



# Characterization and Management of Food Loss and Waste

in North America



**David Donaldson**  
**Commission for Environmental Cooperation**

**Global Methane Forum**  
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# About the CEC

- The CEC was created in 1994 by Canada, Mexico and the United States through the North American Agreement on Environmental Cooperation (NAAEC), a side agreement to NAFTA
- The CEC facilitates cooperation and public participation to foster conservation, protection and enhancement of the North American environment for the benefit of present and future generations
- The CEC Council is comprised of the ministers of Environment and Climate Change Canada, US Environmental Protection Agency and *Secretaría de Medio Ambiente y Recursos Naturales* (Semarnat)

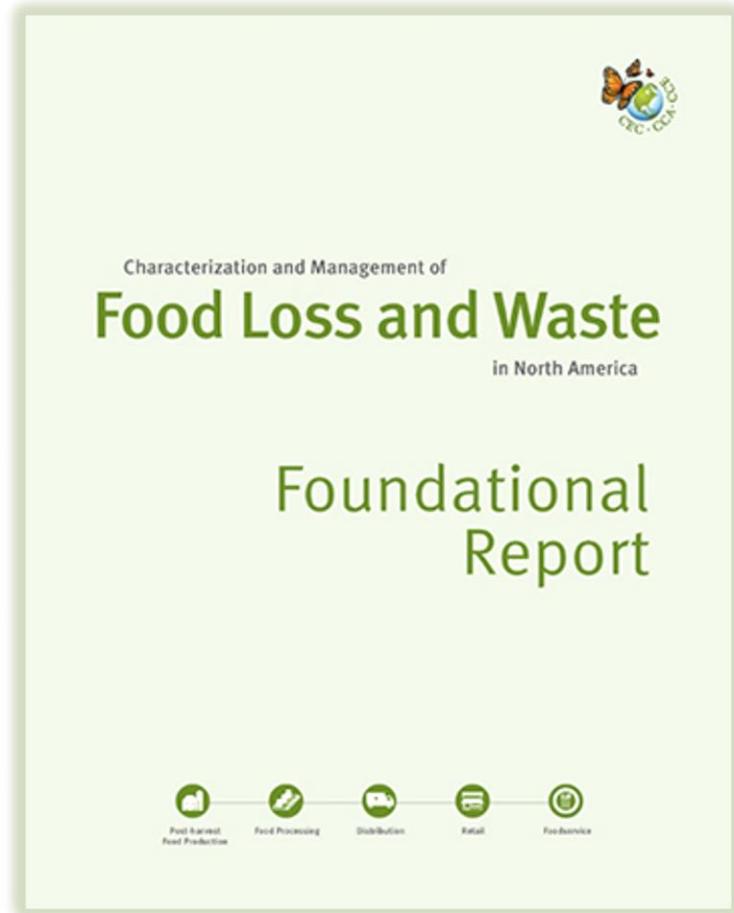
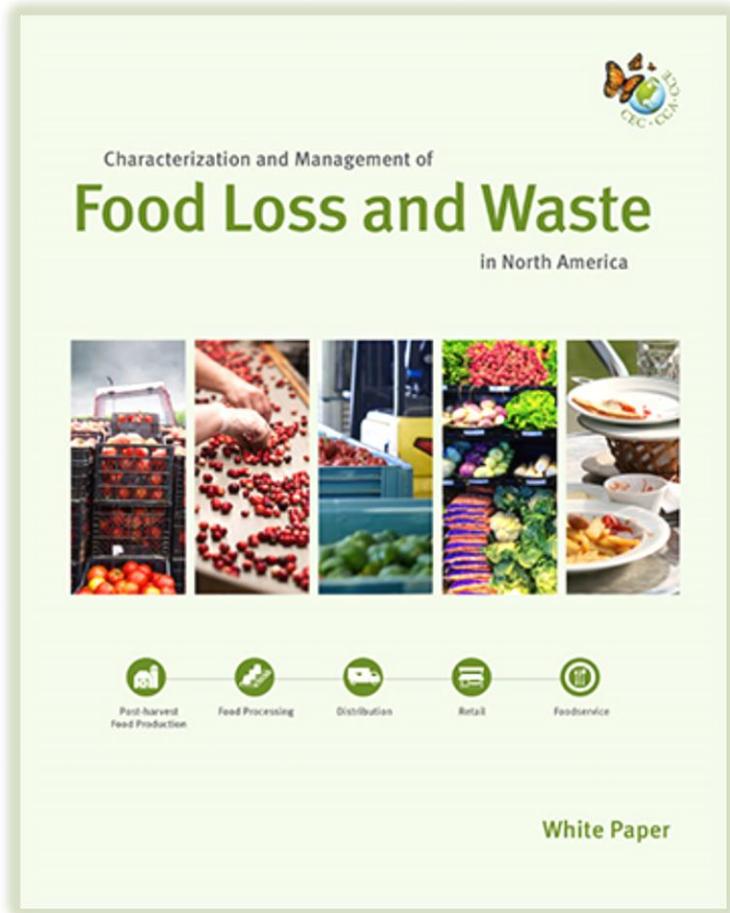


