SIAP Training Program for Supporting the Monitoring of Sustainable Development Goals (SDGs) 2030 in the Asia Pacific Region

SDG Indicators under FAO Custodianship

SDG 12.3.1.a – Food Loss Index

Goal 12: responsible consumption and production

Target 12.3: "By 2030 halve per capita global food waste at the retail and consumer level, and reduce food losses along production and supply chains including post-harvest losses"

Food Loss Index
Focuses on the *supply* side of the value chain, to improve its efficiency and **decrease food** losses

| | 12.3.1.a | Food Loss |

"...reduce **food losses** along **production and supply chains**, including post-harvest losses."

Food Waste Index
Focuses on the *demand* side of the value chain (retailers and consumers) to improve utilization of food and halve food waste

| | 12.3.1.b | Food Waste |

"...halve per capita **food waste** at the **retail** and **consumer levels**."

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SDG INDICATOR 12.3.1

- Target 12.3 separates the supply side of the food chain from the retail and consumption stages, and sets different objectives: a decrease of food losses and a 50% reduction of food waste.
- The measurement methods of loss and waste differ greatly and methodological development has taken two separate paths accordingly.
- FAO and UNEP recommend that the target be monitored with two separate **sub-indicators 12.3.1.a *Food Loss Index* and 12.3.1.b *Food Waste Index*** and that these be considered for up-grade separately. Proposal in line with the proposal for indicator refinement.
- Indicator 12.3.1.a presented here covers the first component of target 12.3 (supply-side of the food chain)
- **Indicator 12.3.1 –Food Loss Index:** m*easures **changes over time in the percentage of food production that it is lost up to the retail stage** at the country, regional and global levels.*

INTERNATIONAL DEFINITION OF FOOD LOSS

*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**.*

"Definitional Framework on Food Losses and Waste" developed in an inclusive consultative process over three years; Food Loss definition measurable and has been field tested.

- Boundaries between the Food Loss Index and the Food Waste set consistently with the SDG target formulation (supply side versus retail & consumption).

- Boundaries necessary for operational purposes to enable measurement along the whole food chain

- Boundaries consistent with the FAO's definition of agriculture production and Food Balance Sheets framework, the only global source of available official food loss data.
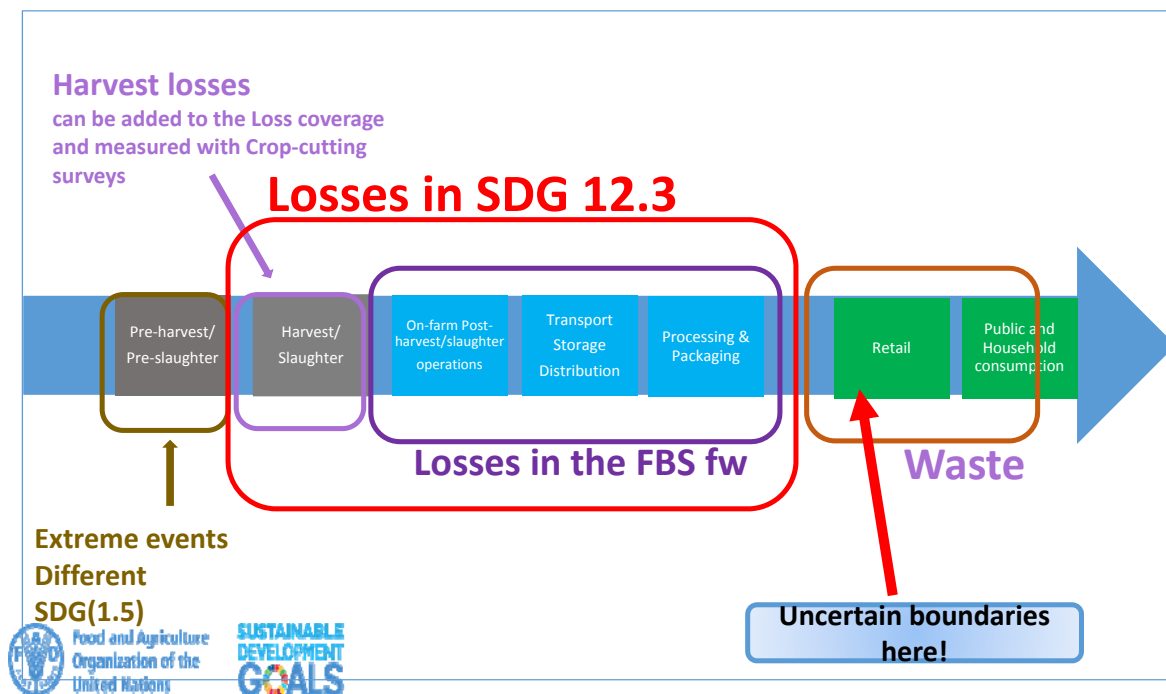
Challenge: Boundaries of the food supply chain in the operational definition of the FLI

