

# Smart Reduction of Consumer Food Waste: Using technology for the benefit of retailers and consumers





*The digital era has brought a profound opportunity for change in the consumer food industry. More than ever before, digital technology is empowering producers, retailers and consumers alike to revolutionize their operations and unlock ways to reduce waste and meet the needs of a growing global population."*

**Kees Jacobs**  
Capgemini



*Disruption is an important agent for innovation in the consumer food business. With the goal of better lives through better business, the future is bright for digital innovations that will ultimately reduce waste, increase value to retailers, and contribute to the health and wellness of consumers."*

**Ruediger Hagedorn**  
The Consumer Goods Forum

## Executive Summary

- The proportion of food thrown away by retailers is the lowest, at around 5%. Still, retailers can obtain a median of USD 5.1 in return for every dollar invested in reducing food waste.
- Food retailers have an influential role to play in how consumers buy, cook, and even store and dispose of food at home.
- Reducing household consumer food waste results in savings that can be directed to high-quality food products with higher profit margins for retailers (upselling) or to trying new products (cross-selling).
- Technology can influence behavior, facilitate collaboration, and enable information exchange and transparency to avoid food waste. Combining organizational and regulatory solutions with technological ones is key.
- The Internet of Groceries can connect retailers and consumers from the moment the product is chosen at the supermarket, through its storage and cooking, up to its disposal, or consumption.



## Food Loss vs Food Waste

There is a distinction between “food loss” and “food waste.” “Food loss” refers to food that “spills, spoils, incurs an abnormal reduction in quality such as bruising or wilting, or otherwise gets lost before it reaches the consumer”<sup>37</sup>. Such losses often result from poor infrastructure and deficient technology, transportation, refrigeration, and packaging<sup>38</sup>.

“Food waste” is described as “food that is of good quality and fit for human consumption but that does not get consumed because it is discarded, either before or after it spoils”<sup>37</sup>. Food waste often results from a decision to throw food away.

Reasons for food waste include high aesthetic requirements, especially for fruit and vegetables, the mismatch of supply and demand between retailers and consumers, and the physical and cognitive distance between production and consumption. Harvested bananas that fall off a truck are considered food loss, while brown-spotted bananas thrown away at a grocery shop or at home are considered food waste<sup>36</sup>. Together, food losses and food waste are referred as food wastage.

## Objective

Cappgemini and The Consumer Goods Forum, through this End-to-End Value Chain Learning Series, aim to identify the challenges and opportunities that food retailers face and the important role they can play in reducing food waste among consumers.

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## Introduction

In the film ‘Just Eat it—A Food Waste Story’ leading food waste expert Dana Gunders said: “Imagine walking out of a grocery store with four bags of groceries, dropping one in the parking lot, and just not bothering to pick it up. That’s essentially what we’re doing.”

The world produces enough food to feed every one of us, yet almost one billion people live in hunger<sup>35</sup>. Between one third and half of all food produced globally is wasted or lost along supply chains every year<sup>35</sup>. That’s enough to feed twice the number of hungry people in the world<sup>35</sup>. Producing food that will be lost or wasted means wasting human labor, money, land, energy, and water. To put things in perspective, in order to produce food that is never consumed, a surface area larger than Canada and India combined is used,<sup>1</sup> three times the water volume of Lake Geneva is squandered,<sup>2</sup> and roughly 20% of total deforestation is caused <sup>3</sup> <sup>11</sup>. Stunningly, if food losses and waste were a country, it would be the third largest greenhouse gas emitter in the world, <sup>11</sup> as well as a significant contributor to climate change.

1 Roughly 1.4 billion hectares of land in 2007

2 Roughly 250 km<sup>3</sup> of water in 2007

3 Total food production causes 70% of annual deforestation

But what if we start seeing food loss and waste not only as a problem, but also as a source of untapped opportunity? By forcing us to think differently, problems can become enablers of policy change, social development, environmental governance, and business innovation. Many inventions in the food and beverage industry, including pasteurization, canning, controlled fermentation, and refrigeration, came to exist as a result of trying to solve a pressing problem. The need to keep food fresh led to ice harvesting practices in the 1830s, which resulted in the commoditization of ice, which then paved the way for the acceptance of artificial refrigeration. During the Roman Empire, the aversion to wasting any part of the animal led to the creation of food products that are still consumed today. During the late Middle Ages, roughly 80% of the average household income was spent on food and drink in most of Western Europe. People would mix leftovers with the most disparate ingredients available, creating dishes such as *sammelsur* in Germany and *salmagundi* in England.

