

# Waste and hunger

THE ECONOMIC, SOCIAL AND ENVIRONMENTAL  
COSTS OF FOOD WASTE

# ALETHEIA

IL SEGRETO DEL BUON VIVERE



DIVULGA

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## Abstract

Food waste is an extremely important issue that involves all phases of the supply chain and while an enormous quantity of food is wasted in the world, between 690 and 785 million people suffer from hunger. According to FAO estimates, lost and wasted food could feed 1.26 billion people every year.

Today, around a third of the food produced globally is wasted, which translates into a total quantity of 1.6 billion tons, compared to over 5 available, with a phenomenon that involves the entire supply chain: from the upstream phases, where the overall loss is 680 million tons, to the subsequent phases where approximately 1 billion tons of food is lost. Of this, 61% is wasted by families, 26% by administration services and 13% by the distribution and sales network.

Going into even more detail, according to the FAO definitions it is possible to distinguish between "waste" and "losses". The first indicates food suitable for human consumption but discarded or left to deteriorate, while the second concerns losses caused by inefficiencies in the production phases.

In Europe, almost 59 million tons of food waste are generated every year, equal to 131 kg per inhabitant. More than half of these can be traced back to domestic consumption, with 70 kg per capita. The economic impact is also significant with an average loss of 333 Euro per capita, for a total value of 149 billion Euro.

Italy ranks third among the main European countries for food waste in volume, preceded only by Germany and France.

In this scenario, the path to reducing food waste is more urgent than ever, also in consideration of the objectives that the 193 UN member countries have set themselves in the 2030 agenda for sustainable development.

This brief in-depth analysis intends to focus on the main facts and numbers regarding the increasingly marked dichotomy between food waste and world hunger.



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## 1. Waste and hunger

Food waste has been at the centre of global debate for years due to a series of implications that stem from it. In fact, it is a problem that involves all phases of the agri-food chain, from production to consumption. There are countless environmental, economic and social impacts that derive from it and which we will aim to summarise through the main numbers on the phenomenon.

In addition to environmental issues, one of the main reasons why food waste is an issue of enormous importance is represented by the phenomenon of food insufficiency: while an important portion of food is wasted in the world, in other areas of the planet millions of people suffer hunger.

By reducing waste and saving just a quarter of the food that is no longer available, we could be able to provide enough for those who today cannot have safe access to food.

In the world between 690 and 785 million people suffered from hunger in 2022 (a) and, if we consider the average value of 735, this is 122 million more than in 2019, with a growth of 20% from the pandemic to today. More generally, the phenomenon of food insecurity (b) affects approximately 29.6% of the world population with 2.4 billion people in 2022. [1] According to FAO estimates, lost and wasted food could feed around 1.26 billion people every year. [2]

These numbers confirm, in fact, that the difficulties in accessing food for important portions of the world's population are not attributable so much to the lack of food but mainly to inefficiencies in its distribution. Numbers also confirmed in the Report "The Mediterranean diet: the economic, social and environmental consequences of healthy nutritional styles" of the Aletheia Foundation. [3]

The path to reducing food waste is more urgent than ever, also in consideration of the objectives that the 193 UN member countries have set themselves in the 2030 Agenda for Sustainable Development. Among these, Objective 12 has the goal of guaranteeing sustainable production and consumption models with the aim of halving global food waste by 2030. A path that integrates with what is established by objective 2 of the same 2030 Agenda focused on hunger, food security, nutrition and sustainable agriculture with the aim, in this case, of guaranteeing everyone, in particular the poor and most vulnerable people, secure access to nutritious and sufficient food by 2030 (c).

## 2. The numbers of waste in the world

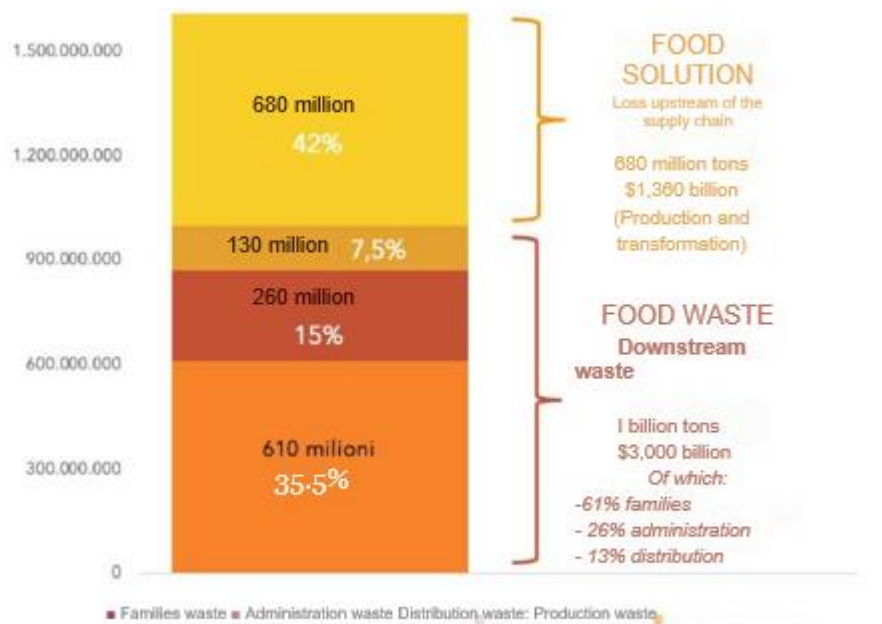
Today, around a third of food produced globally is wasted. We are talking about over 1.6 billion tons, compared to the 5.3 available [4] (d). Or it is dispersed upstream, before reaching the shelf, with negative protagonists above all the management and transformation phases of the product after harvesting. Or downstream, where the greatest responsibilities lie with the sales network, administration services and, above all, with families.

