

## Is this the era of food waste policy?

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### Abstract

Food loss and waste is high on government and business agendas. The problem has had major consequences and has gained considerable attention in public and scholarly debate, as well as among governments at all levels, from local to international. Hundreds of putative solutions have been proposed, and more administrations than ever before have committed to significantly reducing the quantity of food that is lost or wasted. But what works? And how? This chapter introduces the volume by reviewing the context of food loss and waste policy and by presenting the research questions and summaries of the chapters within it.

Scattered on the floor are grapes, leaves of vegetables, half a lemon, nuts, figs and other edible food waste. It could be the score of some dumpster diving, but it is not. It is a decorative mosaic from the second century AD displayed in the Vatican Museums in Rome, a fine example of *asàrotos òikos*, or 'unswept floor'. Like the ancient Greeks before them, patricians and upper-class Romans used to decorate their dining rooms with hyperrealistic representations of the debris of a banquet; food waste was a symbol of the wealthy elite.

In the last two thousand years, these decorations have gone out of fashion. We no longer showcase our garbage with pride, but food loss and waste (FLW) is an integral part of our lives. For an intuitive picture of the magnitude of the problem, start thinking of the last piece of food you wasted: an unopened package passed the expiry date, some spoiled fruit, leftovers from dinner or the cooked food you diligently stored but then forgot. Now, consider that not only do these things happen in every household worldwide, but that the food you throw away has also survived a long journey along which other pieces of food just did not make it. Some remained in the field or were discarded for marketing standards, while others were just too abundant and were therefore destroyed to avoid price collapse. Some were rejected for passing the sell-by date. And still others were just a bit blemished or their packaging too damaged to be displayed to you; they were perfectly edible but never reached your table.

The latest estimates reveal that more than one-third of the food produced is lost or wasted. The Food and Agriculture Organization of the United Nation (FAO) estimated that

13.8% of food produced in 2016 was lost from farm up to, but excluding, the retail stage, with regional peaks reaching 20–21% (FAO 2019). In addition to losses, 17% of global food production is wasted in households, food services and retail, amounting to about 931 million tonnes of food waste in 2019 alone (UNEP United Nations Environment Programme 2021). FLW has major consequences for environmental sustainability and food security. The FAO estimated that in 2013, FLW was the third largest contributor to greenhouse gas emissions after the United States and China, consumed an amount of blue water equivalent to the annual discharge of the Volga River (i.e. 250 km<sup>3</sup>) and was produced occupying in vain about 30% of the world's agricultural land area (FAO 2013).

However, if there is an FLW crisis, it is not a crisis of attention. Interest in the topic began to rise in the aftermath of food price spikes between 2008 and 2011, when reducing waste and losses began to be reconsidered as a tool to increase food security (Rosegrant et al. 2018). More governments took action against FLW, and NGOs exposed the paradox of vast quantities of food surpluses failing to reach people in need (Lang and Heasman 2015). All major food institutions started to work on FLW, and in 2015, the problem obtained global institutionalisation. That year, the General Assembly of the United Nations adopted the 2030 Agenda for Sustainable Development. Among its 17 Sustainable Development Goals (SDGs), SDG 12 aims to ensure sustainable consumption and production patterns and sets a target (12.3) to halve per capita global FLW by 2030.

FLW is high on the public agenda. Since the 1990s, academic publications on the topic have constantly grown, with steep acceleration in the last 10–20 years (Chen et al. 2017; Zhang et al. 2018). The COVID-19 pandemic has further increased attention: food hardship has grown (Ziliak 2021), and the redistribution of surplus food to people in need has gained even more importance (Barker and Russell 2020). In March 2022, the latest Synthesis Report for the Food System Summit Dialogues of the United Nations reported that 72% of National Pathway Documents referenced 'ending food loss and waste' among their priority themes (United Nations 2022). Hundreds of government officials at all jurisdictional levels, international organisations, businesses, scholars from many disciplines and citizens worldwide are thinking about reducing FLW. We have entered the era of food waste policy.