Tackling food loss and food waste today would accomplish more than simply increasing the availability of food to feed our growing population. It would also improve the sustainability of our food supply chains, increase the resilience of our grocery-retailing businesses, and lead to innovation. Besides, who knows what new culinary and technological creations could come of it?

## A financial business case for reducing food waste

Table 1: 10 main reasons for food waste at home<sup>21</sup>

### 10 Main reasons for household food waste

1. Food gone “past use” or “best before” date (34%)
2. Impulsive food purchases or special offers (30%)
3. Food visibly gone bad or smelling bad (30%)
4. Cooking excessive quantities of food (27%)
5. Not eating food that needs to be consumed first (25%)
6. Trying to buy more fresh food (23%)
7. Buying too much (22%)
8. Routine cleaning (24%)
9. Buying multipacks of perishable products (22%)
10. Dissatisfaction due to unmet taste expectations (22%)

In contrast to households, the proportion of food discarded by retailers is lowest, at around 5%<sup>9</sup>. Retailers have been at the heart of initiatives to reduce food waste, stimulating consumers to accept misshapen or imperfect produce, donating surpluses to food banks and clearing up confusion about expiration dates. The research of Champions 12.3,<sup>13</sup> demonstrates that food companies along the supply chain can obtain a median of USD 14 in return for every dollar invested in reducing food losses and waste (Table 2 shows the costs and benefits of reducing food wastage for these companies). Retailers in particular can obtain a median of USD 5.1 for every invested dollar by using simple and low-cost methods such as meeting regularly with suppliers, introducing or increasing daily communications with suppliers, linking forecasting methods to order planning processes, developing tools to assess underperforming lines, improving tools to increase the accuracy of order amendment, and reviewing progress on a regular basis<sup>13</sup>.

## Most food waste takes place at home

If you are reading this from Europe, the United States, Canada, or Australia, you probably will have thrown away between 3.5 to 7 lbs of good food by the end of the week.<sup>1,2,3</sup> Wasting food has environmental, social, and economic costs that start adding up at the farm and increase with every additional step towards the consumer. For this reason, the household is the worst possible place for food to be wasted. Yet, it is here that the highest percentage of food waste takes place. Households in economically developed countries are responsible for about 38% to 47% of their country’s food waste<sup>5,6,7,8</sup>. The pertinent question is, why do we as consumers tolerate this when we balk at other inefficiencies of similar magnitude? We wouldn’t accept the cashier throwing away one of every three products we purchase or if a taxi dropped us off one-third of the way from our destination. One explanation could be our lack of awareness regarding the quantity of food we waste at home. Throwing away expired products that have been shoved to the back of the refrigerator is perceived as cleaning rather than wasting. Not eating overripe, brown bananas is considered to be in the interest of one’s well-being, rather than wasteful, and disposing of small leftovers is perceived to be an inevitable part of washing dishes.

The ten main reasons for food waste at home, according to research UK-based Waste & Resources Action Program (WRAP),<sup>21</sup> are as shown in the table below. In the end, the act of wasting food is a decision influenced by information, convenience, emotions, awareness, ethics, preferences, uncertainty, and money.





Table 2: Costs and benefits for retailers entailed with reducing food wastage<sup>13</sup>

Costs	Benefits
<ul style="list-style-type: none"> <li>• Identifying, quantifying, and inventorying food wastage</li> <li>• Prioritizing hotspots</li> <li>• Monitoring progress over time</li> <li>• Purchasing or leasing on-site equipment to quantify food wastage</li> <li>• Training staff on food wastage reduction practices</li> <li>• Purchasing equipment to redesign material flow or improve food storage</li> <li>• Changing storage, handling, and manufacturing processes</li> <li>• Changing packaging to extend shelf-life</li> <li>• Changing date labels on packaging</li> <li>• Pursuing other staff and technology investments to reduce food loss and waste</li> </ul>	<ul style="list-style-type: none"> <li>• Avoiding the costs of buying food (as ingredients or directly for sale) that previously had been lost or wasted without being sold</li> <li>• Increasing the share of food purchased or prepared that gets sold onward to customers</li> <li>• Introducing new product lines made from food that otherwise would have been lost or wasted</li> <li>• Reducing food waste management costs (including labor) and tipping fees</li> <li>• Realizing other modes of reducing input costs or increasing output sales</li> </ul>

## Encouraging consumers to reduce food waste

The global economic cost of food wastage is estimated at USD 750 billion every year<sup>4</sup>. Asking who is responsible for reducing consumer food waste is no longer a relevant question. Unique to food supply chains is the fact that one way or another, we are all part of them and the consequences of wasting food affect us all. In fact, food retailers have an influential role to play in how consumers buy, cook, and even store and dispose of food at home.

