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4 **Recycling, recovering and preventing “food waste”: competing solutions for food**
5 **systems sustainability in the United States and France**

6
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8
9 Abstract

10 In recent years, a wide range of organizations in developed countries have embarked
11 on efforts to address the economic, environmental and social impacts of “food waste.”
12 Based on more than 120 interviews and complementary observations in the United
13 States and France, this paper examines how recent mobilizations impact the way
14 surplus food is actually managed with respect to sustainable production and
15 consumption (SPC). The analysis of multiple stakeholders’ interests and motives
16 complements a growing literature on food waste prevention and management focused
17 on technical evaluations of “solutions.” Recent frameworks on food surplus and waste
18 establish one hierarchy of preferable categories of solutions: first, prevention
19 (reducing surplus at the source), then recovery (reusing for human consumption) and
20 finally recycling (feeding animals, creating energy or compost). Fieldwork results
21 show that actors with different interests in food commodity chains actually develop
22 *competing* solutions, both within and between three hierarchies based on
23 environmental, social and economic goals. In the long term, the solutions they
24 promote may therefore not achieve “win-win-win” benefits for all actors and at all
25 scales. Drawing on a distinction between “weak” and “strong” sustainability, this
26 paper argues that “strong” prevention based on holistic changes in the food system is
27 the most sustainable solution to food surplus and waste. It suggests that academics
28 focus on strong food surplus prevention, but also that advocates encourage
29 government and corporate actors to differentiate between weak and strong actions to
30 diffuse strong sustainability across organizations and countries.

31
32 Keywords

33 Food waste
34 Food surplus
35 Waste prevention
36 Sustainability
37 Recycling
38 Re-use

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1. Introduction

Over the last few years, a wide range of organizations in developed countries have embarked on efforts to address the economic, environmental and social impacts of “food waste,” estimated at a third of food production in North America and Europe (Gustavsson et al., 2011; see Schneider, 2013a for a review). International organizations and advocates argue that producing food that does not get eaten represents an unnecessary exploitation of land, water, and other resources, in addition to worsening food insecurity (Lundqvist et al., 2008; Stuart, 2009). Reports claim that food waste accounts for a share of global carbon emissions equivalent to a medium-sized country (FAO, 2013). National studies have explored the various causes of food losses and waste--stating that up to half happens at the consumer level in developed countries--and calculated its economic cost--amounting to more than 161 million USD a year in the United States (Buzby et al., 2014; MEDDE, 2012; WRAP, 2013). In this context, many private companies and community organizations have started initiatives to “recycle,” “recover,” and “prevent” what they characterize--in different ways--as “food waste.” This article examines the extent to which recent mobilizations around food waste shift the management of *surplus* food towards sustainable production and consumption (SPC) in two developed countries, France and the United States.

In both countries, most organizations working to reduce food waste endorse a “food recovery hierarchy” that ranks the most appropriate responses to surplus food: prevention (reducing at the source; optimizing processes; adapting production to needs), recovery (redistributing food to people who need and/or want it), and finally recycling (feeding animals; using scraps for industrial production, energy, or compost) (EC, 1975; EC, 2008; US EPA, 2011).¹ This paper shows how in practice the three approaches and the solutions they imply *compete* with one another in multiple hierarchies based on environmental, social and economic interests. The dominant visions of food waste and subsequent solutions generally focus on the management of existing surplus through recycling and recovery, overlooking long-term shifts toward sustainability. Moreover, both in France and the U.S., the most common initiatives towards prevention focus on increasing efficiency and question neither the power relationships and scale of food commodity chains nor the appropriate levels and patterns of consumption. Multi-stakeholder mobilization, which is three years older and more developed in France, has encouraged mostly marginal changes toward sustainability.

The central contribution of this paper to the growing literature on food waste is to highlight the limitations of each category of solutions and the tensions between them, drawing on data from more than 120 stakeholders in two countries. Further, it shows that analyses of prevention should distinguish between “weak” and “strong” actions with respect to sustainable production and consumption (Lorek and Fuchs, 2013; O’Rourke and Lollo, 2015). The article thus suggests that a switch from recycling, recovery and weak improvements to stronger prevention is necessary to achieve more “radical” changes (from Latin *radix*, the root) that address root causes of food waste (Lorek and Spangenberg, 2014; Tukker et al.,

¹ Wording may vary depending on institutions. In this article, “recovery” refers to *food* recovery (also called redistribution) and not *energy* recovery (part of or below “recycling” depending on the hierarchies).

2 2008). This comparative analysis of the concrete case of food waste, revealing similar
3 tensions in two national policy contexts, informs theoretical discussions on sustainable
4 production and consumption in developed countries by highlighting inherent competition
5 between weak and strong solutions. Significant implications can be drawn not only for
6 researchers, but also advocates who have to further analyze and encourage government, non-
7 profit, and business actors to implement *strong* prevention actions.

8 The paper is structured as follows: Section 2 discusses the relevance of the question
9 for the study of food waste and food system sustainability. Section 3 describes the data
10 collection, which consisted primarily of 120 in-depth interviews. Section 4 analyzes the
11 emergence of a food waste “movement” which combines actors with distinct environmental,
12 social, and economic goals that promote distinctive, competing solutions to food surplus and
13 waste. Section 5 discusses the potential of the food surplus and waste issue to lead to the
14 sustainable production and consumption of food. Section 6 concludes on the implications of
15 this study for food waste management and food system sustainability.

16 17 2. Relevance of the research and theoretical framework

18
19 Complementing technological or quantitative assessment of impacts, this research explores
20 challenges and opportunities that arise when actors across value chains, with differing
21 objectives and motives, implement various hierarchies of actions around food waste.

22 23 *2.1. Exploring environmental, economic and social aspects of the “food waste hierarchy”*

24 An increasing number of studies in waste management, industrial ecology and circular
25 economy specifically address *food* waste through the concept of a “hierarchy,” often referred
26 to as the “3Rs”--reduce, re-use, recycle--of waste management. A European directive first put
27 this hierarchy into law in 1975 (EC, 1975), while the U.S. Environmental Protection Agency
28 endorsed a similar framework in guidance documents that specifically addressed food (US
29 EPA, 2011).

30 Research has analyzed the implementation of this hierarchy for various types of waste
31 (Hultman and Corvellec, 2012; Van Ewijk and Stegemann, 2015), including, more recently,
32 food (Garcia-Garcia et al., 2015: Fig. 5 p. 70, Papargyropoulou et al., 2014). Scholars
33 advocate for a holistic “food surplus and waste framework” based on the waste hierarchy to
34 “tackle food *surplus and waste* throughout the global food supply chain” (Papargyropoulou et
35 al., 2014). The hierarchy is a useful concept because it encompasses the diverse ways surplus
36 food enters various circuits of distribution, whether as a commodity, a free product, or an
37 organic resource that can be re-commoditized.

38 In the existing literature, a major focus has been the environmental impacts of food
39 waste (Cuéllar and Webber, 2010; FAO, 2013; Hall et al., 2009; Kummu et al., 2012; Venkat,
40 2011) analyzed in particular through life-cycle assessments (Buratti et al., 2015; Eriksson et
41 al., 2015; Lundie and Peters, 2005; Schenck and Huizenga, 2014; Williams and Wikström,
42 2011). As Papargyropoulou et al. (2014) acknowledge, “the waste hierarchy, as a framework,
43 primarily focuses on delivering the best environmental option” (p.110), and is part of
44 American and European *environmental* laws. Yet the concept of a hierarchy based only on
45 environmental criteria is a “rough generalization” (Eriksson et al., 2015). For example,

2 accounting for GHG emissions only, anaerobic digestion of food waste can have a better
3 impact than using surplus for animal feed or for donations (which are even higher in the
4 hierarchy), depending on the surplus products' characteristics such as water and energy
5 content (ibid).

6 Thus, while food waste has been generally considered in terms of its environmental
7 impacts, environmental, social, and economic values can compete in practice. It is therefore
8 important to reinforce the study of economic and social implications of most solutions. Food
9 waste solutions can be subject to economic and financial analyses such as the ones conducted
10 for packaging waste recycling in France and Europe (Cabral et al., 2013; Da Cruz et al.,
11 2014). Moreover, while food waste scholars increasingly exchange with the fields of public
12 health or food poverty (Escajedo San-epifanio and De Renobales Scheifler, 2015, Neff et al.,
13 2015a), studies assessing the potential of food redistribution (O'Donnell et al., 2015; Phillips
14 et al., 2011; Reynolds et al., 2015; Schneider, 2013b) should be put into perspective with
15 social and political criticisms of such systems (Midgley, 2013; Poppendieck, 1999).

