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Survey and Workshop on Preventing and Reducing Food Loss and Waste (FLW) to Achieve Sustainable Food Systems in APEC Economies

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Produced by

Dr. Christiam Méndez-Lazarte

Professor - Researcher
Universidad de Lima
Email: cmendezl@ulima.edu.pe

Project overseer:

Ministry of Agrarian Development and Irrigation - MIDAGRI

Lizardo Calderón Romero

Email: lcalderon@midagri.gob.pe

José Luis Alarcón

Email: jalarcon@midadri.gob.pe

Mónica Isabel Loayza Pinedo

Email: mloayza@midagri.gob.pe

For

Asia-Pacific Economic Cooperation Secretariat 35 Heng Mui Keng Terrace

Singapore 119616
Tel: (65) 68919 600
Fax: (65) 68919 690
Email: info@apec.org Website: www.apec.org

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Introduction

Food loss and waste (FLW) undermine the sustainability of global food systems. When food is lost or wasted, all the resources used in its production—including water, land, energy, labor, and capital—are also wasted. Additionally, the disposal of FLW in landfills contributes to greenhouse gas emissions, accounting for 8–10% of global greenhouse gas emissions (United Nations Framework Convention on Climate Change, 2020), exacerbating climate change. FLW also negatively impacts food security and availability, increasing food prices (United Nations, 2022). The FAO says reducing food loss and waste (FLW) can significantly improve food availability and access (FAO, 2019). However, the impact of these reductions varies depending on the extent of their implementation and the stage of the supply chain where the interventions occur (FAO, 2011; FAO & World Resources Institute, 2019).

Globally, approximately one-third of all food produced for human consumption is lost or wasted, which amounts to about 1.3 billion tons annually (United Nations, 2022). Post-harvest losses for fruits and vegetables can exceed 50% (FAO, 2011). According to FAO estimates, the food lost and wasted each year could feed 1.26 billion hungry people worldwide (FAO, 2019). These figures highlight the urgency of addressing FLW, especially in developing regions.

One of the key challenges governments faces is the lack of detailed information about FLW and limited institutional capacity to design and implement effective policies. In the context of APEC member economies, climate change continues to complicate efforts to reduce FLW. It is crucial to evaluate the measures implemented to address this issue and identify areas for improvement.

Measuring the implementation of FLW policies presents a critical opportunity to advance reduction efforts across APEC economies. A well-designed measurement process enables better resource allocation and regulatory adjustments, leading to substantial reductions in FLW over time. By quantifying both the impact and the implementation of these policies, economies can ensure more efficient use of resources and foster greater accountability.

Progress in preventing and reducing FLW varies significantly across APEC economies. More developed economies have established stronger mechanisms to address FLW, while others face constraints such as limited resources and institutional capacity, which hinder the implementation of concrete actions. Understanding these disparities is essential for developing effective, region-wide solutions.

This report contributes to ongoing efforts by focusing on four key dimensions essential for the successful implementation of FLW policies: strategy and planning, leadership and governance, policy instruments, and measurement. These dimensions provide a structured framework for systematically monitoring progress and verifying achievements in each area. The report also identifies critical factors related to measuring FLW in APEC economies, such as different definitions of FLW, the stages of the supply chain involved, the methodologies employed, and the classification of food products affected.

Moreover, the report presents an analysis of FLW policy implementation in nine APEC economies, highlighting progress, challenges, and best practices that can be shared across the region. The study examines various indicators used to report FLW, enabling a more accurate and standardized evaluation across member economies.

In line with these goals, objectives of this report are to:

- Assess the current status of FLW policies in APEC economies, identifying gaps and opportunities in their implementation.

- Develop a comprehensive framework for measuring FLW, utilizing indicators that reflect the implementation of FLW processes, policy effectiveness, and data collection capacities, based on recommendations from international organizations such as the Inter-American Development Bank (IDB) and the FAO.

- Facilitate the sharing of best practices and strengthen cooperation among APEC economies, helping member economies move towards a more coordinated and effective approach to reducing FLW.

Background on the metrics.

The implementation of policies for preventing and reducing FLW reduction across APEC economies faces numerous challenges, particularly when considering the diversity in economic development, infrastructure, and institutional capacities. One of the primary obstacles is the lack of reliable and consistent data across food supply chains. Accurate and comprehensive data is essential for developing evidence-based policies, yet many economies struggle to gather sufficient data to quantify the scale of FLW. This issue is exacerbated by the complexity of food chains, where losses occur at various stages, making it difficult to design effective interventions without accurate measurement (Chang & Hsu, 2017).

Inconsistent data collection methods hinder economies' abilities to track and measure FLW accurately. Developed economies often have more robust systems in place, but developing economies face resource constraints, limited institutional capacity, and a lack of awareness regarding the importance of data collection in this area (Chang & Hsu, 2017). Furthermore, without reliable data, it becomes difficult to monitor the progress of policy implementation or to assess where targeted interventions are most needed. This gap in data also limits the ability of policymakers to set realistic goals for FLW reduction and complicates efforts to develop standardized methods for comparison across economies (APEC Secretariat, 2018).

In this context, difficulties in measuring FLW arise from multiple aspects, including information availability, measurement methods, terminology, and the need for a holistic vision of the supply chain. One significant barrier is the low accuracy and reliability of domestic-level data, when it is available. In many economies, the fragmentation and lack of comparability of information across sectors lead to an incomplete picture of food losses and waste along the supply chain (Cattaneo et al., 2021). Another factor contributing to the inconsistency in FLW figures is the failure to include pre-harvest losses in many classification systems (Delgado et al., 2021). This omission skews the overall data, leaving out key points of loss in the early stages of production.

Moreover, variability in measurement methods and estimates of food losses and waste exacerbate the challenges of gathering accurate data (Hoehn et al., 2023). The methodology for measuring FLW needs to adopt a holistic approach that integrates both qualitative and quantitative data at different stages of the value chain (Delgado et al., 2021). Such an approach would allow for more precise tracking of FLW and help economies identify critical points of intervention.

Another significant challenge is the lack of consensus on both the terminology and the methodology for measuring FLW. The subjectivity in defining and classifying FLW further complicates the standardization of data collection methods (Hoehn et al., 2023). Without a unified framework for terminology and methodology, it is difficult for economies to compare their progress in reducing FLW or to share best practices effectively. This inconsistency is particularly evident in the different ways food losses are defined and categorized across economies, creating gaps in the comparability of data.

Furthermore, the cross-sectoral nature of FLW reduction efforts introduces additional complexity. Reducing FLW requires the collaboration of multiple sectors, including government ministries, private industry, and civil society organizations. However, in many APEC economies, these sectors

often operate with competing priorities, making it difficult to create a cohesive strategy for FLW reduction. For example, government ministries may prioritize different aspects of FLW, such as agricultural production, waste management, or food security, often resulting in fragmented efforts that lack coherence (Chang & Hsu, 2017). This lack of coordination is further complicated by the limited involvement of the private sector and non-governmental organizations, which are essential for driving innovation and investment in FLW reduction initiatives (APEC Secretariat, 2018).

Additionally, one of the most pressing challenges is the lack of awareness and understanding of FLW, both among policymakers and the general public. This issue, combined with the complexity of the supply chain and the interactions between the various parties involved, makes it difficult to design and implement effective policies (Hoehn et al., 2023). Many economies face competing policy priorities, and FLW reduction often falls behind other pressing issues in the food system, such as food security or agricultural productivity (Cattaneo et al., 2021). As a result, FLW reduction policies are frequently underfunded and underdeveloped, limiting their overall effectiveness.

Logistical and technological limitations also present significant barriers to implementing FLW reduction policies. In many economies, inadequate infrastructure—such as storage facilities and efficient transport systems—leads to substantial food loss throughout the supply chain. These losses are often concentrated in the early stages, such as post-harvest, due to factors like poor storage conditions and inefficient processing techniques. These logistical challenges underscore the need for investment in infrastructure that supports better food handling practices across the supply chain (APEC Agricultural Technical Cooperation Working Group, 2022).

Measuring FLW is equally complex, given the diversity of food systems and the absence of standardized measurement frameworks across APEC economies. While some advanced economies have developed robust tracking systems, many developing economies lack the necessary resources and technical capacity to implement similar frameworks. Without a unified approach, economies struggle to establish baseline data, track progress, and compare outcomes across the region. Standardization of FLW metrics would allow for better monitoring and help identify best practices that can be adapted across different contexts (Chang & Hsu, 2017).

The disparity in measurement methodologies between economies poses an additional challenge. Developing a common framework for measuring FLW could help economies improve data accuracy and facilitate cross-economy comparisons. However, achieving such standardization requires significant capacity-building efforts, particularly in developing economies where resources for implementing advanced data collection and monitoring systems are limited. APEC initiatives have highlighted the importance of developing shared methodologies and building the technical capacities of economies to implement these systems effectively (APEC Secretariat, 2018).

Public-private partnerships (PPPs) can be instrumental in overcoming these challenges, particularly by fostering innovation and investment in FLW reduction technologies. Governments can play a crucial role by incentivizing the private sector to invest in FLW reduction efforts, such as through tax breaks, subsidies, or regulatory mandates. Similarly, the private sector can offer technological solutions and innovative approaches that enhance the efficiency of supply chains and reduce losses

at various stages. Encouraging these partnerships could drive more effective policy implementation and help overcome financial and technological barriers (APEC Agricultural Technical Cooperation Working Group, 2022).

In conclusion, while APEC economies have made progress in developing policies to prevent and reduce FLW, significant challenges remain. These include the lack of reliable data, the need for cross-sectoral collaboration, logistical and technological limitations, and the absence of standardized measurement frameworks. By addressing these barriers through capacity-building, knowledge sharing, and public-private partnerships, APEC economies can improve their FLW policies and work towards achieving significant reductions in FLW. As economies continue to refine their approaches, it will be essential to establish stronger data collection systems, enhance cross-sector collaboration, and create a unified framework for measuring FLW across the region (APEC Secretariat, 2018).

Framework: Public Policy Implementation for FLWs approach

One of the main opportunities identified in this study is to assess the progress of economies in relation to the implementation of FLW policies. To this end, the conceptual framework used in this study propose to differentiate between two types of fundamental indicators: process indicators and outcome indicators.

Process indicators focus on operational activities, measuring efficiency and allowing for continuous monitoring. These indicators can be both quantitative and qualitative, and their goal is to identify opportunities that facilitate informed decision-making and enable quick adjustments to policies when necessary. Specifically, these indicators measure concrete actions within the policy implementation process, evaluating the efficiency of operations, resource use, and the real-time identification of bottlenecks that may hinder progress.

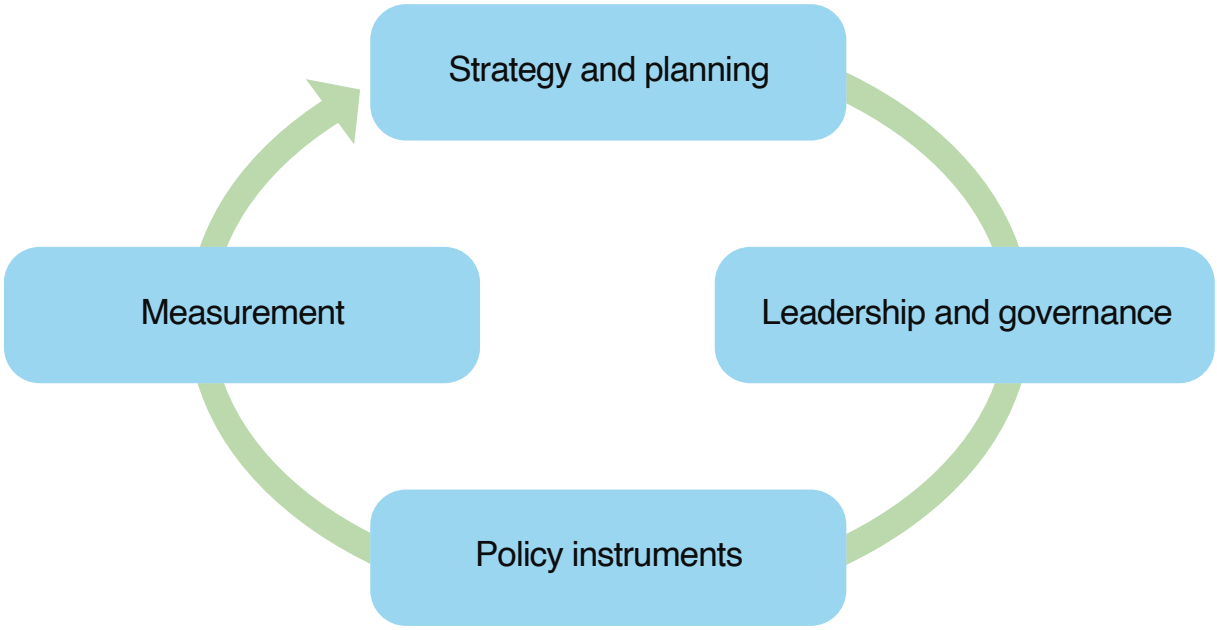
On the other hand, outcome indicators are oriented towards measuring the long-term impact of policies on society. They focus on achieving specific objectives and the significant changes that these policies generate in overall well-being, such as improvements in public health, education, food security, or economic development. These indicators are crucial for assessing the degree to which strategic objectives and goals defined in public policies have been achieved. Additionally, they provide critical information about the enduring effects of interventions, beyond immediate results, allowing for adjustments, resource reallocation, and improvements in the effectiveness of government programs.

Process indicators

The evaluation of the implementation process of public policies related to FLW in APEC economies has been structured around four key dimensions: i) strategy and planning, ii) leadership and governance, iii) policy instruments, and iv) measurement of FLW. Altogether, these dimensions offer a comprehensive framework for thoroughly analyzing how APEC member economies are advancing in the adoption and execution of their policies, as well as for identifying areas for improvement and opportunities for strengthening the management of these policies.

The strategy and planning dimension should focus on setting clear, achievable goals aligned with the needs and capacities of various actors in the agri-food system. The planning process should include identifying critical areas for measurement, based on an analysis of the idiosyncratic conditions of each economy, as well as specific to each sector. Additionally, it is crucial for economies to secure the necessary financial and human resources for the effective implementation of public policies. Designing specific strategies tailored to the issue of FLW is essential to ensure tangible results.

Figure 1. Dimensions of public policy implementation process.



Regarding the leadership and governance dimension, this aims to assess the level of commitment and coordination capacity among key actors in the agri-food system, with a particular emphasis on intersectoral collaboration. The implementation of governance mechanisms that promote active participation and effective communication among stakeholders is crucial. Furthermore, it is necessary to establish strong leadership for guiding and managing inertia to change and adopting new practices that facilitate the transformation of the agri-food system, promoting a collaborative and results-oriented approach.

The policy instruments dimension refers to the development of specific regulations or tools for reducing FLW, as well as promoting efficient practices within the agri-food system. Economies should design and implement incentives that encourage the adoption of sustainable practices by all involved actors. Additionally, it is fundamental to promote awareness campaigns aimed at educating both the general population and organizational leaders about the importance of preventing and reducing and preventing FLW, thereby fostering a cultural shift towards sustainability.

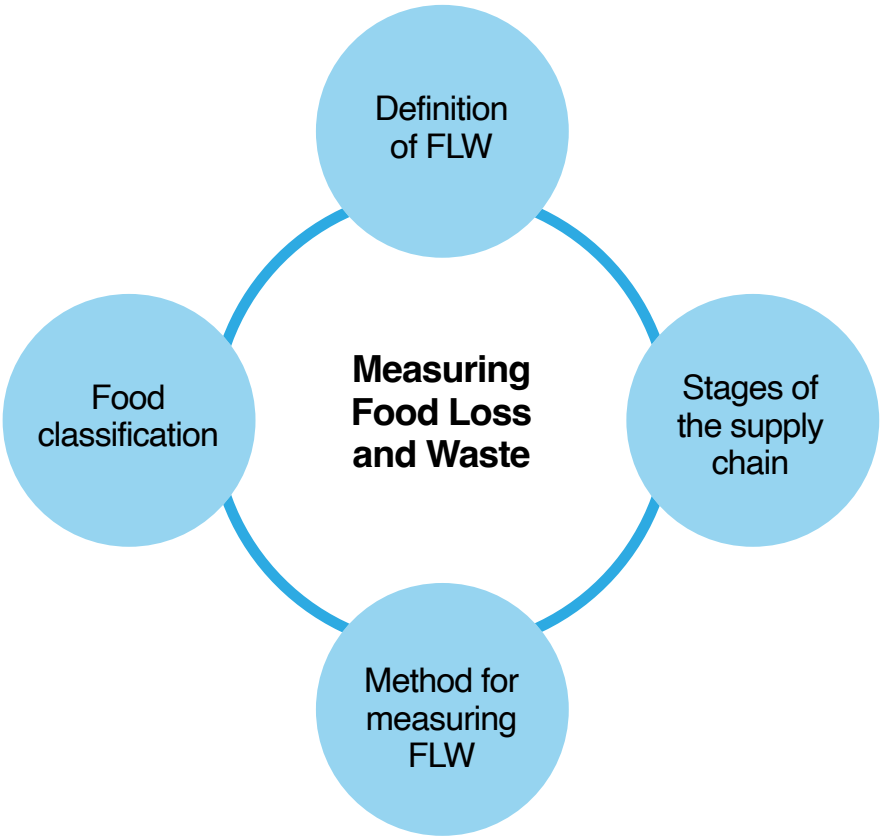
Finally, the measurement dimension involves economies defining clear and precise metrics to assess the success of policies aimed at preventing and reducing and preventing FLW. It is necessary to implement systems for periodic data collection that allow for continuous monitoring and effective feedback to adjust public policies based on the results obtained. Moreover, economies should evaluate their interventions to identify opportunities for improvement and replicate successful strategies observed in other APEC member economies, fostering a mutual learning approach.

Outcome indicators

The Food and Agriculture Organization of the United Nations (FAO) has developed in 2011 one of the most consulted or referred global estimations in studies on FLW (Gustavsson et al., 2011). Subsequently, several methods have been designed, with different approaches to measure FLW, but all showing opportunities for improvement to be applied on a global scale, being one of it the definition of food losses and food waste (Hoehn et al., 2023).

From the literature review on measurement models, there are four key elements to consider as a starting point to initiate the process of measuring FLW: i) definition of FLW, ii) classification of food, iii) stages of the food supply chain and iv) methods applied for each stage.

Figure 2. Key elements for the measurement of food losses and waste.



Agreeing on a basic or standardized definition of FLW is an opportunity to improve its measurement and comparability in APEC economies (Chan & Shih-Hsun, 2017).

Table 1. Example of food groups.

FAO, 2011	FAO, 2019
Cereals	Cereals and pulses
Oilcrops and pulses	
Fruits and vegetables	Fruits and vegetables
Meat	Meat and animal products
Fish	
Roots and tubers	Roots, tubers, and oil-bearing crops
Dairy	Other

The classification of food is another relevant aspect that needs to be delimited and standardized to make comparisons between economies. Foods can be classified into different groups, such as foods of animal origin, foods of plant origin, cereals, fruits, vegetables, dairy products, meats, fish, eggs, pulses, among others (Cattaneo et al., 2021). However, there are different classifications depending on the organization and research author.

The stages of the food supply chain are fundamental to understanding and addressing the FLW problem, as they help to circumscribe the causes and focuses public policy actions. The stages of the supply chain considered for measuring FLW include agricultural production, handling and storage, processing and packaging, distribution and households (Gascón et al., 2022; Kim & Park, 2023), these vary slightly according to the various institutions and reference authors. These stages have been used in studies to understand FLW in different economies. (Kim & Park, 2023).

Table 2. Examples of supply chain stages

Gustavsson et al., 2011	CEC, 2021	BID, 2020	FAO, 2019
Agriculture	Primary Production	Production	Harvest
			Post-harvest
Post-harvest		Manipulation and storage	Transportation, storage and distribution
Processing	Processing and Manufacture	Processing and packaging	Processing and packaging
Distribution	Distribution and Wholesale	Distribution	
Consumption	Retail	Consumption	Retail
	Food Service / Institutions		Public and household consumption
	Household		

A variety of methods exist to measure food loss and food waste including: analysis of production and sales data, material flow modeling, direct weighing of discarded food, diary analysis, use of mobile apps to record wasted food, consumer and producer surveys, carbon footprint analysis, life cycle assessments, collection of production volume data, and use of FAO food balance data, among others (Schanes et al., 2018; Kim and Park). Some of these methods have been applied in economies such as Korea; Japan; South Africa; Belgium; and Brazil, among others (Kim and Park, 2023). In the face of this diversity of methods, it is important to unify a methodology for measuring FLW that allows comparison between economies.

Classes of FLW indicators typically include physical quantity (Gustavsson et al., 2011), monetary value, nutritional value (Fabi et al., 2021), and percentages (Gustavsson et al., 2011) (Ver Figure 2). These indicators are often presented for total amounts, food groups, and stages of the supply chain.

Indicators for FLW encompass the quantity of lost or wasted food, often measured in tons, at different stages of the supply chain, such as agricultural production, distribution, and consumption (Gustavsson et al., 2011). Finally, it is considered important to measure FLW in terms of physical quantities and relate them to the use of natural resources (Fabi et al., 2021).

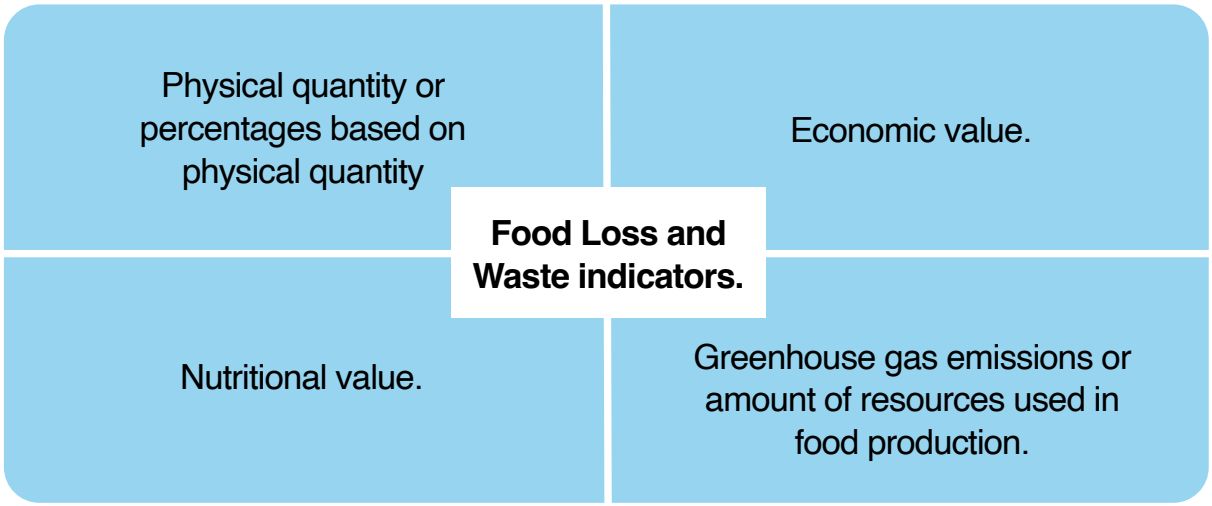
Additionally, indicators consider the environmental dimension, such as the impact of greenhouse gas emissions associated with the production of lost or wasted food (Gustavsson et al., 2011; Fabi et al., 2021). Another indicator is the amount of resources used in the production of food that ultimately goes to waste (Gustavsson et al., 2011).