Indeed, greater centrality in public debate has meant that hundreds of putative solutions have been proposed. In the United States, ReFED reviewed 27 initiatives (ReFED 2016), later expanded into 42 potential solutions grouped around seven action areas (ReFED 2021). In the European Union, a Joint Research Centre report analysed 22 types of interventions (Caldeira, De Laurentiis, and Sala 2019), while the EU Platform on Food Losses and Food Waste (2019) presented 47 recommendations for prevention. As a last example, the World Resources Institute recently compiled a global agenda with 107 'To Dos', a list that was not intended to be exhaustive (Flanagan, Robertson, and Hanson 2019). More examples are reviewed by Christian Reynolds in Chapter 3.

Expanding on these inventories is not the ambition of this book, which takes precisely the opposite direction. Proposals of innovations constitute the fundamental first step towards policy change, but food waste policy is relatively recent, and the evidence accumulated about how it works is limited. There is a need for more analysis of its effectiveness and what is needed to make it (more) effective. Therefore, the first goal of

this book is to conduct an in-depth analysis of a selection of programmes to contribute to the advancement of the evidence base, looking at their results and taking a practical stance towards detecting good ideas, obstacles and possible advice for designers and implementers.

Its second goal is to frame FLW policy within the broader literature. When a new problem enters public debate, there is a tendency to overemphasise its special character and the distinctiveness of its features and purported solutions. Notwithstanding the obvious peculiarities, food waste policy is not a separate or special field and can profit from the knowledge accumulated in disciplines such as public administration, management and public policy analysis. New problems are not exempt from old risks, and solutions can emerge thanks to ideas already developed in other sectors. The chapters in this volume present several examples of these circumstances regarding for instance how the problem of FLW is framed, the likelihood of implementation gaps and the presence of resistance and inter-administrative conflicts.

### Research questions and case selection

The volume starts by addressing two research questions: What works to fight food waste and loss? And how do FLW policies work? The first concerns the impact of interventions, and it is not an easy one to answer. Beyond the difficulties in determining what impacts to measure, there is an overall paucity of data, and in several cases, this impairs a reliable assessment. Nonetheless, all the chapters in this book provide some measures of the effectiveness of the analysed interventions and—depending on the perspective they take—also shed light on the many ways in which effectiveness can be measured, such as reduction of FLW, environmental measures (e.g. efficiency in the use of resources), cost savings, increased food security, nutritional improvements, social impacts (e.g. sense of community) and even anti-corruption. This variety emphasises the multifaceted character of the problem of FLW and the various ways in which the problem and solutions are framed.

Because advancing learning is our main focus, the second question asks: How do interventions work? As mentioned, the book aims to offer an in-depth analysis of the practice of FLW policy—what happens when these tools are implemented on the ground: whether they work as expected, how target groups and beneficiaries react, what administrative and contextual conditions help or hinder effectiveness and whether there are major gaps in or resistance to implementation.

The chapters intentionally focus on successful and promising interventions. The goal of the book is to discover patterns that can be useful to designers and implementers, and we start with the assumption that—although failures can certainly provide much information and stimulus to change—the conditions of success are present and detectable primarily in those cases that actually deliver positive results. National case studies in Chapters 7–12 provide comprehensive reviews of the interventions implemented in several countries and also present revealing examples of blind spots or

cases of outright implementation gaps. Several chapters, especially those investigating local initiatives, highlight barriers and obstacles and suggest ways to overcome these hurdles through innovative interventions. All the chapters present good ideas and lessons for future policymaking.

