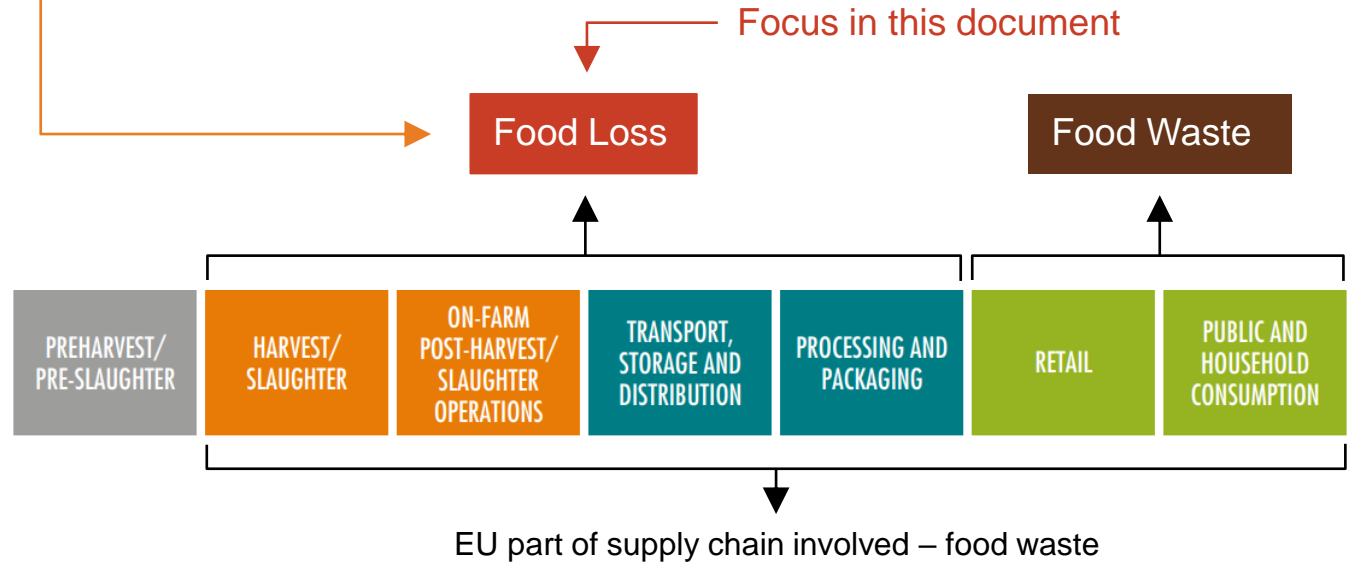


FL quantification INTRODUCTION

What is Food Loss (and Waste)?

EU has no split up into Food Loss and Food Waste; only Food Waste

SDG 12.3 and FAO use split up which is related to part of the supply chain



Food Loss (and Waste)

- is on the agenda in NL, EU (legal targets are coming!) and worldwide
- can be complex to quantify
- quantification is necessary to act effectively (hot spots)
- quantification provides insight in ROI with respect to reduction measures (business case)

This tool is based on the WRI FLW protocol and created to accommodate stakeholders to quantify food loss in the context that is described above



Legend



please click on arrow to go to next slide
(this arrow is there only if we want you not to skip relevant info)



this can be used to go to previous (whatever number) slide
(only 1 back)



end of subtopic (in most cases you select another block at the top
or on the side)



click to go to reference list



click to go to abbreviations



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

What steps to take?

Step 1: Define goals

Step 2: Make the goal(s) SMART

Step 3: What type of information do I need?

Step 4: Select quantification method

Step 5: Upscaling considerations

Background: Reference list

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 1: Define goal(s)

Context:

- various entities (EU, UN, countries) set goals with respect to FLW reduction
- some are/will be legally binding, most of them not
- these goals are high level (world, continent, country)
- Non-governmental stakeholders can comply with these goals, but don't have to (yet); they can make their own targets

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 1: Define goal(s)

Comply with external goal(s)

EU regulation



SDG 12.3



NL government



Set your own goal(s)

Own goal(s)

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Introduction

Goal

External: EU regulation



The Commission is proposing to set legally binding food waste reduction targets to be achieved by Member States by 2030, as part of the revision of the Waste Framework Directive, adopted by the Commission on 5 July 2023. The results of the first EU-wide monitoring of food waste levels carried out in 2020 will serve as a baseline to assess progress towards the targets.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Introduction

Goal

EU - Goal



Current proposal (to be formalized)

Member States (region) are required to take the necessary measures to reduce food waste by the end of 2030:

- by 10%, in processing and manufacturing (tons of fresh mass),
- by 30% (per capita), jointly at retail and consumption (restaurants, food services (=out of home) and households).

Reference year is 2020 (or earlier, when data are available)

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Introduction

Goal

External: SDG 12.3

- In September 2015 at the United Nations General Assembly, countries of the world formally adopted a set of 17 Sustainable Development Goals (SDGs).
- SDG 12.3 is about Food Loss and Waste

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Introduction

Goal

SDG 12.3 - Goal

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 (hence no quantitative targets for food loss). Reference year is 2015.

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Introduction

Goal

External: NL government

- The Netherlands (as the EU) is committed to expanding the SDG 12.3 goal, which applies from distribution to consumer, to a 50% reduction in the entire food chain.
- There is no formalization yet within the EU nor in the Netherlands

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Introduction

Goal

NL government – Goal

The Dutch government, together with the other EU member states, has committed to the UN SDG Goal 12.3: reduce food waste at consumers and retail by 50% by 2030 compared to 2015 and reducing food waste in the rest of the chain.

The Dutch government has to comply with EU legal targets when they become official (see EU regulation – Goal)

Conversion of Dutch policy to stakeholders not discussed yet (implication for companies (if any) unclear)

E

Step 1:
Define goals

EU regulation

SDG 12.3

NL government

Own goal(s)

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Choose your own goal(s)

Examples: want to

- reduce FL value with 10% next year
- know if packaging investment is feasible in relation to food loss savings (ROI)
- monitor to find hot spots and reduce food loss there
- be at least at the same level as competitors with respect to food loss

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 2: Make the goal(s) SMART

Before you can start the quantification of your loss, you need to be very specific (SMART) about what you want with respect to several choices (scope). Moreover, the context is relevant, since definitions of FLW may vary in the different regions.

This document supports you in this complex process.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

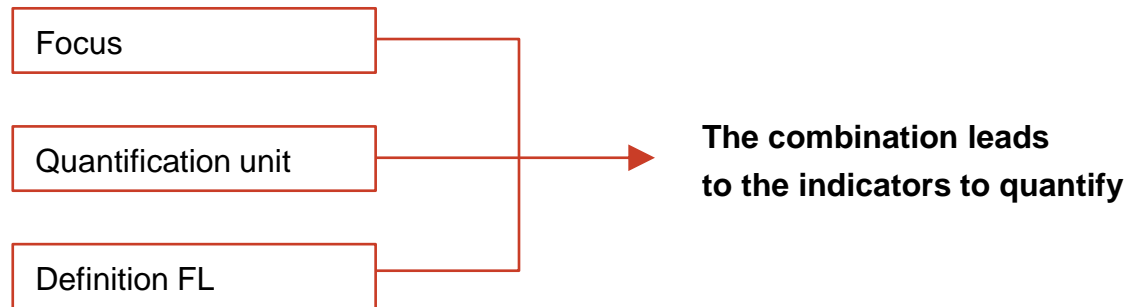
Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 2: Make the goal(s) SMART



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Scope a: Focus

Scope b: Quantification unit

Scope c: Definition FL(W)