Retailers influence consumers' choices through data-driven marketing, which includes savvy visual merchandizing, assortment planning, and seamless customer engagement in an "Any Time," "Anywhere," and "Any Device" (ATAWAD) environment. Driving consumers to reduce food waste at home immediately conjures up the frightening perspective of reduced sales volumes. Should retailers encourage consumers to reduce food waste at home at risk of losing sales? One leader in the food retailing industry thinks so. In 2013, Tesco's CEO Dave Lewis, declared a war on food waste, even at the risk of selling less of it. He said, "It may sound counter-intuitive [...] to help our customers reduce the amount of food they waste, because it is likely to involve reducing the volume of food they buy [...] But the issue that we are trying to solve is a long-term risk to society"<sup>10</sup>.

### Reducing Food Waste Could Increase Upsell and Cross-Sell Opportunities

In reality, reducing food waste can free up consumers' budgets that may otherwise have been diverted to the purchase of other food products<sup>14</sup>. Consumers could choose to spend this newly available budget on high-quality foods with higher profit margins for retailers (upselling), or on trying a new product (cross-selling). Being a food-adventurous consumer can be the result of having money left over once

less elastic purchases have been made. Consumers could expand their purchasing options while retailers expand their specialty and exotic food sections. However, this could also lead to further food wastage: Trying new food products is a major cause of food waste by consumers,<sup>6</sup> while the mishandling of fruit and vegetables in export leads to spoilage and damage along the way. According to Joost Snels, a researcher on fresh food chains at Wageningen University and Research, a systematic approach is important for making interventions to reduce food wastage. Failure to do so could only shift the wastage to other stages of the supply chain instead of eliminating it. For example, packaging improvements may delay the deterioration of products but do not guarantee the complete elimination of food wastage. Tackling food wastage requires taking into account interconnected systems with a multitude of stakeholders having different interests, opinions, and economic positions.

As difficult a task as it is, a pivotal moment already took place in 2015 when the United Nations General Assembly set a target of 50 percent per capita reduction in food losses and waste along food supply chains by 2030 under the Sustainable Development Goal of responsible consumption and production (UN, 2016). This stimulated many companies and food supply chain stakeholders to buckle down and do something. With momentum on their side, small, medium, and large enterprises have fueled a fast-growing trend of avoiding food waste with creative campaigns like: "Loving your leftovers," "Waste less, Save more" (Sainsbury), "Great Taste, Less Waste" (Morrisons) and "No time for waste" (Tesco). Likewise, companies reaching consumers digitally and delivering just the right amount of ingredients per meal, such as Blue Apron, Marley Spoon, and HelloFresh, are rising in popularity. HelloFresh, for example, grossed more than 800,000 active subscribers in eight countries since its establishment in 2011<sup>15</sup>.



## Disrupting organizational and regulatory solutions in the digital era

There are numerous initiatives to reduce food waste, but the market has yet to realize a systemic change through which food waste is not only treated but instead avoided whenever possible. Fragmented approaches to reducing food waste may only cause a shift in the place and time in which it occurs. In some cases, supermarket donations to food banks end up being wasted by the food banks since they contain products for which the food banks don't have recipients<sup>16</sup>. Matching supermarket supply with the demands of food banks can result in food waste reduction by using one of the most ubiquitous forms of Information Technology—the app. In the UK, a food bank app has been developed through which food banks can adjust their food needs in real time, allowing donors to see the availability of required products on a Traffic Light dashboard: urgent products colored in red, items in short supply in yellow, and those currently well stocked in green<sup>17</sup>. By using this app, Canterbury saw a one-hundred percent increase in donations of needed products in just one month<sup>18</sup>. Other apps such as Food Storage and Shelf Life, help consumers reduce waste by providing storage- and shelf-life information about more than 350 food products.

