Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

SDG 12.3.1.a Food Loss Index

An introduction

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Carola Fabi, Team Leader, Methodological Innovation and SDG 12.3.1 a Focal Point

ESS, Food and Agriculture Organization

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

Overview

- General context
- Definitional framework
- Country Food Loss Index
- Global Food Loss Index

Working for #ZeroHunger

Objectives of this session

- Understand the SDG target 12.3 and indicator 12.3.1.
- Present the operational definition of food losses for SDG 12.3.1a
- Describe the methodology to calculate the Country Food Loss Index (FLI) and Global Food Loss Index (GFLI) and how to interpret them
- Understand the pieces of information needed to calculate the Country Food Loss Index and the hidden challenges
- Provide the materials and inputs FAO has generated

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SDG 12.3.1.a General Context

Food losses and waste is part of the Agenda 2030

1/3 of food is lost or wasted

FAO raised awareness on food loss and waste with a global estimate in 2011

SDG Target 12.3

reflects growing attention to the issue

Creation of two indices to measure progress towards this target

FOOD LOSS INDEX

FOOD WASTE INDEX

SDG 12.3 target and indicators

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

"By 2030…reduce food losses along production and supply chains, including post-harvest losses."

12.3.1.a Food Loss Index

Supply side from production up to but not including retail

"By 2030…halve per capita global food waste at the retail and consumer levels."

12.3.1.b Food Waste Index

Demand side from retail up to households

SDG 12.3.1.a Food Loss Index

Challenges for establishing the SDG Food Loss Index:

- Lack of shared and internationally agreed concepts and definitions
- Lack of international guidelines on how to define and collect postharvest losses and waste data at national level
- Complexity of measurement: cost, multiple dimensions (stages of the value chain, typologies of actors, product characteristics, value chain length and complexity)
- Reporting both the national and international indicators in a comparable way

Current data situation:

- Mainly case studies based on expert opinions focused on few products or stages of the value chain)
- Reliable nationally representative data on losses are generally not available (7% official data reported yearly in FAOSTAT, 42 Countries reported in 2019)

SDG 12.3.1.a Food Loss Methodology to harmonize a framework

2016

TIER III
Methodology in development

- Conceptual and definitional framework
- Methodology for the Food Loss Index

2018

2020

TIER II
Methodology approved

- Global Estimation Model to fill current data gaps
- Guidelines on data collection for countries (survey-based)

…

…TIER I
Countries report sufficient data

- Capacity development for data collection and reporting
- Official data is available in 50% of the countries
- Additional improvements for cost-efficiency

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SDG 12.3.1 a Definitional Framework

OPERATIONAL FOOD LOSS DEFINITION – SDG 12.3.1.a

*"Food losses are all the crop and livestock human-edible commodity **quantities** that, directly or indirectly, **completely exit** the **post-harvest**/ slaughter production/ supply chain by being discarded, incinerated or otherwise, and **do not re-enter in any other utilization** (such as animal feed, industrial use, etc.), **up to, and excluding, the retail level**.*

*Losses that occur during storage, transportation and processing, also of imported quantities, are therefore all included. Losses include the commodity **as a whole with its non-edible parts**."*

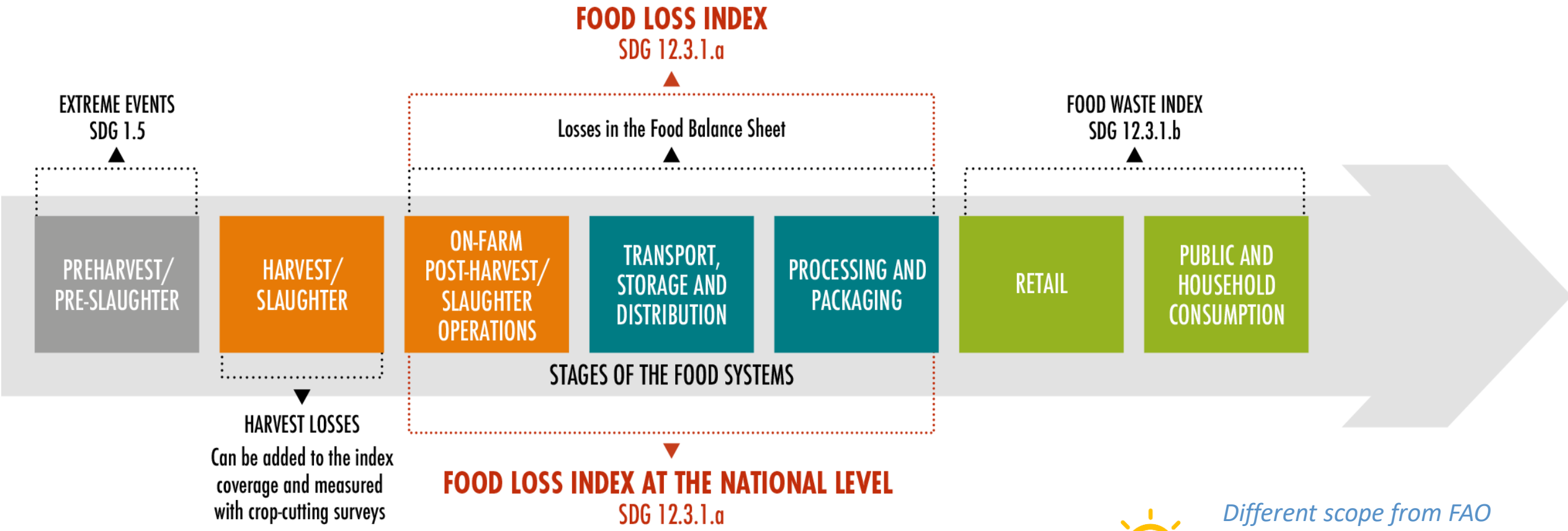
→ *Focuses on the viability of definitions to produce consistent measurement*

Conceptual definition: "Food loss is the reduction of quantity and quality of food"

- Quantities, not qualitative nor economic losses.
- Separates food losses and food waste by stage, not by causes or intentionality.
- Tracks losses by commodity along its supply chain.
- Considers edible and non-edible parts as losses.
- Food that is sent to any other utilization (non-food utilizations) is NOT considered a loss.