In the upstream phases, i.e. in production and transformation activities, physiological losses, failed harvests due to product deterioration or unfavourable market conditions, generate an overall loss of approximately 680 million tons (Graph. 2.1), equal to 13% of the global food availability. The processing phase alone generates approximately 16% of the overall waste, or 260 million tons of food, for an economic loss estimated at approximately 2,000 dollars per ton of food lost.

The impact of the activities of this first part of the supply chain in waste accounting varies significantly between different areas of the world (Graph. 2.2). In less developed countries, this part of the food system produces over 20% of waste, while in more developed countries the incidence is at lower values, around 10% for the United States and Europe. The explanation lies in the different technological and infrastructural facilities, which produce an inevitable gap in production efficiency. The losses detected along the production chain are, in fact, often attributable to the malfunctioning or inefficiency of the systems, to the degradation of the product during handling or transportation, to defects in the packaging for distribution, as well as to unfavourable climatic conditions.



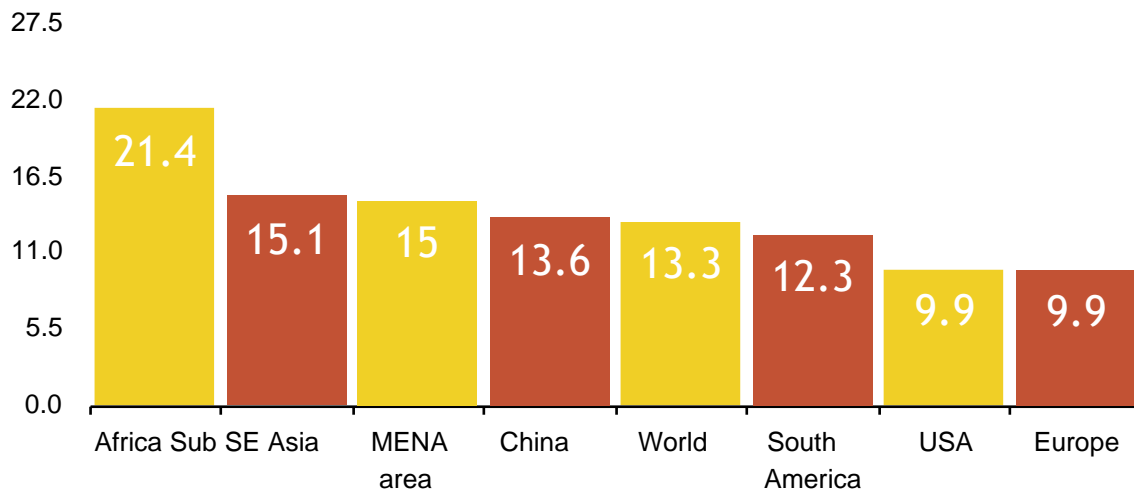
Graph 2.1: Distribution of Food Loss and Food Waste along the supply chain (Million tons, % and value €)



Source: Elaboration by the Divulga Study Centre on FAO data

Subsequently, in the various further stages of the supply chain up to final consumption, approximately 1 billion tons of food is lost, equal to a fifth of the food available globally. Of this, 61% is wasted by families, 26% by administration services and 13% by the distribution and sales network.

Graph 2.2: Losses and waste in the early stages of the supply chain out of the total food (% by country)



Source: Elaboration by the Divulga Study Centre on FAO and United Nations data

### 3. Still a lot of confusion: waste, surplus or waste?

It is often the case that similar terms such as leftover, wastage, excess, waste or loss are used as synonyms for food waste, even if in reality they express different concepts. Sometimes the definition of "food waste" differs between organisations and jurisdictions of individual countries and this makes both its measurement and the implementation of actions aimed at aligning approaches to adopt suitable prevention and reuse strategies for products difficult.

According to the FAO (2013), "food loss" means the decrease in the mass or nutritional value of food originally intended for human consumption, mainly caused by inefficiencies in supply chains; "food waste", however, means food suitable for human consumption that is discarded, regardless of whether or not it has been stored after the expiry date or allowed to deteriorate; finally, "food wastage" refers to any food that is not consumed, therefore it includes both food loss and waste [5].

At European level, in 2012, the European Commission, took up Parliament's invitation to present a legislative proposal to align the definitions, launched the Fusions project (Food Use for Social Innovation by Optimizing Waste Prevention Strategies), which in 2014 presented its framework [6]. For Fusions, "food waste" is any food and inedible parts of food, removed from the food supply chain for recovery or disposal, through composting, ploughed/unharvested crops, anaerobic digestion, bioenergy production, cogeneration, incineration, disposal in sewers, landfill or thrown into the sea [7]. In this new definition of food waste Fusions also includes drinks and liquid waste, fish thrown into the sea and waste of any material ready for collection, but which is not collected, as well as the inedible parts of food (e.g. skin, bones , etc.), significantly expanding the scope of waste defined by the FAO in 2013.

It is important to underline that at European level, in 2008, "waste" had already been defined in the framework of the so-called Waste Directive 2008/98/EC (e) as "any substance or object which the holder discards or has the intention or obligation to discard".

Consistent with Fusions' definition of food waste, with Directive 2018/851 the Union also introduced the definition of "food waste", as "all foods (f) that have become waste" (g) and with the delegated decision (EU) 2019/1597 (h) the explicit definition of food waste, which also includes animal and plant tissue waste for the primary phase.

Based on the common methodology established by Delegated Decision (EU) 2019/1597, in 2022 the Member States performed the first survey of food waste by communicating all the data to Eurostat, which collected, reprocessed and published them on its website [8] .

However, despite the definitions and the common survey methodology, the data collected by the Member States was heterogeneous, highlighting that a problem of unambiguous interpretation of what constitutes food waste persists and which still needs to be improved.