### How can technology help?

Technology may not solve the problem of food loss and waste on its own. The potential benefits of radio frequency identification technologies (RFID) are constrained by the lack of uniformity in global standards, high costs, lack of trust, misinterpretation of data, and a lack of collaboration in the supply chain<sup>19</sup>. Combining organizational, regulatory, and technological solutions is key. Getting the right algorithm to tackle food loss and waste requires not only taking into account the individual interests of supply chain stakeholders,

their motivational drivers and willingness to reduce food losses and waste, but also innovative technologies. Technology can catalyze behavioral change by acting as a tool for information exchange and transparency among the supply chain partners, thereby fostering trust-based collaborative relationships.

Could, then, an IT-driven supply chain transformation contribute to solving food waste by consumers? IT has helped optimize supply chain operations from the back-office to the point of sale by improving supply chain visibility and collaborative partnerships leading to enhanced food quality and safety. Reduction of food losses has been achieved thanks to the quicker response time of stakeholders that is made possible by automating ordering processes, streamlining payment mechanisms, scheduling warehousing,

### Four ways technology can help reduce consumer food waste

- Offer concrete data on the amount of food that consumers waste (e.g., Smart Bins)
- Encourage non-wasteful behaviors (via apps with recipes for leftovers/online shopping lists)
- Dynamically match demand and supply (with electronic shelf labels/ in-store beacons/food bank app)
- Make avoiding waste the path of least resistance (rent a retailer's SmartFridge) electronic shelf labels.

monitoring delivery, controlling systems for quality assurance, collecting products' data, and tracking bar codes, among others<sup>20</sup>. However, the use of IT has been scarce in tracking food products up until their consumption or end-of-life. The focus has been mainly to streamline the logistical and transport process from the manufacturer to the retailer.

## Innovative tech to encourage waste-avoiding behavior

The use of IT to improve the interaction between retailers and customers has already proven to be successful. Next-generation loyalty programs, one-to-one personalization, and omni-channel customer engagement are some of the significant advances. Andrew Parry, project manager at WRAP,<sup>21</sup> suggests that seven out of the ten main reasons for consumer food waste (shown in Table 1) could be alleviated with technology without disregarding the power of informing and educating customers about the use of such technology.

### Envisioning the Internet of Groceries

In Seattle, a regulation passed in 2015 imposes a one-dollar fine every time food is found in consumers' dumpsters<sup>22</sup>. The inspection of the trashcans is a strenuous task, accomplished by workers who comb manually through the trash, and here technology would come in handy. Smart waste containers that measure the filling percentage<sup>23,24</sup> and content of waste<sup>25</sup> of restaurants, retailers, and city dumpsters already exist thanks to wireless sensors and built-in scale cameras connected to the internet. Using IT would not only alleviate the manual labor but also increase its accuracy. The Internet of Things, or rather, the Internet of Groceries, can not only facilitate tasks, but also has the potential of connecting retailers and consumers from the very moment the product is picked up at the supermarket, through its storage and cooking, up to its disposal, or ideally, complete consumption rather than disposal.

It can all start by enabling customers to create online shopping lists and add ingredients to their shopping basket based on recommended recipes. At the store, consumers could be able to validate product freshness through smart labels, such as printed sensors,<sup>26</sup> or portable spectrometers, such as the SCIO,<sup>27</sup> and have instant access to information about products or ingredients. Using beacons, retailers could reach consumers who have downloaded the store app and enabled Bluetooth to offer them personalized suggestions related to the products located in their close proximity<sup>28</sup>. Through dynamic pricing using electronic shelf labels, prices could be adjusted in real time to instantaneously improve the uptake of products with a shorter shelf life. Likewise, consumers could receive in-store customized offers according to their pre-identified preferences, such as their willingness to buy products close to their sell-by date or malformed products. We have become accustomed to buying and selling fruit that looks like it came out of a template, thereby consuming and retailing a rather unrepresentative sample of nature. For example, increasing sales of curved cucumbers could help redefine the norm.

Another trend in parallel with food waste reduction and the Internet of Things is collaborative consumption, or the sharing economy, which allows consumers to enjoy access to more products and services while consuming fewer physical resources. Imagine consumers no longer needing to own a fridge. Imagine retailers offering smart fridges to loyal consumers and imagine that same fridge placing direct orders, assessing the freshness of products, suggesting storage solutions, offering recipe ideas, and communicating with consumers through their mobile devices.