Some indicators include a Food Loss Index (FLI), which measures the economic value of food losses using on-farm prices of agricultural products (Fabi et al., 2021). Alternative measures are also used that express food loss in terms of lost calories, which are relevant for interventions focused on improving nutritional outcomes (Fabi et al., 2021).

Another class of indicators includes the percentage of global food loss, the percentage of food loss in different product groups, and the percentage of food loss in low- and middle-income regions (Fabi et al., 2021). Additionally, the percentage of food loss in perishable products such as fruits and vegetables are considered in comparison to other crops (Fabi et al., 2021).

Finally, the FAO and the United Nations Environment Programme (UNEP) have created two indicators to measure Sustainable Development Goal 12.3. One is called the Food Loss Index (FLI) (FAO, 2019), and the other is the Food Waste Index (FWI) (UNEP, 2021). Although both indicators have their limitations, they are global indicators that would enable the comparison of economies' progress regarding FLW. The FLI focuses on the percentages of food removed from the supply chain, monitoring the development of these percentages over time compared to a baseline period, currently set in 2015, to track progress towards Sustainable Development Goal 12.3 (FAO, 2019). On the other hand, the FWI focuses on the amount of food wasted at the consumer stage, providing a measure of food waste in terms of tons (FAO, 2019).

Figure 3. Class of indicators for FLW.



Source: Gustavsson et al., 2011; Fabi et al., 2021

Also, classes of indicators expressed in the percentage of FLW in an economy, by food group, and at different stages of the supply chain are considered. Finally, complex indices such as the Food Loss Index and Food Waste Index have been developed to monitor the progress towards SGD 12.3 (FAO, 2019).

There are also indicators aimed at monitoring progress in the measurement of FLW. These indicators consider the establishment of an explicit target to reduce food loss and/or waste by 50% by 2030, geographic coverage: the percentage of the domestic population under the target, and the calculation and disclosure of data on FLW consistent with the FLW Accounting and Reporting Standard (Hanson et al., 2022).

Some economies have developed domestic plans with dashboards to monitor indicators of FLW. These dashboards guide specific actions aimed at reducing food losses and waste. The use of such tools reflects a commitment to data-driven policy-making and continuous improvement. By integrating real-time data and tracking progress against set goals, these dashboards help ensure that strategies remain effective and responsive to evolving challenges in food waste management.

Methodology

The study was conducted in two phases. In the first phase, a survey was distributed to the 21 APEC member economies, of which nine participating economies responded. The survey required each economy's representatives to provide an official and verifiable source of secondary information for each affirmative response. This approach aimed to ensure that the data provided was reliable and accurately represented progress in implementing policies for preventing and reducing and preventing FLW.

For the analysis of the information, a mixed-methods technique was employed. Initially, a descriptive analysis of the overall results from the survey was carried out, followed by a case analysis for each of the 9 participating economies, which allowed a more detailed examination of their performance with respect to the four dimensions of public policy implementation process identified in the conceptual framework of the study.

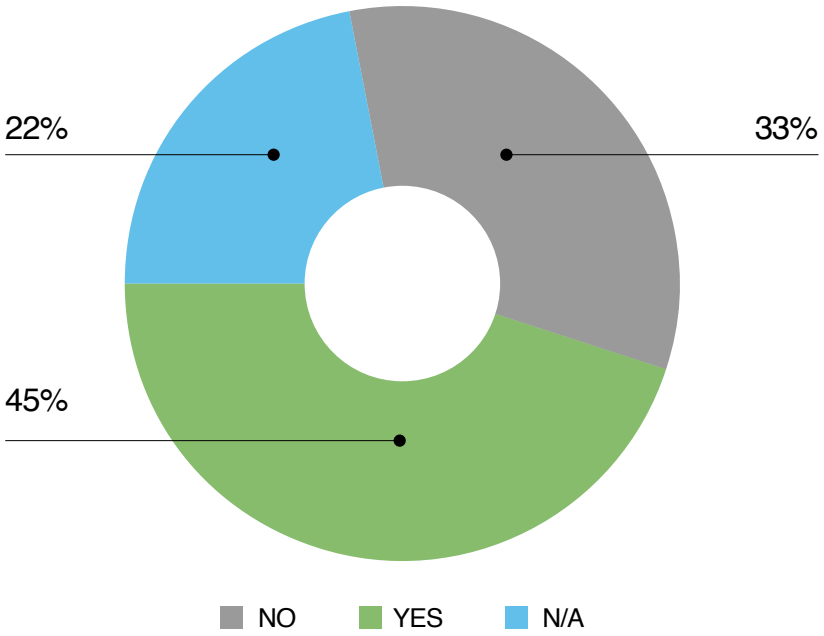
Therefore, in a second phase, each economy was evaluated, through a rubric developed, to rate its progress in each of the four dimensions of the public policy implementation process. This rubric classified the progress of the economies into three levels: advanced, in progress and initial. The information source for this assessment included both the survey and secondary documentation provided by the 9 participating economies, enabling a comprehensive and comparative evaluation of progress in each dimension.

Results Phase 1: Report on the Survey

Strategy and Planning

APEC member economies participating in the study tend to have broader targets than Sustainable Development Goal 12.3 (SDG 12.3), which aims to halve per capita global food waste and reduce food losses by 2030. These targets are often aligned with broader environmental sustainability and food security goals and, in many cases, are linked to outcome indicators that allow for assessing their long-term impact. Nevertheless, the study reveals that 45% of economies have defined a clear target related to reducing and preventing FLW, as detailed in Figure 4.

Figure 4. Does your economy have set an explicit target for reducing Food and Loss Waste (FLW) consistent with SDG 12.3?

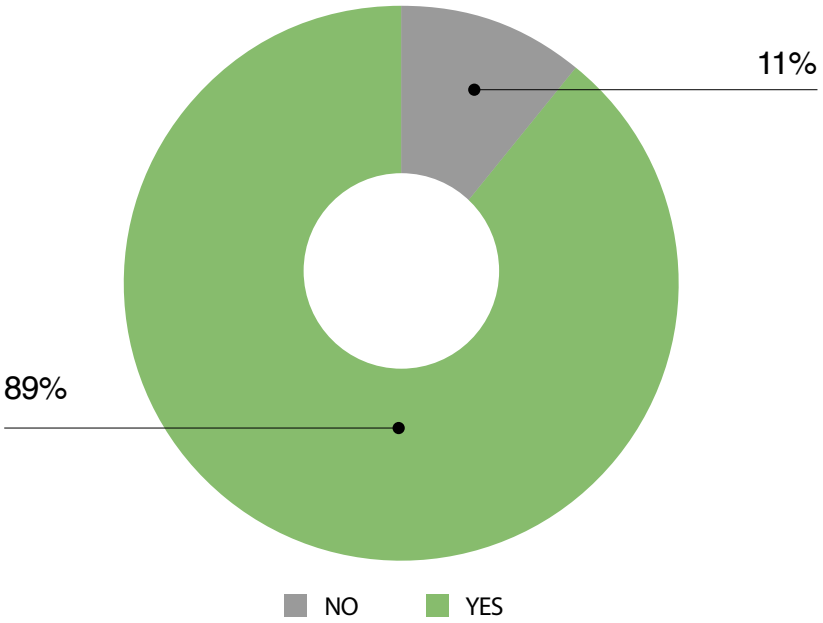


As shown in Figure 5, almost all participant economies have a domestic strategy aimed at reducing and preventing FLW. In some cases, this strategy is also integrated into a broader domestic plan addressing issues related to climate change and environmental sustainability. In few economies, a domestic strategic plan specifically focused on FLW has been developed, as well as a clear roadmap that defines the necessary actions to achieve the set goals. These roadmaps are crucial for guiding resource management efforts, as they lay the groundwork for the allocation of financial and human resources, facilitating a more structured and efficient implementation of public policies.

For example, Thailand and Australia have detailed roadmaps that outline steps, initiatives and milestones for achieving their FLW targets. These economies have established a schedule of actions that allows the effective mobilization of resources for policy execution. For instance, Australia's roadmap includes collaboration with the private sector to foster innovation in reducing food waste, while Thailand has focused its efforts on strengthening institutional capacity and promoting public awareness campaigns.

The development of these strategies and roadmaps demonstrates a progressive and structured approach to combating FLW, highlighting the importance of clear leadership and a long-term vision.

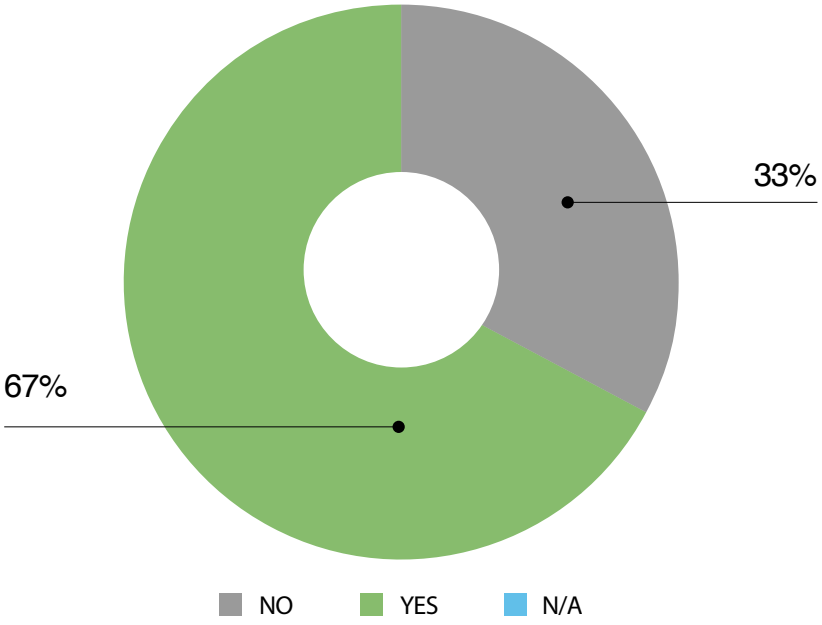
Figure 5. Does your economy have a domestic strategy for FLW reduction?



Leadership and Governance

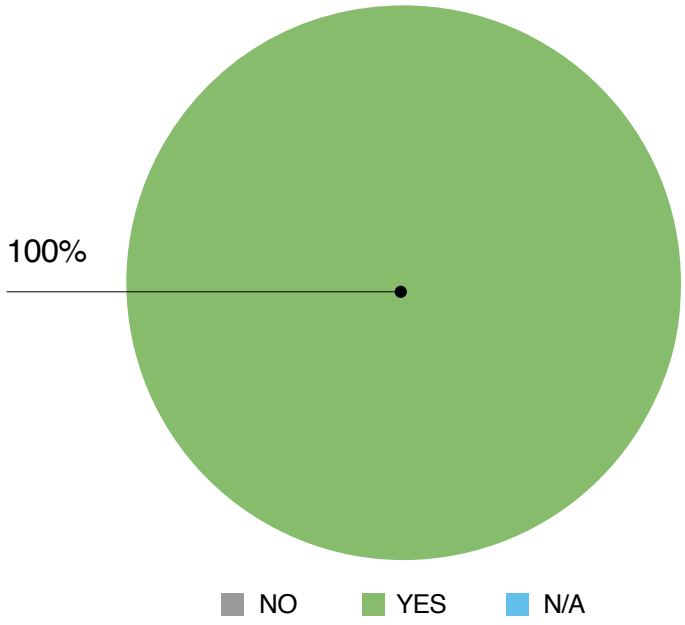
As shown in Figure 6, most of the economies in the study have official agencies designated by law or government documents responsible for monitoring guiding the reduction of FLW. These agencies play a central role in the implementation of public policies, although approaches vary among economies. In some cases, a specific commission or public agency dedicated exclusively to addressing this issue has been established, reflecting a significant institutional commitment.

Figure 6. Does your economy have official agency(ies) designated by law or government document as responsible for domestic monitoring the FLW reduction?



The creation of multi-stakeholder platforms have become key coordination spaces. These spaces help create links and build consensus around coherent policies, laws and frameworks. These platforms bring together various stakeholders, such as government institutions, non-profit organizations, and the private sector, promoting a collaborative approach to tackling FLW. In many economies, these platforms also include the participation of academic institutions, such as research centers and universities. This type of collaboration has enabled the development of technological innovations as well as the application of research that supports the implementation of actions aimed at reducing FLW. As shown in Figure 7, all participant economies have some kind of these multi-stakeholder platforms of collaboration, involved in a variety of FLW preventing and reducing activities.

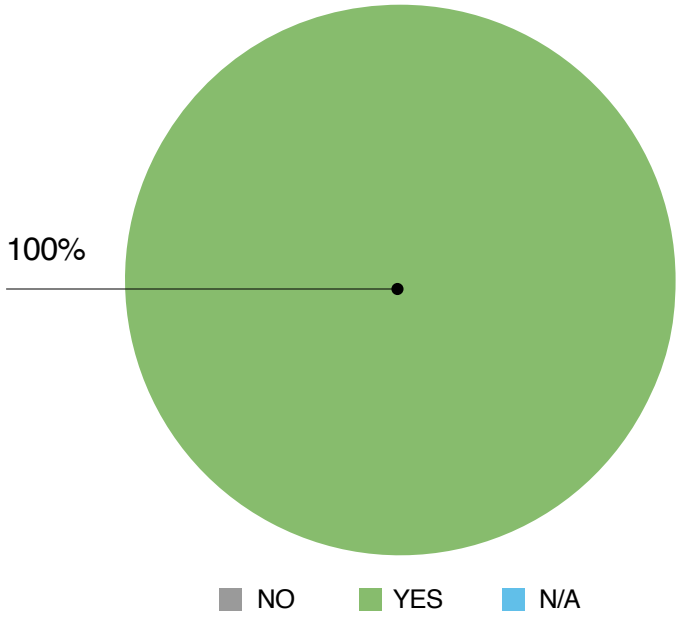
Figure 7. Does your economy have the collaboration of multiple stakeholders regarding the FLW, including the public sector established?



The role of non-profit organizations is particularly relevant in several economies, where they act as key intermediaries between the public and private sectors, facilitating actions to reduce and prevent FLW. Additionally, there is a growing participation of private companies, including some global corporations operating in multiple economies, highlighting the relevance of the private sector in adopting sustainable practices. These companies not only contribute to implementing loss and waste reduction strategies within their own operations but also foster collaboration with other food system actors.

The study found that 100% of the participant economies have agencies or organizations specifically dedicated to the prevention, reduction, recovery, reuse, or disposal of “edible” food that would otherwise be wasted (See Figure 8). However, these collaborative initiatives often focus primarily on food waste generated in the later stages of the supply chain. Attention to earlier stages related to food loss—such as the primary production is still limited.

Figure 8. Do you know of any agencies or organizations that are engaged in the reduction, recovery, reuse, or disposition of 'edible' FLW?

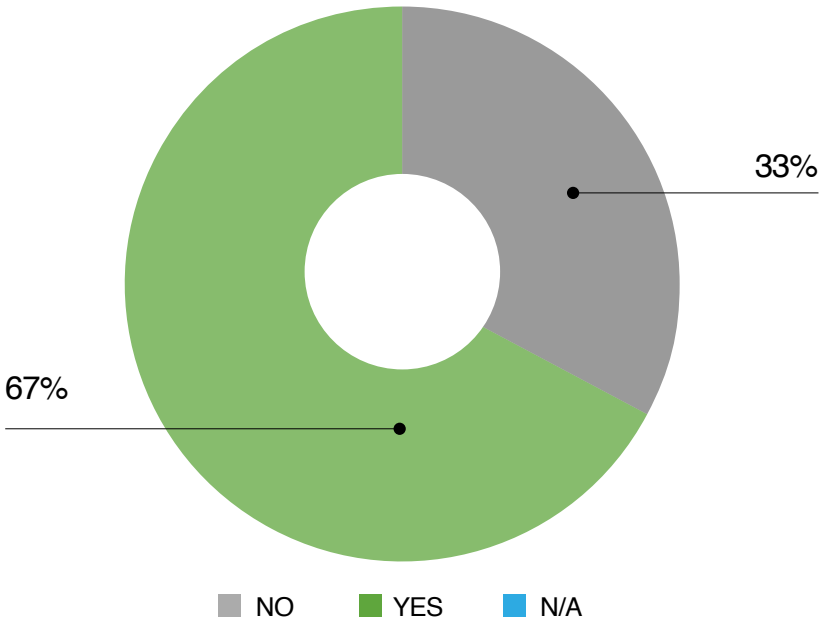


Policy Instruments

Implementing effective policies for preventing and reducing FLW can be significantly enhanced through the design and execution of policy instruments aimed at changing the behavior of agri-food system actors.

Such instruments may include government-supported public communication efforts and education campaigns to raise awareness among consumers and businesses about the environmental and economic impacts of FLW. These actions are vital for promoting public understanding and encourage responsible food consumption and disposal behaviors. As shown in Figure 9, 67% of the surveyed economies have effectively implemented such initiatives. Nevertheless, this represents an opportunity for improvement, as expanding these educational efforts could enhance public understanding and drive positive behavioral changes related to food waste.

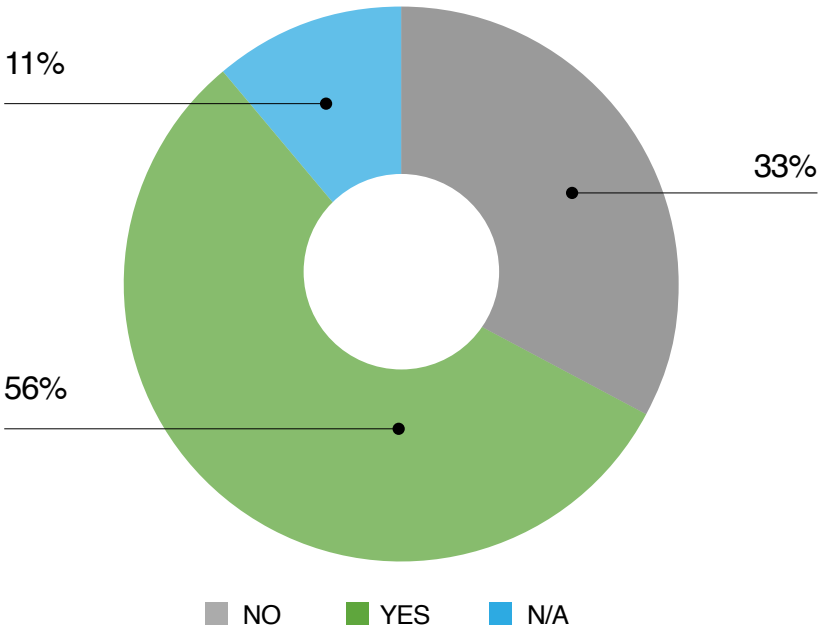
Figure 9. Does your economy have Government-supported public FLW communications effort conducted in the past 12 months?



Developing regulations and standards for proper food handling provides a framework for reducing FLW and ensuring is managed appropriately. Introducing financial and non-financial incentives further supports the adoption of best practices. These include subsidies for food preservation technologies and tax benefits for implementing sustainable practices. By integrating these diverse policy instruments, economies can foster sustainable FLW and encourage positive changes across the supply chain.

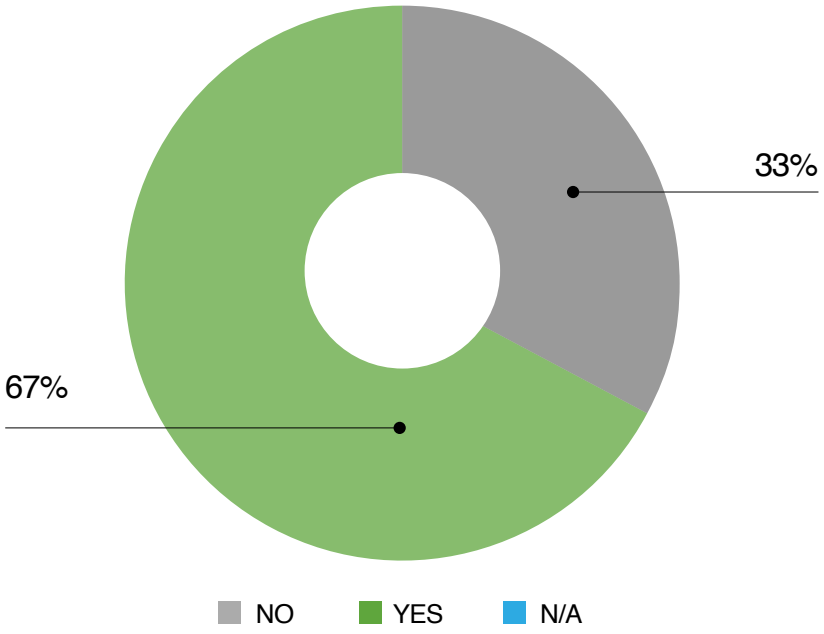
Food donation is an effective food waste reduction measure. This measure helps redirect edible surplus food to those in need and whilst reducing food waste. Despite its importance, only 56% of the surveyed economies have established policies or laws that incentivize donations through mechanisms like liability limitations or tax exemptions (see Figure 10), showing that there is scope for improvement in this field.

Figure 10. Does your economy have policies or legislation to encourage food donations in place (e.g., liability limitations, tax breaks)?



