

Limit losses, avoid waste:
Causes and solutions for food waste.



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Food loss and waste is an enormous problem that poses major challenges to humanity on multiple levels. According to United Nations (UN) estimates, the world's population will reach 8.5 billion by 2030 and is expected to rise to 10.4 billion by 2100.¹ In view of land consumption and changing conditions due to global warming, the fullest possible use of the food produced and the avoidance of food waste are becoming increasingly important. Today there are already many approaches and technical solutions that can lead to a reduction in the amount of food lost to feeding humanity.

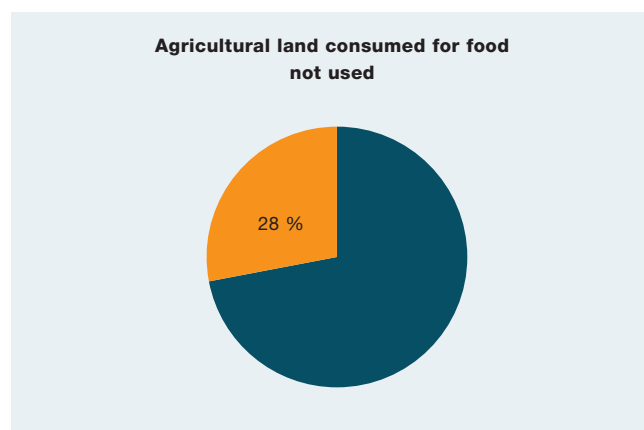
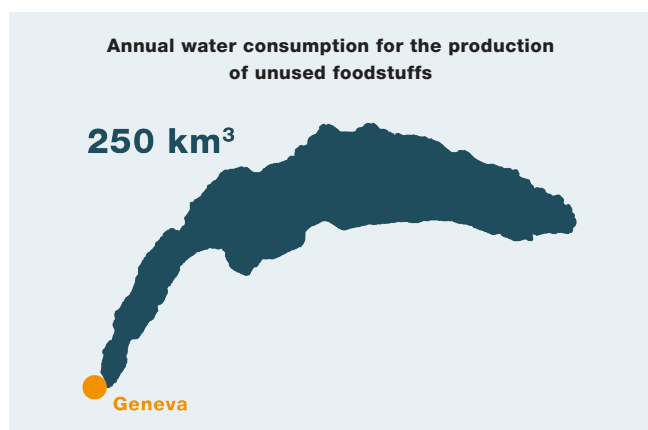
A global problem: Food waste leads to enormous losses

According to recent figures from the United Nations Food and Agricultural Organization (FAO), the global volume of food waste is estimated at 1.6 billion metric tonnes of "primary product equivalents." The total food waste for the edible part of it is 1.3 billion tonnes. The resulting carbon footprint is estimated at 3.3 billion metric tonnes of greenhouse gases released into the atmosphere each year. Added to this is a water consumption of 250 km³ annually for the production of lost or wasted food. For comparison: This amount corresponds to about three times the volume of Lake Geneva.

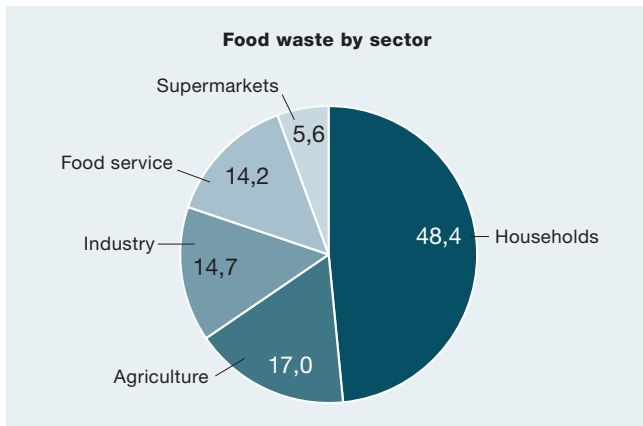
The consumption of land is just as large: 1.4 billion hectares of land are farmed annually for food production that is lost or wasted. This corresponds to 28 percent of the world's agricultural land, which is thus also no longer available for nature - biodiversity is declining as a result.²

