

# Food Loss + Waste

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## PROTOCOL

**North American Workshop on Food Waste Reduction and Recovery**  
**Practical Approaches to Measuring, Tracking and Reporting Food Loss and Waste**

March 1, 2017

By Kai Robertson  
Lead Advisor, FLW Protocol, World Resources Institute

# About the FLW Protocol

A multi-stakeholder effort to develop a global  
*Food Loss and Waste Accounting and Reporting Standard*  
(*FLW Standard*)



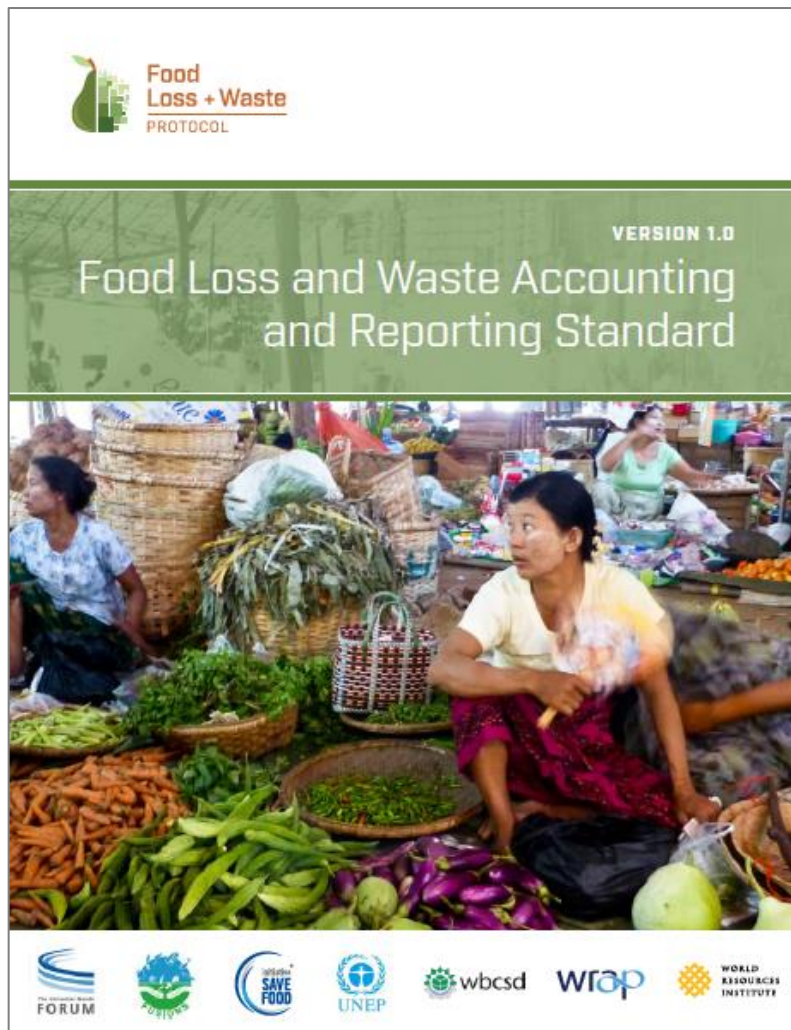
World Business Council for  
Sustainable Development

Secretariat



Working together for  
a world without waste

# Launched June 2016



- Global voluntary standard
- Common language, requirements, and guidance for quantifying and reporting on the weight of FLW
- Benefits of using the *FLW Standard*:
  - ✓ Consistency and transparency
  - ✓ Set and track progress using a clear framework
  - ✓ Understand where FLW is generated to guide action

# Questions to Ask When Measuring

A rustic wooden surface with various food items including green onions, orange slices, and cracked eggs. The background is a dark, textured wooden surface. In the foreground, there are several green onions, some orange slices, and several cracked eggs. The eggs are cracked open, showing the yolks and whites. There are also some small, light-colored seeds or nuts scattered around. The overall scene is a still life of fresh ingredients.