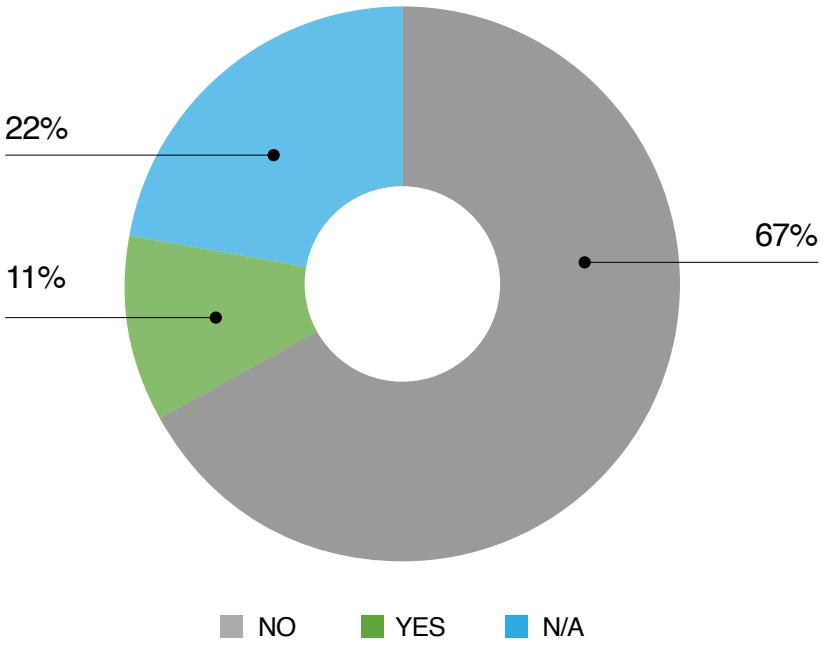
As shown in Figure 11, 67% of surveyed economies have reformed food date labeling policies to help reduce consumer confusion about food safety and quality. Reducing consumer confusion through reforming date labeling can further support food waste reduction.

Figure 11. Does your economy have, or have reformed, food date labelling policies or legislation enacted to avoid consumer confusion about product safety and quality?



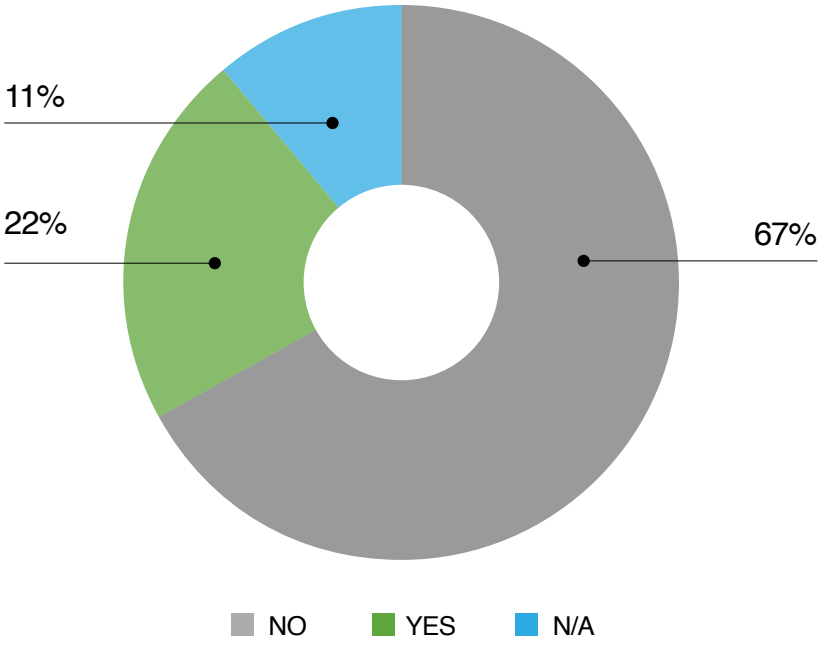
Only 11% of the participating economies have incentive programs, such as subsidies and tax exemptions, to improve food storage on farms or in nearby areas (See Figure 12). However, some economies, as for example Chinese Taipei, have taken steps in this area, investing in big infrastructure like State reserves or Socialized service centers facilities, as well as promoting technological innovation at farmers' household storage.

Figure 12. Does your economy have programs or incentives (e.g., subsidies, tax breaks) to improve on-farm or near-farm food storage?



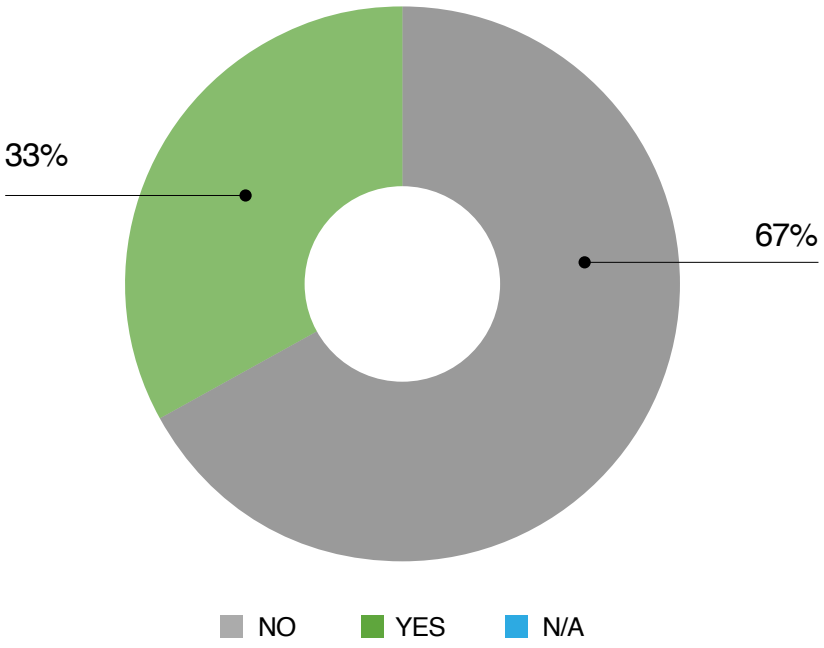
As shown in Figure 13, 67% of the participating economies reported not having established mandatory systems for measuring and reporting FLW. Only 22% of the surveyed economies mentioned to have implemented this type of policy instrument that contribute to monitoring FLW prevention and reduction.

Figure 13. Does your economy have mandatory corporate measurement and reporting of FLW?



As illustrated in Figure 14, only 33% of the participating economies have introduced incentives to divert food waste from landfills. These measures include bans on the disposal of organic waste, aimed at reducing the environmental impact of FLW.

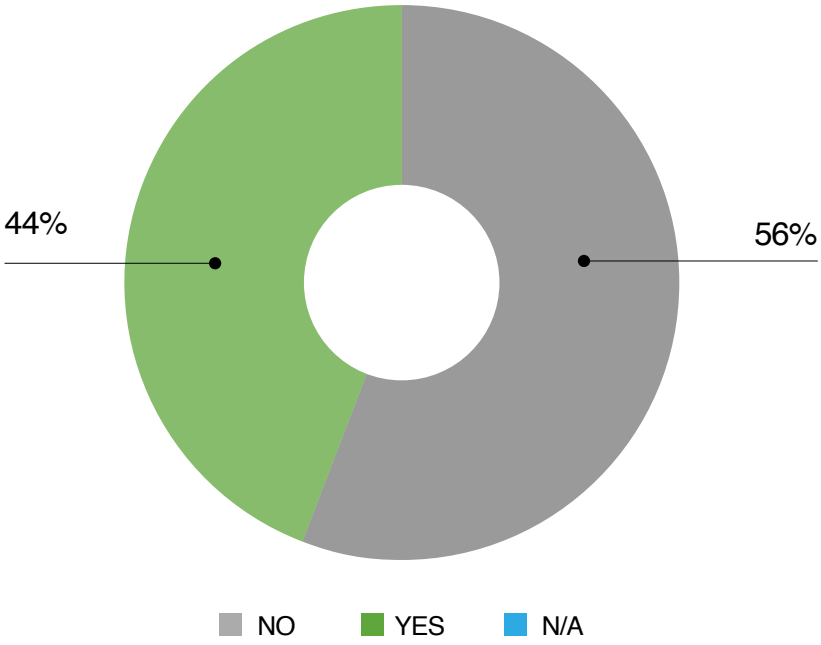
Figure 14. Does your economy have Incentives for diverting food waste disposal (e.g., landfill ban for organic waste, organic waste tax)?



Measurement

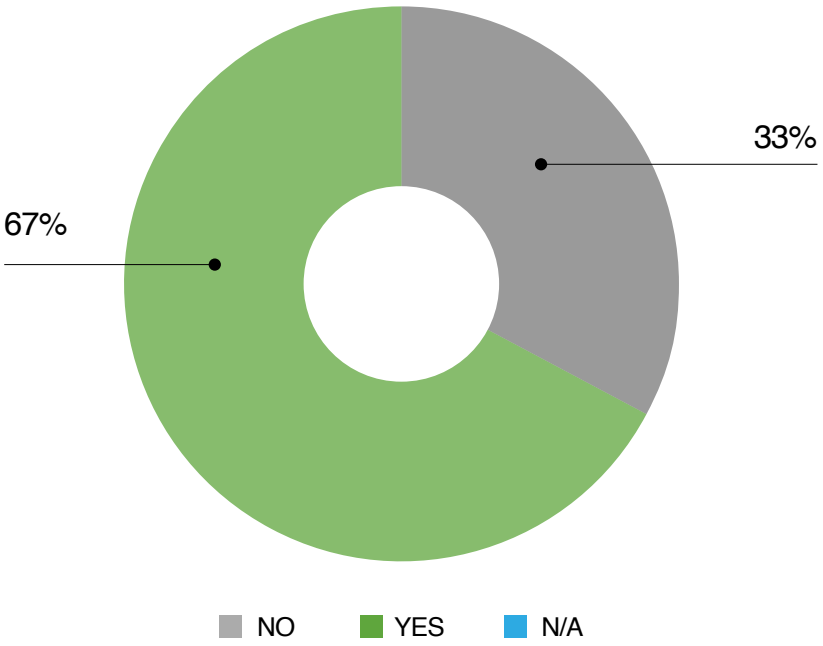
Establishing FLW baseline is a key milestone for developing and implementing FLW policies. However, only 44% of the surveyed economies have measured and publicly reported their FLW in the past three years (see Figure 15).

Figure 15. Has your economy measured and publicly reported its FLW in the last 3 years?



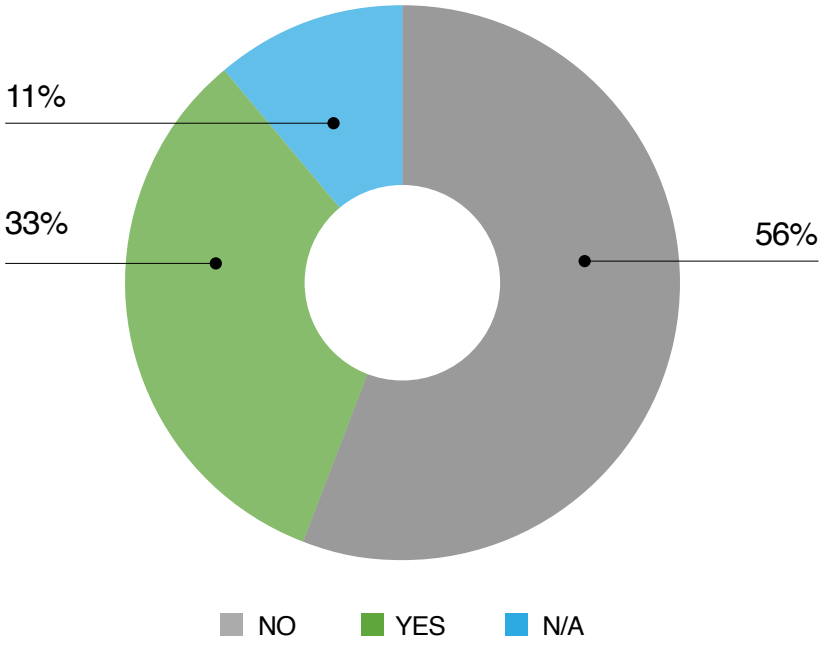
On the one hand, while 67% of the surveyed economies reported having a method for measuring FLW as shown in Figure 16, on the other hand, 56% indicated that they lack an adequate system for comprehensive data collection, accounting, and statistics necessary for effective FLW monitoring and reporting throughout the food supply chain (see Figure 17). This gap highlights the need for robust data management frameworks to accurately track and address FLW.

Figure 16. Does your economy have or follow any method in order to quantify FLW?



Additionally, as shown in Figure 17, 56% of the surveyed economies reported no answer and 11% not having available information on their FLW statistics system, reflecting a potential lack of clarity or progress in this area. Developing a standardized method and facilitating the exchange of best practices among economies that have established baselines offer opportunities to enhance the implementation of FLW policies across APEC member economies. Strengthening these efforts could lead to more effective policy outcomes and better management of food resources.

Figure 17. Is there any data collecting/accounting/statistics system for tracking and reporting of food losses and waste along the food chain in your economy?



As shown in Figure 18, efforts have been made by 44% of the economies to quantify FLW at each stage of the supply chain. This indicates that there are valuable experiences that could be shared among APEC member economies. These experiences could be shared through the development or creation of knowledge-sharing mechanisms.

Figure 18. Can you indicate the volume in tons of FLW per stage of the supply chain in your economy for the list of products below, if available?

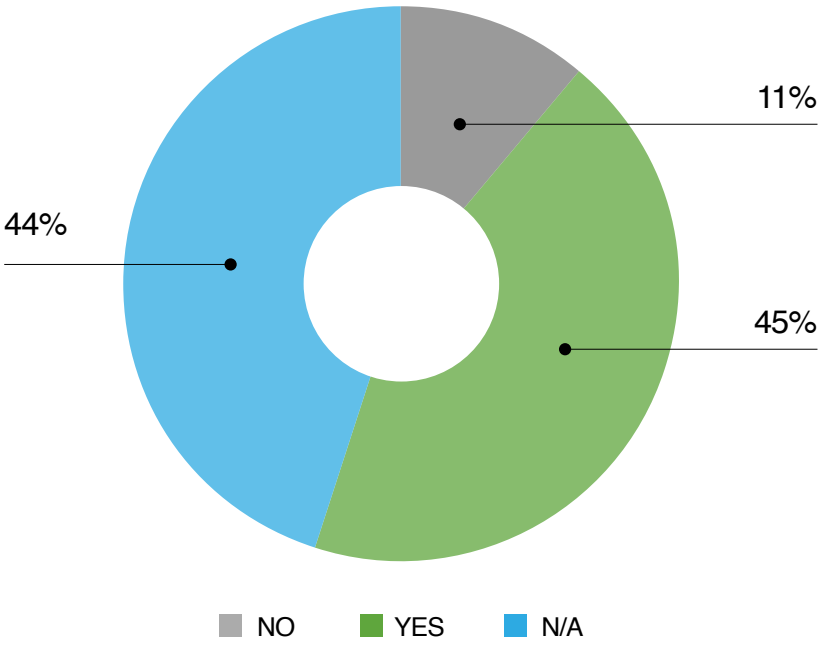


Figure 19 illustrates the various methods employed by the surveyed economies to quantify FLW. The graph compares six different approaches, showing the percentage of economies that use or follow each method to monitor and measure FLW within their food systems. Each bar represents the proportion of economies utilizing a specific method, ranging from consumer and producer surveys to more specialized techniques such as material flow modeling and FAO data usage.

The most used method is consumer and producer surveys, with 44% of the economies employing it. This method involves gathering data directly from key stakeholders in the food supply chain, including consumers and producers. Surveys provide valuable qualitative and quantitative insights into the behaviors, practices, and experiences related to FLW. By leveraging this direct input, economies can assess where in the supply chain food is being lost or wasted, what factors contribute to these losses, and potential areas for improvement. The popularity of this method suggests that it is an accessible and relatively low-cost way to collect FLW data, particularly for economies that may not have advanced technological or infrastructural capabilities.

The second most used method, at 33%, is direct weighing of discarded food. This approach provides a more objective and measurable form of data collection by physically weighing the amount of food waste generated at different points along the supply chain. This method offers precision and reliability because it directly quantifies the actual food lost or discarded,

as opposed to relying on estimates or self-reported data from surveys. However, it is also labor-intensive and may be more challenging to implement across large or fragmented food systems.

Material flow modeling, used by 22% of economies, represents a more sophisticated and data-driven approach. This method involves tracking the movement of food through the supply chain and identifying where inefficiencies or losses occur. By mapping out the flow of materials (in this case, food), economies can estimate losses at various stages, from production to consumption. This method is particularly useful for economies with advanced data infrastructure, as it allows for a more systematic and holistic understanding of where FLW are happening. However, it also requires access to comprehensive data and modeling capabilities, which may explain why fewer economies use this approach.

Less commonly used methods include the use of FAO food balance data (19%) and the collection of production volume data (11%). However, the food balance method provides economies with a macro-level perspective on FLW, often incorporating broader agricultural and trade data; this method involves the use of internationally standardized metrics provided by the Food and Agriculture Organization (FAO) to estimate food loss at domestic level (FAO, 2017). While this method is useful for comparative purposes, it may not capture the specific and localized nuances of FLW within a particular economy.

Similarly, the collection of production volume data focuses on measuring the total amount of food produced and comparing it to food available for consumption, with losses being inferred based on discrepancies. This method is likely more prevalent in economies with established agricultural sectors that track production closely. However, it provides a less direct measurement of FLW, as it often involves estimating losses rather than directly measuring them.

Lastly, 11% of economies reported using other methods to quantify FLW, which were not specified in Figure 19. This category may include experimental or alternative approaches that are not widely adopted but offer unique insights for certain economies based on their specific context or needs.

Figure 19. Does your economy have or follow any method to quantify FLW? (Alternatives)

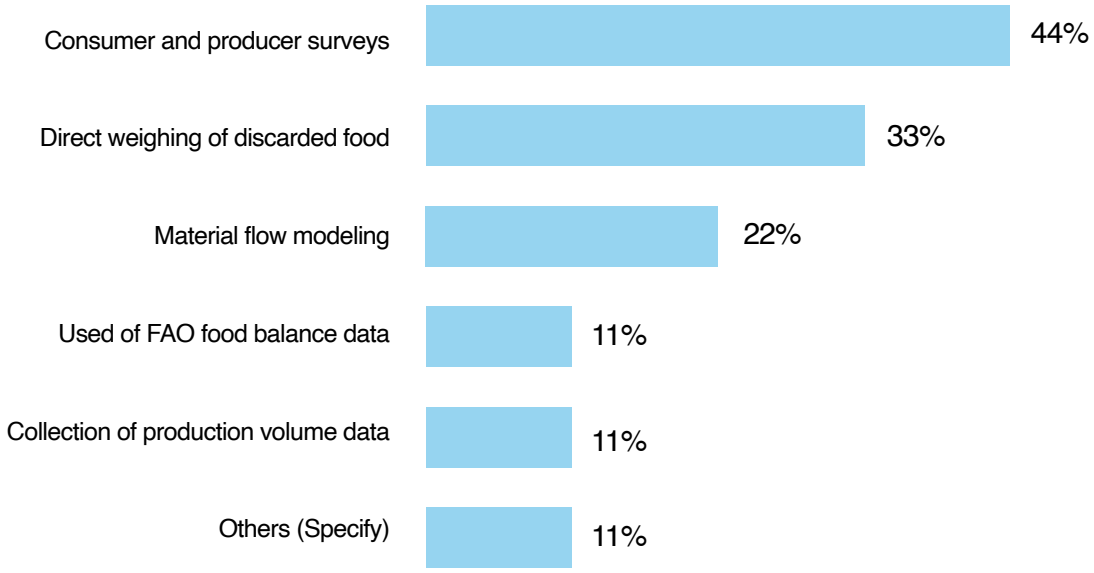


Figure 20 illustrates the most relevant difficulties that surveyed economies encounter when measuring FLW. The bar graph highlights several challenges, with each bar representing the percentage of economies identifying a particular issue as a significant barrier.

The lack of accurate and reliable data stands out as the most prominent challenge, cited by 78% of the economies. This underscores a widespread difficulty in gathering precise information, which is crucial for quantifying FLW effectively. Without reliable data, it becomes challenging for economies to monitor progress, set realistic targets, and implement evidence-based policies.

Another major issue highlighted is the complexity of the supply chain and its interactions between the actors involved, with 67% of economies reporting this as a significant hurdle. The food supply chain is inherently multifaceted, with various stakeholders involved at different stages and these intricate interactions make it difficult to trace and measure FLW accurately.

The lack of detailed information on losses and wastage per food product in the supply chain is also noted by 67% of the economies. This suggests that economies struggle to obtain specific, itemized data for different food products, limiting their ability to pinpoint where in the supply chain interventions would be most effective.

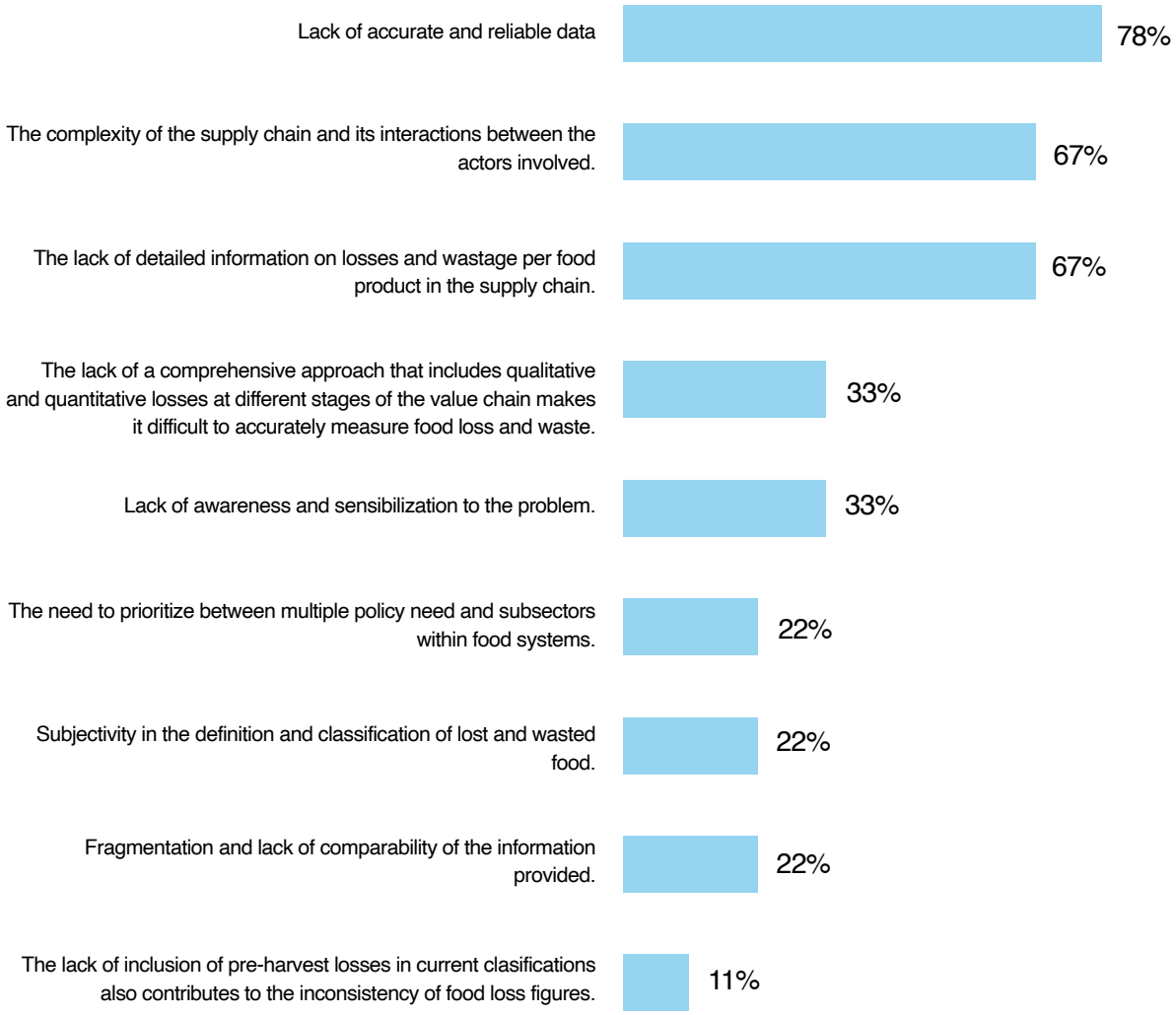
Further challenges are related to the lack of a comprehensive approach that includes both qualitative and quantitative losses at various stages of the value chain. This issue, cited by 33% of the economies, points to the difficulty of integrating both types of data to form a holistic understanding of FLW, as economies often rely on either quantitative figures or qualitative assessments without combining the two.

