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EXECUTIVE SUMMARY

# REDUCING FOOD LOSS AND WASTE

*Setting a Global Action Agenda*

With support from



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WRI.ORG

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Consortium for Innovation  
in Post-Harvest Loss  
and Food Waste Reduction



# FOREWORD

How is the world going to feed nearly 10 billion people while also advancing economic development and meeting the challenge of climate change? This has become one of the paramount questions of our time. Reducing food loss and waste is part of the answer.

Tackling the issue of food loss and waste can generate a “triple win.” Reductions can save money for farmers, companies, and households. Wasting less food means we can feed more people. And reductions can alleviate pressure on climate, as well as on water and land.

Fortunately, a modern movement around food loss and waste reduction is emerging. In 2015, nations of the world adopted the Sustainable Development Goals (SDGs)—including “Target 12.3,” which calls for halving the rate of food loss and waste by 2030. In 2016, a group of leaders came together to form the Champions 12.3 coalition to help inspire ambition and motivate action toward this SDG target. Numerous organizations, including those we lead, have launched initiatives to address this important issue. And recent landmark studies such as the World Resources Report *Creating a Sustainable Food Future* and the EAT-Lancet Commission’s *Healthy Diets from Sustainable Food Systems* make the case that halving the rate of food loss and waste is necessary if the world is to sustainably feed the planet over coming decades.

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The issue is now on the minds of public and private sector leaders. Ambitions have been raised. Steps are being taken. What we need now, though, is a shared vision of what needs to happen to get the world on track to halving food loss and waste. We need a Global Action Agenda.

In this report, we offer that agenda. First, we encourage countries and companies to adopt the global SDG 12.3 target as their own, measure their food loss and waste (since what gets measured gets managed), and take action on the hotspots identified. Although simple, this “Target-Measure-Act” approach is proving effective. Second, we identify a short-list of “to do’s” for each type of actor in the food supply chain. If you don’t know which actions to take, start with this list and go from there. Third, to scale up the impact and pace of these actor-specific interventions, we recommend 10 interventions that tackle food loss and waste across the entire supply chain, target a handful of food loss and waste hotspots, and help set the enabling policy and financial conditions that are necessary for success.

We hope this report will inspire you to play a role in helping create a sustainable food future. The need is urgent—because food is a terrible thing to waste.



RADISH

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# EXECUTIVE SUMMARY

Reducing food loss and waste can help meet the UN Sustainable Development Goals (SDGs) by 2030, contribute to the Paris Agreement on climate change, and sustainably feed the planet by 2050. This report lays out a **Global Action Agenda** that will help reduce food loss and waste and achieve SDG 12.3. This action agenda includes a Target-Measure-Act approach, an actor-specific “to-do” list, and 10 “scaling interventions” designed to take the approach and to-do list to scale.

## HIGHLIGHTS

- Numerous studies find that the world experiences significant levels of food loss and waste, with losses “near the farm” predominant in lower-income regions and waste “near the plate” predominant in higher-income regions.
- Halving the rate of food loss and waste is an important “no regrets” strategy that would contribute to achieving the UN Sustainable Development Goals, meeting the goals of the Paris Agreement on climate change, and sustainably feeding the planet.
- This report, based on extensive desk-based research and input from partner organizations, proposes a **Global Action Agenda** to reduce food loss and waste. It involves three main components.
- Governments and companies should follow the “Target-Measure-Act” approach: Adopt a target to halve food loss and waste by 2030, measure how much and where food is being lost and wasted, and take action on the hotspots.
- All actors in the food supply chain should kick-start their actions by pursuing a “to-do” list tailored to their specific roles.
- Governments and business leaders should pursue 10 “scaling interventions” that have the potential to rapidly scale, accelerate, and broaden deployment of the Target-Measure-Act approach and the actor-specific interventions.

## Background

**Reducing food loss and waste is an important strategy to help meet the UN Sustainable Development Goals (SDGs) by 2030, contribute to the Paris Agreement on climate change, and sustainably feed the planet by 2050.** SDG 12 aims to ensure “sustainable consumption and production patterns,” and one of its targets (SDG 12.3) calls for halving rates of food loss and waste. This in turn would contribute to meeting a number of other SDGs, such as those on hunger, poverty, and health. Recent modeling efforts indicate that halving food loss and waste rates would yield significant reductions in greenhouse gas (GHG) emissions because more efficient use of food would reduce the need for land conversion for additional food production and slow the rate of increase in fertilizer applications and methane emissions from food in landfills (Searchinger et al. 2018; Willett et al. 2019). Moreover, a recent World Resources Report (Searchinger et al. 2018) and a just-released report from the

EAT-Lancet Commission (Willett et al. 2019) both identify halving food loss and waste as a critical element in achieving a sustainable food future. The private sector is also making changes to tackle food loss and waste, with over 30 of the world’s largest global companies having set targets in line with SDG 12.3 (Flanagan et al. 2018). In short, reducing food loss and waste is rapidly rising on public and private sector agendas as a strategy to help fix an inefficient food system for the sake of people and the planet.

## About this report

This report lays out a **Global Action Agenda** for reducing the rate of food loss and waste and thereby achieving SDG 12.3. The action agenda includes a Target-Measure-Act approach, an actor-specific “to-do” list, and 10 “scaling interventions” designed to take the approach and to-do list to scale.