**1. Why quantify?**

**2. What to quantify?**

**3. How to quantify?**



# A Structured Approach to Quantifying and Reporting FLW

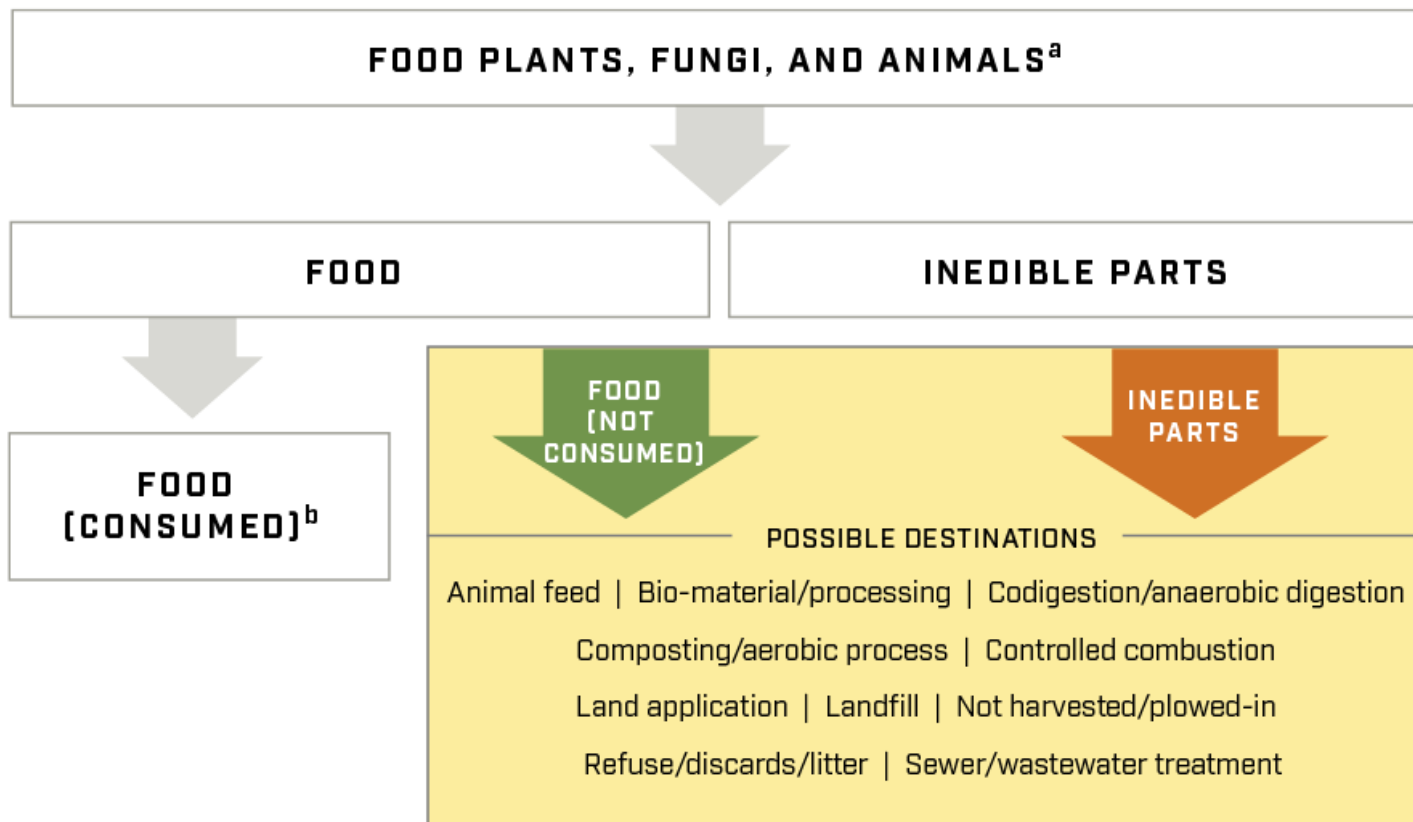
## 1. Why and what to quantify

*FLW Standard* requires defining what is quantified

- ✓ Provides clear definitions for describing scope



# What to Quantify?



*FLW Standard* allows an entity to select which combination of

- (1) Material Types (i.e., food and/or inedible parts) and
- (2) Destinations (i.e., which of the ten listed) it considers to be “food loss and waste”

The *FLW Standard*’s accounting and reporting requirements and guidance apply to that which is in the shaded box (i.e., removed from the food supply chain)

<sup>a</sup> Intended for human consumption (i.e., excludes crops intentionally grown for bioenergy, animal feed, seed, or industrial use)

<sup>b</sup> At some point in the food supply chain (including surplus food redistributed to people and consumed)

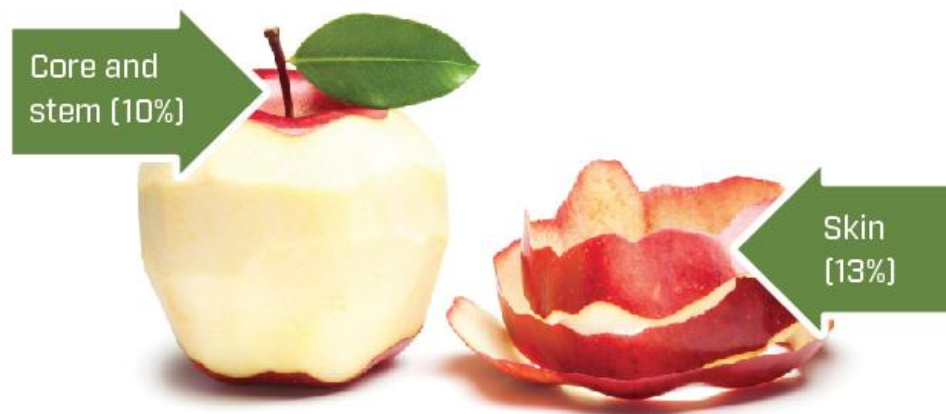
# Components of FLW – What MATERIAL TYPE(S)?

Entity determines what material type(s) to include



**Food:**<sup>a</sup> Any substance—whether processed, semi-processed, or raw—that is intended for human consumption.

Apple [Raw]

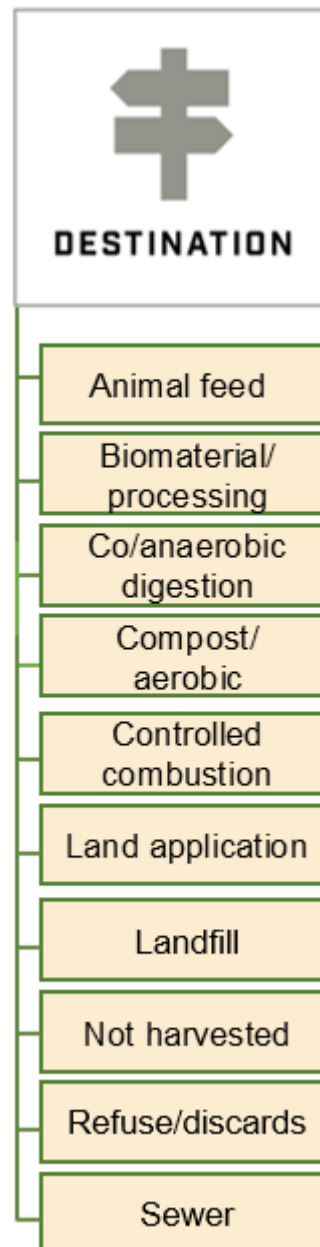


Source: USDA (2015)

**Inedible parts:** Components associated with a food that, in a particular food supply chain, are not intended to be consumed by humans.

