

## 12. SURPLUS FOOD REDISTRIBUTION SYSTEMS AS A FOOD WASTE PREVENTION TOOL

<https://doi.org/10.18559/978-83-8211-209-2/12>

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### Abstract

The main objective of this chapter is to present solutions designed in order to redistribute surplus food as a food waste prevention tool. Food surpluses are generated both in supply chains and in households. This chapter presents the surplus food redistribution system structure in terms of entities included into it. Three main types of SFRS institutions will be presented: food banks operating both as front-line and warehouse entities, social supermarkets and food sharing systems, which work as initiatives based on some premises (physical places) where food may be left and taken from, as well as initiatives operating thanks to Internet platforms. Three categories of these platforms are characterised in this chapter: the “sharing for money” model, which is primarily a B2C for-profit model to reduce waste and, at the same time, generate revenue, the “sharing for charity” model in which food is collected and given to non-profit organisations, and the “sharing for the community” model which is a B2C or C2C model where food is shared amongst consumers.

**Keywords:** surplus food redistribution system, food bank, social supermarkets, food sharing initiatives, food sharing platforms.

**JEL code:** Q57.

### Introduction

The contemporary model of food production and distribution is oriented on a mass-scale operations and products commodification. It results in the growing access to a wide variety of food products but, on the other hand, it contributes to the creation of a huge amount of unsaleable products. Keeping in mind the cost of food production (including the environmental cost), the amount of food wasted every year and the level of food insecurity still existing all over the world (Berti et al.,

#### Suggested citation:

Borusiak, B., & Knežević, B. (2024). Surplus food redistribution systems as a food waste prevention tool. In K. Pawlak-Lemańska, B. Borusiak & E. Sikorska (Eds.), *Sustainable food: Production and consumption perspectives* (pp. 184–197). Poznań University of Economics and Business Press. <https://doi.org/10.18559/978-83-8211-209-2/12>



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2021), it is absolutely necessary to develop solutions in order to use food already produced and prevent it from being wasted. Where does wasted food come from? The patterns of food waste seem to vary, based on numerous criteria, including income categorisation; lower-income countries primarily experience food waste during the production and processing stages of the food supply chain, whereas middle- and high-income countries tend to waste food more significantly during the final stage of household consumption (Amirudin & Gim, 2019). It means that food leftovers are generated practically in every country, on every level of food distribution channels, and that they all may (and should) be included into food redistribution systems, which play a twofold role: reducing food insecurity and preventing surplus food waste. There are a variety of reasons, both on the side of producers and consumers, for which food is still good for consumption but unsaleable, and may be easily turned into waste instead of being recovered. These reasons are presented in Table 12.1.

**Table 12.1. Main barriers to food waste recovery**

Supply side	Demand side
<ul style="list-style-type: none"> <li>• stigma associated with food waste as a symbol of inefficiency</li> <li>• underestimation of the quantity of food waste/perception that it is not a significant issue</li> <li>• insufficient awareness of social and environmental impacts of food waste</li> <li>• regard for waste disposal as an acceptable solution</li> <li>• perception that food waste is inevitable and socially acceptable</li> <li>• belief that food waste is not the responsibility of suppliers on a personal level</li> <li>• lack of coordination with demand-side actors in the food supply chain</li> <li>• complexity in managing the recovery of perishable goods within a limited timeframe</li> <li>• absence of clearly defined processes and activities for food waste recovery within the food industry, seen as time-consuming, labour-intensive and costly</li> <li>• undefined and unapproved food waste recovery procedures at the corporate level in retail stores</li> <li>• lack of a system to measure and track food waste</li> <li>• retailers' practice of discarding products based on "sell by" dates and appearance standards</li> <li>• insufficient information for consumers regarding the meaning of "best-before" labels</li> <li>• reluctance to sell products resulting from processing errors and packaging-related issues</li> <li>• prioritisation of financial considerations over environmental concerns in relation to food waste disposal/recovery</li> <li>• limited quantities of edible waste, making recovery challenging in terms of logistics</li> <li>• financial and reputational risks for food businesses due to health and safety concerns associated with food donations</li> <li>• misconception of liabilities arising from food waste donations/transfers</li> <li>• lengthy donation processes and additional costs, efforts and logistical challenges</li> <li>• higher expenses associated with food donation compared to disposal</li> </ul>	<ul style="list-style-type: none"> <li>• consumers' reluctance to purchase imperfect/suboptimal products and items nearing the "best before" date</li> <li>• consumer misconceptions regarding "best before" labels</li> <li>• lack of coordination with suppliers within the food supply chain</li> <li>• retailers' practices of rejecting products based on "sell by" dates and appearance criteria</li> <li>• processing errors and packaging issues not deemed acceptable by potential recipients</li> <li>• limited financial and time resources of charitable organisations for food collection</li> <li>• mismatch between potential food donations and the specific needs of charitable organisations</li> <li>• limited resources and time for charitable organisations to handle administrative procedures associated with food donations</li> <li>• challenges in managing the recovery of perishable goods within a limited timeframe</li> </ul>