# Presentation Overview

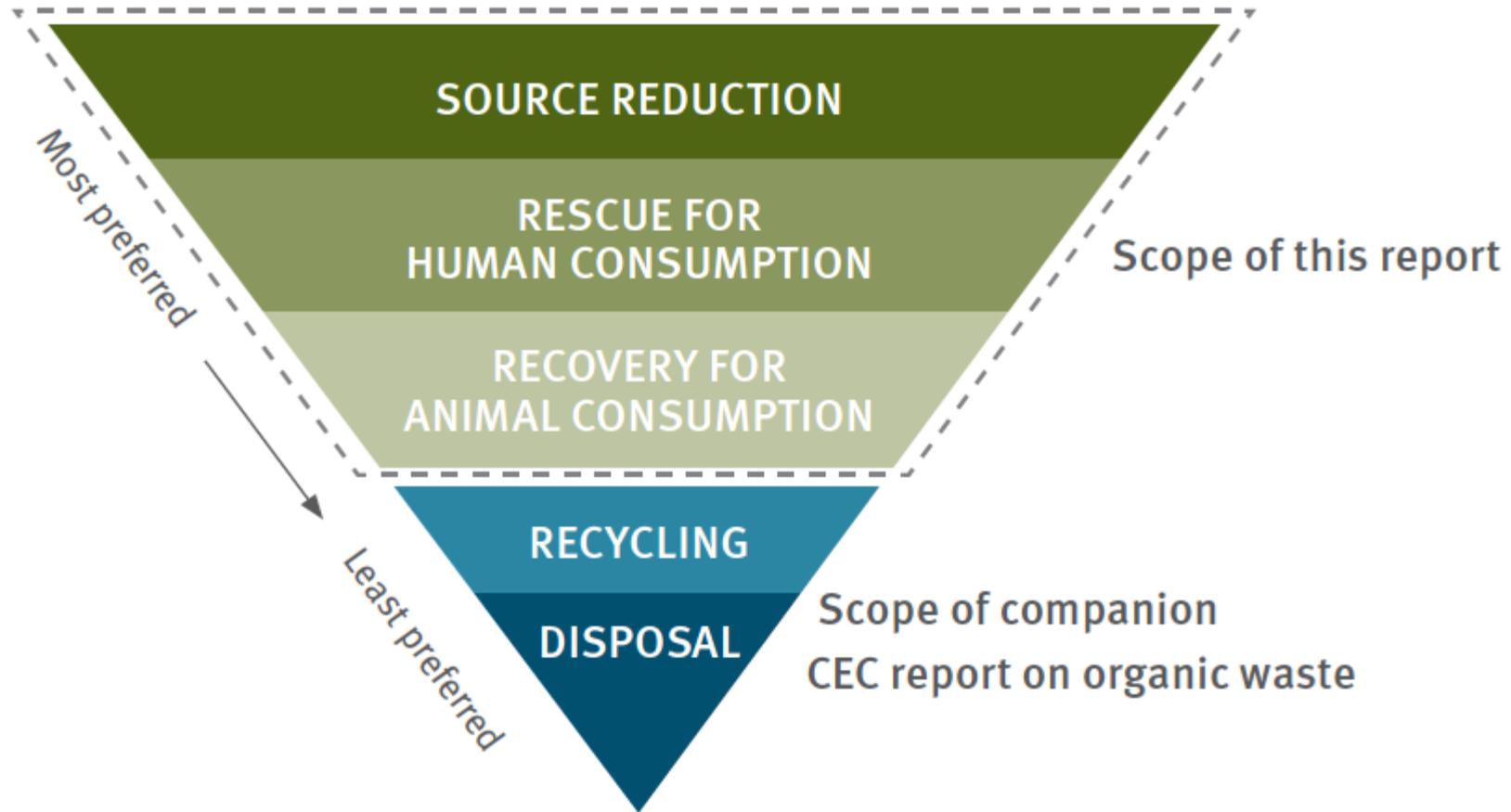
- Foundational Report and White Paper
- Food Loss and Waste in North America
- Environmental and Socio Economic Impacts
- Opportunities
- Commitments and Initiatives
- What's Next