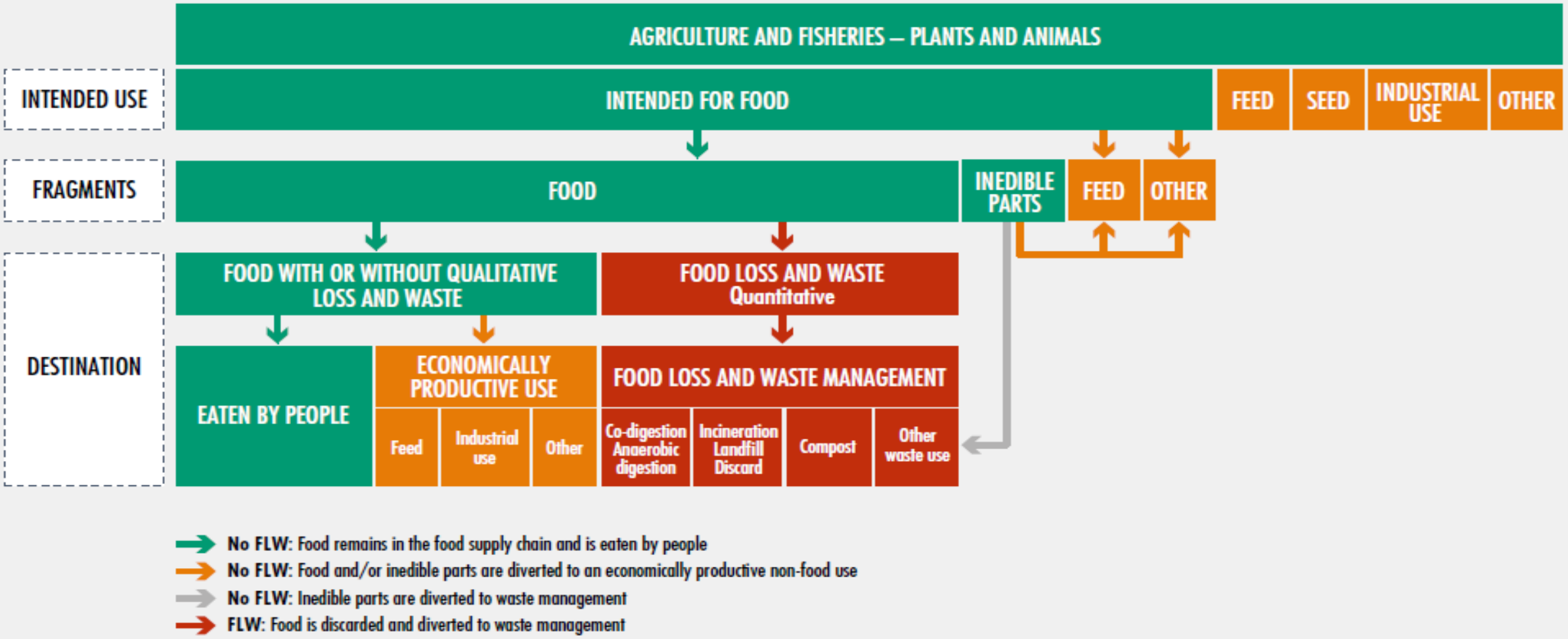
→ *Strives for conceptual completeness*

SCOPE OF THE FOOD LOSSES INDEX



Different scope from FAO 2011 Study (included Harvest, Food Loss and Food Waste)

SCOPE AND CONCEPTS OF FOOD LOSSES



FOOD LOSS DEFINTION FOR EACH COMMODITY GROUP

	Cereals, pulses	Roots, tubers	Fruits, vegetables	Animal product	Fish and fish product
Pre-harvest losses	Losses of mature crops before harvesting (eaten, rotten, affected by climate)	Losses of mature crops before harvesting (climate, pest and diseases, animals)	Losses of mature crops before harvesting (climate, pest and diseases, animals)	Losses at bearing, rearing	
Primary product					
Harvest losses	Losses during the harvesting process (fallen on the ground)	Losses during the harvesting process (left in the ground)	Losses during the harvesting process (left, fallen on the ground, grading during harvesting)	Egg harvesting/ milking/ pre-slaughtering losses (transport) and slaughtering losses	Losses at the time of catch occurring at ponds/landing centers/ boats
Post-harvest losses	Produce removed and discarded in grading, cleaning, packaging, processing, storage, transportation along the supply chain (on-farm and off-farm stages) up to retail (but excluding retail)				

COMMON QUESTIONS

Pre-harvest, harvest or post-harvest losses?

- Cereals that were **damaged by climate** or pest **but were harvested** and discarded in post-harvest?
  A: Post-harvest loss

- Fruits that were **left on the field/tree** due to harvest practices or grading?
  A: Harvest loss

- **Plots** that were **not harvested due to climate** or pests?
  A: Pre-harvest loss

- **Plots** that were **not harvested due to markets**/prices?
  A: Pre-harvest loss (but part of economic decisions that might be studied separately)

COMMON QUESTIONS

Is this a food loss or not?

- Cereal is sorted out **due to poor quality** and used as **animal feed (e.g cattle)**.
  A: No
- Discarded meat parts are sent to **pet food industry**.
  A: No
- Fruits are graded out and sent **to any non-food industry (further resource utilization)**.
  A: No
- Discarded food from wholesale markets is sent to **bioenergy producing** plants?
  A: No
- Discarded food from wholesale markets is sent to **compost**.
  A: Yes
- Are **egg shells** considered a food loss?
  A: No

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SDG 12.3.1 a Country Food Loss Index

COUNTRY FOOD LOSS INDEX

The Country Food Loss Index (FLI) is a fixed-base weighted index (Laspeyres-type) widely used in official statistics:

$$FLI_{it} = \frac{FLP_{it}}{FLP_{it_0}} * 100$$

j = commodity
i= country
t = year

$$FLP_{it} = \frac{\sum_j \boldsymbol{l_{ijt}} * (q_0 * p_0)}{\sum_j (q_0 * p_0)}$$

- The FLI measures trends in percentage losses over time, comparing a national average Food Loss Percentage (FLP) in the current year to the same percentage in the base year.
- A FLI < 100 means that a country has met the SDG target 12.3.1.a

COUNTRY FOOD LOSS INDEX

1. Focuses on **10 key commodities** in 5 main groups
2. Measures Food Loss **Percentages** (FLP) and not total losses
3. Monitors changes in the Food Loss Percentage **over time**
4. Based on **nationally representative** loss percentages along the 10 selected supply chains