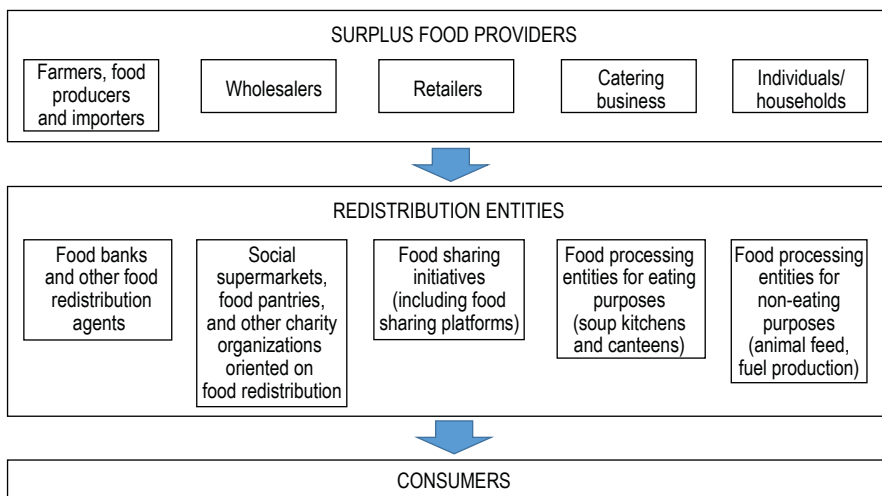
Source: (Ciulli et al., 2020; Hingston & Noseworthy, 2020; Zielińska et al., 2020).

This chapter focuses on preventing food from becoming waste by delivering it to potential consumers directly or indirectly through surplus food redistribution systems. It is organised as follows: first, a surplus food redistribution system (SFRS) will be defined and its general structure will be presented; then, four types of key institutions of the SFRS will be described: food banks, social supermarkets, food sharing initiatives and food sharing platforms applying three different models: “sharing for money”, “sharing for charity” and “sharing for community”.

## 12.1. Structure of surplus food redistributive system

Food redistributive systems emerged due to a huge amount of leftovers occurring on every level of the distribution system. Their main objective is to collect food which is unsaleable but still good for consumption. Collected food may be given for free or sold (as it is or processed), and in this way both food waste and food insecurity can be reduced (Vittuari et al., 2017).

The distribution system for surplus food consists of providers (farmers, food producers and importers, wholesalers, retailers, catering companies, individuals), redistribution entities (redistributing food products and processing food) and end users (consumers). The general structure of a food redistribution system by the type of entities involved in the process is presented in Figure 12.1.



**Figure 12.1. General structure of food redistribution system**

Source: own elaboration.