This large amount of land illustrates the significant economic as well as environmental and social impact of food waste. It affects the profitability of the entire food industry, including agriculture, processing plants, as well as retailers and restaurants. The damage is immense: Currently, \$750 billion worth of products are lost to the food industry worldwide due to food waste. Specific factors here include improper handling of food and data logging procedures, and inadequate training.³

However, this figure only illustrates part of the problem: According to data from the American NGO "ReFED", by far the most food is wasted in private households, at 48.4 percent.⁴



¹ United Nations: [Population](#).
² FAO: [Food wastage footprint - Impacts on natural resources](#).
³ Bloomberg: [New Data Shows US Food Waste Is Getting Worse](#).
⁴ ReFED: [Food Waste Monitor](#).



First, however, the production of food itself requires resources such as water, land and energy. Business enterprises must also calculate the labour force: In the U.S., just over ten percent of the labour force is employed in agriculture or related industries.⁵ By wasting food, all these resources are consumed without a profit. Since not all of the food produced is used, waste also plays a role in price levels, since the cost of waste must be allocated to the remaining food.⁶ Other costs are incurred for the use of scarce resources such as water, energy, fertilizers and pesticides, which are unnecessarily consumed in the case of food waste.

Food production is also highly relevant to climate change. 31 percent of man-made greenhouse gas emissions come from global agricultural and food systems.⁷ It is not only carbon dioxide that is emitted. Beef production in particular produces a high amount of methane, which is particularly harmful to the climate.⁸ In addition, waste disposal is a problem: When food ends up in landfills, it decomposes and produces methane as well. When food is wasted, those emissions are generated for nothing, further exacerbating climate change unnecessarily.

Last but not least, food waste also has a social component. After a steady decline in the 2010s, the number of people suffering from hunger has risen to as many as 828 million in 2021. That's about 46 million more people since 2020 and 150 million more compared to 2019.⁹ Here, not only the shortage itself plays a role, but also the unfair distribution between the world regions, which leads to concomitant phenomena such as high migration pressure from the global south to the industrialized nations. Reducing food waste can be an important step toward more sustainable development.

**Loss and waste:
Where exactly is food lost?**

Although retailers and restaurants together account for a rather small percentage of food waste, about 20 percent, the problem has a significant economic impact on businesses. Direct financial losses for supermarkets and restaurants occur throughout the value chain. For example, there are costs for purchasing, storing and, in the case of restaurants, preparing and cooking the food. In both cases, disposal incurs additional costs. Unsold food in retail stores and the discarding of prepared but unmarketable food in restaurants also represent a missed revenue opportunity that negatively impacts the profitability of an operation.

⁵ US Department of Agriculture: [Selected charts from ag and food statistics charting the essentials](#).

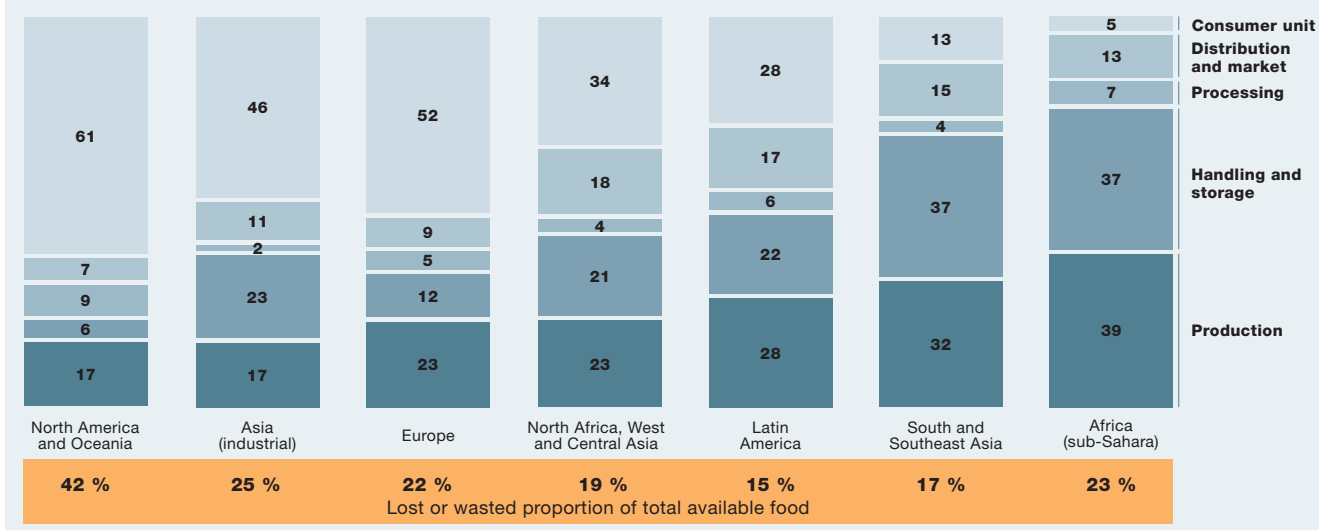
⁶ Sustainable Food Trust: [The hidden cost of UK food](#). Revised edition 2019.