THE FOOD LOSS INDEX METHODOLOGY

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

$$FLI_{it} = \frac{FLP_{it}}{FLP_{it_0}} * 100 = \frac{\sum_j l_{ijt}*(q_0*p_0)}{\sum_j l_{ijt=0}*(q_0*p_0)} * 100$$

- 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

The base year for SDG monitoring should ideally be 2015.

- The benchmark at country level can be based on the first survey period (variable year).
- A harmonized base period will have to be set to produce regional and global aggregates.
- The Food Loss Index can be compiled for all countries and aggregated into SDG regions using Loss data from the Food Balance Sheets (data for 60 countries for at least 1 commodity) and modelled estimates by FAO.

THE FOOD LOSS INDEX METHODOLOGY

- FLI covers the 2 key commodities (Central Product Classification - CPC Rev. 2.1 Ext.) for each of the 5 food groups (10 in total), selected on the basis of their share on total value of production.

  - Sustainable costs and efforts, data relevance

- At global level, losses are weighted with the commodity' value of production

  - They capture the key economic considerations (economic importance, inefficiencies of the food system that result in higher costs, input costs, ..)

  - National indexes can use different -policy related- criteria: e.g. Nutrition parameters or environmental footprints (GHG, water use)

Selecting the Basket of Commodities

- Setting a common basket of goods for global monitoring is a challenge:
  - the same commodities are not relevant for all countries
  - loss statistics cannot cover the entire basket
- Trade-off between relevance at country level and comparability across countries

Comparability	Relevance
Build the international basket under 5 headings: 1. Cereals & Pulses; 2. Fruits And Vegetables; 3. Roots, Tubers & Oil-Bearing Crops; 4. Animals products; Fish and fish products	Countries determine the two commodities in each heading Policy focus Economic relevance Food security relevance

Default Basket relevance

- Top 10 commodities within 5 big headings
- Cereals & Pulses
- Fruits & Vegetables,
- Roots & Tubers, Oil-Bearing
- Other Crops (Sugar, Stimulants, Spices),
- Animals Products & Fish and Fish Products.

- The default process is to:
  - Compile value of production for every commodity (in the base year)
  - Group commodities by category and rank them
  - Select the top 2

SELECTING THE BASKET OF COMMODITIES

	Top 15 World Commodities by Gross Production Value (2005, Int'l $)	Top 14 India Commodities by Gross Production Value (2005, Int'l $)
Cereals & Pulses	Wheat	Rice, Paddy
	Maize (Corn)	Wheat
Fruits & Vegetables	Asparagus	Mangoes, Mangosteens, Guavas
	Cabbages	Bananas
Other	Almonds, In Shell	Sugar Cane
	Chestnuts, In Shell	Anise, Badian, Fennel, Coriander
Roots, Tubers & Oil-Bearing Crops	Soya Beans	Potatoes
	Groundnuts, Excluding Shelled	Groundnuts, With Shell
Animals Products & Fish and fish products	Meat Of Cattle With The Bone, Fresh Or Chilled	Meat, Buffalo
	Meat Of Pig With The Bone, Fresh Or Chilled	Meat, Cattle