Beyond looking for programmes and initiatives that have delivered positive results, we selected cases to increase the scope of evidence in terms of both geography and the type of intervention implemented. The chapters span several geographic areas—North and South America, Africa, Europe and Asia—while also differentiating in terms of the scale of the intervention, whether local, national or supranational. In terms of the type of intervention, the case studies include examples of food redistribution, gleaning, valorisation, information campaigns, labels and certification, regulations, fiscal incentives and administrative simplifications. Table 1 provides a summary of both the geography and the kinds of interventions covered by the book.

<TABLE 1 APPROXIMATELY HERE>

### The content of the book

The volume is organised into four parts: Understanding food loss and waste, International programmes, National policies and Local initiatives. The first part is comprised of Chapters 1–3, which introduce the reader to the concept of FLW, how it can be measured, its causes and consequences and how it can be reduced.

In the first chapter, Clara Cicatiello introduces the book by briefly reviewing the definitions of FLW, as well as the rationale for and approaches to assessing FLW. She acknowledges how measurements and methods have greatly expanded in recent years, providing several examples of measurement in different contexts and at different stages of the food supply chain. However, reliability in measurements remains a challenge. After having presented the Food Loss Index and Food Waste Index and reviewed the EU methodology, the chapter analyses several methods of measurement in depth: direct measurement, waste compositional analysis, diaries, scanning, mass balance, food waste coefficients, proxy data and surveys. The chapter also takes an applied approach, reviewing some of the methodological and practical challenges that practitioners face when using different methods at different stages of the food chain.

Noemi Pace investigates the causes and consequences of FLW in Chapter 2. She provides an extensive literature review that offers several insights into where FLW is produced and why. The chapter analyses micro-, meso- and macro-level causes across the food supply chain. The impact of FLW is mainly analysed in terms of sustainability and food security. As for environmental consequences, it provides a thorough investigation of FLW's impacts on greenhouse gas emissions, depletion of blue water and landfill disposal. Finally, the chapter provides an analysis of the complex interactions between FLW and food security, showing that positive outcomes following FLW reduction are not guaranteed.

In Chapter 3, Christian Reynolds provides a full overview of policy initiatives developed to tackle FLW, thus introducing the reader to the set of interventions analysed in the case studies. The chapter investigates the food waste hierarchy as a foundational framework for setting up policy actions and then reviews the possible interventions, distinguishing seven types of initiatives: public policy and regulation, taxes and fees, voluntary agreements, information provision, nudges, changes to standards and others (including interventions in hospitality, surplus and donation, valorisation and animal feed, and technical and innovative actions). The chapter also discusses cross-cutting issues that impact FLW policy. It acknowledges the need for multiple initiatives to tackle FLW effectively, highlighting that strategies focusing only on reduction and prevention may not have long-term impacts. It also advocates for a broader food system approach, involving all actors in the food chain at all geographic levels. Finally, the chapter stresses paying attention to policy coherence by controlling for positive and negative spillover.

The second part is dedicated to international and cross-country case studies, which are reported in Chapters 4–6. In Chapter 4, Qiushi Yue, Daniella Salazar Herrera and Omar Benammour discuss how social protection programmes can contribute to a sustainable and inclusive food system. The main proposal of the chapter is that embedding food aid initiatives—which are typically carried out by volunteers and NGOs—within wider social protection programmes can increase their precision, scale and effectiveness. These kinds of synergies are investigated in four cases: Ireland, Costa Rica, Alaska and Brazil. The case of Ireland allows for the assessment of the interaction between a supranational programme, the Fund for European Aid to the Most Deprived (FEAD) and its national implementation by the national ministerial administration and food recovery partner. The case of Costa Rica investigates the direct redistribution of food to people in need that was managed by the National Centre for Food Supply and Distribution. The cases of Alaska and Brazil allow us to explore the benefits of programmes for the redistribution of seafood bycatch, avoiding the waste of food and providing to recipients quality proteins otherwise unavailable.