There are a variety of redistributive entities which can be distinguished with several criteria (Michellini et al., 2018), such as:

- a) organisation profile: profit or non-profit, pure player, brick and mortar, click and mortar, types of technologies: website, app, website and app, geolocation,
- b) delivery models: Business-to-Consumer (B2C); Business-to-Business (B2B); Peer-to-Peer (P2P); Consumer-to Consumer (C2C), Consumer-to-Business (C2B),
- c) type of donor: farmers, producers, distributors, consumers,
- d) type of beneficiary: consumers, non-profit organisations,
- e) type of transaction: donation or sale,
- f) social impact: waste reduction, poverty reduction,
- g) type of client they are oriented on: B2B (food banks), B2C (social supermarkets, food pantries), C2C (food sharing initiatives),
- h) type of activity: food resell, donate, process.

The entities presented in Figure 12.1 may interplay; for example, food banks supply soup kitchens, food pantries or other charity organisations which give food to people in need. In the following part of this chapter the most important entities will be presented, including their origin, mode/s of activity and future perspectives.

## 12.2. Food banks

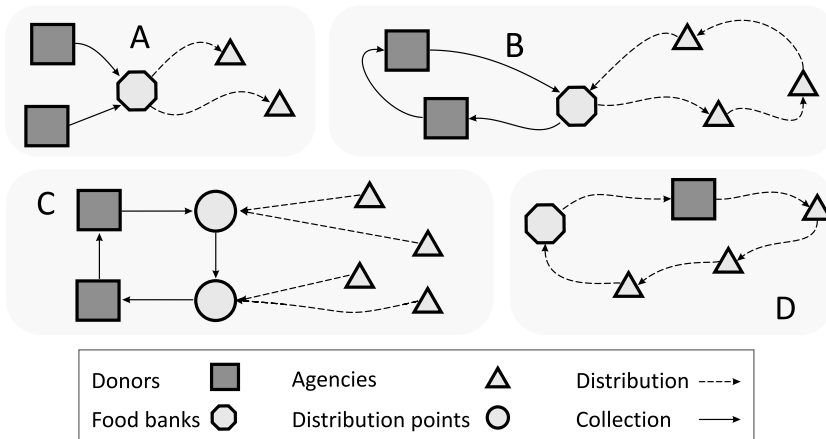
Food banks are “humanitarian aid organisations that collect, organise and deliver food to nonprofit member agencies and to individuals to help alleviate the society’s hunger problem” (Ataseven et al., 2018). Their main objective is to reduce food insecurity of people in need. Food banks are usually charitable organisations that operate as nonprofit entities, aiming to provide food assistance to individuals who face difficulties in affording an adequate supply to prevent hunger. As was mentioned above, food banks typically work in conjunction with intermediaries such as food pantries and soup kitchens. The first food bank in the world—St. Mary’s Food Bank—was established in the United States in 1967. Since then, a significant number of food banks has been established worldwide. In Europe, the first one was organised in 1984 in France and their numbers saw a rapid increase following the global rise in food prices that commenced in late 2006. The growth of food banks accelerated further during the financial crisis of 2007–2008, which exacerbated economic challenges for individuals with low incomes (Global Food Banking Network, 2023).

A significant differentiation among food banks lies in their operational model, primarily categorised as either the “retailer” model or the “warehouse” model. Under the first one, food banks directly distribute food to individuals in need. In contrast, the warehouse model involves supplying food to intermediaries such as

food pantries, soup kitchens and other front-line organisations. In some countries (e.g., the United States and Australia), the standard approach for food banks is to function as warehouses rather than directly supply the end-users, although there are exceptions (Bacon & Baker, 2017). Conversely, in other countries (like Great Britain, France, Germany and Poland), food banks typically both distribute food parcels directly to people experiencing hunger and work as warehouses delivering food to aid organisations (Rizvi et al., 2021).

Another distinction pertains to the charity model versus the labour union model. Food banks operated by charitable organisations often prioritise food recovery efforts to prevent wastage and encourage volunteerism. Conversely, those managed by labour unions may place greater emphasis on providing nourishment to the hungry through any available means, offering employment opportunities for the unemployed, and focusing on education, particularly in informing users about their civil rights.

