

# Mexico

Conceptual Framework  
for a national strategy  
on food loss and waste



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# Abbreviations and acronyms

<b>AD</b> anaerobic digestion	<b>CONAFAB</b> National Commission of Balanced Feed Manufacturers and Animal Nutrition	<b>FND</b> <i>Financiera Nacional de Desarrollo Agropecuario, Rural, Forestal y Pesquero</i> (National Development Bank for the Agricultural, Rural, Forestry and Fishing Sectors)
<b>ANTAD</b> National Retailers Association	<b>CONAGUA</b> National Commission of Water	<b>FUSIONS</b> EU project entitled: Food Use for Social Innovation by Optimizing Waste Prevention Strategies
<b>AMEG</b> Mexican Association of Bovine Cattle Feeding	<b>CONAPESCA</b> National Commission on Fisheries and Aquaculture	<b>GHGs</b> greenhouse gases
<b>AMENA</b> Mexican Association of Animal Nutrition Specialists	<b>CONEVAL</b> <i>Consejo Nacional De Evaluación de la Política de Desarrollo Social</i> (National Council for the Evaluation of the Social Development Policy)	<b>IFPRI</b> International Food Policy Research Institute
<b>ASERCA</b> Agency of Services for Marketing and Development of Agricultural Markets	<b>CNA</b> National Agricultural Council	<b>INECC</b> <i>Instituto Nacional de Ecología y Cambio Climático</i> (National Ecology and Climate Change Institute)
<b>BAMX</b> Mexican Food Banking Network	<b>CEC</b> Commission for Environmental Co-operation	<b>INEGI</b> <i>Instituto Nacional de Estadística, Geografía e Información</i> (National Institute for Statistics, Geography, and Information)
<b>CANIRAC</b> National Chamber of the Restaurants and Food Industry	<b>CGF</b> Consumer Goods Forum	<b>LAC</b> Latin America and the Caribbean
<b>CENTRAL DE ABASTO</b> Mexico's national wholesale market and supply center	<b>CPEUM</b> Political Constitution of the United Mexican States	<b>LGS</b> Ley General de Salud (General Health Law)
<b>COFECE</b> Federal Commission of Economic Competition of Mexico	<b>FAO</b> Food and Agriculture Organization of the United Nations	<b>NDCs</b> nationally determined contribution (under the Paris Agreement on climate change)
<b>CONACCA</b> National Confederation of Merchants Groups of the Wholesale Market	<b>FLW</b> food loss and waste	
<b>CONACYT</b> National Council of Science and Technology		

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**NGO**

non-governmental organization

**PEPGIR**

*Programa Estatal para la Prevención y Gestión Integral de los Residuos* (State Program for the Prevention and Integral Management of Waste)

**PHL**

post-harvest loss

**PESA**

Strategic Project for Food Security in Rural Areas

**PND**

*Plan Nacional de Desarrollo* (National Development Plan)

**PROLOGYCA**

Competitiveness Program in Logistics and Supply Centers

**RME**

raw material equivalent

**SAGARPA**

Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food

**SDGs**

(United Nations) Sustainable Development Goals

**SEMARNAT**

Secretariat of the Environment and Natural Resources

**SECTUR**

Secretariat of Tourism

**SEDESOL**

Secretariat of Social Development

**SHCP**

Secretariat of Finance and Public Credit

**SIAP**

Agrofood and Fisheries Information Service

**UN Environment**

United Nations Environment Programme

**WB**

World Bank

**WRAP**

Waste and Resources Action Programme

**WRI**

World Resources Institute

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# Executive summary

Food loss and waste (FLW) is one of the key challenges currently facing the world.

About one third of all food produced for human consumption is lost or wasted globally, amounting to approximately 1.3 billion tons a year. Food is lost or wasted throughout the supply chain, from initial agricultural production through to final household consumption, while over 800 million people (or 11.3% of the global population) suffer from chronic hunger and malnutrition.<sup>1</sup> FLW generates negative economic, social and environmental impacts. Valuable resources are lost as a result of FLW in terms of water, energy, land, biodiversity and other inputs that are used to produce food, ultimately contributing to greenhouse gas emissions and the depletion of natural resources.

**Mexico, as highly urbanized, middle-income country, is no exception to these dynamics as it experiences high levels of food loss and waste throughout each phase of the supply chain.** An estimated 20 million tons of FLW occur each year from farm gate to retail, representing over 35% of total food produced in the country. The economic cost associated with FLW in Mexico has been estimated at US\$25 billion (representing about 2.5% of Mexico's GDP),<sup>2</sup> which includes a direct and negative impact on the income of both farmers and consumers. While these estimates are known to be conservative and further analysis is required to fully understand the dimensions of FLW in the country, this phenomenon occurs at a time when 24 million people are food insecure and 9 million live in extreme poverty in Mexico.

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## 1.3bn tons

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The amount of food produced for human consumption wasted globally

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<sup>1</sup> <http://www.fao.org/food-loss-and-food-waste/en/>

<sup>2</sup> World Bank (2017). Food Loss and Waste in Mexico: an Economic, Environmental and Social Perspective. 'A product level mass balance calculation of waste in the supply chain between farm gate and the consumer for 79 most consumed products.'





**Addressing these challenges is important to Mexico.** In addition to fulfilling its commitments under the United Nations Sustainable Development Goals (SDGs), in particular, Goal 12.3 on sustainable production and consumption, Mexico is determined to tackle FLW through the development of a national strategy that would provide the basis by which key stakeholders (private sector, civil society and government) can identify and adopt concrete measures and policy options to address this challenge. Within this context, the Government of Mexico has requested technical support from the World Bank to develop a Conceptual Framework to inform the preparation of a future national FLW strategy.

**The objective of the Conceptual Framework (the framework) is to guide the process for the development of a national strategy for FLW.** It identifies the ‘hotspots’ where losses and waste occur along the food supply chain and provides an initial list of solutions for the short-, medium- and long-term that could help prevent and reduce FLW. The framework builds on: (i) the current understanding of the challenges associated with FLW in Mexico; (ii) the main sources of FLW (the ‘hotspots’) and their underlying causes; and (iii) identifying and mapping potential solutions as a roadmap of actions that can be implemented in the short-, medium- and long-term. The framework was developed through a broad consultation with relevant stakeholders in the public and private sectors, academia, civil society and international organizations that recognize FLW as a strategic priority for the country.

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It is against this backdrop that this report serves as the basis for structuring a future national strategy for addressing and reducing FLW in Mexico.  
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## 20m

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An estimated 20 million tons of FLW occur each year from the farm gate to retail

**The framework developed here provides a structure for addressing FLW in Mexico and sets the stage for strategic interventions.** The work is a compilation of information on FLW in Mexico, data on the international experience of FLW, and an analysis of existing data gaps. It examines the existing legal and regulatory framework governing FLW in Mexico and the current support provided. It considers the whole system of food production and consumption, prioritizing areas for intervention and outlines the main causes of FLW in each area. Based on research, discussions with stakeholders and international experience, this document lists a range of solutions that can prevent and reduce FLW in Mexico. The interventions are qualitatively prioritized and an action plan is outlined that spans different time periods and identifies the key actors.

**Identified hotspots of FLW occur for multiple reasons,** including lack of pricing information, lack of adequate infrastructure, inability to meet sanitary and phytosanitary standards, and lack of economic incentives, among others. These cover primary production, wholesale and retail markets, households, and hospitality services. The report characterizes the key hotspots and provides several options that could be further developed to form specific actions as part of a national strategy. Prioritizing these actions through an in-depth cost-benefit analysis is a valid next step in the process of developing a national FLW strategy for Mexico.



“ The report characterizes the key hotspots and provides several options that could be further developed to form specific actions as part of a national strategy. ”

“  
The framework aims to ensure that FLW is not moved around the food system from one place to another, but is prevented and reduced in the first place.  
”

**The framework indicates how Mexico can tackle FLW systemically and effectively.** The scale of the challenge is large, with 20 million tons of FLW annually from farm gate to retail and an estimated 11 million tons of FLW from households. Working systemically and in an integrated manner across the whole supply chain (i.e., from farm to fork)<sup>3</sup> will ensure that solutions are focused on delivering SDGs 12.3. The framework aims to ensure that FLW is not moved around the food system from one place to another, but is prevented and reduced in the first place.

**The development of this framework positions Mexico as a global leader in tackling FLW.** There are clear economic, social and environmental reasons for tackling FLW in a systematic manner and given the costs of FLW and the benefits of addressing it, there is a compelling case to make this a priority for Mexico. This report represents a crucial step in taking Mexico in that direction.



<sup>3</sup> Unless otherwise specified, 'supply chain' means farm to fork.

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# Introduction

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## Background and rationale

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### Background

1

#### Tackling FLW is an important challenge for Mexico.

Internationally, Mexico has a high profile in the dialogue on FLW, with two ministerial representatives participating in the Champions 12.3 coalition (at the time of writing) and through its presence on the Commission for Environmental Co-operation (CEC) project on FLW measurement. The Government of Mexico is also represented on the Board of UN Environment's One Planet Network, which aims to help deliver SDGs 12 on sustainable production and consumption. Encouraging reductions in food loss and improving recycling are key parts of this program.

2

#### This report arises from a request by the Government of Mexico to support its effort towards developing a national strategy for FLW reduction.

A working group comprising representatives from the President's office, the Secretariat of Agriculture (SAGARPA), the Secretariat of Environment and Natural Resources (SEMARNAT) and other public, private and civil society agencies was established in July 2017 to address the challenges of FLW in Mexico and to seek potential solutions. The consensus pointed towards the need for a concerted approach. On this basis, a formal request for technical assistance was extended to the World Bank Group by the Ministry of Finance (SHCP) of Mexico to support the development of a Conceptual Framework that would inform the preparation of a future national strategy for FLW reduction.

3

#### The report builds on numerous stakeholder consultations.

In February 2018, the working group launched the development of the Conceptual Framework. This set specific commitments for members of the working group, the private sector and civil society in supporting the formulation of the Conceptual Framework. In April 2018, SEMARNAT and the Danish government hosted a joint workshop to address the role of public-private partnerships in reducing FLW in Mexico. Action is already taking place in the private sector to measure and address FLW in its operations. Several leading private companies indicated their interest in doing more, while collaborating with the government and other businesses. The development of this framework has therefore benefited from the inputs and feedback of multiple stakeholders (see Annex 8).

## Rationale for a Conceptual Framework for a national strategy on FLW

4

### A Conceptual Framework on FLW is a step towards the formulation of a national strategy.

This framework provides an overview of the FLW situation in Mexico, along with a range of recommended short-, medium- and long-term actions which could be implemented to help reduce FLW. The underpinning analysis has been undertaken to assist the Government of Mexico in developing a future strategy on tackling FLW. If developed and implemented, this strategy could deliver significant financial, social and environmental benefits to Mexico, while aligning with the SDGs. Further cost-benefit analysis on the proposed solutions will be part of its development in order to better quantify the financial, social and environmental impacts of addressing FLW in Mexico.

5

### Generating losses and waste is costly.

Producing food requires a major investment of resources (water, land, fertilizers, energy). Disposing of waste is also costly. In Mexico each year, at least 20 million tons of food are lost and wasted. Based on the estimated environmental cost and lost sales from both import and export commodities, the country spends an estimated US\$25 billion (2.5% of GDP) on FLW.<sup>4</sup> This figure does not include the cost of food that is not consumed or the cost to municipalities of collecting and disposing of food waste. As such, the financial cost is likely to be substantially higher.

6

### Improving supply-chain efficiency is key to reducing economic and social regional disparities.

For Mexico, targeting reductions of losses along supply chains is important for minimizing regional disparities in food production and consumption between the north and south, especially considering the specificities of post-harvest losses for various agricultural commodities, the limited links between producers and markets, and the lack of opportunities to add value among small producers.



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This framework provides an overview of the FLW situation in Mexico, along with a range of recommended short-, medium- and long-term actions which could be implemented to help reduce FLW.

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<sup>4</sup> It was not possible to attach a cost estimate to the urban solid waste figure due to lack of granular detail on the type of food wasted and whether the waste was edible or inedible.

## 7 There are untapped opportunities for adding value and redistributing food.

More effective management of food that has already been produced would significantly benefit the country. Mexico's capacity for adding value is currently low and its potential high. The emerging growth in the fruit and vegetable sector, for example, can benefit from the introduction of strategies that would increase shelf-life, while alternative processing outlets could help reduce economic and physical losses. Furthermore, given that 24 million Mexicans are considered food insecure, policies and strategies to support the redistribution and donation of safe and nutritious food are paramount.

5 Food Loss and Waste (FLW) Protocol (2016). Food Loss and Waste Accounting and Reporting Standard (Version 1.0). [https://www.wri.org/sites/default/files/REP\\_FLW\\_Standard.pdf](https://www.wri.org/sites/default/files/REP_FLW_Standard.pdf)

6 <http://www.fao.org/resources/infographics/infographics-details/en/c/414196/>

7 Taken from <http://www.fao.org/platform-food-loss-waste/food-waste/definition/en/>

8 <http://www.fao.org/food-loss-and-food-waste/en/>

9 Food and Agriculture Organization of the United Nations (2011). *Food wastage footprint and climate change*. <http://www.fao.org/3/a-bb144e.pdf>

10 <http://www.fao.org/save-food/resources/keyfindings/en/>

11 <https://data.worldbank.org/country/netherlands>

12 <https://data.worldbank.org/country/mexico>

## Definition of food loss and waste

### 8 Defining and measuring FLW is an ongoing process.

Early work on FLW suffered from the absence of an international agreement on the definitions and methods for measuring FLW. The FLW standard for global accounting and reporting was developed by an international, multi-stakeholder coalition (including UN Environment, FAO, CGF, World Business Council for Sustainable Development, WRI, WRAP and FUSIONS) to address this issue. As part of this process, a working definition for FLW has been adopted as: '(edible) food and/or associated inedible parts removed from the food supply chain'.<sup>5</sup> This working definition is used in this document.

### 9 The UN FAO defines food loss as 'the decrease in quantity or quality of food'.

Food waste is part of food loss<sup>6</sup> and refers to the discarding or alternative (non-food) use of food that is safe and nutritious for human consumption along the entire food supply chain, from primary production to household consumer level. Food waste is recognized as a distinct part of food loss, because the drivers that generate it and the solutions to it are different from those of food loss.<sup>7</sup>

## Global scale and approaches to food loss and waste

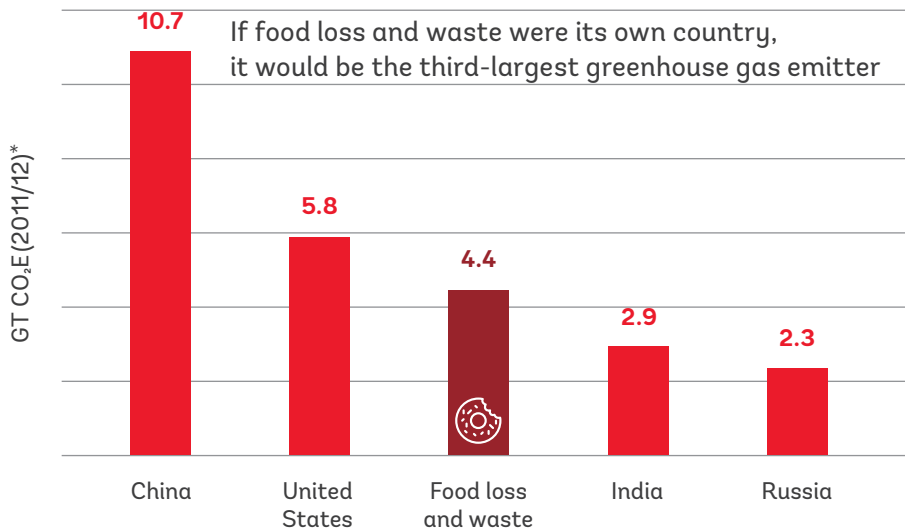
### 10 Around one-third of the food produced globally never reaches consumers, while 2 billion people go to bed hungry every night.<sup>8</sup>

The financial costs and environmental impact of FLW are large. Research suggests that if food waste were a country, it would be the third largest greenhouse gas (GHGs) emitter, after the USA and China (see Figure 1).<sup>9</sup> At the global level, according to FAO, food loss and waste amounts to roughly US\$680 billion in industrialized countries and US\$310 billion in developing countries.<sup>10</sup> To put this into perspective, this is larger than the GDP of the Netherlands in 2016,<sup>11</sup> and equivalent to over 90% of Mexico's GDP in the same year.<sup>12</sup>

### 11 While loss of food occurs in all countries, there are important differences between developed and developing countries.