Step 2: Make the goal(s) SMART

Make a choice with respect to

- a) **Focus:** What product, what geographic area, which part of the supply chain, and for what time period do you want to quantify?
- b) **Quantification unit(s):** weight, value, % of input , ...
- c) **Definition FL(W):** there are various definitions for FL(W), and maybe you want to make one yourself

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Scope a: Focus

Scope b: Quantification unit

Scope c: Definition FL(W)

Step 2a) **Focus** select one per item

- **Product:** (food total, food category, food product(s), variety of food product)
- **Boundary:** region (continent, country, province, company location(s),...)
- **Supply Chain Link:** Sector, supply chain link(s), activity within supply chain link (e.g. storage at farm level)
- **Time:** want to quantify FL per year, season, week, for 2023

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Scope a: Focus

Scope b: Quantification unit

Scope c: Definition FL(W)

Examples own choices Step 2a) Focus

Example 1: farmer Janssen wants to quantify the food loss of his strawberries in the summer season of 2023

dimension	Example 1	Example 2	Example 3
Product	Strawberry	Sea fish	Fruit & vegetables
Boundary	Farm location	IJmuiden	NL
SCL	Farm Janssen	Fish market	Wholesale sector
Time	Summer 2023	2023	2023



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Scope a: Focus

Scope b: Quantification unit

Scope c: Definition FL(W)

Remark

- Note that for every choice in the focus (product, SCL, etc.) more selections can be made, e.g., for you want to quantify FL for mango and banana. In that case, the quantification of FL will be treated separately per product. It is then very likely that there is overlap between the approaches when this protocol is applied.
- The user can combine wherever appropriate.
- This holds for all focus items with more than 1 selection.

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Scope a: Focus

Scope b: Quantification unit

Scope c: Definition FL(W)

Step 2b) Decide on the **quantification unit**

In FLW quantification practice, there are three major **quantification units**:

1. Weight (kg, tons, Mtons, ...)
2. % of production/inputs
3. Value (money)

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Scope a: Focus

Scope b: Quantification unit

Scope c: Definition FL(W)

Step 2b) Decide on the **quantification unit**

Other examples of **quantification units** are:

- Food loss index (index for FLW % compared to reference year; like FAO with 2015 index =100)
- Kg per capita

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Scope a: Focus

Scope b: Quantification unit

Scope c: Definition FL(W)

Step 2b) Remarks on the **quantification unit**

Quantification can be done by interviews, literature review, measurements,
Hence, measurements are quantifications, but not all quantifications are measurements! (See step 4)

If you want to measure, some **quantification units** require other data, not related to FLW:



E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Scope a: Focus

Scope b: Quantification unit

Scope c: Definition FL(W)

Step 2c) What FL(W) definition to use?

There are various definitions ([click here](#) ►), and they are complex

Advice

- Use a standard definition, since it will extend your options for communication (external, instead of internal only). Moreover, it is aligned with national and/or international, and eventually legally binding goals
- To support the quantification, translate the definition of FL(W) to your business by classifying the side streams into what is called FL(W) and what is not

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 2: Make the goal(s) SMART: choose

Comply with external goal(s)

EU regulation



SDG 12.3



NL government



Set your own goal(s)

Own goal(s)

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information



EU – Focus

dimension	EU
Product	Food in total
Boundary	Country
SCL	Per SCL*/entire SC (here focus on loss part of SC)
Time	Per year (reference year is 2020)

*Confusing definitions:

<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:02002R0178-20220701>

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

EU - Quantification unit



There are two **quantification units**

- weight in tons
- kg per capita

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

EU – Definition Food Waste*



Food waste is all unprocessed, partially processed or processed product that, produced for human consumption intend to be, or reasonably expected to be ingested by humans, but which the holder discards or intends or is required to discard. It is including edible and inedible parts, but excluding animal feed, ingredients and chemicals as destination (see [Ladder of Moerman](#) ▶).

Starts after harvest (left on field is no food loss)

*note that EU does not differentiate between food loss and food waste

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

EU – Indicators for food waste



Region	Total	Primary production	Processing	Retail / distrib.	Out of home	Households
EU	58400	5100	12400	4200	5400	31300
NL	2587	315	1131	210	83	848

FLW weight (kton) Data: EU 2021

Indicator = total fresh mass in tons (QU) of food (product) waste per supply chain link (SCLs) per country (region) per year (time period)

Other indicator (derived) = food waste in kg per capita per supply chain link per country per year

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

EU – More information?



EU food waste hub (special website)

https://ec.europa.eu/food/safety/food_waste/eu-food-loss-waste-prevention-hub/news

EU document how to monitor

<https://ec.europa.eu/eurostat/documents/342366/351811/Food+-+Guidance+on+food+waste+reporting.pdf/5581b0a2-b09e-adc0-4e0a-b20062dfe564?t=1654175854418>



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

SDG 12.3 – Focus

Dimension	SDG 12.3
Boundary	Country
Product	Food in total
SCL	SC split in Food loss and Food waste part, according to FAO definition. Here, focus on loss part
Time	Per year (reference year is 2015)

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

SDG 12.3 – Quantification Unit

- Weight (tons)
- Food loss index (see Indicators for definition)
- Kg loss per capita

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

SDG 12.3 – Definition FL

Food loss is all the crop, livestock and fish human-edible commodity quantities that, directly or indirectly, completely exit the post-harvest/slaughter/catch supply chain by being discarded, incinerated or otherwise disposed of, and do not re-enter in any other utilization (such as animal feed, industrial use, etc.), up to, and excluding, the retail level. Food loss includes both ‘food’ intended for human consumption and its associated ‘inedible parts’.

(see [Ladder of Moerman](#) ►)

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

SDG 12.3 – Indicator(s)

- Food loss per capita per country in kg per year
- Food Loss Index (FLI): percentages of food removed from the loss part of the supply chain. Focus is on the top ten commodities by economic value within five basic commodity groups for each country (FAO)

Additional info required: population size and production

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

SDG 12.3 – More information?

<https://champions123.org/sites/default/files/2020-09/champions-12-3-guidance-on-interpreting-sdg-target-12-3.pdf>

<https://www.fao.org/3/ca6030en/ca6030en.pdf> (p.34: FLI)

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

NL government – focus

Dimension	NL
Boundary	NL
Product	Food in total
SCL	Per SCL/entire SC (here focus on loss part of SC)
Time	year

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

NL government – Quantification unit

- weight (tons)
- Kg per capita

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

NL government – Definition FLW

Since 2020 the NL has adopted the EU definition for food waste. Before that (2009-2019) residual flows to animal feed were considered food waste and inedible parts of food products not. This is now reversed: animal feed is no longer food waste, while both edible and inedible parts of food now are (see [Ladder of Moerman](#) ▶).

Like in the EU 'left on field' (primary production) is no food loss

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

NL government – Indicators

Front end measurement: (this is quantifying at the source of the food waste)
Currently, the Dutch government uses the same indicators as the EU: *total fresh mass in tons per supply chain link* (see EU regulation – Indicators).