# Components of FLW – What DESTINATION(S)?

Entity determines what destination(s) to include

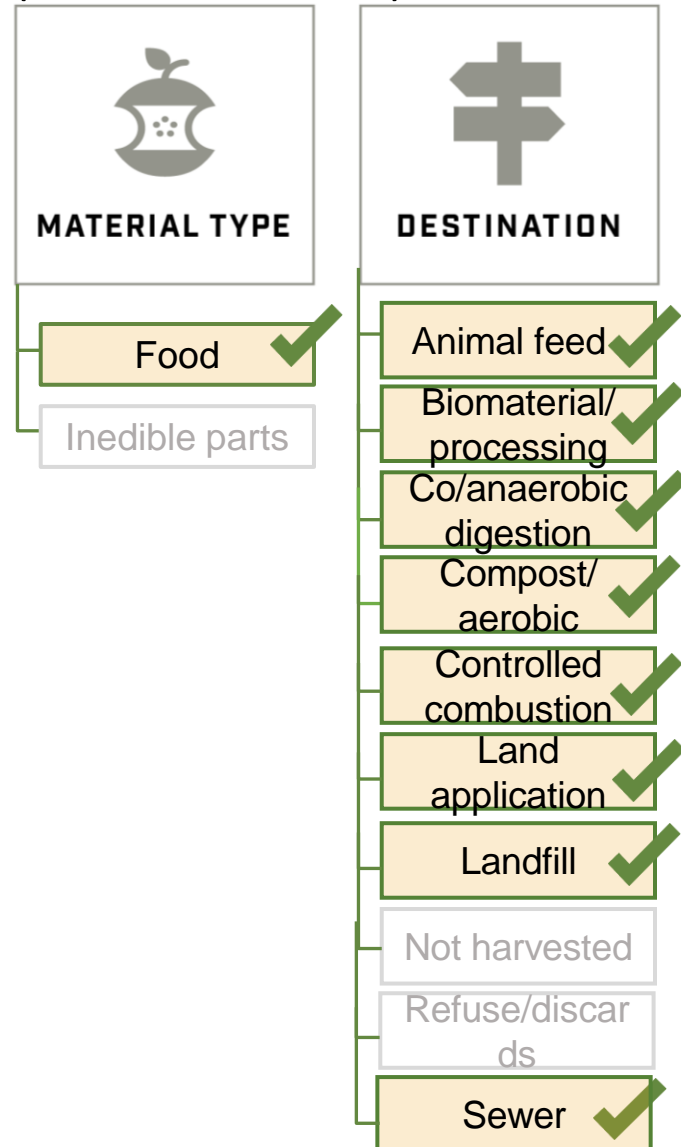




# Scope of US Food Loss and Waste Data

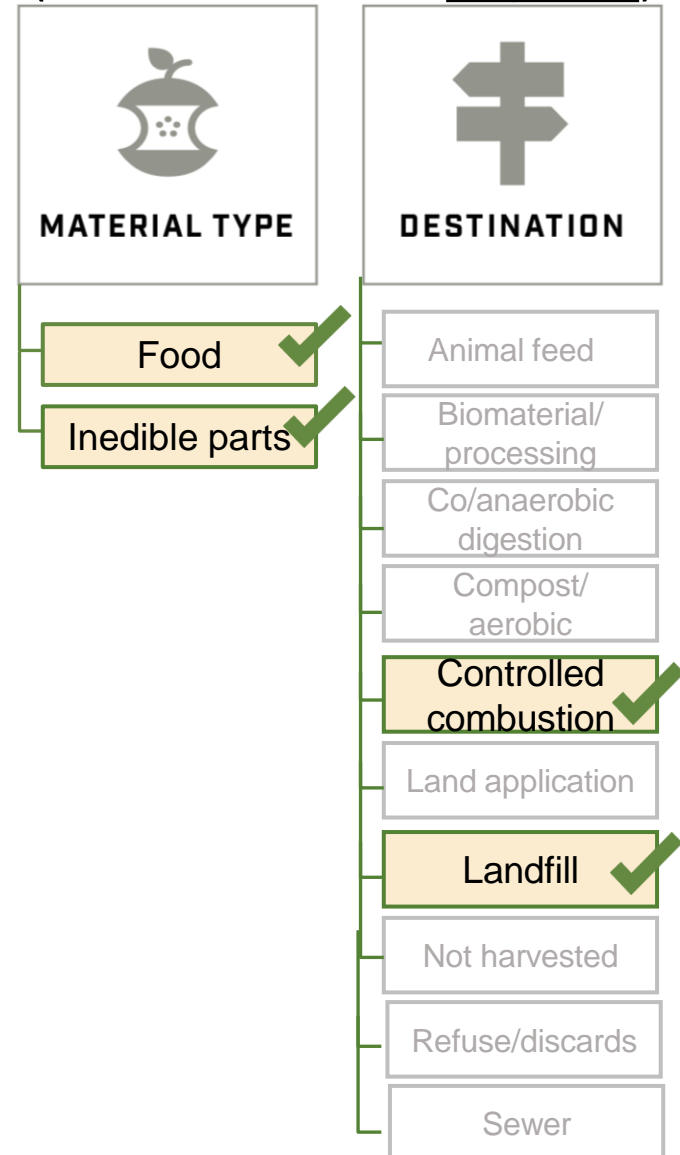
USDA

(66.5 million tons)