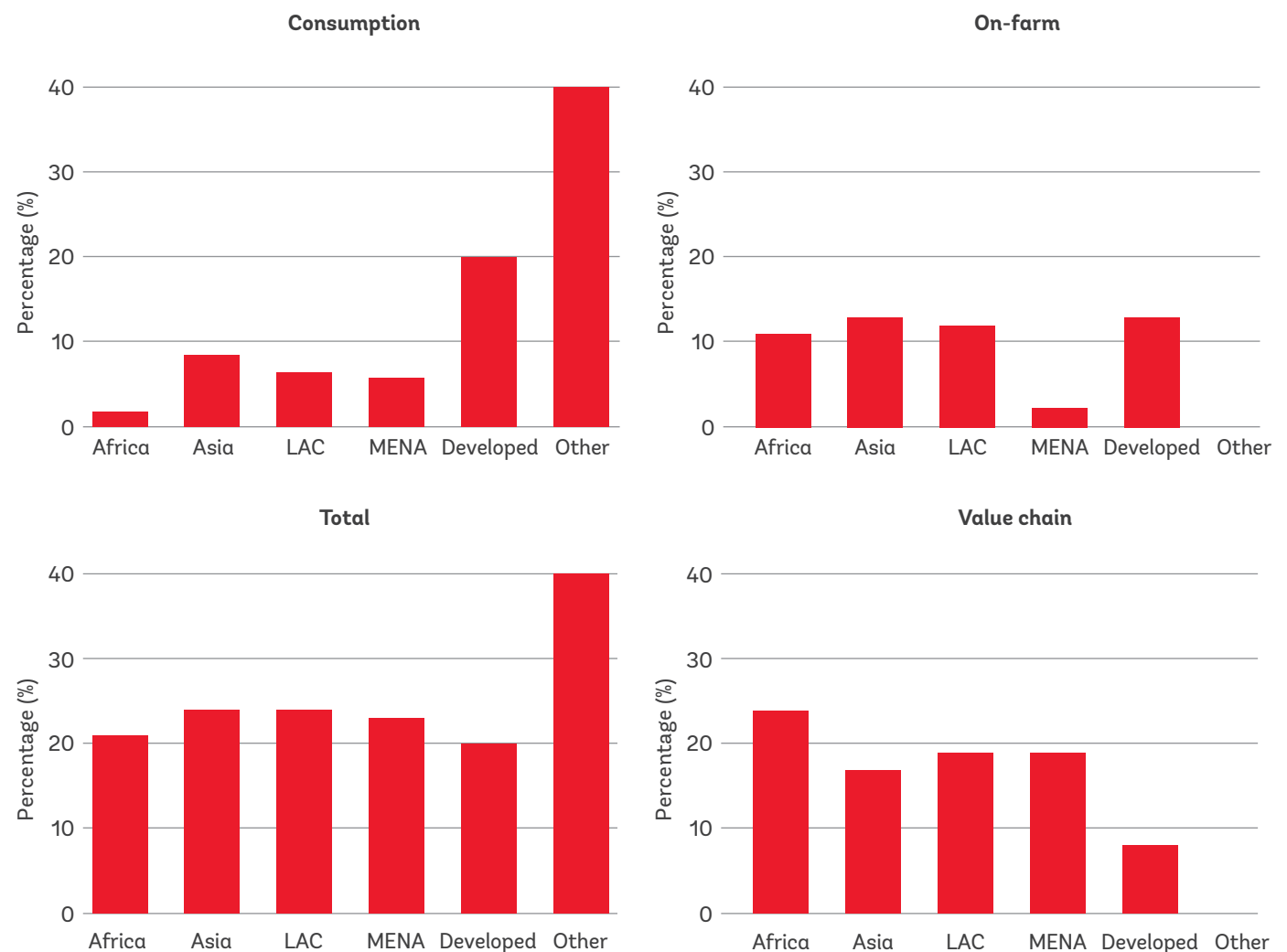
In developed countries, most food is lost at the consumer level, while for developing countries, food loss occurs primarily along the supply chain, underscoring the many limitations in these countries on efficient post-harvest management and distribution of food. In Latin America and the Caribbean (LAC), most food is lost along the supply chain (19%), followed by on-farm (12%) and end-consumer (6.4%) (see Figure 2).

**Figure 1: GHGs emissions of FLW in relation to nation states**



\*Note: Figures reflect all six anthropogenic greenhouse gas emissions, including those from land use, land-use change, and forestry (LULUCF). Country data is for 2012 while the food loss and waste data is for 2011 (the most recent data available). To avoid double counting, the food loss and waste emissions figure should not be added to the country figures.  
 Source: CAIT. 2015; FAO. 2015. *Food waste footprint & climate change*, Rome: FAO.

**Figure 2: Average estimated loss by region and type of loss**



Source: Rosengrant et al., 2015

**12**  
**To combat this and other global food production and consumption challenges, SDGs 12 was established.**

Specifically, sub-goal 12.3 sets the challenge of halving per-capita global food waste at the retail and consumer levels and reducing food losses along production and supply chains, including post-harvest losses, by 2030. A national strategy for FLW would ideally be aligned with this goal. In addition to contributing towards the achievement of SDGs 12.3, a strategy would also make a significant contribution to SDGs 1, 2, 3, 11, 13, 14, 15 and 17 (see Figure 3). See Annex 1 for a short description of the relevant SDGs.

**13**  
**There is a compelling case for aligning a national strategy for FLW with SDGs 12.3.**

Action on FLW can improve efficiencies along the value chain, reduce the loss of food, help reduce GHGs emissions and contribute to the requirements of the Paris Agreement. Research by WRI and WRAP has shown that investments in initiatives to reduce FLW have generated a median return on investment of \$14 for every \$1 invested.<sup>13</sup> This research considered data from 1,200 business sites from across the food supply chain in 17 countries. In addition, work in the UK on the cost savings from FLW reduction across the supply chain estimated a financial benefit of around \$100 for every \$1 invested by government.

**Figure 3: The Sustainable Development Goals**





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**There is recognition of SDGs 12.3 both at the government and business level in Mexico.**

In addition to setting targets aligned with SDGs 12.3, a national strategy would establish a guiding principle to inform the national priorities, the actions for each stakeholder and the development of an implementation plan. Among the principles of 12.3 that would be embedded in a national strategy are: (i) preventing FLW; (ii) food recovery and donation, so that every piece of suitable food is destined for human consumption; (iii) channeling FLW to animal feed; (iv) food recycling and recovery; and (v) final disposal.<sup>14</sup> These guiding principles focus on prevention, underlining significant financial, social and environmental benefits that are greater than those arising from dealing with FLW once it has occurred, and are in line with the food waste hierarchy (see Figure 4).

15

**Mexico can be a leader among developing countries in preventing FLW.**

By setting a goal and developing a national strategy for FLW across the food supply chain, Mexico would not only address a growing problem, but also be a leader among developing nations, providing a blueprint for the development of similar strategies elsewhere. Mexico is a pioneer in thinking on FLW: a comprehensive analysis for quantifying volumes of FLW and assessing its environmental, economic and social costs has been carried out in the country; a high-level, multi-disciplinary working group has been established; and it is among the first countries to begin the development of a comprehensive national strategy for FLW. Mexico's neighbors have developed their own approaches – a roadmap to reduce food waste by 20% in the USA<sup>15</sup> and an FLW Strategy for Canada.<sup>16</sup> Other countries have adopted SDGs 12.3 as an aim, but few have underpinned it with technical studies or a comprehensive national strategy.

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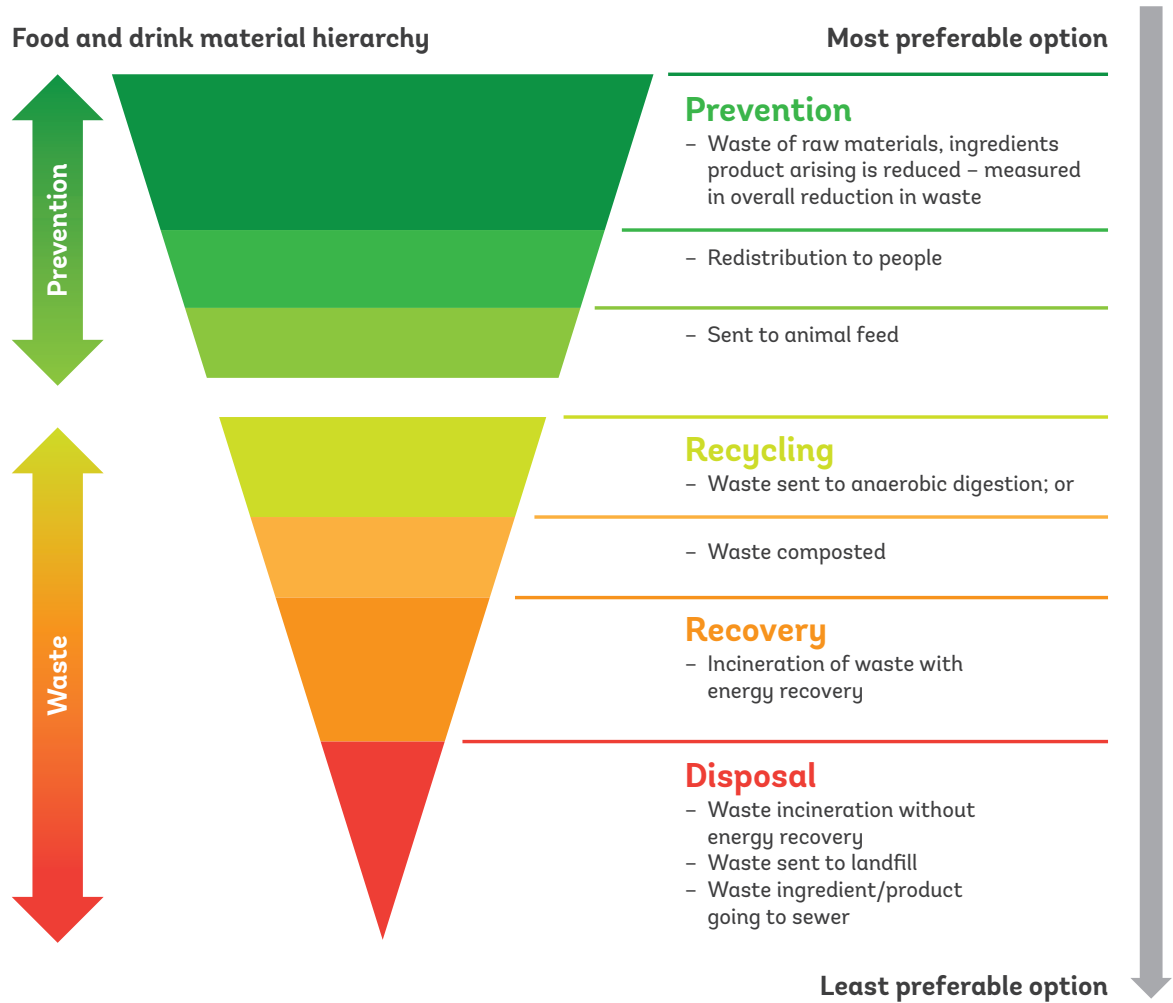
13 <https://champions123.org/the-business-case-for-reducing-food-loss-and-waste/>

14 [http://www.wrap.org.uk/sites/files/wrap/image/Food\\_and\\_Drink\\_hierarchy.jpg](http://www.wrap.org.uk/sites/files/wrap/image/Food_and_Drink_hierarchy.jpg)

15 [https://www.refed.com/downloads/ReFED\\_Report\\_2016.pdf](https://www.refed.com/downloads/ReFED_Report_2016.pdf)

16 <http://www.nzwc.ca/focus/food/national-food-waste-strategy/Documents/NZWC-FoodLossWasteStrategy.pdf>

Figure 4: Food loss and waste hierarchy. Source: WRAP



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### Preventing FLW can have important economic implications for Mexico.

The food loss agenda in Mexico equates to improving efficiency along the supply chain. It is important for minimizing regional economic disparities between the north and the south of the country, through improved food production and distribution. This is important in the context of the water and environmental footprint of Mexico's agricultural sector, which consumes more than 70% of the freshwater resources and remains the second largest emitter of GHGs – at 12% of the total in 2018<sup>17</sup> – after the energy sector.

17

### Reducing FLW brings benefits to Mexico's growing hospitality and tourism sectors.

Recent research by WRAP and WRI for Champions 12.3 identified significant savings to businesses that invest in FLW measurement and prevention.<sup>18</sup> For example, a deep analysis into the hotel sector<sup>19</sup> found that, on average, hotels achieved a 21% reduction of FLW in one year. Over 70% had recouped their investment in the first year and 95% within two years. Nearly 90% of sites invested less than US\$20,000, which was less than 1% of sales on average. Similar results were found for the catering sector.<sup>20</sup> Working on FLW reduction in Mexico in these sectors would improve the competitiveness of the sector in comparison with its international competitors.

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Working on FLW reduction in Mexico in these sectors would improve the competitiveness of the sector in comparison with its international competitors.

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17 Inventario Nacional de Emisiones de Gases y Compuestos de Efecto Invernadero (INECC) (2018)

18 <https://champions123.org/the-business-case-for-reducing-food-loss-and-waste/>

19 <https://champions123.org/the-business-case-for-reducing-food-loss-and-waste-hotels/>

20 <https://champions123.org/the-business-case-for-reducing-food-loss-and-waste-caterers/>

# Conceptual Framework

18

**Tackling FLW requires a systemic approach.**

The causes of food loss and waste are often complex and multi-faceted. They arise because of the actions of multiple actors across the supply chain and the behavior of millions of people in their homes and when they eat out. International experience suggests that the solutions often require co-operation across the supply chain, supported by government, trade associations and relevant non-governmental organizations (NGOs).<sup>21</sup>

<sup>21</sup> Watkins, A & Simister, M. (2017). Our Food, Our Future. Kent, UK: Urbane Publications.

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**A proposed Conceptual Framework for a national strategy on FLW consists of three steps:**

## **Step 1: Context**

**Outline the current understanding of the FLW problem.**

## **Step 2: Causes**

**Identify the main sources of FLW in the Mexican economy (the 'hotspots') and their underlying causes.**

## **Step 3: Clear actions**

**Map potential solutions and propose clear actions that can be implemented in the short-, medium- and long-term.**

## **Step 1: Context: Outlining the current understanding of FLW in Mexico**

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**The first part of outlining the problem of FLW is to build a case for considering it in the first place.**

This involves i) quantifying the volume of FLW; ii) determining the social, environmental and economic dimensions and costs related to FLW; iii) identifying the relevant legal and institutional frameworks; and iv) building an overall picture of FLW in Mexico from the available information.

## i) Quantifying the volume of FWL

21

**The scale of the problem in Mexico is large.**

The World Bank estimates that in Mexico, about 20 million tons of FLW a year arise from 79 products, from farm gate to point of purchase. These 79 products represent 81% of the total food purchased by an average Mexican household.<sup>22</sup> In addition, it is estimated (from urban solid waste and waste composition data from three states and 13 municipalities) that there may be around 11 million tons of food waste annually from households.<sup>23</sup> The amount of FLW in primary production (i.e. before the food leaves the farm premises) is still largely unknown. Therefore, the estimated scale of around 30 million tons a year is the lower boundary of a wide (but as yet undetermined) range of FLW generated in Mexico, one of the largest agricultural producers in Latin America and a global agricultural power.

## ii) Determining the social, environmental and economic dimensions and costs of FLW

22

**The economic costs of FLW are significant.**

The economic cost of the 20 million tons from 79 products is estimated at MX\$500 billion (US\$25 billion), representing approximately 2.5% of Mexico's GDP.<sup>24</sup> This includes some of the environmental costs and lost sales, both domestically and for export markets, but does not include the cost to families and businesses of buying food that is never eaten or the associated cost to municipalities of food as part of solid waste management systems. As such, the true financial cost is likely to be substantially higher.

23

**The social dimension of FLW is considerable.**

Fifty-three million people live in poverty in Mexico, of which 24 million are considered food insecure and 9 million live in extreme poverty.<sup>25</sup> Malnutrition is widespread among the poor. Hence, providing food to those who need it should be a priority. While not all FLW is edible (e.g. animal bones and fruit seeds and stones, such as those in avocados), recent estimates of post-farm-gate FLW in the UK show that as much as 70% is edible.<sup>26</sup>

Although in Mexico the proportion of edible to inedible is likely to be lower, FLW is still a significant source of potentially edible food that could be put to much better use than sending it to landfill or using other methods of disposal such as incineration or leaving it in the fields. Estimates for Mexico show that redistributing FLW from the supply chain could provide people living in extreme poverty with 48.3 kg beef, 21.7 kg rice and 80.9 kg tomato a year.<sup>27</sup>

22 World Bank (2017). Food Loss and Waste in Mexico: an Economic, Environmental and Social Perspective. 'A product level mass balance calculation of waste in the supply chain between farm gate and the consumer for 79 most consumed products.'

23 See Annex 6 for more detail. The two estimates have been made using methods that are not comparable and there is an unknown overlap between the two and therefore they should not be summed.

24 It was not possible to attach a cost estimate to the urban solid waste figure due to lack of granular detail on the type of food wasted and whether the waste was edible or inedible.

25 Coneval (2017). [https://www.coneval.org.mx/Medicion/Paginsa/Pobreza\\_2008-2106.aspx](https://www.coneval.org.mx/Medicion/Paginsa/Pobreza_2008-2106.aspx)

26 WRAP (2018). <http://www.wrap.org.uk/sites/files/wrap/Courtauld%20Commitment%202025%20-%20baseline%20report%20for%202015.pdf>

27 World Bank (2017). Food Loss and Waste in Mexico: an Economic, Environmental and Social Perspective.

**24**  
**The environmental footprint of FLW is large.**

The embedded GHGs emissions from only 25 of the 79 agricultural products studied is around 36 million tons of CO<sub>2</sub> equivalent.<sup>28</sup> In addition, if all 20 million tons of food waste is disposed of in landfill, it would be responsible for more than 36 million tons of direct GHGs emissions. The household food waste that goes to final disposal sites may add an estimated 15 million tons of additional GHGs emissions.<sup>29</sup> As such, the GHGs footprint of FLW in Mexico is large and tackling it requires policy interventions as part of the country's commitment to reducing GHGs emissions by 22% by 2030.