16 Finally, all the categories of solutions along the hierarchy need to receive equal
17 scientific attention. Most studies on food waste solutions have so far focused on what is
18 actually the bottom of the hierarchy: recycling. Higher levels of the hierarchy are difficult to
19 measure in terms of environmental impacts and the analysis of recovery is more uncertain
20 than that of recycling (Eriksson et al., 2015). Among all the responses to food waste,
21 prevention is the least tangible and directly measurable (Gentil et al., 2011; Laurent et al.,
22 2014; Zorpas and Lasaridi, 2013). Studies on prevention thus generally focus on individual
23 behavioral changes rather than systemic outcomes.

24 The contribution of this paper, with respect to the food waste hierarchy, is to put into
25 perspective the environmental, social and economic dimensions of each set of solutions
26 *simultaneously*, based on the point of view of different actors with competing motives.

28 *2.2. Encompassing a wide range of actors along the food chain*

29 Reducing food waste can be seen as a "social dilemma" or "public goods game" involving a
30 wide range of actors, some of which are "cooperators" putting resources to reduce waste and
31 others are "defectors." The qualitative research in this paper complements behavioral
32 economics and computational sciences on these behaviors and co-evolutionary dynamics
33 (Perc et al., 2013; Perc and Szolnoki, 2010). By analyzing the differing points of views and
34 strategies of various actors in two national policy contexts, a sociological approach helps
35 understand action mechanisms and organizational systems in place.

36 As surplus and waste exist all along commodity chains, an extensive analysis cannot
37 be restricted to one stage within this system. In most developed countries, including France
38 and the United States, studies have shown that food surplus and waste is most prevalent at the
39 stage of consumption (Gustavsson et al., 2011). Yet, as experts point out, there is a lack of
40 information about what is lost at the production and harvesting stages due to market
41 fluctuations or aesthetic criteria for produce (Buzby et al., 2014; Kantor et al., 1997). Based
42 on the available information, exploratory studies on specific sectors, such as produce in the
43 U.S. (Berkenkamp and Nennich, 2015) and oil crops in France (Fine et al., 2015), confirm the
44 existence of such waste at early stages of the value chain. Moreover, a large part of the
45 consumer waste stream is generated by practices upstream, such as packaging, promotional

2 offers, and restaurant portion sizes, as well as socially patterned consumption habits such as
3 shopping frequency (Aschemann-Witzel et al., 2015; Evans, 2014, Hawkins, 2012; Le Borgne
4 and Sirieix, 2013; Neff et al., 2015b). It is therefore important to look beyond the
5 “producers/consumers” dichotomy to examine the chain in a holistic way, from growing food
6 to the end of its life. Fundamental changes to solve a public goods dilemma require further
7 attention to public policies and social institutions and cannot be restricted to consumer
8 practices.

9 Such an approach also raises the issue of the appropriate scale of solutions. When
10 recycling and recovery are promoted as ways to create closed loops or a circular economy, the
11 number of intermediaries involved in the loop needs to be discussed. For example, should
12 municipalities implement large-scale composting facilities or promote backyard composting?
13 Answering such questions is all the more important because a larger scale, for its part,
14 requires more formalized procedures to avoid potential contamination, which may generate
15 more surplus and waste. The scale of a solution largely determines the governance of and
16 actors involved in implementation.

17 Given the complexity of food-waste related processes at various scales, an
18 international perspective offers insights on the mechanisms in place--as well as potential
19 solutions--within the public, corporate and non-profit sectors. Recent analyses putting policies
20 into perspective across European countries show that food waste enters many regulatory
21 frameworks: beyond waste management, it is related to food safety regulation, food assistance
22 policies, financial and tax frameworks (Vittuari et al., 2015). While dedicated regulation on
23 food waste is on its way in France (Mourad, 2015; Samuel, 2015) and the U.S. (H.R.4184,
24 2015), it is necessary to identify and consider the whole spectrum of legal frameworks and
25 policy actors in the food waste field.

26 27 *2.3. Analyzing potential changes toward “strong” sustainability*

28 The mobilization around food waste offers a valuable case to analyze the tension between
29 fundamental and superficial changes in food system governance. We should analyze each
30 solution and combination of solutions in relation with its potential to contribute to greater
31 sustainability through “weak” or “strong” sustainable production and consumption (O’Rourke
32 and Lollo, 2015). Even if recycling, recovery and “weak prevention” are generally focused on
33 consumers and limited in comparison with “strong prevention,” they have a potential for
34 deeper changes and generating collective social, environmental and economic benefits if they
35 constitute “incremental” steps toward stronger actions (Willis and Schor, 2012).

36 Interestingly, the emerging movement to address food waste transcends typical
37 dichotomies in food politics, such as public vs. private or NGOs and social movements vs.
38 companies (Holt Giménez and Shattuck, 2011; Schurman and Munro, 2010). “Institutional
39 entrepreneurs” play an important role in diffusing ideas through organizations (DiMaggio,
40 1988). Similarly to environmental managers in the case of waste management (Rothenberg,
41 2007), young professionals and activists involved in food waste reduction could play an
42 important role in pushing radical ideas towards sustainable production and consumption
43 practices.

44 In the end, this research has relevant implications for governance and policies, by
45 demonstrating the need for stronger prevention and the role that a wide range of actors in the

2 political, corporate or non-profits realms can play in its diffusion. The example of food waste
3 can then be of interest for the analysis of other commodity chains (Friedland, 1984; Gereffi et
4 al., 2005; Gereffi and Korzeniewicz, 1994). While the study of production and consumption
5 systems often overlooks the part which is *not* actually consumed, post-distribution and
6 “waste” stages are actually key to the implementation of circular economy and sustainability.
7 A better understanding of challenges and opportunities related to food waste solutions can
8 help the relevant actors implement sustainable solutions in other sectors.

9 10 3. Data and methods: “diving” into the food waste movement

11
12 From 2013 to 2015, the author collected quantitative and qualitative data from a wide range of
13 experts, policy makers, corporate representatives, workers, community leaders and activists
14 working to address food waste in France and the United States. The two countries share
15 similar levels of economic development and organization of food production, distribution and
16 consumption.² They have comparable levels of food surplus and waste (Gustavsson et al.,
17 2011). On the other hand, the two nations differ in terms of consumption patterns, hunger-
18 relief policies and waste management regulations,³ which allows for an examination of the
19 impacts of these factors.

20 The author carried out 68 semi-structured primary interviews in France and 57 in the
21 U.S., complemented by 19 and 29 secondary interviews (i.e. exploratory or informal
22 discussions), respectively, along with more than 80 observations in both places at
23 conferences, farms, processing plants, food banks, and composting facilities. Annex 1
24 summarizes data collected and Annex 2 presents interview details. In both countries, data
25 collected through interviews and observations was complemented by analysis of scientific
26 reports and documents on food waste--including confidential data from interviewees--and
27 consistent follow-up on related news and social media.

28 After identifying the relevant actors for the prevention and management of food waste,
29 the author grouped them in categories based on their role related to food waste (business and
30 social innovation, multi-level policy, activism, corporate responsibility) and their activity in
31 food commodity chains (production, wholesale, retail, catering, redistribution, etc.). Specific
32 players such as representatives of consumers’ organizations and financial markets dealing
33 with agricultural commodities were included to enlarge the perspective. While they may
34 simplify more complex realities such as overlapping fields and people and organizations with
35 multiple involvements, categories were necessary for data analysis.

36 The author was generally granted the desired fieldwork access, with conditions of
37 confidentiality particularly for industry facts and figures. In the U.S., part of the data was
38 collected through regular volunteer work for one small non-profit organization and a major
39 environmental organization, both working on food waste. In France, since 2012 the author has

² The U.S. and France are both rich countries—the GDP per capita was 53,000 USD and 42,500 USD in 2013, respectively--with an industrialized and consolidated food system--the three main supermarket chains control more than 50% of the market in both countries.

³ For example, “food stamps” in the U.S. differ from French food assistance policies. Food expenditures accounted for 9.8% and 17%, respectively, of disposable personal income in 2013. Waste management regulations and taxes are also different in each country.

2 participated in multi-stakeholder working groups for the French National Pact Against Food
3 Waste led by the Ministry of Agriculture and engaged in volunteer organizations and social
4 movements.