Required components:

i) Selecting the **Basket of Commodities**

ii) Choosing the **Base Year**

iii) Compiling the **Weights**

iv) **Collecting data** and estimating food losses percentages at national level for each commodity over time

0) FOCUS ON FOOD LOSS PERCENTAGES

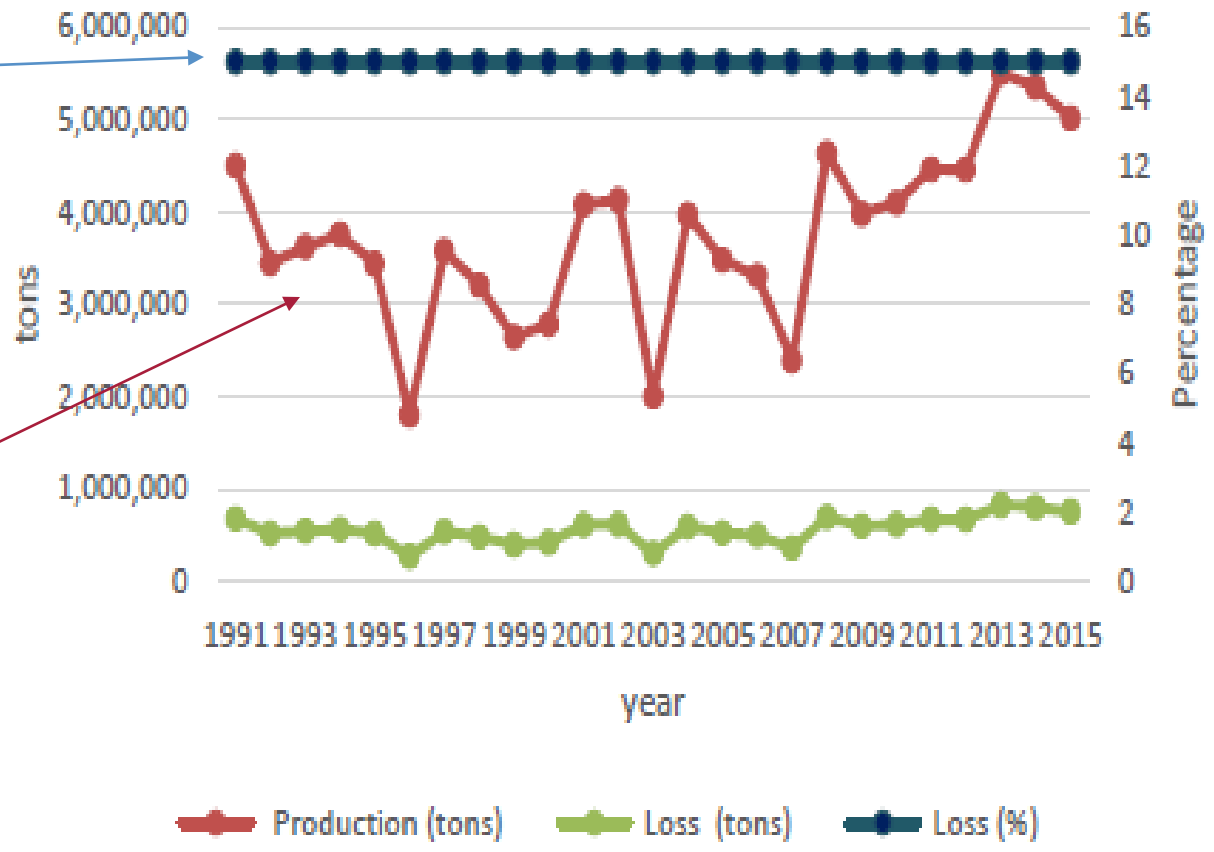
Percentage losses versus total losses:

Percentage Losses l_ijt are set here using a constant factor of 15%. You can see that loss quantities fluctuate with production.

→ *Lower production would than mean lower loss volume, **but without tackling the causes** of losses*

→ *We don't want to have the **noise of production fluctuation** in the food loss index*

→ *With food loss percentages we **focus on structural food losses** (independently of level of production)*



1) SELECT THE COMMODITIES BASKET FOR THE COUNTRY FLI

Reasoning for allowing countries to select a national commodity basket:

- Loss statistics cannot cover the entire basket
- The same commodities are not relevant for all countries
- Trade-off between relevance at country level and comparability across countries

FAO will use the following default process in case the country does not provide a selection:

1. Compile value of production for every commodity (in the base year)
2. Group commodities by category and rank them
3. Select the top 2

Comparability

1.Cereals & Pulses;
2.Fruits And Vegetables;
3.Roots, Tubers & Oil-Bearing Crops;
4.Animals products;
5.Fish and fish products
6.Other crops (stimulants, spices, sugar, etc.)

Relevance
Countries determine the ten commodities by analyzing:

- Policy focus
- Economic relevance
- Food security relevance

1) SELECT THE COMMODITIES BASKET AND BUILD THE DATA SET – EXAMPLE

Heading	CPC	Item Name	Production	Imports	Production + Imports	Price	Percent of total value of Production	Reference Quantity	Value of Reference Quantity
			Average 2014-2016 (Tons)	*Average 2014-2016 (Tons)*	*Average 2014-2016 (Tons)*	*International dollar prices from FAOSTAT*	*Based on value of production FAOSTAT*	*If Import/Production<0.1, Production; If Import/Production> or =0.1, Production + Imports*	*Reference Quantity * Price*
Cereals & Pulses	0111	Wheat	2,511,008	8,056,666	10,567,675	232	0.28	10,567,675	2,451,700,600
Cereals & Pulses	0115	Barley	963,288	NA	1,700,073	195	0.04	963,288	187,984,305
Fish & Fish Products	0		0	0	0	0	0.00		
Fish & Fish Products	0		0	0	0	0	0.00		
Fruits & Vegetables	01234	Tomatoes	1,169,982	15	1,169,997	468	0.03	1,169,982	547,152,378
Fruits & Vegetables	01314	Dates	984,783	7	984,790	1050	0.03	984,783	1,034,158,936
Meat & Animals Products	02211	Raw milk of cattle	3,099,608	75	3,099,683	386	0.08	3,099,608	1,197,611,041
Meat & Animals Products	21115	Meat of sheep	272,989	3,492	276,480	4555	0.01	272,989	1,243,365,663
Roots, Tubers & Oil-Bearin	01450	Olives					0.02	611,007	619,836,112
Roots, Tubers & Oil-Bearin	01510	Potatoes	4				0.13	4,657,076	1,132,572,941
Other	01371	Almonds in shell					0	69,135	362,067,766
Other	02910	Natural honey					0	7,161	25,946,684
							Total Value of Reference Quantity:		**8,802,396,426**

$$FLP_{it} = \frac{\sum_j l_{ijt} * (q_0 * p_0)}{\sum_j (q_0 * p_0)}$$

2) CHOOSE THE BASE YEAR

The base year for SDG 12.3.1.a monitoring and reporting should ideally be 2015:
The benchmark at country level can be based on the first survey period (variable year).