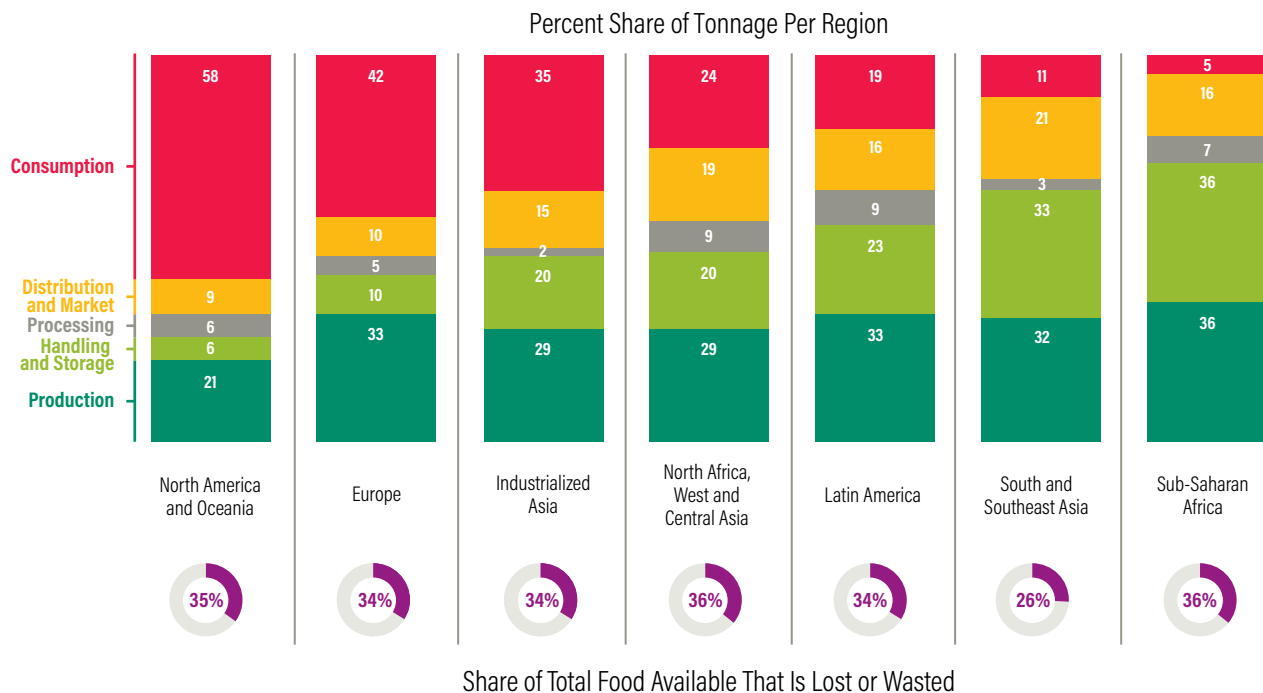
The Global Action Agenda is designed to guide businesses, governments, civil society, and other actors in the food supply chain who can play a role in tackling food loss and waste, individually and collectively.

This report was jointly prepared by WRI with support from The Rockefeller Foundation, and in collaboration with food loss and waste experts from the Consortium for Innovation in Postharvest Loss and Food Waste Reduction, Iowa State University, the University of Maryland, the Natural Resources Defense Council (NRDC), United Nations Environment Programme (UNEP), Wageningen University & Research, the Waste & Resources Action Programme (WRAP), and the World Bank.

## What is the food loss and waste challenge?

**A significant amount of food intended for human consumption is never eaten.** In 2011, the Food and Agriculture Organization of the United Nations (FAO) launched a landmark publication, *Global Food Losses and Food Waste: Extent, Causes and Prevention* (FAO 2011), with the headline finding that one-third of all food is lost or wasted between the farm and the plate. Despite its uncertainties, this figure remains the only global estimate currently available. Our assessment of more subcontinental and commodity-specific studies conducted since then suggests that the FAO data are broadly correct.

Figure ES-1 | **Distribution of Food Loss and Waste by Region and Stage in the Food Supply Chain, 2007**



Notes: Values displayed are of food loss and waste as a percent of food supply, defined here as the sum of the "Food" and "Processing" columns of the FAO Food Balance Sheet. Numbers may not sum to 100 due to rounding.  
Source: WRI analysis based on FAO (2011).

### The distribution of food loss and waste across the food supply chain varies by region of the world.

Food loss and waste at the point of consumption in homes and restaurants appears to be a hotspot of food loss and waste in high-income regions, whereas losses during handling and storage are a hotspot in low-income regions. On-farm production losses (i.e., during and just after harvest) are an issue in all regions (FAO 2011) (Figure ES-1).

**The world is calling for halving the rate of food loss and waste.** In September 2015, nations of the world formally adopted a set of 17 Sustainable Development Goals (SDGs) as part of the 2030 Agenda for Sustainable Development—global goals to end poverty and hunger, protect the planet, and ensure prosperity for all. SDG 12 seeks to “ensure sustainable consumption and production patterns.” The third target under this goal, Target 12.3, calls for halving “per capita global food waste at the retail and consumer levels and reduc[ing] food losses along production and supply chains, including post-harvest losses,” by 2030 (UN 2017).

### Why does it matter?

#### Food loss and waste matters in terms of the environment, economy, food security, jobs, and ethics.

*The environment:* The food that is lost and wasted each year accounts for an estimated 8 percent of annual GHG emissions, consumes a quarter of all water used by agriculture, and requires an agricultural area the size of China. *The economy:* The annual market value of lost and wasted food is estimated at an astounding \$940 billion globally (FAO 2015a). *Food security:* More than 1 billion metric tons of food per year is never consumed in a world where one in nine people are still undernourished (FAO et al. 2018). *Jobs:* Reducing food loss and waste could play a modest role in job creation across the supply chain, ranging from smallholder processing facilities close to the farm to technology start-up companies that help redistribute food that would otherwise be wasted. *Ethics:* Reducing food loss and waste is considered by many people as simply “the right thing to do.”

**The benefits of reducing food loss and waste can be significant.** For instance, reducing the current rate of food loss and waste by 50 percent by 2050 would have the following results:

- It would close the gap between food needed in 2050 and food available in 2010 by more than 20 percent (Searchinger et al. 2018).
- It would avoid the need to convert an area of natural ecosystems roughly the size of Argentina into agricultural land between 2010 and 2050 (Searchinger et al. 2018).
- It would lower GHG emissions by 1.5 gigatons of carbon dioxide equivalent (Gt CO<sub>2</sub>e) per year by 2050, an amount more than the current energy- and industry-related emissions of Japan (Searchinger et al. 2018).

### What is causing food loss and waste?

**Understanding why food loss and waste occurs (whether intentionally or not) is important to successfully reducing it.** The most immediate reasons food leaves the human food supply chain (the “direct causes”) tie back to concern about a food’s safety or suitability for consumption, or there being no perceived use or market for it. This may be due to deterioration or suboptimal quality, or issues such as the food’s appearance, excess supply, and seasonal production fluctuations. Leading to these direct causes are a number of “underlying drivers.” These can be technological, managerial, behavioral, or structural in nature. The technological drivers are poor infra-

structure, inadequate equipment, and suboptimal packaging. The managerial drivers are inadequate food management practices, skills, or knowledge; inflexible procurement practices; poor supply and demand forecasting and planning; and marketing strategies. The behavioral drivers are norms and attitudes, lack of awareness, and concerns about possible risks. The structural drivers are conditions in demographics, climate, policies and regulations, economics, and financing that lead to food loss and waste. These 15 underlying drivers need to be addressed if food loss and waste is to be reduced.