Selecting the Basket of commodities, nationally

- Countries can go beyond the top 10 or revise the basket
  - Keep international reporting to a minimum but focus on a larger number of supply chains if needed
  - Policy focus can shift
  - Over a 10 year period the highest value products under the Fruits and Vegetables category changed for 40% of countries.
  - Similar commodities (walnuts and pistachios; goats and sheep; etc) will likely be similar in perishability, but economic factors may trigger differences loss

Compiling the Weights

- Weights give each commodity its relative importance
- Fixed in the reference year: The index changes only if percentage losses change
- Several kinds of weights are possible

Choices of Weights

> Economic value – emphasis on losses that are market driven, bias towards higher valued commodities, commodity groupings adjust against bias; also useful for ascertaining benefits-costs of policy

Other Weights can be applied in parallel to show impact of changing losses on policies

- Contribution to diets (caloric or protein value) - bias towards meats and staples, no emphasis on fruits and vegetables which might need more resources to grow & transport, higher energy consumption
- Environmental factors (water or C02) – Bias against meats and fruits and vegetables and nuts, as well as production systems by country

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FOOD Loss INDEX (FLI) - Main principles and methodology

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

Indicator 12.3.1

- A Food Loss Percentage can be interpreted as the percentage of production that does not reach the retail stage.

Steps to compiling the Index if the data exists:

1. Select Basket of commodities and compile weights
2. Compile Food Loss Percentages
3. Compare Food Losses over time
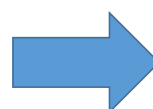
➡ Food Loss Index

Indicator 12.3.1 – Loss percentages

- Step 1: loss percentages of each commodity at country level

  - Percentage losses versus total losses

  - l_{ijt} is the loss percentage (estimated or observed)

  - Where: j = commodity, i = country, t = year

Step 2: Compile the **Food Loss Percentage (FLP)** of the whole basket of commodities at country level:

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

weights

- The FLP is composed of several commodities
- The FLP is the average loss of these commodities
- Not all commodities have the same importance - weights

Step 3 : Calculate the country **Food Loss Index**

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

- Where:
  - i = country, t = year
  - t_0 is the base year (set at 2015 for the SDG monitoring)
  - FLP_{it} is the country Food Loss Percentage
- The country FLI shows the change in the food loss percentage over time (compared to a base period)

INDICATOR 12.3.1 - GLOBAL FOOD LOSS INDEX (GFLI)

Countries' FLI must be aggregated for SDG monitoring by regions and for the world, which will be done as part of FAO's custodial role.
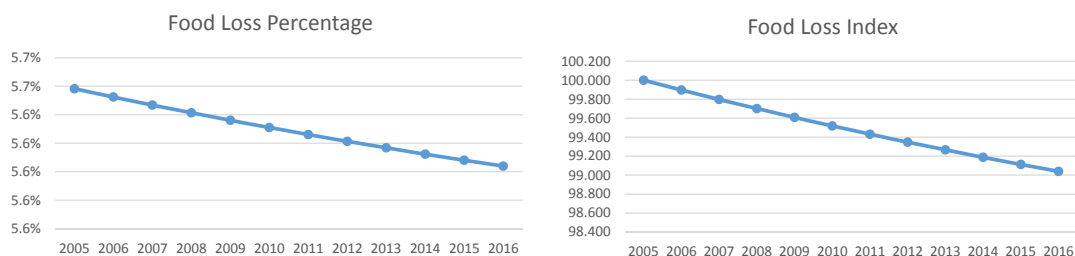
$$GFLI_t = \frac{\sum_{i=1}^{G} FLI_{it}*w_i}{\sum_{i=1}^{G} w_i} *100$$

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

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FLI - Monitoring trends

Food Loss Percentage

Food Loss Index

|											
FLP	**5.7%**	5.7%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%	5.6%
FLI	**100.0**	99.9	99.8	99.7	99.6	99.5	99.4	99.3	99.3	99.2	99.1	99.0

PILOT STUDIES

- FLI tested for all countries, but with high % of modelled-based data (FAO estimates)

- Several countries were contacted to pilot test the index with their own data (India, Russia, Turkey, Saudi Arabia, USA) but most of them eventually withdrew mainly because of the lack of reliable data.