Lack of awareness and sensitization to the problem is another difficulty recognized by 33% of the economies. This reflects the need for increased education and communication efforts to raise awareness about the impact of FLW, not just among policymakers but also among consumers and businesses.

Moreover, economies experience other difficulties including the need to prioritize between multiple policy needs and sub-sectors within food systems (22%), subjectivity in the definition and classification of lost and wasted food (22%), and fragmentation and lack of comparability of the information provided (22%). These challenges highlight the competing demands within food systems, the complexity of agreeing on standardized definitions, and the inconsistencies in data, making it harder to develop coherent and comparable strategies across different economies.

Finally, the lack of inclusion of pre-harvest losses in current classifications was noted by 11% of the economies, underscoring a relatively smaller but still relevant gap in how food loss is categorized. Pre-harvest losses, which occur before the food even enters the supply chain, are often left out of FLW assessments, contributing to inconsistencies in the reported figures.

Figure 20. What do you consider to be the most relevant difficulties in measuring FLW in your economy?



Results Phase 2: APEC economies' performance in the four dimensions of public policy implementation process for FLW approach

The assessment of progress in implementing FLW policies reveals that economies show more advancement in the dimension of leadership and governance. These economies have assigned agencies or commissions responsible for addressing the issue and have created multi-stakeholder platforms that foster collaboration across various sectors. The involvement of academia, including universities and research centers, as well as non-governmental organizations and private companies, has been crucial in mobilizing resources and knowledge towards innovative sustainable solutions.

While economies have made strides in developing broad plans to address issues such as climate change, specific strategies focused on reducing FLW still need to be developed. It is essential for economies not only to create plans but to also establish measurable and observable indicators over a defined period. Implementing a roadmap with clear and defined activities and milestones will enable economies to monitor their progress more precisely, ensuring greater accountability and efficiency in policy execution. Integrating stakeholder feedback into the planning process can help tailor strategies to local needs and improve their effectiveness.

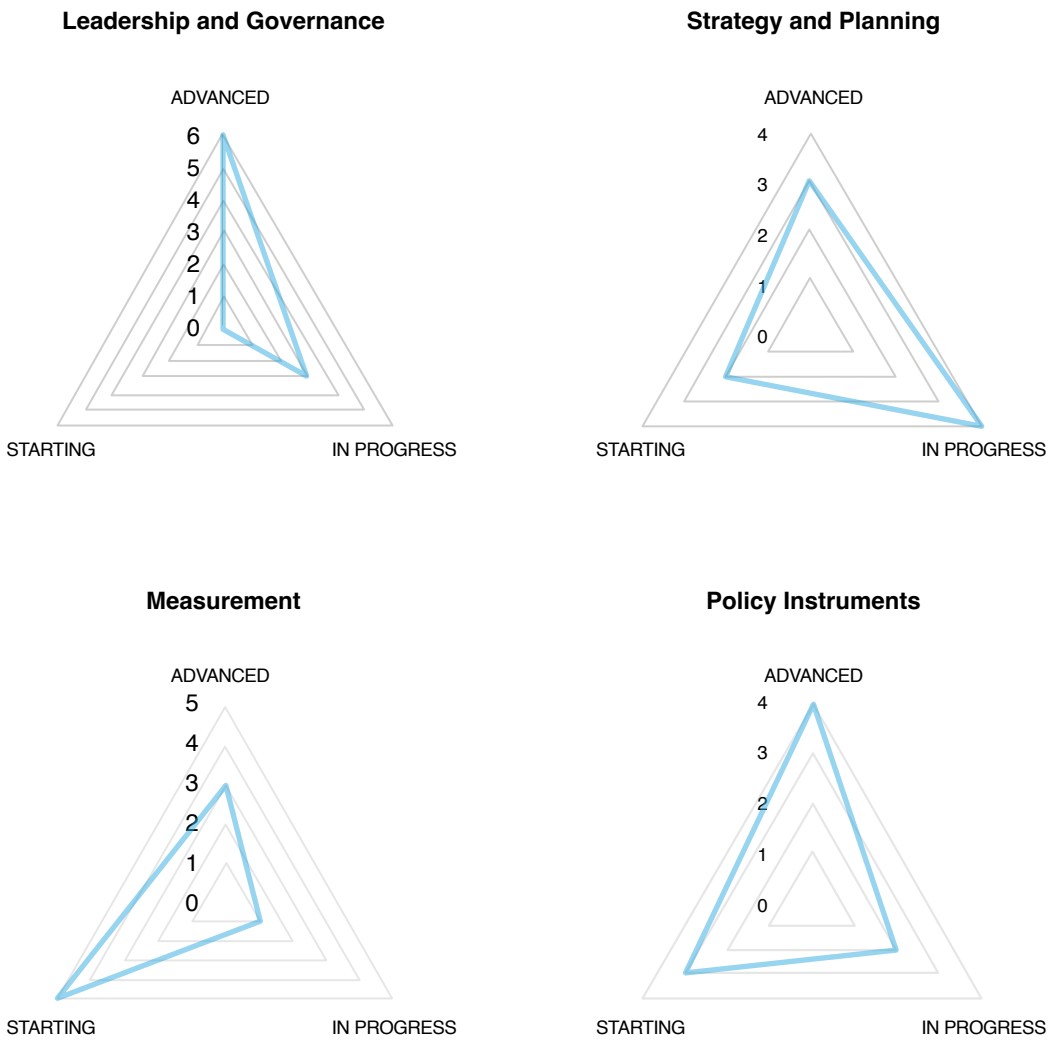
Economies have a valuable opportunity to share experiences and learnings. Results in this area have been varied, with some economies making progress in developing food donation programs and implementing labeling standards to prevent waste. However, more sophisticated and effective incentives are still needed to promote significant reductions in FLW. Continuous evaluation of these instruments is required to ensure their effectiveness and to make necessary adjustments. This may involve periodic reviews and updates based on emerging data and trends.

Measuring FLW remains a significant challenge for many economies. While some have initiated systems for tracking these metrics, there are considerable gaps in coverage and accuracy. Strengthening measurement systems across all stages of the food supply chain is crucial. Economies that have developed robust measurement frameworks can provide valuable insights and methodologies to others. This exchange of knowledge will be pivotal in enhancing the overall capability of APEC members to effectively monitor and address FLW. Developing standardized metrics and data collection protocols can further support this effort.

The development of more detailed and systematic measurement tools is necessary to address these challenges. Improved data collection methods and analytical approaches can offer a clearer understanding of the scope and impact of FLW. Establishing standardized practices for data reporting and sharing can also contribute to more effective policy-making and implementation. Enhanced data visibility will enable economies to better identify key areas for intervention and track the success of their policies over time.

Finally, fostering ongoing collaboration and innovation is essential for advancing efforts to prevent and reduce FLW. By encouraging joint projects, research initiatives, and policy dialogues among APEC member economies, it is possible to accelerate progress and achieve shared goals. Continued engagement and support for innovative solutions will be key to overcoming existing barriers and driving sustainable changes within the food system. Promoting cross-border partnerships and leveraging new technologies can provide additional avenues for tackling FLW effectively.

Figure 21. Indicators of progress in economies in the dimensions of implementation of public policy on FLW.



Workshop: Preventing and reducing FLW to achieve sustainable food systems in APEC economies

A full-day workshop was held on 12 August 2024 in Trujillo city, with the goal of both sharing best policy practices, information, and successful cases in the prevention and reduction of FLW, and complementing the survey results from the APEC member economies.

Experts from various APEC economies gathered together to participate in this event to addressed the global challenge of FLW in this region, through the exchange of information and points of view on this critical theme.

Session 1 to 4 of the workshop, had the objective to delve into each of the dimensions of the public policies implementation process for FLW, which is why the workshop is subdivided into: i) Session 1: Strategy Panel (Case Studies), ii) Session 2: Collaboration of Stakeholders Panel, iii) Session 3: Policy instruments and Measurement, iv) Session 4: Technology and Innovation, v) Session 5: APEC Agenda of preventing and reducing FLW to 2030, contributing to The Food Security Roadmap Towards 2030, vi) Session 6: Results of the Report preventing and reducing FLW to achieve sustainable food systems in APEC economies.

I. Mr. Maximo Torero, Chief Economist, Food and Agriculture Organization of the United Nations (FAO), as keynote speaker, presented the FLW problem and its impacts from a global perspective. Likewise, on the one hand, he highlighted the importance of having policy instruments upstream in the food value chain, especially in cases of economies with a high level of food insecurity; on the other hand, he also mentioned the importance of having policies such as: food safety procedures for donation, date labeling, liability protection for food donations, tax incentives and barriers and government grants and incentives to support infrastructure innovation, technology collaborations and education focused on downstream segments of the food supply chain to prevent and reduce food waste. The presentation went on highlighting that a balanced mix of policy instruments is needed and should target both upstream (production) and downstream (retail and consumer) segments of the food value chain, with a focus on technology, innovation, and education to prevent and mitigate food waste. Finally, he mentioned that the circular approach to food systems vs. the linear approach is essential for achieving cross-cutting policy goals, as well as the need to have statistical information from the most micro level to inform the design of public policies to prevent and reduce FLW.

II. Mr. Jose Alarcón, Ministry of Agrarian Development and Irrigation (Peru), spoked about the importance of having, on the one hand, an institutional and public policy framework focused on preventing and reducing FLW, and on the other, clear governance for the system that allows all actors to be brought together under a single leadership of a specialized agency, focusing on the advances and challenges from the regulatory framework and the definition of the measurement strategy in the Peruvian case.

III. Dr. Ching-Cheng Chang (Chinese Taipei), made a presentation on the funded studies on FLW at APEC members economies by Chinese Taipei. It showed the most relevant results of the 4 surveys and studies carried out among APEC member economies, grouped into developed and developing economies, during the years 2017, 2018, 2021 and 2023. The 2017 study focused on the inventory of policies for reduce FLW, the 2018 study focused on feasible solutions for FLW

reduction, with special emphasis on the PPP's approach; while that of the year 2021 focused on the impact of the Covid-19 pandemic and that of the year 2023 on the resilience, and digitalization, of the APEC's post-pandemic food system. Finally, Dr. Chang mentioned some examples of what comes next, in terms of policy actions, to keep on progressing in FLW prevention and reduction.

IV. Daniela Potocnjak, Sustainability analyst – Office of Agrarian Studies and Policies (ODEPA) (Chile), presented Chilean's policies to address FLW, focusing on the role of the Domestic Commission for the Prevention and Reduction of FLW – DCFLW, as an advisor agency specialized on this theme, and a key piece in the governance of the system, mentioning the initiatives undertook by this Commission, like: food recovery and valorization through food microbanks and solidarity ecomarkets, promoting communicational campaign, among others. Finally, Dr. Potocnjak ended her presentation with some challenges to be tackled by this agency.

V. Dr. Nita Yulianis, Director of Food and Nutrition Surveillance, National Food Agency (Indonesia), started her presentation explaining the Indonesia's commitment to prevent and reduce FLW, through the National Food Agency, which supports strengthening regulations, increasing behavior awareness, improving support systems, optimizing funding, developing research, utilization & collection of data on FLW synergize with related stakeholders to strengthen Global, Regional and Domestic Food Security. Then, she mentioned that the National Food Agency initiated the Food Rescue Movement in collaboration with the 'pentahelix' sector: Academy, Business, Community, Government and Media. Next, she presented the framework of how this initiative works, the phases involved, and the actions undertaken since it was created in 2022 until 2024, like policy dialogues or domestic campaigns, in order to stop food waste.

VI. Sarah Laughton, Representative World Food Programme (Peru), talked about the surplus food redistribution, its scope and rationale. Also, she mentioned the strategies adopted by Argentina; Mexico; and Peru. Finally, she ended her presentation with some key ideas, emphasizing that only economies that have adequate estimates of losses can demonstrate progress in reducing food waste.

VII. Juan David Sáenz Henao, Trade and Agriculture Directorate, Organisation for Economic Co-operation and Development (OECD), presented the Stocktaking of FLW Policies Study they have been developing within the framework of the OECD member economies. The method of this study, based on a questionnaire and three case studies, and its conceptual framework for analyzing FLW policymaking processes was explained. Finally, some general lessons learned from the ongoing study were shared.

VIII. Sam Oakden – A/Director Industry Action, End Food Waste Australia, (Australia), started his presentation talking about Australia's commitment to reduce food waste by 50% by 2030, presenting general figures for the quantification of this waste and the costs it generates for its economy and its impact on climate change. Then, he introduced the role that plays End Food Waste Australia in the Australian food system including research through the End Food Waste Cooperative Research Centre, supporting industry to act on food waste and influencing consumer behaviour through a nationwide campaign. Also, he explained the methodology used

to create the Australian food waste baseline and how this is used to prioritise interventions using evidence-based approach. Finally, two key multi-stakeholders initiatives delivered by End Food Waste Australia were presented: i) Australian Food Pact, a voluntary and multi-year commitment to help reduce food waste in businesses and their supply chains; and ii) Sector Action Plans, which develops workable priority actions unique to specific sectors. Lastly, an example of data reporting was presented which outlined the value to businesses and government of collecting and analyzing food waste data to inform other sustainability initiatives.

IX. Dr. Sun Hui, Academy of National Food and Strategic Reserves Administration (ANAFRA) (People's Republic of China), started her presentation talking about the background of the problem of FLW in China, then focuses on strategies to prevent and reduce FLW through the application of technological innovation in different phases of the entire food supply chain like: drying and transportation technology, storage technology and processing technology. With respect to storage, different types of State reserves and different types of technology (like for pest control or digital monitor systems) for these facilities were presented. Also, she mentioned the positive impacts of adopting these innovative technologies in State reserves facilities. Then, the presentation continued on with farmers' household storage, which represent between 8 to 10% of the food loss in China. Also, she presented the Socialized Services, which are facilities for Grain Post-harvest Service Center with huge capacity (5,500+). Additionally, she spoke about various way of promotion and training for small holder grain storage. To end up the presentation she mentioned some future perspectives.

X. Dr. Matthew Tan, Associate Professor – Engineering, Singapore Institute of Technology (Singapore), started his presentation talking about the FLW Workshop Implications of Processed Food Waste and some recommendation arrived at this workshop. Then, he continued explaining the current activities and the outcomes that are being held under the collaborative project with Kosmode Health: i) Upcycling of Spent Barley Grains (Processed Food Waste) and ii) Up-Valuing Processed Food Waste for Human Nutrition, how these grains are transformed to protein that become a functional food suitable for human consumption, and from which can derive for example the production of noodles. Finally, he ended up his presentation mentioning upcoming activities with other projects that have social impact on food security, like the collaboration with Planet Net Zero.

XI. Dr. Tony Shih Hsun Hsu (Chinese Taipei), started his presentation showing the five key action areas of The Food Security Roadmap Towards 2030, which aims to improve the APEC regional food system's environment, the action that are involved in the definition of Action Area 17(e) "FLW (FLW) Reduction". Also, he presented the implementation plan, its objective and the specific voluntary actions or initiatives that APEC members economies may individually or collectively implement to deliver on the Roadmap for 2030. Next, he presented a review progress by 2025, which involve the collection of newly updated FLW inputs from each APEC member economy through a survey and a summary review report per economy. Additionally, five general questions for 2025 FLW reduction progress review survey were presented, as well as a general structure of the brief summary report for each member economy.

XII. Dr. Christiam Méndez Lazarte, APEC Consultant (Peru), made a presentation of the Survey Report on Preventing and Reducing FLW to Achieve Sustainable Food Systems in APEC Economies 2024, starting with explaining the importance of evaluating the progress of economies in the area of FLW through two types of indicators: i) indicators of process and ii) indicators of outcomes, and the study's public policy implementation for FLWs approach. Then, the four dimensions and policies tools involved in the approach were presented. Next, the methodology of the study was exposed. The results of the study were then presented taking into consideration the performance of those economies of APEC, who responded the survey, in the four dimensions of Public Policy Implementation for FLW approach: 1) strategy and planning, 2) leadership and governance, 3) policy instruments and 4) measurement, explaining that in each dimension the economies had three levels of performance: i) starting, ii) in progress and iii) advanced. To end the presentation, some conclusions and recommendation of the study were discussed.

Summary of discussions and policy interventions developed from the workshop

A key topic that generated an exchange of information and opinions among representatives from different economies was the redistribution of FLW through food banks and recovery programs. These initiatives are vital for ensuring that surplus food is not wasted but instead directed to those in need. Various approaches to this issue were highlighted during the workshop, such as:

1. Food recovery and valorization:
    - Several participants shared initiatives focused on food recovery through local microbanks and solidarity ecomarkets, highlighting how these strategies can reduce food waste while supporting vulnerable communities.

2. Surplus food redistribution:
    - Strategies for redistributing surplus food were discussed, emphasizing the need for sound policy frameworks to regulate and facilitate these efforts in various economies. The examples from specific regions were especially insightful in demonstrating how structured approaches can make a difference.

3. Multi-actors platforms:
    - The role of multi-sector collaboration was highlighted, showcasing how different sectors—academia, businesses, communities, governments, and media—can work together to promote food recovery and reduce FLW. This multi-stakeholder engagement is key to ensuring that food security efforts align across all areas.

4. Private sector and public-private partnerships:
    - Participants also explored the importance of public-private partnerships in enhancing food recovery and redistribution efforts. By bringing together governments, businesses, and civil society, these partnerships play a critical role in minimizing food waste and ensuring that surplus food reaches those in need.

These presentations illustrate a shared commitment to food recovery and redistribution as part of efforts to prevent and reduce FLW, with food banks or similar programs serving as a crucial tool in redistributing surplus food and addressing food insecurity.

Also, and linked to the prior theme, another topic discussed was the need to move towards a comprehensive circular economy approach to improve the analysis of the dynamics of food systems.

The APEC workshop on Preventing and Reducing FLW some common policy interventions developed from the presentations were identified:

i) Policy Framework and Governance: One theme was the need for a well-structured regulatory framework. Presenters emphasized the importance of creating balanced policy instruments that address both upstream (production) and downstream (consumption) segments of the food value chain. It was also highlighted that effective governance structures are crucial to ensure coordination among various stakeholders, with specialized leadership needed to unify efforts and facilitate the implementation of FLW reduction strategies.

ii) Impact of Technology & Innovation on supply chain infrastructure and generation of new final products: Technological innovation along the food supply chain was mentioned as a critical tool to reduce FLW. This includes innovations in storage, transportation and pest control, which can significantly mitigate losses during production and distribution. In addition, recycling food waste into new value-added products was highlighted, demonstrating how technology can transform waste into economic opportunities, while reducing environmental impact.

iii) Collaboration and Multi-Stakeholder Engagement: Collaboration between multiple sectors—academia, business, government, and civil society—was seen as essential for successful FLW interventions. Multi-stakeholder initiatives that promote cooperation and shared responsibility were highlighted as effective strategies for reducing food waste. These collaborations not only bring together diverse expertise but also ensure that efforts are more comprehensive and inclusive, addressing various aspects of the food supply chain.

iv) Measurement and Data: Throughout the workshop, the importance of accurate data collection and consistent measurement of FLW was highlighted. Presenters discussed the need for accurate estimates and reliable indicators to monitor progress and evaluate the effectiveness of public policies aimed at reducing FLW. Developing standardized methodologies to measure FLW at different stages of the supply chain is crucial to compare progress across economies and identify areas requiring further intervention.

v) Education and Awareness: Many participants underscored the importance of education and public awareness in reducing FLW. Effective communication campaigns were seen

as key to changing consumer behavior and promoting more sustainable practices. Educational initiatives that target both the general public and specific sectors of the food industry were highlighted as vital components of a broader strategy to prevent FLW. Such efforts contribute to fostering a culture of responsibility and sustainability across economies.

These common threads—policy, innovation, collaboration, data, and education— reinforce the knowledge that a comprehensive approach to tackling FLW across APEC member economies; as well as, that monitoring not only the output but the public policies implementation process for FLW are needed.

Conclusions

The survey results have shown that APEC economies have made progress in implementing strategies and setting concrete objectives for preventing and reducing FLW. However, there are differences between the progress achieved by developed economies and those in developing stages. All economies, regardless of their development level, have advanced not only in planning and strategy but also in leadership and governance. The creation of multi-stakeholder platforms involving public organizations, NGOs, private companies, and academia has been key in mobilizing resources and generating concrete commitments in the fight against FLW.

Some economies have developed roadmaps with specific milestones that help better allocate resources, along with specialized agencies committed to the prevention and reduction of FLW. These roadmaps are essential for ensuring policy implementation consistency and facilitating the monitoring of progress. Specialized agencies, in turn, are a key factor in consolidating these efforts as they provide the leadership and structure necessary to achieve FLW objectives.

One of the most significant aspects highlighted in the survey results is the disparity in the creation and implementation of policy instruments. While developed economies already have a range of well-defined instruments, developing economies are still in the process of designing these mechanisms in greater depth. Food donation and expiration date labeling are two of the most widely used instruments across economies in general, but the incorporation of new instruments that can more comprehensively address FLW, as well as the proper monitoring of the results of these instruments, remains pending.

The measurement of FLW presents another significant challenge. Some developed economies have already implemented their first baseline, which constitutes a best practice that other economies could follow. Baselines provide a crucial reference for measuring progress and setting reduction goals. Gradually, some developing economies have shown interest in establishing their first baseline, indicating positive evolution towards the standardization of FLW measurement mechanisms.