**The underlying drivers of food loss and waste are closely interrelated.** An instance of food loss or waste is often driven by more than one driver (e.g., rice losses may occur due to inadequate storage bags, which, in turn, may be caused by a grower’s lack of access to credit to purchase better bags). Moreover, while an underlying driver may affect one stage of the food supply chain, the generation of loss and waste might actually occur at a different stage. For instance, orders modified last-minute by food retailers at the distribution and market stage of the food supply chain can result in fruits and vegetables being left in the farm field, leading to losses during production.

**Among the various underlying drivers, some are more relevant in certain regions.** For example, lack of infrastructure is typically a more significant driver in low-income countries, whereas social norms and attitudes such as the acceptability of not eating all the food on one’s plate are often a driver in high-income countries.





Reducing food losses close to the farm (during production as well as handling and storage) can be a result of “good economic development.” As economies develop and underlying drivers shift, food loss may give way to food waste closer to the plate.

## What should be done about it?

**Governments and companies should pursue a simple but effective “Target-Measure-Act” approach to reducing food loss and waste:**



TARGET

*Set targets.* Targets set ambition, and ambition motivates action. Governments and companies should therefore adopt an explicit food loss and waste reduction goal aligned with SDG 12.3—a 50 percent reduction by 2030.



MEASURE

*Measure your food loss and waste.* The adage “what gets measured gets managed” holds true for food loss and waste as well. Quantifying food loss and waste within borders, operations, or supply chains can help decision-makers better understand how much, where, and why food is being lost or wasted. This information provides an evidence-based foundation for prioritizing interventions to reduce food loss and waste, and helps entities monitor whether they are on track to realizing their target. Governments and companies should therefore start to measure their food loss and waste and monitor progress over time.



ACT

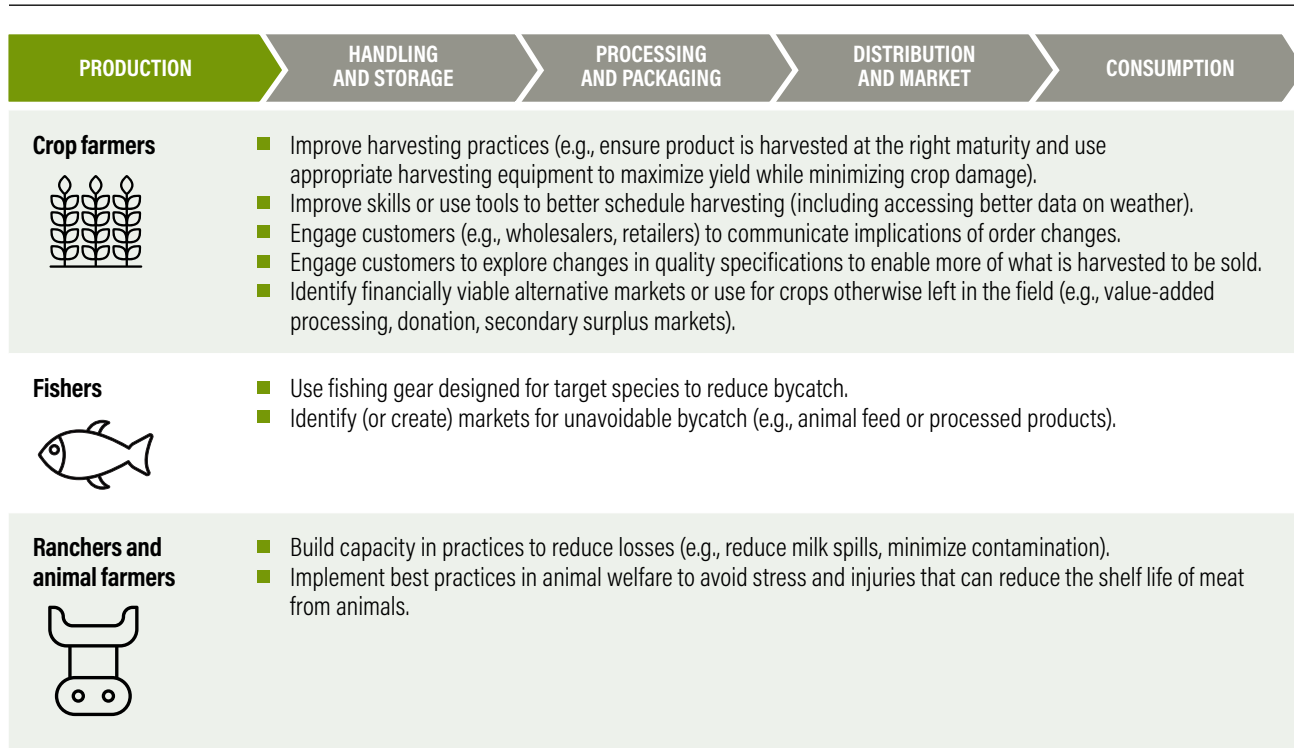
*Take action.* What ultimately matters is action. However, there is no proverbial “silver bullet” action for reducing food loss and waste. Rather, reducing it at scale will require numerous actors in the food supply chain to implement a variety of context-specific interventions. Figure ES-2 provides a priority to-do list for each type of actor to get started reducing food loss and waste. Governments, companies, farmers, citizens, and others should immediately get moving on implementing their respective to-do lists.

## Experiences from reduction initiatives that are making progress provide a number of insights on taking action:

- Awareness is a start (but only a start).
- Make the “business case” to motivate actors (so they see reducing food loss and waste as in their self-interest).
- Recognize that there is no silver bullet (a number of interventions are typically required).
- Which interventions are relevant vary between and within countries (especially depending on the level of economic development).
- Beware of knock-on effects across the supply chain (reductions at one stage might merely trigger loss and waste elsewhere).
- Collaboration between actors is crucial (especially when pursuing a “whole supply chain” approach).



Figure ES-2 | Priority “To Dos” by Actor (Not Exhaustive)



Source: Canali et al. (2014); CEC (2017, 2018, 2019); Clowes et al. (2018a, 2018b, 2019); Food Loss and Waste Protocol (2016); Global Knowledge Initiative (2017); Gunders and Bloom (2017); Hegnholt et al. (2018); HLPE (2014); ReFED (2016); Gooch et al. (2019); WWF-US (2018).