- The Food Loss Index compilation was tested on India's data. India is the only country that has carried out two nation-wide sample surveys on food losses along the entire supply chain for 45 commodities.

NB. The main challenge is not in the calculation the FLI, rather the availability of loss factors along the various stages of the supply chain for the key food commodities.
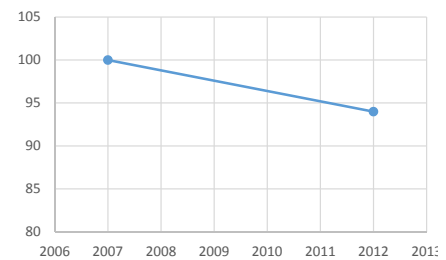
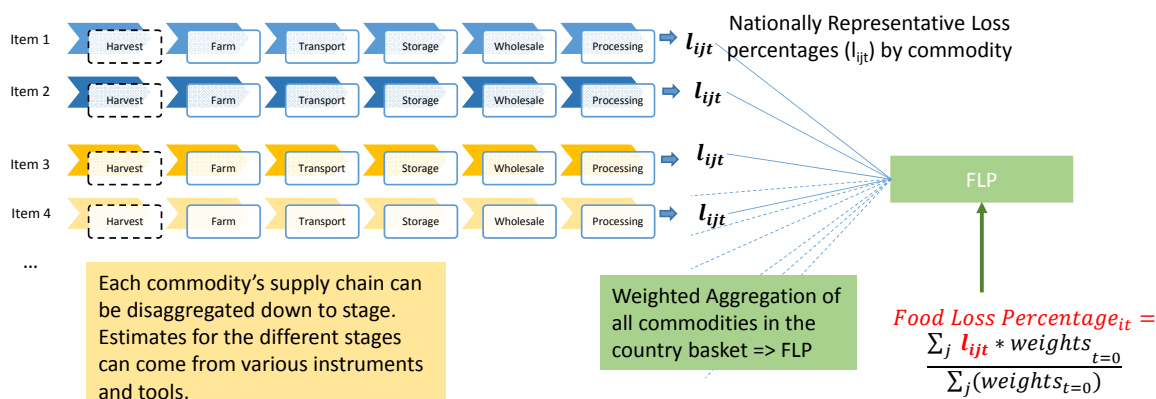Food Loss Index for India 2007-2012 (2007=100)

Addressing data gaps: guidelines for data collection

- The loss data collection and estimation methodology is described in a set of Guidelines for the Measurement of Harvest and Post-harvest Losses, that draw from an extensive review of the literature and best practices, field tests in countries, and final peer reviews.

- The Guidelines provide recommendations on the measurement of percentage losses for:

  - The various stages of the food supply chain: Farm, Transport, Storage, Processing, Packaging, Wholesale.

  - The main commodity groups: Grain & Pulses; Fruits & Vegetables; Animal products & Milk; Fish

  - The selection of the critical loss point (different across products ad countries) => value chain analysis

Nationally Representative Loss percentages (l_{ijt}) by commodity

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

$$Food\ Loss\ Percentage_{it} = \frac{\sum_j l_{ijt} * weights_{t=0}}{\sum_j (weights_{t=0})}$$

Recommended measurement tools by stage of the value chain

Stage	Recommendation

Farm	• Harvest losses - Crop-cutting surveys
	  o Different yield, different definition of production
	• Post-harvest losses – Sample surveys
	  o Relevant when there are very many small actors
	  o May cover on-farm storage, on farm transportation
	  o Can be complemented by experimental design or two-stage sampling c practices
	• Post-harvest losses – complete enumeration
	  o Large commercial farms that keep accounting records (few)