5 Relevant categories were represented in comparable proportions for the two countries,
6 with some variation to account for transnational differences: the public sector includes more
7 activities in France than in the U.S., for instance, thus it is more represented in data collection
8 in France (almost a quarter of interviews). More start-ups and NGOs focused on food waste
9 were identified in the U.S. (with 23 interviewees as opposed to 15 in France), partly due to the
10 size and innovation capacity of the country. Food assistance organizations are over-
11 represented in the U.S., reflecting the size of the charity sector and the author's opportunity to
12 carry out in-depth investigations in two food banks (see Annex 1). Although most of the
13 fieldwork was carried out in the Paris region in France and in the Bay Area, California, in the
14 U.S., attention was given to obtain information from other French regions and American
15 states, as well as a from Belgium, Italy and the United Kingdom for international initiatives.
16 A fifth of French interviews were conducted in ten regions outside Paris and more than a third
17 of the American interviews were conducted with organizations and individuals based outside
18 California, in 13 different states.

19 The proportion of "secondary" interviews is higher in the U.S. (a third of the
20 interviews, as opposed to around a fifth for France) mainly because the author had to carry
21 out more exploratory research for the foreign fieldwork. 61 interviews were recorded while
22 the rest was transcribed from notes afterwards. Basic statistical analyses and coding of
23 recurrent facts, such as actors using certain framings or offering similar solutions, were
24 performed using Excel spreadsheets. Based on the analysis of the interviews, the author
25 identified how both individual and organizational actors understood surplus food and waste,
26 their preferred sets of solutions, and how they related to a broader food waste movement.
27 Observations at field sites allowed the author to compare discourse and practice. Given the
28 qualitative nature of the data, this research aims at assessing potential challenges and
29 opportunities--rather than direct effectiveness--of each category of solutions.

31 4. Results: competing visions of food surplus and waste solutions

32
33 Data analysis reveals multiple roots of the food waste movement and identifies a typology of
34 actors with various visions of surplus food. Results further show the type of solutions they
35 adopt (recycling, recovery, weak and strong prevention) and the tensions between solutions.

37 *4.1 A food waste "movement" with multiple roots*

38 As illustrated in Fig. 1, since 2008-2009, an increasing number of actors have been
39 associating their activities with the expression "food waste" or "gaspillage alimentaire" in
40 French, the latter of which is a more normative and usually pejorative label implying a sub-
41 optimal use of food. As one indicator, the appearance of the term in French media increased
42 40-fold between 2010 and 2014.⁴

⁴ Appearance of "gaspillage alimentaire" on *Europresse* article database: 7 articles in 2007, 55 in 2010, 676 in 2012, and 2173 articles in 2014 (Searched: 3/9/2015).

2 **[Insert Fig. 1 about here]**

3 Following British author and activist Tristram Stuart's *Waste: uncovering the global*
4 *food scandal* (2009), various groups around the world have organized events to raise
5 awareness on the topic, generally through the free distribution of "rescued" food (Interviews
6 1, 13, 37, 46, 122, 123). Food redistribution organizations have also started using the words
7 "food waste" and communicating the environmental impacts of their donations (Interviews
8 81, 164). Industries in the U.S., including the Food and Marketing Institute, the Grocery
9 Manufacturers Association and the National Restaurant Association formed a Food Waste
10 Reduction Alliance (FWRA) in 2011. In France and the U.S., more than 30 start-ups and non-
11 profits were created since 2010 with the stated mission of "fighting food waste."⁵

12 The rapid emergence of dedicated events and organizations was fostered by multi-
13 stakeholders' initiatives in both countries. In France, a National Pact Against Food Waste, led
14 by the Ministry of Agriculture since 2012, gathered multiple stakeholders committed to
15 reducing food waste by 50% by 2025 by raising awareness, fostering partnerships, and
16 improving regulations (MAAF, 2013). In the United States, hundreds of government, business
17 and non-profit leaders from across the country gathered in conferences such as the first "Zero
18 Food Waste Forum" (ZFWF) organized by environmental organizations in California in 2014,
19 and the second ZFWF, partly led by the U.S. Zero Waste Business Council, in Texas in 2015
20 (Interview 127). These events emphasized industry best practices, local waste-related
21 regulations, and awareness campaigns such as the Environmental Protection Agency's (EPA)
22 "Food Recovery Challenge" or "Food: Too Good to Waste" campaign, which started in 2010.

23 In the meantime, the term "food waste" has appeared on national and local
24 governments' political agendas. In April 2015, French policy makers released 36 proposals
25 for a "national policy to fight food waste," some of which were under consideration by the
26 French Parliament at the time of writing (Mourad, 2015). In September 2015, two years after
27 France, the U.S. Department of Agriculture and the EPA announced a national goal to cut
28 food waste in half by 2030 (Bloom, 2015).

29 Yet interviews and observations show that participants in the food waste movement
30 come from diverse backgrounds and often have divergent interests in the food system. For
31 many organizations that now use the framing of "food waste," food surplus was initially part
32 of broader concerns and activities without being their main focus. The following streams of
33 interests--not exhaustively--converged on food waste, albeit for different reasons:

- 34 - **Anti-capitalism, food justice and food sovereignty:** Social movements like
35 "freegans" use food waste and "dumpster-diving" as a strategy to ostensibly live
36 outside capitalism (Interviews 36, 42, 122). Other radical movements, such as Food
37 Not Bombs, which has had chapters around the world since 1987, use surplus food to
38 claim food as a right and offer "solidarity, not charity" by distributing free food in
39 public spaces (Edwards and Mercer, 2007; Interview 122).
- 40 - **Local and sustainable food systems:** Slow Food, created in 1986 in Italy to advocate
41 for "fair and good food," was the inspiration of some of the first events directly aimed

⁵ For example, the "Food Surplus Entrepreneur Network" counts 25 entities in France in 2015:
<http://fsnetwork.org/entrepreneurs/> (Accessed: 12/3/2015). Several entities identified during
interviews in the two countries are not listed on online platforms.

2 at cooking collectively with surplus produce to raise awareness about food waste, now
3 called “Disco Soups” (Interviews 2, 13, 14; observation of Disco Soup events).

- 4 - **Zero waste and environmental protection:** “Zero waste” movements have focused
5 on reducing all types of waste, not just that of food, since the 1980s. Public
6 environmental agencies in the U.S. and France started focusing on food waste through
7 diverting materials from landfills. Increasingly, environmental policies have
8 emphasized the reduction of *food* waste, not only because organics compose a large
9 part of the waste stream but also because producing food requires large quantities of
10 land, water and other inputs (FAO, 2013; see, for example, interviews 46, 129, 133).
- 11 - **Charity and social responsibility:** Food banks started redistributing surplus, long
12 before the notion of “food waste” became popular, as part of their charity work and to
13 appeal to donors’ sense of social responsibility (Interviews 81, 159, 168). 20 years
14 ago, the U.S.’s Bill Emerson Good Samaritan Act of 1996 was passed to facilitate
15 food donations and protect donors--generally, businesses benefiting from tax benefits--
16 from liability.
- 17 - **Agriculture and food security:** The French Ministry of Agriculture and Food used to
18 manage food surplus stocks generated by the Common Agricultural Policy through a
19 quota system. Since the end of quotas in 2015, the Ministry has remained in charge of
20 regulating production and may see redistribution of extra commodities through
21 hunger-relief programs as an opportunity to limit surpluses (Interviews 21, 54). The
22 U.S. Department of Agriculture started tracking data on food losses after World War
23 II out of concerns for food security and availability.⁶ In 1997, the department
24 organized its first conference on food recovery after realizing the double problem of
25 hunger and waste (Interview 113).
- 26 - **Industrial efficiency:** Agri-food and food service companies have long managed
27 losses and surplus to maximize economic efficiency. Several business representatives
28 in the U.S. and France say that they want to reinforce existing efforts at a time of thin
29 margins and economic downturn (Interviews 54, 55, 62, 65, 136, 144, 150).

30 In the two countries, despite these divergent activities and interests, most groups have
31 converged on a similar “framing” (Snow and Benford, 1992) of food waste as an
32 environmental, social and economic problem. Similar numbers and statements like “America
33 throws away 40% of its food” circulate through institutional campaigns, grassroots
34 organizations’ websites, and expert reports (Gunders, 2012). The simultaneous presentation of
35 environmental, economic, and social dimensions supports the construction of *food* waste as a
36 public issue, especially in comparison with other types of waste. In France, a government
37 representative explains that policies related to food waste gained more attention when they
38 became part of the Food Administration, as opposed to other types of waste that were less
39 “*sexy*”⁷ (Interview 19). Indeed, environmental activists mention their fear that current
40 discussions on *food* waste may take away from discussing waste and over-consumption more
41 generally (Interview 39).