Figure ES-2 | Priority “To Dos” by Actor (Not Exhaustive), continued

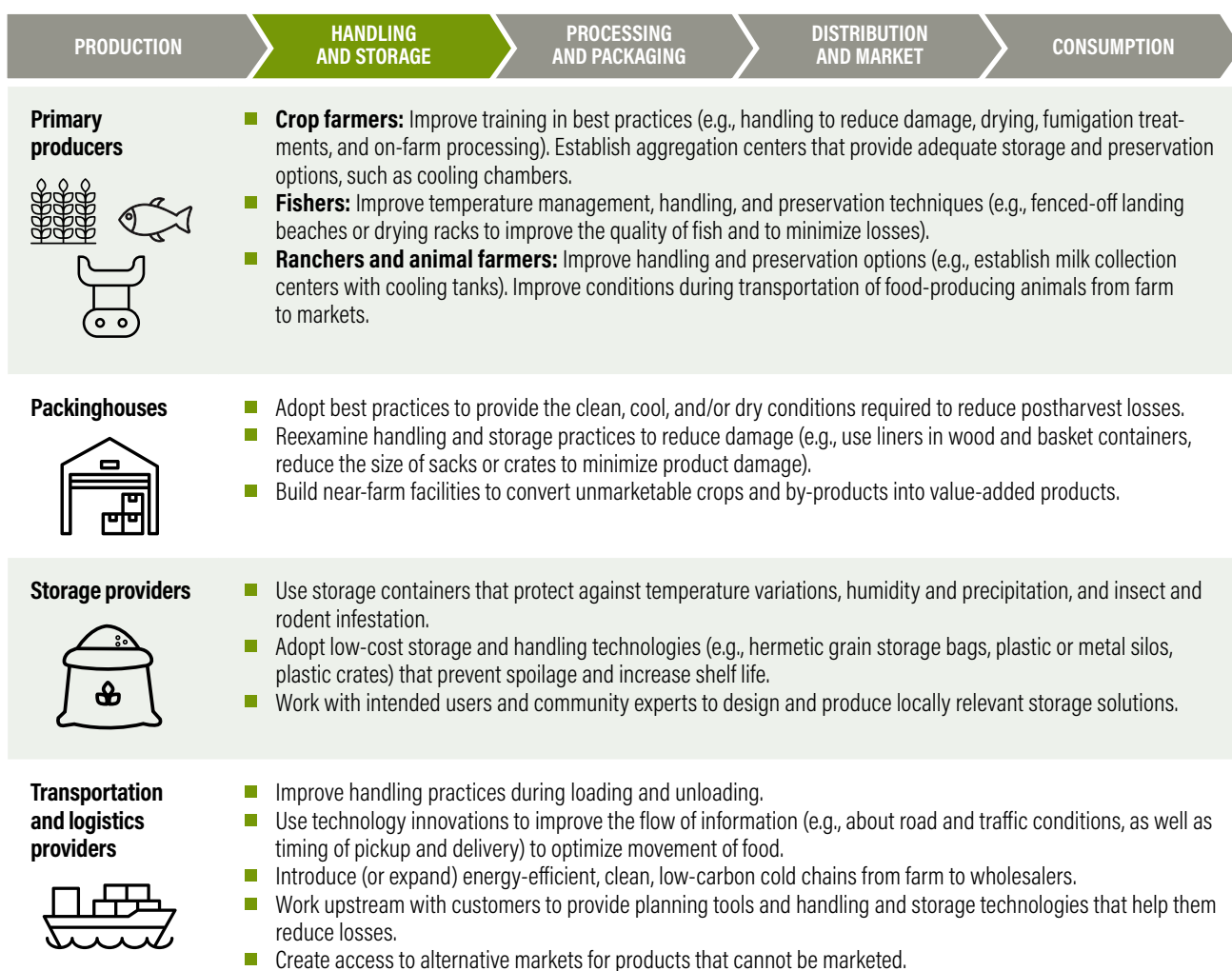


Figure ES-2 | Priority “To Dos” by Actor (Not Exhaustive), continued