In Chapter 5, Romina Cavatassi, Robert Delve and Giuseppe Maggio review seven interventions funded by the International Fund for Agricultural Development (IFAD). They show how the reduction of food loss, the increase in food security and rural development are tightly linked. The seven cases in the chapter focus on three industries—fishing, crop production and livestock—implemented in Indonesia, Mozambique, Rwanda, Timor-Leste, Lower Guinea and Faranah, and Kenya. The projects comprise investments in post-harvest equipment and infrastructures, processing and packaging facilities, market linkages and training programmes. All the programmes provided relevant results in terms of preventing losses. Evidence from these initiatives allows the authors to draw five lessons regarding the impacts, design and implementation of projects that can reduce food loss, increase income and ensure food security.

In Chapter 6, Fabrizio D’Angelo traces the history of efforts made by the European Union to tackle FLW. He acknowledges how, together with the SDGs, the first large study to estimate European food waste, the FUSIONS study, worked as a trigger for taking action to fight FLW. The chapter describes the regulations issued by the European Union (the Circular Economy package, the Green Deal, and the Farm to Fork Strategy) and the work

of the EU platform on Food Losses and Waste. The chapter ends with two case studies that analyse EU institutions not as regulators but as practitioners in the reduction of food waste. The case studies explore actions taken by the European Economic and Social Committee, the European Committee of the Regions and the Council of the European Union in reducing food waste on their premises. This 'inside look' allows us to evaluate how many actions can be implemented by the food service and how much effort is required for the successful implementation of a food waste reduction programme.

Part 3 of the book includes six chapters that review national policies implemented in France, Italy, Romania, Japan, China and the United States. In Chapter 7, Marie Mourad provides an in-depth analysis of French policy, focusing on the 2016 reform. She debunks the idea of a tough French policy mandating a ban on food waste and shows how even apparently tough regulations may result in limited obligations and results. She analyses the obligation to respect the food waste hierarchy, the prohibition to destroy food voluntarily, the mandate to sign a contract with a food assistance organisation and other regulations subsequent to the 2016 law. The findings indicate that the government capacity to control and enforce obligations is limited, transforming prescriptions into more voluntary measures. The chapter discusses several blind spots of current policymaking, especially regarding the dominance of donation over prevention, the quality of the food donated, the risk of donation dumping and the unbalanced interests dominating food decision making.

In Chapter 8, Simone Buseti investigates Italian food waste policy by tracing its evolution from the 1990s to the latest reforms in 2016. The analysis covers a wide array of tools, from incentives to software logistics and new institutions. The chapter shows how the subjects targeted by regulations and incentives may not respond as expected, thus limiting or neutralising the effect of the policy. This is especially true in the case of the legal permission to donate food past the best-before date, an innovative provision that is resisted by donors, food banks and recipients. The chapter also stresses the importance of precisely targeting incentives and regulations to address not only the producers of waste, but also the decision makers who can start prevention and recovery programmes. Finally, the analysis also sheds light on the effectiveness of municipal discounts on the waste collection tax as a way to incentivise donations, and elaborates on the possibility to support food recovery organisations.

In Chapter 9, Cristina Vasilescu analyses the recent implementation of the 2016 Food Waste Law in Romania. The law endured a tortuous process of amending, suspension and substitution that resulted in a completely new law being approved in 2018 and amended in 2020. The process transformed what was a set of compulsory measures into a set of mainly voluntary actions. The sole obligation left in the law mandates that businesses produce yearly plans for how to reduce food waste, a provision that lacks sufficient transparency requirements and enforcement mechanisms. One interesting tool, although insufficiently publicised by the government, is a registry of food banks that could be particularly important in a country in which food donation is new. After analysing implementation at the local level, the chapter presents two in-depth case studies of organisations involved in food aid.