# Our Report

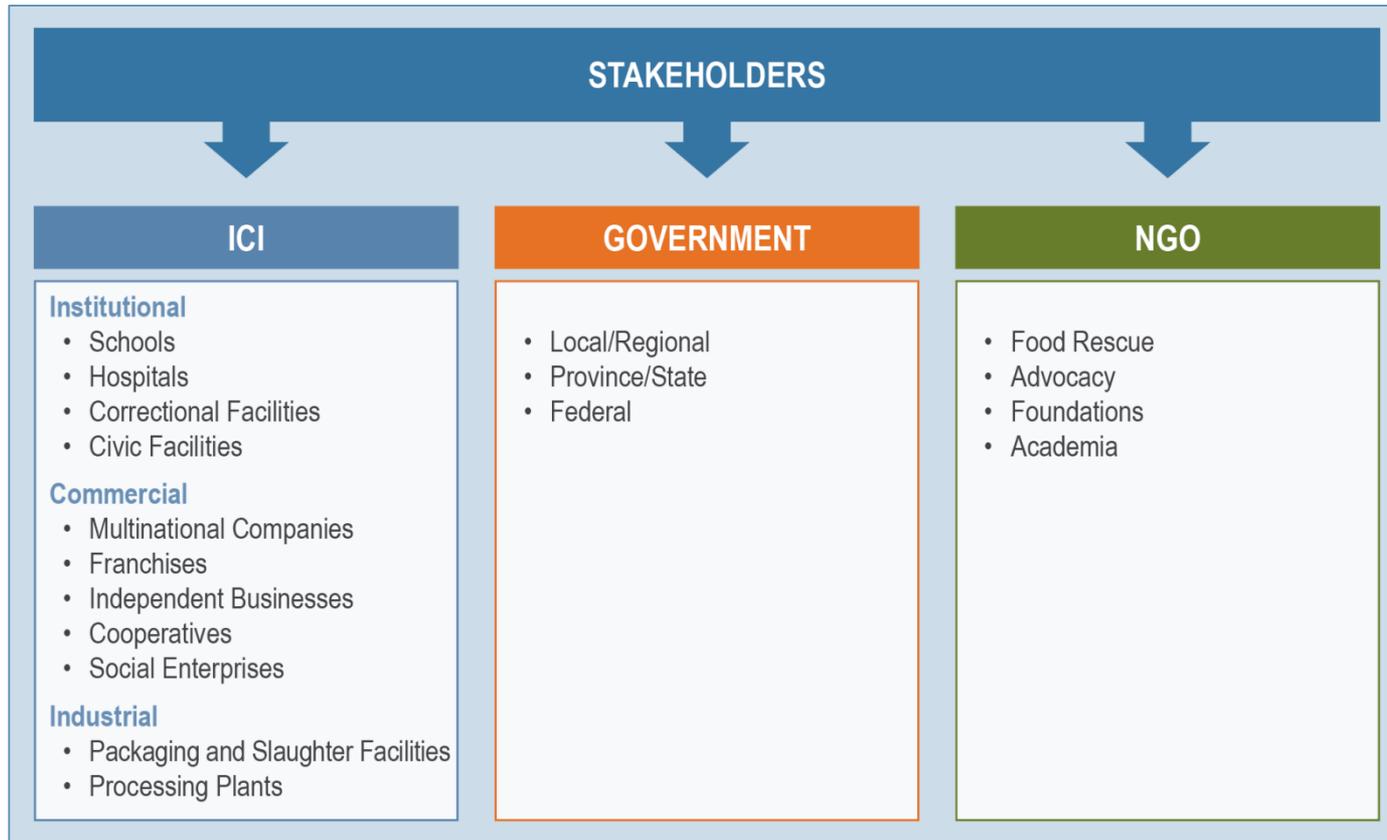


# Food Recovery Hierarchy



Source: Adapted from US EPA 2016a; MacRae et al. 2016; Papargyropoulou et al. 2014; Kelly 2014; WRAP 2013.

# Overview of Stakeholders



# Data Collection and Research Approach

- A total of 167 interviews conducted
- Expert panel meetings
- Case studies in each country across the food supply chain
- Review of reports, white papers, academic papers, news articles, media recordings and government databases
- Literature review including scan of on-the-ground programs and projects implemented by the ICI sector, governments and NGOs in North America and beyond
- North American Workshop, Toronto, ON
- International Food Waste Workshop hosted jointly with the World Bank, Washington DC
- CEC Joint Public Advisory Committee Public Meeting, Tuxtla Gutiérrez, Chiapas



Characterization and Management of

**Food Loss and Waste**

in North America

# What is Food Loss and Waste?

**Food loss** refers to food that is intended for human consumption but, through poor functioning of the food production and supply system, is reduced in quantity or quality.

- Food loss is primarily due to inefficiencies in the food supply chain.
- Examples include food that rots in the field or in storage because of inadequate management, technology or refrigeration, or food that cannot make it to market because of poor infrastructure and thus goes unconsumed.

**Food waste** refers to food for human consumption that is discarded (both edible and inedible parts) due to intentional behaviors. “Food waste” often refers to what occurs along the food chain from the retail store through to the point of intended consumption.

- Food waste often occurs by choice, through poor stock management, or through neglect, and includes food that has spoiled, expired, or been left uneaten after preparation.