Back end measurement: (this is backward calculation from waste statistics)
food waste in kg per capita per year

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

More information

NL government – More information

The latest official information can be found in the ‘Kamerbrief’:

<https://open.overheid.nl/documenten/ronl-b7c66246578f15bf12026df2eeabe70c2f3c61d7/pdf>

E



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

Own goal(s) - Focus

Example: farmer Janssen wants to quantify the food loss of his strawberries in the summer season of 2023

Dimension	Example
Product	Strawberry
Boundary	Farm location
SCL	Farm Janssen
Time	Summer 2023

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

Own goal(s) - Quantification unit

Examples:

- weight in tons
- purchase/sales value

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

Own goal(s) – Definition Food Loss (and Waste)

There are various definitions (see ►), and they are complex

Advice

- Use a standard definition, since it will extend your options for communication (external, instead of internal only). Moreover, it is aligned with national and/or international, and eventually legally binding goals
- To support the quantification, translate the definition of FL(W) to your business by classifying the side streams into what is called FL(W) and what is not

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

EU regulation

SDG 12.3

NL government

Own goal(s)

Focus

Quantification unit

Definition FLW

Indicators

Examples of **quantification indicators**

These indicators include the 5 choices made in 2a and 2b: *product, region, SCL, time period and quantification unit (=QU)*

Examples of indicators that can be quantified:

1. FL **weight** (QU) in a **year** (time period) for **banana** (product) at **ripening stage** (SCL) in the **NL** (region)
2. FL **value** (QU) in tons in **per season** (time period) for the **strawberries** (product) at **our farm** (SCL) in **Venlo** (region)
3. FL **% in weight** (QU) **per week** (time period) for our **broccoli** (product) **sorting line** (SCL) in **Oegstgeest** (region)

E



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Important final remark

The indicators all include the words 'Food Loss'. It is important to stress that the meaning of 'Food loss' very much depends on the definition that is selected. Hence quantification may vary with respect to

- include unavoidable/inedible
- what destinations are considered as 'Food Loss'
- what part of the producer SCL is included (e.g. harvest yes or no)

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

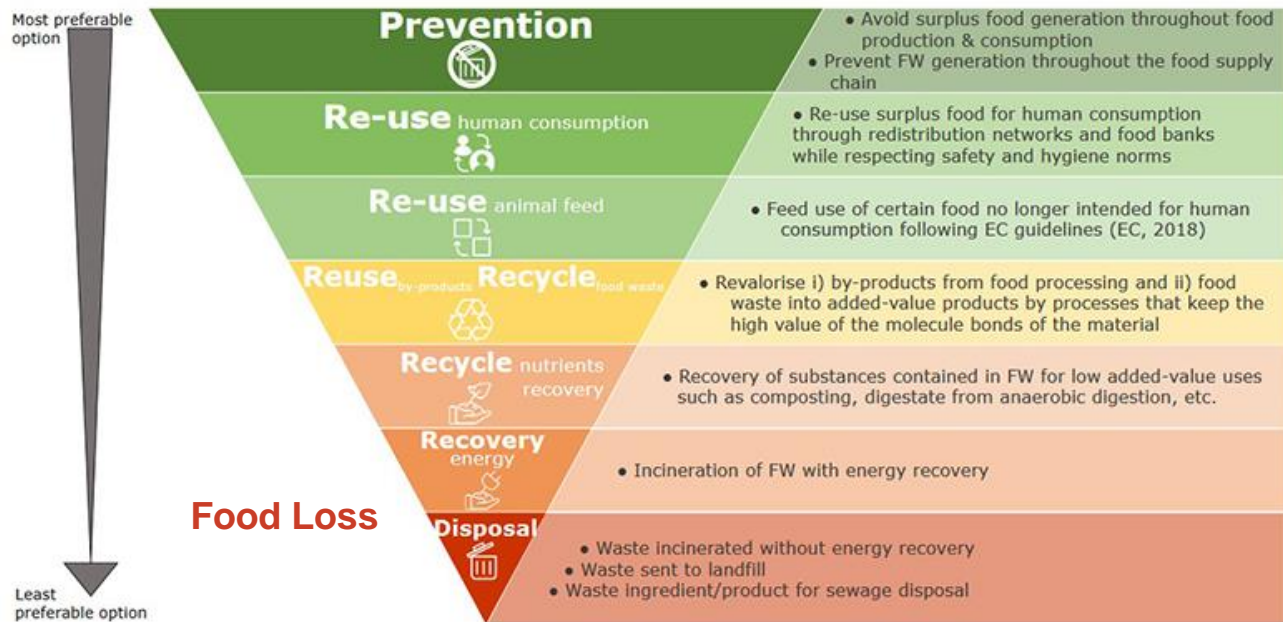
Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Food waste hierarchy (Moerman)



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 3: What Type of information needed?

- To quantify food loss, data need to be collected. The type of required data depends on the indicator(s) and the selected definition of FL.
- In practice, some of the data are available already (in company information system or public data), and some need effort to quantify.
- The next slide provides examples of the most common types of data applied in FL quantification

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Most common types of required data

- Weight of the food loss (sometimes conversion factor is required from value)
- Value of the food loss (you need price at the moment of discard*)
- Value loss in sales (sold at lower price; what is the price decrease)
- Production data (in tons and currency)
- Sales data (in tons and currency)
- Destination(s) of 'food loss' (ladder van Moerman)
- Population size

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Type of information you need

Indicator

Type of information you need	Availability
1. ...	
<ul style="list-style-type: none">• ...• ...	<ul style="list-style-type: none">• ...• ...
2. ...	
<ul style="list-style-type: none">• ...• ...	<ul style="list-style-type: none">• ...• ...

Availability options

- a) Quantification required
- b) Available within company
- c) Partly available in company
- d) Public data
- e) Other, ...



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 4: Select quantification method

This is a complex step. There are many methodologies, and the choice can be made by the user only. The document will guide you through the selection process, based on decision factors that are common in the FLW quantification context.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