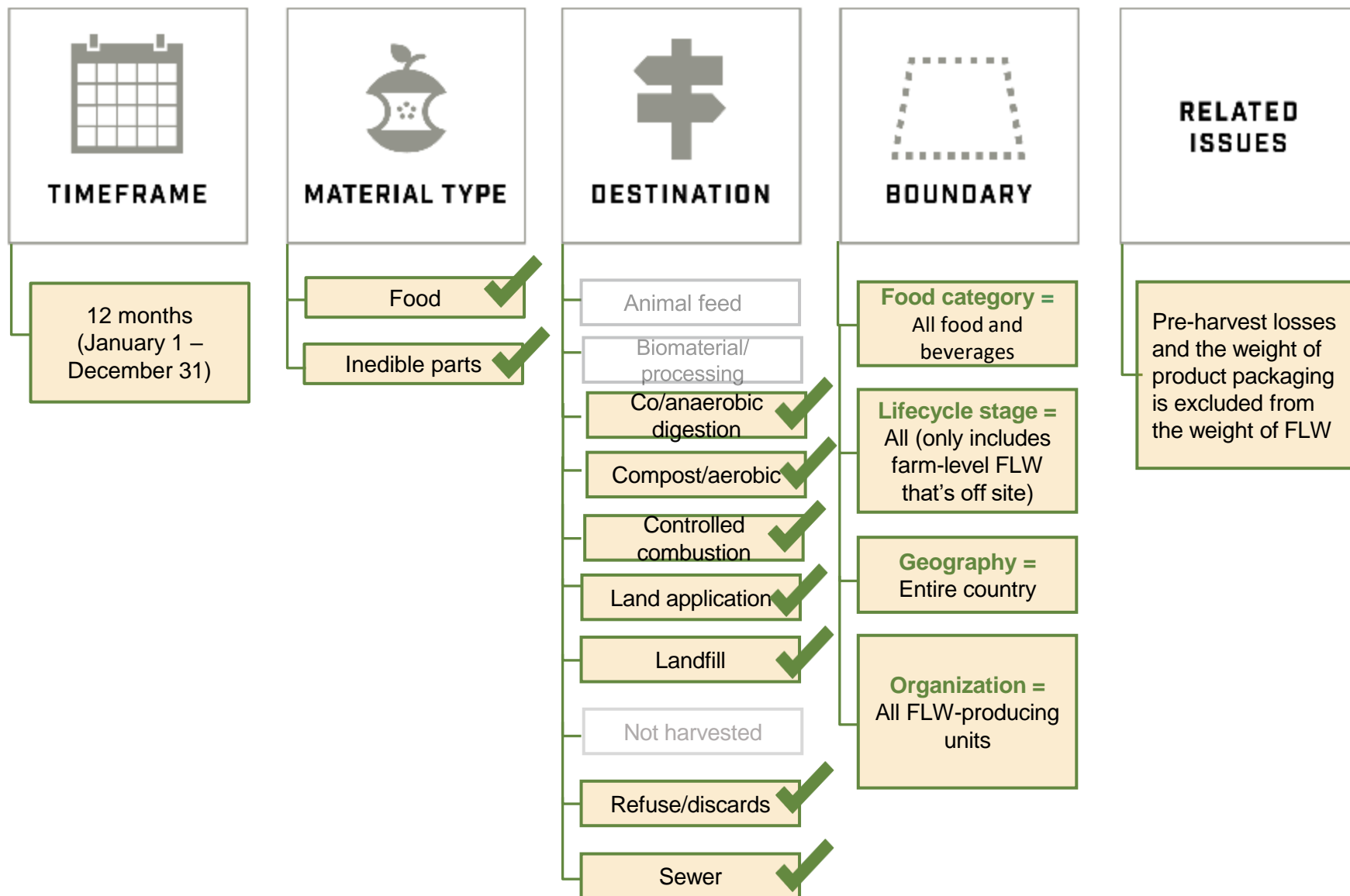


US EPA

(36.46 million tons disposed)



# Scope of Proposed European Commission Definition of Food Waste



# A Structured Approach to Quantifying and Reporting FLW

## 1. Why and what to quantify

*FLW Standard* requires defining what is quantified

- ✓ Provides clear definitions for describing scope

## 2. How to quantify

*FLW Standard* requires describing the method(s) and gives guidance on options


- ✓ *FLW Standard*, chapters 7 – 11
- ✓ *FLW Guidance on Quantification Methods*
- ✓ Quantification Method Ranking Tool



## How to Quantify?

1. Direct weighing
2. Counting
3. Assessing volume
4. Waste composition analysis
5. Records
6. Diaries
7. Surveys
8. Mass balance
9. Modeling
10. Proxy data



Download *FLW Guidance on Quantification Methods*  
@ [www.FLWProtocol.org](http://www.FLWProtocol.org)  
(under the “Tools & Resources” tab)