In Chapter 10, Chen Liu provides an overall investigation of a policy implemented in

Japan, looking at actions undertaken by the national and local governments as well as initiatives promoted by businesses. The chapter shows the early commitment of Japan to fighting FLW and reviews regulations and practices for valorisation, recycling and prevention. It also provides an analysis of several awareness campaigns, communication strategies and other interventions to change consumer behaviour. Finally, the chapter presents two important initiatives undertaken by businesses regarding date marking. One regards changing the one-third rule, i.e. how the period from the date of manufacture to the best-before date is divided. This change drastically reduced the number of returned and unshipped products, simultaneously increasing efficiency in the supply chain. The other innovation regards switching from a best-before date to a best-before month, which has already been introduced by several companies.

In Chapter 11, Xiaohua Yu traces the evolution of FLW policies in China. Interestingly, attention to food waste as a policy problem started as part of an anti-corruption initiative prohibiting extravagance in public administration. FLW was subsequently framed as a problem of national food security. Given China's low self-sufficiency, the risk of the weaponisation of food made the government perceive FLW as another resource for increasing food availability. Notwithstanding the novelty of the policy, the chapter reviews several interventions taken at both the national and local levels, including the recent Empty Plate Movement, i.e. the obligation for consumers to eat all the food ordered in restaurants. The chapter also offers an analysis of the utility function of food waste.

In Chapter 12, Emily Broad Leib and Ariel Ardura provide a thorough examination of the 1996 Bill Emerson Good Samaritan Food Donation Act. The United States was the first country to implement such a law—an innovation that has been replicated and used as a model worldwide. The chapter investigates the results and limits of the liability protection offered by the law. One of the main points in the law is that by changing the structure of private law, it is extremely cost effective: it does not reduce government revenue or require funds or enforcement costs. The bill resulted in an increase in donations and did not increase harm to beneficiaries of donated food. Concerning its limitations, the authors show that even after 25 years, there is still a lack of awareness and clarity about what the law prescribes. In appraising the benefits of the act, an important point is raised about how outdated protections can reduce innovation in food recovery and redistribution.

In Part 4, three chapters are dedicated to local food recovery and redistribution initiatives. In Chapter 13, Anna Davies and Alwynne McGeever open the section on local initiatives and present three cases of social innovation in Dublin, London and Barcelona. They acknowledge how food recovery and redistribution can be a vibrant arena of social innovation and explore initiatives regarding food redistribution, cooking meals and engaging in community projects, gleaning and awareness campaigns. They uncover several challenges to food recovery: unsupportive legislation, lack of resources, raising awareness about the availability of food aid and development of trust with donors and farmers. Finally, the chapter acknowledges the lack of data and significant under-reporting of the social impacts of associations working with food aid. As a possible solution, the chapter presents the case of SHARE IT, a multi-dimensional online platform

for sustainability impact assessment designed specifically for associations working in the urban food system, including a tool for sharing practices.

Chapter 14 consists of an analysis of the Milan Neighbourhood Hubs Against Food Waste by Giulia Bartezzaghi, Claudia Colicchia, Paola Garrone, Marco Melacini, Alessandro Perego and Andrea Rizzuni. Conceived in 2016, the hubs allow for increased efficiency in recovery and redistribution by providing logistical support that allows for the recovery of small and heterogeneous volumes of surplus food, thus increasing the nutritional balance of the food mixes delivered to beneficiaries. The chapter reports the impacts of these hubs by showing how they allow them to overcome several barriers to food recovery: short residual shelf life, discontinuity of demand for surplus food, poor fit with existing operational processes of donors, costs of additional tasks, lack of knowledge and reputational risks. The governance of the hubs is also notable, as it directly involves the municipality, the authors' university, a food recovery organisation, donors, the business association and the non-profit organisations receiving the food.