In this context, the report emphasizes the importance of considering four key elements in designing effective FLW measurement methodologies: stages of the supply chain, food classification, measurement methods, and the construction of indicators based on a comprehensive literature review. These elements enable more precise and standardized measurement, facilitating comparison between economies and tracking progress in reducing FLW.

Finally, the report explores in detail the progress of FLW policy implementation in nine APEC economies, providing a description of the achievements and challenges faced. This analysis represents a first approach to the state of FLW policy implementation in the region and lays the foundation for more detailed monitoring in the future.

In summary, although APEC economies have made significant progress in implementing FLW policies, important challenges remain. The lack of consistent data, disparities in the creation of policy instruments, and the need to develop stronger institutional capacities are key obstacles that must be overcome.

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Appendix 1: Progress on policy interventions in nine APEC member economies.

Information from nine APEC member economies has been collected and systematized to understand their progress in implementing FLW policies. Of these, eight economies have established strategies to tackle FLW and are actively collaborating with a range of stakeholders. Additionally, six of the nine economies surveyed have designated government agencies responsible for overseeing policies related to FLW. These agencies play a crucial role in ensuring effective policy implementation and in coordinating efforts across different sectors.

Challenges were identified during the policy implementation phase. Notably, only five of the nine economies have enacted laws concerning food donation, and similarly, only five have implemented regulations on package labeling to reduce food waste. This suggests a fragmented approach in these critical areas, indicating that not all economies are leveraging legislative tools to their full potential. Moreover, only one economy reported having incentive programs designed to enhance food storage practices on or near farms, highlighting a potential area for development in promoting better food management practices.

Regarding measurement capabilities, only three of the nine economies have regular measurement reports that provide detailed insights into FLW. However, five economies have adopted one or more methods for measuring these issues, reflecting a commitment to data collection and analysis. The variability in measurement practices underscores the need for more standardized and comprehensive approaches to tracking progress.

In conclusion, while there is a broad recognition of the importance of addressing FLW and a strategic approach across the economies, significant gaps remain in policy implementation and measurement capabilities. Addressing these gaps requires concerted efforts to enhance regulatory frameworks and improve oversight mechanisms. Strengthening these areas will be essential for advancing FLW reduction strategies and achieving more effective and sustainable outcomes.

I. AUSTRALIA´S CASE

Strategy and Planning:

Australia has a domestic strategy for FLW – "National Food Waste Strategy: Halving Australia's Food Waste by 2030"[1]. The strategy sets an explicit target for reducing FLW which is to halve the economy's food waste by 2030. The target is directly aligned to United Nation's (UN) Sustainable Development Goal 12.3 (SDG 12.3).

As outlined in the strategy, Australia has adopted a broad and inclusive definition of food waste that covers both 'losses' and 'wastes'. The definition covers:

- Solid or liquid food that is intended for human consumption and is generated across the entire supply and consumption chain
- Food that does not reach the consumer, or reaches the consumer but is thrown away. This includes edible food, the parts of food that can be consumed but are disposed of, and inedible food, the parts of food that are not consumed because they are either unable to be consumed or are considered undesirable (such as seeds, bones, coffee grounds, skins, or peels)
- Food that is imported into, and disposed of, in Australia
- Food that is produced or manufactured for export but does not leave Australia.

This definition excludes food that is produced or manufactured in Australia and is exported and becomes waste in economy

Likewise, Australia has a roadmap which provides a clear path forward to halve food waste by 2030, and includes the collaboration with the private sector to foster innovation in reducing food waste[2].

Leadership and Governance

Australia does not have official agency(ies) designated by law or government document as responsible for domestic monitoring of FLW reduction.

Australia's domestic FLW Strategy states:

"Achieving reductions in food waste is everyone's responsibility. Establishing a program that requires signatories to voluntarily commit to a set of measurable actions that are known to achieve reductions in food waste will help achieve our target".

Australia has the active collaboration of multiple stakeholders established. End Food WasteAustralia(EFWA) is Australia's independent governance body established to help implement Australia's domestic strategy for FLW reduction. EFWA is driving impactful and research-informed food waste action throughout the food supply and consumption chain (supply chain). Their main initiatives include:

[1] More information on Australia's FLW Strategy is available at:
https://www.agriculture.gov.au/sites/default/files/documents/national-food-waste-strategy.pdf

[2] More information on Australia's Roadmap is available at:
https://www.dcceew.gov.au/environment/protection/waste/publications/roadmap-reducing-food-waste

- The End Food Waste Cooperative Research Centre which focuses on collaborative and industry-led research on solutions to reduce food waste across the supply chain and to transform unavoidable waste into saleable products.

- The Australian Food Pact (AFP): a voluntary agreement that brings together Australia's largest food retailers, manufactures and primary producers to target food waste throughout their supply chains.

- Sector Action Plans (SAPs), which bring together sector-specific stakeholders to identify and deliver sector-specific projects to reduce food waste. SAPs have been developed for the bread and bakery, dairy, food cold chain, food rescue, horticulture sectors. More SAPs are underway or being explored.

- 'The Great Unwaste', an economy-wide consumer behavior change campaign designed to unite, inspire and support Australians to collectively reduce food was in their homes.

At the time the survey was completed, Australia had not conducted a government-supported public FLW communications effort in the prior 12 months. Australia has many agencies and organizations engaged in the reduction, reuse, recovery and disposition of "edible" FLW across the supply chain. The table below lists the key government agencies and the key non-government organizations (NGOs)/nonprofit organizations (NPOs), with a role in preventing and reducing "edible" FLW.

The government agencies listed in the table are those with policy responsibility for food waste (according to Australia's comprehensive definition of 'food waste'). Many also partner with EFWA in their delivery of Australia's domestic strategy for FLW reduction. It is worth mentioning that as Australia has over 500 local government organizations, these have not been listed here.

The NGOs/NPOs listed in Table I.1 include Australia's largest food rescue and food relief organizations. They play a key role in redirecting surplus edible food to Australians in vulnerable or food insecure situations, and in diverting FLW from landfill back into the consumption chain.

There are a number of other organizations that have a role in the avoidance, recovery, reuse and disposition of "edible" FLW (including food businesses, food waste solution providers and peak bodies), but these have not been listed in Table I.1.

Table I.1 Agencies/Organizations and roles

Agencies/Organizations	Roles	Main Activities
	Government	
Economy-wide government - Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW)	Responsible for Australia's legislation, strategies and policy frameworks for waste management. Provides domestic leadership and coordination in waste matters. Ensures Australia's international obligations for waste are met.	DCCEEW's main activities related to "edible" FLW include: - working with all levels of government, the supply chain, and End Food Waste Australia in implementing Australia's domestic strategy for FLW reduction - delivering actions relevant to FLW under other domestic waste policies - collecting and reporting FLW data.
State and territory government - **Australian Capital Territory:** Transport Canberra & City Services Directorate - **New South Wales (NSW):** Environment Protection Authority - **Northern Territory** Department of Environment, Parks and Water Security - **Queensland:** Department of Environment, Science and Innovation - **South Australia (SA):** Green Industries SA - **Tasmania:** Department of Natural Resources and Environment	Responsible for the management and regulation of waste within their jurisdiction in accordance with their own legislation, policies and programs.	The main FLW activities related to "edible" FLW differ between each state and territory. Generally, within their jurisdiction, their main activities include: - developing and implementing FLW policies - trialing/piloting and delivering FLW programs - investing in FLW projects and programs, including through grants - investing in FLW research - supporting local governments in managing FLW.

Agencies/Organizations	Roles	Main Activities
- Victoria: Sustainability Victoria **- Western Australia:** Department of Water and Environmental Regulation		
Local government (councils) - There are over 500 local governments in Australia.	Responsible for the on-ground management of waste within their jurisdictions.	The main FLW activities related to "edible" FLW differ between local governments. Generally, within their jurisdiction, their main activities include: - developing and delivering FLW policies - delivering public education campaigns to reduce FLW.
	NGOs/NPOs	
End Food Waste Australia (EFWA)	- Established to support industry action and collaboration towards meeting Australia's target to halve food waste by 2030. - Links government, businesses, industry bodies, retailers and consumers to help deliver mutually beneficial collaborations and food waste solutions.	EFWA's key initiatives include: - the End Food Waste Cooperative Research Centre which is leading food waste reduction research and delivering evidence-based solutions to all levels of government and the supply chain - the Australian Food Pact (AFP), a voluntary commitment program supporting food businesses to reduce food waste along the supply chain - Sector Action Plans (SAPs) which establish a framework for targeted food waste reduction interventions in specific sectors - 'The Great Unwaste', an economy-wide consumer behaviour change campaign helping Australian households reduce the amount of food they waste.

Agencies/Organizations	Roles	Main Activities
	NGOs/NPOs	
Major food rescue/food relief organizations: - Foodbank - OzHarvest - SecondBite/FareShare	- Rescues surplus, edible food from food businesses for donation to Australians in food insecure situations. - Advocates for action on FLW.	The main activities differ between each organization. Generally, the main activities include: - collecting surplus, edible food from food business and delivering it to food relief organisations and programs for donation to Australians in food insecure situations - partnering with major Australian food businesses, including Australia's largest retailers, to rescue their surplus, edible food - partnering with Australian businesses who donate ingredients, packaging and transport for providing a regular supply of staple foods for food relief - transforming rescued and donated food into cooked, nutritious meals for food relief - delivering education programs including for reducing food waste, eating healthy, and easy and affordable cooking - delivering food waste avoidance education campaigns.

Policy Instruments:

With respect to policies or legislation to encourage donations of food that could become lost or waste (e.g., liability limitations, tax exemptions), each Australian State and Territory has laws to protect individual donors and business from civil liability that may arise from potential harm associated with donated food. While these laws are not identical, they share common elements including:

- A donation of food must be made in good faith (i.e., without intent to harm the recipient) and for a charitable of benevolent purpose;
- The donation of food must be made with the intent that the end recipient receives the food free of charge;
- The food must be safe to eat when it is donated, according to food safety standards of each respective State or Territory; and
- Where the food requires a particular handling method to ensure it remains safe for the end consumer, the donor must provide instruction on how to properly handle the food.

Australia offers tax donations for in-kind donations (including food donations) to organizations registered to receive tax deductible gifts or donations. These deductions are defined under Australia's Income Tax Assessment Act 1997[3].

Also, more information on Australia's food donation policies and legislation can be found in the Australia Legal Guide: Food Donation Law and Policy (developed by Harvard Law School Food Law and Policy Clinic (FLPC) and The Global FoodBanking Network)[4].

In addition, in order to prevent consumer being misguided about the safety and quality of products, Australia does have food labelling policies or enacted legislation. Food Standards Australia New Zealand (FSANZ) is an independent statutory agency which develops joint food standards for Australia and New Zealand. FSANZ is responsible for developing and amending food safety standards in the Australia New Zealand Food Standards Code (FSC) to protect public health and maintain a safe food supply[5]. It is important to mention that FSANZ does not enforce the FSC; in Australia, enforcement is the responsibility of food enforcement agencies in the states and territories. Each state and territory has its own Food Act which applies the FSC in the respective jurisdiction.

On the other hand, Australia has reported to have nor programs or incentives (e.g., subsidies, tax exemptions) to improve storage on farms or places nearby farms; neither mandatory corporate measurement and reporting of FLW

[3] Available at: https://www.legislation.gov.au/C2004A05138/2022-07-01/text.

[4] Available at: https://www.foodbank.org.au/wp-content/uploads/FBA/Documents/Australia-Legal-Guide-6.22.22.pdf

[5] More information about FSANZ, specifically on food labelling, is available on their website at: https://www.foodstandards.gov.au/consumer/labelling.

Nevertheless, Australia does have incentives for diverting food waste disposal, however, each state and territory has different strategies. Some states have banned vegetative matter from being disposed of landfill, for example, South Australia[6]. Other States have put waste levies on organic waste to landfill, but if it is directed to composting (i.e., recycling), then it does not attract the levy. Western Australia is one example[7]. Other States and Territories are seeking to have zero organic waste to landfill through programs, incentives and grants, for example, New South Wales[8].

Measurement:

Regarding the economy's measure and publicly report its FLW in the last 3 years, Australia has measured and publicly report its FLW in last 3 years. The last measurement of Australia's total food waste measurement was completed in 2021 by Food Waste Innovation Australia Limited (FIAL).

In 2021, FIAL commissioned the Food Waste Strategy Feasibility Study. This study included a stage to update Australia's food waste baseline. The study[9] found that in 2018-19, Australians produced approximately 7.6 million tons of food waste across the entire food supply and consumption chain, equivalent to 312 kilograms per capita.

Moreover, Australia has or follows their own method in order to quantify FLW as in 2019 Arcadis was commissioned to deliver Australia's 2019 Food Waste Baseline (2019 Baseline)[10]. This project was the first detailed quantification of food waste across Australia's food supply and consumption chain (from primary production to consumption and disposal or recovery). The 2019 Baseline[11] used 'a best-fit approach for each sector, based on the available data on industry production and waste generation'. The final report states:

> *'It is noted that data on food waste is a challenge on many levels. Many organizations have no reporting frameworks to collect food waste data. What data is collected can be highly variable, with uncertain protocols on data management, food waste definition and transparency on end destinations. The approach to data collection and modelling was designed to address these issues to the fullest extent possible, including verifying the approach with experienced food waste practitioners in Australia and the UK, assessment of best practice internationally and direct consultation with local stakeholders to gather data and validate assumptions.'*

[6]More information on South Australia's ban is available at: https://www.epa.sa.gov.au/page/view_by_id/4279.

[7]More information on Western Australia's waste levy returns and exemptions is available at: https://www.wa.gov.au/service/building-utilities-and-essential-services/waste-management/waste-levy-returns-and-exemptions

[8]More information on New South Wales activities is available at: https://www.epa.nsw.gov.au/news/media-releases/2023/epamedia230118-helping-households-reduce-their-landfill-waste.

[9]The full report, executive summary and appendices are available from FIAL's website at: https://www.fial.com.au/sharing-knowledge/food-waste

[10]The full final report is available at: https://webarchive.nla.gov.au/awa/20230925064047/https://www.dcceew.gov.au/sites/default/files/env/pages/25e36a8c-3a9c-487c-a9cb-66ec15ba61d0/files/national-food-waste-baseline-final-assessment.pdf ; and the executive summary is available at: https://webarchive.nla.gov.au/awa/20230626201705/https://www.dcceew.gov.au/sites/default/files/env/pages/25e36a8c-3a9c-487c-a9cb-66ec15ba61d0/files/national-food-waste-baseline-executive-summary.pdf

[11] Full details of the methodology for the 2019 Baseline can be found in 'Section 2 Baseline Methodology' and 'Appendix B Detailed Methodology' of the final report. The sections include detailed descriptions of the methodology developed to collect available data and model food waste across the food chain, including data sources, assumptions, limitations, and adaptations to suit the Australian context and policy objectives.

Besides, in 2021 Food Innovation Australia Limited (FIAL) published the Food Waste Strategy Feasibility Study (Feasibility Study)[12]. One of the objectives of the Feasibility Study was to 'update and improve the 2019 Baseline to ensure that it is fit for purpose, both as an evidence base for this project and future policy development, and as a tool for monitoring progress against the 2030 target'. To update the 2019 Baseline, the Feasibility Study[13] used 'a mass balance approach to measure food waste and losses across the food value chain'. The final report states:

> *'Using a mass balance approach in modelling food waste in Australia means that it is possible to estimate the volume of food going to market, and the overall proportion that is lost at some point in the supply chain. Each stage of our food production system is linked within the model, so as to keep the flow of material coming in (production) and out (loss/ waste) balanced.'*

However, Australia currently lacks a data collection, accounting, and statistical system for tracking and reporting food losses and waste along the food chain.

On the other hand, Australia faces significant challenges in accurately measuring FLW. These challenges stem from the absence of reliable data, lack of detailed information on losses per food product throughout the supply chain, the complexity of interactions within the supply chain, and the absence of a comprehensive approach that integrates qualitative and quantitative losses at various value chain stages. This complexity complicates the accurate measurement of FLW. Additionally, Australia has not responded regarding innovative technologies or best practices for prevention, reduction, recovery, and recycling of food losses and waste to support implementation.

Finally, regarding the estimation of FLW in terms of the volume in tons per stage of the food supply chain in the economy of the list of product groups listed below, the Food Waste Strategy Feasibility Study contains the best-available information and statistics on the FLW situation in Australia. The Feasibility Study did not determine the volume FLW per stage of the food supply chain by 'product group'. As such, in the table below (next page), the total food waste per food supply chain stage has been added to the 'Other' row. The food supply chain stages specified in the Feasibility Study has also been indicated in parenthesis.

[12]The Feasibility Study full report, executive summary and appendices are available from FIAL's website at: https://www.fial.com.au/sharing-knowledge/food-waste

[13]Full details of the methodology used for updating the 2019 Baseline can be found in Section 4 of the full report, and 'Appendix 3' of the appendices.

Table I.2 Measuring Supply Chain Stages in tones

FLW by Product group	Stages of Food Supply Chain						Year collected	Sources
	Quantity (1,000 ton/yr) of FLW							
	Harvest/ Slaughter	On farm Post Harvest/Slaughter operations	Transport, Storage and Distribution	Processing and Packaging	Retail	Public and Household Consumption		
Cereals and pulses								
Fruits and vegetables								
Meat and animal products								
Roots, tubers, and oil-bearing crops								
Other (All)	1,683 (Primary production)		258 (Distribution)	1,276 (Manufacturing)	527 (Wholesale - Retail)	3,932 (Hospitality, Institutions, Household)	2021 (data from 2018-2019)	Feasibility Study

And in terms of percentage of FLW per stage of the food supply chain in the economy of the list of product groups listed below, the Food Waste Strategy Feasibility Study (Feasibility Study) contains the best-available information and statistics on the FLW situation in Australia. The Feasibility Study did not determine the volume FLW per stage of the food supply chain by 'product group'. As such, in the table below (next page) the total percentage of food waste per food supply chain stage has been added to the 'Other' row. The food supply chain stages specified in the Feasibility Study has also been indicated in parenthesis.

Table I.3 Measuring Supply Chain Stages in percentages

FLW by Product group	Stages of Food Supply Chain						Total/Year collected	Sources
	Percentage of FLW							
	Harvest/ Slaughter	On farm Post Harvest/Slaughter operations	Transport, Storage and Distribution	Processing and Packaging	Retail	Public and Household Consumption		
Cereals and pulses							100%	
Fruits and vegetables							100%	
Meat and animal products							100%	
Roots, tubers, and oil-bearing crops							100%	
Others (All)	22% (Primary production)		3% (Distribution)	17% (Manufacturing)	7% (Wholesale - Retail)	51% (Hospitality, Institutions, Household)	100%/ 2021 (data from 2018-2019)	Feasibility Study

II. CANADA'S CASE

Strategy and Planning

Canada has reported not having set an explicit goal of reducing FLW; neither a domestic strategy for FLW reduction.

Leadership and Governance

In terms of developing institutions and the leadership of the FLW system to address the problem of FLW, Canada does not have an official agency(ies) designated by law or government document as responsible for domestic monitoring of FLW reduction.

With respect to the articulation and collaboration of multiple stakeholders within the FWL ecosystem, Canada has reported to have collaboration of multiple stakeholders, including the public sector (e.g., public-private partnerships) established, mentioning the Collaborative Efforts section of the report *Taking Stock: Reducing FLW in Canada (2019)*[14].

On the other hand, Canada´s government does have supported public FLW communications effort conducted in the past 12 months, an example of it is Take Action – Eating for a Greener Future[15].

Furthermore, Canada has the involvement of agencies/organizations (including NGOs and NPOs) that contribute to couple with the FLW issue, as it can be seen in the table below:

Table II.1 Agencies / Organizations and Roles

Agencies/Organizations	Roles	Main Activities
Agriculture and Agri-Food Canada (AAFC)	Government (federal)	See below for key activities on FLW between 2019-2023
Environment and Climate Change Canada (ECCC)	Government (federal)	See below for key activities on FLW between 2019-2023
Other	Non-governmental organization	Several non-governmental organizations are involved in various aspects of FLW prevention and diversion. For examples, see Collaborative Efforts section of the report Taking Stock: Reducing FLW in Canada (2019), available at: https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/food-loss-waste/taking-stock.html#toc11

[14] https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/food-loss-waste/taking-stock.html#toc11

[15] https://agriculture.canada.ca/en/sector/canadian-food-system/taste-commitment/take-action

Food Waste Reduction Challenge (AAFC)

- November 2020: Under the Food Policy for Canada, AAFC launched the CAD20 million Food Waste Reduction Challenge. The Challenge has sparked new thinking, perspectives, and ideas, with over 500 applications from innovators to deliver game-changing solutions that prevent or divert food waste, advance technologies that extend the life of food or transform food waste.

- The Challenge offers prizes for innovators that deliver game-changing solutions to reduce FLW. The Challenge's business model streams offer up to CAD10.2 million for innovative ways of doing business to prevent or divert FLW across any or multiple segments of the food supply chain. The novel technology streams offer up to CAD6.5 million in prize funding for innovative technological solutions that can extend the life of food or transform food that would otherwise be lost or wasted.

- The Challenge has attracted nearly 600 applicants across diverse of solution spaces including artificial intelligence, mobile applications, upcycling to new foods or high value products, and novel packaging and food treatment technologies to extend the shelf life of food. So far in the Challenge process, 42 semi-finalists have been awarded CAD100,000 each. From those, 12 finalists in the Business models streams have received up to CAD400,000 each, and another 6 finalists in the Novel Technologies streams received up to CAD450,000 each. Finalists are competing for one of four grand prizes worth up to CAD1.5 million.

- Examples of solutions include: Technologies that remove ethylene from refrigerated, humid air keeping the food fresh longer; upcycling fruits and vegetables into easily usable ingredients such as dehydrated powder, frozen cubes and pasteurized purees; easy-to-use and eco-friendly indoor food composter; transforming waste into textiles, bioplastics, and building materials.

Federal Leadership in Food Waste Reduction (AAFC)

- In April 2021, as part of the UN Food Systems Summit on 23 September 2021 the Government of Canada hosted a series of eight Food Systems Dialogues between April and June 2021 engaging with a diverse range of experts and organizations across Canada. This includes a dialogue specifically on ways to foster collaboration on FLW in Canada on 19 April 2021. Over 50 participants representing diverse perspective and roles across Canada's food systems attended, with general agreement that FLW remains an important food system issue to be addressed.

- In the face of significant food system challenges caused by the COVID-19 pandemic, AAFC launched the CAD50 million Surplus Food Rescue Program, which redistributed eight million kilograms of food from disrupted supply chains to help meet growing demand at food banks and community food organizations during the COVID-19 pandemic.

- AAFC's Science and Technology Branch (STB) undertakes research and development related to FLW reduction, such as research that focuses on developing value-added ingredients from processing by-products, and using advanced processing technologies to help prevent spoilage.