A food bank supply chain includes three main actors: donors, food banks and agencies. The term agency is used to describe entities (usually non-for-profit entities) that receive the food and distribute it to individuals. In some cases, donations are performed directly at the food bank; however, in most cases, the food bank organises the transportation of donations—different solutions are presented in Figure 12.2.



**Figure 12.2. Different food bank supply chains**

Source: (Rivera et al., 2023).

Food banks also receive financial donations that allow them to acquire more goods, particularly supplies that are not commonly donated. Due to typically higher demand than donations, food banks need to assess strategies to ensure fairness and equity while maximising the efficiency of their distribution operations (Rivera et al., 2023).

Redistribution of surplus food to people in need is usually presented as a win-win solution to the food paradox, despite being controversial (Caplan, 2016). It is mainly based on the fact that food banks do not always deliver proper food (in terms of quantity and quality) to their clients. Many clients of food banks consider themselves, and are considered by others, to be stigmatised. They see themselves as failures, excluded from normal society, and often claim to be ashamed that they cannot provide for their families. Consequently, it happens that donating food to a food bank does not guarantee food waste prevention. Food bank practices that are the best at meeting client needs and improving food security are those that provide culturally appropriate and suitable foods in ways that clients perceive as dignifying (Bazerghi et al., 2016). Contemporary approaches to improving services include increasing the quality of food provisions, establishing safe and welcoming spaces, as well as providing greater integration with health care and health promotion. Appropriate foods for food banks are those that are deemed safe, nutritious and able to meet special dietary requirements. Furthermore, another important issue is free choice of food; if people visiting food banks can select food items from displays, as in a grocery store, instead of receiving pre-packed hampers, it is more likely that they will utilise them all (Rizvi et al., 2021). Given the substantial dependence on donated food, educating staff and donors on the selection and distribution of suitable food items can enhance the food bank's ability to alleviate food insecurity. Overcoming operational obstacles, such as resource constraints, restricted opening hours and limited awareness of available services, is also crucial to ensure that food bank programs are inclusive and accessible to all. Meeting these conditions is vital to make food banks a tool to prevent food waste effectively.

### 12.3. Social supermarkets

Social supermarkets are a relatively new and specific form of social enterprises (Holweg & Lienbacher, 2011; Maric & Knezevic, 2014) and a new retail format (Lienbacher, 2012; Bogetic et al., 2018). Social supermarkets were first developed in Austria in 1990, where SOMA, a nonprofit organisation, coordinates the entire retail process in the country (from product suppliers to point-of-sale distribution). In Croatia, the first social supermarket was opened in 2009 (Michelini et al., 2018). Such supermarkets significantly developed across Europe as a response to the economic crisis (2008–2014) which caused an increase in poverty in some countries. Thus, one of their most important objectives is to address the problem of poverty and material deprivation, which is deepening in the third millennium. On the other hand, social supermarkets resolve another sustainability issue. They contribute to the reduction of food waste in traditional food supply chains. As an

organisation, social supermarkets' mission is to help to redistribute food surpluses generated within traditional food supply chains to people who are at risk of poverty or in material deprivation and food insecurity (see Figure 12.2). As a new type of organisation, social supermarkets foster positive social change by fulfilling the material needs of socially disadvantaged groups and giving them an opportunity to preserve their dignity in an environment where they can choose various kinds of goods at extremely low prices (EU Fusions, 2015; Maric & Knezevic, 2014).