Regarding Italy, Law 166/2016, created with the aim of limiting waste through the redistribution of surpluses and unused goods for social solidarity purposes, presents an interesting distinction between "food surpluses" and food waste". In the first case, in fact, food products that are unsold or not served, but which can be donated, are included. Instead in the second case, "food waste" means all the food products that are still edible and potentially usable for human or animal consumption and which, in the absence of a possible alternative use, are destined to be disposed of.

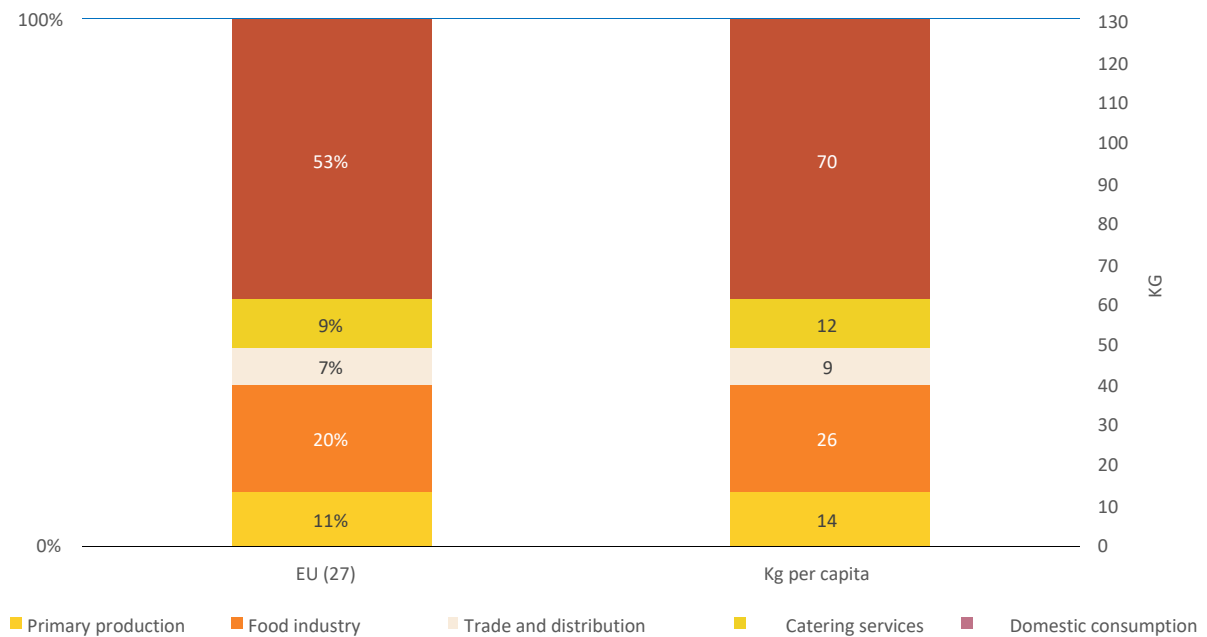
## 4. In Europe

### 4.1. 131kg of waste per inhabitant

In the European Union, almost 59 million tons of food waste are generated every year, equivalent to 131 kg per inhabitant [8]. 53% of food waste is attributable to domestic consumption, equal to 70 kg per inhabitant (Graph. 4.1.1). The remaining 47% consists of waste generated within the food supply chain: from primary production, which represents 11% of the total, to transformation 20%, through catering and distribution, equal to 9% and respectively 7%.

At the same time, approximately 32.6 million people cannot afford a quality meal every two days [9].

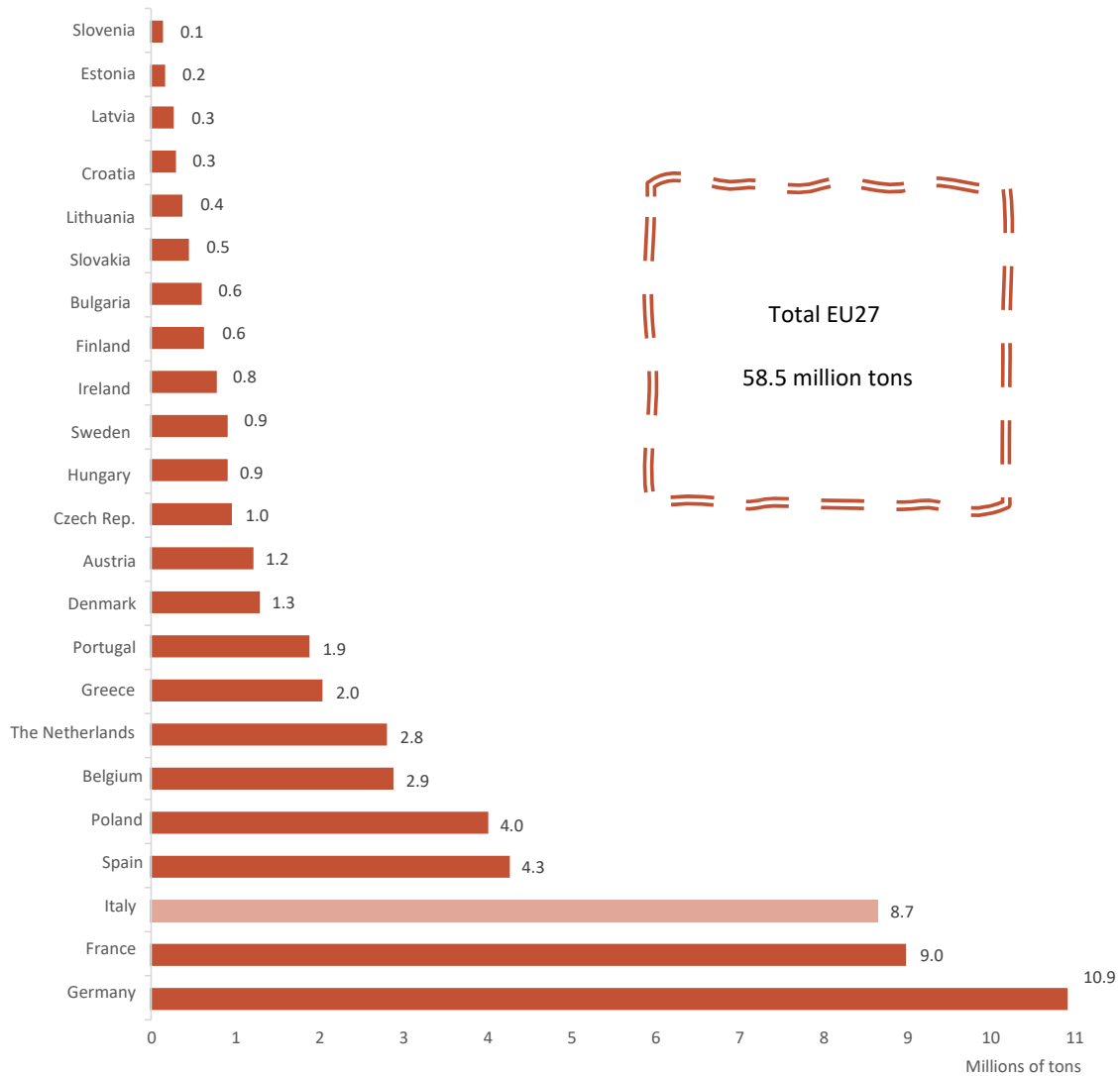
Graph 4.1.1: Food waste in the EU divided by phases (% and kg per capita)