28 World Bank (2017). Food Loss and Waste in Mexico: an Economic, Environmental and Social Perspective.

29 This uses an average landfill emissions disposal factor of 1.8 per ton of food waste on the estimated 78% (INEGI) of 11 million tons of food waste disposed of to landfill.

30 World Bank (2017). Food Loss and Waste in Mexico: an Economic, Environmental and Social Perspective.

31 <http://www.circleofblue.org/2018/latin-america/floods-water-shortages-swamp-mexico-city/>

32 <http://www.globalwaterforum.org/2012/05/07/understanding-water-scarcity-definitions-and-measurements/>

33 CONAGUA (2015). <http://www.conagua.gob.mx/CONAGUA07/Publicaciones/Publicaciones/ATLAS2015.pdf>

34 For example, Universal Declaration of Human Rights (Article 25); International Covenant on Economic, Social and Cultural Rights (ICESCR) (Article 11); Additional Protocol to the American Convention on Human Rights in the area of Economic, Social and Cultural Rights ('PROTOCOL OF SAN SALVADOR') (Article 11); United Nations Convention on the Rights of the Child (UNCRC) (Article 24); and the Declaration on the Right to Development (Article 8).

**25**  
**The water resources required to produce food are enormous and trade-offs in water use are high.**

An analysis estimated that FLW arising from the production of 22 products required 40 billion cubic meters of water a year.<sup>30</sup> This would provide all the water required by the entire population of Mexico (120 million people) for 2.4 years. This is significant, given the scarcity of water in parts of Mexico: some estimates suggest that one-fifth of the population of Mexico City do not have a reliable tap-water service, yet a lot of the water used for food production is wasted through FLW.<sup>31</sup> Estimates suggest that water availability in some regions will reach 1,000 cubic meters per inhabitant by 2030, constituting a shortage condition under the Falkenmark Index.<sup>32,33</sup>

**iii) Identifying the relevant legal and institutional frameworks**

**26**  
**Significant legal and institutional frameworks relevant to FLW already exist in Mexico.**

Article 4 of the Constitution provides the overarching legal and regulatory framework associated with FLW. It states that: i) All individuals have the right to nutritional, sufficient and quality nourishment; and ii) Every person has the right to a healthy environment for his/her own development and well-being. A FLW strategy can contribute to and safeguard these two rights through interventions that, first, increase access to food by poor segments of the population and second, reduce pollution by improved waste management. In addition, Article 27 defines integral and sustainable rural development as key to fulfilling the Mexican population's right to 'nutritional, sufficient and quality nourishment food'. Mexico recognizes this as a fundamental human right and has signed several international agreements to this effect.<sup>34</sup> An overview of the current situation is presented in Table 1 and a more detailed discussion is provided in Annex 2.

**Table 1: Summary of the legal and institutional framework in relation to FLW**

Area	Situation	Implementer
Nutrition and rural development	Sustainable Rural Development Act 2001 and Social Development Act 2003: These promote equal opportunities and sustained poverty reduction through various national programs. Specific to FLW is the Zero Hunger National Program, which aims to minimize post-harvest and food losses during storage, transportation, distribution and commercialization (Objective 4).	SAGARPA
	General Health Act 1984 (superseded 2018): This establishes the participation of the Ministry of Health in government feeding programs and the design and development other nutrition-related programs, in conjunction with health authorities and states (Article 114).	Ministry of Health
Health protection and food redistribution	There is limited enforcement of sanitary and phytosanitary regulations on food redistribution through the collection and donation of food. Despite this, 104,000 tons are donated each day. There are modest incentives to encourage businesses to redistribute surplus food. Mexico lacks a 'Good Samaritan' law, whereby liability is transferred from the donor to the recipient organization.	Various agencies
Waste management	The Prevention and Integral Waste Management General Act 2003 (LGPGIR) defines household waste as organic waste (Article 18). Food waste less than 10 tons is urban waste and managed by municipalities. Waste above 10 tons is special handling waste and managed by states. Final waste disposal occurs in either landfill or open-dump sites. Some states require householders and businesses to separate waste into 'organic' and 'inorganic'. Currently, this separation rarely leads to separate collection of these waste streams because such separation is sporadic.	Sub-national governments, states and municipalities
Climate change	The Paris Agreement of 22 April 2016 was ratified by the Senate in September 2016. The General Law on Climate Change was amended on 25 April 2018 to include the adoption of nationally determined contributions (NDCs). These NDCs cover waste management and specifically mention new general legislation for integral waste management, local tariffs for waste disposal, new finance and public policy, and efficient use of bio-digestion.	SEMARNAT

27

**There is room for improvement.**

First, careful consideration can be given to the rationale for introducing a ‘Good Samaritan’ legal instrument, given that food redistribution is already taking place under the current legal framework. Second, the current sporadic waste separation (organic from inorganic) can be extended beyond households and businesses to the management of waste collection and disposal, in order to promote reductions in FLW. Third, the FLW national strategy could complement the NDCs by helping to address a critical source of emissions and meet the required GHGs reduction goals.

**iv) Building an overall picture of FLW in Mexico**

28

**FLW occurs at all stages of the Mexican supply chain.**

There are sufficient data on FLW in Mexico to identify an indicative baseline of around 30 million tons, while also highlighting the hotspots. However, the data are not sufficiently accurate to quantify the specific amount and types of food lost and wasted at different parts of the food chain. Gaps in data and the accuracy of information have been identified throughout (see Annex 3), but the data nevertheless suggest that there is significant FLW in the

primary production and consumption stages. Figure 5 demonstrates the flow of food across the supply chain, giving an indicative visualization of the points of loss and waste along that chain. The arrows indicate an estimate of the weight of food as it moves from primary production to consumers and through to disposal. The data available for FLW in Mexico are sufficient to give a rough estimate of loss or waste at each stage in the value chain for all food, although the exact amounts and proportions will vary significantly between products and over time.

**Box 1:**

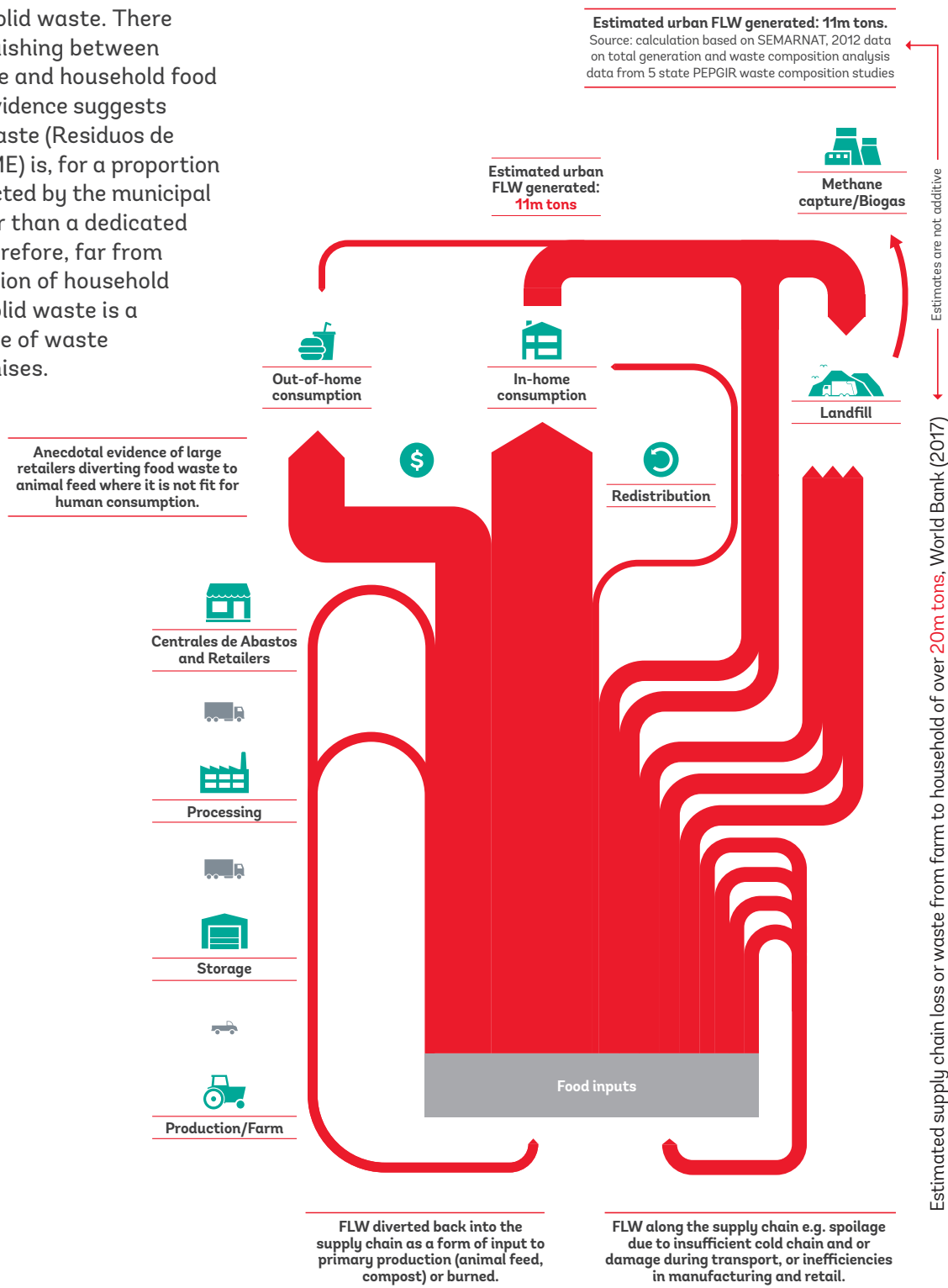
The hospitality and food services sector is growing rapidly in Mexico, with some estimates putting growth at 4.3% a year. This places the sector in a position to have an increasing impact on FLW. Food waste in the tourism sector and hotels is significant. Studies in the UK have identified that 18% of all food purchased in the hospitality sector is wasted, 75% of which could have been eaten. In simple terms, this means that one in every six meals served is wasted. The scale of the global tourism sector is significant, representing 9% of global GDP and employing 1 in 11 people, with an industry value of US\$1.5 trillion a year. International tourist arrivals are expected to increase by 3.3% a year until 2030. For one-third of developing countries and 50% of least developed countries (LDCs), tourism provides the main source of foreign exchange income.

Globally, one estimate indicates that 73 billion tourist meals are served a year, with an estimated 200 million meals a day provided. Based on growth predictions for international tourists by 2020, this means an **additional** 2.5 billion meals will be required annually – that is an **additional** 7 million meals a day – bringing the total to 23.4 billion meals a year by 2030.



**Figure 5: Visualization of food flows in Mexico, including indicative loss and waste<sup>35</sup>**

Food in municipal solid waste. There is difficulty distinguishing between business food waste and household food waste. Anecdotal evidence suggests Special Handling Waste (Residuos de Manejo Especial, RME) is, for a proportion of businesses, collected by the municipal waste trucks rather than a dedicated RME collection. Therefore, far from being a representation of household waste, municipal solid waste is a complicated mixture of waste from different premises.



<sup>35</sup> Sources: Indicative flow sizes are based on a wide variety of evidence: 20 million ton estimate from World Bank (2017). *Perdidas y desperdicios de alimentos en Mexico*; 11 million ton estimate is calculated for this report based on SEMARNAT (2012). *Diagnóstico básico para la gestión integral de los residuos* and conservative use of state/municipal waste composition studies under the PEPGIR program (see Annex 6). The term 'landfill' represents all treatment of waste, of which landfill is by far the most significant. Some FLW will be processed by composting and thermal processors.

**Table 2: Availability, quality and accuracy of data on the measurement of FLW by stage in the value chain**

Information	Stage in the supply chain					
	Production				Consumption	
	On-farm production	Handling/storage	Processing/packaging	Distribution/market	Out-of-home	Household
Availability of information on quantity or percentage of FLW	Moderate	Moderate	Moderate	Moderate	Low	Low
Coverage of whole country/majority of products	Moderate	Moderate	Moderate	Moderate	Low	Moderate
Average quality of methods	Moderate	Moderate	Moderate	High	Low	High
Accuracy of quantifying FLW for that part of the supply chain	Low	Low	Low	Low	Low	Moderate

29

**Identifying available data on FLW is a critical step in building a picture of the flow of food through the value chain.**

There is sufficient information in Mexico on FLW to enable the development of an indicative baseline for FLW for the whole country. This is more than other countries have been able to achieve. As mentioned above, the estimate of FLW from farm to retailer of over 20 million tons a year and the indicative estimate of consumer waste of around 11 million tons a year give an indication of the scale of FLW in Mexico. However, there is no study that breaks down the FLW at each stage of the food value chain. More information on this is vital for long-term efforts to reduce FLW by helping prioritize actions in the short term.

The information available at each stage of the value chain varies in quantity, quality and accuracy, as summarized in Table 2.<sup>36</sup> It is important to note that the information is graded according to its quality, quantity and accuracy specifically for measuring FLW. This may be different from its original purpose, for which the grading would be different.

<sup>36</sup> Accuracy was decided based on international experience and understanding of quantification methods of FLW. For example, it is known through various studies (e.g. WRAP (2013). *Household food and drink waste in the UK*) that food waste diaries under-report waste significantly, but are more accurate than other surveying methods.

30

**Although the information exists, there is no a common framework for FLW measurement across the food value chain.**

**a. Production, handling and storage:** Data on FLW in primary production are available for certain products. SIAP calculates post-harvest loss for 12 agricultural products based on agreed factors applied to production. While these are indicative only, other estimates are anecdotal (e.g. 50% of tomatoes lost in the field) and there is no comprehensive study on this part of the supply chain for the majority of products. INEGI is planning a pilot survey on 18 products that will contribute to expanding the database. Handling and storage have relatively accurate information collected under ASERCA for grain only, mainly focused on mass balances in storage facilities. There is potential to expand this to other products in the future.

**b. Manufacturing, processing and packaging:** Larger manufacturers have a varying quality of production data that can give estimates of FLW. Within the timeframe of the project, it was not possible to secure access to these data.

**c. Distribution and market:**

The multinational retail corporation Walmart, with approximately 25% of the overall market share for food retail, has data on its FLW. This will provide a significant indication for the formal side of this part of the value chain, if it can be secured. Information on informal retail does not currently exist.

**d. Consumption:** While there are a small number of (relatively) accurate studies on household (food) waste generation, there is a lack of granular and country-wide data on household and out-of-home consumption. Government studies under the PEPGIR program show that a large proportion of food waste (around 30%) is contained within the waste collected by municipal waste collection services. However, due to the complexities of the waste management system in Mexico, this is not an accurate representation of FLW generation in households alone and may even include FLW from retail and/or manufacturing. Very little is known about out-of-home consumption. The hospitality and food services sector varies considerably by type and formality of business, with associated varying levels of FLW. Given the rapid growth of this sector and the importance of eating out in Mexican culture, this is likely to be a growing source of FLW.

31

**There are important data gaps that need to be addressed.**

**a. Food loss:** While there are data on production, enough to identify hotspots and potential actions, the variation in on-farm loss between agricultural products is large. Therefore, prioritizing products as subjects for action must be done on the basis of factors other than the proportion of waste they represent, for example by the number of formal producers to work with or the importance of individual products to the national diet or economy.

**b. Informality:** Table 2 does not take into account the informal sector across the supply chain. Up to 50% of food retail is estimated as informal and a large number of producers in the south are subsistence farmers. For example, SAGARPA estimates that between one-quarter and one-fifth of white-maize production is for self-consumption.<sup>37</sup> The informal sector at each stage of the supply chain represents a significant gap in data and one that needs to be better understood to address FLW in the longer term. The informal sector has different challenges and opportunities than the formal one.

<sup>37</sup> <http://www.numerosdelcampo.sagarpa.gob.mx/publicnew/productosAgricolas/cargarPagina/4>

**c. Middle men:** There is no quantitative information on ‘middle men’ who act between stages of the supply chain as informal handlers and distributors. Anecdotal evidence suggests they have some influence on FLW (for example, in withholding or providing out-of-date pricing information to farmers that may prevent them from harvesting), but there is no significant information on the effect this has on FLW.

**d. Waste collection:** There is need for a better understanding of how closely waste collection data are linked to different stages of the value chain. For example, what proportion of municipal solid waste is from households rather than businesses and how much of the weight is informally recycled before it reaches a collection center? It is crucial to know whether the high proportions of organic waste seen in municipal waste collections are coming primarily from households or from businesses that should be using raw material equivalent (RME) collection instead.