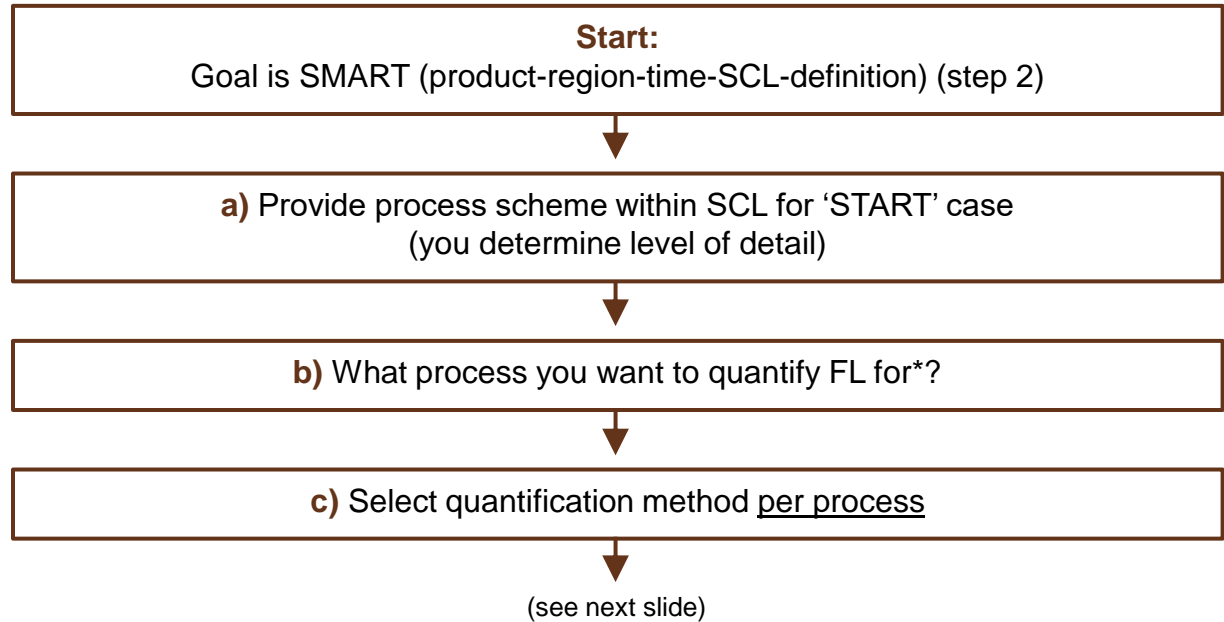
c) Considerations method selection

d) List of methodologies

e) Actual method selection

f) Examples

Approach for method selection



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

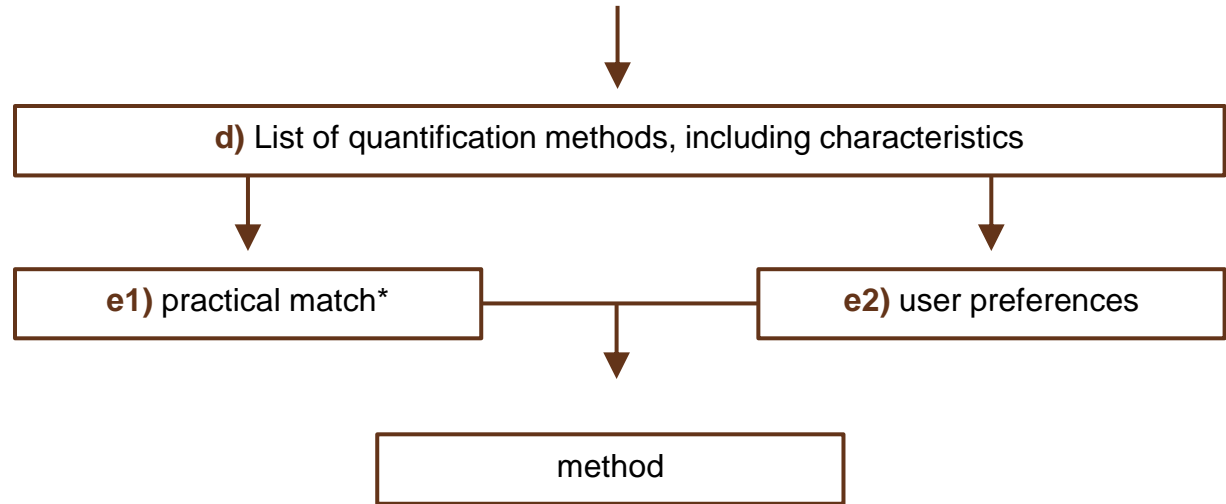
c) Considerations method selection

d) List of methodologies

e) Actual method selection

f) Examples

Approach for method selection



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

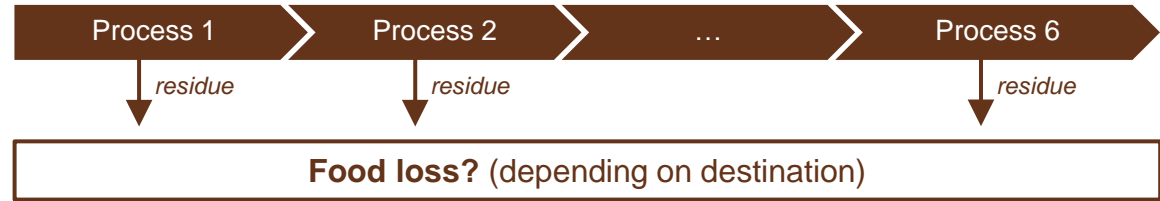
c) Considerations method selection

d) List of methodologies

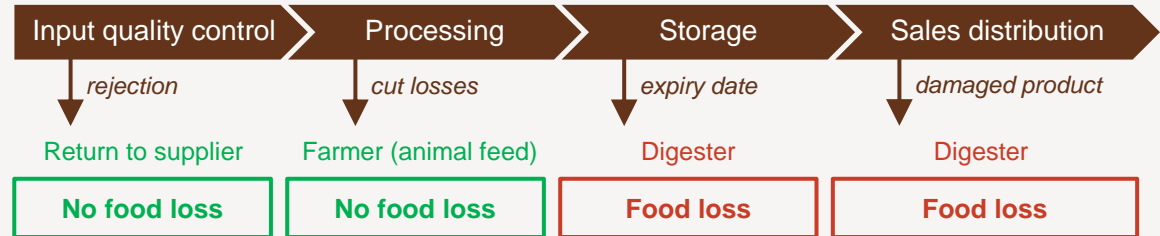
e) Actual method selection

f) Examples

a) Provide process scheme within SCL



Example wholesaler



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

c) Considerations method selection

d) List of methodologies

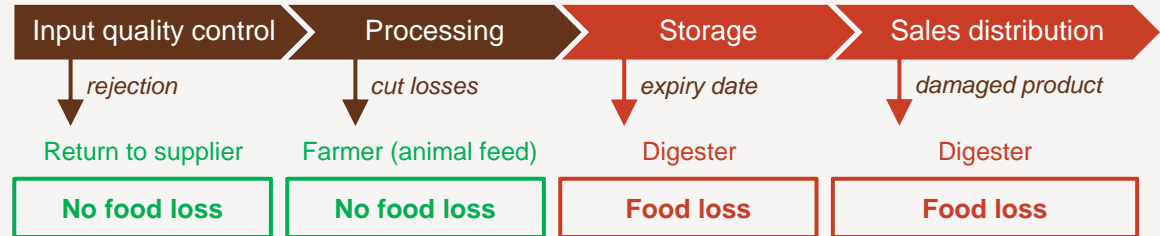
e) Actual method selection

f) Examples

b) What process you want to quantify for?



Example wholesaler



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

c) Considerations method selection

d) List of methodologies

e) Actual method selection

f) Examples

c) Considerations method selection per process

Again, choices must be made. Now the required data are described, it is time to select a method. Each of the methodologies has its own characteristics (pros and cons), and the 'best' choice is always user-driven, depending on his/her requirements (e.g., time, accuracy). This document supports the decision making with respect to the methodology and beyond, by zooming in how the methodology can be applied per selected process within the SCL.

Examples are presented per method.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

c) Considerations method selection

d) List of methodologies

e) Actual method selection

f) Examples

d) List of quantification methods

Assessing volume

Modeling

Counting

Proxy data

Diaries

Records

Direct weighing

Secondary data/literature

Expert opinion

Surveys/interviews

Mass balance

Waste composition analysis

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Assessing volume

Assessing the physical space occupied by FLW, and using the result to determine the weight

Example:

household keep track of how many portions they throw away (1 portion is defined as a handful), and later (based on sampling) the conversion to weight is made. This avoids the laborious effort of weighing.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Assessing volume

Characteristics	Answer
Direct access to FLW needed?	Yes
Level of accuracy?	Low-medium
Track causes?	No
Required resources	Medium
Handle mixed FLW?	No
Records FLW available?	No
Is much of the FLW prepacked?	Don't know
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	No

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Assessing volume

- Is always part of another quantification method (e.g. diary)
- *Relatively* little effort (participation easier)
- Additional sampling is required for conversion to weight
- In most cases difficult to use. Examples are rare: household diaries writing down portions of a certain product, or a restaurant operator estimating how full a garbage container is

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Counting

Assessing the number of items that make up FLW and using the result to determine the weight; includes using scanner data and “visual scales”

Example:

Counting packed food products and calculate FL by multiplication with weight per piece. This avoids the laborious effort of weighing.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Counting

Characteristics	Answer
Direct access to FLW needed?	Yes
Level of accuracy?	Medium-High
Track causes?	No
Required resources	Medium
Handle mixed FLW?	No
Records FLW available?	No
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	No

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Counting

- *Relatively* little effort (participation easier)
- Calculation (evt. additional sampling) is required for conversion to weight)
- Mainly used for (pre)packed products (e.g. bags, expiry date products)
- In most cases recruitment of participants required