Luciana Marques Vieira and Daniele Eckert Matzembacher close the book with an account of how the COVID-19 pandemic worked as a focusing event for policy change around food donation in Brazil. They provide in-depth evidence from two case studies of recovery initiatives implemented in Sao Paulo, one already consolidated and another started precisely in response to the pandemic. They highlight how recovery initiatives fill an 'institutional void' by substituting for public administrations and providing a fundamental public service. The analysis allows the authors to extrapolate macro-, meso- and micro-level blind spots that suggest lessons to improve policy. Among the several insights offered by the chapter, the authors stress the importance of updating the technology of redistribution and making technology more accessible to recipients. They also show how the direct connection of farmers to low-income neighbourhoods allows them to provide food at low costs, which ensures fair remuneration to producers.

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Case studies	FLW interventions
<b>Chapter 4</b> Ireland, Costa Rica, Alaska (US), Brazil	<ul style="list-style-type: none"> <li>- Social protection programmes</li> <li>- Food redistribution</li> <li>- Seafood bycatch redistribution</li> <li>- Incorporation of fish bycatch and byproducts in school meals</li> </ul>
<b>Chapter 5</b> Indonesia, Mozambique, Rwanda, Timor-Leste, Lower Guinea and Faranah, Kenya	<ul style="list-style-type: none"> <li>- Investments and subsidies for new equipment</li> <li>- Infrastructures provision and maintenance</li> <li>- Training, capacity building and technical assistance</li> <li>- Networking of firms</li> <li>- Financial support schemes</li> <li>- Climate-smart post-harvest infrastructures</li> <li>- Improved access to markets</li> </ul>
<b>Chapter 6</b> European Union	<ul style="list-style-type: none"> <li>- Regulation</li> <li>- Institutions</li> <li>- Monitoring, forecasting, prevention and redistribution</li> </ul>
<b>Chapter 7</b> France, California (US)	<ul style="list-style-type: none"> <li>- Economic incentives</li> <li>- Campaigning</li> <li>- Obligation to follow the food waste hierarchy, sign a contract with food banks, sort food before donating</li> <li>- Measurement obligation for business and label for good performers</li> <li>- Food redistribution</li> </ul>
<b>Chapter 8</b> Italy	<ul style="list-style-type: none"> <li>- Fiscal incentives and discounts on waste collection tax</li> <li>- Good Samaritan Law and donation of food past the best before date</li> <li>- Software Logistics</li> <li>- Institutions</li> <li>- Data production and campaigns</li> </ul>
<b>Chapter 9</b> Romania	<ul style="list-style-type: none"> <li>- Food waste law with liability exemption</li> <li>- Registry of food recovery organisations</li> <li>- Yearly plan on reduction by business</li> <li>- VAT exemptions</li> <li>- Food redistribution</li> </ul>
<b>Chapter 10</b> Japan	<ul style="list-style-type: none"> <li>- Food recycling law and Food loss reduction promotion law</li> <li>- Valorisation</li> <li>- Campaigning and communication initiatives</li> <li>- Review of date marking and practices</li> <li>- Demand forecasting</li> <li>- Recovery and redistribution</li> </ul>
<b>Chapter 11</b> China	<ul style="list-style-type: none"> <li>- Anti-corruption policy</li> <li>- Regulation against losses across the supply chain</li> <li>- Technological and infrastructural investments</li> <li>- Empty plate movement</li> </ul>
<b>Chapter 12</b> USA	<ul style="list-style-type: none"> <li>- Good Samaritan Law</li> </ul>
<b>Chapter 13</b> Dublin (IE), London (GB), Barcelona (ES)	<ul style="list-style-type: none"> <li>- Food redistribution intermediary</li> <li>- Food service and cooked meals from surplus</li> <li>- Gleaning and transformation of gleaned food</li> <li>- Online platform for sustainability impact assessment</li> </ul>
<b>Chapter 14</b> Milan (IT)	<ul style="list-style-type: none"> <li>- Neighbourhood Hubs Against Food Waste</li> </ul>
<b>Chapter 15</b>	<ul style="list-style-type: none"> <li>- Food redistribution intermediary</li> <li>- COVID-19 emergency food redistribution</li> </ul>

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