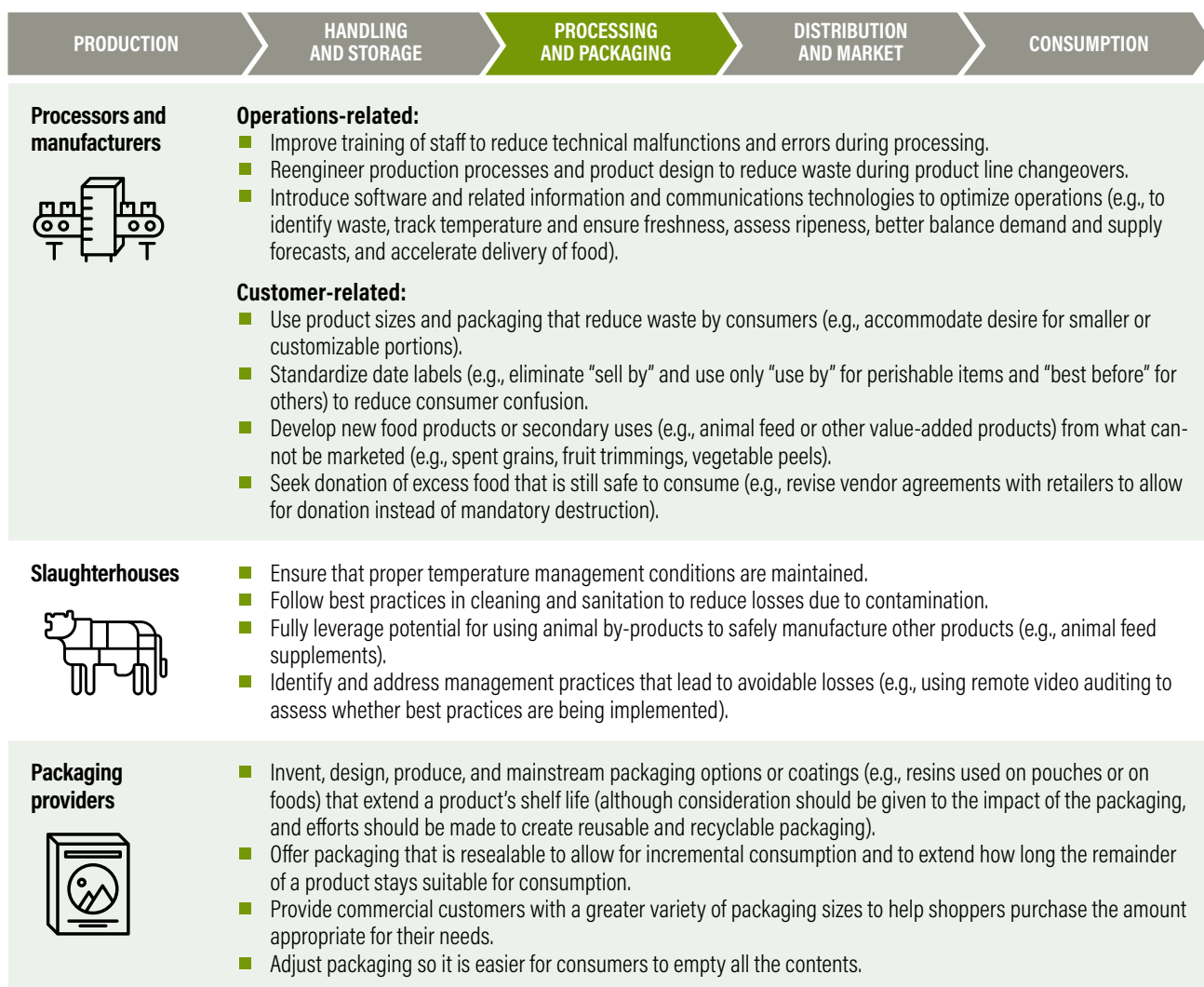


Figure ES-2 | Priority “To Dos” by Actor (Not Exhaustive), continued

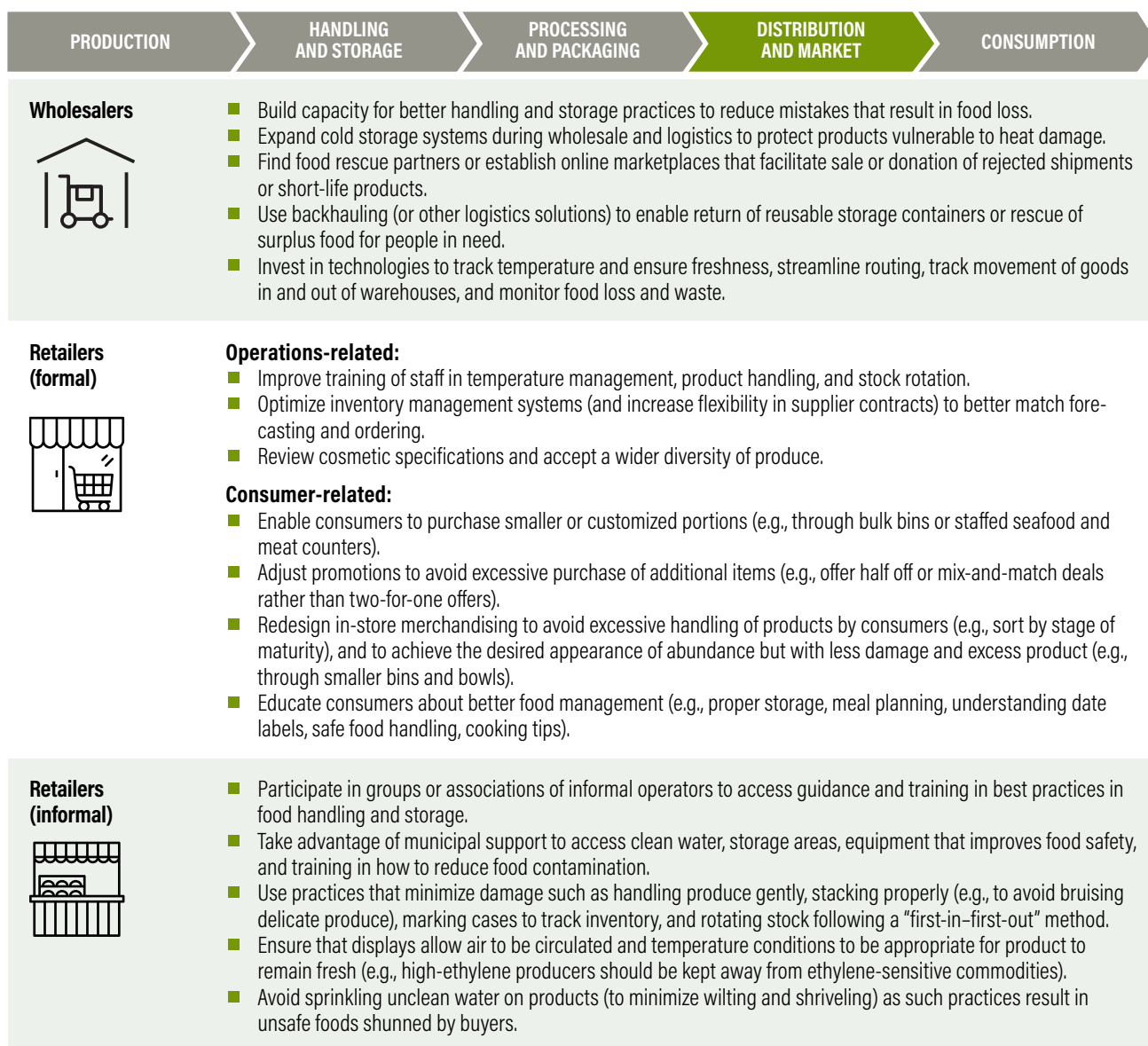