32

**The broad flow of food through the value chain in Mexico is similar to that in other countries in the world.**

Using the available data, a picture can be developed of the flow of food through the Mexican value chain. There are country-specific points of difference or importance, including the significance of public-private partnership wholesale markets (Centrales de Abastos) and the world’s second largest foodbank network. However, it is possible to simplify the value chain across the following stages of production and consumption: i) production (e.g. farms) and storage (e.g. silos); ii) processing (e.g. tortilla production); iii) markets (e.g. Centrales de Abastos, supermarkets); and iv) consumption (e.g. households, restaurants). Examples from successful global approaches to reducing FLW are provided in Annex 4.

## Step 2: Causes: Identifying FLW hotspots and understanding their causes

### FLW hotspots in Mexico

33

**Hotspots are nodes in the food supply chain where a significant amount of food is lost or wasted.**

Hotspots occur where the weight of FLW is the greatest in terms of volume, but can also be related to value, environmental impact or other strategic reasons that a country considers important. The hotspots identify areas of greatest concern, but are not necessarily all the areas that a country should act on immediately, as prioritization is needed. In developing this analysis, the evidence specific to the Mexican situation was combined with international experience in order to pinpoint hotspots that are both endemic to Mexico and likely to occur elsewhere, according to other evidence. Examples include research conducted across the EU,<sup>38,39,40</sup> and in Africa, Asia and around the world.<sup>41,42,43</sup> Overall, this shows that in developing countries, the hotspots tend to be more related to production and less focused on the consumption part of the food system. As countries develop, the proportion of food wasted in production decreases and more waste is proportionately seen in retail, in hospitality and food service, and in the home.<sup>44</sup> Other factors that influence the hotspots include the scale of the food and drink sector in the country, technology uptake and possibly cultural factors.

38 <https://www.eu-fusions.org/index.php/publications/265-establishing-a-common-framework-for-food-waste-definition-and-identifying-its-drivers>

39 <https://www.eu-fusions.org/index.php/publications/268-stimulating-social-innovation-on-food-waste>

40 <http://www.wrap.org.uk/content/quantification-food-surplus-waste-and-related-materials-supply-chain>

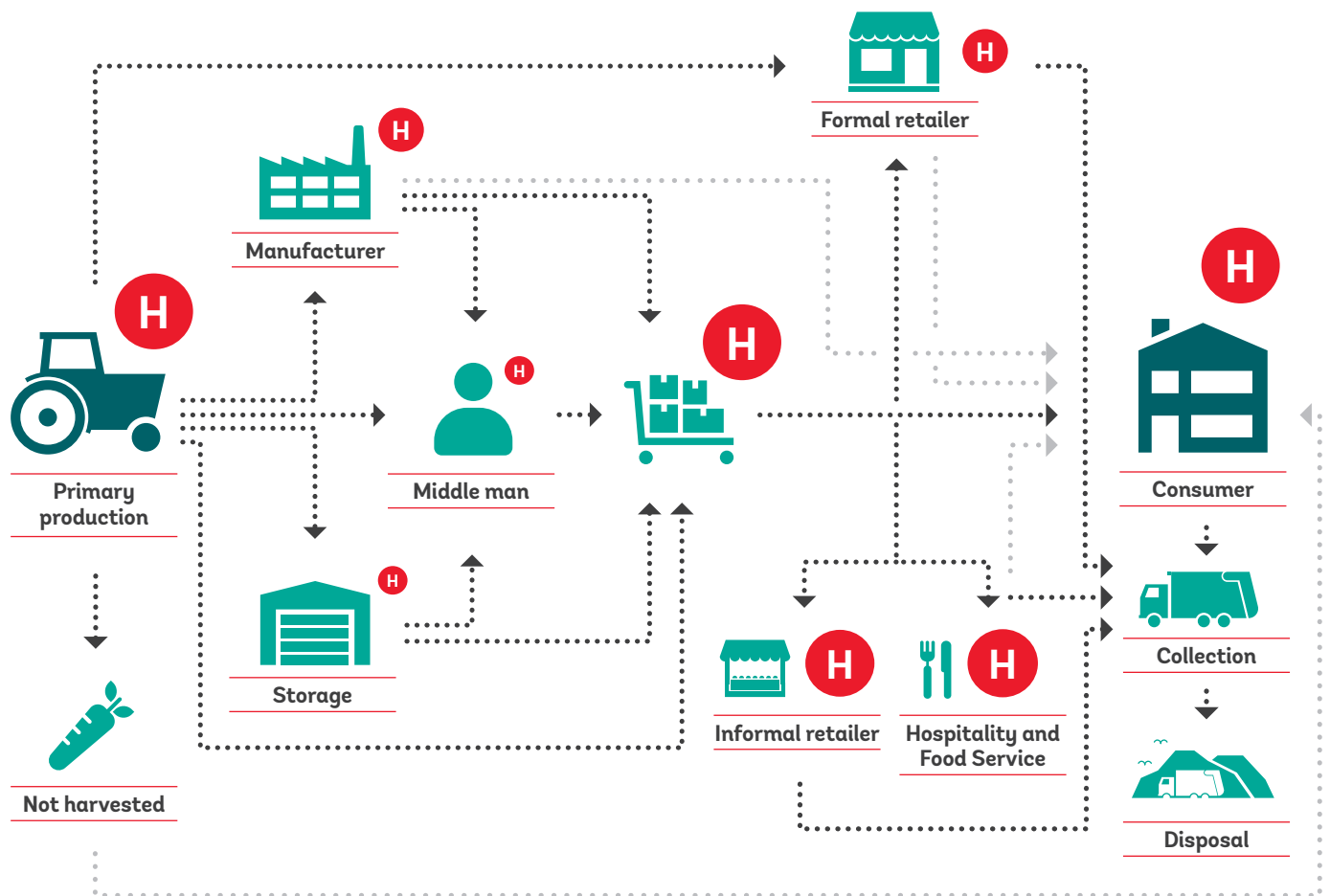
41 Nagiri et al. (2014). The diversity of postharvest losses in cassava value chains *JARTS* 115(2): pp. 111-123.

42 Hodges et al. (2011). Postharvest losses and waste in developed and less developed countries: opportunities to improve resource use. *Journal of Agricultural Science* 149: pp. 37-45.

43 Fox, T. (2013). *Global Food: Waste Not Want Not*. London: Institution of Mechanical Engineers (ImechE).

44 Gustavsson et al. (2011). *Global Food Losses and Food Waste*. Rome: Food and Agricultural Organization of the United Nations.

Figure 6: Size of hotspots across the supply chain in Mexico



**34** Hotspots can be of different sizes.

The supply chain map (Figure 6) illustrates the scale of hotspots arising throughout the food supply system. In order to determine the size of the hotspot, three factors have been taken into account: i) data from the World Bank commissioned report;<sup>45</sup> ii) information gathered from stakeholder interviews; and iii) international experience. At each stage of the supply chain, the percentage of FLW that constitutes a small, medium or large hotspot differs.

<sup>45</sup> World Bank (2017). *Perdidas y desperdicios de alimentos en Mexico*.

35

### Institutional and market failures underpin the hotspots.

Market failure occurs when the market cannot achieve optimal performance. Some examples of market failures relevant for food loss include: excess market power; information asymmetries; lack of markets; distortions in capital markets; externalities<sup>46</sup> and public commodities. Market failures can also occur when logistical, food distribution or market problems arise due to a lack of adequate intervention by private or public institutions or the absence of them (resulting in, for example, damaged roads, insufficient infrastructure, insecurity in specific territories, etc.).

Institutional failures can be viewed as a sub-set of market failures that occur when public interventions on the regulation side (such as institutional policies, laws etc.) fail to promote economic activity. The institutional function must act to maintain the proper functioning of markets by seeking to introduce general objectives that would not be reached exclusively by private initiative. Table 3 summarizes the market and institutional failures that arise in Mexico. For more detail on market and institutional failures, see Annex 5.

<sup>46</sup> In economics, externalities are costs or benefits that affect a party who did not choose to incur those costs or benefits.

**Table 3: Summary of specific market and institutional failures in Mexico**

Failure	Impact
Asymmetric information	Lack of information on quality, price and safety leads to lower productivity and/or higher costs.
Food quality and safety standards	Agricultural producers are not able to achieve the quality attributes demanded by international markets and are unable to participate in the domestic market due to weak infrastructure.
Limited access to credit	Limited access to credit in the agricultural sector substantially limits agricultural production and the incorporation of technologies that modernize the production and distribution of food.
Unequal use of technologies	The production of non-standardized food is not suitable for marketing through traditional channels.
Excess market power	Economic distortions arise from a high concentration on the production and commercialization of food.
Failures in food distribution	The dynamics of the food distribution network function inefficiently and ageing distribution infrastructure leads to losses.

36

### Market failures and their impacts can be illustrated by the journey of one product through the supply chain.

Figure 7 illustrates the movement of tomatoes through the supply chain and the ways in which the different market failures cause them to be lost or wasted. It is important to note that the losses at each stage are not quantified as there is currently insufficient data.

This data could be collected, as illustrated in Figure 8, which details the losses of potatoes from one particular supply chain in the UK hospitality sector.

Figure 7: How tomatoes are lost and wasted in the supply chain

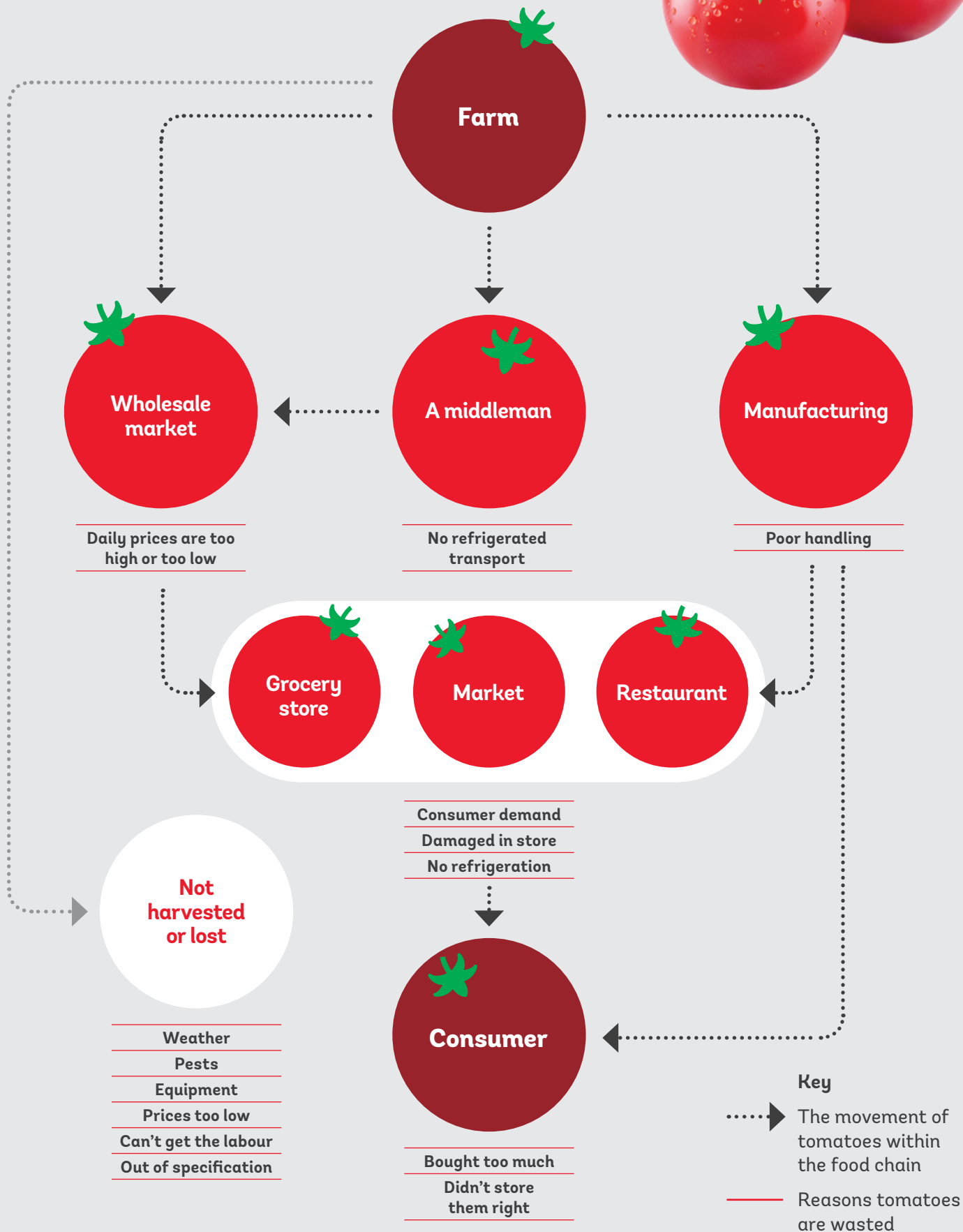
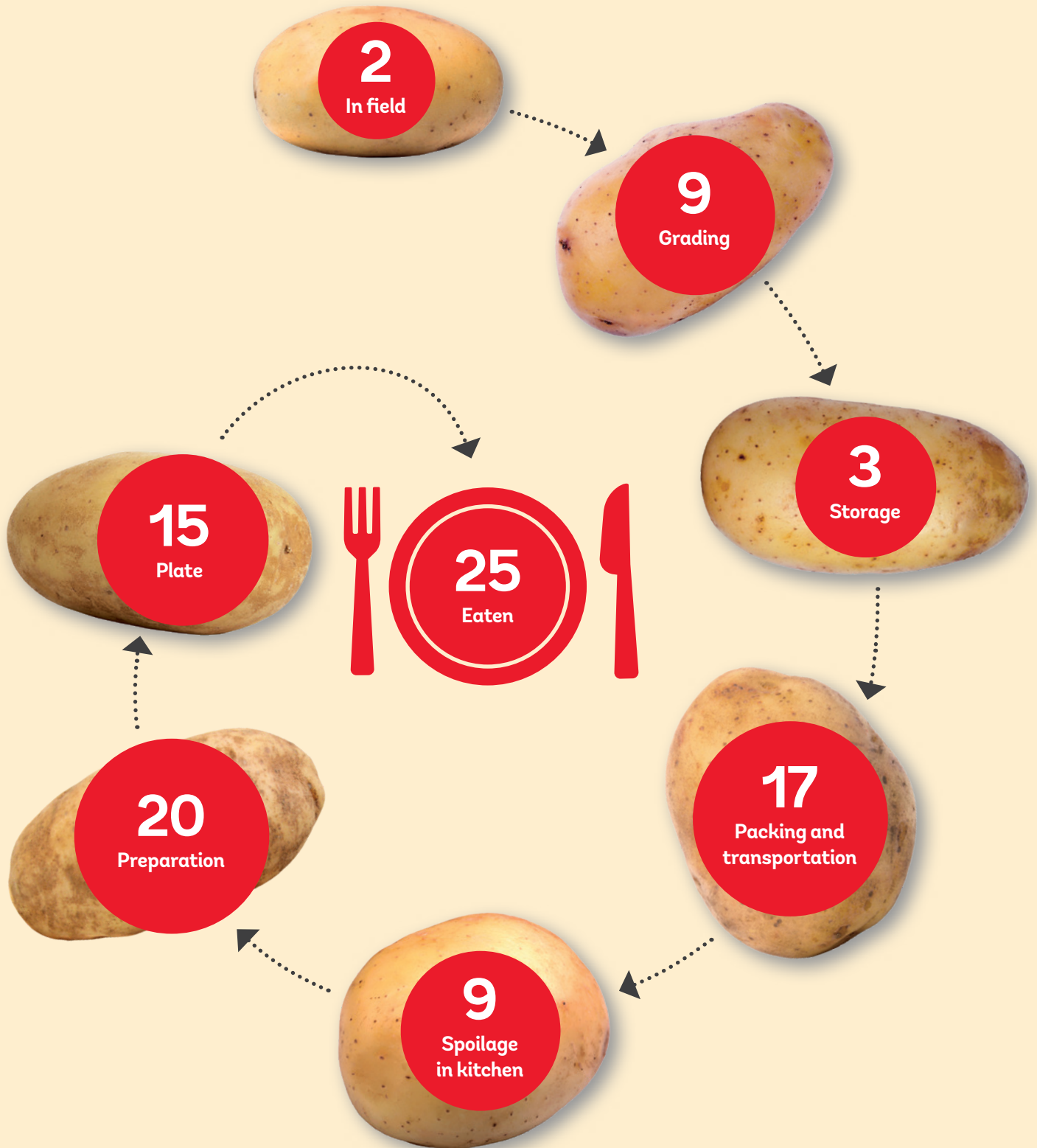


Figure 8: Number of potatoes (out of 100) lost from a particular supply chain in the UK hospitality supply chain





## Causes of FLW across the supply chain

37

**In the case of Mexico, hotspots of FLW occur for multiple reasons.**

The description of causes has been derived from discussions with stakeholders and World Bank research. There are similarities in the causes of FLW in different parts of the supply chain; for example, lack or asymmetry of

information is identified as a cause across multiple stages. In some cases, this can be a standalone cause, but in many cases, the market failure is systemic, with the impact of a market failure in one part of the supply chain being felt elsewhere. Hence, a systemic approach is believed to be more effective in identifying causes, as opposed to addressing each stage of the supply chain independently.<sup>47</sup> Table 4 provides a broad summary of causes for each hotspot.

