzing the first stage of the food supply chain, respectively primary production, France has the highest quantity of food waste that takes place in it, precisely 1244000 tonnes of fresh mass. At a significant difference of approximately 400000 tonnes, ranks on the second place Spain, with 845620 tonnes of fresh mass. Italy and Poland occupy the third and fourth place with a little difference of approximately 30000 between them, meaningly 672971 tonnes and 639352 tonnes of fresh mass. Greece has the fifth place regarding the quantity of food waste in primary production, with 372204 tonnes and Netherlands the sixth, with 315150 tonnes of fresh mass. All the other unmentioned countries from the European Union have an amount of food waste under 300000 tonnes of fresh mass.

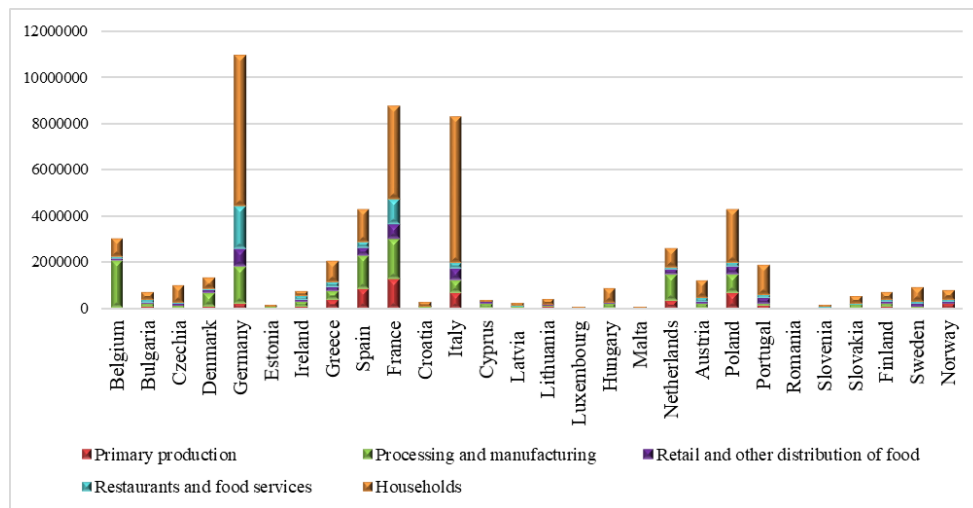
In processing and manufacturing, it is notable the fact that the quantities of food waste are much more increased than in the first stage. This time, Belgium, a country that in primary production had a quantity under 300000 tonnes, ranks the first, with 2022535 tonnes of fresh mass. France, which occupied the first place regarding the quantity of food waste in primary production, has the second place now, with 1270000 tonnes of fresh mass. At a difference of approximately 100000 tonnes from France, follows Germany, with 1612505 tonnes of fresh mass, then Spain with 1419257 tonnes of fresh mass and Netherlands with 1131100 tonnes of fresh mass. The quantities decrease under 1 million tonnes, and in the ranking follows Poland with 809287 tonnes, Denmark with 607693 tonnes and Italy with 542409 tonnes of fresh mass. All the unmentioned countries have quantities under 500000 tonnes of fresh mass.

Continuing with the next stage, namely retail and other distribution, it is important to mention that the quantities are much more decreased than in the other two previous stages. There is no country that has a quantity higher than 1 million tonnes of fresh mass. In this case, the first place regarding the food waste, is Germany, with 762352 tonnes of fresh mass, followed by France at a difference of approximately 130000 tonnes, which has 633000 tonnes of fresh mass. In the third place, at a difference of about 150000 tonnes, ranks Italy, with 474252 tonnes of fresh mass. The fourth and fifth place, Spain and Poland, have nearly the same quantity, precisely 348219 tonnes of fresh mass and 345514 tonnes of fresh mass. On the sixth and seventh place are Portugal and Netherlands, with 224838 tonnes and 209805 tonnes of fresh mass. Greece and Sweden are the last two countries in the ranking, with 150472 tonnes and 108000 tonnes of fresh mass and the other unmentioned countries have quantities of food waste under 100000 tonnes.

Regarding restaurants and food services, again, on the first place is Germany with 1860980 tonnes, followed by France with 1084000 tonnes of fresh mass. At an enormous difference of approximately 800000 tonnes, is Italy which has 263013 tonnes of fresh mass. On the fourth and fifth place are Spain and Greece, with a small difference between them, and counting 220032 tonnes and 213023 tonnes of fresh mass. The next to ones, Ireland and Poland, have nearly the same value, respectively 188955 tonnes and 186433 tonnes of fresh mass. Austria is the last country in the ranking which has more than 100000 tonnes, counting 178428 tonnes of fresh mass.

The last stage of the food supply chain, is the consumption in households and here are the largest amounts of food waste. There are six countries that have their amount of waste higher than 1 million tonnes of fresh mass. Germany, as it happened in other stages of the supply chain, occupies the first place with the quantity of 6496282 tonnes of fresh mass. At a difference of approximately 150000 tonnes is Italy, with 6338620 tonnes of fresh mass. France is on the third place with 4083000 tonnes of fresh mass and at a significant difference comes Poland with 2300626 tonnes of fresh mass. Spain and

Portugal are the last two countries that have quantities higher than 1 million tonnes, respectively 1434726 tonnes and 1285442 tonnes of fresh mass. (Figure 4)



**Figure 4. Food waste by sectors of activity in EU, 2021 (tonnes of fresh mass)**

*Source: Authors own adaptation by*

## CONCLUSIONS

The current global food waste should be a much better managed priority than it is today, at the level of each country, but also in a global context. Although all countries, especially those developed, publicly state that they are taking sustained measures to reduce food waste, in fact this is not at all consistent and effective, given that this influences and even determines global food security. [20]

The fact that various institutions and organizations around the world (Food and Agriculture Organization of the United Nations, World Health Organization) presents approximate data, which are often exceeded by those from certain sources, by other different sources, it indicates an inconsistency between data collection methods, which is why measures to reduce food waste are also prevented. [6]

Minimizing food waste is one of the objectives of the United Nations Agenda for Sustainable Development 2030. According to Objective 12, global food waste at retail and consumer level must be reduced by 50% by the end of the decade and food losses must be minimized. Member States must take preventive and reduction measures to achieve these objectives (campaigns, knowledge exchange and reporting of wasted foods). [10]

It is essential to analyze the root causes of food waste, its impact on communities and the viable solutions that can contribute to reversing this destructive trend. Through education, awareness and concerted action, we can move towards a future in which food is appreciated, distributed and consumed with respect to the limited resources of our planet. [16]

We can all make a difference, therefore try the following to reduce food waste:

- Plan the upcoming meal many days in advance;
- Never go shopping without a list;
- Avoid buying when you're hungry;
- Properly store the food;
- Freeze the meals;
- Purchase imperfect-looking vegetables and fruits that are frequently on sale.

[7]

These are only some of the actions that should be taken by everyone and the easiest to apply and that will certainly help the environment.

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