Source: Elaboration by the Divulga Study Centre on Eurostat data

Among the main EU countries for food waste in absolute terms (Graph. 4.1.2) we find Germany in first place with 10.9 million tons, followed by France with 9 million tons and, very close behind, Italy, in third place, with 8.65 million tons. Spain (4.26) and Poland (4) follow in the ranking. Overall, these countries represent 63% of total EU waste.

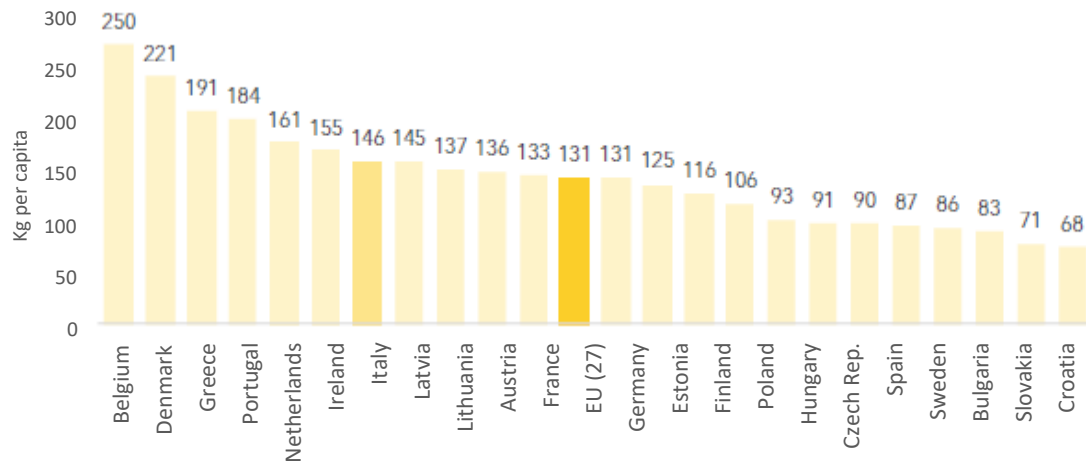
Graph 4.1.2: Food waste in the EU by country (millions of tons) (i)



Source: Elaboration by the Divulga Study Centre on Eurostat data

Instead, analysing the per capita values (Graph. 4.1.3) Belgium is in first place in the ranking with 250 kg/per capita, followed by Denmark with 221 kg/per capita and Greece with 191 kg/per capita (I). Values much higher than the European average which, as mentioned, stands at 131 kg per inhabitant. With 146 kg/capita, Italy is above the EU average, at the top of the ranking of the least virtuous countries.

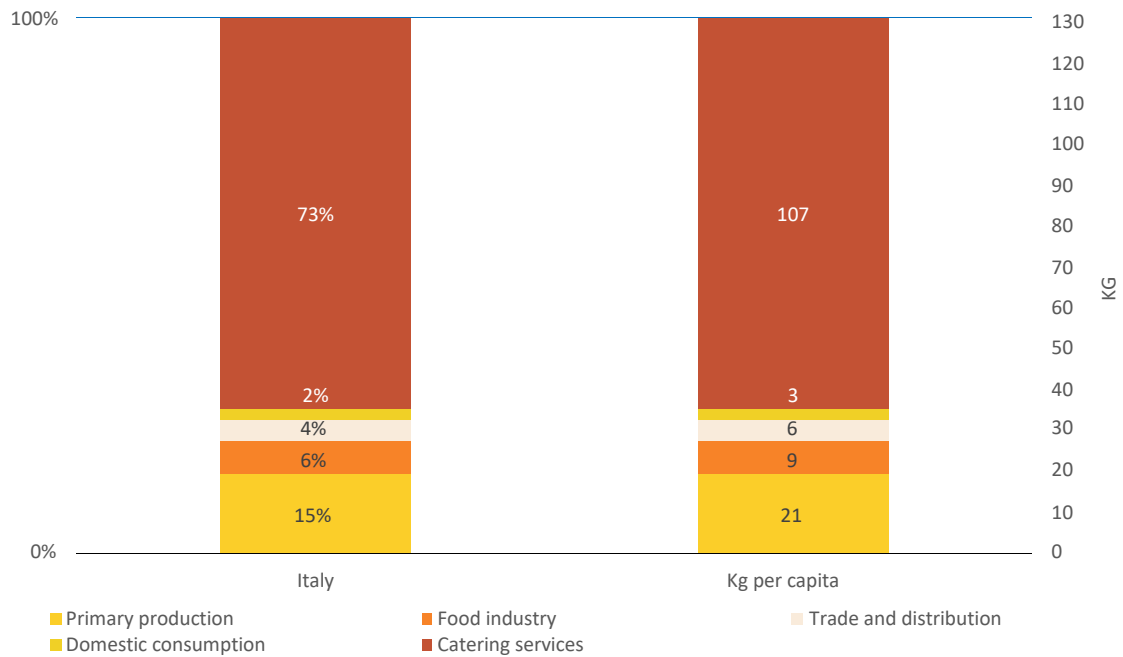
Graph 4.1.3: Food waste in the EU by country (kg/per capita)