**Table 4: Conceptualizing hotspots and causes**

	Information	Knowledge and skills	Infrastructure and technology	Logistics	Finance and credit	Legal and institutional
<b>Largest perceived losses and waste (level 1)</b>						
Primary production	✓	✓	✓	✓	✓	
Manufacturing	✓		✓			✓
Wholesale market	✓		✓			✓
Informal retail	✓		✓			
Hospitality and food services	✓	✓	✓			
Consumer	✓					
<b>Medium perceived losses and waste (level 2)</b>						
Storage			✓			
Formal retail	✓	✓				✓
<b>Minor perceived losses and waste (level 3)</b>						
Middle man	✓		✓	✓		

<sup>47</sup> For example, helping a farmer to harvest their avocados earlier in the production cycle to ensure a longer shelf-life would provide economic benefits to the farmer and enable more avocados to reach the consumer, ensuring that the embedded impact of labor, fertilizer etc. is not wasted. However, if the demand for avocados and the capability of the rest of the supply chain to deliver them to the consumer are not taken into account, the avocados could still be wasted, negating the environmental benefits or even having a more negative effect on the environment.

38

**Causes from farm to market:**

Primary production in Mexico is undergoing significant and rapid change. Many sub-sectors are consolidating and investing in precision agriculture, forecasting, processing and the transformation of food into longer life products (e.g. dried and preserved products, sauces, salsas etc.) and into an effective cold chain. Some of the key causes of food loss at this stage are:

**i) Information:** Small farmers do not have access to accurate pricing information, which affects the timing of harvest and post-harvest decisions, as they are concerned about their ability to recover the cost of production and harvest. This could lead to on-farm loss due to delays in harvesting or insufficient storage facilities. There is a lack of regular and detailed measurement of FLW, making it difficult to improve practice across the agricultural sector.

**ii) Knowledge and skills:** Many small farmers are not able to negotiate the sale of their products (avocados, tomatoes etc.) at a suitable price to cover their costs because the quantities produced are very small (around 10 tons a year). The lack of organization to generate products on a sufficient scale makes it very difficult to obtain certification for export because the costs are disproportionately high. Many small producers haven't been able to work effectively with their neighbors to pool their resources, negotiate better prices, invest in collective production or

collaborate to minimize FLW. While there is a strong drive towards improving the quality and safety of food, meeting sanitary and phytosanitary standards (SPS) can generate FLW due to imperfections and stringent grading criteria. In the absence of markets for products that don't meet these standards (e.g. for processing into long-life products or into animal feed), FLW can be significant. In addition to products that don't make the grade, most supply chains generate by-products as part of their operations (e.g. the heads and tails of shrimp from aquaculture or fishing, or the blood from cattle). These may be discarded or could be used for value addition of other products (e.g. pet food).

**iii) Finance and credit:** Small farmers do not know about the credit services they can access and so struggle to invest in their farms. Many farmers, of a range of sizes, don't appear to have contracts for their production and as such are planting crops without a clear understanding of market requirements, and no certainty on price. This can lead to over-production of food and increases in FLW. Payment terms to farmers who have secured such contracts may lead to the farmer having to wait a significant time to be paid (e.g. three months), making cash flow and investment more difficult. Although the redistribution of food from agriculture does occur in a number of states, insufficient incentives to donate food could be restricting the degree to which food is re-purposed.

**iv) Infrastructure and technology:**

Many small producers, even when organized into producer associations, do not have adequate infrastructure to store or pack what they produce, including access to cold storage. Inadequate storage can result in immediate losses of fruits and vegetables, milk and other perishable products that cannot be delivered to the market on time.

**v) Logistics:** The duality of Mexico's agricultural sector represents itself not only in terms of the scale of production, but also in relation to the geographic concentration of production, which does not correlate with market demand and therefore creates an environment for the cyclical generation of food loss. For example, the tomatoes that are produced throughout the country cover an average distance of 484 kilometers and a maximum distance of 2,838 kilometers from production to final consumer. Similar distances are travelled by products ranging from chicken to lemons. In Mexico, there are 813 cities of 10,000 inhabitants or more,<sup>48</sup> but only 91 wholesale markets, dominated by the largest one, which is located in Mexico City. Produce may be transported to one market, only for it to be transported to another, before it finally reaches a retailer, extending travel times and GHGs emissions, increasing the risk of waste, and reducing product shelf-life for the retailer and consumer alike. The concentration of production of specific products and commodities also affects the Mexican foodbank network, requiring individual foodbanks to 'trade' with each other.

48 <http://worldpopulationreview.com/countries/mexico-population/cities/>

### Box 2: Concentration of production in Mexico

There are many small farmers in Mexico, mainly concentrated in the center-south of the country. Mexico has 2,017,937 farms of under 5 hectares that use traditional production practices, are not linked to markets and have difficulties accessing credit and consequently investing in technology.<sup>49</sup> There is also a sector of large producers, predominantly in the north. In its 2015 report on competition in Mexico's agri-food sector, COFECE showed that of a total of 33,466 tomato growers, the 100 largest control 55.5% of sales, with the State of Sinaloa being the largest producer.<sup>50</sup> Similarly, of a total of 18,751 producers, the 100 largest control 77.3% of potato sales and of 9,550 producers, the 100 largest control 40.8% of total apple sales. In the livestock sector, the concentration of production is similar: of a total of 243,983 cattle producers, the 100 largest control 38.3% of sales; of a total of 51,509 producers, the 100 largest control 79.0% of pork sales; of 4,041 producers, the 100 largest control 82.4% of the total sales of birds; of 259,475 producers, the 100 largest control 17.1% of total milk sales; and of 432 producers, the 100 largest control 90.4% of egg sales.

39

### Causes in manufacturing:

As noted, there has been significant investment in many of the food supply chains in Mexico. There is a range of scale in food producers and scope to improve the efficiency of production, reduce FLW, and make better use of waste and by-products.<sup>51</sup> However, challenges remain:

#### i) Infrastructure and technology:

Post-harvest processing is limited by inadequate infrastructure for storage, cold storage and equipment for processing food. FLW results from there being insufficient capacity to convert food into longer shelf-life or value-added products (e.g. dried products, packaged items, ready meals and sauces) that could be sold in national and international markets.

ii) Information: There is a perceived 'cost of doing business' that incorporates 'acceptable' levels of FLW from manufacturing processes. These are often not challenged and therefore not considered as opportunities for efficiency gains and cost savings. Often, the scale of FLW can be obscured by the terms that are used for different aspects of waste in manufacturing, For example 'off-spec products', 'spillage', 'shrinkage', 'process losses', 'contamination losses' and 'spoilage'. There is also a lack of regular, detailed measurement of FLW, making it difficult to improve practice.

iii) Legal and institutional: Some manufacturers may be afraid of legal action resulting from food donation, so they do not donate food. Given that many manufacturers in Mexico are already significant contributors to foodbanks, this may be more of a perceived barrier to donating food. There may be insufficient incentives to donate food. This could be because the cost of disposal is low (or perceived as low), in comparison with the specific incentives for donation. Given the success of foodbanks in Mexico, there is a real opportunity to build a network of distribution centers that serves the nation, particularly in urban areas. Lack of investment in this infrastructure is seen as a barrier to further increasing donations.

49 Encuesta Nacional Agropecuaria (ENA) (2014) INEGI.

50 COFECE (2015). *Reporte sobre las condiciones de competencia en el sector agroalimentario* [https://www.cofece.mx/cofece/images/Estudios/COFECE\\_resumen\\_v04\\_alta.pdf](https://www.cofece.mx/cofece/images/Estudios/COFECE_resumen_v04_alta.pdf)

51 For more detail on food processors in Mexico, see <http://www.promexico.gob.mx/documentos/sectores/presentacion-alimentos-procesados.pdf>

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**Causes for intermediaries and distributors:**

These businesses and individuals act as the link between primary producers, particularly between small producers and the wholesale markets (Centrales de Abastos) and occasionally retailers.

**i) Infrastructure and technology:**

Many intermediaries have the capacity to transport food from the producing areas to the city: sometimes the distance that food travels is significant, as shown previously with tomatoes that travel an average of 484 kilometers to reach the final consumer. FLW results from insufficient numbers of refrigerated trucks, a lack of monitoring technology to ensure that the cold chain is preserved, and inadequate technology for managing logistics.

**ii) Information:** There is a lack of information on food demand at wholesale markets to ensure that food is transported to the most appropriate location. Mexico has 813 cities of 10,000 inhabitants or more, but only 91 wholesale markets, dominated by the largest one, which is located in Mexico City. Produce may be transported to one market only for it to be transported to another before it finally reaches a retailer, thus extending travel times and GHGs emissions, increasing the risk of waste, and reducing product shelf-life for retailers and consumers. In addition, there is a lack of regular and detailed measurement of FLW by suppliers, making it difficult to improve practices. Finally, access to markets is not fully open to all potential buyers and sellers and this might lead to inefficiencies and price distortion.

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**Causes at wholesale markets:**

Wholesale markets can be found in most large Mexican cities, where they act as a hub for concentrating and selling produce to the retail sector (particularly the informal sector), to the hospitality and food service industry, to individuals and in some cases to manufacturers.

**i) Infrastructure and technology:**

The Centrales de Abastos has a reasonable infrastructure for managing the food stocks that reaches it, but there is real scope for improvement in refrigeration and freezing to preserve food for longer and reduce FLW. Furthermore, there is an absence of local food processing, manufacturing or packing that could serve to act as a market for products that don't meet the premium quality requirements or to preserve it for sale in the formal or informal markets.

**ii) Information:** There is lack of transparency on price in the markets, leading to food being wasted. In addition, there is a lack of data on the demand for food over time and on regular detailed measurement of FLW, making it difficult to improve practices. In addition, the sales, input and output figures for the various products are gathered and managed separately, which makes it difficult to calculate total mass flows of food for the market.

**iii) Legal and institutional:**

There are insufficient incentives to donate food. This could be because the cost of disposal is low in comparison with the specific incentives for donation. In wholesale markets, there appeared to be significant

informal food redistribution through unofficial 'pickers' (often homeless people), although the scale of this was difficult to determine.

42

**Causes at informal retail:**

A *tianguis* is an itinerant, open-air market whose sales activities are carried out on the streets on certain days of the week. These businesses have gained relevance in the distribution of food since the 1970s, particularly in urban areas inhabited by low-income populations. Some estimates suggest that informal markets could be responsible for half of all retail food sales in Mexico. These markets do not have any type of infrastructure and the vegetables and fruits sold are exposed to the elements, accelerating the ripening process and causing large amounts of food waste that probably ends up in landfill.

**i) Infrastructure and technology:**

By their nature, *tianguis* lack ways of preserving food. There is a significant risk that food will not be sold in time and will be wasted. Their informal nature may also make donation to foodbanks difficult.

**ii) Information:** Unless the retailers are good at keeping records and are able to occupy the same pitch on a regular basis, it may be hard to predict demand accurately, potentially resulting in overstocking and waste, particularly in the absence of infrastructure. There is a lack of measurement of FLW, making it difficult to improve practices.

43

**Causes in formal retail:**

There has been substantial growth in the supermarket sector in Mexico in recent years. They constitute, on average, 34.5% of the grocery food market (i.e. excluding hospitality and food service) in large Mexican cities, but with large differences between them: for example, Mexico City is the most concentrated at 70.3%; in Guadalajara the figure is 34%, and in Monterrey, 55.9%.

**i) Information:** Based on international experience, forecasting and stock control are key to minimizing in-store food waste. Balancing product availability with a thorough understanding of FLW is key to minimize FLW, while providing excellent customer service. There is also lack of regular and detailed measurement of FLW, making it difficult to improve practices and correlate waste with other factors, such as shelf-life, in-store practices (e.g. discounting food consistently when it is nearing its use-by date) and fluctuations in demand. This causes inadequate forecasting and stock control.

**ii) Legal and institutional:** There may be insufficient incentives to donate food. This could be because the cost (or perceived cost) of disposal is lower in contrast with the specific incentives for donation. Also, some retailers may be afraid of legal action resulting from food donation, so they do not donate food. Given that some retailers in Mexico are already significant contributors to foodbanks, this may be more of a perceived than actual barrier.

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**Causes in the hospitality and food services sector:**

The hospitality and food services sector is growing rapidly in Mexico, with some estimates putting it at 4.3% a year.<sup>52</sup> Given its growth, the sector could have an increasing impact on FLW.

**i) Information:** There is very limited measurement of food waste in the sector, because the cost of purchasing and disposing of food is perceived to be the 'cost of doing business', i.e. it is a normal part of the finances of food businesses and cannot be changed. In addition, staff have limited time to undertake food waste measurement in the busy environment of a kitchen. There seems also to be a lack of awareness of the compelling business case for reducing food waste and what solutions exist. For example, portion sizes may be bigger than needed for customers, leading to plate waste or food may be stored ineffectively, meaning products are thrown away rather than being used in time.

**ii) Infrastructure and technology:** There appears to be a perception that the measurement of food waste requires investment in expensive technology. There are technologies available to help, ranging in cost and complexity, although costs are usually much less than the benefits associated with reductions in waste.<sup>53</sup> There are also low-tech, low-cost options for measuring food waste, such as simple luggage scales or even just household scales and a pen and paper.

**iii) Knowledge and skills:** International experience suggests that kitchen skills training does not focus on reducing food waste and that skills are not kept up to date.

This leads to waste in the preparation of food. Furthermore, menus are not optimized to make best use of the available food and storage of food is not always optimized to ensure food lasts as long as possible and gets used in time.

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**Causes for the final consumer:**

There is some evidence of the scale of food waste in households in Mexico. Recent estimates based on urban solid waste data and waste composition data from five states found a total of 11 million tons of waste a year from households (Annex 6). There are some compositional studies that indicate it could be significant in some cities, suggesting the need for further investigation of the problem.

**i) Information:** Greater consumer awareness on reducing food waste and money-saving strategies, such as improved planning, better storage and correct portion sizes, is required. In some households, there may be a lack of refrigeration, making it harder to manage stocks of fresh food. Furthermore, consumers are confused by date labels, don't know how to prepare the correct portions of food (leading to waste and potentially obesity), and are unsure about how to make the best use of leftovers.

<sup>52</sup> Calculated for 2016 from SECTUR data: <http://datatur.sectur.gob.mx/sitepages/inicio.aspx>

<sup>53</sup> Champions 12.3 (2017). *The business case for reducing food loss and waste: Hotels* [https://champions123.org/wp-content/uploads/2018/04/Report\\_Hotels\\_The-Business-Case-for-Reducing-Food-Loss-and-Waste.pdf](https://champions123.org/wp-content/uploads/2018/04/Report_Hotels_The-Business-Case-for-Reducing-Food-Loss-and-Waste.pdf)

### Step 3: Clear action: How might FLW be effectively tackled?

#### Prioritizing areas for action

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Once the hotspots and their causes have been identified, they can be prioritized.

The prioritization approach used here focuses on the magnitude of each hotspot, in terms of volumes of loss and waste. The prioritized solutions are ones that might have the largest financial, social and environmental impact in comparison to cost and may be relatively easy to deliver in terms of complexity, and requirements for changes to existing legislation and fiscal arrangements. The prioritization has considered what could be possible in the short-, medium- and long-term and seeks solutions that take a systemic approach and maximize synergies across the supply chain. Where

appropriate, context and direction were taken from the experiences of other countries and international organizations such as FAO,<sup>54</sup> the EU<sup>55</sup> and Australia.<sup>56</sup> The output of the prioritization approach is summarized in Figure 9 and Table 5.

#### Identifying potential solutions

47

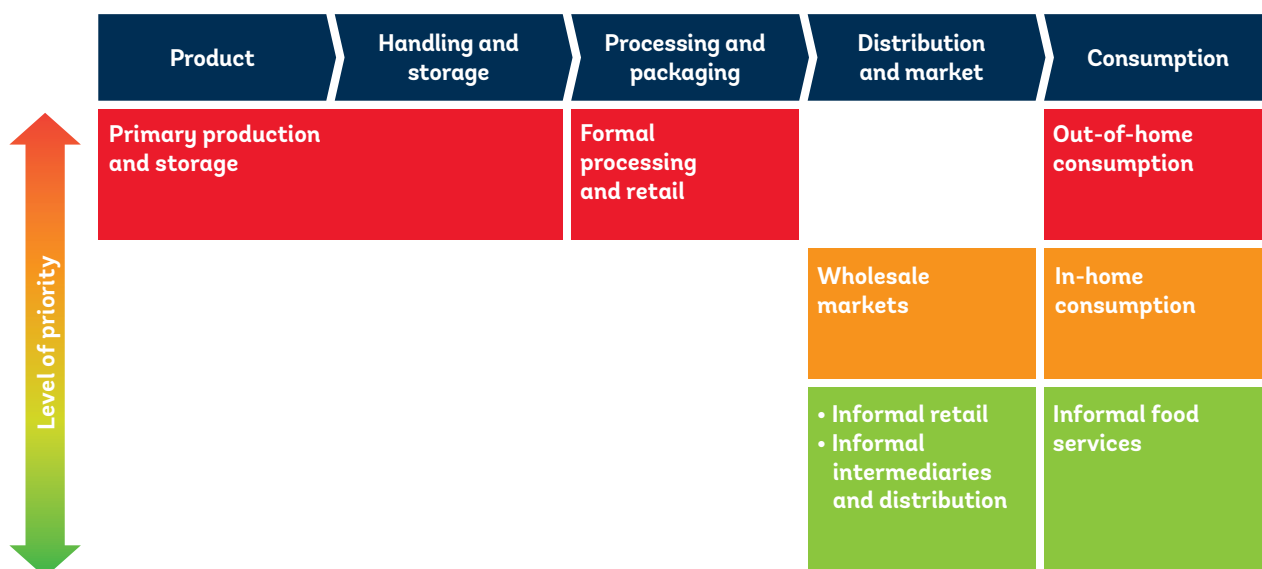
Prioritizing hotspots while understanding their underlying causes enables the identification of solutions and prioritization of actions to tackle FLW.