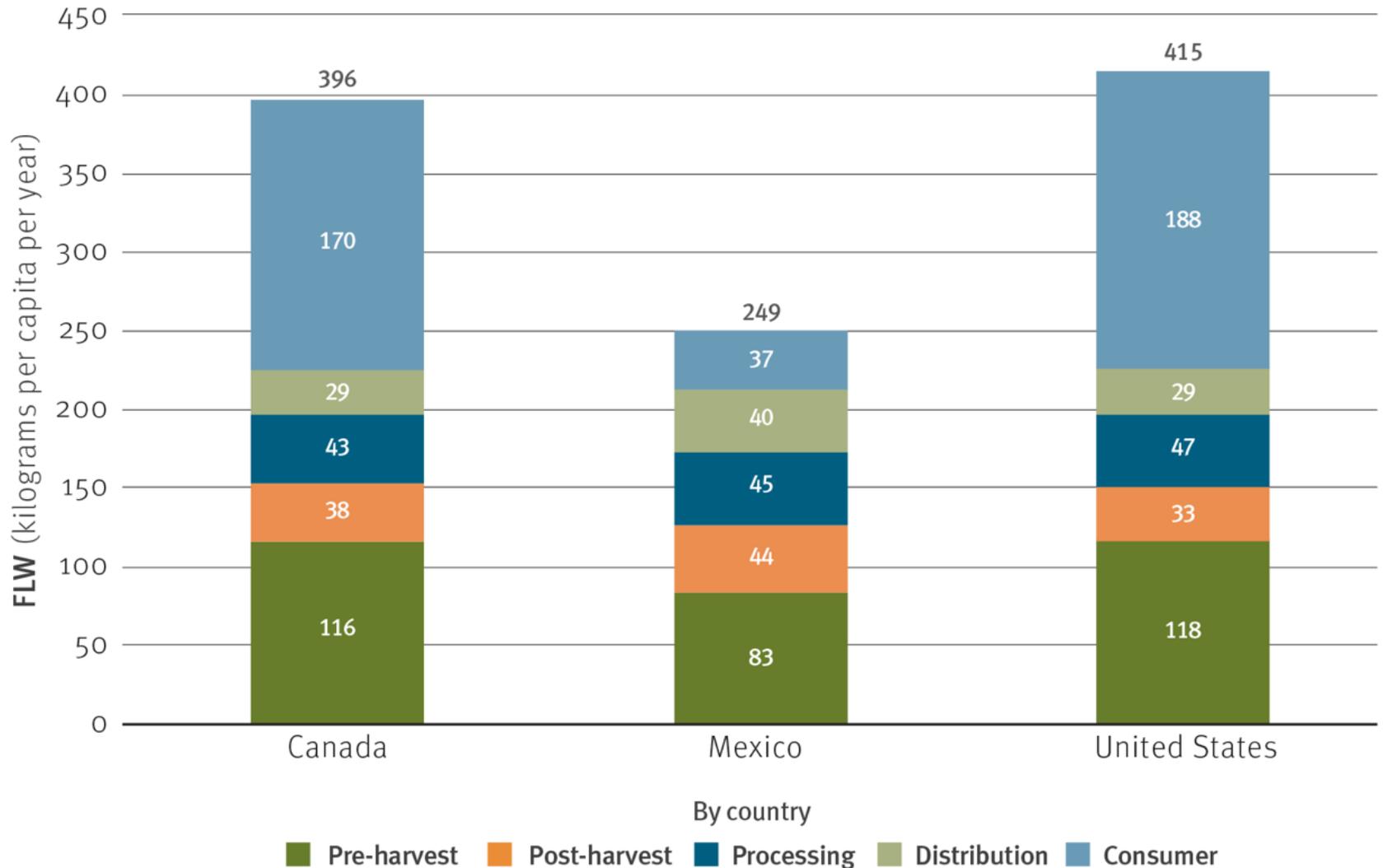


Characterization and Management of

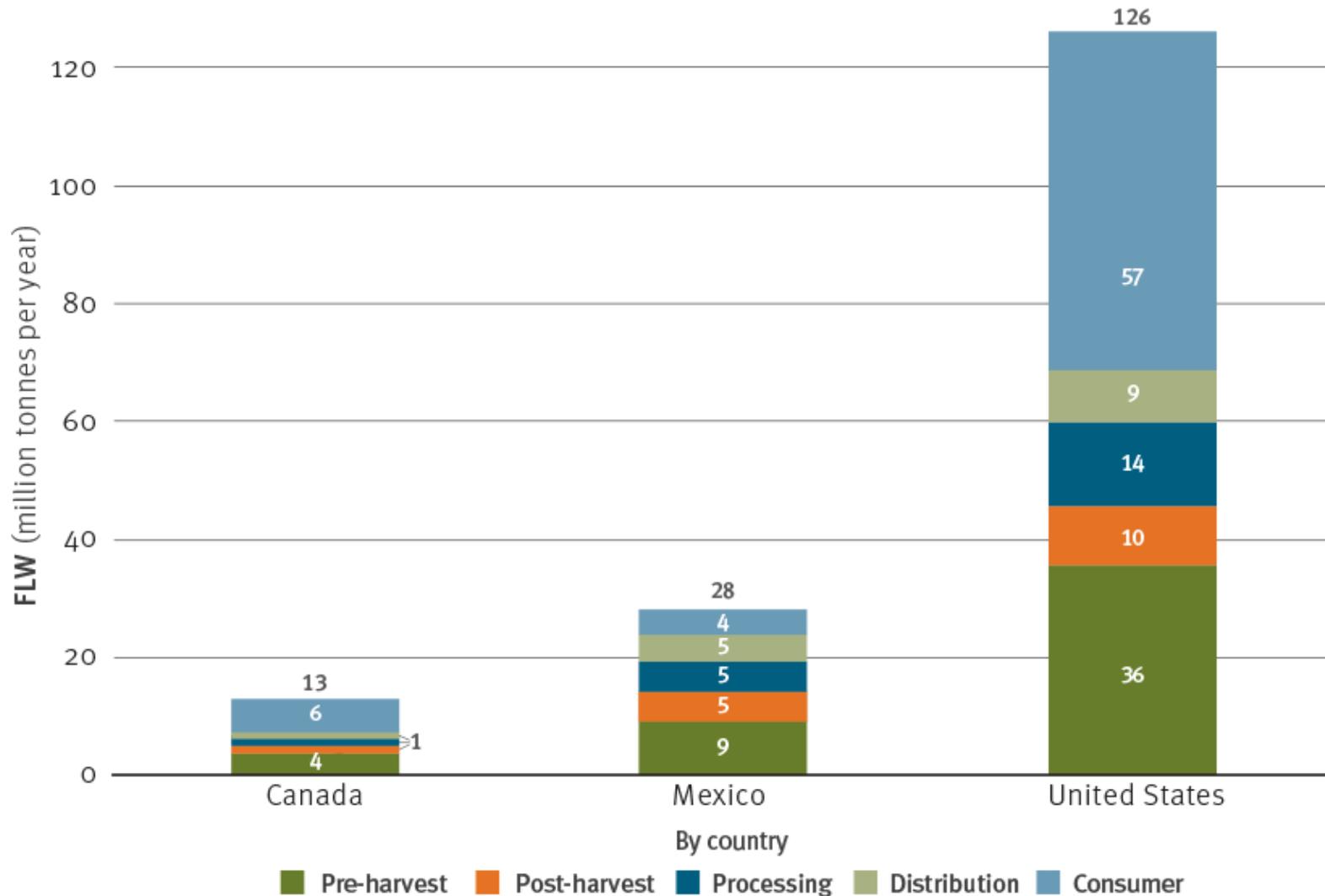
