

Article

A Social Innovation Model for Reducing Food Waste: The Case Study of an Italian Non-Profit Organization

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Abstract: Food waste (FW) is always considered as one of the main challenges for the planet Earth in terms of ethical and social impacts as well as economic and environmental ones. In September 2015, the UN launched the Agenda for 2030 for sustainable development, establishing the 50% reduction in FW at the retail and consumer levels by 2030, as well as food loss along food supply chains. However, there are some concerns about the possibility of concretely reaching this target. One is surely due to the fact that more targeted strategies are more oriented towards logistic/marketing functions than social ones, losing the importance deriving from the reconfiguration of social networks in food redistribution. In this context, the aim of this paper is to improve understanding about how social innovation models can enhance FW reduction, building new relations inside the stakeholders network, and involving new actors usually not actively participating. To do this, the authors present a case study of an Italian non-profit project, named Avanzi Popolo 2.0, adopting this type of approach. The results highlight the importance of building the sense of community and of creating social capital in local food redistribution networks for tackling the issue of FW reduction.

Keywords: food supply chain; food waste; surplus food; EU regulation; social innovation; non-profit organization; community networks; food redistribution

1. Introduction

Food Waste (FW) represents one of biggest concerns facing mankind today in terms of ethical and social impacts—linked to unmet nutritional needs of societies such as food poverty, food insecurity, and hunger—as well as economic and environmental ones—due to excessive consumption of natural resources and greenhouse gas (GHG) emissions (Huang et al. 2020; Caldeira et al. 2019; Scherhauser et al. 2018). The FW environmental impacts are very important and linked to soil erosion, deforestation, water and air pollution, as well as GHG emissions that occur in all the FSC, from the agricultural phase until the waste management phase (Scherhauser et al. 2018). Poore and Nemecek (2018) revealed that the Food Supply Chain (FSC) is responsible for 26% of anthropogenic GHG emissions, almost 13 Gt CO_{2-eq}, in line with Intergovernmental Panel on Climate Change—IPCC (2019). Additionally, almost 24% of these emissions come from food that is lost upstream of FSC (15%) and wasted (9%) in downstream. Thus, the total FLW is responsible for around 6% of total global GHG emissions (Ritchie 2020).

In this context, in September 2015, the United Nations (UN) launched the Agenda 2030 including the establishment of 17 sustainable development goals (SDGs) in order to realize economic growth, social integration, and environmental protection. Among them, SDG 12 intends to “Ensure sustainable consumption and production patterns” within which, target 12.3 is referring specifically to FW “By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses” (United Nations 2015). Thus, the aim to reduce FW by 50%,

as established by the target 12.3, would decrease GHG net emissions, in the range of 20 to 30% of total food—sourced, and generally produce benefits for human health, mainly safeguarding food security, and natural resources, reducing the pauperization of land, water and nutrients (Arneith et al. 2019).

In this direction, many initiatives have been launched worldwide to develop policies and strategies for resolving the problem of FW. Among them, it is worth noting: the FUSIONS Project by 7th Framework Programme of the European Union (EU) (Östergren et al. 2014; Vittuari et al. 2016); Save Food Initiative by FAO; Think Eat Save by UNEP and FAO; Food Waste Protocol by World Resources Institute; the Circular Economy Package and Directive (EU) 2018/851 by the European Commission (EC) (European Commission 2015, 2020).

Although, at an international level, many countries started to make commitments to follow the UN indications, there are some concerns about the possibility to concretely reduce FW. Indeed, the concept of FW is often associated with Food Loss (FL), and sometimes also to Surplus Food (SF), which refers to “the edible food produced, manufactured, retailed or served that has not been consumed by humans (mainly due to socio-economic reasons), including food produced beyond nutritional needs (Mourad 2016)”. Though differences between FL and FW have been scientifically validated and defined, the term “FLW” is often used as one category along all stages of FSC (Muriana 2017; HLPE 2014). This causes difficulty in obtaining separated data at the global and local level as well as the right dimension of single impacts deriving from FL and FW. To overcome this concern, FAO in 2019 perfected its initial definition (FAO 2011) and, trying to standardize most definitions, focused only on the quantitative loss and waste along the FSC, with the others focused on the quality character (nutritional, cosmetic, food safety). The update definitions are: “FL is the decrease in the quantity or quality of food resulting from decisions and actions by food suppliers in the chain, excluding retail, food service providers and consumers. FW is the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food services and consumers” (FAO 2019). This approach will hopefully improve data collection, data comparability and evidence-based regulatory and policy decisions for prevention and reduction of FLW (Van der Werf and Gilliland 2017; Priefer et al. 2016; Parfitt et al. 2010). Certainly, with the possibility to estimate a definite FW amount, the strategies necessary to prevent and reduce FW could be made more effective than the current ones (Teigiserova et al. 2020; CEC 2019; FAO 2019; Lemaire and Limbourg 2019; Searchinger et al. 2019; Corrado and Sala 2018; Porter and Reay 2016).