This section outlines the possible solutions for tackling FLW in the short-, medium- and long-term. Potential solutions are derived from recommendations received during stakeholder consultations and international examples of best practice. Tables 6, 7 and 8 provide a menu of solutions categorized by priority level, the hotspot they address, the cause(s) of the

hotspots and the timeframes (Table 6 for short term, Table 7 for medium term and Table 8 for long-term). Solution numbers refer to the longlist of solutions that can be found in Annex 7.

54 <http://www.fao.org/platform-food-loss-waste/food-loss/food-loss-reduction/en/>  
 55 <https://www.eu-fusions.org/>  
 56 Commonwealth of Australia (2017). *National Food Waste Strategy: Halving Australia's food waste by 2030* <https://www.environment.gov.au/system/files/resources/4683826b-5d9f-4e65-9344-a900060915b1/files/national-food-waste-strategy.pdf>

Figure 9: Prioritization of areas for action



**Table 5: Prioritization of areas of action**

Action area	Hotspots included	Rationale
<b>Higher priority</b>		
Primary production	Primary production Storage	<ul style="list-style-type: none"> <li>Evidence of high FLW</li> <li>Large economic, environmental and social importance and therefore benefit from action</li> <li>Synergy between two hotspots allows for integrated solutions</li> </ul>
Formal processing and retail	Manufacturing, retail (formal), distribution (formal)	<ul style="list-style-type: none"> <li>Size and market power of actors in formal sector allow for integrated solutions between different stages of the supply chain</li> <li>Growing economic area in Mexico</li> <li>Smaller number of actors allows for faster action at larger scale</li> </ul>
Out-of-home consumption	Hospitality and food service (formal)	<ul style="list-style-type: none"> <li>Growing sector in Mexico and therefore likely to be a growing source of FLW</li> <li>Reducing costs will improve financial performance in a highly competitive national and global environment and tackling FLW may provide a distinction in sustainability performance against competitors</li> <li>Culturally important</li> </ul>
<b>Medium priority</b>		
Centrales de Abastos	Wholesale market	<ul style="list-style-type: none"> <li>A significant proportion of Mexican food supply passes through these but is currently a shrinking share of the market</li> <li>Estimates of waste are medium compared with other areas</li> </ul>
In-home consumption	Household	<ul style="list-style-type: none"> <li>Not enough is known about the causes and types of food wasted from the home to act immediately in a strategic manner</li> <li>However, there are indications of large amounts of waste deriving from this hotspot, so this should be a medium-term priority</li> </ul>
<b>Lower priority</b>		
Informal sector	Retail (informal), food service (informal), intermediaries and distribution (informal)	<ul style="list-style-type: none"> <li>Large area of dispersed actors of varying size of waste across multiple sections of the value chain</li> <li>Difficult to act at scale</li> </ul>

**Table 6: Potential solutions to address causes of FLW in priority areas in hotspots for the short term****Solution for FLW hotspots**

Hotspot	Information	Knowledge and skills
<b>High priority</b>		
Primary production	<p><b>Solution 1:</b> Encourage collaboration between ASERCA, SIAP and the <i>Secretaría de Economía</i> in order to share data and expand existing mechanisms to get timely pricing information to more farmers.</p> <p><b>Solution 11:</b> Build on existing FAO/SAGARPA data to estimate FLW arisings more completely at the pre-farm-gate stage. Complement this analysis with other sources of information by asking others (such as Mexico's Food Banking Network, private sector and CNA) to share data on FLW and take a role in developing a database that quantifies pre-farm-gate losses and their causes.</p> <p><b>Solution 12:</b> Ask Food Banking Network to share and improve its data on FLW and to take a role in quantification.</p>	<p><b>Solution 2:</b> Promote collaboration and association among groups of small farmers to offer larger amounts of food to internal and (potentially) external markets, enabling better access to markets and ensuring less food is lost on farms through lack of market access.</p> <p><b>Solution 3:</b> Promote existing credit schemes alongside pricing information, e.g. for storage of grain crops, irrigation systems, purchase of refrigerated storage etc., the lack of which can contribute to FLW. Investigate any gaps in financing.</p> <p><b>Solution 7:</b> Undertake research on potential markets for products of a wider range of quality, across the main food production categories, e.g. fruit, maize and seafood.</p> <p><b>Solution 8:</b> Evaluate the impact of cosmetic standards on FLW in conjunction with retailers. The voluntary agreement (#17) could be a vehicle for engaging retailers.</p> <p><b>Solution 9:</b> Select three commodities (e.g. shrimp, tomatoes and pork) and evaluate all the losses and waste across the supply chain. Compare wastes and by-products to gaps in existing markets, e.g. animal feed supplies or value-added products.<sup>57,58</sup></p>



Infrastructure and technology	Transport and logistics	Credit	Legal and institutional
<p><b>Solution 6:</b> Continue roll-out of existing credit schemes (#3) to fund investment specifically to reduce FLW (e.g. for grain storage or for small or mobile packaging or processing plants) in rural communities and incorporate reduction of FLW into planning for the schemes (to include a review and expansion of financing directed at micro- and small agricultural entrepreneurs, and a specific review of investments that result in a reduction in FLW).</p>			<p><b>Solution 4:</b> Trial the provision of more contracts with small farmers in key sectors (such as tomatoes) to investigate the impact on farmers and on FLW (consider including clauses on the monitoring of FLW).</p> <p><b>Solution 10:</b> Understand current levels of redistribution from agriculture (this could possibly be supported through data from foodbanks or CONACYT and universities).</p>

57 <http://www.wrap.org.uk/content/food-futures> (see 'Unlocking the new value from wastes')

58 <http://www.enterrafeed.com/>

59 For example, <http://www.enterrafeed.com/>

**Solution for FLW hotspots**

Hotspot	Information	Knowledge and skills
<b>High priority</b>		
Formal processing and retail	<p><b>Solution 17:</b> Agree a voluntary agreement (VA) between federal government, interested states and businesses (including retailers and manufacturers) to focus on reducing waste across the supply chain. The voluntary agreement could include multiple activities to address FLW along the supply chain – for example reviewing date labelling, improving measurement and the skills needed to measure accurately, implementing new approaches to waste reduction and increasing donations. Encourage all signatories to measure FLW and report annually. Use these data to develop a work program to reduce FLW across the sector.</p> <p><b>Solution 20:</b> Evaluate the international experience on the impacts of increasing the cost of waste disposal on recycling.</p>	<p><b>Solution 21:</b> Encourage more businesses to collect food waste separately to help increase recycling and show businesses the scale of food they are wasting. Drive this by piloting technologies that establish a potential market for separately collected FLW, e.g. as feedstock for animal feed production.<sup>59</sup></p>

Infrastructure and technology	Transport and logistics	Credit	Legal and institutional
<p><b>Solution 13:</b> Refocus and promote existing technical and financial support mechanisms on developing food manufacturing capabilities (e.g. FND). Make FLW reduction a criterion for investment, thereby focusing investment on delivering the best outcome for FLW.</p> <p><b>Solution 14:</b> Evaluate technical and logistical options for reducing and making best use of the FLW in key supply chains. This could include packaging optimization, production line optimization and whole-supply chain projects (#17), but also new technologies and other innovations.</p> <p><b>Solution 15:</b> Build on existing academic networks (e.g. CONACYT) to develop new approaches to FLW measurement and prevention.</p> <p><b>Solution 16:</b> Encourage research from CONACYT on low-cost technologies that can be used in situ, to give added value to the products by farmers and processors.</p>	<p><b>Solution 22:</b> Working through the voluntary agreement (#17), encourage companies to share space on lorries to transport produce, so as to maximize the amount of produce carried.</p>		<p><b>Solution 18:</b> Survey a cross-section of businesses on the barriers to expanding food donation.</p> <p><b>Solution 19:</b> Encourage all parties (all levels of government, businesses and donors) to co-invest in foodbanks with existing donors to complete the building of a national network of foodbanks and a supporting infrastructure, serving the whole supply chain, particularly covering urban areas where there are the highest numbers of people living in poverty. Use existing SAGARPA schemes as a vehicle working with state authorities.</p>

60 <http://www.wrap.org.uk/content/food-futures>

61 For example, <http://www.enterrafeed.com/>

**Solution for FLW hotspots**

Hotspot	Information	Knowledge and skills
<b>High priority</b>		
Hospitality and food services	<p><b>Solution 23:</b> For the hospitality sector, work with SECTUR and the relevant states to implement food-waste reduction voluntary agreements, firstly as a pilot in a key resort to establish the approach. It should include technical measures e.g. encouragement of measurement and redistribution, reducing plate size for buffets, establishing a prevention manual for affiliated hotels and restaurants and also awareness raising with customers.</p> <p><b>Solution 24:</b> Undertake measurement within the voluntary agreement to establish exactly the potential for savings within this sector, perhaps working with a local university (possibly from the CONACYT network).</p>	<p><b>Solution 25:</b> Promote the training done through CANIRAC (or other organizations) on adopting measures and planning at restaurants for reducing FLW.</p>
<b>Medium priority</b>		
Wholesale market	<p><b>Solution 27:</b> Make price information more transparent, as suggested in #1.</p>	
Household in home	<p><b>Solution 30:</b> Plan a compositional analysis of household waste, conducted alongside INEGI's plans to survey the population in 2020.</p>	<p><b>Solution 32:</b> Integrate food waste prevention skills into any existing relevant programs that already provide training and advice to consumers and, in particular, helping those in poverty.</p>
<b>Lower priority</b>		
Informal sectors	<p><b>Solutions 33, 34 and 35:</b> Commission universities to undertake an assessment of the amount and causes of food waste in informal markets. This could be extended to other informal parts of the value chain. Assess the food lost from the long-distance distribution of food across Mexico that results from the relatively few wholesale markets. Based on this analysis, decide on whether there is a need to intervene to improve distribution efficiency.</p>	

**Infrastructure  
and technology**

**Transport  
and logistics**

**Credit**

**Legal and  
institutional**

**Solution 26:** Use an independent organization to work with the markets to evaluate the causes of lack of investment in technology for preserving food, composting or anaerobic digestion technology of FLW in central markets or the option of diverting waste to other markets<sup>60</sup> or animal feed<sup>61</sup> and consider schemes that could address these barriers.

**Solution 29:** Use the approach proposed for manufacturing (#19), so that there is the opportunity to increase redistribution from markets.

**Table 7: Potential solutions to address causes of FLW in priority areas in hotspots for the medium term**

**Solutions for FLW hotspots**

Hotspot	Information	Knowledge and skills
<b>High priority</b>		
Primary production	<p><b>Solution 1:</b> Investigate innovative ways of getting timely pricing information to (small) farmers (e.g. through technological approaches including SMS, by expanding internet access etc.) and provide training to farmers on how to use the information effectively (e.g. more collaboration).</p> <p><b>Solution 11:</b> Use the data to focus fiscal incentives and existing programs where these can have the biggest impact. Improving skills in harvesting could be an area of focus, depending on its significance in causing FLW. Capture food loss data on farms as part of routine monitoring operations developed through SIAP and ASERCA in SAGARPA.</p>	<p><b>Solution 2:</b> Investigate mechanisms to encourage co-operatives or associations of small farmers, e.g. through training, sample co-operation agreements, case studies or more formal support programs.</p> <p><b>Solution 3:</b> Investigate gaps in access to credit for farmers (small and large) that could be causing FLW and update or develop schemes to fill these gaps.</p> <p><b>Solution 7:</b> Use research to focus on encouraging food manufacturing to provide a market for a wider range of produce quality. This could be done using the voluntary agreement outlined in #17.</p> <p><b>Solution 8:</b> Evaluate potential solutions to reduce waste, through changes to contracts (#4), changing the standards, adding product lines based on lower cosmetic standards, investment in food processing and manufacturing, or redistribution in conjunction with retailers and manufacturers.</p> <p><b>Solution 9:</b> Expand the analysis to other crops and develop the business case for converting the identified losses/waste and by-products into value-added products and identify funding sources for pilots, perhaps through international funding mechanisms (GEF, GCF, etc.), designed to tackle climate change.</p>

Infrastructure and technology	Transport and logistics	Credit	Legal and institutional
<p><b>Solution 6:</b> Continue investment and, based on data gathered in other activities, work out the need for further infrastructure support. Evaluate the impact of the investment made.</p>		<p><b>Solution 5:</b> Investigate impact of credit gaps to FLW and develop appropriate credit lines.</p>	<p><b>Solution 4:</b> Consider a scheme for developing a ‘fair standard’ contract for relations between farmers and supply chain so that farmers can have a better view of what they will be required to provide so they can plan and invest, helping to reduce FLW (e.g. through overproduction).</p> <p><b>Solution 10:</b> Based on data from FAO/SAGARPA and foodbanks, look at scope to increase redistribution in a way that doesn’t lead to perverse incentives or unintended outcomes (e.g. too much food being donated without the accompanying foodbank infrastructure or a reduction in discounting of prices in store).</p>

62 For example, <http://www.enterrafeed.com/>

Solutions for FLW hotspots

Hotspot	Information	Knowledge and skills
<b>High priority</b>		
Formal processing and retail	<p><b>Solution 17:</b> Implement work program and monitor progress. Link to the waste initiatives mentioned above. Suggest a long-term aim of delivering SDGs 12.3.</p> <p><b>Solution 20:</b> Based on the outcome, determine what changes need to be implemented. Integrate with existing government programs on tackling waste management.</p> <p><b>Solution 23:</b> Improve information on FLW associated with transportation conditions.</p>	<p><b>Solution 21:</b> Depending on the outcome of the pilot programs, encourage investment in technology that drives a market for separately collected FLW. Encourage the waste management industry to invest in collection.</p>
Hospitality and food services	<p><b>Solutions 23, 24 and 25:</b> Continue and evaluate the impact of the pilot(s) and identify potential new sites to show its impact.</p>	



Infrastructure and technology	Transport and logistics	Credit	Legal and institutional
<p><b>Solution 13:</b> Continue to support, given long-lead in times.</p> <p><b>Solution 14:</b> Develop the detailed case for investment for converting waste and by-products into value-added products (e.g. animal feed)<sup>62</sup> and secure funding for pilots, perhaps funded through international funding mechanisms designed to tackle climate change.</p> <p><b>Solution 15:</b> Pilot the best new approaches through the voluntary agreement (# 17).</p> <p><b>Solution 16:</b> Depending on the outcome of the research, determine whether there is a need for a program to encourage the commercialization of new technologies.</p>	<p><b>Solution 22:</b> Evaluate the impact of potential monopolies in the sector on FLW. Try to secure better information on FLW resulting from transporting food in unsuitable conditions.</p>		<p><b>Solution 18:</b> Based on the findings of the survey, develop options and evaluate their potential impact.</p> <p><b>Solution 19:</b> Continue investment from all parties until the network is completed. Maintain focus on helping equip citizens and communities to grow out of poverty and eat healthily.</p>

**Solutions for FLW hotspots**

Hotspot	Information	Knowledge and skills
<b>Medium priority</b>		
Wholesale market	<b>Solution 27:</b> Monitor the impact of enhancing transparency and expanding pricing information.	<b>Solution 28:</b> Implement a measurement system to record waste more accurately in the market, to target significant sources of waste with targeted investment. Start at one wholesale market to evaluate impact.
Household in home	<b>Solution 30:</b> Conduct compositional analysis and publish the results. This will show the full extent of household waste, its causes and what needs to change to reduce FLW. Begin the development and testing of consumer messaging to reduce FLW, e.g. buying just what is needed, how to interpret labelling, how to store food to maximize life etc.	
<b>Lower priority</b>		
Informal sectors	<b>Solutions 33, 34 and 35:</b> Work with municipal authorities to use data to investigate the barriers to the potential provision of defined market areas in parts of cities where informal markets are established, with some infrastructure that helps reduce FLW, as happens in some Asian countries. This could also involve the provision of fridge and freezing capacity and encouraging market holders to discount food towards the end of the day to reduce waste and maximize income.	

**Infrastructure  
and technology**

**Transport  
and logistics**

**Credit**

**Legal and  
institutional**

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**Solution 26:** Implement changes that help overcome the barriers to investment.

**Solution 31:** Investigate potential in-home solutions to FLW and whether any are viable in a Mexican context e.g. home composting, as an additional strand to the compositional research.