Figure ES-2 | Priority “To Dos” by Actor (Not Exhaustive), continued

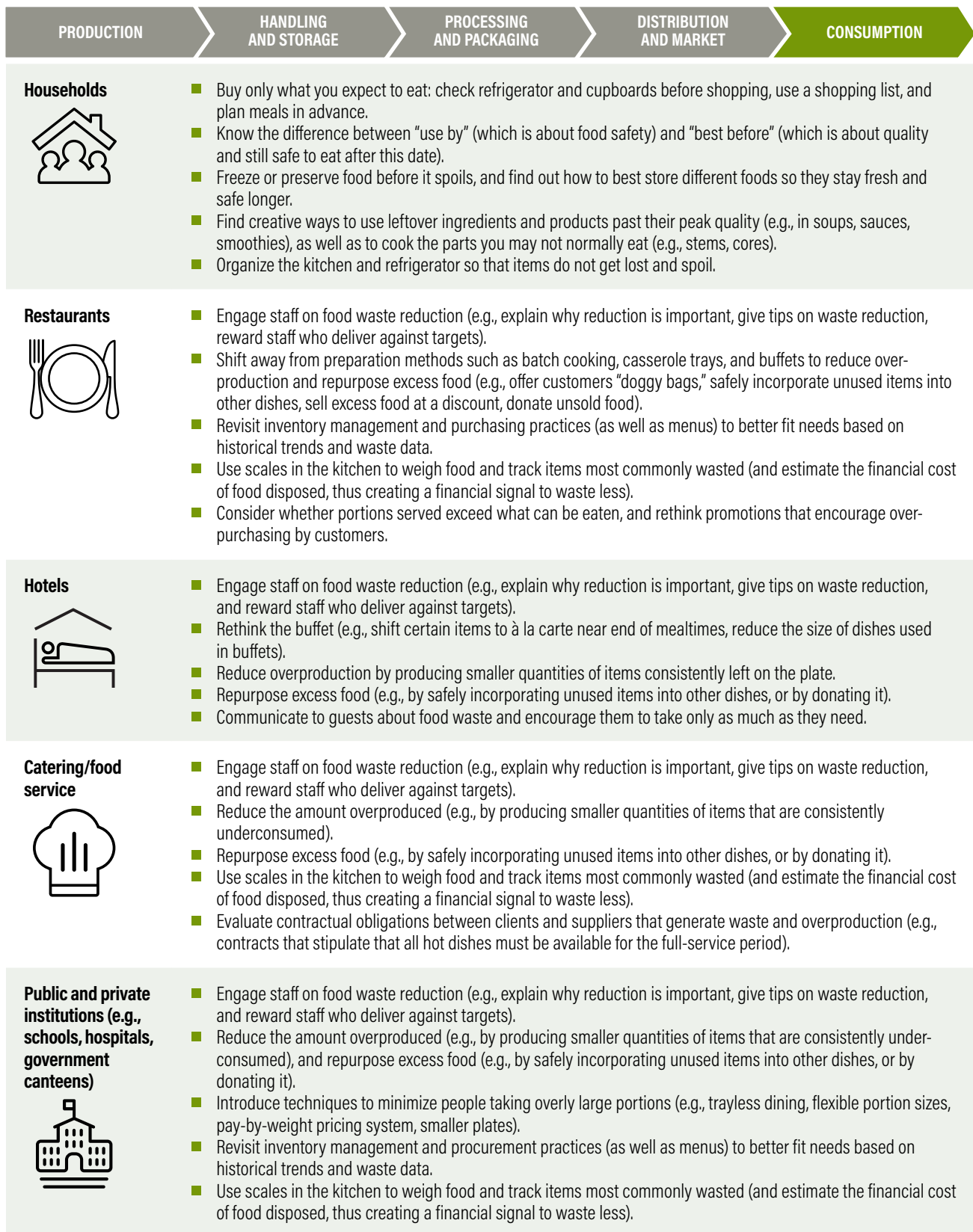
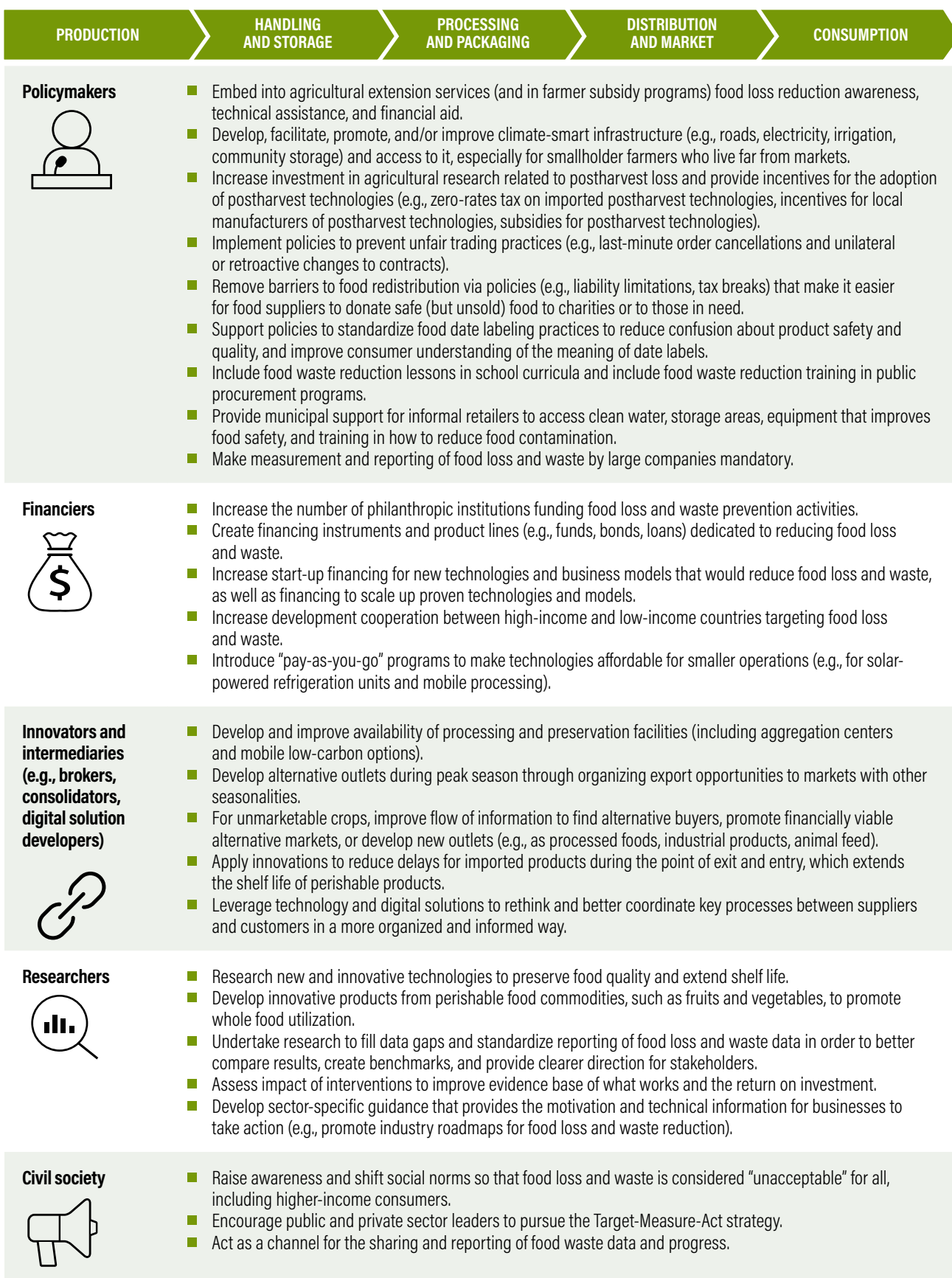