Source: Elaboration by the Divulga Study Centre on Eurostat data

In Italy (Graph 4.1.4) the largest percentage of waste is concentrated within the home with 73% of the total (107 kg/per capita) followed by the production and transformation phase (21%, equal to 30 kg/per capita) and finally in distribution and catering (6% overall, equal to 9 kg/capita).

Graph 4.1.4: Food waste in Italy divided by phases (% and kg per capita)



Source: Elaboration by the Divulga Study Centre on Eurostat data



## 4.2. The economic impact

The problem of waste and losses along the supply chain and within the home generates a series of implications not only from the point of view of global food safety. In fact, the economic losses are important, both on the supply side, in particular with regard to waste upstream and along the food supply chain, and for final consumers with regard to waste that occurs within the home.

Overall in the European Union the phenomenon generates an estimated cost of around 148.7 billion Euro, of which over 60 billion in the production chain and 88.5 billion deriving from household consumption. All this translates into a loss of approximately 333 Euro for each EU inhabitant (Graph. 4.2.1).

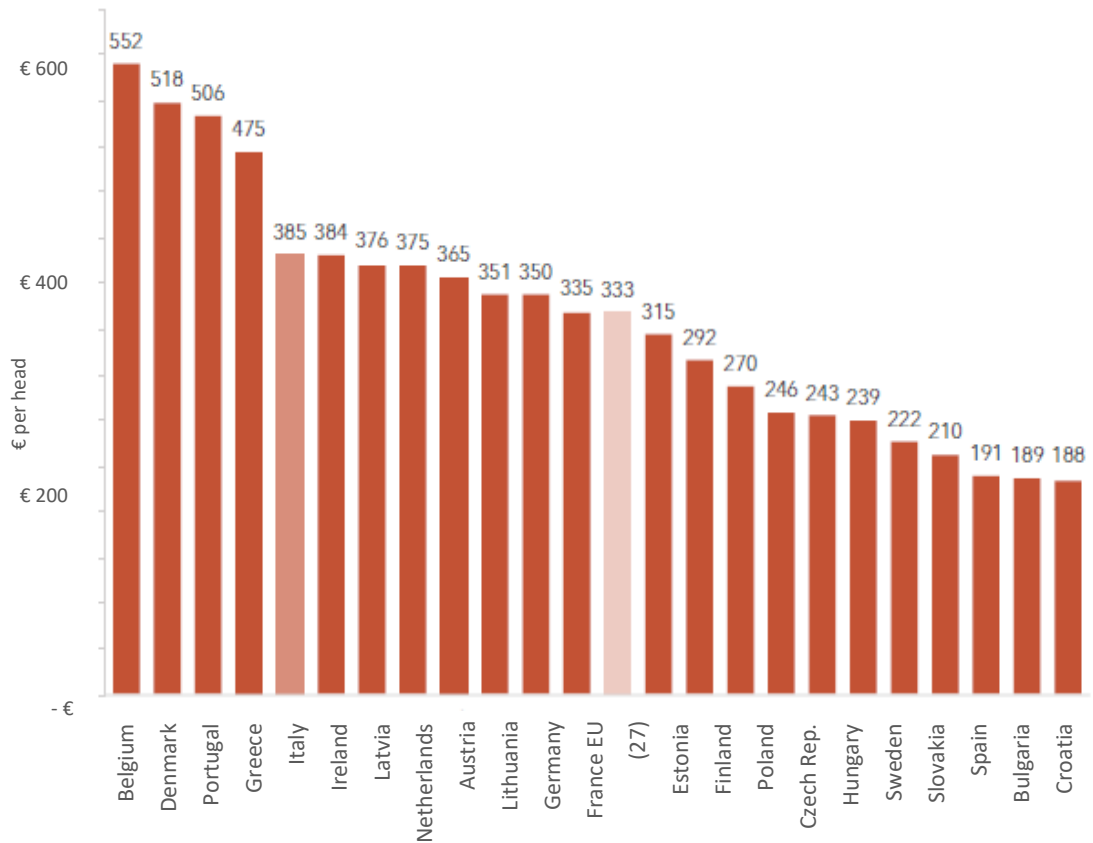
Graph 4.2.1: Economic value of food waste in the EU (Billions €/€ per capita)



Source: Divulga Study Centre estimates based on Eurostat data

However, the value of food waste per capita is very different between European countries (Graph. 4.2.2). In the top five positions we find Belgium (552), Denmark (518), Portugal (506), Greece (475) and Italy (385) (k). Among the most virtuous states are Slovakia (222), Spain (210), Bulgaria (191), Croatia (189) and Slovenia (188), while the EU average stands at 333 Euro per inhabitant