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**Table 8: Potential solutions to address causes of FLW in priority areas in hotspots for the long-term****Solutions for FLW hotspots**

Hotspots	Information	Knowledge and skills
<b>High priority</b>		
Primary production	<p><b>Solution 1:</b> Evaluate the impact of expanding pricing information to farmers on FLW and establish whether it needs to continue.</p> <p><b>Solution 11:</b> Evaluate the impact of program on a regular basis e.g. every two years.</p>	<p><b>Solution 2:</b> Implement most suitable farmer association mechanism(s) to encourage more co-operatives or associations of small farmers and evaluate impact.</p> <p><b>Solution 3:</b> Evaluate the schemes in terms of value for money and impact on reducing FLW.</p> <p><b>Solution 7:</b> Evaluate impact on farming incomes and FLW reduction.</p> <p><b>Solution 8:</b> Based on the evaluation, scale up using existing mechanisms such as FND.</p> <p><b>Solution 9:</b> Implement full-scale roll-out of new and existing technology and extend the analysis to other food sub-sectors. Existing funding mechanisms such as FND or banks could finance the investment.</p>
Formal processing and retail	<p><b>Solution 17:</b> Use the voluntary agreement to drive change across the supply chain and assist in helping farmers and citizens reduce FLW.</p> <p><b>Solution 20:</b> Determine what changes are needed to improve national waste management program.</p>	<p><b>Solution 21:</b> Evaluate the impact and consider whether this approach has implications for the separate collection of FLW from small businesses and potentially households.</p>
Hospitality and food services	<p><b>Solutions 23, 24 and 25:</b> Extend the pilots nationally, integrating FLW measurement and reduction into the training of Mexican chefs and their staff. Use food waste 'champions' and trade associations to promote the benefits of FLW reduction to a wide audience within the hospitality and food services sector.</p>	

Infrastructure and technology	Transport and logistics	Credit	Legal and institutional
<p><b>Solution 6:</b> Implement new schemes targeted at areas requiring infrastructure support through existing or revised financial support mechanisms.</p>		<p><b>Solution 5:</b> Potentially establish an independent regulator to review how the code has been implemented and to arbitrate in disputes.</p>	<p><b>Solution 4:</b> Evaluate progress and implement the scheme at scale depending on the findings. This could be supported by a legal code governing the fair relations between actors in the supply chain, which could be the subject of arbitration.</p> <p><b>Solution 10:</b> Monitor progress in reducing on-farm FLW and adjust programs accordingly.</p>
<p><b>Solution 13:</b> Evaluate progress and refocus as needed.</p> <p><b>Solution 14:</b> Implement full-scale roll-out of new technology and extend the analysis to other food sub-sectors.</p> <p><b>Solution 15:</b> Roll out successful technologies funded by national or international financial institutions.</p>			<p><b>Solution 18:</b> If needed, implement relevant options to drive redistribution further.</p> <p><b>Solution 19:</b> Work through the voluntary agreement to remove any further barriers to redistribution, where it makes sense to do this. Build links particularly with the hospitality and food services sector to capture more food.</p>

**Solutions for FLW hotspots**

Hotspots	Information	Knowledge and skills
<b>Medium priority</b>		
Wholesale market		<b>Solution 28:</b> If successful, roll out to all wholesale markets.
Household in home	<b>Solution 30:</b> Implement a wider campaign based on the tested messages to help citizens reduce food waste or encouraging civil society to act.	<b>Solution 32:</b> Review the provision of cooking skills in schools and consider whether there is a need for further provision.
<b>Lower priority</b>		
Informal sectors	<b>Solutions 33, 35 and 34:</b> Based on the analysis and the data on FLW, devise ways of encouraging traders to use these spaces for retailing, taking advantage of the improved facilities and producing less waste.	

**Infrastructure  
and technology**

**Transport  
and logistics**

**Credit**

**Legal and  
institutional**

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**Solution 26:** Evaluate the impact on the generation of FLW at markets.

**Solution 31:** Depending on the findings, determine whether there is an intervention that justifies public support.

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48

**There is ample international experience on the efficacy of a number of these solutions.**

For example, voluntary agreements between businesses, trade associations and governments have been shown to be effective in the UK and Norway and are being developed elsewhere, including Sweden, Denmark, South Africa, Australia, the USA and Canada and Germany. They have been shown to be effective in the hospitality and food service sector and across the food supply chain. Encouraging measurement in businesses is also a powerful driver of change within businesses.



**Case Study**  
**Food waste reduction in catering**

**Background**

BaxterStorey is a catering company based in the United Kingdom and Ireland that provides food for a range of sectors. In 2014, BaxterStorey began implementing a food-waste reduction program that weighs, reports and classifies food waste through its proprietary online accounting system. A total of 910 sites are now acting to reduce food waste across its estate. The company initiated this work after joining WRAP’s hospitality and food service sector voluntary agreement. Its work focused initially on understanding the amount and causes of food waste in its operations and using these insights to drive change. Central to its approach was regular reporting of progress to management.

**Result**

BaxterStorey initiated an innovative measurement method that keeps its costs to a minimum and links to its proprietary cloud-based accounting system. The company measures food waste and its value across all of its sites. Before implementing the program, BaxterStorey wasted between 7% and 10% of food purchase volume, at a cost of between US\$6.5 million and US\$10 million a year. The company set a target of 3% and tracks progress using weekly food waste reports.<sup>63</sup>

**\$10m**

BaxterStorey wasted between 7 and 10 percent of food purchase volume, at a cost of between US\$6.5 million and US\$10 million per year.

63 [https://champions123.org/wp-content/uploads/2018/07/18\\_WP\\_Champions\\_BusinessCase\\_Catering\\_FINAL.pdf](https://champions123.org/wp-content/uploads/2018/07/18_WP_Champions_BusinessCase_Catering_FINAL.pdf)



49

**Investigating novel methods of turning waste into products could also have a significant impact on the industry (see Annex 9 for additional case studies).**

### **Box 3: Success in reducing losses of aubergines, tomatoes and chilli peppers in Culiacán, Mexico**

In the Culiacán area, in the Mexican state of Sinaloa, a pioneer case of decreasing food losses was developed. In 1985, there were losses of 70,000 tons a year of aubergine production, equivalent to 30% of annual production. The annual losses fell to 5% with the introduction of a technological improvement.

Thirty-five years ago, the largest producer in the area (responsible for about 20% of the aubergines sold in the USA) analyzed the causes of aubergine losses in the immediate post-harvest stage. Finding that losses were caused by poor handling of the product from the harvest and during transportation to the factory where the product is selected and packaged, he wondered if it would be possible to eliminate this procedure, where workers handled the product on the farm, deposited it in transport trucks, unloaded it in the factory and selected it there, by quality levels.

The decision was to introduce mobile ‘selection factories’ and ‘packaging’ – instead of taking the product to the factory, the factory comes to the farm. With the ‘factory’ mounted on a truck, it became mobile and was transported to the guardrails at the foot of the land, where the aubergines were being harvested. A system was installed to wash the aubergines directly after harvesting, at the bottom of the furrows. The product is then transported using a system of magnetic strips to lift it into the truck, where it is packed in boxes that are immediately sent to another attached truck that has cold chambers.

The incorporation of this packaging technology significantly reduced the costs associated with having a static packaging factory and also saved on electricity costs that had previously been spent on cold rooms. Losses of aubergines through bruising were reduced and the incorporation of this technology saved the producer US\$70 million a year. The technology quickly became widespread and today this type of mobile packer is used throughout the state of Sinaloa, especially in the immediate post-harvest stage for tomatoes, chillies and aubergines.<sup>64</sup>

<sup>64</sup> It is important to highlight that new methodologies help to avoid waste, but must be managed under good agricultural practices to ensure safe products.

50

**Encouraging collaboration across the supply chain helps drive rapid change.**

FLW is a systemic issue and therefore tackling it requires businesses and primary producers to work together to address the causes of FLW. Having an independent facilitator to bring the companies together in a pre-competitive space and making the findings widely available to the sector as a whole, can help generate new best practice and disseminate the findings widely. Central to driving change is understanding the current level of waste and challenging employees and suppliers to consider new ways of operating that reduce FLW (for more case studies, see Annex 9).

51

**Helping citizens reduce FLW can also be very effective.**

Providing citizens with information on what is being wasted and why and then providing simple hints and tips to reduce food waste can result in significant reductions in FLW. This approach is being used in at least eight countries around the world.

## Case Study

### Helping citizens reduce food waste

#### Background

In 2007, WRAP developed the internationally renowned Love Food Hate Waste campaign. The campaign helps raise awareness of the issue of food waste and empowers consumers to waste less food and save money through practical advice, effective tools and helpful tips.

WRAP's partners – retailers and brands, local authorities, and community groups – confidently use the ready-made resources as these are based on extensive evidence. Working with the grocery industry, WRAP devised ways to make it easier for consumers to tackle their food waste and get the most out of what they buy: pack sizes that are better suited to today's households and improved labelling, for example.

WRAP's ground-breaking work is now reaching international audiences in the UK, Canada, Australia and New Zealand, where the campaign works across 60 councils and community groups to reduce consumer food waste. In Saudi Arabia, WRAP partnered with Savola to share its strategic guidelines, frameworks, tools and tips. Sharing its proven practices is helping Saudi Arabia to achieve maximum impact in its own food waste prevention and reduction program.

#### Result

Over a five-year period, WRAP's work helped UK consumers reduce avoidable food waste by 21% (1.1 million tons a year) – enough to fill Wembley Stadium in London to the brim every year. All the good food saved was worth US\$17 billion. WRAP plans to help consumers get better value from their food and to cut waste further.



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# 21%

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Over a five year period the work helped UK consumers reduce avoidable food waste by 21%

## From options to action

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### Solutions exist to reduce FLW, but their economic viability needs to be evaluated.

An important factor to consider when setting and designing interventions to reach a country's target for FLW reduction is to consider to what level a reduction is feasible, given the costs of achieving it. De Gorter (2014) argues that for economic agents (farmers, processors, transporters, retailers and consumers), the economics of food loss dictate that it is rational for these profit-maximizing or utility-maximizing entities to generate FLW, if there are diminishing returns on investments to reduce losses. It may be the case that for individual agents, the costs outweigh the benefits, thus making it rational to generate losses or waste. However, while this decision may be optimal for an individual agent, it might be sub-optimal from a societal perspective. In the absence of market failures (including imperfect markets and information asymmetries), there may be no space for policy interventions to have a significant impact, if agents along the food supply chain behave rationally but do not take into account negative externalities to society such as environmental costs, food security and so on (De Gorter and Just, 2018).

65 <https://www.refed.com/analysis?sort=economic-value-per-ton>

53

### Cost-benefit analysis.

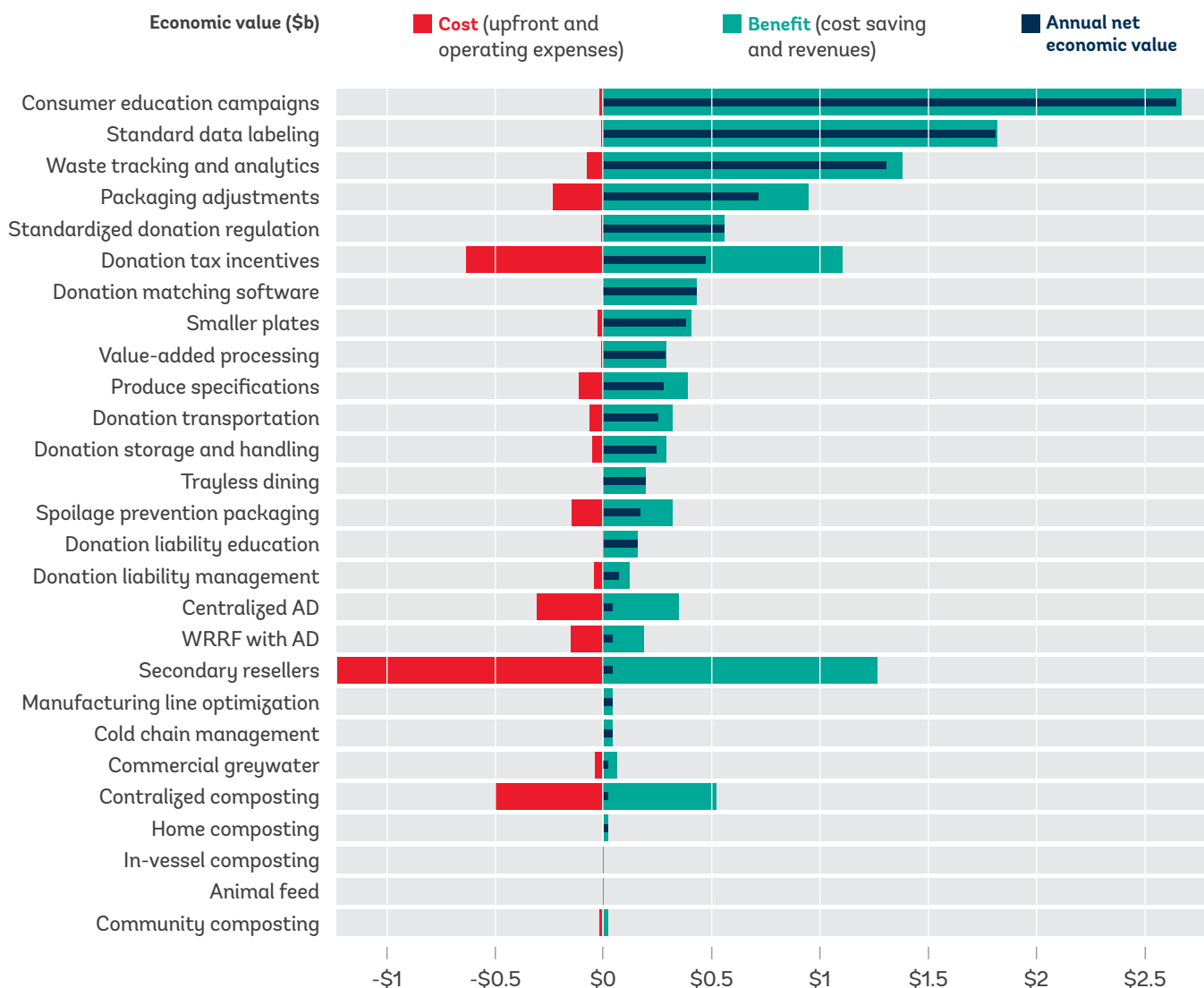
For any country, including Mexico, prior to any investments, a detailed cost-benefit analysis of FLW interventions would be necessary to gauge the return on investment to determine an acceptable level of loss for different commodities, based on the characteristics of losses along the value chain and its national context. According to global literature, the economic rationale exists for potential FLW reduction solutions, whereby the marginal benefits of eliminating losses outweigh the costs of interventions. For example, Rethink Food Waste (ReFED)<sup>65</sup> carried out a robust cost-benefit analysis across a comprehensive list of over 50 possible food-waste solutions as part of its preparation of the Roadmap to Reduce US Food Waste. Based on data availability, cost-effectiveness, scalability and the feasibility of implementation, 27 solutions were selected to primarily target consumer-facing food businesses, where market share is concentrated among a small set of companies that affect FLW both upstream (through farms and manufacturers) and downstream (through consumers). A marginal food waste abatement cost curve ranked each of the 27 solutions by economic value per ton and landfill diversion potential.

The core conclusion of the cost curve was that prevention and recovery solutions generally result in greater economic value per ton, while recycling solutions have significantly larger diversion potential. Over US\$10 billion of net annual economic value was identified from implementing the 27 solutions. Over 75% of the economic value is from prevention solutions, with 23% from recovery and the remaining potential from recycling. Figure 10 illustrates the cost-benefit ratio of each solution.

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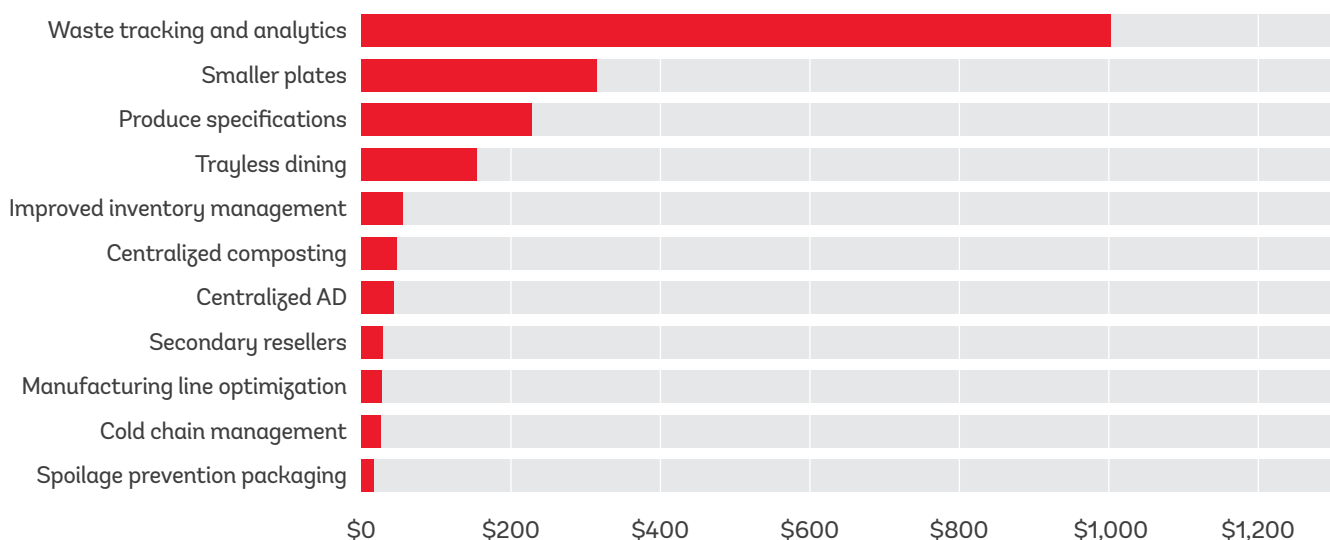
Additional calculations included those for business profit potential and non-financial impact, which is defined as the expected annual profits that the private sector can earn by investing in FLW solutions after adjusting for the initial investment required, differentiated costs of capital, and benefits that accrue to non-business stakeholders. The study estimates that there is US\$1.9 billion of annual business profit potential from the revenue and cost-savings of implementing nine prevention and two recycling solutions (see Figure 11).