⁶ Loss-Adjusted Food Availability Documentation: [http://www.ers.usda.gov/data-products/food-availability-\(per-capita\)-data-system/loss-adjusted-food-availability-documentation.aspx](http://www.ers.usda.gov/data-products/food-availability-(per-capita)-data-system/loss-adjusted-food-availability-documentation.aspx) (Accessed: 5/12/2015)

⁷ All translations from French by the author.

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4.2 *Actors and organizations' differing visions of food surplus and waste*

Actors and organizations relevant to the prevention and management of food waste have different interests and places in food commodity chains, which allowed the author to place them in eight categories across the two countries (see Annex 1).

Despite efforts to build common measurements (HLPE, 2014, pp. 21–28; WRI, 2014), actors and organizations from distinct categories have very different definitions of “food waste” and adequate “solutions.” The English word “waste” can relate either to something that has been “wasted”--like “gaspillage” in French--or something that was not necessarily usable in the first place, like “scraps” or “trash.” In both languages, the threshold between a “good,” “wise” use of resources and a “wasteful” one is variable. For example, the General Secretary of the French Federation of Wholesale Markets includes an incinerator project--supplying energy to a low-income neighborhood from food scraps--in her organization’s “fighting food waste” policy, even though advocates of food recovery considered burning food still “waste” (Interview 68). A book author and advocate against climate change in the U.S. goes further and claims that converting grains into animal protein is a “waste” of resources (Interview 129).

As these examples illustrate, various public and private entities have distinctive visions of surplus food. They subsequently create hierarchies of what “solutions” they prefer for implementation. Behind the overarching prioritization of prevention, recovery and recycling, three environmental, economic, and social hierarchies of actions can be identified. They rank specific solutions based on the respective goals of protecting the environment, generating exchange and profit, and feeding people. As illustrated in Fig. 2, for each hierarchy, some categories of solutions are more likely to be implemented than others: for instance, actors and organizations focused on pollution and environmental impacts tend to promote recycling, businesses looking for economic benefits encourage the optimization of processes and sales, and non-profit entities with social goals dedicate themselves to food recovery and redistribution.

[Insert Fig. 2 about here]

Generally, actors consider food as “wasted” if it is exchanged in a way they consider sub-optimal within a given hierarchy. For example, from the economic perspective expressed by many corporate representatives, food is wasted if it is donated for free instead of being sold (Interviews 55, 61, 62, 140, 147, 150). From an environmental perspective, food is wasted if it goes to feed composting worms instead of feeding other animals (one step higher in the environmental hierarchy), as one farmer and several environmentalists put it (Interviews 27, 115, 118, 139). Measurement units help rank the actions in each hierarchy: environmental impacts are measured in tons of waste, CO2 emissions, or impacts on soil and water; social impacts by numbers of meals or calories; and economic impacts as savings or profits. Individuals and organizations are negotiating specific thresholds for moving food from one circuit to another, such as expiration dates that distinguish between saleable food, potentially donated food, and (supposedly) non-edible food to be thrown away.

Yet, as surplus food is a material and perishable good, the ways to manage it are limited and not always compatible. For example, redistribution can compete with composting: food can be offered to a charity to be donated and then be composted, but not the other way

2 around. Actors at national, regional and local scales in both countries show that funding such
3 as investments and grants, informational resources such as communication campaigns or
4 media coverage, and human resources are finite, so not all actions can be effectively promoted
5 at the same time (Interviews 18, 20, 21, 112, 117, 118).

6 In this context, the author analyzes what hierarchies and solutions are the most
7 *dominant*, based on which appear the most in public reports and discussions, in the media and
8 during interviews, as well as which are the most encouraged or funded by policies and turn
9 into concrete projects. People and organizations do not generally refer to only one solution or
10 even one set of solutions, but analyzing the most common ones helps understand how surplus
11 food is actually being managed. The following sections on recycling (4.3), recovery (4.4), and
12 “weak” (4.5) and “strong” (4.6) prevention present further fieldwork results on 1) the
13 meaning and implementation of each category of solutions; 2) the opportunities for and
14 competition between environmental, economic, and social interests in the respective
15 hierarchies; 3) the broader challenges each raise. Fig. 3 summarizes the potential benefits,
16 barriers and limitations of each category of solutions as well as their key proponents.

17 **[Insert Fig. 3 about here]**

19 *4.3. Recycling: using “food scraps” as resources*

20 Recycling entails using “food scraps” or “organic resources” or “materials”⁸ that cannot be
21 consumed by humans. The food waste hierarchy ranks the most environmentally preferable
22 uses of scraps as animal feed, industrial uses like chemicals or cosmetics, energy production
23 through anaerobic digestion, and lastly, composting. Some innovations focus on feeding
24 animals with food scraps, such as the “Pig Idea” campaign that was launched in 2013
25 (Interview 37). An increasing number of companies are also investing in infrastructures and
26 technologies for “waste-to-energy” processes. For example, a project endorsed by the
27 Innovation Center for U.S. Dairy aims to put 1,300 methane digesters on dairy farms by 2020
28 (Interview 137). French governmental subsidies support similar investments (Interview 19).
29 In the meantime, municipalities like San Jose in California are increasingly processing
30 municipal or commercial waste through centralized anaerobic digesters.

31 Many regulations and infrastructures aim to increase composting: in 2014, 198 U.S.
32 municipalities had begun curbside collection of food scraps (Yepsen, 2015). A city official in
33 California explains that a mandate on composting is the best way to make it financially
34 sustainable and generalized: “*When they started having waste collection in American cities in*
35 *the 20th century, people volunteered but it needed to be mandatory, for health and safety.*
36 *Composting is ‘health and safety’ for the global community, it’s the same”* (Interview 119).

37 The comparison of the two countries and wide variations between U.S. states
38 demonstrate the impact of financial taxes along with regulations: the higher cost of landfilling
39 in France and in California vs. other U.S. states, for instance, means a higher “opportunity
40 benefit” for diverting from landfill, making recycling more profitable (see Da Cruz et al.,
41 2014, for an economic analysis on packaging waste). Economic incentives for recycling also
42 depend on end-markets for biofuels or compost in agricultural areas, which vary widely
43 across place and time (Interviews 87, 169, 170).

⁸ Words in quotes are based on the lexical analysis of interviews in English or translated from French.

2 In the end, recycling may be at the bottom of the food recovery hierarchy, but it is
3 often promoted as the first solution by companies and municipalities, following the example
4 of Californian cities that are often seen as leaders, including in France. One advantage of
5 recycling--especially compared to prevention--is its directly measurable results: waste kept
6 out of landfills. Despite the uncertainties of a new market and new technologies, recycling is
7 seen as an opportunity to create both environmental and economic value. Even when capital-
8 intensive projects are not profitable in the short term, they aim at complying with future
9 regulation and providing long-term economic gains

10 Yet the different systems that public and private entities develop are not always
11 compatible. One sustainability manager at a retail store explained they chose composting over
12 anaerobic digestion because "*I have this very simple approach: take food waste and compost
13 it and grow more food! It's a personal philosophy*" (Interview 148). A city official in
14 California criticized a program that would centralize and mix food waste with wastewater
15 materials to produce energy because the mixed *digestate* (the remaining material that was not
16 only organic) would have to go to the landfill and therefore not match "zero waste" goals
17 (Interview 119). Tensions between recycling methods are also arising in France where the
18 waste management sector has become more and more privatized (Interviews 39, 41, 87).

19 At the same time, recycling is happening at an increasing scale through the
20 commoditization of what was formerly "waste," notably in California. An owner of a family
21 farm illustrates this phenomenon: "*I used to go to a big bakery and now they donate
22 everything to a big guy [one company] ...they would give bread to 20 people [20 different
23 farmers]. Also I would get oil from restaurants ...now they sell to companies that make
24 biofuels...it has become a commodity*" (Interview 139). Beyond tensions and competition
25 around the commodification of waste, a key challenge associated with recycling is the risk of
26 distracting from prevention and recovery efforts higher up in the food waste hierarchy. In San
27 Francisco, a communication campaign for composting in 2014 depicted pizza leftovers in a
28 cardboard with the caption "California Gold." The poster implied that recycling leftovers--not
29 prevention--was an appropriate way to re-value food surpluses.