Storage	• Losses and quantities stored
	• Model or experimental design
	  o Inventory of storage facilities with their characteristics
	  o Controlled experiment of the various products, length and storage con
	• Administrative data
	  o Very large storage facilities
	  o Accurate accounts and records
	• Farm sample survey (on-farm storage)
	  o Smallholder farms (large population, small quantities)
	• Auxiliary data: Administrative data
	  o Weather at harvest
	  o Monthly Prices

Recommended measurement tools by stage of the value chain

Stage	Recommendation
Transport	• Losses and quantities: Sample survey of the trucks • Measuring a sample of product at destination
Wholesale	• Agreement with the private sector o Quantities sold through the market, discarded product • Sample or traders in the wholesale markets
Processing	• Agreement with the private sector o Companies accounting records o Complete enumeration or experimental design

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS

TESTING THE GUIDELINES

- Tested in 5 countries and implemented in 3, by NSOs &/or Ministries of Agriculture.
- Validation of the guidelines: harvest and postharvest losses can be measured and aggregated into a total PHL percentage.

Commodity Group	Test Country	Full Implementation
Grains and Pulses	Ghana MINAGRI & Malawi NSO	Malawi, Namibia, Zimbabwe
Fruits and Vegetables	Mexico INEGI	
Animal products	Zambia NSO	
Fish	Finland NRI (LUKE)	

- Test in Malawi and experience in India showed that farmer's declarations lead to systematic underestimation in comparison with objective measures (recommended).

Food and Agriculture Organization of the United Nations

SUSTAINABLE DEVELOPMENT GOALS
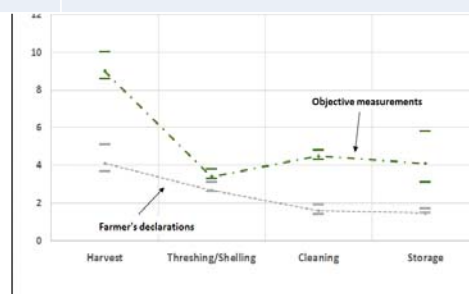
CONSULTATIONS: 17 EVENTS, 53 COUNTRIES

- Methodology presented to national official statisticians and experts, international experts and academia in <u>17 regional or international events since October 2016</u>

Formal consultations:

- FAO's external consultation on SDG indicator 12.3.1 in September 2017: **European Union**, Germany, India, Malaysia, Mexico, Trinidad and Tobago, USA, United Kingdom, Zimbabwe.

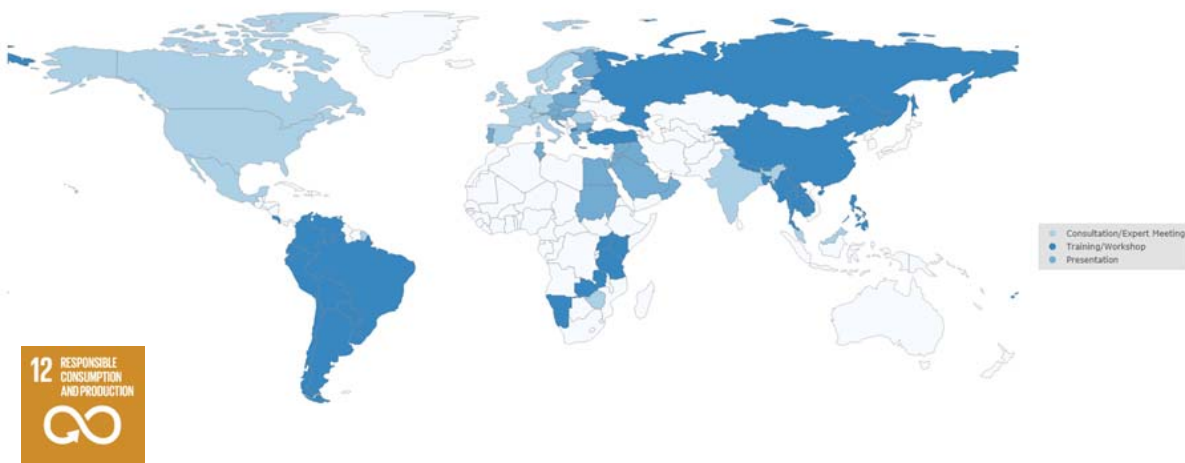- Webinar with the IAEG-SDG on 5 July 2018, in which FAO received feedback from Canada, Germany and India