**Figure 10: Cost-benefit ratio of potential solutions**



Source: ReFED analysis

**Figure 11: Annual business profit potential of different solutions (\$m)**



Source: ReFED analysis

**55**  
**Cost-effectiveness.**

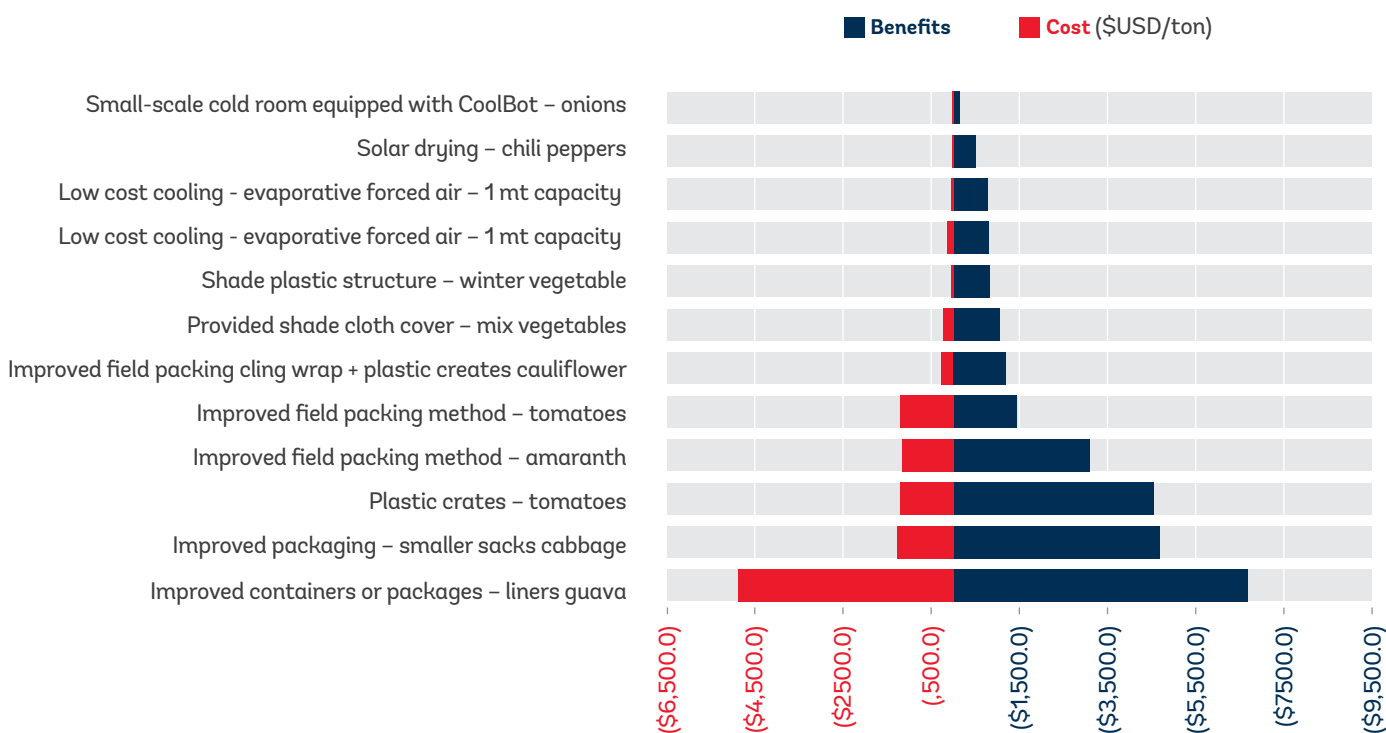
The literature on smallholder-targeted interventions in developing countries to reduce post-harvest loss (PHL) has largely focused on understanding the impact of technological solutions.<sup>66</sup> Evidence is starting to emerge on the cost-effectiveness of the application of a range of small-scale food-loss technologies to various post-harvest stages. The University of California, Davis carried out a field study to assess the feasibility of 32 potential small-scale post-harvest technological solutions to reduce PHL (see Figure 12). Results indicate that 80% of the technologies evaluated were cost-effective and of an appropriate scale for successful adoption and management by

small-scale horticultural producers and retailers in Africa and South Asia.<sup>67</sup> This work highlights the importance of the availability of technology in the country, as well as accompanying technical assistance as chief requirements for achieving reductions in PHL.

**56**  
In many cases, the adoption of technological solutions to losses is slow, a key reason for this being the need for an appropriate supporting infrastructure network (roads, electricity and rail, among others) to improve and/or increase the ability of farmers to access markets. The International Food Policy Research Institute (IFPRI) analyzed the return on investment from the infrastructure development needed to enable

conditions that would reduce PHL (see Table 9).<sup>68</sup> The results show that investment in infrastructure for reductions in PHL contributes to lower food prices, higher food availability and improved food security, and has positive economic rates of return.<sup>69</sup> It is important to note that infrastructure interventions benefit the economy more broadly and thus these interventions will generate greater benefits that go beyond the reduction of PHL alone. The analysis also indicated that reductions in PHL are not a low-cost alternative to productivity growth for achieving food security; rather, large-scale reductions in PHL requires significant public investment and they complement investments in long-term productivity growth to achieve food security.

**Figure 12: Cost benefit analysis of technological solutions for small-scale post-harvest losses**



Sources: Based on data from UC, Davis study

**Table 9: Cost-benefit analysis of infrastructure solutions to post-harvest losses<sup>70</sup>**

Financial variable US\$ billion	Scenario 1	Scenario 2
Benefits derived from investments	624	704
Costs	110	118
Benefit-cost ratio	6	6

Source: Based on IFPRI results

**57**  
**An action plan for implementing the proposed solutions is key to their implementation.**

Having identified solutions for the short-, medium- and long-term, it is necessary to put them into operation. More information on the nature of each recommended solution and the relevant stakeholders can be found in Annex 7.

**58**  
**In developing these actions, there are trade-offs that have been considered.**

The solutions proposed bring multiple financial, social and environmental benefits. The benefits of each solution in each category vary. For example, increasing redistribution of food to those in need brings significant social benefits, but doesn't specifically tackle the reasons why there was surplus food in the first place. In contrast, prioritizing FLW prevention in primary production and processing brings significant financial and environmental benefits, but has limited social benefits. As such, solutions have been prioritized so as to maximize the benefits against all three criteria listed above as far as possible. There is, however, a focus on preventing

FLW being produced in the first place so as to reduce the cost and environmental impact of Mexico's food system and then making the best use of what surpluses and waste still arise.

**59**  
**When implementing the plan, there will be other trade-offs to consider.**

In each of the solutions, there will be choices as to which food categories to focus on initially. For example, there may be a strong steer towards focusing on waste streams with a high value or that are associated with high GHGs, for example, those arising from meat and fish production. In terms of where the largest amount of FLW may be situated, international experience suggests that the largest amount in weight terms may be in fruit and vegetables and in bread production. Decisions about which category to focus on initially are probably best taken after discussion between businesses and government where the net benefits and mechanisms for covering costs can be considered.

66 Those losses occurring at the handling, storage, processing and distribution stages.

67 <http://ucce.ucdavis.edu/files/datastore/234-2428.pdf>

68 [https://www.copenhagenconsensus.com/sites/default/files/food\\_security\\_nutrition\\_assessment\\_-\\_roseggrant\\_0.pdf](https://www.copenhagenconsensus.com/sites/default/files/food_security_nutrition_assessment_-_roseggrant_0.pdf)

69 Assuming 100% cost allocation to PHL and 10% discount rate. Scenario 1 assumes 3% reduction in PHL by 2020 and 5% by 2025 for perishable and non-perishable crops. Scenario 2 assumes 1% reduction in PHL for non-perishables and 4% perishables crops by 2020.

70 Assuming 100% cost allocation to PHL and 10% discount rate, scenario 1 assumes 3% reduction in PHL by 2020 and 5% by 2025 for perishable and non-perishable crops. Scenario 2 assumes 1% reduction PHL for non-perishables and 4% perishables crops by 2020.



### Case Study

## Driving waste reductions through voluntary agreements with businesses

### Background

The Courtauld Commitment is a voluntary agreement with food businesses and retailers aimed at improving resource efficiency and reducing waste within the UK grocery sector. It was launched in 2005 and is now in its fourth phase. It is supported by all the major retailers and food and drink manufacturers.

Courtauld 2025 is a ten-year commitment to identify priorities, develop solutions and implement changes to cut the carbon, water and waste associated with food & drink by at least one-fifth in 10 years.

### Result

Since 2005, WRAP has made significant progress in reducing food and drink waste, by working with businesses and consumers to eliminate over 8 million tons of food waste.

Over the four-year period of phase 1 of the Courtauld Commitment, 1.2 million tons of food and packaging waste was prevented, with a monetary value of US\$2.3 billion, and a saving of 3.3 million tons of CO<sub>2</sub>, which is equivalent to the emissions from 500,000 round-the-world flights.

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# \$2.3bn

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During Phase 1 of the Courtauld Commitment 1.2 million tonnes of food and packaging waste was prevented, with a monetary value of \$2.3bn

# Conclusions and proposed next steps

## Building a Conceptual Framework

**60** There are clear economic, social and environmental reasons to tackle FLW in a systematic way.

Not only will it help Mexico deliver against multiple Sustainable Development Goals (e.g. Goals 1, 2, 3, 11, 12, 13, 14 and 15), but it will also help to mitigate climate change, drive sustainable economic growth and deliver on key social targets. The cost of FLW to Mexico's economy is significant, with conservative estimates of approximately MX\$500 billion every year (excluding preliminary household waste estimates at 11 million tons a year).

**61** Given the costs of FLW and the benefits of tackling it, there is a compelling case to make this a priority for Mexico.

Reducing FLW can: i) drive efficiency and competitiveness in priority sectors, such as food and drink production (12.6% GDP)<sup>71</sup> and tourism (7.4% GDP),<sup>72</sup> where Mexico is already a global player; ii)

<sup>71</sup> <http://www.worldmrio.com/>

<sup>72</sup> <https://www.wttc.org/-/media/files/reports/economic-impact-research/countries-2017/mexico2017.pdf>

deliver good food to vulnerable people who are food insecure (currently 24 million); and iii) reduce GHGs emissions in line with Mexico's GHGs emission reduction program and the Paris Agreement on Climate Change, among others.

**62** The Conceptual Framework developed here provides a structure for addressing FLW in Mexico and sets the stage for strategic interventions.

The work is a compilation of information on FLW in Mexico, data on international experiences, and an analysis of existing data gaps. It examines the existing legal and regulatory framework governing FLW and the current support provided. It considers the whole food production and consumption system, prioritizes the areas for intervention and outlines the main causes of FLW in each area. Based on research, discussions with stakeholders (see Annex 8) and international experience, this document lists a range of solutions that can prevent and reduce FLW in Mexico. The interventions are qualitatively prioritized and an action plan is outlined that spans different timescales and identifies the key actors.

**63** The Conceptual Framework is an integrated model of technical and policy approaches towards addressing FLW.

Wherever possible, the solutions build on existing Mexican programs and initiatives. The framework proposes working closely with businesses, since many of the solutions will have to be carried out by the private sector, within a supportive political context. It looks for economic opportunities rather than focusing on legislative changes, as opportunities act as a strong driver of business change. It aims to drive innovation and infrastructure development and to take advantage of new technology and international best practice. It addresses data gaps that will allow the strategy to be reviewed and updated over time. The Conceptual Framework takes a systemic view of what is known about the Mexican food system, an approach that has been used by several leading countries around the world. It focuses on dealing both with food loss and food waste together, recognizing that their causes arise all along the supply chain, and that tackling both will bring the biggest benefits to businesses and the Government and citizens of Mexico.



## Key findings

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**Based on the analysis, a clear set of prioritized interventions has been proposed that could form the basis of a national strategy:**

- **Prevent:** Prevent FLW in key parts of the supply chain
- **Prioritize:** Improve the use of surplus food and get more value from unavoidable food waste and by-products

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**Preventing FLW in the first place is key to dealing with it.**

Understanding the causes of FLW is important for identifying adequate solutions. Together, these solutions address the needs of small farmers and big businesses alike and stimulate innovation across the supply chain. They outline research that needs to be conducted across the supply chain to identify new opportunities for reducing FLW. They encourage existing programs to be more focused on FLW reduction and suggest ways of driving investment in infrastructure and making the market operate more openly.

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**Actively engaging the private sector is a critical element for the success of any strategy.**

Striking voluntary agreements with businesses across Mexico involved in the production and sale of food would likely bring about concrete results. This would complement the commitment to delivering SDGs 12.3 and could bring continuity to government efforts. Currently, there is significant interest from both businesses and trade associations in this approach, given the scale of the cost savings that could be achieved. This scope could help drive rapid change, focus valuable business resources on preventing FLW to the benefit of the country as a whole, while reducing the cost to the public sector. In addition, voluntary agreements provide a framework for developing approaches that help farmers and citizens reduce FLW. A voluntary agreement is proposed for retail and food manufacturing and separately for the hospitality and food service sector.

67

**Increase the donation of food to people.**

The prioritized interventions encourage the expansion of the current network of foodbanks across Mexico, focusing on areas of urban deprivation and poverty. Given the current positive effect that foodbanks have, enabling an environment for further food recovery and donation should be prioritized. These interventions also propose to use the voluntary agreements to drive food donations and to develop cost-effective ways of helping the flow of good food to foodbanks by sharing logistics to transport food and using new technology to link donors with foodbanks.

68

**Promote food donations and capacity for animal feed.**

The capacity of the animal feed market to use selected food waste or by-products should also be developed. This would have the added benefit of off-setting expensive imported products and potentially increasing the profitability of the sector.

69

**Create value-added products from unavoidable food waste.**

The introduction of cutting-edge technology to Mexico to generate value-added products and by-products from FLW should be promoted. Potential products include pharmaceuticals, vitamins and fine chemicals. Relying on FLW as feedstock for innovative approaches to animal-feed production shows particular promise. Such approaches can increase jobs and economic activity while reducing FLW. The interventions suggest ways of piloting and scaling up promising technologies. Valorization of FLW implies that businesses could pay for the FLW feedstock, making investment in cost-effective collection systems more viable. In future, these technologies may even serve to help divert separately collected FLW from municipal sources or even households cost-effectively. This could help deliver a more sustainable waste management system, particularly for Mexican cities, where the amount of FLW available may allow economies of scale.

**Next steps: developing a national strategy for Mexico**

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**In order to structure, finalize and deliver a national FLW strategy for Mexico, the following steps are recommended:**

**a) Review the identified solutions and scope** recommended in the Conceptual Framework and align these with the priorities of the government. Furthermore, the Conceptual Framework suggests that the strategy should be aligned with SDGs 12.3, and as such, should focus on the parts of the food-supply chain where there is the most loss and waste and where interventions can bring the greatest benefits.

**b) Conduct an in-depth cost-benefit analysis of the prioritized solutions** to ensure their economic feasibility. The benefits of developing and implementing the national strategy could outweigh the costs of inaction. There could be a role for international organizations in funding parts of the strategy, as some of the solutions will reduce GHGs emissions and alleviate poverty.

**c) Conduct a series of consultations** with key stakeholders (this could be led by the high-level working group) to obtain feedback and update the draft national strategy accordingly. It will be important to engage and give continuity to the working group in developing the national strategy.

**d) Finalize the draft national strategy**, based on results from these consultations, making the case for change, identifying where to focus, and stating the priority interventions that are needed, by whom and when. The national strategy should also outline interim milestones and when implementation will be reviewed.

**e) Publish the national strategy and implementation plan.** Carry out awareness-raising campaigns to key stakeholders as part of the dissemination strategy.

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Based on international experience, this process could be completed in between six and nine months, depending on the statutory minimum duration of the final consultation and the degree of consultation required by the federal government.

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# Annexes

The following is a list of annexes that can be found in the Annex Report:

- Annex 1** Relevant sustainable development goals
- Annex 2** Current legal and institutional framework
- Annex 3** Data assessment and gaps
- Annex 4** Examples of successful approaches to reducing FLW
- Annex 5** Institutional and market failures
- Annex 6** Waste generation estimates
- Annex 7** Detail of key actions and interventions
- Annex 8** List of stakeholders
- Annex 9** Case studies

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