30 31 *4.4. Recovery: a new market opportunity for food surplus*

32 Food recovery involves accessing "extra," "excess," or "wholesome food"--rarely called
33 "waste"--at production, distribution, and consumption in order to bring it to people who need
34 or want it. Food recovery can involve gleaning unharvested produce on farms and at markets,
35 re-processing food (for example, making jam with blemished products), or rapidly matching
36 the supply of available extra food to the demands of food banks and charities.

37 Recovery is one of the most frequently promoted solutions to food waste in both
38 countries. People working for local governments, food corporations, hunger-relief
39 organizations, or recently created social enterprises all use a similar rhetoric:
40 entrepreneurship, innovative technologies, and better logistics can "solve the problem of food
41 waste" by connecting surplus food with "hungry" people, in a social, economic, and
42 environmental "win-win-win." Recovery makes sense to many producers and businesses that
43 see surplus food as "necessary" or as a "normal part of business" because of seasonality,
44 variability of prices, and unpredictability of demand. Similarly, a redistribution agency insists
45 that caterers "*have to waste, especially when they do not know how many people they will be*

2 *...serving... They always produce 10% more, it's not an exact science... if there were a place for*
3 *all of the food left over everyday by the normal business as it's run, then no one in America*
4 *would be hungry” (Interview 90).*

5 For corporations, recovery is a way to benefit from tax incentives for donations and
6 save on disposal costs while improving their public image. In France, companies' tax
7 reductions (subtracted from taxes) account for 60% of their in-kind donations' stock value,
8 within the limit of 0.5% of sales (*Art. 238bis CGI*, 2014). Although the complexity of tax
9 codes makes direct comparison difficult, France's incentives appear to be among the strongest
10 in Europe if not the world (Vittuari et al., 2015). In the U.S., qualified business taxpayers
11 receive tax deductions (calculated before taxes) derived from the cost to produce the donated
12 food and its full fair market value and limited to 15% of the taxpayer's income (H.R.4719,
13 2014). Additional tax incentives exist in some states: for example, the Colorado Charitable
14 Crop Donation Act, signed in 2014, offers a 25% tax credit to local producers for the
15 wholesale value of the food that they donate to food banks.

16 While historically food recovery was mainly carried out by non-profit organizations, a
17 few start-ups now see it as a potential profit-making opportunity. For example, a mobile
18 application created in Chicago in 2014, that connects American restaurants and caterers with
19 local charities, charges businesses a fee proportional to their tax deductions to pick-up and
20 donate their extra food (Interview 93). In that case, financial incentives are key to
21 transforming environmental or social benefits into economic value. As a person responsible
22 for food waste prevention at the West Coast office of the EPA phrases it, “*we just need to*
23 *align economic incentives with the food recovery hierarchy!*” (Interview 115).

24 Yet, while estimates show that less than 10% of surplus food is currently redistributed
25 in the U.S. (FWRA, 2014), few actors ask what would happen if more food were
26 redistributed. One of the main challenges of food recovery is that food donations are not
27 necessarily adapted to the needs of hunger-relief organizations and their “clients,” especially
28 in terms of nutrition. Many food banks already have too much of certain foods such as bread
29 and pastries. One manager of a food bank in Arizona explained that a large share of the
30 donated food is given to bears, not humans (Interview 159). In France, the founder of a food
31 assistance organization denounced the fact that hunger-relief policies often do not question
32 the quality of the food and dignity of access: “*they [policy makers] count in kilograms per*
33 *poor person!*” (Interview 82). In that system, some companies are encouraged to donate (and
34 food banks are encouraged to distribute) “heavy” foods that are not necessarily nutritious, like
35 soda (Interviews 83, 161, 166). Activists use the label “charity washing”--based on the notion
36 of “green washing”--to denounce fake charitable actions that dump unneeded products
37 (Interviews 81, 130).

38 In the meantime, food recovery is increasingly becoming institutionalized. Donations
39 are associated with formalized procedures to protect from liability, ensure compliance with
40 safety rules, and calculate tax incentives. The food bank network Feeding America is
41 developing national agreements with chain stores' headquarters to obtain regular in-kind
42 donations and financial support for large infrastructures (Interview 162). In both national
43 contexts, this formalization conflicts with grassroots organizations that distribute food from
44 restaurants and caterers to homeless shelters. Many small-scale agencies do not have
45 resources to fill out the required paperwork (Interviews 3, 13, 91, 98). Direct partnerships at

2 the local level might be disrupted, along with more informal practices like giving food to
3 stores employees at the end of the day or showing clemency to “gleaners” and “dumpster
4 divers” who salvage food left on the ground or in supermarkets’ dumpsters.⁹

6 4.5. “Weak” prevention: food waste as a dysfunction

7 Prevention is ahead of recovery in the food surplus and waste hierarchy, but often last in
8 practice. In order to avoid “losses,” “breakage,” “dysfunction,” “shrink,” “mistakes,” or
9 “errors” at each stage of the food chain, prevention aims at optimizing the level of “desired
10 food surplus” necessary to offset risks (Papargyropoulou et al., 2014). Optimizing production
11 quantities also relies on raising “awareness” among consumers, often seen as responsible for
12 developed countries’ waste (Interviews 45, 126). Campaigns focus on the consequences of
13 waste and its drivers at an individual level, such as poor planning, storing and cooking
14 practices or the use of expiration dates.

15 Businesses and environmental organizations promote their own optimization practices
16 as an environmental and economic “win-win” that reduces the “cost of doing business” and
17 the “externalities” of waste. Professionals in the retail, processing or catering sectors
18 increasingly share “toolkits” and “best practices,” carry on waste tracking audits, or even hire
19 technical assistance to improve processes and train employees (Interviews 55, 66, 76, 136,
20 144, 152, 153). A start-up created in 2007 to improve waste measurement and management in
21 the American food service sector was one of the first to propose a service to optimize “food
22 waste” based on weighing and tracking (Interview 89). Many social entrepreneurs in France
23 and the U.S. promote optimization “solutions,” such as smart-phone applications and
24 technologies that help sell products close to their expiration dates at a discount price in order
25 to increase sales and reduce waste (Interviews 9, 94).

26 As defined here, “weak” prevention relies on the belief that improved processes and
27 technologies--without a fundamental change in business models--are enough to significantly
28 prevent and almost eradicate waste. A report produced with French industry experts promotes
29 “smart” packaging and technological innovation as a significant way to prevent waste, with
30 the support of the Ministries of Industry and Agriculture (PIPAME, 2014). One large-scale
31 produce farmer in Southern California argues that “*in about 20-30 years if we are smart, use
32 new technology, we won’t have the word ‘waste’ anymore*” (Interview 138). Technology-
33 oriented discourses seem more prevalent in the U.S., especially when it comes to farming
34 techniques (including GMOs) that have not been accepted in Europe so far.

35 Prevention based on optimization is nonetheless weak for several reasons. First,
36 prevention often relies on companies’ voluntary commitment and “best practices,” both of
37 which do not push beyond economic profitability. Second, prevention is often predicated on
38 the assumption that it will not lead to major transformation in food markets. There is
39 generally no assessment of what would happen if consumers stopped buying the food that is
40 currently wasted, up to 40% of total purchases. As the director of sustainability at a large
41 French retail chain confesses, “*when jam sales decrease because people make more jam at
42 home with blemished fruits, chicken will have teeth* [French equivalent of “when pigs fly”]!”

⁹Fieldwork observations revealed that many store managers allowed such practices, in both countries, despite corporate guidelines that sometimes recommend to “bleach” food in order to make it inedible.

2 (Interview 62). In fact, most interviewees in the retail sector do not expect consumer waste to
3 decrease enough to reduce sales.

4 Currently, the changes that are promoted to prevent waste are generally marginal ones
5 and industry leaders consider waste reduction as a “pre-competitive” issue on which
6 companies, through the food waste reduction “alliance” or “pact,” can work together to
7 comply with similar standards, maintain certain market characteristics, and adapt to or
8 preempt government regulations (see, for example, interviews 53, 64, 136, 137, 156). As one
9 leader in the Food Waste Reduction Alliance mentions, “*When the government comes up with*
10 *regulations, it always screws up everything... We are in the best position in the private sector*
11 *to manage our own impact... [rather] than having the government telling us what to do”*
12 (Interview 150). The discussions on expiration dates, both in France and in the US, are
13 emblematic of an attempt to optimize practices and processes--raising awareness about dates
14 and homogenizing rules--without changing the overarching system of date setting--including
15 the persistence of dates on non-perishable products like salt or flour--that still accounts for a
16 significant percentage of waste (Leib and Gunders, 2013; Lyndhurst, 2011).