The current amount of FW, for what has said before, varies widely. The first and official data was provided by FAO (2011): a third of the food produced for human consumption, or about 1.3 Gt/year, was lost or wasted annually along the FSC. The study highlighted that FL was equal to 280–300 kg/year/per capita, in Europe and North America, and to 120–170 kg/year/per capita in sub-Saharan Africa and South/Southeast Asia. While, FW was equal to 95–115 kg/year/per capita, in Europe and North America, and to only 6–11 kg/year/per capita in sub-Saharan Africa and South/Southeast Asia. Many other studies have been conducted by academics on the quantification of FW and/or FL for a specific country (i.e., Canada, United States, Finland, Switzerland, Pakistan, United Kingdom, Western Europe) (Colombo de Moraes et al. 2020; Van der Werf and Gilliland 2017) or globally. For instance, Thi et al. (2015) estimated that FW in developed countries was 107 kg/p/year and 56 kg/p/year for developing countries in 2015, which amounts to 50–55% of municipal solid waste in developing countries (Sodiq et al. 2019; Thi et al. 2015). It is evident that these figures are quite far away from the FAO and IPCC data. At a European level, a great contribution was given by the EU FUSIONS project that has produced two main outcomes: a manual on FW quantification (Tostivint et al. 2016), and an estimate of FW generated at the European level (Stenmarck et al. 2016). The project affirmed that, in 2012, FW in the EU-28 was equal to of 88 Mt, including both edible food and inedible parts associated with food (173 kg/p/year). The total amount of food produced in the EU for 2011 was around 865 kg/p, which meant wasting 20% of the total food produced.

In this context, legislators have also taken part into this debate. For example, in Europe, following the EU Waste Directive (2008/98/EC) approach, based on the waste hierarchy pyramid, a few Countries have adopted National Plans for waste prevention and reduction specifically focused on food, and many

more have implemented single initiatives against FW (EU 2008, 2018). According to the FUSIONS Project, just 4 out of the analyzed 15 Countries do have a Waste Management National Plan, exclusively focused on food: France, The Netherlands, Italy and Spain. At a municipal level, 117 Mayors signed the Milan Urban Food Pact (MUFPP), on 15 October 2015, through which they committed, among others, “to develop sustainable food systems that are inclusive, resilient, safe and diverse, that provide healthy and affordable food to all people in a human rights-based framework, that minimize waste and conserve biodiversity while adapting to and mitigating impacts of climate change” (MUFPP 2015). Anyway, the best-structured normative interventions are widely considered to be the national laws against FW approved four years ago in France—Law n. 138 of 11 February 2016 (Assemblée Nationale et Sénat 2016)—and in Italy—Law n. 166 of 19 August 2016 (Camera dei Deputati e Senato della Repubblica 2016).

Consequently, it becomes decisive to evaluate the different approaches to the FW management at a national level, where certainly country-level variation in policy efficiency is wide and policies affect food sustainability significantly (Agovino et al. 2018). In some EU Member states, bottom up approaches to address this problem are being adopted, hence involving all actors of FSC, emphasizing the importance of formal multistakeholder collaborations, and focusing on the role of different relational forms in stakeholder networks (exchange of information, sharing of resources, and development of cooperative projects) (Ghinoi et al. 2020). In other words, the application of social innovation (SI) models for reducing FW could represent a valid alternative tool for ensuring sustainable production and consumption. Some examples in this direction are provided by the social ecological innovations, such as the community gardens, in order to boost sustainable development in urban areas as well as rural areas (Rusciano et al. 2020) or by the experience of combined commitment of local communities and volunteering associations for provisioning food in the time of Covid-19 (Cattivelli and Rusciano 2020). Nowadays, the human and local dimensions represent key elements for achieving the sustainable development in view of implications linked to the economic ethics and long-term development perspectives (Gatto 2020). In recent years, SI has been applied in numerous economic sectors, including diverse actors in collective initiatives. The debate on SI is currently enhanced by many academic and institutional contributions, above all from the 2000’s (Bonoli et al. 2000; Chesbrough 2003; Christensen et al. 2006; Huston and Sakkab 2006; Mulgan 2006; Hämäläinen and Heiskala 2007; Flew et al. 2008; Pol and Ville 2009; Murray et al. 2010; OECD 2010; BEPA 2011; Neumeier 2012; Nicholls and Murdock 2012; Guida and Maiolini 2013; Pellizzoni 2014; Van der Havea and Rubalcaba 2016; Edwards-Schachter and Wallace 2017; Polman et al. 2017). The reason is mostly linked to the economic and social changes that our society has had to face in the two last decades. It has been necessary to generate alternative development models that were more effective for meeting new social needs. Thus, an increase in a number of institutions, networks and agencies, focused on SI activities, as well as the creation of non-profit incubators, social accelerators and hybrid platforms, occurred (Peters et al. 2004; Caroli 2015). This has favored the SI spreading in practice and in the political fields, making more real its effects on society. Although a common and internationally recognized definition does not exist (Lombardi 2017), Murray et al. (2010) identified a description that is almost complete: “new ideas (products, services and models) that simultaneously meet social needs and create new social relationships or collaborations. In other words, they are innovations that are both good for society and enhance society’s capacity to act”. Some worthy reviews were carried out by Edwards-Schachter and Wallace (2017), reporting a comprehensive and accurate analysis of all studies on the SI definition from 1955 to date, Foroudi et al. (2020), collecting and analyzing 370 publications (with a total of 2941 citations), from 1970 to 2019, and Gupta et al. (2019), discussing on the impacts on the SI due to the new-age technologies, for understanding if they can really provide resource-efficient solutions and multiple outcome benefits.