For international comparability:

- A harmonized base period will have to be set to produce regional and global aggregates
- FAO needs to interpolate (model) loss percentages in the baseline year and in a common reporting year

3) COMPILE THE WEIGHTS

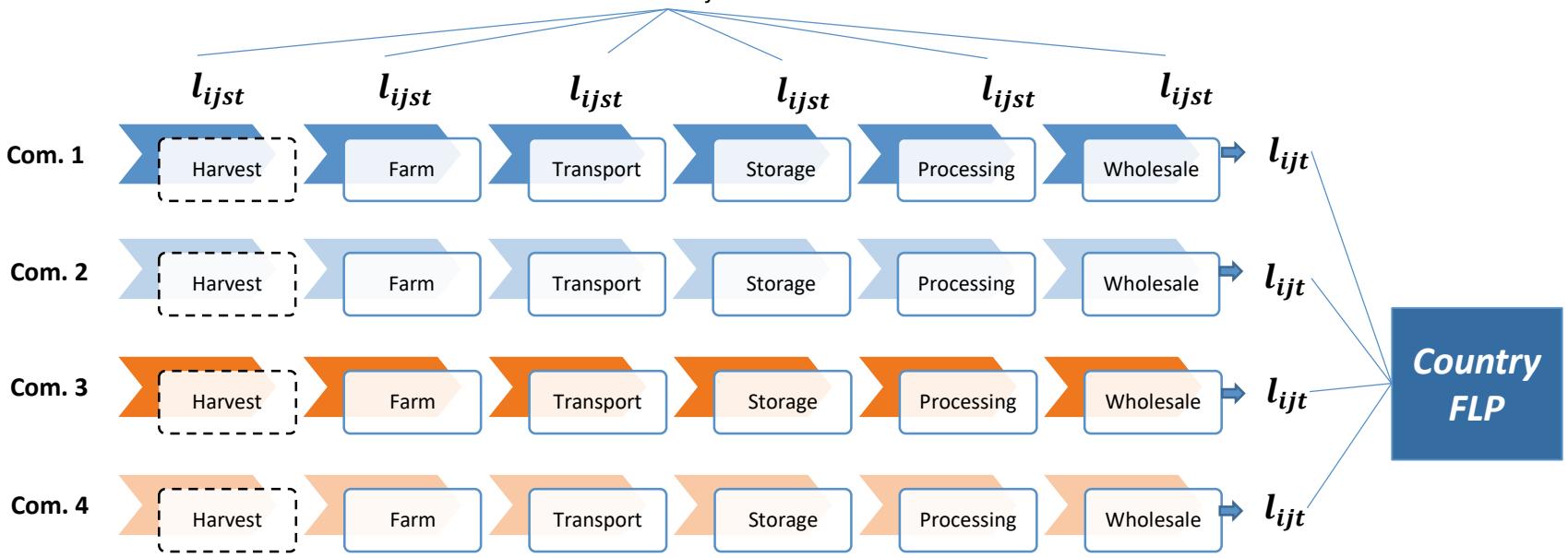
FAO calculates SDG 12.3.1.a with weights based on economic values to aggregate reported food loss percentages by commodity. The NFLI is then biased towards higher economic-valued commodities (fixed for the base year).

Countries can additionally apply other weights to their food loss percentages if of interest for national decision making:

- **Nutritional factors**: e.g. caloric or protein values will be biased towards meats and staples, but not on fruits and vegetables
- **Environmental factors**: e.g. water or C02 can be biased against meats, fruits, vegetables and nuts, as well as production systems by country

4) COLLECT DATA AT COUNTY LEVEL (I)

Food loss percentages by commodity representative at national level (l_{ijt})



Each commodity's supply chain can be disaggregated down to stage. Estimates for the different stages can come from various instruments and tools.

Weighted Aggregation of all commodities in the country basket FLP

Break down the problem into structured parts –stages
Simplify the supply chain to main stages

Get to loss estimates for each stage
Each stage will have different measurement challenges in terms of tracking loss quantities over time

Evaluate where the information comes from at each stage
How to think about layering information to keep this cost-effective

4) COLLECT DATA AT COUNTY LEVEL (II)

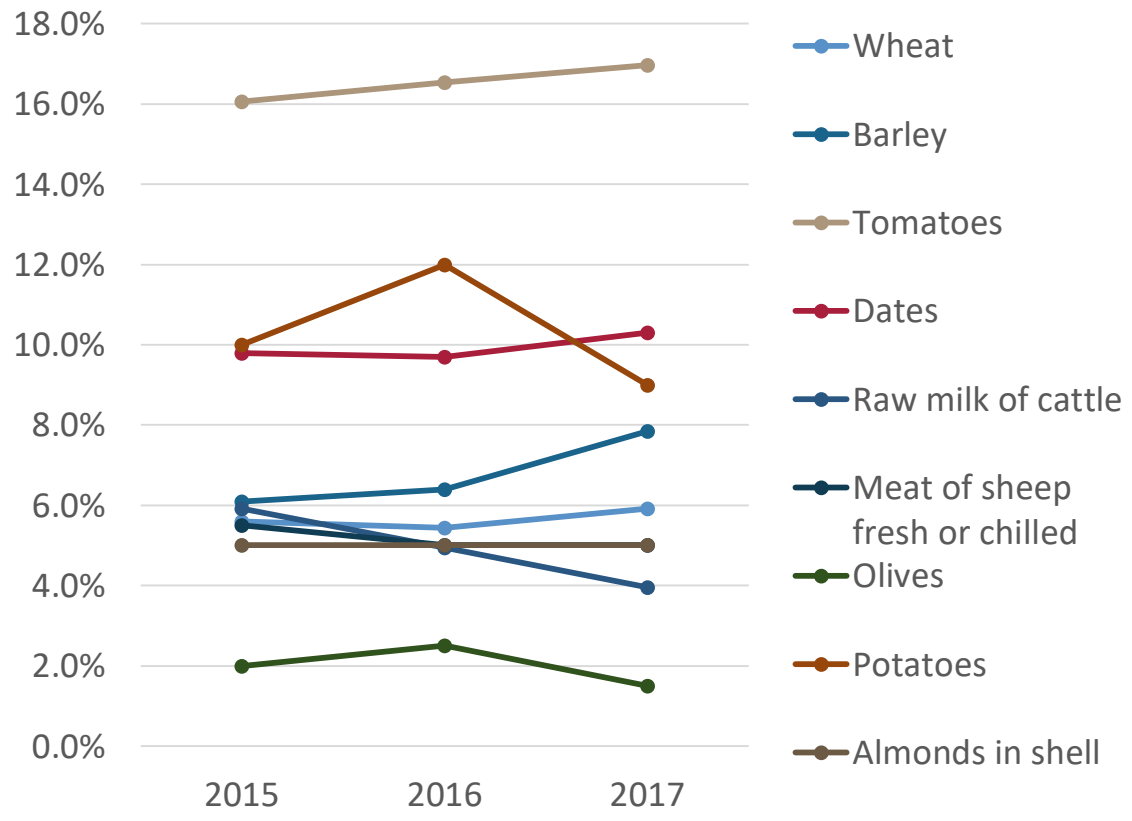
The Country Food Loss Index is based on country data on food losses:

- The data is usually generated at stage level and aggregated along the supply chain (up to retail)
- In some cases, food losses are estimated for the whole supply chain (indirect methods)
- It is probable that data is not collected each year, then the data from previous year are used or interpolation methods can be used

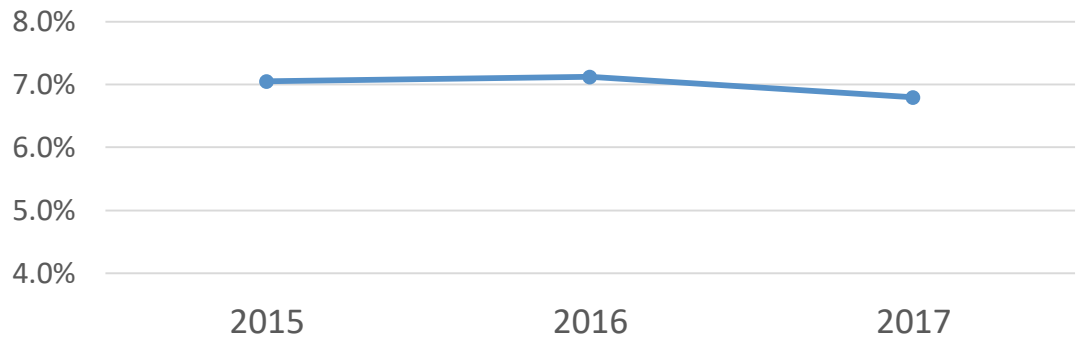
			Year		
Group	Item Code	Item Name	2015	2016	2017
Cereals & Pulses	0111	Wheat	5.6%	5.4%	5.9%
Cereals & Pulses	0115	Barley	6.1%	6.4%	7.9%
Fish & Fish Products	0				
Fish & Fish Products	0				
Fruits & Vegetables	01234	Tomatoes	16.1%	16.5%	17.0%
Fruits & Vegetables	01314	Dates	9.8%	9.7%	10.3%
Meat & Animals Products	02211	Raw milk of cattle	5.9%	4.9%	4.0%
Meat & Animals Products	21115	Meat of sheep fresh or chilled	5.5%	5.0%	5.0%
Roots, Tubers & Oil-Bearing Crops	01450	Olives	2.0%	2.5%	1.5%
Roots, Tubers & Oil-Bearing Crops	01510	Potatoes	10.0%	12.0%	9.0%
Other	01371	Almonds in shell	5.0%	5.0%	5.0%
Other	02910	Natural honey			

5) COMPILE, MONITOR AND REPORT THE COUNTRY FOOD LOSS INDEX

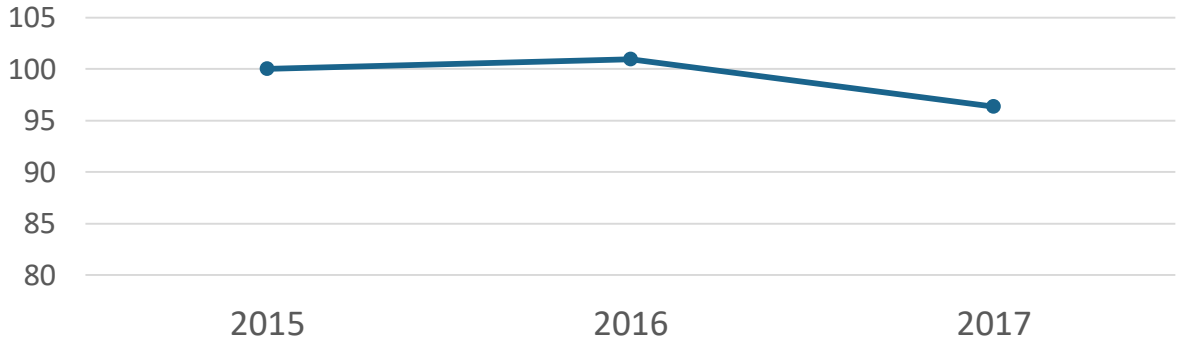
Commodity Food Loss Percentages l_ijt (Whole supply chain) for the selected commodities



Country Food Loss Percentage for all selected commodities (FLP_it) (weighting applied)



Country Food Loss Index (FLI_it) (base year applied)



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SDG 12.3.1 a Global Food Loss Index

GLOBAL FOOD LOSS INDEX

Countries' FLI must be aggregated for SDG 12.3.1.a monitoring by regions and for the world, which will be done as part of FAO's custodial role.

$$GFLI_t = \frac{\sum_{i=1}^{G} FLI_{it} * w_i}{\sum_{i=1}^{G} w_i} *100$$

Where:

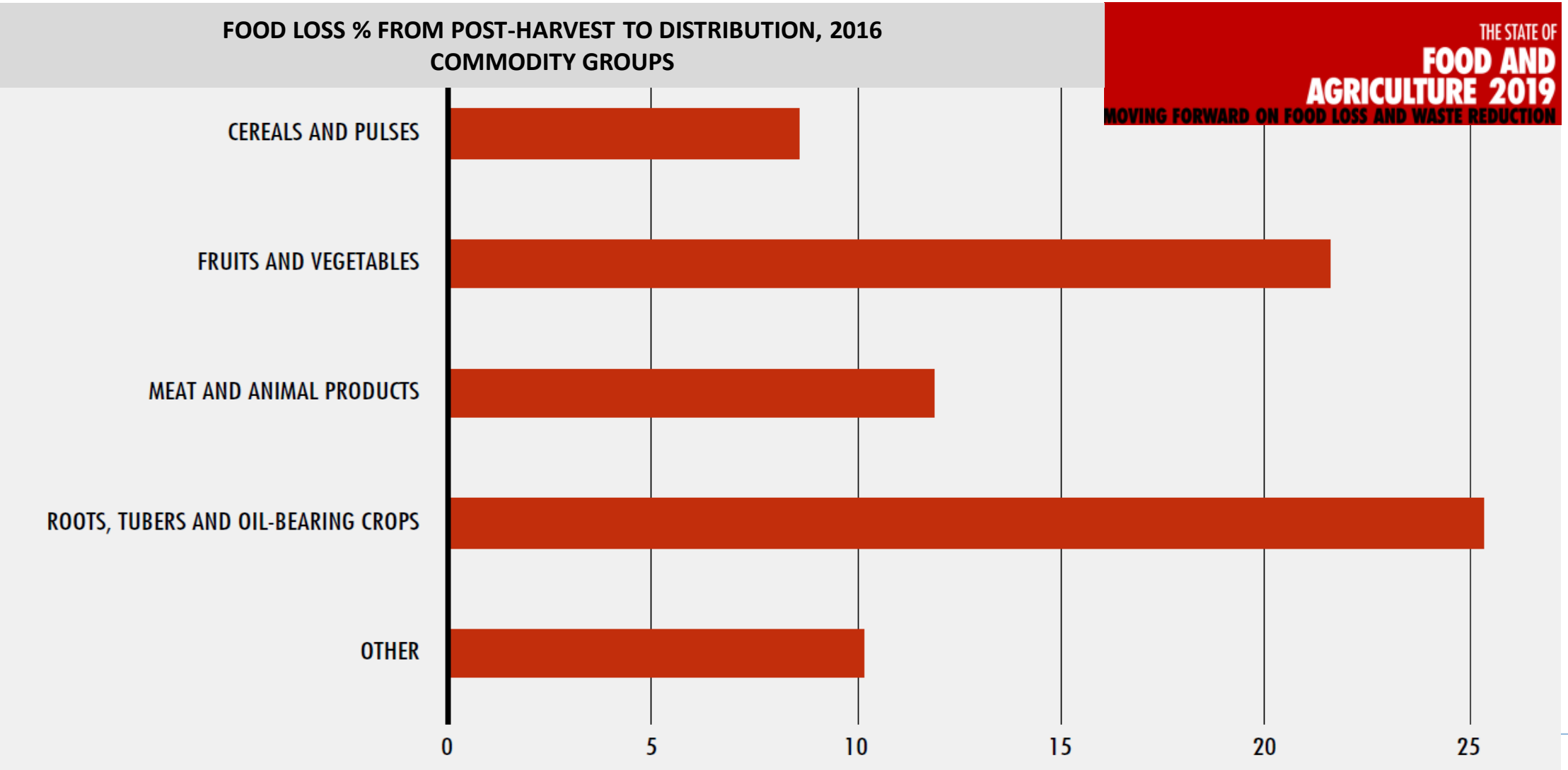
- w_i are the country weights equal to the total agricultural value of production

- **Aggregates** Country Food Loss Indices
- Weighted by economic **value of production** of the commodities

If no data is available:

- **Global Food Loss Model** estimates food losses for the countries
- These are placeholders and will be replaced once countries provide own **estimates**