Workshops on SDG 12.3 with in-depth discussions (53 countries and organizations)

- Argentina, **African Union**, Bolivia, Brazil, Burkina Faso, Canada, **CARICOM**, Chile, China, Colombia, Costa Rica, Ecuador, Egypt, **European Union**, Germany, India, Indonesia, Iraq, Italy, Jordan, Kyrgyzstan, Lao , FYR Macedonia, Malawi, Malaysia, Mauritius, Mexico, Myanmar, Namibia, Nepal, Norway, Oman, Palestine, Paraguay, Peru, Qatar, Russia, Samoa, Saudi Arabia, Sudan, Switzerland, Syria, Thailand, The Netherlands, Tunisia, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela, Zambia, and Zimbabwe.

Presentations to Regional Commissions on Agricultural Statistics (127 countries in AFCAS, APCAS, IICA) and international conferences (ICAE, ICAS-VII)

Data collection methods: Guidelines on the measurement of losses

Measuring l_{ijt} is at the core of the matter.

- Range of surveys and sample-based statistical tools
- To obtain nationally representative loss estimates in a cost-effective manner
- Grounded in the National Statistics Systems
- Drawn from 40 years of methodological literature and field practice

Grains
Published and tested

Fruits and Vegetables, Milk and Meat, Fish and products

Training material - eLearning

Training course on postharvest losses surveys for grains

Global Strategy
IMPROVING AGRICULTURAL & RURAL STATISTICS

Training Course on Post-Harvest Losses – English

This material for in-classroom training on the measurement of harvest and post-harvest losses for food grain targets decision makers, survey managers, questionnaire designers, trainers of field staff and data analysts interested or involved in the measurement of food losses.

Training course on SDG 12.3.1
Global Food Loss Index: in progress

Capacity development

Country	SIAP Workshop October - participants
Bhutan	Ms Manisha Subba and Mr Jamyang Kuenzang, Ministry of Agriculture and Forests
Laos	Ms Kok Phommachanh and Mr Sypaseut Navongsa, Lao Bureau of Statistics
Malaysia	Ms Nur Khairu*nniz*a Binti Harun and Mr W Mohd Shahrulnizam Bin W Mohd Najuri, Department of Statistics
Samoa	Ms Siata Teu Ulu, Samoa Bureau of Statistics
Thailand	Ms Busaya Pinsuwan, Office of Agricultural Economics

THANK YOU

For more detailed information on Indicators 12.3.1 please see:

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

SDG INDICATOR 12.3.1.A - CHALLENGES

Lack of shared and internationally agreed concepts and definitions

Lack of international guidelines on how to define and collect postharvest losses and waste data

Reliable nationally representative data on losses are generally not available (4.4% official data reported yearly in FAOSTAT)
- Mainly case studies based on expert opinions focused on few products or stages of the value chain

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

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SDG 12.3.1 GLOBAL FOOD INDEX

BUILDING THE INDEX

FLI - UNDERLYING DATA: COMPILING THE FOOD LOSS INDEX

$$Food\ Loss\ Index\ (year\ t)\ =\ \frac{Food\ Loss\ Percentage_i(year\ t)}{Food\ Loss\ Percentage_i\ (Baseline\ year)} * 100$$