In this context, the application of the SI approach for reducing FW, according to the target 12.3 of the Agenda 2030, could certainly represent a valid alternative to be considered as a tool to assure a sustainable production and consumption at a global level. Indeed, SI initiatives might engage consumers more efficiently because, as known, they can activate relations among them, creating or reconfiguring their social networks and introducing an innovative practice with a high possibility to be

accepted (Lombardi et al. 2020). This is particularly true for promoting change in resource-intensive consumption patterns and searching to diffuse these initiatives, amplifying their sustainability effects, as recognized by the same policy actors. Indeed, several efforts have been made at an international level to affect attitudes of consumers without significant results. This is due to the consumer's conduct of everyday life, characterized by routines and habits that are unlikely to have been taken into account.

In light of the aforementioned premises, the aim of this paper is to improve understanding about how SI models can enhance FW reduction, building new relations inside the network of FSC stakeholders, and involving new actors usually not actively participating. To this end, a qualitative analysis of the current academic literature in this field along with an empirical analysis of a case study, named *Avanzi Popolo 2.0*, an SI project run by a non-profit Italian organization, have been carried out. The authors aimed at underlining the critical issues that have emerged from the traditional SI models for reducing FW, revealing the principal differences with the case study, linked to the importance of building the sense of community and of creating social capital in local food redistribution networks.

2. Methodology

In this paper, a qualitative analysis has been used to develop a summary of the most representative academic literature on SI models applied for reducing FW along with an empirical analysis of a case study, located in Southern Italy.

The qualitative analysis has used data from the scientific literature generated through a combination of: (a) database searches (cross-discipline platform of Elsevier and Clarivate) as of June 2020, and (b) screening references of studies retrieved under (a). The authors have intended to select studies highly referenced to identify, underline, and assess all data related to the above-mentioned subject. The authors have decided to not limit the search to a specific timespan, even if the field of application is very new and so recent.

The empirical analysis, instead, has been carried out thanks to the direct involvement of one of the four members of the case study, acting as co-authors of this paper. This has allowed the analysis to have updated and detailed data, and a critical point of view about this topic.

By underlining the critical issues that emerged from the traditional SI models, described in the academic literature, the authors have tried to reveal the main differences with the case study, linked above all to the importance of reconfiguring the local food redistribution networks for tackling the issue of FW reduction.

Case Study

As underlined previously, the empirical analysis has been carried out by examining a case study, specifically an Italian project, named *Avanzi Popolo 2.0* (AP). It was born in 2015 and run by "Aps Farina 080 Onlus", a not-profit organization that aims at activating citizens against FW. AP (literally "leftovers people") sounds very similar to "Avanti Popolo" ("Forward people!"), the initial verse of an historical popular song associated with the Communist Party. This word game is a reference to the political sense of tackling FW. The project's dimension is mainly urban, located in the city of Bari (in the south-east of Italy, Apulia region) but also covering the entire territory around (Figure 1). In 2019, the project won the "Living Zero Waste" award promoted by the Italian Environment Ministry, Last Minute Market and the Bologna University, and in December 2018 one of its founders was awarded by the Italian President of the Republic of a special honor for its commitment against FW.