PRELIMINARY ESTIMATES – GLOBAL FOOD LOSS MODEL



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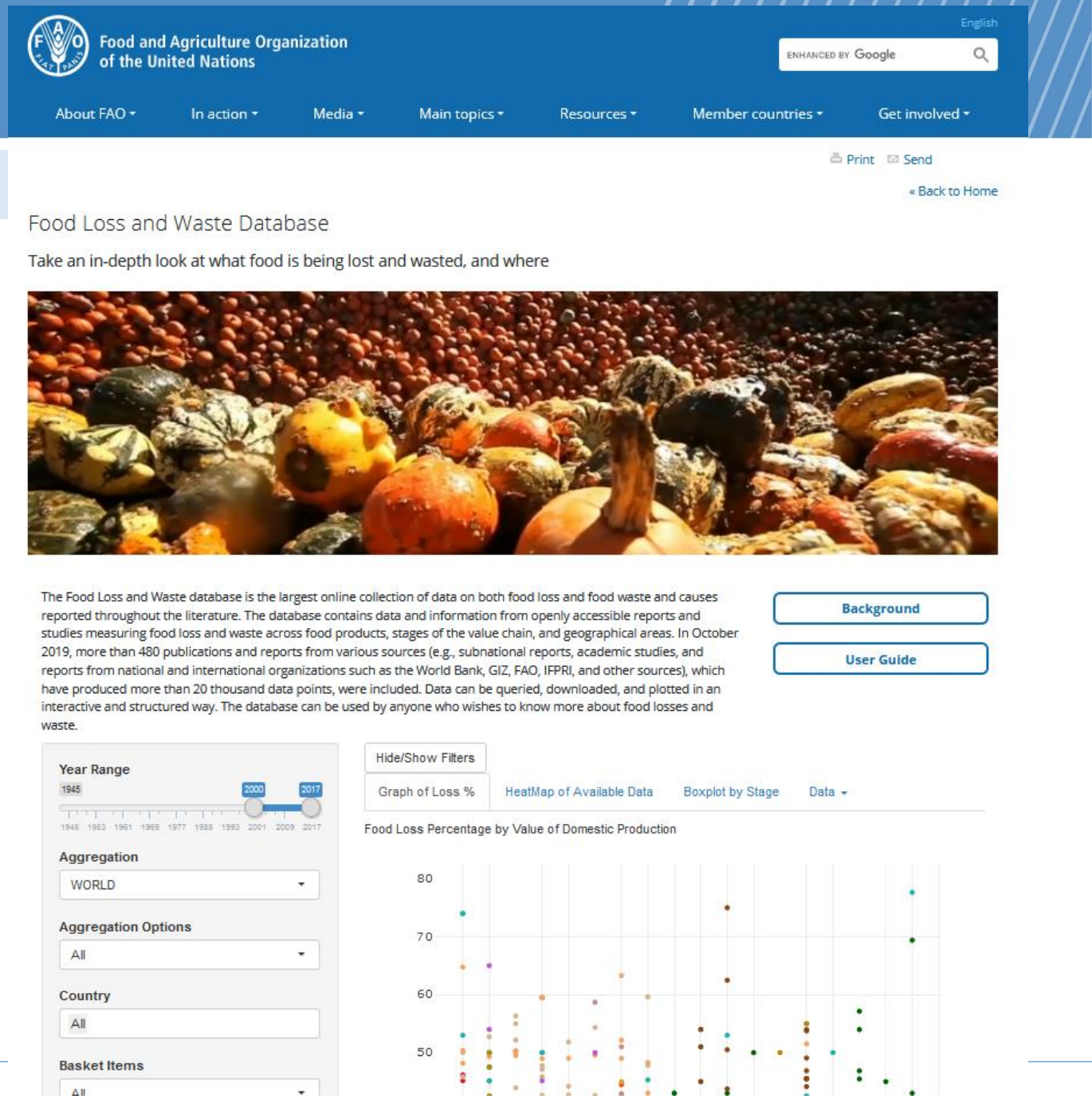
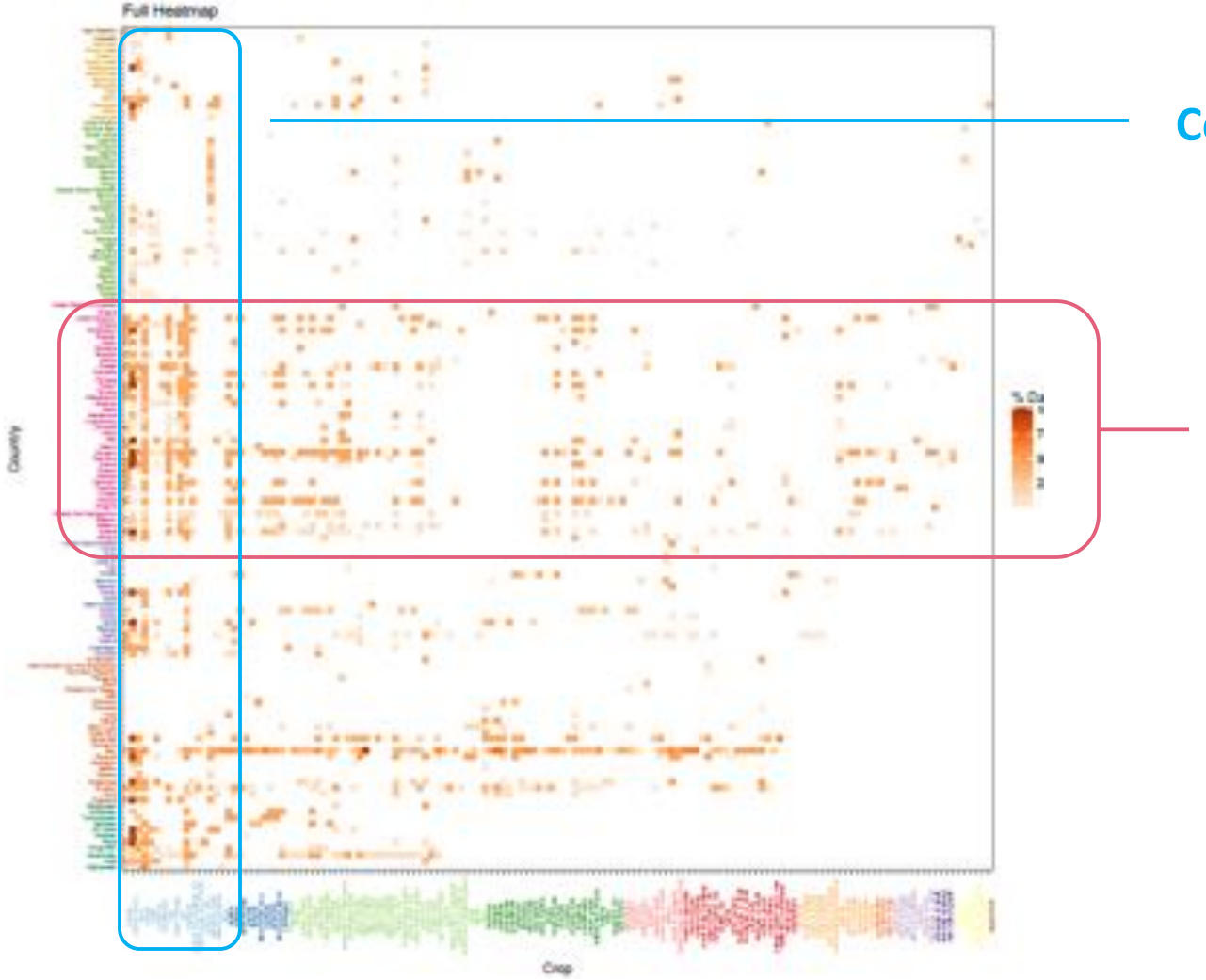
FOOD LOSS AND WASTE DATABASE

FAO generated a global Food Loss and Waste database:

- Largest online collection of data on both food loss and food waste reported throughout the literature
- Data and information from openly accessible reports/studies
- Approx. 20 thousand data points (in October 2019)
- Data can be queried, downloaded, and plotted in an interactive and structured way



FOOD LOSS DATA AVAILABILITY IN THE WORLD – A HEAT MAP



Cereals

Europe and North America

- Lack of information
- All kind of data sources (FBS, expert opinions, studies, surveys)
- Underestimation of food losses (FBS)
- No trend, no possible monitoring of improvements