Figure ES-2 | Priority “To Dos” by Actor (Not Exhaustive), continued



## What progress has been made so far?

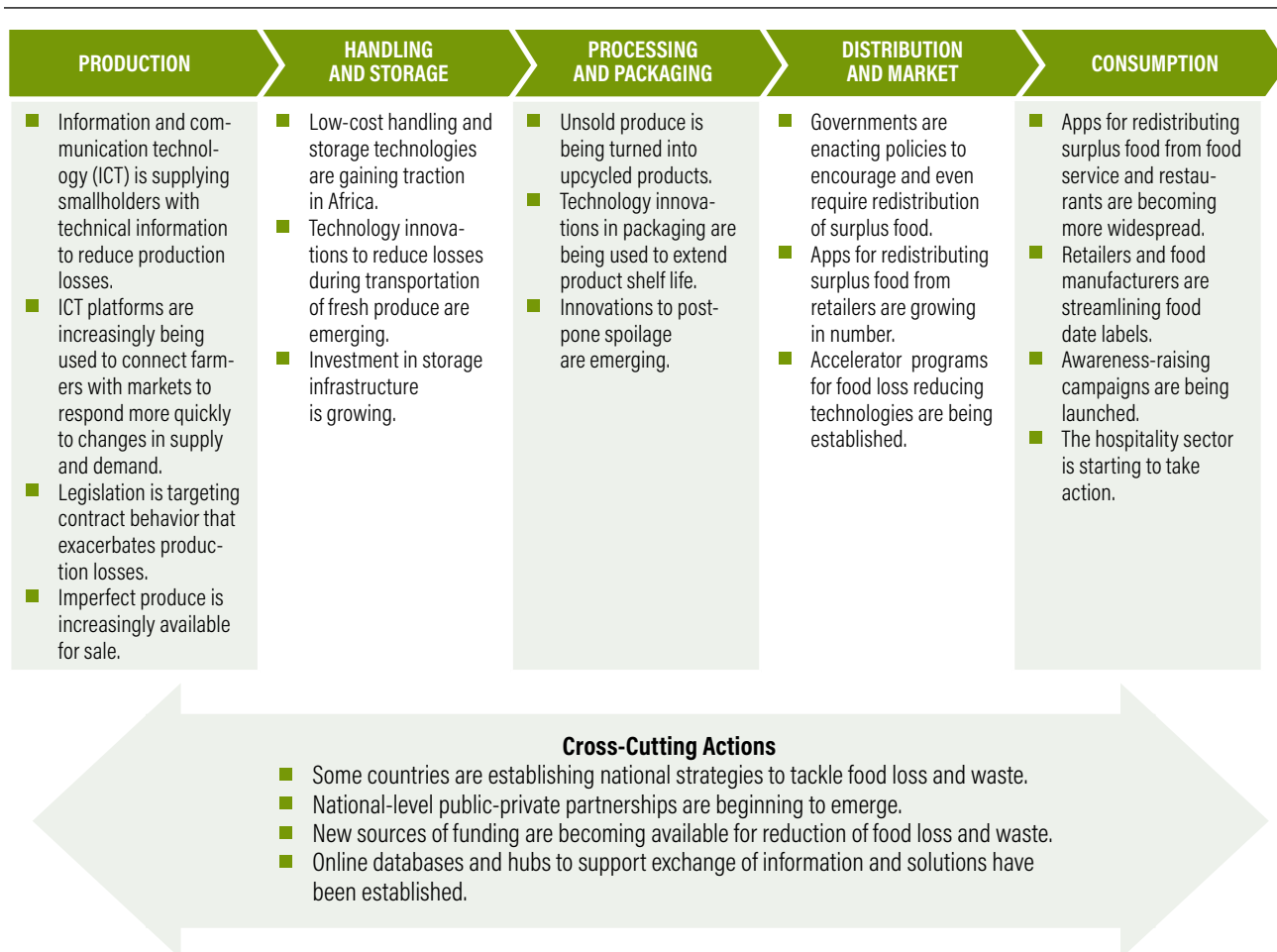
**Progress has been made toward implementing some aspects of Target-Measure-Act.** In terms of setting targets, 50 percent of the world’s population now lives in a country that has set an explicit, public target aligned with SDG 12.3 (Flanagan et al. 2018). In addition, 32 of the world’s 50 largest food companies (by revenue) independently have set—or participate in programs that have set—a food loss and waste reduction target consistent with SDG 12.3 (Flanagan et al. 2018). In terms of measurement, countries representing 12 percent of the world’s population measure food loss and/or waste within their borders, and more than 30 of the world’s largest companies are now measuring food loss and waste within their operations. In terms of taking action, over the past few years a number of

technologies, policies, and business practices have been designed along the food supply chain to tackle food loss and waste (Figure ES-3).

## What needs to happen next?

**Despite the progress to date, much more must be done and done much faster if SDG 12.3 is to be met.** Most of the specific interventions on the to-do lists are already technically possible. The problem is that too few actors are deploying them. Why? In some cases, it may be lack of awareness, concern, or focus regarding food loss and waste. In others, it may be lack of ability or resources (e.g., technical, financial). And in still others, it may be lack of collaboration across a large number of actors needed to effect change. What is needed next is a series of “scaling interventions” that address these bottlenecks.

Figure ES-3 | **Emerging Developments to Reduce Food Loss and Waste across the Supply Chain**



Source: WRI analysis.



**To address this, we propose 10 such scaling interventions that have the potential to accelerate and broaden deployment of the Target-Measure-Act approach and of the actor-specific interventions.** Three of them take a whole supply chain approach, four of them target specific hotspots of food loss and waste, and three more enhance enabling conditions for reducing food loss and waste. They may not constitute a comprehensive set, but they are a good starting point for making progress.