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Diaries

Maintaining a daily log of FLW and other information (paper-based or electronically)

Example:

typically used in households: The diary usually calls for the participant to log the amount and type of food being lost or wasted, along with how and why the FLW was discarded.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Diaries

Characteristics	Answer
Direct access to FLW needed?	Yes*
Level of accuracy?	Low-Medium
Track causes?	Yes
Required resources	Medium
Handle mixed FLW?	No
Records FLW available?	No
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	No

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Diaries

- Recruitment participants required
- Preparation of material requires significant effort
- Level of expertise required for setting it up
- Qualitative information can be collected as well (e.g. causes, purchasing and storage behaviour)

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Direct weighing

Using a measuring device to determine the weight of FLW

Example:

hospitals running a kitchen, have leftovers when portioning. These waste flows can be weighed per component in the kitchen.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Direct weighing

Characteristics	Answer
Direct access to FLW needed?	Yes
Level of accuracy?	High
Track causes?	Yes
Required resources	High
Handle mixed FLW?	No (only if product list contains mixed products)
Records FLW available?	No
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	No

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Direct weighing

- Level of expertise required for setting it up
- Qualitative information can be collected as well (causes, which moment/meal of the day, ...)
- Reference value required by independent person (behaviour changes when observed/measured)

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Expert opinion

Asking 2 or 3 experts (from the sector and science; maybe some FLW measurement expertise or small tests with FLW is available) and let them estimate the FLW at the focus point (mostly provided as a %)

Example:

in storage of agricultural products, farmers have an idea how much % is FL.
Scientist have an independent view and may have access to reference values from literature or experiments

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Expert opinion

Characteristics	Answer
Direct access to FLW needed?	No
Level of accuracy?	Medium
Track causes?	Yes
Required resources	Low-Medium
Handle mixed FLW?	No
Records FLW available?	No
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	No

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Expert opinion

- Quality of output very much depends on experts you can ask (e.g. years of experience)
- Qualitative input can be acquired (e.g. causes, trends, technologies to avoid FLW)
- Experts often know where the focus of the FLW is in a certain SCL (e.g. French Fries processor at peeling). This could help to reduce the quantification effort.

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Mass balance

Measuring inputs (e.g., ingredients at a factory site, grain going into a silo) and outputs (e.g., products made, grain shipped to market) alongside changes in levels of stock and changes to the weight of food during processing

Example:

country level: production – change in stock + imports – export – consumption = FLW.
FAO used this approach for many years.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Mass balance

Characteristics	Answer
Direct access to FLW needed?	No
Level of accuracy?	Low-Medium
Track causes?	No
Required resources	Medium
Handle mixed FLW?	No
Records FLW available?	Yes
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	Yes

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Mass balance

- Required information is available in most cases
- The higher the number of sources, the required level of expertise as well as the cost may be high (because of e.g. data conversion, different categorizations, etc.)

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Modeling

Using a mathematical approach based on the interaction of multiple factors that influence the generation of FLW

Example:

farmer characteristics and causes can be used as inputs for a model with output the FLW. Examples of identified inputs are: experience, educational level, use of fertilizer.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Modeling

Characteristics	Answer
Direct access to FLW needed?	No
Level of accuracy?	Low-Medium
Track causes?	Yes
Required resources	High
Handle mixed FLW?	No
Records FLW available?	No
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	No

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Modeling

- Modeling requires lots of input and output data
- Experience with statistics in modeling techniques is necessary
- Until now, no promising results are derived
- Lot of work is done on cause analysis

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Proxy data

Using FLW data that are outside the scope of an entity's FLW inventory (e.g., older data, FLW data from another country or company) to infer quantities of FLW within the scope of the entity's inventory

Example:

FL data for a certain crop in one country, may be similar in a neighboring country if climatic and development conditions are similar.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Proxy data

Characteristics	Answer
Direct access to FLW needed?	No
Level of accuracy?	Low-Medium
Track causes?	No
Required resources	Low
Handle mixed FLW?	No
Records FLW available?	Yes (on proxy data)
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	Yes

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Proxy data

- Quality of result of quantification very much depends on quality of proxy data (completeness, comparable units, ...) and representativeness of proxy for actual FLW
- Understanding the focus point (product-scl) is necessary to apply this approach by determining the appropriate proxies

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Records

Using individual pieces of data that have been written down or saved, and that are often routinely collected for reasons other than quantifying FLW (e.g., waste transfer receipts or warehouse record books)

Example:

in retail, everything is automatically saved in computer systems: sales, purchases, waste (often with cause). Also stock-keeping tools at wholesale can be used.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Records

Characteristics	Answer
Direct access to FLW needed?	No
Level of accuracy?	High
Track causes?	Depends
Required resources	Low, if records already provide the required info
Handle mixed FLW?	No
Records FLW available?	Yes
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	Yes

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Records

- Records are most likely to be useful in the manufacturing, retail and food service sectors, since proprietors frequently collect and track data relating to purchasing, food inventory and waste management (including donation receipts).
- To obtain insight in the accuracy, it is necessary to find out how the data in the records are collected

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Secondary data/literature

This method uses data that is collected earlier by someone else.

Example:

in secondary data/literature lots of direct measurements are carried out on FLW. If the focus is similar, these data are often used as estimate for the FLW in their own situation.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Secondary data/literature

Characteristics	Answer
Direct access to FLW needed?	No
Level of accuracy?	Low
Track causes?	Depends
Required resources	Low
Handle mixed FLW?	Possible
Records FLW available?	No
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	No

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Secondary data/literature

- You need access to (scientific) literature
- Therefore, some level of experience in FLW terminology (and its complexity) is required
- Take a close look at the reference if conditions and timing (year; not 1996) of research are close to the situation you want to quantify FL for

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Surveys/interviews

Gathering data on FLW quantities or other information (e.g., attitudes, beliefs, self-reported behaviors) from a large number of individuals or entities through a set of structured questions

Example:

a quantitative survey is carried out with VAVI (potato processors).
Every year a standardized quantitative questionnaire is sent to the companies.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Surveys/interviews

Characteristics	Answer
Direct access to FLW needed?	No
Level of accuracy?	Low-Medium
Track causes?	Yes
Required resources	Medium-High
Handle mixed FLW?	No
Records FLW available?	Depends
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	Depends

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Surveys/interviews

- Surveys are a cost-effective way of gathering information from many individuals or entities on attitudes, beliefs and self-reported behaviors (consumers, restaurants, farmers).
- Can gather data on otherwise difficult-to-measure material flows
- Typically, surveys show underestimated figures of FLW

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method description: Waste composition analysis

Waste composition analysis is a process of physically separating, weighing and categorizing waste. It can be used both to determine total amounts of FLW and to categorize the different types of foods that have been discarded (e.g., fruits, vegetables, meat), or distinguish between food and inedible parts.

Example:

typically used for household FLW analysis, to see what categories and/or products are wasted the most by consumers. Campaigns can be started based on these results.