## Food Loss and Waste

in North America

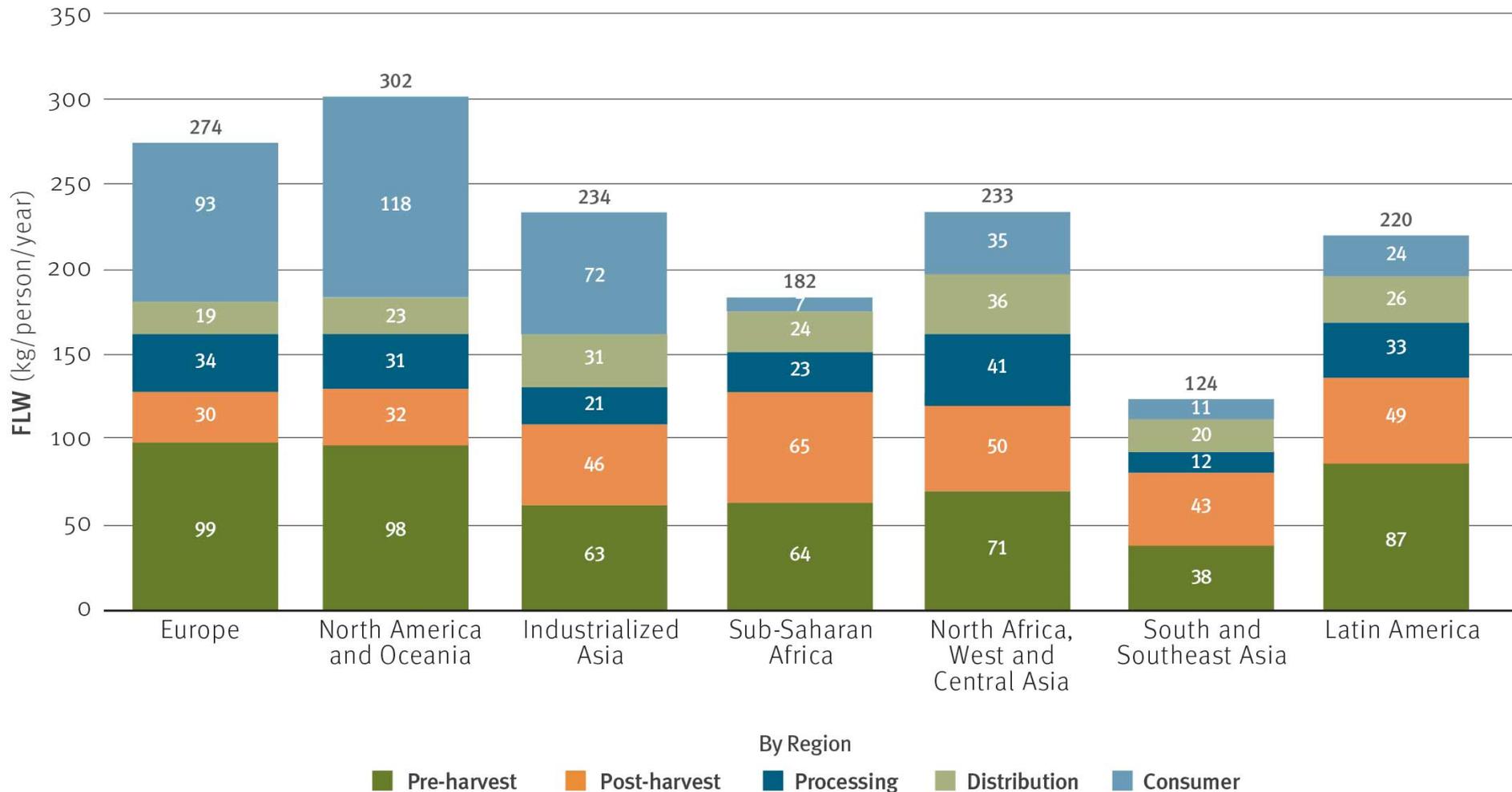
# Estimates of Food Loss and Waste Per Capita, North America