AP is active in three different areas: (i) connecting "waste places" (as primary producers, processors, retailers, restaurants and families) with "need places" (charities, soup kitchens, and NGOs). This is a typical Food Redistribution Activity (FRA), since the association operates to save and redistribute SF; (ii) managing its platform (www.avanzipopolo.it), a food sharing online community that allows people to exchange food in a direct way; (iii) educating and sensitizing people about FW social, environmental and economic impacts through public events, workshops and educational programs. In each of these

areas, the association adopts an SI perspective, working on the creation of a community network where a number of different stakeholders play a role in tackling FW, as will be described in the next section.



Figure 1. Location and logo of Avanzi Popolo 2.0. Source: own elaboration.

3. Results and Discussion

3.1. Results

According to the qualitative analysis of the academic literature, the authors have noted that over the last years, several reviews have been published on the different strategies implemented for reducing both FW and SF. Most of them focused mainly on the human re-use of these products, starting from the retail and consumption levels. On the contrary, few studies have been carried out on SI models for tackling FL issues. Additionally, the SI approaches have been sometimes defined and classified by the scholars with diverse terms. This caused an overlapping of meaning with a consequent difficulty to properly cluster the different categories. Furthermore, diverse tools can be used for implementing SI models, bringing confusion between what is the approach and what is the concrete way to develop it. In light of this premise, for simplifying the comprehension of the main existing SI models for reducing FW, the authors have reported some of the most representative references that have well identified these categories (Table 1). Afterwards, they have used them to underline the key elements and the critical issues of such models.

Surely, a very important study, coming from the experience of the EU FUSIONS project, is that of [Vittuari et al. \(2017\)](#). It is a well-structured literature review on the characteristics of *Food redistribution activities* and their social impact. The FRAs involve several categories of organizations and initiatives that distribute surplus and edible food for human consumption: they can be distinguished by (i) type (Food Banks, social supermarkets, etc.); (ii) product range and freedom of choice by the client (free choice vs. pre-packed—doggy bags); (iii) price charge (free distribution, symbolic price, reduced price); (iv) services offered in addition to food provision (employment, counseling, house, etc.); (v) accepted donations (products or money, organization and companies or private individuals). These models offer services to encourage social inclusion and combat food insecurity, at least temporary and partially. Anyway, the economic benefits are rather small and the increase in chances for future employments, for workers engaged in FRAs, is moderate. Thus, it is necessary to assess which are the additional services provided by FRAs, i.e., to explore the social impact hotspots along with economic and environmental ones.

Table 1. Results of the qualitative analysis of the academic literature.

SI Model	Description	Critical Issues	References
<i>Food redistribution activities</i>	Distribution of surplus and edible food for human consumption	Partially and temporary solutions; Still small socio-economic benefits (employment and effective FW reduction)	Vittuari et al. (2017)
<i>Food rescue</i>	Non monetary reuse: Food Banks or food sharing	Complexity related often to logistical problems regarding supply as well as marketing	Sedlmeier et al. (2019)
	Monetary reuse: secondary markets		
	Traditional rescue organizations: Food banks	Administrative and logistical barriers Limited funds, space, other resources Need for improved relationships and communication	Hecht and Neff (2019)
Complementary rescue organizations: services and apps			
Original rescue: sale strategies			
<i>Food donation after the best-before date</i>	Donation of food surpluses for social solidarity, prioritizing their allocation for human use	Reputational risks Consumers non not targeted	Busetti (2019)
<i>Food sharing</i>	Web platforms and mobile applications	Not commonly socially accepted	Schanes and Stagl (2019)
		Donor-recipient reciprocity and balance are rare	Harvey et al. (2019)
		Still little empirical evidence that food sharing is efficient	Morone et al. (2018)
<i>Volunteerism in non-profit not-profit organizations</i>	Social enterprise model for creating value-added “upcycled” products by SF	Moral issue for participating in such programs as volunteers	Rondeau et al. (2020)

Sedlmeier et al. (2019) and Hecht and Neff (2019) introduced a different term for identifying reuse of SF for human consumption, that is *Food rescue*. According to Sedlmeier et al. (2019), there are two basic approaches to reuse, non-monetary and monetary ones. In the first case, “businesses collaborate with nonprofit organizations on a donation basis, without the exchange of money for surplus food and other articles (i.e., food banks or food sharing). In the second category, (secondary) markets, typically in the form of business models, and marketing of flawed items (e.g., damaged packaging, a few days to best-by date) through regular retail at a reduced price, are involved”. Hecht and Neff (2019) distinguished three organization types: “traditional rescue organizations, such as Food Banks, gather the largest amount; complementary rescue organizations, including services and apps to manage donation and delivery logistics; programs to collect food from sources not often included in food rescue such programs creating value-added food products, etc.; and the original rescue, by connecting directly to distributors, or implementing alternative sale strategies such as discounting older foods”. Both authors concluded that food rescue systems are complex but surely provide many positive environmental and economic benefits providing an outlet for SF. However, due to this complexity, often related to logistical problems regarding supply as well as marketing, it is very important to increase collaboration and data exchange among the different actors of FSC. It is necessary, indeed, to bond sustainability-oriented purposes with a profit one to overcome some issues such as the administrative and logistical barriers, the limited funds, space, and other resources, and the need for improving relationships and communication.