⁷ FAO: [New FAO analysis reveals carbon footprint of agri-food supply chain](#).

⁸ United States Environmental Protection Agency: [Agriculture and Aquaculture: Food for Thought](#)

⁹ FAO: [UN Report: Global hunger numbers rose to as many as 828 million in 2021](#).

The statistics show that in less developed regions, food waste tends to occur on the production side, while in more highly developed regions, a larger proportion of food is wasted by the consumer (the figures refer to kilocalories wasted in percent).



Distribution of food loss along the cold chain by region. Note: Due to rounding up and down, the figures may not add up to 100. Source: WIR analysis, based on FAO. 2011. Global Food Losses and Food Waste – Extent, Causes and Prevention. Rome: UNFAO.

Causes of food waste in restaurants

Throughout the restaurant production chain, risks always arise with regard to food loss or waste. During food preparation, edible parts of food may be discarded as waste. This is often caused by inefficient working techniques or improper planning, which also affects the menu when some ingredients cannot be used in their entirety. Another issue is overproduction: Striving to stock enough food to meet demand may result in not all prepared food being sold or consumed. The excess food is then often thrown away. Leftover food on plates must also be disposed of, if only for food hygiene reasons. Portion sizes can play a role here.¹⁰

While the behaviour of guests can only be influenced indirectly, there are immediate starting points when it comes to product storage, as poor storage or incorrect handling of food can lead to premature spoilage. When food spoils or expires, it is usually thrown away, in order to avoid health risks. In this case, donations, for example to food banks or soup kitchens, are no longer an option.

Another important point is the focus on problem awareness. Interviews with experts revealed that food waste is not typically measured as part of a restaurant's standards and the information collected is not used, for example, in communications to kitchen teams.¹¹

¹⁰ Sakaguchi; Pak: [Tackling the issue of food waste in restaurants: Options for measurement method, reduction and behavioral change.](#)

¹¹ Clowes; Hanson; Swannell: [The business case for reducing food loss and waste: Restaurants.](#)

5 tips against food food waste in restaurants

The following tips can help minimize food waste in restaurants. This allows companies that handle food in a sustainable manner to make a positive contribution to environmental protection. Most importantly, they ensure the economic viability of their business through reduced costs. Many hosts are now actively using these advances to communicate with their guests.¹²

1) Use modern technology and data!

Establishing data collection and analysis software is a first step toward improving food safety management in restaurants. Software technology can ensure effective outcome measurement, faster responses and continuous improvement. For example, automated temperature monitoring can prevent temperature limit violations, such as when the doors of refrigerators and freezers or cold rooms are left open. With the help of an alarm, such as is possible with the testo Saveris 2, it is possible to react before the freshness, quality and safety of the food suffers. Similarly, the potential of a food product can be fully exploited, for example by optimizing the useful life of frying oil by determining and documenting the TPM value. Testo can also provide a suitable measuring instrument for this purpose in the form of the testo 270 frying oil tester.