 **Food  
Loss + Waste**  
PROTOCOL











THE FLW STANDARD    TOOLS & RESOURCES ▾    ABOUT ▾

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### Downloads

-  GUIDANCE ON FLW QUANTIFICATION METHODS (PDF)
-  FLW QUANTIFICATION METHOD RANKING TOOL (XLS)

### Individual Chapters from the Guidance on FLW Quantification Methods

-  GUIDANCE ON DIRECT WEIGHING (PDF)
-  GUIDANCE ON COUNTING (PDF)
-  GUIDANCE ON ASSESSING VOLUME (PDF)
-  GUIDANCE ON WASTE COMPOSITION ANALYSIS (PDF)
-  GUIDANCE ON RECORDS (PDF)
-  GUIDANCE ON DIARIES (PDF)
-  GUIDANCE ON SURVEYS (PDF)
-  GUIDANCE ON MASS BALANCE (PDF)
-  GUIDANCE ON MODELING (PDF)
-  GUIDANCE ON PROXY DATA (PDF)

# A Structured Approach to Quantifying and Reporting FLW

## 1. Why and what to quantify

*FLW Standard* requires defining what is quantified

- ✓ Provides clear definitions for describing scope

## 2. How to quantify

*FLW Standard* requires describing the method(s) and gives guidance on options

- ✓ *FLW Standard*, chapters 7 – 11
- ✓ *FLW Guidance on Quantification Methods*
- ✓ Quantification Method Ranking Tool



## 3. Summarizing the inventory

*FLW Standard* requires reporting on 8 items for consistency and transparency (5 apply to all situations)

# The Eight *FLW Standard* Accounting and Reporting Requirements

- 1. Base FLW accounting and reporting on the principles of relevance, completeness, consistency, transparency, and accuracy**
- 2. Account for and report the physical amount of FLW expressed as weight**  
(e.g., pounds, kilograms, tons, metric tons)
- 3. Define and report on the scope of the FLW inventory**
  - a. Timeframe
  - b. Material type
  - c. Destination
  - d. Boundary

(See *FLW Standard* for details, including related issues)
- 4. Describe the quantification method(s) used.** If existing studies or data are used, identify the source and scope
- 5. If sampling and scaling of data are undertaken,** describe the approach and calculation used, as well as the period of time over which sample data are collected (including starting and ending dates)
- 6. Provide a qualitative description and/or quantitative assessment of the uncertainty around FLW inventory results**
- 7. If assurance of the FLW inventory is undertaken** (which may include peer review, verification, validation, quality assurance, quality control, and audit), create an assurance statement
- 8. If tracking the amount of FLW and/or setting an FLW reduction target,** select a base year, identify the scope of the target, and recalculate the base year FLW inventory when necessary



## Focus for 2017

### **Promote adoption and use of the *FLW Standard***

- News update to interested stakeholders (sign up @ [www.FLWProtocol.org](http://www.FLWProtocol.org))
- Case studies to highlight “users” of *FLW Standard*
- Translating Executive Summary (Chinese, Japanese, Spanish)
- Trainings and presentations
- FLW database / inventory reporting platform

## Some Helpful Hints

1. Build on current data: waste collection receipts, scanner/shrink data (retailers), inputs/outputs of materials (manufacturers)
2. Identify who has the data (e.g., operations)
3. You don't need a super accurate number to get started
4. Measurement itself triggers prevention
5. Think beyond “landfill diversion”



# Acknowledgements | Funders of WRI's FLW initiative



Ministry of Economic Affairs

*The Netherlands Ministry of Economic Affairs*



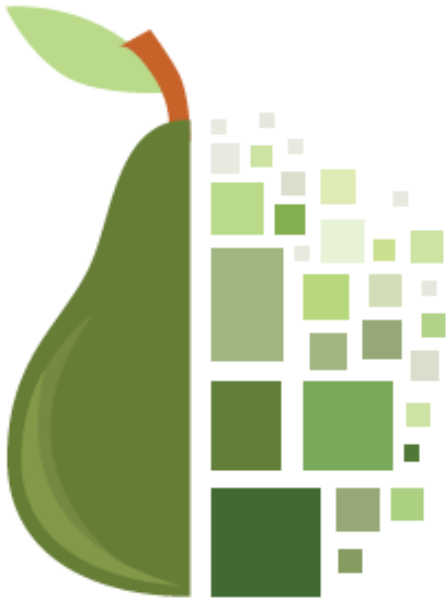
Ministry of Foreign Affairs of the  
Netherlands

MINISTRY OF FOREIGN AFFAIRS OF DENMARK  
**DANIDA** | INTERNATIONAL  
DEVELOPMENT COOPERATION



*Note:* The Ministry of Foreign Affairs of the Netherlands, the Royal Danish Ministry of Foreign Affairs, the Swedish International Development Cooperation Agency (SIDA) and the Department of Foreign Affairs and Trade of Ireland (Irish Aid) provided core funding of the World Resources Institute, which made possible the development of the Food Loss and Waste Protocol.

## DISCUSSION



# Food Loss + Waste

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## PROTOCOL

[www.flwprotocol.org](http://www.flwprotocol.org)

For questions and suggestions, contact:  
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# APPENDIX

# FLW STANDARD ACCOUNTING AND REPORTING REQUIREMENTS

**1. Base FLW accounting and reporting on the principles of relevance, completeness, consistency, transparency, and accuracy**

**2. Account for and report the physical amount of FLW expressed as weight (e.g., pounds, kilograms, tons, metric tons)**

**3. Define and report on the scope of the FLW inventory**

a. *Timeframe*. Report the timeframe for which the inventory results are being reported (including starting and ending date)

b. *Material type*. Account for and report the material type(s) included in the FLW inventory (i.e., food only, inedible parts only, or food and associated inedible parts).