# Estimates of Food Loss and Waste Total, by Country



# Estimates of Food Loss and Waste Per Capita, by Region



# Environmental and Socio-Economic Impacts

Impact Category <sup>1</sup>	Unit	Canada	Mexico	United States	North America
Life-Cycle Greenhouse Gas Emissions for Landfilled FLW <sup>2,a</sup>	million tonnes CO <sub>2</sub> e per year	21 <sup>a</sup>	49 <sup>b</sup>	123 <sup>b</sup>	193
Water Use <sup>3,c</sup>	billion m <sup>3</sup> per year	1.5	2.7	13.4	17.6
Wasted Cropland <sup>3,c</sup>	million ha per year	1.8	4.4	15.9	22.1
Fertilizer Use <sup>3,c</sup>	million tonnes per year	0.33	0.63	2.97	3.94
Biodiversity Loss <sup>3,d</sup>	loss equivalent to X million US\$ per year	26	64	229	319
Energy Use <sup>3,e</sup>	10 <sup>18</sup> Joules per year	1.0	3.4	8.9	13.3
Wasted Landfill Space <sup>2,f</sup>	million m <sup>3</sup> per year	4.2	8.6	25.9	38.6
FLW Tipping Fees <sup>2,f</sup>	million US\$ per year	326	249	1,293	1,867
Market Value of FLW <sup>3</sup>	billion US\$ per year	24 <sup>g</sup>	36 <sup>h</sup>	218 <sup>i</sup>	278
Wasted Calories <sup>3,j</sup>	trillion kcal per year	20	20	177	217

1. Assumptions and parameters for quantifying environmental and socio-economic impacts are provided in the CEC foundational report *Characterization and Management of Food Loss and Waste in North America*, Section 6 and Appendices 4 and 6 (CEC 2017).
2. Life-cycle greenhouse gas emissions, wasted landfill space and wasted tipping fees were only calculated for landfilled FLW; the estimates exclude FLW disposed of, unharvested, or lost by other means.
3. While not explicitly stated in each methodology, estimates assume FLW from all stages of the food supply chain are included. Estimates shown only include the direct cost (market value) of FLW. Indirect costs such as labor, transportation, storage and wasted resources are not included.

Note: CO<sub>2</sub>e = carbon dioxide equivalent; m<sup>3</sup> = cubic meters; ha = hectare; kcal = kilocalories.

Sources: a. ICF Consulting 2005, US EPA 2015; b. US EPA 2015; c. Kummu et al. 2012; d. FAO 2014; e. Cuellar and Webber 2010; f. Green Power Inc. 2014, EPA Victoria 2016; g. Gooch et al. 2014; h. Gutiérrez Aguilar 2016; i. ReFED 2016; j. Lipinski et al. 2013.

# Environmental and Socio-Economic Impacts



**22 MILLION**  
hectares per year of **wasted cropland** from FLW in North America = the area of the US state of Utah



**US\$1.9B**  
spent on **landfill tipping fees** each year



The yearly caloric value of FLW in North America is enough to **feed** close to **260 million people**



**3.9 MILLION**  
tonnes per year of **wasted fertilizer** from FLW in North America = enough to cover the state of Chihuahua!