- AAFC is also working towards cutting FLW in federal facilities across the economy, for example by donating fresh fruits and vegetables from agriculture research centers to local charities. In 2021, AAFC partnered with Public Services and Procurement Canada and Food Banks Canada on a pilot project to donate fresh fruits and vegetables from agriculture research centers to local charities. A total of 550 lbs of carrots, 1000 lbs of apples, and over 27,000 lbs of potatoes were donated in the pilot year. In 2022, the project's second year, over 60,000 lbs of AAFC crops, including a broader range of fruits and vegetables, have been donated to food banks across Canada.

Canadian Agricultural Partnership (AAFC)

- The Canadian Agricultural Partnership was a CAD3 billion five-year (2018-2023) investment by federal, provincial and territorial (FPT) governments to strengthen and grow Canada's agriculture and agri-food sector. This included CAD1 billion in federally funded programs, some of which have been used to support initiatives on FLW.

- January 2021: Under the AgriInnovate program, the Government of Canada invested up to CAD6 million for Enterra Feed Corporation (2021) to support the construction of a full-scale commercial facility that helps to reduce food waste through sustainable insect production for animal feed.

- March 2021: Under the AgriCompetitiveness program, the Government of Canada invested up to CAD1.6 million for Agriculture in the Classroom Canada to teach Canadian youth the importance of farming and the agri-food sector, including resources on food waste.

- April 2022: Under the AgriInnovate program, the Government of Canada announced up to CAD6 million to help Entosystem Inc. build a new fully operational facility in Drummondville, Quebec, to scale-up their conversion of food and other organic waste into sustainable, insect-based products to feed animals.

Taking Stock Report (ECCC)

- Environment and Climate Change Canada (ECCC) is responsible for waste mitigation and management, including organic waste such as FLW. In 2019, ECCC completed a Taking Stock report summarizing the current state of knowledge and practice on reducing FLW across Canada's food systems. [Link]

- Environment and Climate Change Canada (ECCC) also hosted a Workshop on Reducing FLW in Canada on 28 February 2019 at the Pearson Convention Centre in Brampton, Ontario. Approximately 100 Canadian experts from industry, government, and the not-for-profit sector participated in the event, which provided a forum to share ideas and discuss opportunities for measuring and reducing FLW across the food supply chain.

Commission for Environmental Cooperation (ECCC)

- ECCC has also led Government of Canada collaboration with US and Mexico counterparts through the Commission on Environmental Cooperation (CEC) to develop several tools on quantifying FLW and engaging youth.

Low Carbon Economy Fund (ECCC)

- 11 February 2020 Investment of up to CAD6 million to support the City of Peterborough, Ontario, develop a centralized composting center that will divert food and waste to a new, modern facility and city-wide expansion of the pilot Green Bin program. [Link]

- 1 March 2021 Investment of approximately CAD2.7 million to support the Town of Petawawa, Ontario, to upgrade its digesters to divert food waste from landfills by turning it into clean energy (biogas). [Link]

- 29 September 2022 Investment of up to CAD1.4 million to support Redcliff Cypress Regional Waste Management Authority, in Redcliff, Alberta, to reduce carbon dioxide and methane emissions by diverting organic waste from a landfill with the help of a compost treatment facility. [Link]

- 29 September 2022 Investment of up to CAD10 million to support PurEnergy Inc., in Havelock Township, Ontario, to build a waste diversion facility that diverts organic waste from a landfill and processes it using anaerobic digestion to produce biogas and fertilizer. [Link]

Food Waste Prevention and Diversion: Research and Capacity Building Fund (ECCC)

- Federal grants available to municipal, local and Indigenous governments to support:
    - Research activities, such as demonstration projects, pilots, and other research projects that will help inform program specifications and policy development that optimize food waste prevention and diversion
    - Capacity building activities, such as the development of guidance resources and toolkits,

and knowledge sharing initiatives that connect experts across sectors and disciplines to facilitate information exchange and skills development

Policy Instruments

With respect to policies or legislation to encourage donations of food that could become lost or waste (e.g., liability limitations, tax exemptions), each provincial and territorial government in Canada has enacted liability protection legislation to protect food donors; these provide a strong defense against liability for any illness caused by the donated food[16]. Also, several Canadian provinces have tax incentive measures in place to encourage food donations by farmers and some are able to claim a non-refundable tax credit for donations of agricultural products to a provincial charity and community food program. For example:

- Ontario: An eligible person that donates agricultural products to eligible community food programs in Ontario may be able to claim the non-refundable Community food program donation tax credit. This credit is in addition to the Charitable donation tax credit. The credit is worth 25% of the fair market value of the agricultural products donated.

- British Columbia: The farmers' food donation tax credit is a non-refundable income tax credit to encourage farmers and farming corporations to donate certain agricultural products that they produce in B.C. to registered charities, such as food banks or school meal programs. The credit is 25 percent of the eligible amount of a farmer's qualifying gifts for the tax year.

On the other hand, in order to prevent consumer being misguided about the safety and quality of products, Canada does have food labelling policies or enacted legislation, as stated in Section 5(1) of the *Food and Drugs Act* in Canada (federal legislation) which prohibits food labelling in a manner that is false, misleading or deceptive or is likely to create an erroneous impression regarding its character, value, quantity, composition, merit or safety[17].

Canada has reported no information with regards to having programs or incentives (e.g., subsidies, tax exemptions) to improve storage on farms or places nearby farms. Nor it has mandatory corporate measurement and reporting of FLW. However, Canada does have incentives (e.g., landfill ban for organic waste, organic waste tax) to divert food waste disposal, examples of which are the following:

- Some Canadian provinces and municipalities have implemented bans on the disposal of organic waste, including food waste, in landfills.

- Nova Scotia has banned compostable organic material, including food waste, from landfill disposal. This means compostable organic material must be source-separated and delivered to a composting facility[18].

[16]More information available at: https://nzwc.ca/Documents/FoodDonation-LiabilityDoc.pdf

[17]https://laws-lois.justice.gc.ca/eng/acts/f-27/page-2.html#h-234067

[18]https://laws-lois.justice.gc.ca/eng/acts/f-27/page-2.html#h-234067

- Prince Edward Island has implemented a regulation banning the disposal of organic waste in landfill through the Environmental Protection Act in 2002[19].
- In British Columbia, regional districts are responsible for the management of municipal solid waste and recyclable materials. Many B.C. communities have a full or partial ban for disposing organic waste at their landfills, including[20]:
  - Capital Regional District
  - Cowichan Valley Regional District
  - Metro Vancouver
  - Regional District of Nanaimo
  - Squamish and Whistler
  - City of Terrace

Measurement

Regarding economy´s measure and publicly report its FLW in the last 3 years, Canada has no measured and publicly reported its FLW in the last 3 years, and does not follow any method in order to quantify FLW; nor does it have a data collecting/accounting/statistics system for tracking and reporting food losses and waste along the food chain.

Additionally, in terms of the most significant problem in measurement of FLW, Canada reported to be the Lack of accurate and reliable data. Second, the fragmentation and lack of comparability of the information provided. And third, the complexity of the supply chain and its interactions between the actors involved.

Furthermore, with regards to the topic about innovative technologies or best practices on prevention, reduction, recovery, recycling of food losses and waste that would help support the implementation, Canada mentioned that the Government launched the Food Waste Reduction Challenge in 2020[21], seeking to identify innovative solutions that prevent or divert FLW at any stage of the food supply chain. This includes innovative business models and novel technologies.

Finally, regarding the estimation of FLW in terms of the volume in tons, and percentage, per stage of the food supply chain in the economy of a list of product group, Canada reported that the best available estimates of FLW in the economy are from independent research by Second Harvest and Value Chain Management International, *The Avoidable Crisis of FoodWaste Technical Report* (2019)[22]. The images below are from this research:

[19] https://www.princeedwardisland.ca/sites/default/files/legislation/e-09-environmental_protection_act.pdf

[20] https://www2.gov.bc.ca/gov/content/environment/waste-management/food-and-organic-waste/organic-waste-diversion/residential-organic-waste-diversion

[21] https://impact.canada.ca/en/challenges/food-waste-reduction-challengehttps://impact.canada.ca/en/challenges/food-waste-reduction-challenge-novel-tech

[22] https://www.secondharvest.ca/getmedia/58c2527f-928a-4b6f-843a-c0a6b4d09692/The-Avoidable-Crisis-of-Food-Waste-Technical-Report.pdf

		Millon Tonnes	Percent of Food Inpust	Percent of total FLW
Food System Inputs		61.12	61.12	61.12
Food Consumed		25.58	41.9	
Total FLW		35.54	58.1	58.1
	Avoidable FLW[22]	*11.17*	*18.3*	*31.4*
	Unavoidable FLW	*24.37*	*39.9*	*68.6*

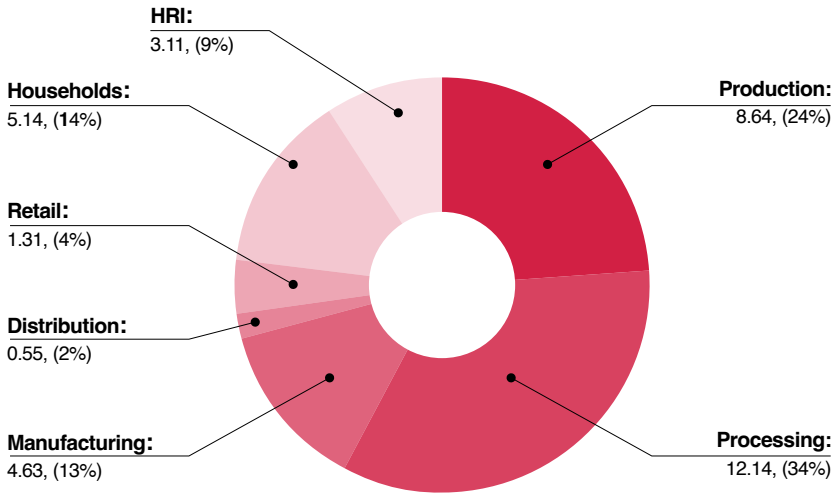

Table II.2 Canadian Food System Overview: Inputs, Losses, Consumed (Volume and Percent).

Chain Location	Volume (million tonnes)	Value ($ billion)
Production (Produce)	0.66	2.88
Processing	2.25	9.78
Manufacturing	2.57	11.17
Distribution	0.55	2.41
Retail	1.31	5.70
Household	2.38	10.37
HRI	1.44	7.14
TOTAL	**11.17***	**49.46***

Figure II.1 Tonnage (in Millions) and Percentage of Total Waste

Food Type	Grow / Produce			Processing		Manufacturing		Distribution	Retail	Consumer (HH)		HRI		Total FLW ocurring along the food value chain	Losses (%) ocurring during Rescue and Redistribution
	Unplanned Loss	Planned Loss	Storage / Pack loss	Planned Loss	Unplanned and post processing Loss	Planned Loss	Unplanned and post processing Loss	Loss	Waste	Prep waste	Plate waste	Prep waste	Plate waste		
Dairy and Eggs	0.00	0.00	0.14	0.00	0.00	0.46	0.52	0.08	0.16	0.53	0.48	0.35	0.31	3.03	7%
Field Crops	0.00	1.69	2.65	8.84	1.24	0.97	1.84	0.17	0.78	1.05	0.94	0.93	0.78	21.89	5%
Produce	0.66*	0.66	2.77	0.74	0.82	0.41	0.00	0.23	0.28	0.85	0.69	0.28	0.25	7.97	5%
Meat / Poultry	0.00	0.00	0.00	0.25	0.14	0.22	0.19	0.04	0.05	0.11	0.10	0.10	0.08	1.28	7.50%
Marine	0.00	0.04	0.00	0.05	0.04	0.00	0.00	0.03	0.04	0.07	0.06	0.01	0.01	0.34	N/A
Sugar / Syrups	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.15	0.12	0.00	0.00	0.36	N/A
Total	0.66	2.41	5.57	9.89	2.25	2.07	2.57	0.55	1.31	2.76	2.38	1.68	1.44	34.88	

Table II.3 Volume and Value of Avoidable, Potentially Edible Waste
Table II.4 Estimated FLW along the Chain (in Metric Tons – Millions)

*5% edible product left unharvested = avoidable/potentially edible FLW.

III. CHILE'S CASE

Strategy and Planning

Chile has set an explicit goal of reducing FLW. The Circular Economy Roadmap to 2030 includes explicit goals regarding FLW and its impact on the generation of solid waste, awareness and quantification campaigns, among others.

Also, Chile does have a domestic strategy for FLW reduction. The Circular Economy Roadmap to 2030 includes features of FLW and a Roadmap for the Prevention and Reduction of FLW[23].

Leadership and Governance

In terms of developing institutions and the leadership of the FLW system to address the problem of FLW, Chile does have official agency(ies) designated by law or government document as responsible for domestic monitoring of FLW reduction. The powers or responsibilities are divided between the Ministry of Agriculture through the Office of Agricultural Studies and Policies (food loss) and the Ministry of the Environment (food waste).

With respect to the articulation and collaboration of multiple stakeholders within the FWL ecosystem, Chile has the collaboration of multiple stakeholders, including the public sector (e.g., public-private partnerships) established. The Ministry of Agriculture coordinates the National Commission for the Prevention and Reduction of FLW, where private and public actors, academia and civil society participate.

Additionally, Chile´s government does have supported public FLW communications effort conducted in the past 12 months[24].

Nevertheless, Chile does not report any information with regards to which agencies/organizations (including NGOs and NPOs) are engaged in the reduction, recovery, reuse or disposition for "edible" FLW (e.g. food bank, foreign aid, feed, biomass, organic compose, etc.), and what are their roles and main activities.

Policy Instruments

Chile does not have yet policies or legislation to encourage donations of food that could become lost or waste (e.g., liability limitations, tax exemptions), however there are initiatives being discussed in Parliament.

Chile does not have food labelling policies or enacted legislation in order to prevent consumer being

[23] https://economiacircular.mma.gob.cl/wp-content/uploads/2021/07/HOJA-DE-RUTA-PARA-UN-CHILE-CIRCULAR-AL-2040-ES-VERSION-COMPLETA.pdf
https://bibliotecadigital.odepa.gob.cl/bitstream/handle/20.500.12650/72534/20230627_hoja%20de%20ruta%20PDA-2.pdf

[24] https://economiacircular.mma.gob.cl/desperdicio-de-alimentos

misguided about the safety and quality of products. Also, it has no programs or incentives (e.g., subsidies, tax exemptions) to improve storage on farms or places nearby farms. Neither does it have mandatory corporate measurement and reporting of FLW, nor offers programs or incentives (e.g., landfill ban for organic waste, organic waste tax) to divert food waste disposal, but there are initiatives being discussed in the Parliament

Measurement

Regarding economy´s measure and publicly report its FLW in the last 3 years, Chile has no measured and publicly reported its FLW in the last 3 years, and does not follow any method in order to quantify FLW; nor does it have a data collecting/accounting/statistics system for tracking and reporting food losses and waste along the food chain.

On the other hand, in terms of the most significant problem in measurement of FLW, Chile mentioned the Lack of accurate and reliable data. In second place, the lack of detailed information on losses and wastage per food product in the supply chain. And finally, the complexity of the supply chain and its interactions between the actors involved.

With respect to innovative technologies or best practices on prevention, reduction, recovery, recycling of food losses and waste that would help support the implementation, Chile has no answer.

Finally, regarding the estimation of FLW in terms of the volume in tons, and percentage, per stage of the food supply chain in the economy of a list of product group, Chile reported no measures.

IV. JAPAN'S CASE

Strategy and Planning:

Japan has set an explicit target for reducing FLW. The reduction target for both FLW from food business (food manufacturers, wholesalers and retailers and restaurants) and from households are to halve the FLW by FY 2030 against the level of baseline FY 2000[25].The Act on Promotion of FLW Reduction aims to reduce food waste by 50% by 2030, and came into force on 1 October 2019 This law defines reduction of food loss as a social measure for preventing still-edible foods from being discarded. It was enacted to encourage all Japanese people to tackle the issue independently in an effort to promote food loss reduction as an economy-wide movement.

Japan does have a domestic strategy for FLW reduction, which is included in the following official documents: Basic Policy on Promotion of FLW Reduction (Consumer Affairs Agency), The 4th Fundamental Plan for Establishing a Sound Material-Cycle Society (the Ministry of Environment), and Basic Policy of the Food Waste Recycling Law (The Ministry of Agriculture, Forestry and Fishery).

The Basic Plan on Consumer Policy is a five-year plan derived from the Basic Act on Consumer Policy, which was established by the government to promote consumer policy. The plan outlines the guidelines set by the government for policy measures aimed at implementing consumer policy in a structured manner, ensuring the protection and promotion of consumer interests. It provides a summary of the main directions for consumer policy, as well as specific actions in each area and issues that require particular attention.

Leadership and Governance

In terms of developing institutions and the leadership of the FLW system to address the problem of FLW, Japan has official agency(ies) designated by law or government document as responsible for domestic monitoring of FLW reduction[26].

In terms of fostering collaboration among multiple stakeholders concerning FLW, including the public sector through public-private partnerships, Japan has established The Council for Promotion of FLW Reduction for this purpose.

Also, Japan's government has supported public FLW communication efforts within the past 12 months. An example of this was on 30 October 2023 during the National Convention on Promotion of FLW Reduction held in Kanazawa City, Ishikawa Prefecture. The convention was hosted by Kanazawa City and the National Network Council Against FLW (a local government community for FLW Reduction), and co-hosted by the Consumer Affairs Agency, the Ministry of Agriculture, Forestry and Fisheries, and the Ministry of Environment.

Additionally, Japan has 3 main types of entities engaged in the reduction, reuse, recovery and disposition of "edible" FLW across the food supply and consumption chain (supply chain), as shown in the table below:

[25]https://www.caa.go.jp/policies/policy/consumer_policy/information/food_loss/education/assets/Foodloss_Situation.pdf.

[26]Please refer to the CAA website at the laws concerning the FLW reduction promotion: https://www.caa.go.jp/policies/policy/consumer_policy/information/food_loss/promote

Table IV.1 Agencies / Organizations and Roles

Agencies/Organizations	Roles	Main Activities
1. Local Governments	Cooperation with Local Public	Awareness dissemination activities towards local FLW reduction
2. Food Bank Organizations	Supply Foods to the Facilities that needs foods	Effective use of the unused foods etc.
3. Recycling Business Entities	Recycling Business	Recycling use of the wasted food etc.

Note: Individual names are not listed because there are too many.

Policy Instruments

With respect to policies or legislation to encourage donations of food that could become lost or waste (e.g., liability limitations, tax exemptions), Japan mentioned to have tax incentive (deductible treatment) for the food supply to food banks[27]. In addition, in order to prevent consumer being misguided about the safety and quality of products, Japan does have food labelling policies or enacted legislation, the main one being Food Labelling Act[28],[29].

On the other side, Japan reported to have no answer about having programs or incentives (e.g., subsidies, tax exemptions) to improve storage on farms or places nearby farms; neither a mandatory corporate measurement nor reporting of FLW. Nevertheless, Japan does have incentives for diverting food waste disposal, as stated in the “Act on Promotion of Recycling and Related Activities for Treatment of Cyclical Food Resources”[30].

Measurement

Regarding economy´s measure and publicly report its FLW in the last 3 years, Japan has measured and publicly report its FLW in last 3 years[31]. As well, Japan has or follows these 2 methods in order to quantify their FLW: i) direct weighing of discarded food and ii) consumer and producer surveys.

[27] https://www.maff.go.jp/j/shokusan/recycle/syoku_loss/attach/pdf/foodbank-10.pdf

[28] https://www.japaneselawtranslation.go.jp/ja/laws/view/3649

[29] Also, the Food labelling system revision history is available at: https://www.caa.go.jp/policies/policy/food_labeling/food_labeling_act

[30] Please refer to the 14th page of the following link: https://www.maff.go.jp/j/shokusan/recycle/syoku_loss/attach/pdf/161227_4-73.pdf

[31] Transition of Food loss and waste amount is shown at the below link: https://www.caa.go.jp/policies/policy/consumer_policy/information/food_loss/education/assets/Foodloss_Situation.pf

Furthermore, Japan does have a data collecting/accounting/statistics system for tracking and reporting of food losses and waste along the food chain, as shown in the table below:

Table IV.2 Sources of information

Name of the data collecting/accounting/ statistic system	Agencies in charge (public or private)	Legislations (if applicable)	Year Enacted
1. Survey on measures and progress of reduction and recycling of food waste, etc..	Ministry of Environment.	-	-
2. Periodical report based on the "Act on Promotion of Recycling and Related Activities for Treatment of Cyclical Food Resources"	Ministry of Agriculture, Forestry and Fisheries	"Act on Promotion of Recycling and Related Activities for Treatment of Cyclical Food Resources"	2000

Lastly, regarding the estimation of FLW volume in tons per stage of the food supply chain in the economy for the listed product groups, Japan's measures are presented in aggregate terms, outlined as follows:

Table IV.3 Measuring Supply Chain Stages in tons

FLW by Product group	Stages of Food Supply Chain						Year collected	Sources
	Quantity (1,000 ton/ yr) of FLW							
	Harvest/ Slaughter	On farm Post Harvest/ Slaughter operations	Transport, Storage and Distribution	Processing and Packaging	Retail	Public and Household Consumption		
		2.79 million tons (from food business (food manufacturers, wholesalers and retailers and restaurants))				2.44 million tons (from households)	5.23 million tons	Estimates on FY 2021

V. MEXICO'S CASE

Strategy and Planning:

Mexico has reported non information on whether it has an explicit goal of reducing FLW; even though it mentioned that despite the SDG indicator 12.3 is not specifically in the economy's SDG agenda, the goal is consistent with other mechanisms aimed at achieving this goal such as the 10th North American Leaders Summit, in which an ambitious plan was agreed to cut FLW by half by 2030.

Mexico does have a domestic strategy for FLW reduction in a planning phase entitled: FLW Attention Strategy.

Leadership and Governance

In terms of developing institutions and the leadership of the FLW system to address the problem of FLW, Mexico does not have official agency(ies) designated by law or government document as responsible for domestic monitoring of FLW reduction.

With respect to the articulation and collaboration of multiple stakeholders within the FWL ecosystem, Mexico has reported to have collaboration of multiple stakeholders, including the public sector, including the public sector (e.g., public-private partnerships) established, mentioning an agreement with the Mexican Association of Food Banks (BAMX) as one example.

Nevertheless, Mexico reported not having done government-supported public FLW communications effort conducted in the past 12 months.