Many other studies focused on specific SI models such as the research of Busetti (2019) that analyzed the introduction of innovative measures in Italy, such as the possibility of *donating food after the best-before date (BBD)* and a significant simplification of the bureaucracy of donations. The author has observed “The results highlight the marginal importance of bureaucratic procedures in the cost structure of donations, the diverse responses of different donors and food rescue organizations, and the importance of considering the capacity and preferences of charities when an increase in donations is expected”. Some critical issues have emerged from this type of approach: (i) consumers are the main producers but are

not targeted by the policy; (ii) manufacturers resist donations because of reputational risks; and, (iii) organizations distributing aid packs may refuse this food. All these factors limit both the supply of and demand for food past the BBD, despite legal provisions promoting its donation.

Schanes and Stagl (2019) analyzed new forms of initiatives for redistributing SF due to the emerging information and communication technologies (web platforms and mobile applications). They studied the *Food sharing practice*, exploring people's underlying motivations and their individual goals. They have revealed that these motivations and goals are rich and diversified and can mutually reinforce each other. However, this practice is not currently commonly and socially accepted for food provisioning and tackling FW at the consumers' level. In this context, Morone et al. (2018) have confirmed that actually there is still little empirical evidence that the introduction of sharing economy approaches could contribute to reducing FW. From their preliminary studies, tested on a small group of students, they revealed that: *"the adoption of food sharing practices by households do not automatically translate into food waste reduction. A number of factors, were evident from a quali-quantitative analysis of the sample (i.e., environmentally friendly behavior, economic awareness, domestic skills and collaborative behaviors) might act as 'enablers' to make sharing practices more effective"*. Similarly, Harvey et al. (2019) investigated food sharing by using a different approach: a social network analysis applied to a relative mobile application in United Kingdom. They aimed at assessing how new social configurations can transform food provision by using this practice that breaks the traditional Business to Consumers (B2C) model, where food is simply purchased as a commodity. They observed that *"The results challenge existing theories of food sharing (reciprocity, kin selection, tolerated scrounging, and costly signaling) as inadequate by showing that donor-recipient reciprocity and balance are rare, but also show that genuinely novel social relations have formed between organizations and consumers which depart from traditional linear supply chains"*.

Finally, Rondeau et al. (2020) explored the motivations at the base of *Volunteerism in non-profit organizations* that try to address food insecurity through a new social enterprise approach. This latter relies on the creation of value-added "upcycled" products from second-grade food and on the offer of training opportunities for youth facing barriers to employment. The authors showed *"Tackling food insecurity and reducing the environmental impact of food waste are values which would most likely influence the respondents' willingness to volunteer in food upcycling activities"*. However, they stressed *"The complexity of using rescued food in food insecurity programming is not just a theoretical or academic concern but is also an important moral issue for those participating in such programs as volunteers"*.

Concerning the empirical analysis of the case study, Avanzi Popolo 2.0, the authors have revealed that the project, until December 2019, obtained the following results: (i) due to its FRA, it has recovered more than 23,000 kg of SF, connecting 94 food operators with 31 non-profit entities with a clear increasing trend in the last 5 years (Figure 2); (ii) on its platform, it has registered 110 food exchanges; moreover the association manages a network of seven social fridges, located in spaces open to the public (such as co-working spaces, churches, student associations); (iii) finally, AP has organized several workshops and educational programs in three schools, involving 200 students, regarding its commitment in educating and sensitizing people about FW reduction (Avanzi Popolo 2.0 2020). It especially works in primary schools, introducing the environmental and social problems connected with FW and spreading the practice of food sharing among children, through the experience of a school pantry that students and teachers can use to directly exchange food in their closest reference community (Figure 3). Another relevant educational activity is the distribution of doggy-bags in the city of Bari: profiting from the relationship already established with a number of restaurants participating in the recovering activities, AP has proposed to them the supply of doggy bags in order to further reinforce their image as food services that care about FW. The first supply is offered for free by the association to incentivize their use, whereas the following are regularly paid. At the moment five restaurants in the city are using AP doggy bags.