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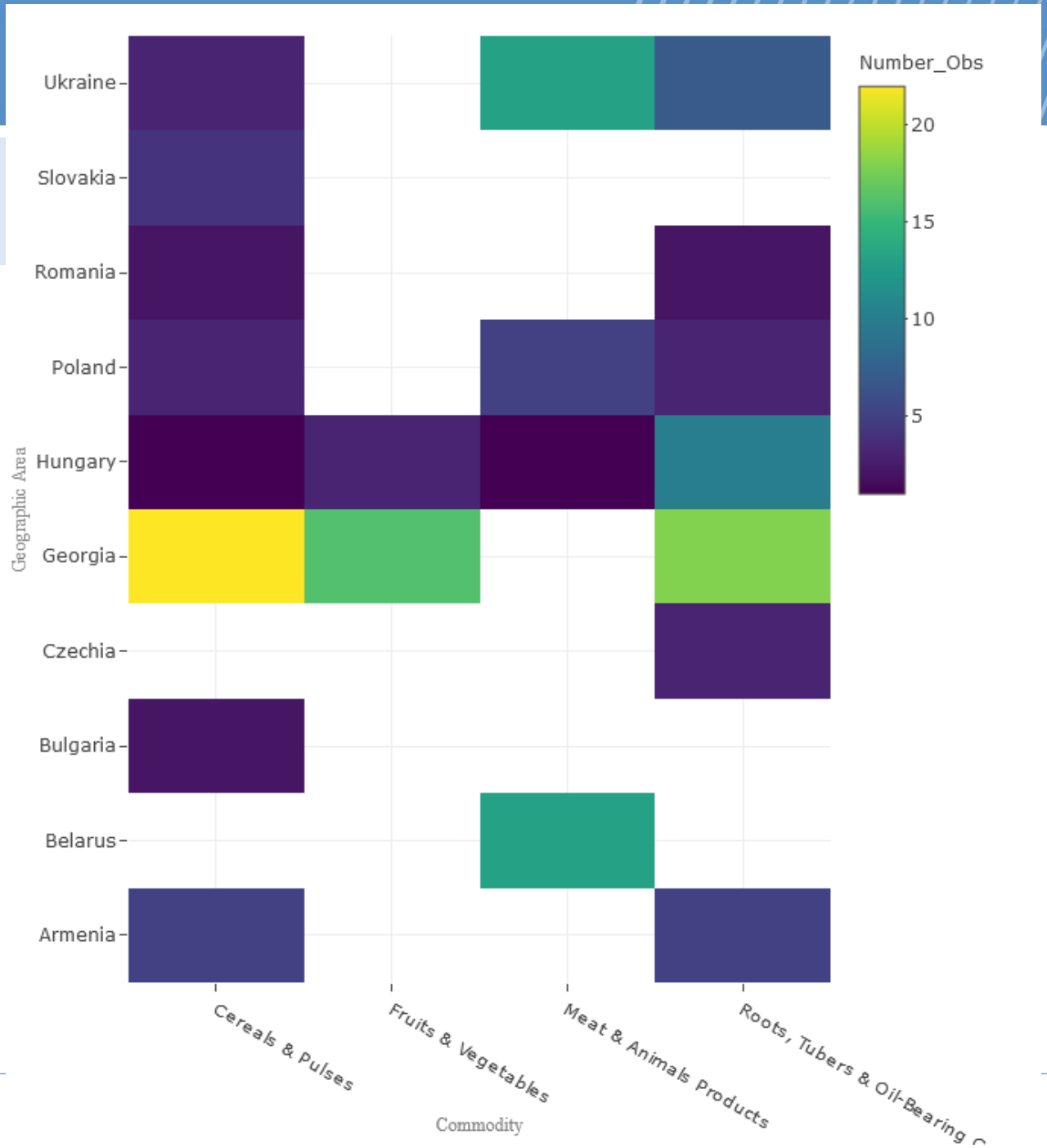
HEATMAP OF AVAILABLE DATA IN THE REU REGION

- Several commodity groups have no data within the region
- These blanks are then estimated using a Food Loss estimation model
- The objective in the SDG is to make sure that there are more commodities reported in the region by commodity group



DATA COLLECTION EFFORTS ARE KEY

Data collection efforts are key to obtain the country loss percentage *l_ijt.*

Which is the priority of FAO´s technical assistance to the countries.

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SDG 12.3.1 a

FAO work

TECHNICAL ASSISTANCE FROM FAO FOR COUNTRIES FOR SDG 12.3.1.a MONITORING AND REPORTING

Countries:

Technical assistance to countries on:

i) Design data collection strategies
ii) Design and implement data collection methods and instruments
iii) Data integration/validation/aggregation

Global:

FAO, as custodian, is providing:

i) The framework for international comparability, monitoring and reporting
ii) Methods to fill data gaps

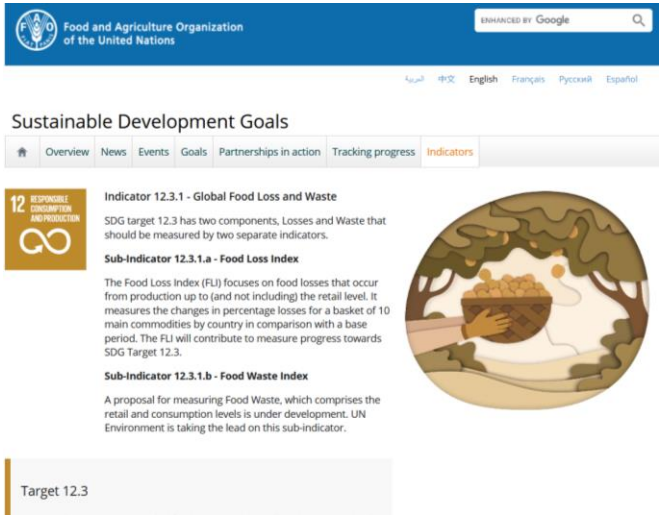
Technical support SDG 12.3.1.a:

- FL definitional and conceptual framework
- FAO Case study methodology for FL assessment
- Guidelines for Data Collection Strategy
- Data Collection Guidelines (Cereals, Fruits & Vegetables, Animal Products, Fish and Fish Products)
- Methodological innovations

- SDG 12.3.1a Methodology
- Food Loss and Waste data base
- SDG 12.3.1.a Reporting mechanism and instruments
- SDG 12.3.1.a Global, regional and country estimation model

MATERIALS AND LINKS

SDG 12.3.1 a website (all relevant materials)



http://www.fao.org/sustainable-development-goals/indicators/1231

Technical Platform on the Measurement and Reduction of FLW

http://www.fao.org/platform-food-loss-waste/en/

State of Food and Agriculture (SOFA) 2019 Food Loss and Waste

http://www.fao.org/publications/sofa/2019/en/

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Thank you very much!

Carola.Fabi@fao.org