On the other hand, Mexico has the involvement of agencies/organizations (including NGOs and NPOs) that contribute to couple with the FLW issue, as it can be seen in the table below:

Table V.1 Agencies / Organizations and Roles

Agencies/Organizations	Roles	Main Activities
1. Mexican Association of Food Banks (BAMX),	Food recovery and distribution.	Recover food and distribute it among people in need Works within an agreement with "Waste and Resources Action Programme" organization (WRAP), called Pacto por la Comida
3. Red Temática 12.3: para reducir pérdidas de alimentos	Research FLW awareness	Research to contribute to the sustainability of food supply chains, through designing, establishing and evaluating strategies, both technological as well as social innovation, which lead to reducing FLW in Mexico.

Policy Instruments

With respect to policies or legislation to encourage donations of food that could become lost or waste (e.g., liability limitations, tax exemptions), Mexico reported to have none. However, does have food labelling policies or enacted legislation in order to prevent consumer being misguided about the safety and quality of products, as stated in the NOM-051-SCFI/SSA1-2010. This law was later reviewed and on 24 January 2020 its modification was approved. Under the new law, food and beverage manufacturers are required to include warning labels in the shape of black octagons on products that are high in calories, sugar, salt, saturated fats, and trans fats.

Mexico has reported having no programs or incentives (e.g., subsidies, tax exemptions) to improve storage on farms or places nearby farms, nor mandatory corporate measurement and reporting of FLW, neither offers programs or incentives (e.g., subsidies, tax exemptions) to divert food waste disposal.

Measurement

Regarding economy´s measure and publicly report its FLW in the last 3 years, Mexico reported to have measured and publicly reported its FLW in the last 3 years, and to follow the consumer and producer survey's method. Moreover, it reported to have a data collecting/accounting/statistics system for tracking and reporting food losses and waste along the food chain. In 2021 the National Institute of Statistics and Geography (INEGI) undertook the Encuesta de Residuos Agroalimentarios y Materia Orgánica (ERAMO) 2021 pilot test.

Additionally, in terms of the most significant problem in measurement of FLW, Mexico reported to be the Lack of accurate and reliable data. In second place, the fragmentation and lack of comparability of the information provided. Third, the subjectivity in the definition and classification of lost and wasted food. Fourth, the lack of detailed information on losses and wastage per food product in the supply chain. Fifth, the complexity of the supply chain and its interactions between the actors involved. And last but not least, the need to prioritize between multiple policies needs and sub-sectors within food systems.

Furthermore, with regards to the topic about innovative technologies or best practices on prevention, reduction, recovery, recycling of food losses and waste that would help support the implementation, Mexico mentioned the use of biomass, under the bioeconomy framework, could help mitigate the negative impacts of FLW, with a renewed food system that focuses on sustainably using renewable biological resources, including biomass, to produce goods, services, and energy, respecting the limits of ecosystems

Finally, regarding the estimation of FLW in terms of the volume in tons, and percentage, per stage of the food supply chain in the economy of a list of product group, Mexico reported no measures.

VI. PERU'S CASE

Strategy and Planning:

Peru has reported not having yet set an explicit target for reducing FLW. However, it is working on setting a target to measure SDG 12.3.1 and it is expected to start measuring next year.

Peru does have a domestic strategy for FLW reduction, which is included in the following official document: the Law 30988, which came into force on 12 March 2020 with the publication of its regulations D.S. N° 003-2020-MINAGRI, which sets the activities to promote reducing and preventing FLW.

Leadership and Governance

Regarding the development of institutions and leadership within the FLW system to address the problem of FLW, Peru has designated its Ministry of Agrarian Development and Irrigation (MIDAGRI) as the official agency responsible for domestic monitoring of FLW reduction according to law.

Furthermore, with respect to the articulation and collaboration of multiple stakeholders within the FWL system, Peru does have the active collaboration of multiple stakeholders, including the public sector (e.g., public-private partnerships) established. Peru is working with the Multisectoral Commission on Food and Nutritional Security, which brings together a variety of public and private stakeholders around a diversity of food security challenges, including FLW. Moreover, among the international collaboration are FAO and locally Food Bank.

The Peruvian government has reported not supporting any public efforts aimed at communicating about FLW in the past 12 months. However, regarding the involvement of agencies/organizations (including NGOs and NPOs) in the reduction, recovery, reuse, or disposal of edible FLW (e.g., food banks, foreign aid, animal feed, biomass, organic composting, etc.), Peru has the participation from a variety of entities, including domestic firms. These organizations play crucial roles and undertake various activities to address the issue of FLW, as outlined in the table below:

Table VI.1 Agencies / Organizations and Roles

Agencies/Organizations	Roles	Main Activities
Food bank of Peru	Recovery and sensitization	They work with local markets, recovering food and educating to the beneficiaries, etc.
Organization “ollas communes”	Recovery	They recover food from local markets to share to vulnerable people
La Calera	Reduction/recovery	They reduce and recover losses and waste from their activities
Red Ollas comunes de Manchay	Recovery	They recovery food from local markets to share to vulnerable people
Banco de Alimentos	Recovery and sensitization	They recover food and educate to the beneficiaries, etc.
Programa Recicla. District Municipality of Huancán of the department of Junín.	Reduction/recovery	Food Utilization
Cencosud Perú	Reduction	Improvement of internal processes and the efficiency of the production chain
Citrus Vending S.A.C	Recovery	Enhancement of small-caliber and dark Valencian oranges for natural juices, and use of their peels and bagasse for baking by-products
RESTO-ZERO	Reduction/recovery	Initiative that develops products from the peel and pulp of fruits such as coffee
REduce – Outlet de Alimentos,	Recovery	Virtual store that operates through delivery sales and bases its work on the rescue of imperfect products.
SINBA	Recovery	In alliance with urban recyclers, the company takes advantage of food waste and transforms it into animal feed, distributing its products to urban farms.

Policy Instruments

Peru reported having set the following regulatory framework regarding policies or legislation to encourage donations of food that could potentially become lost or wasted (e.g., liability limitations, tax exemptions):

- Law that promotes the reduction and prevention of food losses and waste (Law N°30988)[32]: The purpose of this Law is to reduce and prevent food losses and waste, at all stages of the food chain, from primary production to human consumption. The Ministry of Agriculture and Irrigation (MINAGRI), in coordination with the sectors involved and in accordance with its powers and budget, adopts the following strategic actions: 1) Promotes and strengthens training activities and promotion of good practices in the management of food, at all stages of the food chain; 2) Promotes the implementation of programs and projects around the reduction and prevention of food losses and waste at the economy-wide, regional and local level; 3) Carry out the respective analysis and evaluation of the projects aimed at reducing and preventing FLW, in order to correct the deficiencies detected and replicate successful experiences related to good practices on the subject; 4) Promotes the participation of the private sector and the population in general in the measures aimed at achieving the objective set forth in this Law; 5) Promotes scientific and technological capacity and the training of researchers specialized in the reduction and prevention of food losses and waste.

- Regulations of Law No. 30988 (DS 003-2020-MINAGRI)[33]: The purpose of this Regulation is to establish the regulatory provisions that facilitate the implementation of the Law that promotes the reduction and prevention of food losses and waste and to establish the promotion and coordination actions carried out by the Ministry of Agriculture and Irrigation and the competent sectors with the participation of regional governments and local governments, to reduce and prevent food losses and waste, at all stages of the food chain, from primary production to human consumption

- Law that Promotes Actions for Food Recovery (Law 31477)[34]: The purpose of this law is to promote actions that allow the recovery of foods of agricultural, fishing and aquaculture origin suitable for direct human consumption to supply the population in vulnerable conditions, in accordance with the provisions of Law 30988, Law that promotes the reduction and prevention of food losses and waste. The purpose of this law is to guide the implementation of actions for the recovery of food in the economy's supply markets, so that they can be classified, selected and referred to the population in poverty and extreme poverty through social organizations that are take charge of this purpose. The Ministry of Development and Social Inclusion, in coordination with the regional and local governments and the sectors involved, is in charge of creating and consolidating the economy registry of final recipient entities.

[32] https://busquedas.elperuano.pe/dispositivo/NL/1791312-3

[33] https://busquedas.elperuano.pe/dispositivo/NL/1791312-3

[34] https://busquedas.elperuano.pe/dispositivo/NL/2068624-1

- Law that promotes the donation of food and facilitates the transportation of donations in situations of natural disasters (Law 30498)[35]: The purpose of this Law is to establish the regulatory framework that facilitates and promotes the donation of food, as well as the donation in cases of natural disasters: 1) The donation of food in good condition that has lost commercial value and is suitable for consumption human, so that, starting from the third year of the entry into force of this Law, food warehouses and supermarkets donate all the food that has this condition, the destruction of the same being prohibited with the purpose of contributing to satisfy the food needs of the most economically vulnerable population; 2) Donations and free services to serve the affected population of localities declared in a state of emergency due to disasters caused by natural phenomena, being applicable during the period of said state of emergency.

Furthermore, to ensure that consumers are not misled regarding the safety and quality of products, Peru has implemented tough food labeling policies and enacted legislation, the main ones the following:

- Consumer Protection and Defense Code (Law No. 29571)[36]

- Peruvian Technical Standard NTP 209.038[37]: establishes the information that all packaged food intended for human consumption must carry: Name of the food, which must indicate the true nature of the food and, normally, must be specific and not generic.

- Regulation of Law No. 30021, Law for the Promotion of Healthy Eating for Children and Adolescents (DS 017-2017-SA)[38]: Its purpose is to establish the provisions and actions that must be implemented for the application and compliance of the Law to promote healthy eating for children and adolescents. The provisions contained in this Regulation are applicable at the economy-wide, regional and local level, in the public and private sectors. Likewise, they cover all natural and legal persons that manufacture, market, import, supply and advertise processed foods within the economy territory.

- Regulation of Legislative Decree No. 1304 (DS 007-2024-PRODUCE)[39]: approves the Regulations of the Law on Labeling and Verification of the Technical Regulations of Manufactured Industrial Products, approved by Legislative Decree No. 1304.

- Law No. 31315 for Security and Nutritional Food, and its regulation of Law, Supreme Decree N° 003-2024-MIDAGRI, being the purpose of this law to establish the legal framework for the development of public policies on food and nutritional security.

[35] https://busquedas.elperuano.pe/dispositivo/NL/1412960-1

[36] https://busquedas.elperuano.pe/dispositivo/NL/1412960-1

[37] https://www.sanipes.gob.pe/documentos/5_NTP209.038-2009AlimentosEnvasados-Etiquetado.pdf

[38] https://www.gob.pe/institucion/minsa/normas-legales/189343-017-2017-sa

[39] https://busquedas.elperuano.pe/dispositivo/NL/2289582-8

On the other side, Peru reported to have no programs or incentives (e.g., subsidies, tax exemptions) to improve storage on farms or places nearby farms; nor a mandatory corporate measurement and reporting of FLW, neither incentive (e.g., subsidies, tax exemptions) for diverting food waste disposal.

Measurement

Regarding economy´s measure and publicly report its FLW in the last 3 years, Peru informed that it has not measure, nor publicly reported its FLW in the last 3 years, and does not have or follows any methods in order to quantify their FLW.

With respect to having a data collecting/accounting/statistics system for tracking and reporting of food losses and waste along the food chain, Peru reported that it does not have one.

Furthermore, with regards the most significant problem in measurement of FLW is the lack of accurate and reliable data. Second, subjectivity in the definition and classification of lost and wasted food. Third, the lack of detailed information on losses and wastage per food product in the supply chain. Fourth, the lack of awareness and sensibilization to the problem. At last, but not least, the complexity of the supply chain and its interactions between the actors involved.

Regarding the topic about innovative technologies or best practices on prevention, reduction, recovery, recycling of food losses and waste that would help support the implementation, Peru reported three examples as follows:

- Joint strategies: https://blogs.iadb.org/innovacion/es/como-la-innovacion-puede-ayudar-a-reducir-las-perdidas-y-desperdicios-de-alimentos-experiencia-ganadores-programa-de-incubacion-sindesperdiciocentroamerica/

- Innovation: Proper packaging: https://www.itene.com/casos-de-exito/zerow-innovacion-reducir-perdida-desperdicio-alimentos/

- Innovation: New procedures for fruit harvesting: https://www.ainia.es/proyectos-publicos/life-gleansmart-reducing-food-loss-fruit-gleaning-upcycling/

VII. SINGAPORE'S CASE

Strategy and Planning

Singapore has reported non information on whether it has an explicit goal of reducing FLW.

However, Singapore reported to have a domestic strategy for FLW reduction. The Food Waste Management Strategy[40] is focused on waste and comprises four different approaches in each of the four parts in which it is subdivided: Strategy 1: Prevent and reduce food wastage at source, Strategy 2: Redistribute unsold/excess food, Strategy 3: Valorise /Treat food waste, and finally Strategy 4: Recover energy.

Leadership and Governance

In terms of developing institutions and the leadership of the FLW system to address the problem of FLW, Singapore does have official agency(ies) designated by law or government document as responsible for domestic monitoring of FLW reduction. The National Environment Agency (NEA) is the agency looking at waste management strategies and is responsible for driving initiatives targeted to reduce waste, including food waste.

With respect to the articulation and collaboration of multiple stakeholders within the FWL ecosystem, Singapore has reported to have collaboration of multiple stakeholders, including the public sector, including the public sector (e.g., public-private partnerships) established. They have various stakeholders involved depending on each of the four parts of the strategy.

Moreover, Singapore has done government-supported public FLW communications effort conducted in the past 12 months. The Say YES to Waste Less (SYTWL) annual campaign was launched on 2019 by NEA to encourage the public to lead a sustainable lifestyle by reducing waste, particularly the use of disposables and food wastage, and focused on the simple actions everyone can take to reduce the consumption of disposables and food wastage. Close to 200 partners across various sectors in Singapore have supported the 2023 year's SYTWL campaign.

On the other hand, Singapore has the involvement of agencies/organizations (including NGOs and NPOs) that contribute to couple with the FLW issue, as it can be seen in the table below:

[40] https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/food-waste-management

Table VII.1 Agencies / Organizations and Roles

Agencies/Organizations	Roles	Main Activities
1. Food Bank Singapore	Feeds the needy through its food distribution programme	Sources and rescues food which is then distributed for food relief efforts such as emergency food rations delivery and daily meal programmes
2. Food from the Heart		Channeling surplus food resources (such as safe-for-consumption bread, community food pack etc.) to those in need
3. Willing Hearts	Feeds the needy through its meal preparation and distribution programme	Prepares, cooks and distributes daily meals to beneficiaries including the elderly, disabled, low-income families, and migrant workers in Singapore

Policy Instruments

With respect to policies or legislation to encourage donations of food that could become lost or waste (e.g., liability limitations, tax exemptions), Singapore indicated no answer. However, it does have food labelling policies or enacted legislation in order to prevent consumer being misguided about the safety and quality of products, as stated in the Sale of Food Act 1973 and Food Regulations (subsidiary legislation under the Sale of Food Act)[41].

Singapore has reported having nor programs or incentives (e.g., subsidies, tax exemptions) to improve storage on farms or places nearby farms, neither offers incentives (e.g., landfill ban for organic waste, organic waste tax) in order to divert food waste disposal. However, it does have mandatory corporate measurement and reporting of FLW. Under the Resource Sustainability Act, large food waste generator would be required to segregate, treat and report food waste[42].

[41]Available at: https://sso.agc.gov.sg/SL/283-RG1?DocDate=20230904

[42]For more information refer to: https://www.mse.gov.sg/resource-room/category/2023-03-21-opening-speech-for-the-second-reading-of-the-rsa/

Measurement

Regarding economy´s measure and publicly report its FLW in the last 3 years, Singapore reported to have measured[43] and publicly reported its FLW in the last 3 years, and to follow the direct weighing of discarded food (Waste sampling at Waste-To-Energy Plant) and consumer and producer surveys methods (Amount of food waste recycled reported by food waste recycling companies).

Nevertheless, with regards to having a data collecting/accounting/statistics system for tracking and reporting food losses and waste along the food chain, Singapore indicated no answer.

On the other hand, in terms of the most significant problem in measurement of FLW, Singapore reported the Lack of accurate and reliable data.

Furthermore, with regards to the topic about innovative technologies or best practices on prevention, reduction, recovery, recycling of food losses and waste that would help support the implementation, Singapore mentioned Co-digestion of source segregated food waste with used waste sludge which will be implemented at Tuas Nexus[44]. This project comprises the integration of the Tuas Water Reclamation Plant (Tuas WRP) and the Integrated Waste Management Facility (IWMF) as an innovative and sustainable solution to meet Singapore's long-term solid waste management and used water treatment needs.

Finally, regarding the estimation of FLW in terms of the volume in tons, and percentage, per stage of the food supply chain in the economy of a list of product group, Singapore mentioned not having food waste data broken down by food waste types or by sources/stages of food production.

[43]NEA Waste statistics webpage https://www.nea.gov.sg/our-services/waste-management/waste-statistics-and-overall-recycling

[44]https://www.nea.gov.sg/media/news/news/index/tuas-nexus-singapore-s-first-integrated-water-and-solid-waste-treatment-facility-begins-construction

VIII. CHINESE TAIPEI'S CASE

Strategy and Planning:

Chinese Taipei has developed a domestic strategy for reducing FLW, which is aligned with the principles of UN SDG 12.3, and is outlined in the following official documents:

- Food and Agricultural Education (FAE) Act (announced on May 2022)[45].
  - This was enacted to promote food and agricultural education as well as to strengthen linkages between diet, environment, and agriculture in order to enhance citizens' health; to pass along and draw attention to dietary and agricultural culture; to promote the sustainable development of agricultural and fishing communities, agriculture, and the environment; and to improve the economy-wide food and agricultural education system and training of relevant personnel.
- Part of Chinese Taipei's "Pathway to Net-Zero Emissions in 2050", under "Lifestyle Transition" is to achieve zero waste catering and low-carbon diet[46].
- Ministry of Health and Welfare: Buy the amount of food that you can finish (2018), First-in-first-out – the method of how to keep your food fresh (2019).
- Council of Agriculture: Big Granary Project, Pilot Project on School Lunch Meal, Longer shelf life and easier for transportation during COVID-19 Pandemic.

Leadership and Governance

In terms of developing institutions and the leadership of the FLW system to address the problem of FLW, Chinese Taipei has official agency(ies) designated by law or government document as responsible for domestic monitoring of FLW reduction, of which the main ones are those mentioned below:

- Ministry of Agriculture (MOA)
  - by virtue of the FAE Act (see answer in 1.2), Art. 2.
  - MOA also takes care of several projects to reduce post-harvest loss, especially in the area of cold chain.
  - MOA has also spearheaded several APEC workshops on FLW even though this is not a task specifically mandated by any government document.

[45] See Articles 4.3 and 12.3 at:
https://law.moj.gov.tw/ENG/LawClass/LawAll.aspx?pcode=M0090039

[46] Download the pathway document from here:
https://www.ndc.gov.tw/en/Content_List.aspx?n=B154724D802DC488

- Ministry of Environment

  Although this ministry is not designated by law to tackle FLW in particular, they cover food waste as part of their general mandate to manage waste[47].

- The Ministry of Health and Welfare cooperate with charity institutions such as foodbanks.

Furthermore, with respect to the articulation and collaboration of multiple stakeholders within the FWL system, Chinese Taipei has the active collaboration of multiple stakeholders including the public sector (e.g., public-private partnerships) established, being the main ones those mentioned below:

- The Ministry of Health and Welfare cooperate with charity institutions such as foodbanks.

- At the local government level, the Social Welfare Department of New Taipei City[48] partner with organizations that do FLW-related operations across the supply chain such as retail and wholesale markets that sell imperfect or ugly fruits and vegetables, food banks and logistics companies for redistributing surplus food, and catering schools. They also coordinate with companies to donate leftover food, guide at least 200 businesses every year to improve their food utilization and reduce their food waste, clean plate campaigns at schools. The New Taipei City Surplus-Food Network, organizes cooking activities for rural and disadvantaged children using imperfect products as ingredients[49].

- Taichung City local government (under its Social Affairs Bureau) works with and regulates local food banks to deliver food to those in need[50].

On the other hand, Chinese Taipei's government does have supported public FLW communications effort conducted in the past 12 months, as is the case of the 2023 APEC workshop on "Reducing FLW by Strengthening Resilience of APEC Food System and Enhancing Digitalization and Innovative Technologies" held in October 2023.

Furthermore, Chinese Taipei has the involvement of variety of agencies/organizations (including NGOs and NPOs), and also international firms that interact and contribute to couple with the FLW issue, as it is shown in the table below:

[47]See for example: On waste-to-energy https://www.moenv.gov.tw/en/D3B33F95FFF616F3/cb3f10e4-5921-4d26-be0a-75adbc6216b0; On Solid Recovered Fuel: https://www.moenv.gov.tw/en/D3B33F95FFF616F3/52414e2f-5669-407e-8d95-52c342889691; ban on transportation of food waste in 2022: https://www.moenv.gov.tw/en/52CA79FA8514892C/17c36210-7918-4dec-91b5-ce237fbbaf0d

[48]https://surplus-food.ntpc.gov.tw/

[49]See also: https://sdgs.ntpc.gov.tw/en/home.jsp?id=3d145d2a095e211d&act=be4f48068b2b0031&dataserno=8d60ab00c62d6b40b92f97fc95705ccb

[50]https://welfare.taichung.gov.tw/english/dfevent/index-1.asp?Parser=9,17,85,,,,6135

Table VIII.1 Agencies / Organizations and Roles

Agencies/Organizations	Roles	Main Activities
1. McDonald's Restaurants Co., Ltd. (Chinese Taipei)	Reduce the food waste from McDonald's	Corporate with farmer, and built the Food Preparation System to control food waste
2. Taiwan People's Food Bank Association	Collect the surplus food and donate to people who necessary	Food recovery https://www.foodbank-taiwan.org.tw/
3. Carrefour Taiwan Foundation	Reduce the food waste in the stage of retail. e.g., https://www.taipeitimes.com/News/taiwan/archives/2022/06/14/2003779868 and https://www.carrefour.com/sites/default/files/2020-08/Combatting%20food%20waste.pdf	Use the cold chain system, processing ugly food, discount the surplus food, and organize education activity
4. Chinese Christian Relief Association	Collect the surplus food and donate to people who necessary	Collect the surplus food and donate to people who necessary
5. Cookmania	Use the inedible food such as onion skin, become a meal	Organize an activity to use inedible food become a meal
6. 1919 Food Bank	Food bank	Food recovery https://1919.org.tw/2021/e-ccra/foodbank.html
7. Donkey move	They partner with 1919 Food bank to redistribute food.	A social enterprise that uses technology to create various vehicles services needed for Chinese Taipei's disadvantaged population https://www.donkeymove.com/
8. eFoood Sharing Map [sic]	A map that uses GPS to share information on how to donate and receive food.	https://efoood.org/
9. GoodWill Food	They purchase imperfect crop from farmers of Chinese Taipei and upcycles them for sale. They also engage in food and agriculture education.	https://www.goodwillfoods.com/pages/about-us

Policy Instruments

With respect to policies or legislation to encourage donations of food that could become lost or waste (e.g., liability limitations, tax exemptions), Chinese Taipei reported to have none apart from those mentioned previously when referred about the articulation and collaboration of multiple stakeholders within the FWL system. But local government levels may have their own initiatives, as the ones mentioned when referred about the articulation and collaboration of multiple stakeholders within the FWL system. Neither, has food labelling policies or enacted legislation in order to prevent consumer being misguided about the safety and quality of products.