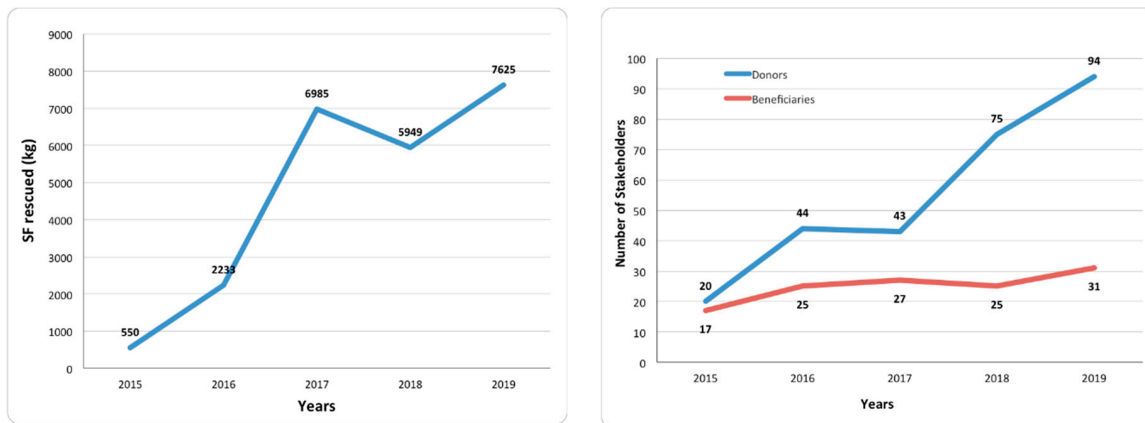


Figure 2. Amount of Surplus Food (SF) rescued (in kg) and number stakeholders involved in Avanzi Popolo 2.0 (AP) from 2015 to 2019. Source: own elaboration.



Figure 3. Educational activity about Food Waste (FW) reduction. Source: Avanzi Popolo 2.0.

A very interesting, new and specific result is related to the recovery of SF from big restaurants during wedding parties. Indeed, above all in Southern Italy, SF, generated at the end of big wedding parties, is typically of high quality but highly perishable, heterogeneous and located in big restaurants quite far from the city center and consequently very costly to be recovered in the traditional way. AP is able to recover this kind of SF within a range of 50 km around the city of Bari, putting the restaurant in touch with a charity in close proximity. Often these operations are carried out in just one-hour time, thanks to an organization that requests charities to adapt themselves to the recovery network's needs in terms of working hours and distribution methods. AP takes up the entire organizational and bureaucratic burden, while the charity materially recovers the SF at the arranged time and redistributes it through its channels. In four years, AP was able to recover wedding parties' leftovers 164 times with an average of 20 kg of SF. Referring to the average value estimated by [Garrone et al. \(2015\)](#) for the SF recovered by food services, equal to 6.5 €/kg, the total value generated by these operations can be estimated to more than 20,000 €, against small costs incurred by AP and the local charities, mostly covered by the volunteers' job. Moreover the activity generates monetary donations coming from the newlyweds who appreciate the offered service. Finally, each stakeholder has an advantage in terms of food for its activities (charities), visibility (restaurant) or the pleasure of not wasting food and giving a social contribution to the community (newlyweds) ([Avanzi Popolo 2.0 2020](#)) (Figure 4).



Figure 4. AP volunteers during SF recovery actions. Source: Avanzi Popolo 2.0.

A similar strategy is used inside the city at the neighborhood level to make possible SF recovery from small retailers. In this case, neighborhood recovering actions are conducted once a week in three different districts and two surrounding towns at the retailers' closing time by a group of volunteers using bike or roller skates who, at the end of the action, leave all the food recovered to charities operating in the same urban area. Moreover, in this case the methodology allows to avoid the need for trucks and intermediate storehouses, and to build strong connections between small retailers, charities and volunteers living in the same area. In the last two years, AP recovered more than 3500 kg of SF from small retailers through the neighborhood recovering actions involving about 100 volunteers. This makes a generated value of more than 8900 €, as [Garrone et al. \(2015\)](#) estimated at a value of 2.5 €/kg of SF recovered from retailers (Figure 4).

A key factor, for the involvement of new actors in the network, is the report of each recovery operation on the AP Facebook page counting 14,000 followers, that is both a social accountability tool directed to the community and an opportunity for visibility for the economic operators involved.

Finally, it is worth noting the role assumed by the association in having participated in the design of the Apulia regional law against FW (l.r. 13/2017), introducing the value of food sharing as a practice effective in tackling FW.

3.2. Discussion

Considering this literature review, it is evident that, in each paper published in recent years, different approaches emerge and they not always stress the importance of network facilitation deriving from a SI approach as well as the presence of some critical issues. In this study, the authors, comparing the innovative model of AP with the traditional ones that are derived from the literature, aimed to show how some critical issues could be solved.