If food or associated inedible parts removed from the food supply chain are accounted for separately in the inventory:

- Describe the sources or frameworks used to categorize a material as food or as inedible parts. This includes stating any assumptions that were used to define whether or not material was “intended” for human consumption
- Describe the approach used to calculate the separate amounts. If applicable, describe all conversion factors used and their sources

c. *Destination*. Account for and report the destinations included in the FLW inventory (i.e., where material removed from the food supply chain is directed). If the destination is unknown, then report the initial path(s) at a minimum.

d. *Boundary*. Report the boundary of the FLW inventory in terms of the food category, lifecycle stage, geography, and organization (including the sources used to classify them).

e. *Related issues*.

Packaging and other non-FLW material. Exclude from an FLW inventory any material (and its weight) that is not food or associated inedible parts removed from the food supply chain (i.e., FLW). If a calculation is needed to separate the weight of FLW from non-FLW materials (e.g., subtracting the weight of packaging), describe the approach and calculation used

Water added/removed from FLW. Account for and report the weight of FLW that reflects the state in which it was generated before water was added, or before the intrinsic water weight of FLW was reduced. If a calculation is made to estimate the original weight of FLW, describe the approach and calculation used

Pre-harvest losses. Exclude pre-harvest losses from the scope of an FLW inventory. Users may quantify such losses but shall keep data separate from the FLW inventory results

**4. Describe the quantification method(s) used. If existing studies or data are used, identify the source and scope**

**5. If sampling and scaling of data are undertaken, describe the approach and calculation used, as well as the period of time over which sample data are collected (including starting and ending dates)**

**6. Provide a qualitative description and/or quantitative assessment of the uncertainty around FLW inventory results**

**7. If assurance of the FLW inventory is undertaken (which may include peer review, verification, validation, quality assurance, quality control, and audit), create an assurance statement**

**8. If tracking the amount of FLW and/or setting an FLW reduction target, select a base year, identify the scope of the target, and recalculate the base year FLW inventory when necessary**



# STRUCTURE OF THE *FLW STANDARD* (PARTS I, II, III)

## PART I. Overview

1. Introduction
2. Definition of terms and applications
3. Goals of quantifying FLW
4. Summary of steps and requirements
5. Principles of FLW accounting and reporting

## PART II. Main requirements

6. Establishing the scope of an FLW inventory
7. Deciding how to quantify FLW

## PART III. Other requirements and recommendations

8. Collecting, calculating, and analyzing data
9. Assessing uncertainty
10. Coordinating the analysis of multiple FLW inventories
11. Recording causes of FLW
12. Review and assurance
13. Reporting
14. Setting targets and tracking changes over time

# STRUCTURE OF THE *FLW STANDARD* (APPENDIX) & *GUIDANCE ON FLW QUANTIFICATION METHODS*

## Appendix to the *FLW Standard*

- A. Approaches to sampling and scaling up data
- B. Separating material types: data sources for conversion factors applied to individual items
- C. Normalizing data
- D. Expressing weight of FLW in other terms or units of measurement
- E. Quantifying and reporting the weight of food rescued

## *Guidance on FLW Quantification Methods* (stand-alone document)

### Introduction

### Quantification Methods

- |   |                 |
|---|-----------------|
| 1. Direct weighing                          | 6. Diaries      |
| 2. Counting                                 | 7. Surveys      |
| 3. Assessing volume                         | 8. Mass balance |
| 4. Waste composition analysis               | 9. Modeling     |
| 5. Records                                  | 10. Proxy data  |
| Appendix: Quantifying FLW if water is added |                 |

# DEFINITION: *MATERIAL TYPES*

## Defining Food and Inedible Parts

**Food:**<sup>a</sup> Any substance—whether processed, semi-processed, or raw—that is intended for human consumption. “Food” includes drink, and any substance that has been used in the manufacture, preparation, or treatment of food. “Food” also includes material that has spoiled and is therefore no longer fit for human consumption. It does not include cosmetics, tobacco, or substances used only as drugs. It does not include processing agents used along the food supply chain, for example, water to clean or cook raw materials in factories or at home.

**Inedible parts:** Components associated with a food that, in a particular food supply chain, are not intended to be consumed by humans. Examples of inedible parts associated with food could include bones, rinds, and pits/stones. “Inedible parts” do not include packaging. What is considered inedible varies among users (e.g., chicken feet are consumed in some food supply chains but not others), changes over time, and is influenced by a range of variables including culture, socio-economic factors, availability, price, technological advances, international trade, and geography.