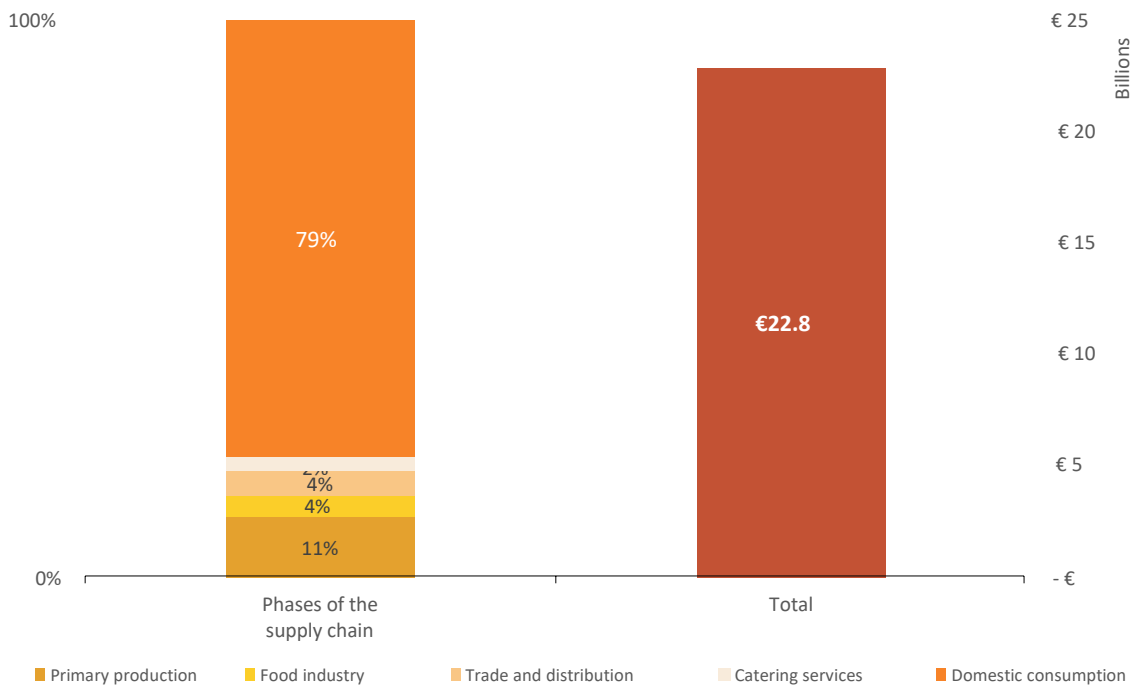
Graph 4.2.2: Economic value of food waste by EU country (€ per capita)



Source: Divulga Study Centre estimates based on Eurostat data

In Italy (Graph 4.2.3) the loss due to food waste reached 22.8 billion Euro, of which 17.92 for domestic consumption, 2.40 deriving from the agricultural phase, 960 million from the food industry, 970 million for food distribution and 550 million for catering services.

Graph 4.2.3: Economic value of food waste in Italy (% various phases, € total)



Source: Divulga Study Centre estimates based on Eurostat data

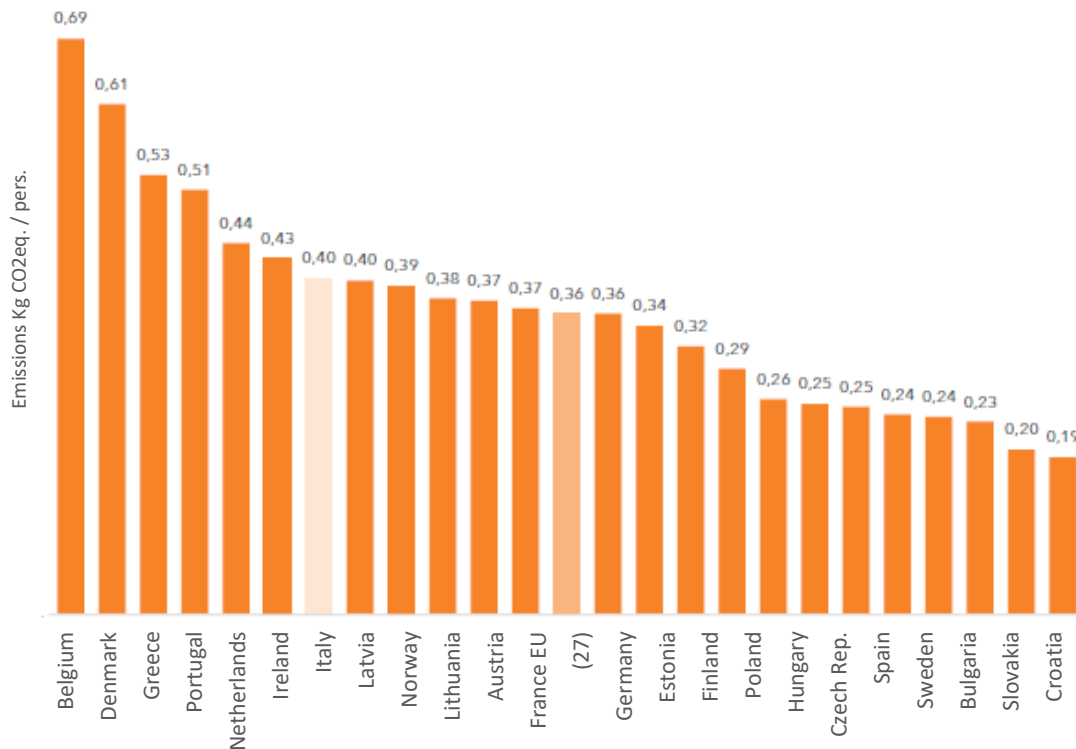
### 4.3. The environmental impact

Food loss and waste account for approximately 10% of global greenhouse gas emissions, contributing to climate instability with extreme weather events such as droughts, floods and more. These changes negatively impact crop yields, potentially reduce the nutritional quality of crops, and cause supply chain disruptions [2].

Based on recent data released by Eurostat (Graph. 4.3.1), it is estimated that annual European emissions attributable to food waste have reached 161 million tons of carbon dioxide (CO<sub>2</sub>), which corresponds to 0.36 kg per person.

Also in this case, Italy's performance is 11% worse than the EU average with 0.40 kg per capita.