### **Whole supply chain approaches**

1. *Develop national strategies for reducing food loss and waste.* Increase the number of countries with national strategies, as these can be an important catalyst for Target-Measure-Act at the country level—aligning public policy, private sector action, and farmer-to-consumer behavior toward a shared goal.
2. *Create national public-private partnerships.* Increase the number of country-level public-private partnerships dedicated to achieving SDG 12.3.
3. *Launch a “10x20x30” supply chain initiative.* Launch a voluntary private sector campaign where at least 10 corporate “power players” commit to Target-Measure-Act themselves and then engage their own 20 largest suppliers to do the same and achieve a 50 percent reduction in food loss and waste by 2030.

### **Hotspot-specific approaches**

4. *Invigorate efforts to strengthen value chains and reduce smallholder losses.* Invigorate efforts to help smallholder farmers reduce food losses during production and storage.
5. *Launch a “decade of storage solutions.”* Kick-start a focused collaboration among storage providers, cold chain alliances, financiers, and governments to get income-sensitive, climate-smart storage technologies into the hands of farmers and distribution networks around the world.

6. *Shift consumer social norms.* Leveraging the latest findings of behavioral science, engage grassroots campaigns, social media, religious communities, and others to make “wasting food” as unacceptable as littering now is in many countries.
7. *Go after GHG emissions reductions.* Use sector-led programs to tackle food loss and waste from beef, dairy, and rice head on, and get the reduction of food loss and waste into nationally determined contributions to the Paris Agreement on climate change.

### **Enabling approaches**

8. *Scale up financing.* Develop funds and financing products dedicated to investing in innovation and scaling up enterprises, technologies, and programs that would reduce food loss and waste.
9. *Overcome the data deficit.* Over the next five years, a concentrated push to measure food loss and waste is needed to overcome this data deficit in time to support achievement of SDG 12.3.
10. *Advance the research agenda.* More research is still needed to answer multiple “next generation” questions that would, in turn, help refine food loss and waste reduction strategies and advance implementation of the global agenda.

## **A call to action**

### **The Target-Measure-Act approach, combined with the actor-specific interventions and the 10 scaling interventions, comprise our proposed Global Action Agenda.**

Momentum is growing, but the world has much more to do. Only 11 years remain to achieve the targets of the SDGs, and food loss and waste is still pervasive. Actors ranging from governments, businesses, farmers, consumers, and everyone in between can play a role in the Global Action Agenda. With worldwide participation, we just might realize a future where no food fit for consumption goes to waste.

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World Resources Institute is a global research organization that turns big ideas into action at the nexus of environment, economic opportunity, and human well-being.

### Our Challenge

Natural resources are at the foundation of economic opportunity and human well-being. But today, we are depleting Earth's resources at rates that are not sustainable, endangering economies and people's lives. People depend on clean water, fertile land, healthy forests, and a stable climate. Livable cities and clean energy are essential for a sustainable planet. We must address these urgent, global challenges this decade.

### Our Vision

We envision an equitable and prosperous planet driven by the wise management of natural resources. We aspire to create a world where the actions of governments, businesses, and communities combine to eliminate poverty and sustain the natural environment for all people.

## ABOUT THE PARTNERS

### Consortium for Innovation in Postharvest Loss and Food Waste Reduction

Established in 2019, the Consortium for Innovation in Postharvest Loss and Food Waste Reduction brings together experts and thought leaders to advance a common research agenda for gaining efficiencies within the global food system. The Consortium represents expertise, knowledge, and innovation in postharvest loss and food waste reduction from institutions in the Americas, Europe, Middle East, and Africa, and across the public, private, and nonprofit sectors.

### The Ed Snider Center, University of Maryland

Housed at University of Maryland's Robert H. Smith School of Business, the Ed Snider Center promotes free enterprise and markets by researching what makes individuals, organizations, and markets flourish; educating thought leaders and influencers; and partnering with executives to apply the center's research to real world challenges. Find out more at <https://www.rhsmith.umd.edu/centers-excellence/snider-center-enterprise-markets/about-us>.

### Iowa State University

Iowa State University is a public, land-grant university, known worldwide for excellence in science and technology, discovery, and innovation, and a student-centered culture. Iowa State's research community aims to help solve society's greatest challenges and improve lives by integrating the research mission with the education and outreach missions of the university. Iowa State University leads the newly established Consortium for Innovation in Postharvest Loss and Food Waste Reduction.

### The Natural Resources Defense Council

The Natural Resources Defense Council is an international nonprofit environmental organization with more than 2.4 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City; Washington, DC; Los Angeles; San Francisco; Chicago; Bozeman, Montana; and Beijing. Visit us at [nrdc.org](http://nrdc.org).

### The Rockefeller Foundation

The Rockefeller Foundation's mission—unchanged since 1913—is to promote the well-being of humanity throughout the world. Today the foundation advances new frontiers of science, data, policy, and innovation to solve global challenges related to health, food, power, and economic mobility. The Rockefeller Foundation seeks to inspire and foster large-scale human impact that promotes the well-being of humanity by identifying and accelerating breakthrough solutions, ideas, and conversations.

### United Nations Environment Programme

Established in 1972, UNEP is the voice for the environment within the United Nations system. It acts as a catalyst, advocate, educator, and facilitator to promote the wise use and sustainable development of the global environment. Visit UNEP online at <http://www.unenvironment.org>.

### Disclaimer

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### Wageningen University & Research

The mission of Wageningen University & Research is "to explore the potential of nature to improve the quality of life." Over 6,500 employees and 12,000 students from more than a hundred countries work everywhere around the world in the domain of healthy food and living environment. The strength of Wageningen University & Research lies in its ability to join the forces of specialized research institutes and the university.

### World Bank Group

The World Bank is a vital source of financial and technical assistance to developing countries around the world—a unique partnership to reduce poverty and support development. The World Bank Group consists of five organizations managed by their member countries. Visit the World Bank online at <http://www.worldbank.org>.

### WRAP

WRAP's vision is a world in which resources are used sustainably. Our mission is to accelerate the move to a sustainable resource-efficient economy through reinventing how we design, produce, and sell products; rethinking how we use and consume products; and redefining what is possible through reuse and recycling. Find out more at [www.wrap.org.uk](http://www.wrap.org.uk).

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