**US\$278B**  
**lost** every year in FLW in North America



The energy embodied in FLW in North America is enough to **power** **274 million homes** each year

**39 MILLION**  
cubic meters of **landfill space wasted** per year in North America on landfilling FLW — equivalent to 13 football stadiums



**13**



**US\$319M**  
value of **biodiversity loss** due to FLW in North America every year



**18 BILLION**  
cubic meters per year, the estimated **water footprint** of FLW in North America = the volume of **7 million** Olympic-size swimming pools



**193 MILLION**  
tonnes CO<sub>2</sub>e per year of **life-cycle GHG emissions** from FLW in North America



= **41 million cars** driven continuously for a year



Post-Harvest



Processing



Distribution



Retail



Foodservice

### Causes of Food Loss and Waste

<ul style="list-style-type: none"> <li>Grading standards for size and quality</li> <li>Inaccurate supply-and-demand forecasting</li> <li>Order cancellations</li> <li>Employee behavior</li> <li>Low market prices and lack of markets (especially for second-grade products)</li> <li>Inadequate sorting</li> <li>Damage from handling</li> <li>Spillage and degradation</li> <li>Inappropriate transportation and storage conditions</li> <li>Cold-chain (refrigeration during transportation and storage) deficiencies</li> <li>Labor shortages</li> </ul>	<ul style="list-style-type: none"> <li>Inadequate infrastructure, machinery</li> <li>Inefficient systems design</li> <li>Damage during production</li> <li>Inaccurate supply-and-demand forecasting</li> <li>Contamination</li> <li>Trimming and culling</li> <li>Supply/demand issues</li> <li>Inconsistent/confusing date labels</li> <li>Inconsistency in quality of ingredients</li> <li>Food safety issues</li> <li>Production line changes</li> <li>Cold-chain deficiencies</li> <li>Facility employee behavior</li> </ul>	<ul style="list-style-type: none"> <li>Damage during transport</li> <li>Inaccurate supply-and-demand forecasting</li> <li>Cold-chain deficiencies</li> <li>Rejection of shipments</li> <li>Poor record keeping</li> <li>Inappropriate transportation and storage conditions</li> <li>Incorrect/ineffective packaging</li> <li>Delays during border inspections</li> <li>Road infrastructure challenges</li> <li>Excessive food distribution centralization</li> </ul>	<ul style="list-style-type: none"> <li>Inaccurate supply-and-demand forecasting</li> <li>Overstocking</li> <li>Food safety concerns</li> <li>Inconsistent/confusing date labels</li> <li>Order minimums and fluctuations in delivery from suppliers</li> <li>Cold-chain deficiencies</li> <li>Rejection of shipments</li> <li>Increasing merchandising standards</li> <li>Product differentiation</li> <li>Market over-saturation</li> <li>Rigid management</li> <li>Marketing practices</li> </ul>	<ul style="list-style-type: none"> <li>Plate composition</li> <li>Expansive menu options</li> <li>Over-serving</li> <li>Over-preparing</li> <li>Unexpected demand fluctuations</li> <li>Preparation mistakes</li> <li>Improper handling and storage</li> <li>Rigid management</li> <li>Facility employee behavior</li> <li>Food safety concerns</li> <li>Use of trays</li> <li>Marketing practices</li> </ul>
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### Key Players That Can Address Causes

<ul style="list-style-type: none"> <li>Farm owners</li> <li>Farm workers</li> <li>Retailers</li> <li>Processors</li> <li>Distributors</li> <li>Food rescue organizations</li> <li>Service providers (storage, equipment)</li> <li>Government (various levels)</li> </ul>	<ul style="list-style-type: none"> <li>Facility managers</li> <li>Facility employees</li> <li>Retailers</li> <li>Distributors</li> <li>Service providers (equipment, process engineers)</li> <li>Food rescue organizations</li> <li>Government (various levels)</li> </ul>	<ul style="list-style-type: none"> <li>Facility managers</li> <li>Farm owners/workers</li> <li>Facility employees</li> <li>Service providers (equipment, transport, packaging)</li> <li>Processors</li> <li>Retailers and intermediaries</li> <li>Foodservice</li> <li>Food rescue organizations</li> <li>Government (various levels)</li> </ul>	<ul style="list-style-type: none"> <li>Facility managers</li> <li>Facility employees</li> <li>Farm owners</li> <li>Processors</li> <li>Distributors</li> <li>Service providers (packaging, technology)</li> <li>Food rescue organizations</li> <li>Government (various levels)</li> </ul>	<ul style="list-style-type: none"> <li>Facility owners and managers</li> <li>Facility employees</li> <li>Service providers (custodial, delivery, food service)</li> <li>Distributors</li> <li>Food rescue organizations</li> <li>Government (various levels)</li> </ul>
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# Opportunities

## **Cross-cutting**

- Develop FLW Policies
- Foster Multi-Stakeholder Collaboration
- Create Voluntary ICI FLW Initiative
- Strengthen Regional Collaboration

## **Measuring, Tracking and Reporting**

- Standardize Measuring, Tracking and Reporting
- Track and Report Performance

## **Source Reduction**

- Standardize Date Labels
- Update Food Grading
- Improve Cold-Chain Management
- Expand Value-Added Processing and Packaging Innovation

## **Food Rescue and Recovery**

- Explore Food Rescue Incentives



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# Case Studies

- Twelve case studies per country from across the food supply chain link food waste solutions to pragmatic and proven approaches

## **Producing Meal from Fish Waste, La Nueva Viga Fish Market, Mexico City**

- Before La Nueva Viga started selling fish waste to meal processing, they paid for collection of fish waste \$8,379 USD per month. Now, receive \$11,229 USD per month of revenue for fish waste processing.