Graph 4.3.1: The environmental impact of food waste (CO<sub>2</sub> Eq per person) (I)



Source: Divulga Study Centre estimates based on Eurostat data

## 5. The anti-waste policy of the EU and in Italy

Food waste has long been an underestimated and poorly analysed phenomenon which has only received greater attention in the last decade, following growing concerns about its effects on the environment. The problem of resource efficiency and waste reduction appeared on the European Union's agenda for the first time, with the 2011 Commission Communication "Roadmap towards a resource-efficient Europe".

It was then resumed in 2012 with the European Parliament Resolution on how to avoid food waste and improve the efficiency of the food chain in the EU and in 2015 with the publication of the Commission Communication on the Circular Economy Action Plan, to support the achievement of sustainable development goals on food waste. In 2016, the Commission established a new consultation tool with interested parties: the European Platform on Food Loss and Waste, with the aim of supporting all actors in defining the necessary measures to prevent food waste, sharing best practices and evaluating the progress made over time, which should have ended its mandate in 2021, then extended for another five years until 2026.

The Platform has shared some important documents which, in the framework of the circular economy, contribute to the prevention and reduction of food losses and waste, including:

- guidelines on food donations, to promote a common interpretation of the Union rules applicable to the redistribution of food surpluses;
- guidelines to encourage the use of foods no longer intended for human consumption as feed;
- key recommendations for action on food loss and waste, to address the main problems at each stage of the food supply chain;
- two operational guidelines, with the support of EFSA, on the correct indications of expiry dates.

In 2020, the fight against waste has become a fundamental part of the European "Farm to Fork" strategy, within the framework of the key actions of the European Green Deal,

which has the ambitious goal of achieving climate neutrality in Europe by 2050 and in this sense is committed to halving per capita food waste at retail and consumer levels by 2030.

To achieve this objective, the Commission, with Directive 2018/851, required Member States to include food waste prevention in their national programs and to measure food waste levels according to a common methodology, which was then defined with the Delegated Decision (EU) 2019/1597.

Lastly, on 5 July 2023 the Commission presented a proposal to amend the framework directive on waste 2008/98/EEC, which requires Member States to reduce food waste in processing and transformation by 10% by 2030 and by 30% in the retail and consumption phase.

These measures will support behavioural change interventions, such as, for example, information campaigns and will contribute to identifying and addressing inefficiencies in the functioning of the food supply chain, to supporting cooperation between all actors, to encouraging food donation and other redistributions for human consumption, to supporting training and skills development and to facilitating access to financing opportunities, in particular for small and medium-sized enterprises.

Currently, this legislative proposal from the Commission is being examined by the Parliament and by the Council of the EU.

In the European context, Italy is a cutting-edge country with regard to legislation to combat waste, having adopted the "Good Samaritan law" since 2003, which favoured the relocation of products for solidarity purposes.

This rule was redefined in Law 19 August 2016, no. 166, the so-called "Gadda law", which also incorporated many elements of the 2013 National Plan against Food Waste (Pinpas) and is recognised as best practice worldwide.

The Gadda law has clarified, harmonised and simplified the regulatory framework on food recovery, encouraging, also through tax breaks, companies, large-scale distribution, commercial establishments and restaurateurs to donate excess food and

allowing all non-profit organisations to benefit from food to support people in need. Already in the first year of the law coming into force (2017), food donations to non-profit organisations increased by +21% and in recent years the Gadda law has helped to strengthen consumers' awareness of eating habits and to make agriculture play a leading role, through direct donations to the poor.

## 6. Prevention is better than... wastage

The numbers cited in summary in the pages of this work highlight the need for targeted and immediate actions. There are multiple trajectories that embrace a series of strategies and activities that can be developed synergistically.

Training and innovation undoubtedly represent crucial assets in this path in which all available tools must be incorporated to combat this rampant, yet worrying, phenomenon of food waste.

Next to this can be mentioned the very important issue related to food labeling and food information on consumer decision-making.

According to a survey developed by the European Consortium for Behavioural Studies (Tns) at European level, 54% of European consumers were not able to correctly identify the meaning of the words "Best before" and 37% of the errors made concerns the confusion that the consumer makes between products that have passed the "expiry date" (and which therefore can no longer guarantee wholesomeness for consumption) and those that have exceeded the "minimum shelf life", often thrown away without there actually being a health risk [10]. This misinterpretation of labels is responsible for 10% of food waste in the EU [11].

It is on this assumption that the European Commission's recent proposal to change the wording on the label is based in order to make clearer the concept according to which many products (such as biscuits, pasta, coffee), not subject to perishability from a microbiological point of view, can also be consumed in a time subsequent to that indicated by the "minimum shelf life", without them constituting a danger to human health. In fact, as described in article 2 of Regulation 1169/2011 relating to the provision of food information to consumers, «minimum shelf life of a food» means the date until which the product retains its specific properties in adequate storage conditions; where "specific properties" refer to characteristics such as aroma, texture, flavour, colour, appearance and consistency.