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Method characteristics: Waste composition analysis

Characteristics	Answer
Direct access to FLW needed?	Yes
Level of accuracy?	High
Track causes?	No
Required resources	High
Handle mixed FLW?	Yes
Records FLW available?	No
Are inputs and outputs recorded that could be used for inferring the amount of FLW?	No

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Methodologies overview

Method description

Method Characteristics

Remarks

Remarks: Waste composition analysis

- The level of detail gives the opportunity to derive data on other environmental indicators like GHG-emission
- In fact, in case of mixed FLW, it is the only reliable way to collect FLW data on a deeper level than 'food total' or 'organic total'
- There are technological devices that support this kind of FLW analysis (e.g. Leanpath)

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

c) Considerations method selection

d) List of methodologies

e) Actual method selection

f) Examples

e) The method selection can be based on three elements:

- Considering all methods on pros and cons (see previous slides)
- Using the practical preferences per SCL as provided from
- Literature and practice
- Using the upgraded WRI decision tool for method selection in
- Relation to your own situation

E

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

c) Considerations method selection

d) List of methodologies

e) Actual method selection


f) Examples


e) Which method is suitable/used for what? (see e1)


		primary production	processing & manufacturing	Distribution and wholesale	Retail	Foodservice	Households
1	Assessing volume						
2	Counting/scanning						
3	Diaries						
4	Direct weighing						
5	Expert opinion						
6	Mass balance						
7	Modeling						
8	Proxy data						
9	Records						
10	Secondary data/literature						
11	Survey/Interview						
12	Waste composition analysis						

Based on reference 1) and 2)

R

 rarely applied/less suitable

 applied regularly/suitable

 often applied/well-suited

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

c) Considerations method selection

d) List of methodologies

e) Actual method selection

f) Examples

e) Which method matches user preferences? (see **e2**)

By clicking the icon, a tool, developed by WRI (a little adjusted by WFBR) provides an option to determine the best suitable methodology according to some user preferences

Decide on what criteria are relevant for you as a user and either check on all the methodologies or click on the [Methodology evaluation tool](#) (downloads FLW Quantification Method Ranking tool)

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

a) Process scheme

b) What process to quantify?

c) Considerations method selection

d) List of methodologies

e) Actual method selection

f) Examples

f) Examples Fruits and vegetables

SC link	Direct weighing	Survey	Expert	Literature
Farmer	▶▶	▶		▶
Wholesaler		▶		

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

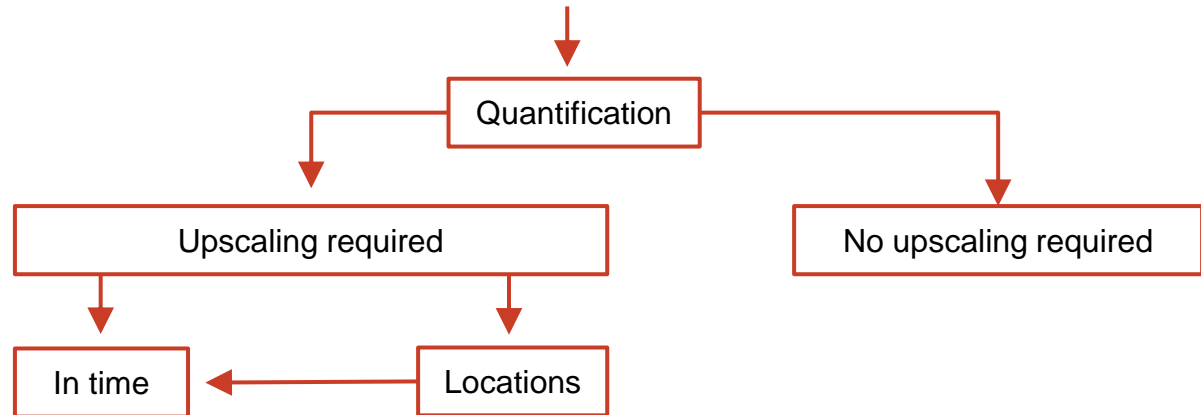
Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 5: Upscaling considerations

Once the data are collected, some additional steps are required to finalize the result. This depends very much on the focus. One of the issues is if upscaling is required:



Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 5: Upscaling considerations

No upscaling required:

E.g., when analysis is limited to one company or very small supply chain, and quantification takes place continuously (supermarket)

Outliers:

these are defined as data point outside the interval ($\mu-3\sigma$, $\mu+3\sigma$) (μ =mean, σ =stdev). Are they caused by e.g., promotions (then FL data should be included, i.e. regular predictable activities) or by incidents (excluded)?

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background:
Reference list

Step 5: Upscaling considerations

Upscaling in time:

necessary if the quantification is limited to a small time period and the target is to estimate the FL for a longer period. E.g., can real measurements for 2 weeks be multiplied by 26 to obtain annual FL data? Is there a seasonality effect?

Upscaling number of locations:

if you interview 50 farmers out of 10,000; is that enough to reach a certain accuracy if you scale up? (<https://www.calculator.net/sample-size-calculator.html>)

Step 1:
Define goals

Step 2:
Make the goal(s) SMART

Step 3:
Type of information needed

Step 4:
Select quantification method

Step 5:
Upscaling considerations

Background: Reference list

1. <http://www.cec.org/files/documents/publications/11869-why-and-how-measure-food-loss-and-waste-practical-guide-version-20-en.pdf>
2. <https://hal.inrae.fr/hal-02799764v1/>

Background:
Reference list

Project definition

When we talk about Food Loss and Waste (FLW), it is important to understand that there are different ways of defining FLW. In this section, we will take a closer look at some definitions to see how they vary.

The project definition used for Food Loss & Waste

On this website, we use the definition of 'Food Loss and Waste' (FLW) used by the Food and Agriculture Organisation of the United Nations (FAO) (2019) [1]. FLW refers to the decrease in quantity or quality of the edible portion of raw, semi-processed or processed food intended for human consumption that is redirected to other non-food uses or productive use. Productive use includes animal feed, industrial use (e.g. biofuels, fibres for packaging material, creating bioplastics, making traditional materials such as leather or feathers (e.g. for pillows), and rendering fat, oil or grease into a raw material to make soaps, biodiesel or cosmetics), and other uses (e.g. use as fertiliser and ground cover). FLW also includes the decrease in the nutritional value, safety or other quality aspects from the time food is ready for harvest or slaughter to consumption. Food that has suffered a qualitative loss or waste but is still eaten by humans is not considered a quantitative loss or waste.

The difference between Food Loss and Food Waste is based on the stakeholder involved. 'Food Loss is the decrease in the quantity or quality of food resulting from decisions and actions by food suppliers from the production stage in the chain, excluding retail, food service providers and consumers. Food Waste is the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food services and consumers.'

Standardised agreed-upon FLW definition

However, to date, there is no standardised and globally agreed-upon definition for FLW. For example, the European Union (EU) uses a different definition than the FAO. In projects, it is advisable to establish a common definition as a first step. This definition should ideally align with existing international definitions to ensure comparability of data collection. [Table 1](#) shows more about the currently applied FLW definitions.



Differences in the international applied FLW definitions

The differences in FLW definitions can be summarised into five main topics:

1. Scope on-farm losses, 2. Destinations, 3. Edible/inedible, 4. Drinks and liquids and 5. Quantitative and qualitative losses. Those five topics are described and visualised below in more detail.

1. Scope on-farm losses

The starting point of the FLW definition differs per source. The FLW definition always start on-farm, but the starting activity differs. Some FLW definitions start when the produce is ready-to-harvest (pre-harvest/pre-slaughter), while other FLW definitions start at the moment of the harvest activity itself (harvest/slaughter) or after harvesting (on-farm post harvest/slaughter operations) (Figure 1).

In the applied FLW definition in this project (FAO 2019), the FLW definition starts when the produce is ready-to-harvest (pre-harvest/pre-slaughter).

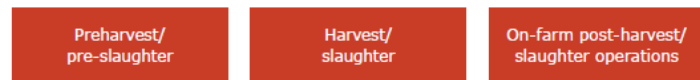


Figure 1: Starting point FLW definition

2. Destinations

Products produced for human consumption, but do not end up as food for consumers, need to go to another destination. Possible destinations are provided in Figure 2. Some FLW definitions include all these provided destinations as FLW, while other FLW definitions exclude animal feed and biomaterial/processing. The destination not harvested can only be included in the FLW definition if the preharvest and/or harvest losses are included in the FLW definition (see 1. Scope on-farm losses).