The consumer surplus, or value, that consumers place on products relative to their price could increase thanks to these technologies, which take over the least pleasant tasks pertaining to food handling, such as planning and storing, and leave to us only the enjoyable activities such as cooking and eating. After all, the utility value of food is a function not only of taste, but also of time, cost, ease, and convenience; wherein throwing food away can sometimes be the optimal decision for a consumer<sup>29</sup>. Keeping leftovers for example, entails storing the food in a container, warming it up, cleaning the container, and washing the dish used for consuming the food. It's too much hassle compared to ordering a pizza, but an attractive option when most of the "hard work" is taken away from us.



*Imagine consumers no longer needing to own a fridge. Imagine retailers offering smart fridges to loyal consumers and imagine that same fridge placing direct orders, assessing the freshness of products, suggesting storage solutions, offering recipe ideas, and communicating with consumers through their mobile devices."*

## The challenge posed by uncertainty and risk

Experts in the field of sustainable supply chains advocate integrated solutions to food loss and waste through which the quality of food products is measured, monitored, and controlled from the moment it leaves the farm until it reaches the consumer. This technology has already been commercially developed.

However, according to Toine Timmermans,<sup>30</sup> of Wageningen University & Research in the Netherlands and an expert in the field of sustainable food chains, technology is roughly ten years ahead of behavioral acceptance by most companies. Some of these companies seem to suffer from the “not-invented-here” syndrome. Understandably, the innovators or early adopters of food waste reduction technologies face uncertainty and risk<sup>31</sup>.

Finally, companies that can take action to reduce food waste should not underestimate the reputational benefits and consumer trust that will accrue on the strength of the social purpose of eliminating food waste. In fact, consumer trust and brand reputation can act as force multipliers to build emotional connections for lifelong relationships with consumers. Such an initiative can also mobilize community activists to the fight against food waste, increase the level of support from policy-makers and maximize shareholder and market value<sup>33</sup>.

## Conclusion

Reducing food waste might look like too huge a problem for a single company to tackle, but experience shows that the smallest efforts can have broad ramifications and inspire others to join the cause. Collaboration with consumers is more possible now than ever before, especially since buying food is no longer merely a necessity, but also an act of cultural expression through which consumers reward companies that reflect their own principles. To increase the chances of successfully reducing food waste, we must realize that retailers are no longer subject to an isolated linear business structure. They are, rather, an integral part of society and of a network of industries interconnected through information technologies. The smart use of information technologies along food supply chains creates opportunities to spur the adoption of common standards, supply chain transparency, and real-time information-sharing practices. If real time is the new standard for business insights, now is also the real time to cut food loss and waste.

Food waste reduction is part of a larger effort to improve the sustainability of our global food systems. Each of us has something to win, either through economic profit or environmental and social benefits. Several initiatives to reduce food loss and waste have proven financially sound and, even though food waste by retailers represents only about five percent, they too can earn significant benefits. Retailers have the tools and insights to change consumer knowledge, mind-set, and behavior. Less food lost and wasted would alleviate the burden on the environment caused by agriculture, transport, and the disposal of food that is never eaten. Even so, reducing food waste is not only about profit, logistics, or the environment. It is also a fundamentally moral choice.

Food retailers can help consumers reduce their food waste by:

1. Understanding why some products are landing in consumers' dumpsters instead of on their plates
2. Increasing the transparency and information consumers have regarding food production processes
3. Making the information about products easy to understand
4. Applying information technologies to help consumers quantify the amount of food wasted at home
5. Helping consumers build a tailored strategy to cut food waste at home.

The use of (information) technology to address environmental, social, and business issues is now ubiquitous and certainly valuable, but is not, on its own, the “goose that lays the golden eggs.” Sometimes, a greater issue is the ability to change deeply entrenched mindsets and to challenge the status quo.

Eating food is one of the most natural acts of human beings. What would you say wasting food would be?





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## About The Consumer Goods Forum

The Consumer Goods Forum ("CGF") is a global, parity-based industry network that is driven by its members to encourage the global adoption of practices and standards that serves the consumer goods industry worldwide. It brings together the CEOs and senior management of some 400 retailers, manufacturers, service providers, and other stakeholders across 70 countries, and it reflects the diversity of the industry in geography, size, product category and format. Its member companies have combined sales of EUR 3.5 trillion and directly employ nearly 10 million people, with a further 90 million related jobs estimated along the value chain. It is governed by its Board of Directors, which comprises more than 50 manufacturer and retailer CEOs.

For more information, please visit:

**[www.theconsumergoodsforum.com](http://www.theconsumergoodsforum.com)**