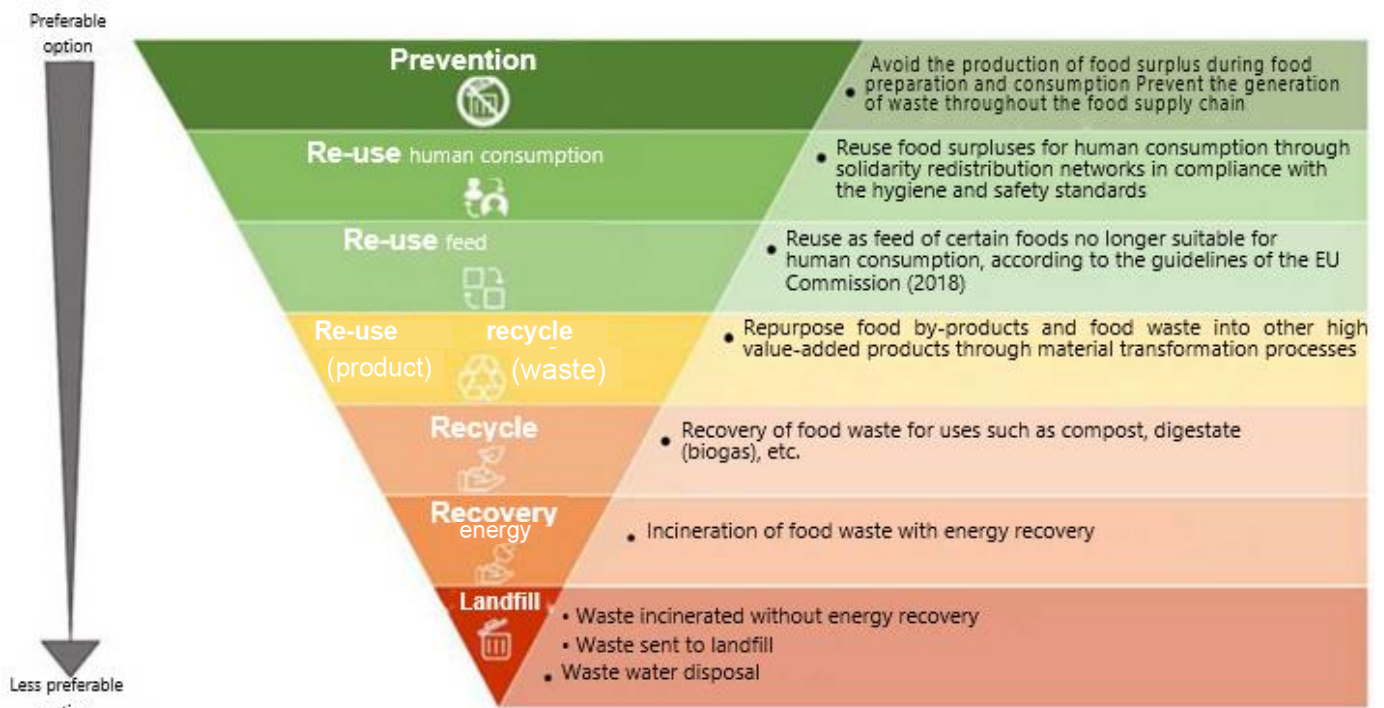
However, the intervention is not new: it had already been announced in Brussels in 2020, as part of the "Farm to Fork" strategy [12]. However, the addition of the wording



“often than after” was considered by member countries to be unclear and ambiguous, placing the evaluation of the quality and food safety of the product on the consumer, also due to problems related to translation into different languages, leading the Commission to announce on 29 June last year the withdrawal of the draft regulation, postponed to a later date.

In Europe the first moves on the topic of combating waste date back to the 1975 Waste Framework Directive (1975/442/EEC) which underwent several updates and additions over the years, up until 2008, when the European Union definitively introduced the concept of waste hierarchy, already previously outlined by the US environmental protection agency in 1970, which suggests various good practices for managing food waste (Fig. 6.1). This tool focuses first on preventive actions, followed by reuse actions, both of products suitable for human consumption and animal feed, recycling of material into products with high added value, i.e., without complete degradation, recycling of nutrients such as composting and digestion anaerobic, energy recovery (incineration) and, finally as the least preferable option, waste disposal.

Figure 6.1: Practical application of the waste hierarchy for food



Source: European Commission [13]

As is evident from the data briefly illustrated on these pages, in addition to the need to reduce domestic waste, it is more crucial than ever to focus on solutions capable of reducing losses and waste in all phases of the supply chain, from production to distribution. In this regard, the role played by strategies capable of bringing food supply and demand increasingly closer together appears indisputable. We can cite, for example, the experience of direct sales which provides an important contribution to the fight against waste and at the same time allows us to eliminate the distances between the place of production and consumption with clear benefits for the environment. As reported by Ispra, in fact, short and local supply chains reduce the levels of scrap and waste that normally occur in the phases prior to final consumption by between 5 and 9 times. Furthermore, purchasing and the direct relationship between producers and consumers are essential tools for making citizens responsible for food waste. And this last theme appears to be the key to a definitive paradigm shift on our planet [14].

## Notes

- (a) Hunger: condition in which daily food energy consumption is constantly below the minimum requirement necessary to maintain a healthy life (FAO).
- (b) Food insecurity: condition in which a person, due to lack of money or other resources, is forced at certain times of the year to eat poor quality diets or to reduce the quantity of food they would normally eat. A family is classified as "severely food insecure" when it is often forced to skip meals, go without eating or to suffer from hunger for an entire day (FAO).
- (c) For more info, see <https://unric.org/it/agenda-2030/>
- (d) Excluding alcoholic drinks.
- (e) Directive 2008/98/EC of the European Parliament and of the Council on waste, art. 3 C.1, dated 19/11/2008 (O.J. L312 -22/11/2008).
- (f) Pursuant to Art. 2 of the Reg. 178/2022, "food" is defined as any substance or product (processed or not) intended to be ingested by human beings (excluding plants before harvesting, tobacco, live animals, feed, etc.).
- (g) Directive (EU) 2018/851 of the European Parliament and of the Council of 30/5/2018 amending Directive 2008/98/EC on waste (O.J. L150 of 14/6/2018).
- (h) Commission Delegated Decision (EU) 2019/1597 of 3/5/2019 supplementing Directive 2008/98/EC of the European Parliament and of the Council regarding a common methodology and minimum quality requirements for the uniform measurement of waste levels food (O.J. L248 of 27/9/2019).
- (i) Excluding Cyprus, Luxembourg and Malta.
- (j) Ibidem.
- (k) Ibidem.
- (l) Ibidem.



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