<sup>a</sup>Adapted from Codex Alimentarius Commission (2013)

## DEFINITION: *DESTINATIONS*

Destination	Definition
<b>Animal feed</b>	Diverting material from the food supply chain <sup>a</sup> (directly or after processing) to animals
<b>Bio-based materials/biochemical processing</b>	Converting material into industrial products. Examples include creating fibers for packaging material, creating bioplastics (e.g., polylactic acid), making “traditional” materials such as leather or feathers (e.g., for pillows), and rendering fat, oil, or grease into a raw material to make products such as soaps, biodiesel, or cosmetics. “Biochemical processing” does not refer to anaerobic digestion or production of bioethanol through fermentation
<b>Codigestion/anaerobic digestion</b>	Breaking down material via bacteria in the absence of oxygen. This process generates biogas and nutrient-rich matter. Codigestion refers to the simultaneous anaerobic digestion of FLW and other organic material in one digester. This destination includes fermentation (converting carbohydrates—such as glucose, fructose, and sucrose—via microbes into alcohols in the absence of oxygen to create products such as biofuels)
<b>Composting/aerobic processes</b>	Breaking down material via bacteria in oxygen-rich environments. Composting refers to the production of organic material (via aerobic processes) that can be used as a soil amendment
<b>Controlled combustion</b>	Sending material to a facility that is specifically designed for combustion in a controlled manner, which may include some form of energy recovery (this may also be referred to as incineration)
<b>Land application</b>	Spreading, spraying, injecting, or incorporating organic material onto or below the surface of the land to enhance soil quality
<b>Landfill</b>	Sending material to an area of land or an excavated site that is specifically designed and built to receive wastes
<b>Not harvested/plowed-in</b>	Leaving crops that were ready for harvest in the field or tilling them into the soil
<b>Refuse/discards/litter</b>	Abandoning material on land or disposing of it in the sea. This includes open dumps (i.e., uncovered, unlined), open burn (i.e., not in a controlled facility), the portion of harvested crops eaten by pests, and fish discards (the portion of total catch that is thrown away or slipped)
<b>Sewer/wastewater treatment</b>	Sending material down the sewer (with or without prior treatment), including that which may go to a facility designed to treat wastewater
<b>Other</b>	Sending material to a destination that is different from the 10 listed above. This destination should be described

<sup>a</sup> Excludes crops intentionally grown for bioenergy, animal feed, seed, or industrial use

## DEFINITION: *BOUNDARY*

Boundary dimension	Definition	Examples
Food category	The type(s) of food included in reported FLW	<ul style="list-style-type: none"><li>• All food</li><li>• Dairy products</li><li>• Fresh fruits and vegetables</li><li>• Chicken</li></ul>
Lifecycle stage	The stage(s) in the food supply chain or food lifecycle within which reported FLW occurs	<ul style="list-style-type: none"><li>• Entire food supply chain</li><li>• Two stages: manufacture of dairy products, and retail of food and beverage</li><li>• At home</li></ul>
Geography	Geographic borders within which reported FLW occurs	<ul style="list-style-type: none"><li>• World (all countries)</li><li>• Eastern Asia</li><li>• Ghana</li><li>• Nova Scotia, Canada</li><li>• Lima, Peru</li></ul>
Organization	Organizational unit(s) within which reported FLW occurs	<ul style="list-style-type: none"><li>• All sectors in country</li><li>• Entire company</li><li>• Two business units</li><li>• All 1,000 stores</li><li>• 100 households</li></ul>

# BOUNDARY (Classification sources to use)

Boundary dimension	Classification source to use (select the most current version)	Selected examples with relevant codes
Food category	<ul style="list-style-type: none"> <li>Select one or more categories from either the <a href="#">Codex General Standard for Food Additives (GSFA)</a> system or United Nations <a href="#">Central Production Classification (CPC)</a> system</li> <li>If more detailed information is used, include appropriate codes from more granular sources including: <ul style="list-style-type: none"> <li><a href="#">Global Product Category (GPC) codes</a> (online, or <a href="#">download an Excel, Word or XML copy</a>)</li> <li><a href="#">United Nations Standard Products and Services Code (UNSPSC)</a></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>All food (GSFA 01.0 –16.0) or (CPC2.1 Divisions 21–24)</li> <li>Dairy products (GSFA 01.0) or (CPC2.1 Group 221 &amp; 222)</li> <li>Fresh fruits and vegetables (GSFA 04.1 &amp; 04.2.1) or (CPC2.1 Group 012 &amp; 013)</li> <li>Chicken (GSFA 08.1.1 [Fresh meat, poultry, and game, whole pieces or cuts]; GPC Brick 10005769) or (CPC2.1 Subclass 21121)</li> </ul>
Lifecycle stage	<ul style="list-style-type: none"> <li>Select one or more United Nations <a href="#">International Standard Industrial Classifications of All Economic Activities (ISIC) codes</a> (At the time of publication, the latest version is “Rev.4”)</li> <li>Regional and national classification systems may be used as well, most of which are derived from the ISIC (e.g., NACE for Europe). The UN Statistics Division lists <a href="#">national classification systems</a></li> <li>If no code exists, write in the lifecycle stage</li> </ul>	<ul style="list-style-type: none"> <li>Entire food supply chain (select relevant group of ISIC codes)</li> <li>Two stages: manufacture of dairy products (ISIC Group: 105) and retail of food and beverage (ISIC Class: 4721)</li> <li>At home (ISIC Class: 9820)</li> </ul>
Geography	<ul style="list-style-type: none"> <li>Select one or more <a href="#">UN regions or country codes</a></li> <li>Write in description for narrower geographic scope. Where available, use a national classification system (e.g., U.S. Census)</li> </ul>	<ul style="list-style-type: none"> <li>World/all countries (UN Code 001)</li> <li>Eastern Asia (UN Code 030)</li> <li>Ghana (UN Code 288)</li> <li>Nova Scotia, Canada</li> <li>Lima, Peru</li> </ul>
Organization	<ul style="list-style-type: none"> <li>Write in number and type of unit(s) and any additional descriptive detail</li> </ul>	<ul style="list-style-type: none"> <li>All sectors in country</li> <li>Entire company</li> <li>Two business units</li> <li>All 1,000 stores</li> <li>100 households</li> </ul>



# SAMPLE FLW INVENTORY REPORTING TEMPLATE





## USING THE FLW STANDARD

The purpose of the *FLW Standard* is to facilitate the quantification of FLW (what to measure and how to measure it) and encourage consistency and transparency of the reported data.