There are many different types of social supermarkets across Europe, but their level of existence and development is very different from country to country as it is shown in research studies done by Holweg and Lienbacher (2011), within project EU Fusions (2015), as well as by Knezevic (2018). The level of existence and development of social supermarkets is influenced by the economic situation of the country and its level of development. Therefore, there is no common, widely accepted and totally clear definition of social supermarkets, because it should be broad enough to integrate all the variations which are developed and existing in different markets. Moreover, as a relatively new phenomenon, social supermarkets are not sufficiently analysed in the literature. However, we can find a number of different definitions and determinations of the term social supermarkets. Some of the definitions are the following:

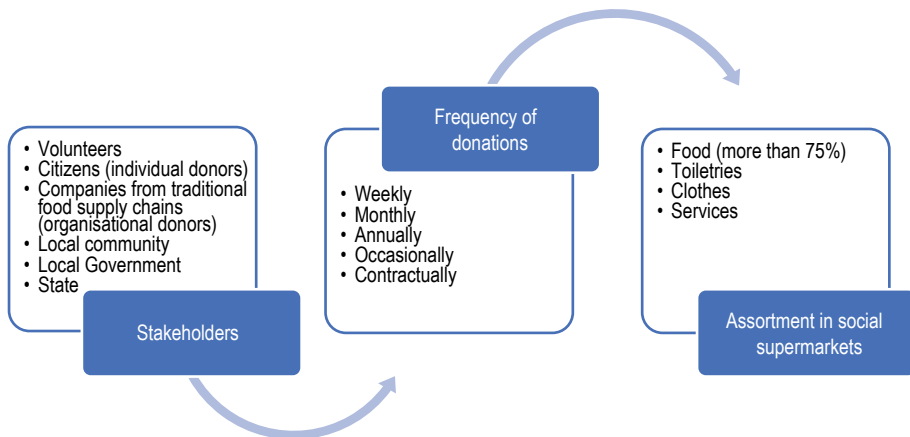
- Schnedlitz et al. (2011) defined a social supermarket as “a small, non-profit oriented retailing operation offering a limited assortment of products at symbolic prices primarily [*sic*] in self-service manner. Authorised for shopping are needy people only. The products are donated by food production and retail companies free of charge as they are edible but not marketable due to small blemishes. Achieved profit is reinvested into social projects”.
- A social supermarket is “a shop selling discounted food to people on a low income” (definition given in *Collins Dictionary*).
- According to Maric and Knezevic (2014), social supermarkets constitute a new retail format that fosters positive social change by fulfilling the material needs of socially disadvantaged groups and giving them an opportunity to preserve their dignity in an environment where they can choose various kinds of goods at extremely low prices or, in some cases, free of charge.
- Some authors emphasise that social supermarkets are nonprofit organisations that base their activity on volunteerism and charity, and if they generate any profits, they use them for charitable activities (Holweg & Lienbacher, 2011).

Schneider et al. (2015) listed several benefits of social supermarkets:

- reduction of food insecurity and users' life quality improvement,
- social inclusion of the users of social supermarkets by fostering their self-confidence in communication with others and feeling of belonging,

- social supermarkets give a possibility of choice to their users and treat them as clients, and not as charity users, which strengthens the sense of dignity,
- environmental benefits due to food waste reduction,
- distribution of surplus food from a company which has the surplus through social supermarkets to final users,
- economic benefits related with reallocation of users' scarce budgets.

In the everyday operation of social supermarkets, the management's ability to carry out donation collection and fundraising activities plays a prominent role. Figure 12.3 shows three key elements in the daily work of social self-services: (1) stakeholders, (2) frequency of donations and fundraising activities, and (3) the assortment of goods offered to customers (i.e. materially deprived citizens).



**Figure 12.3. Key elements in everyday operation of social supermarkets**

Source: own elaboration.

Usually, in social supermarkets, food makes up more than 75% of the assortment (see the results of studies by Holweg and Lienbacher (2011) as well as Knezevic (2018)). That is why, we can claim that social supermarkets are actually a social innovation in food distribution in a way that reduces poverty and prevents hunger among the most socially vulnerable citizens. In addition, based on the conducted primary research (Holweg & Lienbacher, 2011; Knezevic, 2018), social supermarkets dominantly collect donations of food and toiletries: (a) directly from producers, (b) from fast-moving goods (and/or grocery) retailers, and (c) from individuals. The structure of donation sources varies from county to country, and the legal frameworks regarding food donations directly influence the structure of donation sources.