2) Optimize purchasing and storage of products!

Review purchasing and your inventory and gather insights through data. Software solutions can help identify food waste and take targeted improvement actions. Needs can thus be determined based on previous trends. When possible, work with suppliers who promote sustainability and reduced packaging. This can reduce packaging waste.¹³

3) Train your employees!

Raise employee awareness about food waste and train them on best practices to reduce waste. Show them how to properly store, process and recycle food. Find ways to creatively use leftovers and avoid overproduction. Leftover vegetables and meat can be used for soups, stews or stuffings. Make it part of your kitchen practice to reuse leftovers and create new dishes.¹⁴

4) Involve your guests!

Communicate your commitment to reducing food waste to your guests. Offer the opportunity to take home leftover food. Proactively asking restaurant patrons to take home leftovers in so-called "doggy bags" is the second most common method of waste prevention in the United States.¹⁵

5) Donate to non-profit organizations!

There are many organizations and associations that distribute surplus food to those in need. These include, for example, the Tafelläden in Germany or the Food Banks in the USA.¹⁶ This can help put food that would otherwise go to waste to good use.

¹² National Restaurant Association: [More restaurants are sustainable, survey says.](#)

¹³ Harvard Business Review: [How Large Food Retailers Can Help Solve the Food Waste Crisis.](#)

¹⁴ Clowes; Hanson; Swannell: [The business case for reducing food loss and waste: Restaurants.](#)

¹⁵ Sakaguchi; Pak: [Tackling the issue of food waste in restaurants: Options for measurement method, reduction and behavioral change.](#)

¹⁶ [Feeding America.](#)

Causes of food waste in supermarkets

One-third of the food produced in the U.S. is thrown away.¹⁷ In 2021, retailers in the U.S. generated 5.12 million tonnes of surplus food, nearly 35% of which ended up in landfills or was incinerated as waste. Fruit and vegetables accounted for around one-third of this, while dairy products and eggs as well as meat and seafood each accounted for around 14 percent. More than half were due to concerns or confusion with regard to the labelling of the date of freshness. On a positive note, 19.5 percent of food was donated as gifts to people facing food insecurity, a peak compared to other sectors.¹⁸

Various reasons lead to loss. On the one hand, retailers often try to present well-stocked shelves to their customers. This can lead to overproduction and overstocking, as more food is ordered than is actually sold. If this surplus food is not sold in a timely manner, it can spoil or must be disposed of for food hygiene reasons. This concerns, for example, self-service salad counters. In this context, the best-before date also plays a role: When a product reaches or exceeds

the date, it is removed from the shelf and discarded for safety reasons. A distinction must be made here between the expiration date and the best-before date. With the best-before date, products are often edible for longer than indicated. There are by now various initiatives that point this out.¹⁹

The packaging itself also plays a part. Customers' eyes are trained to expect perfect, identically shaped products. Damaged or unsightly packaging can cause food to be removed from shelves and discarded, even if the products themselves are in pristine condition. In this context, the storage and transportation of food must be considered. Improper storage may result in damage to the packaging. Inadequate refrigeration during transport can lead to deterioration in the quality of unpackaged foods such as fruits and vegetables. Even if shape, size and colour do not necessarily have anything to do with quality - the products are therefore often difficult or impossible to sell, as customers often tend to reach for the freshest and best food.²⁰



¹⁷ Business Insider: [Why Grocery Stores Like Trader Joe's Throw Out So Much Perfectly Good Food.](#)

¹⁸ ReFED: [Retailers: Solutions for Grocery Waste.](#)

¹⁹ German Federal Ministry of Food and Agriculture: [National Food Waste Reduction Strategy.](#)

²⁰ Business Insider: [Why Grocery Stores Like Trader Joe's Throw Out So Much Perfectly Good Food.](#)

5 tips against food food waste in supermarkets

1) Use modern technologies for your inventory management!