17 18 4.6. “Strong” prevention: reducing waste through structural changes

19 Only “strong” prevention would question what a “desired surplus” (Papargyropoulou et al.,
20 2014, p.112) is and, beyond optimizing processes, limit the production and consumption of
21 unneeded food. Several activists and advocates point out that the most common definitions of
22 waste distract from its biggest drivers in developed countries: intensive and capitalistic
23 production of food. Based on the realization that more than 3,500Kcal per capita are produced
24 daily in the U.S. and France,¹⁰ while a normal human should consume only around 2,000-
25 2,500Kcal, they call for actions at the top of all environmental, economic, and social
26 hierarchies to change the core organizing principles of production and consumption.

27 Advocates of strong prevention challenge “productivism,” “over-industrialization,”
28 and “homogenization” of food production, along with the permanent availability of a wide
29 range of foods through complex commodity chains (Interviews 13, 38, 42, 91, 110, 122).
30 They question food safety criteria that entail throwing away large quantities of food or the
31 loss of nutritional quality and freshness (Interviews 21, 25, 63, 75, 118, 138, 153). Many
32 interviewees claim that strong prevention would require, among other things, more
33 seasonality and variability, with greater proximity to the land or “nature,” and sharing more
34 food through stronger social links (Interviews 3, 7, 11, 12, 104, 105). Several farmers and
35 cooks mention the necessity for people to be “*closer to the food*” (with fewer intermediaries)
36 through less standardized exchanges (Interviews 4, 51, 59, 79, 139, 142). Another aspect may
37 be the de-commodification of certain products, related to the idea of food sovereignty and a
38 “right to food.”

39 Although focusing on individual consumers is criticized as a “weak” approach,
40 “strong” prevention of food surplus would still imply important changes in consumption
41 patterns, including less choice and availability, more time spent around food, potentially more
42 risk, reduced animal products consumption, and reduced overall consumption. Some
43 advocates even consider reducing consumers’ convenience and refer to “traditions” from

¹⁰ Sources: Food and Agriculture Organization (FAO) and U.S. Department of Agriculture.

2 many cultures and religions that required thriftiness and efforts (see, for example, interviews
3 11, 27, 45, 88, 94).

4 An interesting case of potentially strong prevention, entailing possibly systemic and
5 comprehensive changes from production to consumption, is the recent initiative around “ugly
6 fruit and vegetables” that generally do not reach markets because of their shape or color. After
7 the French retail store *Intermarché* led a very successful marketing campaign to sell carrots
8 that are “ugly” but “good in the inside” at a discounted price, many companies in Europe and
9 the U.S. started exploring similar initiatives (Interview 69). Innovative start-up projects in the
10 U.S. have begun delivering boxes of “cosmetically challenged” produce (Interviews 106,
11 107).

12 Changing esthetic criteria may “strongly” modify long-standing social and cultural
13 expectations on what a good fruit or vegetable is, along with the way produce traders and
14 merchants do business along commodity chains. By reducing unharvested crops, farmers
15 could be paid for a larger part of their production and at the same time make fresh produce
16 more affordable to low-income communities (with additional support of public policies
17 focused on health and nutrition), in a true “win-win” fashion. It may change food production
18 and consumption systems by valuing labor, taste, nutrition and resources more, and branding
19 and standardization less.

20 Yet the scalability, effectiveness and long-term impacts of such programs are still
21 unclear. Up to the time of writing, the French marketing campaign spread “ugly” to other
22 stores, but the impact on sales and prices was unknown (Interview 69). Farmers expressed
23 concerns about an overall decrease in the prices for their produce (including the non-ugly
24 ones) while retailers would maintain relatively high end-of-market prices and benefit from
25 higher margins (Interview 58). In a weak scenario, changing aesthetic standards may not
26 question who sets the standards, nor the power of supermarkets to reject certain food through
27 the way supplier-retailer contracts are set up.

28 In the end, strong prevention is the least promoted solution and only appears in
29 marginal social movements or in individual conversations as a non-official discourse. Only a
30 few environmental organizations have publicly promoted individual practices that could
31 significantly reduce resource waste if they were collectively embraced, such as eating less
32 meat or imported fruit (Interviews 38, 46, 121, 135). A network of young professionals with
33 engineering or business schools degrees and specialized trainings in environmental studies are
34 also spreading “strong” ideas across retailing companies, government agencies for agriculture
35 or the environment, non-profit environmental organizations, and consulting companies.
36 Playing the role of “institutional entrepreneurs” across organizations and countries, some
37 describe themselves as “internal lobbyists” (Interviews 66, 147). While a woman working at
38 one of the main French grocery stores explains that she chose to change things in the long run
39 “from the inside” by talking about her own ethical consumption and sustainability in her
40 work, she adds, “*it may be less naïve [than more radical engagements] ... or more naïve*”
41 (Interview 68).

42 Indeed, most interviewees do not consider strong prevention a “real” solution, and,
43 despite depicting some changes as desirable, they refer to them as “idealistic” and “utopian.”
44 For example, safety criteria based on senses, not labels, and relationships based on trust, not
45 formal agreements, do not seem to be possible in the current organization of production,

2 distribution and consumption. When they individually mention “overproduction,” people do
3 not challenge it or describe it as “part of the system.” A member of the Ministry of
4 Agriculture leading discussions for the French pact against food waste confesses: “*If I talked*
5 *about this, they [producers and unions representatives] would just stand up from their chairs*
6 *and leave*” (Interview 21). Food waste reduction has not been directly included in the U.S.
7 Farm Bill or the European Common Agricultural Policy (CAP), although the latter has taken
8 steps towards less productivist agriculture (Interviews 29, 151). Until now, despite their
9 significant growing rates, alternative forms of food production and consumption remain
10 marginal (less than 5% of the market)¹¹ in both countries.

13 5. Discussion: an impact on the food system?

15 Previous research has suggested that significantly and sustainably reducing surplus food in
16 France and the United States calls for holistic and systemic changes in the production,
17 distribution and consumption of food. Yet, results show that the most promoted solutions and
18 dominant approaches to “food waste” often focus more narrowly on the management of
19 existing surplus. Interestingly, despite differences in the way the French and American food
20 systems are organized and embedded in distinct cultures and political context, key policies
21 and initiatives embraced on “food waste” remain similar. Fig 4 shows key achievements on
22 the food waste field in terms of policies and corporate initiatives, most of which focus on the
23 bottom stages of the hierarchy. Future developments in both places will allow researchers to
24 assess to what extent proactive public policies and regulations are effective.

25 **[Insert Fig. 4 about here]**

26 Until now, recycling, recovery and weak prevention have encouraged, first, the
27 optimization of large-scale and standardized (over)production systems that require large
28 surpluses and, second, the re-use of inevitable surplus to feed inevitably hungry people before
29 recycling the remainder. Strong prevention still seems incompatible with current economic
30 paradigms because its social and environmental values do not easily translate in economic
31 values, as opposed to other categories of solutions that can bring about direct economic
32 benefits. Even solutions that join different economic, social, and environmental interests,
33 supported by entrepreneurship and innovation, generally do not challenge underlying power
34 relationships that define how decisions are made or who controls the profit margins on food
35 markets. In particular, “food waste” concerns have yet to enter overarching agricultural and
36 industrial policies.

37 With rising attention to food waste, many small-scale systems--dumpster-diving,
38 donations from a store manager to a local charity or a local farmer, or gleaning--end up being
39 disrupted in favor of supposedly more efficient large-scale and formalized forms of exchange.
40 At each level, tensions arise about the scale of reducing, re-using, and recycling: backyard
41 composting vs. industrial composting, local organizations vs. food bank networks, etc. The
42 scale goes along with certain standards for food safety and administrative procedures to
43 ensure trust despite the lack of direct inter-personal relationships. While studies about food

¹¹ Sources: French agency for waste prevention (ADEME) and U.S. Department of Agriculture.

2 waste have already established the importance of a hierarchy of the three “Rs” (Garcia-Garcia
3 et al., 2015: Fig. 5 p. 70, Papargyropoulou et al., 2014), this research shows we also need to
4 take into account the scale at which each stage in the hierarchy is best implemented.