## **Grocery Meat and Food recovery Terminal, Montreal food bank**

- Food recovery hub that specializes in recovering perishable food, such as meats, vegetables and fruits. Over 85% needs to be refrigerated or frozen, which is opposite to most food banks which recover mostly dry goods.





# SUSTAINABLE DEVELOPMENT GOALS



## TARGET 12.3

By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses

# Government Programs and Commitments in North America

Country/Region	Programs and Commitments
North America	<ul style="list-style-type: none"><li>▪ North American Climate, Clean Energy, and Environment Partnership Action Plan</li><li>▪ North American Initiative on Food Loss and Waste Reduction and Recovery</li></ul>
Canada	<ul style="list-style-type: none"><li>▪ Strategy on Short-lived Climate Pollutants</li></ul>
Mexico	<ul style="list-style-type: none"><li>▪ National Strategy and Program of Sustainable Production and Consumption</li><li>▪ National Crusade Against Hunger</li><li>▪ Champions 12.3 Initiative</li></ul>
United States	<ul style="list-style-type: none"><li>▪ FLW Target (reduce by 50% by 2030)</li><li>▪ Food Recovery Challenge</li><li>▪ FLW 2030 Champions</li></ul>

## TOOLKITS FOR ICI SECTOR



- Provision Coalition (processors and manufacturers, Canada)
- Food Waste Reduction Alliance (industrial, commercial and institutional [ICI] sector, United States)

## ACTION PROGRAMMES

- National Crusade Against Hunger (Government of Mexico)
- Orange County Food Rescue Pilot, Waste Not OC Coalition (nongovernmental organization [NGO], United States)



## AWARENESS CAMPAIGNS



- Sauve Ta Bouffe (Recyc-Québec [NGO], Canada)
- Love Food Hate Waste campaign (regional government, Canada)
- Zero Waste Initiative (Unilever Food Solutions [ICI], Mexico)
- The Thematic Network on Food Security (NGO, Mexico)
- Food: Too Good to Waste (EPA, United States government)
- Save the Food (Natural Resources Defense Council [NGO], United States)

## INCENTIVE PROGRAMS

- Food Recovery Challenge and US Food Waste Challenge (EPA and USDA, United States government)
- Tax incentives (various locales)



## POLICY AND STRATEGY

- Strategy on Short-lived Climate Pollutants (Government of Canada)
- National Food Waste Reduction Strategy (National Zero Waste Council, Coalition Canada)
- System of Integral Measurement and Productivity Improvement (International Labor Organization [ICI], Mexico)
- National Strategy and Special Program of Sustainable Production and Consumption (Semarnat, Government of Mexico)
- Program of Trade and Market Development (Sagarpa, Government of Mexico)



## FOOD DONATION AWARENESS



- Industry Food Donation Guidelines (British Columbia Center for Disease Control)
- Programme de Récupération en Supermarchés (supermarket recovery program, Quebec)
- Feeding America (United States)

## PORTION SIZE AND NUTRITION EDUCATION

- Dalhousie University and University of Alberta (Canada)
- Slow Food Mexico (NGO, Mexico)
- Mexican Diabetes Association (NGO, Mexico)
- University of Massachusetts and Iowa State University (United States)



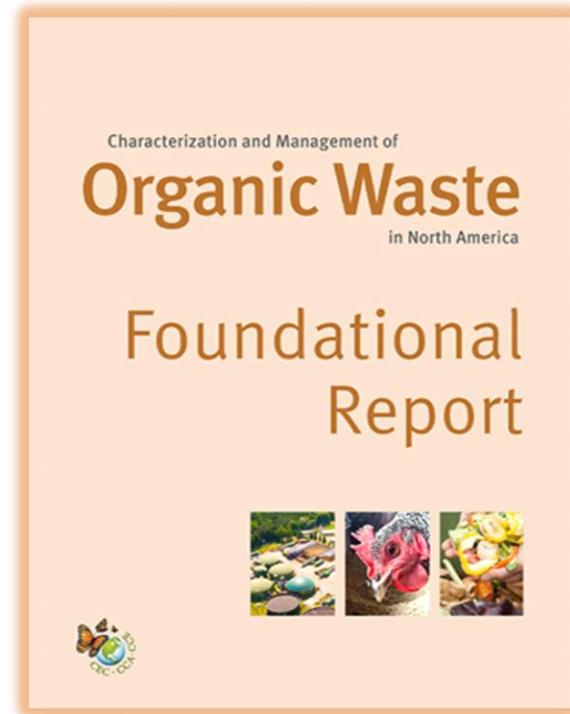
# What's Next?

- Continue work in new project to improve measurement of food loss and waste across the food supply chain
- Developing food waste outreach and learning tools for youth organizations



# Organic Waste

- Companion comprehensive research on organics processing and diversion in North America



# For More Information

North American Food Loss and Waste  
Initiative :

<http://www3.cec.org/fw/>

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