Monitor your inventory regularly, track expiration dates, and make sure older foods are used first. Upgrade your systems with the latest technology. Large supermarket chains in the U.S., such as Target and Whole Foods, use software to input their store layouts so that deliveries can be organized individually in shelf order, moving directly from the distribution warehouse to the sales floor.²¹ Investing in new technologies such as testo Saveris 2 wireless data loggers can reduce the amount of perishable goods that ultimately end up in waste. With the help of automated temperature monitoring of all products requiring (deep) cooling, retailers have certainty about the safety of their food at any time and from anywhere.

2) First expired – First out: Optimize your food logistics processes!

First expired – First out is a concept first introduced in the 1980s for a better supply chain management solution. It ensures that food with the shortest expiration date is sold first. As a result, customers receive consistently high-quality and fresh products.²² Prioritizing products with the shortest expiration date prevents products from going unsold and ultimately ending up in the garbage. Where appropriate, discount promotions for foods with a short shelf life can provide an additional incentive to purchase.

3) Train your employees!

Just like in the restaurant sector, you can make your employees aware of the issue of food waste. Train them on best practices to reduce waste. Show them how to properly store, process and recycle food. Incorrect operation can also be avoided when handling equipment such as refrigeration units.²³

4) Sensitize your customers!

Actively communicate the issue of food waste to your customers and employees. The reasons for the loss are to be found less in technological restrictions than in the interplay of marketing and consumer expectations. This means: consumers expect a high standard in terms of freshness, availability, appearance and texture. Supermarkets can educate customers about the importance of food waste and encourage them to make conscious purchasing decisions. For example: Flawless fruits and vegetables that do not meet aesthetic standards can be intentionally offered for sale rather than discarded.²⁴

5) Donate unsold food!

Supermarkets can partner with non-profit organizations that distribute surplus food to those in need. This can help ensure that food that is still edible is put to good use instead of being thrown away. This engagement can also be used for the company's own ESG communications.²⁵

²¹ Harvard Business Review: [How Large Food Retailers Can Help Solve the Food Waste Crisis](#).

²² Castellano Ramirez: [International Commercial Logistics](#), 2021, p. 34.

²³ FAO: [Good practice in the design, management and operation of a fresh produce packinghouse](#).

²⁴ Verbraucherzentrale: [Lebensmitteleinzelhandel: Vom krummen Obst und Gemüse bis zum MHD](#).

²⁵ Lidl: [Gesellschaftliches Engagement](#).

Image and customer loyalty: Sustainability plays an increasingly important role

Many customers are increasingly sensitive to environmental and sustainability issues. Those who actively address their own sustainability expect the same from their retailers and restaurants. In this respect, even the appearance of an overly careless approach to food and resources is enough to tarnish the image or, in the worst case, scare off potential customers. When in doubt, this customer group opts for stores that are actively committed to combating food waste. Statistics published by McKinsey show that sustainability is particularly important for young people of the so-called "Generation Z" and for financially strong people. Aside from increased profitability, reducing food waste can be a great lever for supermarkets and restaurants to achieve their sustainability goals.²⁶

About us: Introducing Testo



Testo, with its headquarters in Lenzkirch in the Black Forest, is a world market leader in the field of portable and stationary measurement solutions. There are 2,700 employees involved in research, development, production and marketing for the high-tech company in 33 subsidiary companies all around the world. Customers all over the world are impressed by the measuring technology expert's high-precision measuring instruments and innovative solutions for the measurement data management of the future. Testo products help save time and resources, protect the environment and human health and improve the quality of goods and services. In the food sector, measuring instruments and monitoring systems from Testo have proven themselves for decades, and belong to the standard equipment of food services, supermarkets and food producers. An average annual growth of over ten percent since the company's foundation in 1957 and a current turnover of over a quarter of a billion euro clearly demonstrate that the Black Forest and high-tech systems are a perfect match. The above-average investments in the future of the company are also a part of Testo's recipe for success. Testo invests about a tenth of annual global turnover in research and development. For the food sector, Testo has developed specific solutions which combine precise sensors with intuitively operated software and comprehensive services, tailor-made for the requirements of the respective field.

More information at www.testo.com

²⁶ McKinsey & Company:
The path forward for sustainability in European grocery retailing