Nevertheless, Chinese Taipei does have programs or incentives (e.g., subsidies, tax exemptions) to improve storage on farms or places nearby farms, as for example[51]:

- In 2021, the Council of Agriculture (COA) [Now, Ministry of Agriculture] launched a five-year project for cold chain logistics to enhance Chinese Taipei's competitiveness in exports of processed food and agricultural products.
- The new projects are mainly aimed at Chinese Taipei's farming products, including fruit and cereal grains, which supply chain management has shown are prone to disruptions, including price fixing by intermediary brokers.
- Two flagship distribution centers — in Taoyuan and Pingtung County — and eight regional distribution centers were established to increase handling capacity and boost export volumes.
- Centers for heat treatment of food products and low-temperature quarantine testing labs would be upgraded, programs would be implemented for exports of fresh fruit, while cold chain storage systems at large fruit and vegetable market depots in Taipei, New Taipei City, Taichung, and Tainan would be improved.
- It's to help local fishery organizations to upgrade their freezers and processing factories.

Chinese Taipei has not reported having mandatory corporate measurement and reporting of FLW, nor does it offer programs or incentives (e.g., subsidies, tax exemptions) to divert food waste disposal. Additionally, Chinese Taipei has neither measured nor publicly reported its FLW in the last 3 years.

[51]Source: APEC-FLOWS.

Measurement

However, the economy employs two methods to quantify its FLW: i) material flow modeling and ii) FAO food balance data. Chinese Taipei has indicated that it lacks a data collecting/accounting/statistics system for tracking and reporting food losses and waste along the food chain.

Furthermore, with regards the most significant problem in measurement of FLW is the lack of accurate and reliable data. Second, the lack of detailed information on losses and wastage per food product in the supply chain. Third, the lack of awareness and sensibilization to the problem. Fourth, the need to prioritize between multiple policies needs and sub-sectors within food systems. Finally, the lack of a comprehensive approach that includes qualitative and quantitative losses at different stages of the value chain makes it difficult to accurately measure FLW.

Regarding the topic about innovative technologies or best practices on prevention, reduction, recovery, recycling of food losses and waste that would help support the implementation, Chinese Taipei reported the case of Fu-Fruit Co., Ltd. that uses state-of-the-art cold chain equipment (individual quick-freezing or IQF) and intelligent warehouse management systems. They have obtained FSSC22000 food safety certification. Moreover, being dedicated to carbon neutrality and environmental protection, they have installed rooftop solar panels and recycling facility for processing water, as well as investing to meet green building and other ESG standards[52].

And in terms of percentage of FLW per stage of the food supply chain in the economy of the list of product groups listed below, Chinese Taipei reported as follows:

[52]Other best practices available at: https://apec-flows.ntu.edu.tw/.

Table VIII.2 Measuring Supply Chain Stages in percentages

FLW by Product group	Stages of Food Supply Chain						Year collected	Sources
	Percentage of FLW							
	Harvest/ Slaughter	On farm Post Harvest/ Slaughter operations	Transport, Storage and Distribution	Processing and Packaging	Retail	Public and Household Consumption		
Cereals and pulses		2.3%	11.2%	30.2%	5.3%	51%	100%	APEC-FLOWS. Use the FAO food balance sheet and FAO Mass flows model to estimate
Fruits and vegetables		26.8%	19.3%	0.4%	19.3%	34.2%	100%	APEC-FLOWS. Use the FAO food balance sheet and FAO Mass flows model to estimate
Meat and animal products		10.7%	11.7%	10.3%	18.3%	59%	100%	APEC-FLOWS. Use the FAO food balance sheet and FAO Mass flows model to estimate
Roots, tubers, and oil-bearing crops		33.3%	9.3%	20%	11.6%	25.8%	100%	APEC-FLOWS. Use the FAO food balance sheet and FAO Mass flows model to estimate
Others							100%	

IX THAILAND´S CASE

Strategy and Planning:

Thailand does have an explicit target for reducing FLW set for in The National Food Committee Act B.E. 2551 (2008), which is a mechanism that align Thailand's development plans with Sustainable Development Goals (SDGs), especially SDG 12.3 indicator, the National Strategy 2018–2037, the Twelfth National Economic and Social Development Plan (2017–2021), the National Security Policy and Plan (2017–2021), and Thailand 4.0.

Additionally, reducing FLW is the second target of the domestic Strategic Framework, linking all dimensions of food from the agriculture sector, agriproduct processing, services, consumer health and nutrition, as well as culture, tourism, and commerce. This Strategic Framework, which has two phases: Phase 1 (2012-2016) and Phase 2 (2018-2036), was prepared by The National Food Commission, which serves as the primary organization for carrying out or managing the food sector in all its dimensions to be efficient and productive. Besides, the Strategic Framework is built on Sufficiency Economy Philosophy (SEP) as a basic principle, which is expected to contribute successfully to Thailand´s food stability and nutrition as a source of high-quality, safe, nutritional value for consumers.

Also, Thailand has specific differentiated objectives and strategies to address FLW, respectively. With regards to Food Loss, Thailand has launched the Food Management Action Plan Phase I (2023-2027), which aims for a 5 percent reduction of a food loss indicator in the target food group compared to the baseline from 2025 to 2027. Currently, it is in the stage of setting the baseline and developing a draft driving plan for reducing food loss throughout the supply chain.

With respect to Food Waste, Thailand is in the initial stages of collecting data and managing food waste by integrating it into the Action Plan on Food Waste Management Phase I (2023–2027). The objective of the plan is to decrease the proportion of food waste in community solid waste from 38 percent to a maximum of 28 percent. Additionally, the plan aims to cut down food waste in the target segment by 97 kilograms per person per year.

However, regarding the strategies to achieve these objectives, these are still being developed or are at a project or pilot level. In the case of Food Loss, the Project of Loss Assessment in Food, Agriculture Products, and National-Level Food is a significant initiative within the framework of Thailand's Food Management Action Plan Phase I (2023–2027). Ongoing operations involve: 1) the development of detailed proposals, 2) collaboration with academic experts from the Department of Agriculture, a primary agency responsible for reducing loss in crop production to establishing baseline data for diverse agricultural products and food items, and 3) classifying measures to reduce food loss across the value chain and reports outcomes in alignment with SDGs, specifically indicator 12.3.1. by referring FAO standards and methodologies, which provides a universally accepted guideline for studying food loss.

For Food Waste, currently Thailand, as it is reported, still lacks a clear policy framework for handling food waste. In response, the Pollution Control Department has devised a Road Map for Food Waste Management 2023-2030 to serve as a guideline for preventing and addressing food

waste challenges in Thailand. Additionally, the Action Plan on Food Waste Management Phase I (2023-2027) has been introduced to drive collaborative efforts across all sectors, including the government, the private sector, and the public. This plan encompasses three main measures: Measure I: Preventing and Reducing Food Waste; Measure II: Management and Utilization of Food Waste; and Measure III: Development of Tools for Managing Food Surpluses and Food Waste.

Leadership and Governance

In terms of developing institutions and the leadership of the FLW system to address the problem of FLW, Thailand has the National Food Commission, according to the National Food Commission Act B.E. 255, which is responsible for formulating a economy-wide food management strategy in the areas of food security, food quality, food safety, and food education. The National Food Commission has developed the Strategic Framework for Food Management in Thailand Phase 2 (2018-2036) to be consistent with the current food situation and in line with SDG target 12.3.

Within this framework, the Department of Agriculture serves as the agency overseeing food loss in Thailand and is actively implementing a Drive Plan to Reduce Loss in the Production Chain. This initiative aims to minimize food loss based on the economy baseline. Simultaneously, the Pollution Control Department, the primary agency for food waste management, is in the process of introducing the Road Map for Food Waste Management 2023-2030 and the Action Plan on Food Waste Management Phase I (2023-2027).

Furthermore, with respect to the articulation and collaboration within the FWL system, Thailand has the active collaboration of multiple stakeholders, including the public sector.

The Pollution Control Department (PCD) coordinates with the government and the private sector to achieve the objectives outlined in the Action Plan on Food Waste Management Phase I (2023-2027). This involves Measure I: Preventing and Reducing Food Waste. For instance, the PCD, working in collaboration with the Thai Health Promotion Foundation (ThaiHealth) and the Thailand Environment Institute Foundation (TEI), has developed best practices to prevent and reduce food waste for operators in the restaurant industry. Additionally, in partnership with the National Science and Technology Development Agency (NSTDA), the PCD has devised best practices for preventing and reducing food waste among hotel-type operators.

Furthermore, regarding the agencies and organizations (including NGOs and NPOs) involved in the reduction, recovery, reuse, or disposal of “edible” FLW—such as food banks, foreign aid programs, animal feed initiatives, biomass processing, and organic composting—Thailand has engaged a diverse range of entities. These agencies and organizations play a crucial role in addressing the FLW issue through various activities. Their contributions and interactions are detailed in the table below, which illustrates the breadth of their involvement and the impact of their efforts.

Table IX.1 Agencies/Organizations and roles

Agencies/Organizations	Roles	Main Activities
1. Pollution Control Department	Research & Development	Monitoring TARGET 12.3 and 12.3.1(b) Food waste index
2. Department of Agriculture	Research & Development	Monitoring SDG 12.3.1(a) Food loss index.
3. Agricultural Research Development Agency (Public Organization)	Program Management Unit	Support the research budget for the National Food Loss Baseline Project
4. Scholars of Sustenance Foundation (SOS) in Thailand- NPOs	Fight Against Food Waste and Hunger in Thailand	To enhance the food system in the economy to minimize needless loss of surplus food and improve food equity by redistributing high quality surplus food from food related businesses such as hotels, grocery stores, restaurants, and other suppliers to communities in need in Bangkok, Phuket, Hua Hin, Chiang Mai and other places in the economy every day.
5. VV Share Foundation - NPOs	Facilitates food sharing between food excess parties and food deficiency parties.	serves as a matchmaker for the food donors and the food recipients, regardless of their religion or race, to utilize the excess from the food supply chain, reduce FLW, and ensure that every pound of food saved will go to saving lives from hunger.
6. Thailand Environment Institute Foundation - NGOs	Promote environmental and sustainable development issues with respect to international standard.	R&D and suggest environmental policy to governments and the public to disseminate environmental knowledge to society, including information and projects on community waste and food waste.

Policy Instruments

On the other hand, information and its proper communication play a crucial role in raising awareness to prevent food waste. In this regard, Thailand has reported several examples of government-supported public FLW communications effort conducted in the past 12 months:

- The National Research Council of Thailand (NRCT), in collaboration with Dow Thailand Group (DOW), has invited SMEs, startups, and interested individuals to participate in an exhibition entitled "Transform Waste into Wealth with a Business Idea Selected from Food Waste." The event showcases Food Waste Management Research funded by the NRCT, featuring ideas from researchers across the economy on building businesses from real-life food waste.

- The launch of the Food Waste Management Innovation Platform aims to publish innovations in food waste management, compiling Food Waste Management Guidelines. This collaborative effort between NRCT and DOW Thailand focuses on developing participatory food waste management concepts for all sectors, emphasizing practical and commercial implementation.

- The Thailand Development Research Institute (TDRI) has been disseminating information through publicizing the topic of food waste, emphasizing that it's a more significant issue than people may realize. Using effective media communication and easily accessible channels, TDRI aims to generate awareness about the problems and goals of reducing food waste through its website, sharing knowledge with the public.

With respect to policies or legislation to encourage donations of food that could become lost or waste (e.g., liability limitations, tax exemptions), Thailand´s Action Plan on Food Waste Management Phase I (2023–2027) includes a section titled Measure III: Development of Tools for Management of Food Surpluses and Food Waste, which provides incentives to reduce food waste and encourage the donation or allocation of excess food. This includes initiatives like issuing certificates to food donors or offering tax reductions or value-added tax refunds for food suppliers and manufacturers. Also, financial incentives, including subsidies and loans, are offered to communities, cooperatives, food suppliers, and food manufacturers to decrease and handle food waste right from its origin. Comparable incentives are also provided to the private sector to manage value-added food waste.

However, Thailand does not mention having programs or incentives (e.g. subsidies, tax exemptions) to improve storage on or near farms.

Thailand has developed a system to facilitate the management of surplus food by establishing a centralized organization and creating a network of volunteers to connect across Thailand. This network is designed for the distribution of excess food to requested agencies such as food banks, almshouses, and community pantries/pantry of sharing.

In Thailand, surplus food is donated through foundations such as SOS or VV Share Foundation, acting as intermediaries in receiving surplus from the source and distributing it to vulnerable

communities. These foundations follow a standard operating procedure (SOP) outlining criteria, conditions, and methods for donating excess food, including considerations for food characteristics, storage, transportation, and more. In addition, in order to prevent consumer being misguided about the safety and quality of products, Measure I of Thailand´s Action Plan on Food Waste Management Phase I (2023-2027), includes the labeling of food dates to indicate the meaning and distinction between “Expiry Date” and “Best Before End”.

With regards to mandatory corporate measurement and reporting of FLW, these are overseen by the Food Waste Reduction Commission under the Food Chain Safety Steering Committee and the National Food Commission. This commission comprises representatives from relevant governmental, private, and official agencies, along with the National Environmental Commission. The Pollution Control Commission is mandated to monitor and evaluate operations annually, making improvements and reviewing operational guidelines to ensure compliance with the Action Plan on Food Waste Management Phase I (2023–2027). This process includes addressing problems, barriers, and providing problem-solving guidelines for the concerned committee and subcommittee. The information is then published for the public.

Measurement

Regarding economy´s measurement and publicly report its FLW in the last 3 years, Thailand has yet neither measure nor publicly report its FLW in last 3 years because is in the initial stages of implementing operations to decrease FLW, in alignment with the Drive Plan to Reduce Loss in the Production Chain and the Action Plan on Food Waste Management Phase I (2023–2027). Currently, there is no comprehensive Food Waste and Loss (FWL) database for Thailand, as it is still under development through a research study. This study aims to organize food losses in specific target food groups, compare them to the baseline, and analyze the components of the economy’s solid waste.

However, Thailand has initiated operations to establish the food loss baseline by calculating losses from each sub-activity, using the FAO methodology for measuring and monitoring progress with the indicator SDG 12.3.1a Food Loss Index (FLI). As part of the food waste management effort, the study on domestic solid waste components includes examining the amount of waste generated and the physical components of 14 types of solid waste classified according to the IPCC Guidelines for National Greenhouse Gas Inventories.

Moreover, they complement the FAO approach with other alternatives methodologies like: Material flow modeling, Direct weighing of discarded food, Consumer and producer surveys, and Collection of production volume data.

Even though, Thailand doesn’t have yet a data collecting/accounting/statistics system for tracking and reporting of food losses and waste along the food chain, food waste database management is in the process of studying the components of the economy’s solid waste, including the proportion of food waste. The ongoing efforts include establishing a food waste baseline and designing

and implementing a central system or platform for storing and reporting information on food waste generation, reuse, and disposal. Additionally, a food waste calculation program has been developed to create an accounting list of people involved in food waste management. This aims to facilitate networking, support, and the creation of a "Food Waste Knowledge Hub" system, serving as a central knowledge center for food waste management.

On one hand, the most significant problem in Thailand's measurement of FLW is the absence of information regarding the amount of food waste generated by the relevant sectors. This has led to the lack of an economy-wide food waste database and an unknown quantity of actual food waste and loss occurring in each sector. Additionally, there is a deficiency in storage and reporting systems for the quantity of food waste, as well as for food waste reuse and disposal. Second, the lack of detailed information on losses and wastage per food product in the supply chain. Third, the lack of awareness and sensibilization to the problem. Fourth, the complexity of the supply chain and its interactions between the actors involved. Fifth, the lack of inclusion of pre-harvest losses in current classifications also contributes to the inconsistency of food loss figures. Last but not least, the lack of a comprehensive approach that includes qualitative and quantitative losses at different stages of the value chain makes it difficult to accurately measure FLW.

On the other hand, with regards to innovative technologies or best practices on prevention, reduction, recovery, recycling of food losses and waste that would help support the implementation, Thailand is carrying out a Food Waste Exchange Sandbox pilot project in groups with high levels of food waste, such as fresh markets, grocery stores, and restaurants in the prototype area, known as the Sandbox program. This initiative combines the business of managing and utilizing food waste as a raw material, creating added value in industries or other activities like livestock farming, and transforming waste into biogas for energy or fertilizers for agricultural purposes. The project also aims to develop a National Food Waste Database, food waste management guidelines and practices, and establish a "Food Waste Knowledge Hub" to provide a central hub for food waste knowledge exchange and link good information networks on food waste.

Finally, there is no information from Thailand regarding the estimation of FLW in terms of the volume in tons, and on percentage, per stage of the food supply chain in the economy of the list of product groups listed.

Appendix 2: Survey Tabulations

	Questions	Australia	Canada	Chile	Japan	Mexico	Peru	Singapore	Chinese Taipei	Thailand
1.1	Does your economy have set an explicit target for reducing Food Loss Waste (FLW) consistent with SDG 12.3?	1	2	1	1	0	2	0	2	1
1.2	Does your economy have a domestic strategy for FLW reduction?	1	2	1	1	1	1	1	1	1
1.3	Does your economy have official agency(ies) designated by law or government document as responsible for national monitoring the FLW reduction?	2	2	1	1	2	1	1	1	1
1.4	Does your economy have the collaboration of multiple stakeholders regarding the FLW, including the public sector (e.g., public-private partnerships) established?	1	1	1	1	1	1	1	1	1
1.5	Does your economy have Government-supported public FLW communications effort conducted in the past 12 months?	2	1	1	1	2	2	1	1	1
1.6	Which agencies/ organizations (including NGOs and NPOs) you know that are engaged in the reduction, recovery, reuse or disposition for “edible” FLW (e.g. food bank, foreign aid, feed, biomass, organic compose, …, etc.), and what are their roles and main activities?	1	1	1	1	1	1	1	1	1

Questions	Australia	Canada	Chile	Japan	Mexico	Peru	Singapore	Chinese Taipei	Thailand
2.1 Does your economy have policies or legislation to encourage food donations in place (e.g., liability limitations, tax breaks)?	1	1	2	1	2	1	0	2	1
2.2 Does your economy have food date labelling policies have been reformed or legislation enacted to avoid consumer confusion about product safety and quality?	1	1	2	1	1	1	1	2	2
2.3 Does your economy have programs or incentives (e.g., subsidies, tax breaks) to improve on-farm or near-farm food storage?	2	0	2	0	2	2	2	1	2
2.4 Does your economy have mandatory corporate measurement and reporting of FLW?	2	2	2	0	2	2	1	2	1
2.5 Does your economy have Incentives for diverting food waste disposal (e.g., landfill ban for organic waste, organic waste tax)?	1	1	2	1	2	2	2	2	2
3.1 Does your economy measure and publicly reported its FLW in the last 3 years?	1	2	2	1	1	2	1	2	2
3.2 Does your economy have or follow any method in order to quantify FLW? (Alternatives)	1	2	2	1	1	2	1	1	1
3.2.1 Analysis of production and sales data	-	-	-	-	-	-	-	-	-
3.2.2 Material flow modelling	-	-	-	-	-	-	-	1	1
3.2.3 Direct weighing of discarded food	-	-	-	1	-	-	1	-	1

Questions	Australia	Canada	Chile	Japan	Mexico	Peru	Singapore	Chinese Taipei	Thailand
3.2.4 Diary analysis	-	-	-	-	-	-	-	-	-
3.2.5 Use of mobile apps to record wasted food	-	-	-	-	-	-	-	-	-
3.2.6 Consumer and producer surveys	-	-	-	1	1	-	1	-	1
3.2.7 Carbon footprint analysis	-	-	-	-	-	-	-	-	-
3.2.8 Life cycle assessments	-	-	-	-	-	-	-	-	-
3.2.9 Collection of production volume data	-	-	-	-	-	-	-	-	1
3.2.10 Use of FAO food balance data	-	-	-	-	-	-	-	1	-
3.2.11 Others (Specify)	1	-	-	-	-	-	-	-	-
3.3 Is there any data collecting/ accounting/statistics system for tracking and reporting of food losses and waste along the food chain in your economy?	2	2	2	1	1	2	0	2	1
3.4 What do you consider to be the most relevant difficulties in measuring FLW in your economy?	1	1	1	0	1	1	1	1	1
3.4.1 Variability in measurement methods, as well as loss estimates	-	-	-	-	-	-	-	-	-
3.4.2 Lack of accurate and reliable data	1	1	1	-	1	1	-	1	1
3.4.3 Fragmentation and lack of comparability of the information provided,	-	1	-	-	1	-	-	-	-
3.4.4 Subjectivity in the definition and classification of lost and wasted food,	-	-	-	-	1	1	-	-	-

Questions	Australia	Canada	Chile	Japan	Mexico	Peru	Singapore	Chinese Taipei	Thailand
3.4.5 The lack of detailed information on losses and wastage per food product in the supply chain.	1	-	1	-	1	1	-	1	1
3.4.6 Lack of awareness and sensibilization to the problem.	-	-	-	-	-	1	-	1	1
3.4.7 The complexity of the supply chain and its interactions between the actors involved.	1	1	1	-	1	1	-	-	1
3.4.8 The need to prioritize between multiple policy needs and sub-sectors within food systems.	-	-	-	-	1	-	-	1	-
3.4.9 The lack of consensus on terminology and methodology to measure it.	-	-	-	-	-	-	-	-	-
3.4.10 The lack of inclusion of pre-harvest losses in current classifications also contributes to the inconsistency of food loss figures.	-	-	-	-	-	-	-	-	1
3.4.11 The lack of a comprehensive approach that includes qualitative and quantitative losses at different stages of the value chain makes it difficult to accurately measure FLW.	1	-	-	-	-	-	-	1	1
3.5 Are there any innovative technologies or best practices on prevention, reduction, recovery, recycling of FLW you believe would help support the implementation?	0	1	0	0	1	1	1	1	1

Questions	Australia	Canada	Chile	Japan	Mexico	Peru	Singapore	Chinese Taipei	Thailand
4.1 Indicate volume in tons of FLW per stage of the supply chain in your economy of the list of products listed below, if available.	1	1	0	1	0	0	2	1	0
4.6 Indicate percentage of FLW per stage of the supply chain in your economy of the list of products listed below, if available.	1	0	0	0	0	0	0	1	0

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