In the applied FLW definition for this project (FAO 2019) the destinations animal feed and biomaterial/processing are excluded from the FLW definition.

- Animal feed
- Biomaterial/processing
- Co/anaerobic digestion
- Compost/aerobic
- Controlled combustion
- Land application
- Landfill
- Not harvested
- Refuse/discards
- Sewer



Figure 2: Possible destinations of side-streams that do not end up for human consumption

3. Edible/inedible

FLW definitions can include both edible and inedible parts of food, or only include the edible fraction of the food (Figure 3). What part of the food is edible or inedible is culturally decided and therefore subjective. Sometimes the terminology avoidable and unavoidable are used. Although there is a minor difference, we consider them here as equivalent to edible and inedible respectively.

The applied FLW definition for this project (FAO 2019) only includes the edible fraction of food as part of FLW.



Figure 3: Difference between edible and inedible parts of banana



4. Drinks and liquids

The FLW definition include the term food. However the loss and waste of drinks and liquids is less clear. Some FLW definitions mention the loss and waste of water, food products diluted with water, other liquids, and dairy and dairy-based products specifically, while other FLW definitions do not include these products (Figure 4).

The applied FLW definition in this project (FAO 2019) mentions specifically that FLW includes drinks and any substance used in the manufacture, preparation or treatment of food.



Figure 4: Different types of drinks and liquids

5. Quantitative and qualitative losses

Some FLW definitions include both quantitative and qualitative loss and waste along the food supply chain, while other FLW definitions do not consider loss in quality (nutritional losses, cosmetic losses, or loss in food safety) as FLW (Figure 5). Some FLW definitions even include the overconsumption beyond actual dietary requirements as a form of FLW.

The applied FLW definition in this project (FAO 2019) includes both quantitative and qualitative losses as a form of FLW.



Figure 5: Quantitative and qualitative losses

Terminology

Last but not least, one should be aware that 'food waste' is a very sensitive term and topic. Companies therefore frequently prefer using other terms. In the biobased domain, the terms 'side streams' or 'biomass' are used, covering all parts of the product that don't end up as human food.

References

- 1 FAO. 2019. The State of Food and Agriculture 2019. Moving forward on food loss and waste reduction. Rome. Licence: CC BY-NC-SA 3.0 IGO. <https://www.fao.org/3/ca6030en/ca6030en.pdf>

Table 1

	FAO 2019	SDG 12.3	WRI	EU FUSIONS	EU regulation
Source	https://www.fao.org/3/ca6030en/ca6030en.pdf	https://champions123.org/sites/default/files/2020-09/champions-12-3-guidance-on-interpreting-sdg-target-12-3.pdf	https://files.wri.org/d8/s3fs-public/FLW_Standard_final_2016.pdf	https://www.eu-fusions.org/phocadownload/Publications/FUSIONS%20Definitional%20Framework%20for%20Food%20Waste%202014.pdf	DIRECTIVE (EU) 2018/851 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 30 May 2018 amending Directive 2008/98/EC on waste Commission delegated decision (EU) 2019/1597 Guidance on reporting of data on food waste and food waste prevention according to Commission Implementing Decision (EU) 2019/2000
General definition	<p>For the purposes of this report, food loss and waste is understood as the decrease in quantity or quality of food along the food supply chain. Food refers to any substance, whether processed, semi-processed or raw, intended for human consumption.</p> <p>Food loss is the decrease in the quantity or quality of food resulting from decisions and actions by food suppliers from the production stage in the chain, excluding retail, food service providers and consumers. Food waste is the decrease in the quantity or quality of food resulting from decisions and actions by retailers, food services and consumers.</p> <p>Quantitative food loss and waste (also referred to as physical food loss and waste) is the decrease in the mass of food destined for human consumption as it is removed from the food supply chain.</p> <p>Qualitative food loss and waste refers to the decrease in food attributes that reduces its value in terms of intended use. It can result in reduced nutritional value (e.g. smaller amounts of vitamin C in bruised fruits) and/or the economic value of food because of non-compliance with quality standards.</p> <p>Food that has suffered a qualitative loss or waste but is still eaten by humans is not considered a quantitative loss or waste. If either consumers or suppliers discard such food, it is characterised as quantitative food loss or waste, unless diverted to productive use.</p>	<p>Food loss and waste includes both 'food' intended for human consumption and its associated 'inedible parts'. Food loss and waste covers all possible destinations beyond the human food supply chain including 'not harvested/plowed-in', but excluding the destinations animal feed and biobased materials/biochemical processing (where material is converted into industrial products).</p>	<p>Food loss and waste refers to the edible parts of plants and animals produced or harvested for human consumption but not ultimately consumed by people.</p>	<p>Food waste is any food, and inedible parts of food, removed from the food supply chain to be recovered or disposed (including composted, crops ploughed in/not harvested, anaerobic digestion, bio-energy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea), but excluding animal feed and bio-based materials/ biochemical processing. There is no separate definition for food loss.</p>	<p>Food waste is all unprocessed, partially processed or processed product that, produced for human consumption and intended to be, or reasonably expected to be ingested by humans, but which the holder discards or intends or is required to discard. The definition includes edible and inedible parts, and excludes the destination animal feed.</p> <p>All food discarded as waste is covered in the EU simply as food waste, while concept of food loss is used rather to describe loss of food in primary production (e.g. pre-harvest losses), which is excluded from the scope of Waste Framework Directive.</p> <p>From these pieces of information: food waste means all food as defined in Article 2 of Regulation (EC) No 178/2002 of the European Parliament and of the Council (*) that has become waste. 'Food (or 'foodstuff') means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans.'</p>



<p>Scope on-farm losses</p> <p>Food products can be of animal or plant origin and are considered food from the moment that: (i) crops are harvest-mature or suitable for their purpose; (ii) animals are ready for slaughter; (iii) milk is drawn from the udder; (iv) eggs are laid by a bird; (v) aquaculture fish is mature in the pond; and (vi) wild fish are caught with fishing gear.</p> <p>(i) agricultural production and harvest/ slaughter/catch; (ii) post-harvest/slaughter/ catch operations; (iii) storage; (iv) transportation; (v) processing; (vi) wholesale and retail; and (vii) consumption by households and food services. Agricultural production, harvest and post-harvest/ slaughter/catch operations refer to activities where produce is still on the farm or the producer's premises.</p>	<p>One should interpret Target 12.3 as covering the entire food supply chain, from the point that crops and livestock are ready for harvest or slaughter.</p>	<p>Produce refers to the point at which the raw material for food are ready for harvest or slaughter (i.e., ready to enter the economic and technical system for food production or home-grown consumption). Examples of what might be considered 'ready to harvest or slaughter' include the following:</p> <ul style="list-style-type: none"> • Crops that are harvest-mature or suitable for their purpose • Fruit and berries that are mature for harvest • Wild crops, fruits and berries that are harvested • Animals ready for slaughter • Wild animals caught or killed (live-weight) • Milk drawn from the udder • Eggs laid by the bird • Aquaculture fish mature in the pond. 	<p>The food supply chain starts when the raw materials for food are ready to enter the economic and technical system for food production or home-grown consumption . This is a key distinction in that any products ready for harvest or slaughter being removed are within scope, not just those that are harvested and subsequently not used. It ends when the food is consumed or 'removed' from the food supply chain.</p>	<p>The food waste definition starts at primary production from the moment of harvesting (plants) or live animals placed on the market for human consumption, which means when they are ready to offer for sale.</p> <p>Based on this information: food does not include live animals unless they are prepared for placing on the market for human consumption, and it does not include plants prior to harvesting. Placing on the market means the holding of food or feed for the purpose of sale, including offering for sale or any other form of transfer, whether free of charge or not, and the sale, distribution, and other forms of transfer themselves.</p>
--	---	--	--	---