5 Dominant solutions to food waste push for marginal changes and individualized
6 approaches that may be a diversion from more radical actions. For instance, corporations may
7 use food waste as a way to improve their Corporate Social Responsibility and environmental
8 images--generally managed by separate departments or delegated to foundations in large
9 companies--while maintaining day-to-day practices that can include pressuring charities to
10 accept food that is not adequate and to subsequently bear the cost of disposing of it.

11 Yet, addressing food waste nonetheless holds the potential for incremental change
12 towards more radical shifts in the long run, with individual practices leading to more political
13 action, and corporate initiatives leading to broader structural changes. There is indeed a
14 potential for a “switch” from weak to strong sustainability through a network of individuals or
15 “institutional entrepreneurs,” across a wide range of organizations at different scales, who
16 take action to change the system “from within” and spread more radical values. Despite its
17 limitations, we can observe a “movement” toward the actual reduction of food waste in both
18 countries. Regardless of companies’ motives for doing so, it is relevant that they do feel
19 significant pressure to address environmental and social concerns, in this case by taking
20 action to optimize, redistribute, or recycle food surplus.

21 Relatively long-term change in cultural and social expectations, encouraged by
22 education, may alter business practices and regulation. France is now considering a law
23 making donations of supermarkets’ surplus food mandatory, adding a coercive dimension to
24 existing incentives. Regulations may be the ultimate point of leverage in addressing food
25 waste as a public goods dilemma. Once individual and business practices evolve, regulations
26 can set higher standards and transform markets towards sustainability, for instance with tax
27 incentives to encourage donations. Public policies might be able to align financial goals and
28 productive logics with sustainability and social goals. For example, the European Directive on
29 a “circular economy” or recent transformations of the CAP, with the end of production quotas
30 in 2015, show an evolution toward the transformation of production and consumption
31 systems.

32 The cases of the French and American food systems suggest some prospects for
33 incremental change leading to long-term transformations. The U.S. seems behind in terms of
34 corporate sustainable initiatives, with low incentives for waste reduction (low landfill costs)
35 and the institutionalization of “charity” that maintain a permanent need for surplus. Across the
36 Atlantic, French officials are more apt to mention concepts like a “circular” or “sharing
37 economy” (not yet “de-growth” or “radical” changes), conversations that seem almost taboo
38 in the U.S. A majority of interviewees see regulation and policy approaches as disfavored in
39 the U.S. compared to innovation and entrepreneurship, while French public entities try to
40 implement proactive regulations. Despite potential resistance from the food sector, new
41 guidelines for French public policies offer an optimistic vision of potential changes toward
42 stronger prevention and sustainability in the food system.

43 44 6. Conclusion

2 The generalization of current patterns of production and consumption, especially to
3 developing countries with large populations (Myers and Kent, 2003), will not be sustainable
4 without a radical change in the way resources are used. Given that food surplus and waste are
5 increasingly identified as an example of sub-optimal resource-use in developed countries (see
6 for example Thyberg and Tonjes, 2016), research needs to be pursued to further understand
7 the challenges and opportunities raised by potentially *competing* solutions to this problem
8 with regards to sustainable production and consumption.

9 This research found that, in terms of social, environmental, and economic values,
10 various solutions appear to constitute competing categories and hierarchies of solutions, in
11 contrast to the single hierarchy usually mentioned in the literature and endorsed by most
12 actors. Overall, beyond recycling, reusing, or weak prevention, strong prevention requires
13 rethinking the overall governance of the food system and its underlying power relationships
14 between producers, manufacturers, retailers, food banks, NGOs, and other actors. In particular
15 in a context of rapid population growth, only structural transformations of both food and
16 economic systems would ensure universal access to nutritious food in adequate--and not
17 excessive--quantities.

18 This paper shows that “strong prevention” has been the least promoted and most
19 marginal solution so far, although it is the best opportunity from a long-term sustainable
20 production and consumption perspective. While weak technical and logistical solutions are
21 linked to social, economic, and environmental issues that may jeopardize their sustainability
22 in the long run, this paper argues that researchers will benefit from focusing on how to
23 achieve strong prevention. Advocates are also encouraged to push corporate and government
24 actors to move toward strong prevention. The case of food waste could then be extended to
25 other commodity chains that require similar changes in production and consumption patterns.

26 France and the United States were used as empirical cases because they are two
27 developed countries with similar amounts of food waste despite contrasting food cultures and
28 food policies. Various mechanisms observed in France and the U.S. may be shared by other
29 developed countries, notably the recent appearance of food waste on the political agenda and
30 the concentration of efforts on recycling, the bottom of the hierarchy (Eriksson et al., 2015).
31 More generally, the challenges to strong sustainability--not only in the field of food
32 commodity chains--are shared by most industrialized, capitalist economies. Yet, some
33 policies and initiatives remain specific to each national context, such as the strength of tax
34 incentives for company donations in France, which demonstrates the impacts of local actors’
35 and governments’ proactivity.

36 This paper’s empirical results were obtained through in-depth investigation among a
37 wide panel of policy makers, professionals, experts and activists in dozens of states and
38 regions in the U.S. and France. The sample nonetheless remains qualitative: the goal was to
39 include representatives of each relevant category of actors rather than to ensure an exact
40 representativeness of each. The data is limited to the information that actors are willing to
41 give. Other studies may complement this analysis by quantifying the competing impacts of
42 different categories of solutions.

43 Another potential limitation of this study lies in the difficulty of comparing a variety
44 of administrative levels in the two countries (European vs. federal, national vs. state and
45 local). The author also faced the challenge of keeping up with recent developments. For

2 example, regulatory changes were taking place in France at the time of writing, where a “food
3 waste bill” was unanimously approved at the National Assembly on December 9, 2015
4 (Samuel, 2015). On December 7, Rep. Chellie Pingree (Democrat, Maine) formally
5 introduced federal legislation to reduce food waste in the U.S (H.R.4184, 2015).

6 More research must examine the most appropriate scale at which hierarchies of
7 solutions should be implemented. While economies of scale may lead to more efficiency,
8 increasing the length of commodity chains requires more administrative procedures and more
9 safety measures that generate more surplus and waste. Additionally, despite a growing
10 number of studies on food waste, actors in the field point out that very few of them have
11 provided an in-depth analysis of the macro-socioeconomic implications of different solutions
12 and on the impacts of applying the “hierarchy” at one level or another. Analyzing the
13 implementation and efficiency of various policies and initiatives is particularly necessary, for
14 example determining the impact of “mandatory composting” regulations (beyond the analysis
15 of compost efficiency itself) as well as future “mandatory donations” laws. Strong prevention
16 actions such as the seasonal provisioning of imperfect produce deserve even closer attention.
17 By seeing existing real opportunities, advocates and policy makers will hopefully seize them
18 and, beyond marginal adaptations, will work on strong changes toward sustainable production
19 and consumption.