Among the traditional models, Food Banks represent by far the most developed and widespread experience and are usually also considered in national and local regulations as the natural counterpart for food operators available to food recovery. In Europe, the European Federation of Food Banks (that includes 421 Food Banks and branches in 24 countries) reports to have redistributed, in 2018, 781 kt of food, equivalent to 4.3 million daily meals, cooperating with 45,700 charities assisting 9.3 million deprived people ([FEBA 2019](#)). In consideration of their consolidated role, developed in the last 50 years, [FUSIONS \(2016\)](#) does not consider Food Banks as proper SI actors, attributing this status to new models of food redistribution that share the same goals in an innovative way. One of the most important distinguishing features is represented by the kind of stakeholders involved in the recovery network. Usually Food Banks find it worthwhile to establish relationships with big manufacturing companies, disregarding small retailers and services that are closer to the local community.

The role played by the Food Banks is widely acknowledged by the newest national regulations on FW that in some cases have been designed with their direct participation. This is the case of the

Italian law n. 166 approved on 19 August 2016 ([Camera dei Deputati e Senato della Repubblica 2016](#)), developed as a result of the National Plan for Food Waste Prevention (PINPAS) consultation process and of the World Expo hosted in Milan, from May to October of the same year and whose motto was “Feeding the Planet, Energy for Life”. The most interesting innovations introduced by the 2016 law are: the donation procedures’ simplification; the possibility of donating food products with expired “best-before date” as well as mislabeled and confiscated ones and bread baked more than 24 h before; the opportunity for food operators to obtain fiscal incentives proportionally to the amount of donated food; the extension of the organizations entitled to receive food donations to new categories. Although the Italian law has the considerable merit of further facilitating and incentivizing food recovery from big producers, manufacturers and retailers, it is not able to reach other smaller operators as effectively. [Busetti \(2019\)](#), commenting on the impact of the Italian law against FW, highlights that as retail shops and restaurants, producing small amounts of heterogeneous and highly perishable SF, incur high costs and have much less capacity to manage donations in terms of storage space and working time, compared to big manufacturing companies. Assuming the non-profit organizations’ point of view, the results don’t change, as collection and redistribution costs also depend on donations’ quantity and quality, making it highly preferable to recover big quantities of homogeneous food than low amounts of heterogeneous food.

In this context, it is sufficiently evident that the gap is better filled by the AP SI model opposed to the traditional model of the Food Banks, up to today. Not having trucks or storehouses available, AP, instead of centralizing SF management, puts in direct contact food operators and charities, working as a server to facilitate the relationships, with the goal of making the food travel as little as possible and in the shortest time. This strategy, shown in Figure 5 in comparison with the Food Banks model, avoiding the bottleneck effect, reduces the operational costs and allows to work with stakeholders usually not involved in food redistribution networks. It is the case of the local roll skate association that decided to cooperate in the neighborhood recovery actions, they just received AP bags used to carry rescued food or food from the restaurants that during the Covid-19 emergence offered their availability to cook rescued food to be distributed by a soup kitchen. Creating linkages among schools, charities, groups/associations, citizens, food services, small retailers, producers and institutions, in the same urban area, through volunteers’ activation, is a particularly effective community building strategy.

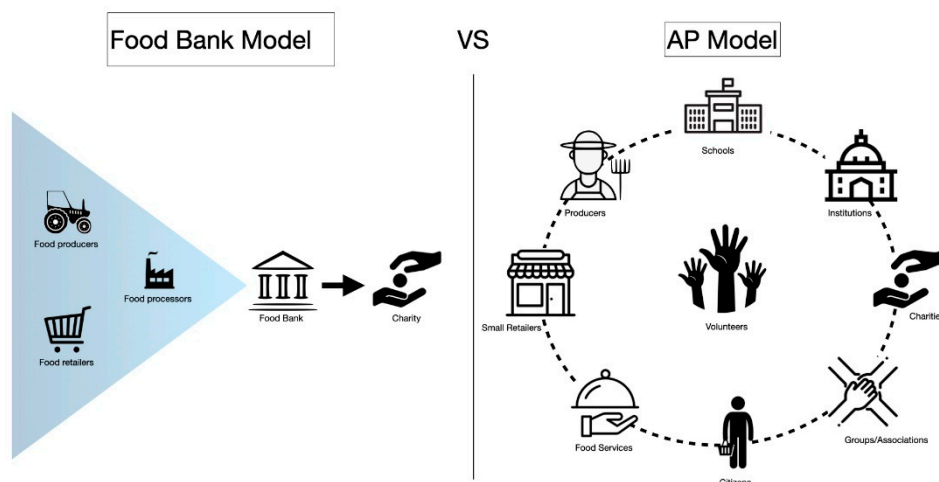


Figure 5. Traditional SI model vs AP model. Source: own elaboration.