<p>Destinations of FLW</p> <p>FLW destinations include co-digestion/ anaerobic digestion, incineration/landfill/ discard, compost, and other waste use. Animal feed, industrial use (including biofuels, fibres for packaging material, creating bioplastics, making traditional materials such as leather or feathers (e.g. for pillows) and rendering fat, oil or grease into a raw material to make soaps, biodiesel or cosmetics), and other uses (including uses such as fertiliser and ground cover) are excluded from the definition.</p>	<p>All side streams that exit the human food chain, excluding animal feed and biomaterial/processing. So FLW destinations include digestion, composting, combustion, land application, landfill, not harvested, plowed-in, refuse/discards, and sewer.</p>	<p>Users of the FLW Standard shall account for and report as much as is known about the destination of the FLW. "Destination" refers to where material removed from the food supply chain is directed. There is a range of possible destinations, which represent a range of alternative uses and potential value. The categories used in the FLW Standard are: Animal feed, bio-based materials/biochemical processing, codigestion/anaerobic digestion, composting/aerobic processes, controlled combustion, land application, landfill, not harvested/plowed in, refuse/discards/litter, and sewer/wastewater treatment. The destinations that are to be considered 'loss and waste' are defined by the entity's goal, local legislation, external policy, voluntary program, or another source separate from the FLW protocol. This means that no FLW definition is provided regarding the destinations.</p>	<p>Any food, and inedible parts of food, removed from the food supply chain sent to destinations composting, plough-in/ not harvested, anaerobic digestion, bio-energy, co-generation, incineration, sewer, landfill, or discards are termed 'food waste'. Any food, or inedible parts of food, sent to animal feed, bio-material processing or other industrial uses are termed 'valorisation and conversion' and are distinct from 'food waste'.</p>	<p>All non-human consumption are included, as it is stated by humans'. Substances destined for use as feed material are excluded from the scope and should therefore not be measured as food waste. Information on food originally intended for human consumption and then directed to animal feed is important for the understanding of material flows related to food and may be useful in planning a targeted food waste prevention policy.</p>
---	--	--	--	--



	FAO 2019	SDG 12.3	WRI	EU FUSIONS	EU regulation
Edible and inedible parts	Inedible parts are not considered as food loss or waste.	Both the food and its associated inedible parts, such as bones, rinds and pits, are part of FLW.	Depending on the goals of quantification, an entity may account for 1) both food and associated inedible parts, 2) food only, or 3) associated inedible parts only.	Food and inedible parts of food that are removed from the supply chain to be recovered or disposed of. So both are part of FLW. Where possible the edible and inedible fractions should be separately analysed or estimated. However including both edible and inedible parts of food in the technical framework is a key to ensuring that the framework can be practically used by all stakeholders in the food supply chain, since it is not always feasible to separately collect edible and inedible parts of food.	Food includes the entire food, including all its parts, both that which is edible and that which is not intended to be eaten.
Drinks and liquid	Food refers to any substance, whether processed, semi-processed or raw, intended for human consumption. It includes drink, chewing gum and any substance used in the manufacture, preparation or treatment of food but does not include cosmetics, tobacco or substances used only as drugs.	Drinks and liquids are not mentioned specifically.	Dairy, drinks and liquids are considered.	It covers both food and drink waste, and hence both solid and liquid disposal routes.	'Food' includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment. It includes water after the point of compliance as defined in Article 6 of Directive 98/83/EC and without prejudice to the requirements of Directives 80/778/EEC and 98/83/EC. Foods which are usually discarded as or with wastewater should not be measured as food waste as there are currently no methods for measuring such waste that would ensure sufficient levels of confidence and comparability of reported data. However, reporting may be possible.
Quantitative and qualitative losses	Quantitative and qualitative losses included.	Only quantitative losses included.	Only quantitative losses included.	Only quantitative losses included.	Only quantitative losses included.

FLW protocol overview

WUR (2022). EFFICIENT Protocol	Protocol developed to quickly gather reliable data and to suggest interventions for FLW reduction	https://www.wur.nl/en/research-results/research-institutes/food-biobased-research/show-fbr/take-the-target-measure-act-approach-to-reduce-food-waste-yes-but-be-pragmatic-about-it.htm
WRI (2016). FLW accounting and reporting standard	Most referenced FLW protocol for monitoring and reporting data	https://files.wri.org/d8/s3fs-public/FLW_Standard_final_2016.pdf
FAO (2018). Global food loss index	Calculation methodology for SDG 12.3 on food losses	https://www.fao.org/3/CA2640EN/ca2640en.pdf
UNEP (2020). Food Waste Index	Calculation methodology for SDG 12.3 on food waste	https://www.unep.org/resources/report/unep-food-waste-index-report-2021
UNEP (2014). Prevention and reduction of food and drink waste in businesses and households: Guidance for governments, local authorities, businesses and other organizations.	Steps for governments, businesses and other organisations to develop strategies, programmes and activities to prevent and reduce food and drink waste	https://wedocs.unep.org/handle/20.500.11822/25194
CEC (2019). Why and how to measure food loss and waste: A practical guide	Step-by-step plan for how companies and governments can begin the process of measuring food loss and waste	http://www.cec.org/files/documents/publications/11814-why-and-how-measure-food-loss-and-waste-practical-guide-en.pdf
IFPRI (2017). The reality of food losses: A new measurement methodology	FLW quantification protocol for producers, middlemen, and processors in seven staple food value chains in five developing countries.	https://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/131530/filename/131741.pdf
EU Fusions (2016). FUSIONS food waste quantification manual to monitor food waste amounts and progression	European quantification manual to monitor FLW at (European) country level	https://www.eu-fusions.org/phocadownload/Publications/FUSIONS%20Food%20Waste%20Quantification%20Manual.pdf
GIZ (2015). Rapid Loss Appraisal Tool (RLAT). Assessing hot spots for food loss in agricultural value chains	Tool and methodology to gather data and suggest interventions for FLW reduction via Participatory Assessment.	https://www.giz.de/de/downloads/giz2021-0313en-rapid-loss-appraisal-tool-user-guide.pdf https://wocatpedia.net/images/5/55/GIZ_RLAT_toolbox.pdf
global food loss metric tool (in development; WWF US, WWF UK, WRI, WRAP, etc).	Develop a FL measurement- and reporting tool for farm level.	https://www.worldwildlife.org/pages/creating-a-unified-approach-to-measure-loss-on-farms-globally



Abbreviations

FAO: food and agricultural organization of United Nations

FLI: food loss index

FLW: food loss and waste

QU: quantification unit

ROI: return on investment

SCL: supply chain link(s)

SDG: sustainable development goals

SMART: Specific, Measurable, Achievable, Realistic, Timely

WRI: World Resources Institute

FL quantification
THANK YOU!

Contact us

Do you have questions about using this tool? We are happy to help.
Please fill out the [contact form](#) and we will get back to you soon.

Author: Han Soethoudt

Version 1, September 2024

www.foodloss-solutions.com



The FL quantification tool, developed by Wageningen University & Research, is part of the KoM project "Synthesising Food Loss Research Results into Applied Food Loss Reduction Tools", project number BO-43-000-044, financed by the Ministry of Agriculture, Fisheries, Food Security and Nature, 2022-2024.