## 12.4. Food sharing initiatives

Food sharing involves collecting unwanted and overproduced food products (which would otherwise be discarded) and redistributing them to people who will consume them. The food products can be collected directly from private households (donated by individuals) as well as from small or medium-sized businesses (restaurants and stores mainly). It can be distributed either directly via distributors or through online communities. In the following subchapter, attention will be focused on the offline solutions. They can be organised either by institutions dedicated to social work (mainly) or by individuals. They require space and equipment (cupboard, refrigerator), as well as a good communication system and purposely designed rules explaining what kind of food may be shared. For example, *Jadłodzielnie Warszawskie* (Warsaw Foodsharing) states that one can bring products that are fit for consumption, have exceeded the date of minimum durability (“best before”), but have not exceeded the expiry date (“use by”). They should be tightly packed and placed in clean containers. Homemade products, e.g., sandwiches, cake, soup, should have a description of the dish, as well as the composition and date of preparation. Dry products can be opened but should be sealed tightly. Rotten products, raw meat, dishes with raw eggs or unpasteurised milk are unacceptable (JedzeNIEwyrzucaj, 2021). Appointed guardians, but also the users themselves, take care of order and cleanliness. In this type of initiatives, the primary concern raised frequently is the challenge posed by food risk policies. In particular, the phenomenon of community refrigerators has created a flash point for food risk enforcement. At the core of the tensions between food sharing initiatives and regulators lay a fundamental difference in their perception of risk allocation. Legislative requirements place the responsibility on an accountable individual to demonstrate adherence to the cold chain during food redistribution. On the other hand, food sharing initiatives often espouse a vision that is more rooted in a commons-based approach to risk and responsibility. The 2017 food donation guidelines issued by the European Commission, primarily motivated by a global campaign to raise awareness and take action against food waste, emphasise the requirement for donated food to be traceable and edible in line with existing food hygiene regulations. However, these guidelines do not specifically outline the roles and responsibilities of the various stakeholders involved in ensuring compliance with these guidelines. As a result, uncertainties persist regarding who should be responsible for providing and financing the new logistics infrastructure necessary to accommodate the increased volumes of redistributed surplus food, as well as who should assess the quality and suitability of surplus food for consumption (Davies et al., 2019).

## 12.5. Food sharing platforms

Food sharing platforms are nowadays recognised as the nexus of various issues that are seen as critical for sustainability, such as waste reduction, social inclusion and community engagement (Schanes & Stagl, 2019). Using digital technologies, such as mobile apps and websites, they create a secondary market for the distribution of food surplus, simplify the process of sharing, gifting and selling items, and spread the practice of sustainable food consumption (Bachnik & Szumniak-Samolej, 2018). Michelini et al. (2018) categorised food sharing models into three types based on the specific marketplace they operate in. Each model is distinguished by unique logistical processes that involve various actors, including providers (businesses or private individuals) and final consumers (users or non-profit organisations).

The initial category of food sharing is represented by the “sharing for money” model, which is operated by for-profit organisations. This model primarily follows a business-to-consumer (B2C) delivery approach, where distributors, retailers and restaurants can list their unsold products on a website or app. Consumers have the option to browse and purchase discounted food either online or directly from the physical store. Some scholars consider this model to be more akin to traditional offerings and classify it as “pseudo-sharing” (Belk, 2014) or “redistribution” (Lago & Sieber, 2016), as it involves monetary compensation. TooGoodToGo is a good example of this type. It was established in 2016 in Denmark as a B2C platform, and it operated in 17 countries in June 2023, mainly in Europe, but also in Canada and the United States, having over 17 million users. Their model is mainly based on a web-based app where food suppliers (stores, restaurants) may register available food which is next reserved by app-users who pay a reduced price for products and pick them up on their own (TooGoodTooGo, 2021).