This network approach makes it possible to overcome some of the critical issues underlined by [Sedlmeier et al. \(2019\)](#) and [Hecht and Neff \(2019\)](#) such as the administrative and logistical barriers, the limited funds, space, and other resources, and the need for improving relationships and communication. This model allows the establishment of a permanent community network, involved in FW management strategies, whose importance is confirmed by the findings from [Ghini et al. \(2020\)](#)

in Ferrara who highlight that “*An existing relationship between two stakeholders is positively and robustly related to the propensity to establish novel relationships of different types*”. More stable networks are also able to offer social services in a more durable and complete way, answering to some of the critical issues expressed by [Vittuari et al. \(2017\)](#). Moreover creating direct relationships between donors and beneficiary organizations can reduce the reputational risks cited by [Busetti \(2019\)](#).

Additionally, retailers and volunteers are more willing to cooperate if they directly know the final beneficiary and can start other cooperation models, profiting from the proximity. The need of moral values for volunteering in FW reduction, as highlighted by [Rondeau et al. \(2020\)](#), can be easily overcome in an urban community network where volunteers can directly witness the social effectiveness of their commitment.

Finally, working on the education side is an effective prevention tool, that allows the targeting of consumers, bridging the regulatory gap highlighted by [Busetti \(2019\)](#). Additionally, spreading food-sharing practices among citizens, makes them more commonly socially accepted, answering to the critical issue by [Schanes and Stagl \(2019\)](#).

4. Conclusions

Currently, reducing FW represents one of the main challenges for human beings in order to mitigate climate change, safeguard food security and decrease food poverty and hunger. Nevertheless, as shown by this study, some constraints exist for reaching 50% FW reduction by 2030, as established by the Agenda 2030.

First, there is no univocal and common definition of FW in the literature, which limits the undertaking of an efficient and real quantification of FW and, as a consequence, of adapting targeted strategies for its prevention and reduction. Indeed, the term “FLW”, along all stages of the FSC, is often used as one category, thus leading to overlapping between FW and FL. Furthermore, only sometimes is the term SF also considered. Second, most of the actions applied to this end are more oriented towards logistic/marketing functions than social ones, losing the importance deriving from the creation or reconfiguration of social networks in food redistribution.

From the regulatory point of view, on the basis of the EU policy against FW, some national legislators have recently introduced new laws aiming at forcing or facilitating relationships between food operators and non-profit organizations, able to recover and redistribute SF, and so to enhance/promote SI models. Specifically, the Italian regulation is much more effective in addressing SF generated by big food manufacturers and retailers than by food services and small retailers because of the higher logistical and transactional costs related to the recovery of heterogeneous and highly perishable food, essentially supporting the Food Banks’ model, with a typical centralized structure.

Considering the qualitative analysis of the literature review, there are many other different approaches that however do not often stress the importance of network facilitation and, at the same time, they still continue to present some critical issues. On the contrary, the model described in the case study can be able to solve these issues typical of more traditional organizations, involving new players in food recovery networks, as shown by the results. As seen in the case study, community networks, where each stakeholder plays a role in the recovery chain, can allow the rescue of SF categories that would be considered uneconomical to be recovered by the traditional SI models. Investing in the creation of new relationships among heterogeneous stakeholders proves to be very effective, contributing to the establishment of long-lasting networks tackling FW and addressing social issues such as food insecurity at the local scale. Avanzi Popolo 2.0 has demonstrated that SI models, involving diverse players, are furthermore able to address new dimensions of the FW issue, working on prevention, both on the consumers’ education side and establishing direct relationships between them and primary producers. This multiple approach is particularly suitable to the local scale where it is easier to build relationships among stakeholders and to imagine connections among the different actions.

The authors recommend a higher integration between traditional and innovative models in order to sum up the strengths of both of the approaches: the Food Banks' ability to recover high volumes of SF and the potentiality expressed by newer models to recover new kinds of SF and to involve new players. Additionally, they suggest to experiment with the direct involvement in food recovery networks of new players mostly disregarded until now: this could be the example, among others, of touristic operators offering food services or of food vending machines from the donors' side, as well as of any formal or informal group of citizens able to play a role in the relationship with the final beneficiaries on the distribution side.

Finally, SI models tackling FW can assume different shapes and organizational structures. Consequently, the authors have decided to investigate some of the most relevant models in the literature without claiming to cover all the existing experiences. A complete overview of SI initiatives tackling FL and FW would be very useful to fully understand the contribution given by this sector to FW reduction. Furthermore, it could be also worthwhile to analyze the donor-recipient reciprocity in food sharing networks as well as of all the different enabling factors, such as eco-friendly and collaborative behaviors and a higher economic awareness, for making FW reduction practices more effective.

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