For a summary of the most important features of the *FLW Standard* (key definitions and requirements), download the stand-alone Executive Summary. Reading this 12-page document first will help you get started. The *FLW Standard* is a comprehensive document, which provides detail and guidance on implementing the requirements. It may be read in its entirety or used as a reference document.

### Downloads

-  [FLW STANDARD EXECUTIVE SUMMARY \[PDF\]](#)
-  [FLW STANDARD \[PDF\]](#)
-  [SAMPLE REPORTING TEMPLATE FOR FLW STANDARD \[XLS\]](#)

At [www.FLWProtocol.org](http://www.FLWProtocol.org),  
under “The FLW  
Standard” tab



# SAMPLE FLW INVENTORY REPORTING TEMPLATE

**SECURITY WARNING**
Macros have been disabled.

Enable Content

A1

✕ ✓ *fx*

A

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**Food Loss + Waste**  
**PROTOCOL**

**FLW STANDARD INVENTORY REPORTING TEMPLATE**  
 (June 2016)

**About this template:**

- This template helps users record and report the results of inventories conducted using the *Food Loss and Waste Accounting and Reporting Standard (FLW Standard)*, Version 1.0.
- It includes items an entity is required to report to be in conformance with the *FLW Standard*.
- Other items are recommended in the standard but not all are included in this template since they are not required (for further details see Chapter 13 of the *FLW Standard*). Those included are marked as "optional" in the template and shaded in gold.
- This is a sample reporting form. An entity may use any format to report FLW provided it contains all the reporting requirements (see Table 4.1 in the *FLW Standard*). An entity may also modify this template to suit its needs.

**Steps for completing this template:**

1. Enable macros. (Click the "Enable Content" button at the top of the screen when you first open the Excel file.)
2. Click the button below to start with Tab I (General information) then go to the other tabs in sequence. Answer the questions in each tab that apply to your situation. Depending on how questions are answered, other questions or fields may become
3. Review the green boxes included on each tab as they contain reference information that will be helpful in completing the
4. For each question in each tab, fill out the box with text or a number, check a box, or select a choice from a drop-down menu, as required by the question.
5. Keep in mind that Tabs V through VIII will not apply to all inventories. Consult the *FLW Standard* for more guidance on when these tabs should be used.
6. When finished entering information into Tabs I through VIII, go to the Summary tab to display the high-level inventory results. At the bottom of the Summary tab is a button that helps you check the inventory for completeness.

**The tabs are organized to report about:**

- I. General information
- II. FLW inventory scope and results
- III. Quantification methods and data sources

**CLICK HERE TO START**  
 (Go to Tab I - General information)

**Legend (cell colors):**

- Required field
- Optional field

Introduction

Summary

I. General info

II. Scope and results

III. Methods-data sources

IV. Data sources

# FLW QUANTIFICATION METHOD RANKING TOOL



## FLW Quantification Method Ranking Tool (June 2016)

### Introduction

**Purpose:** This tool is designed to accompany the *Food Loss and Waste Accounting and Reporting Standard (FLW Standard)*. It provides suggested methods for quantifying food loss and waste (FLW).

**Instructions:** Answer all the questions below to the best of your ability by using the drop-down menus, then press the "Get results" button. This will take you to the Results Tab which ranks all the methods included in the *FLW Standard* (see Chapter 7). You may need to click "Enable macros" when prompted by Excel in order to use this sheet.

#### Note:

- The "Methodology Tab" explains how this ranking of methods was developed.
- The recommendations provided do not take into account the availability of resources (e.g., budget, staff time). The tool does not consider which methods would work well in combination (see "Methodology Tab" for additional details).
- We welcome your questions and suggestions. Please contact Brian Lipinski at [BLipinski@wri.org](mailto:BLipinski@wri.org).

### Questions

Please select answers from drop-down menus

- 1 How important is it to have a low level of uncertainty (high degree of accuracy in the FLW results)? *Note: A higher degree of accuracy is recommended when monitoring targets.*
- 2 Is it necessary to determine the reasons why FLW is generated?
- 3 Can you get direct access to the FLW being quantified?
- 4 Is the FLW (whether packaged or not) mixed with other items or materials (e.g. soil, garden / yard waste, non-organic solid waste, etc.)?
- 5 Is the FLW mainly liquid or solid?
- 6 Does all, some, or no FLW go down the drain/sewer?
- 7 Are inputs and outputs recorded that could be used for inferring the amount of FLW? (e.g. in a factory, the amount of ingredients entering the site and the amount of product leaving the site)
- 8 Is there existing information that describes how FLW varies in response to other factors (e.g. with climate, soil conditions, crop / food type)?

Eight empty drop-down menu boxes for selecting answers to questions 1 through 8.

Please provide answer to question 1  
Please provide answer to question 2  
Please provide answer to question 3  
Please provide answer to question 4  
Please provide answer to question 5  
Please provide answer to question 6  
Please provide answer to question 7  
Please provide answer to question 8