The second model is known as “sharing for charity” and is managed by non-profit organisations, both in an online-only (pure player) and physical (brick and mortar) setting. The primary delivery approach for this model is business-to-business (B2B), business-to-non-profit organisation (B2NPO), and consumer-to-business (C2B), where food is collected from various donors. It is then distributed predominantly free of charge to non-profit organisations at the local and national levels. Food Rescue US is an example. It was founded in 2011 when its two founders, Jeff Schacher and Kevin Mullins, recognised that two growing challenges facing their community and the nation, i.e. food insecurity and food waste, could be solved with innovative technology, volunteers and a direct-transfer model. They founded Community Plates and created a unique model of food rescue that is simple, sustainable and scalable. The whole system works thanks to a web-based app, through which food donors register available food, social service agencies communicate their food needs and details for delivery, and volunteers sign up for

a “food rescue”. Once a match is made between a food donation opportunity and a social service agency, a volunteer rescuer self-schedules to pick up the food from the donor and deliver it directly to the local social service agency serving the community. In June 2023, Food Rescue US was in 43 locations across 25 states and the District of Columbia (Food Rescue US, 2023).

The third model “sharing for the community” is operated by profit and non-profit organisations that operate as pure players. The delivery model in this case is P2P, meaning that food is collected primarily from consumers (in some cases also from business entities) and shared with other consumers at a local level. The goal of this model is to serve a community actively in reducing food waste, and it is considered as “pure or real sharing” when it involves “a resource that was previously used individually or was completely idle during certain times is [*sic*] now shared across customers” without asking for a compensation (Pisoni et al., 2022). The app called OLIO may serve as an example in this case. It was launched in 2015 by a British-American team thanks to over \$50 million collected in five rounds of a fundraising campaign. It was designed as a C2C “sharing for community” platform, dedicated not only to save food leftovers but also to foster the creation of social ties. At the community level, OLIO has over 60,000 trained volunteers who are matched with a business in their neighbourhood (a retailer or a restaurant). On their allotted time and day, a volunteer visits this business and collect all the unsold or unserved food. Then, they take it home, where they may save a part for themselves (10% as a “thank you”), and next, give it to the OLIO app; within minutes their neighbours may request it and finally pick it up. On average, food is usually fully redistributed into multiple homes in less than two hours, thereby enabling the businesses to have zero food waste locations. The OLIO app is also used for non-food household items to be given away as well as for borrowing everyday things instead of buying brand new ones (Olio, 2023a). The app had approximately 7 million users around the world in June 2023, and OLIO is a carbon negative company because it diverts far more greenhouse gas emissions than it produces (Olio, 2023b).

## Conclusions

The food waste hierarchy ranks surplus food donations for human consumption as the next best strategy, when food waste cannot be prevented. Presented forms of surplus food redistribution systems are generally assessed as an effective way of food waste prevention (Sundin et al., 2022). Although there has not been much research on this issue so far, it was found that it has a positive environmental impact. For instance, considering global warming, Eriksson & Spångberg (2017) found an average avoided impact of 0.6 kg CO<sub>2</sub> eq/kg of food donated (only fresh

fruit and vegetables), Albizzati et al. (2019) reported the impact reduction ranging between 0.5 and 2 kg CO<sub>2</sub> eq/kg, and Damiani et al. (2021) stated that the average net environmental benefit of food donation was 1.9 kg CO<sub>2</sub> eq/kg. Measuring SFRS effectiveness is a very complex task as it requires including also other effects, such as the amount of energy consumed by SFRS, direct and indirect rebound effects associated with re-spending of substitution-related monetary savings, as well as the share of redistributed food eaten (Sundin et al., 2022). Reducing food insecurity is another important positive effect that cannot be ignored. However, even if SFRS are effective in preventing food waste, it remains vital to reduce surplus food at every level of food production and consumption.

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