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27

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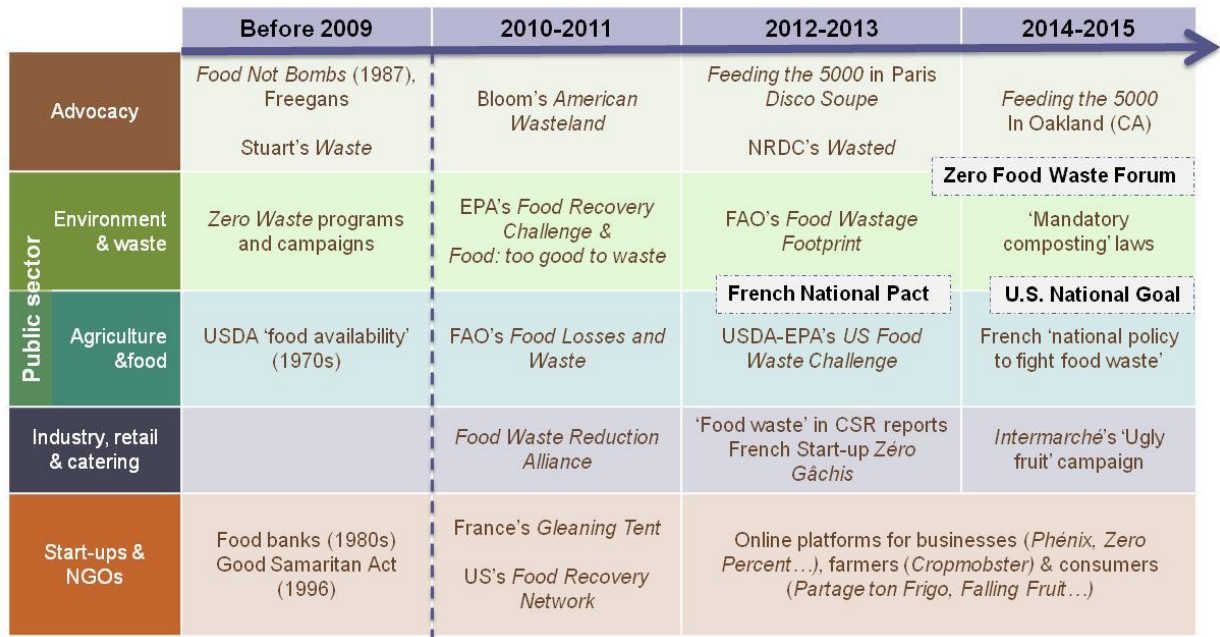
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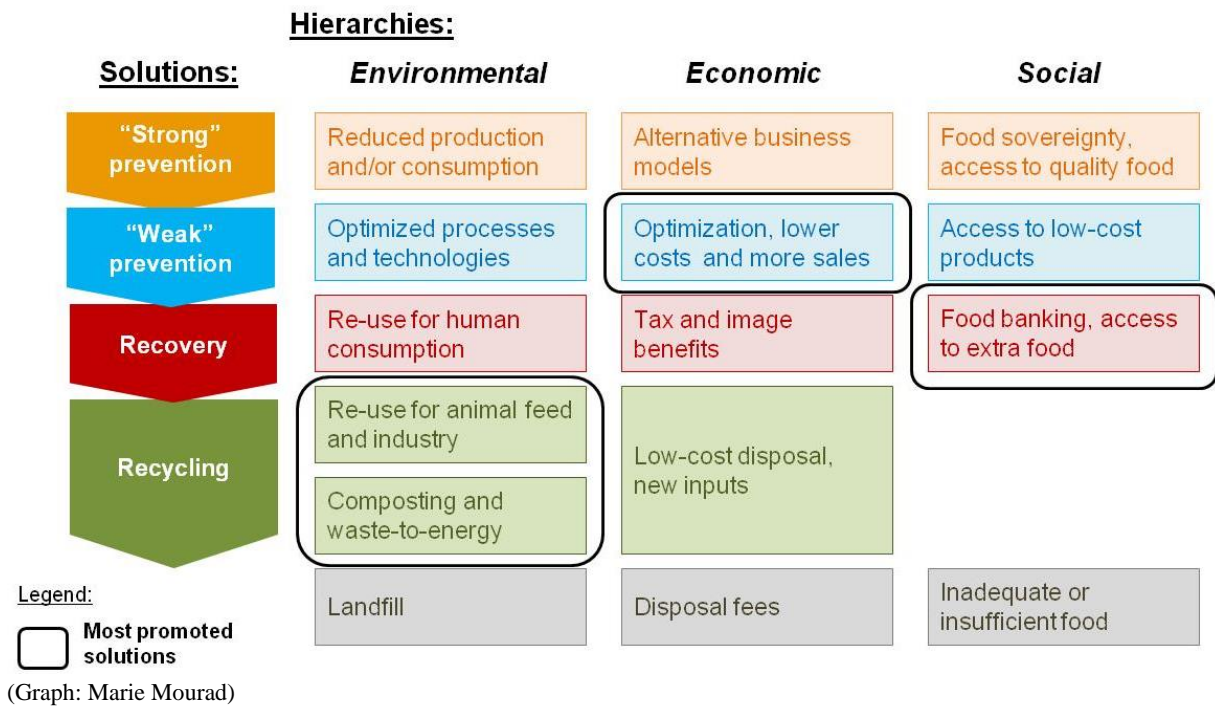
2 Figures and annexes:

3 **Fig. 1.** Mobilization around food waste in the United States and France



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5 (Graph: Marie Mourad)

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7 **Fig. 2.** Competing hierarchies of solutions to surplus food



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2 **Fig. 3.** Potential benefits and limitations of each category of solutions

Solutions	Concrete examples	Key proponents	Benefits	Obstacles and limitations
“Strong” prevention	Direct and local exchanges, shared / free food, seasonal consumption, reduced meat consumption	Radical social movements, small-scale farmers	Long-term environmental sustainability, food sovereignty	Vested interests of influential actors in the current system (large-scale agri-businesses, retailers, waste management), consumer resistance to change
“Weak” prevention	Optimized production and stock management processes, discount shelves, smart labelling, consumer awareness	Large-scale agri-businesses, retailers	Direct economic benefits for companies (lower costs, more sales)	Many processes already optimized, generally resource-intensive technologies (e.g. packaging, apps, GMOs)
Recovery	Food donations and redistribution, smartphone apps to connect donors and non-profits	Large-scale manufacturers, retailers, food assistance networks, social enterprises	Short-term social benefits (hunger-relief), reputation and tax benefits for companies	Logistical constraints, insufficient remedy for food insecurity in the long term (low quality, undignified and irregular access)
Recycling	Separate collection of food wastes, animal feed, anaerobic digestion facilities, on-site composting	Large-scale agri-businesses, food service, waste management	Savings on landfill costs, direct and measurable environmental benefits	Large financial investment for infrastructure, unstable end markets, perverse incentives (need for materials, reduced donation and prevention efforts)

3
4 (Graph: Marie Mourad)

5 **Fig. 4.** Key developments around food surplus and waste in the United States and France

Solutions	France	United States	Comparative development
National strategies	National Pact (2012-2013) 50% Reduction goal promoted by the national government (2013)	Zero Food Waste Forum (2014) 50% Reduction goal promoted by USDA and EPA (2015)	Longer multi-stakeholder mobilization in France that encourages food waste reduction
“Strong” prevention	Marginal development of direct sales (<3% sales); no major change in the CAP Supermarket “ugly fruit” campaign?	Marginal development of direct sales (0.3% of sales); no major change in the Farm Bill	Very marginal alternatives to food systems in both places; food waste concerns not yet included in agricultural policies
“Weak” prevention	“Zero-waste” apps National awareness campaign (2013-15), stores’ engagement	“Zero-waste” apps Smart packaging, GMOs?	More technical-oriented innovation in the U.S. Stronger awareness and stores’ engagement in France
Recovery	Tax reduction: 60% of donation (based on stock value) Mandatory donation bill (partly voted)	Tax deduction: 15% of donation (based on market value, with additional credits in 7 states) Good Samaritan Law (1996) Large food banks network	More proactive regulations in France Stronger culture of charity in the U.S.
Recycling	EU 2008 directive Mandatory recycling of organic waste above 10t per year High subsidies for infrastructures	EPA guidelines Mandatory composting in California , commercial food waste disposal ban in Massachusetts Private, on-site recycling	Stricter thresholds for organic recycling in France, but very proactive regulations in some U.S. states (e.g. California) <i>Food waste increasingly commoditized in both places.</i>

6
7 (Graph: Marie Mourad)

8

2 **Annex 1.** Summary of fieldwork data

CATEGORIES	FIELDWORK IN FRANCE			FIELDWORK IN THE U.S.		
	Primary interviews	Secondary interviews	Observations	Primary interviews	Secondary interviews	Observations
Start-ups and non-profits focused on food waste (prevention and recovery)	15	0	5 events and conferences on innovation and gleaning projects, 24 days with an awareness movement	12	11	Regular volunteer work for an NGO focused on food waste during 8 months
International organizations and public sector (national and local levels)	15	5	4 conferences, regular working groups for the National Pact and 2 studies on household food waste (national agency)	9	1	-
Advocacy and activism (NGOs, experts, consumer organizations)	10	6	3 conferences and events, including the Zero Waste movement	6	9	5 events including the Zero Food Waste Forum, government agencies' webinars, collaboration with an environmental NGO
Wholesale and retail (commodity markets, distributors, grocery stores)	9	3	5 visits (stores, warehouses), food pick-ups, observation of dumpsters	8	0	2 conferences and webinars (industry groups), food pick-ups, observation of dumpsters
Catering and restaurants	4	4	-	5	2	1 visit (university restaurant kitchen)
Farming, processing and packaging industry	8	1	2 visits (farm, fruit picking), 2 conferences	7	1	3 visits (farm and packing facilities), industry webinar
Food assistance organizations (food banks, charities)	4	0	-	6	4	4 visits (warehouses, soup kitchens)
Waste management	3	0	2 visits (transfer station, recycling and incineration facility)	4	1	1 conference, 4 visits (transfer station, composting facility, digester, landfill)
TOTAL	68	19		57	29	

3

4 **Annex 2.** Detailed fieldwork data

5 [see separate document]