

1 INTRODUCTION

This Model Guidance accompanies the IFC Food Loss Impact Tool version 3.

The first part of the guidance highlights the main updates done to the tool compared to the previous version.

The second part of this guidance outlines the steps the user should take in order to calculate the Food Loss and Greenhouse Gas (GHG) emissions associated with an investment project aimed at reducing losses along the food value chain. This first part refers exclusively to the Interface tab of the tool. When more than one project is indicated in the Interface tab, the tool calculates the impact results of each project separately in terms of avoided food loss quantities and corresponding avoided emissions.

The last part of the guidance explains the outputs of the tool, located in the tab Impact Results. The main output is a breakdown of avoided food losses and avoided total emissions broken down by each stage of the value chain. Other outputs include indicators related to the avoided food loss.

Please note: to function correctly, the tool requires the user to enable Macros and ActiveX

2 SUMMARY OF CHANGES FROM PREVIOUS VERSION

Version 3 of the IFC Food loss Impact Tool includes 4 major updates:

- Addition of 43 new countries: Algeria, Armenia, Australia, Azerbaijan, Canada, Georgia, Iceland, Japan, Moldova, New Zealand, Norway, Switzerland, Tunisia, and Turkmenistan, UK, USA and 27 EU countries. This brings the total number of countries covered by the tool to 160.
- Addition of 30 new commodities, bringing the total number of commodities to 80:
 - Aquaculture: Tuna, Salmon, Shrimp, Tilapia, Catfish
 - Oils: cotton seed oil, sunflower oil, olive oil, palm oil
 - Animal Protein / Dairy products: yogurt, cheese, butter
 - Fruits & Vegetables: blueberries, raspberries, strawberries, watermelons, litchi, pears, cherries, mandarins, cucumbers, sweet peppers, onions (fresh), asparagus, broccoli, spinach.
 - Nuts & Seeds: coconuts, walnuts, hazelnuts, pistachios
- Multi-country supply chain functionality, allowing to calculate avoided emissions for transport stages between different countries within a supply chain enabling users to account for imports/export losses.

- Addition of non-climate impact indicators, related to food security, avoided water use and water country risk profiles, avoided land use and biodiversity country risk profiles, as well as avoided nitrogen and fuel use.

3 INTERFACE

3.1 Section 1 - General information

This section covers the basic user inputs required by the IFC Food Loss Tool to produce a first level estimate for GHG emissions and other impacts associated with food loss savings. Some user inputs covered in this section are mandatory, while others are optional or automatically calculated by the tool.

The mandatory inputs cells in the Interface tab are indicated with an asterisk and light blue color. Cells for optional inputs are indicated in a yellow color:

Color key	Cell Type	Description/Action
Mandatory information	Input cell	Manual entry required
Optional information	Input cell	Manual entry optional
Non-editable Cell	Non-editable cell	Non-editable cell

Figure 1: Color key

For simplicity, all snapshots included in this section are related to the production value chain stage, but information on the functionalities and user inputs can be applied for all other stages covered by the tool. Additional user inputs that can be provided to improve the estimates provided are described in section 3.2.

3.1.1 Clear and reset data

The *Reset Data* button clears all user inputs (including advanced user inputs) provided within the tool. The functionality can be used every time the user wants to restart the analysis from scratch.

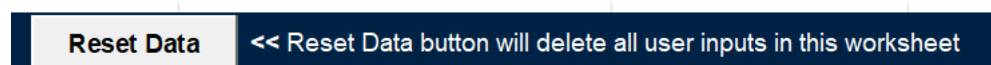


Figure 2: Reset data

3.1.2 Supply chain description, countries and commodity

In the Interface tab, the user must indicate whether the supply chain happens in one single country or in multiple countries:

- If the value chain happens in one country only: the user should specify “No” to the question “Do the supply chain stages happen in more than one country?*” and select the relevant country in the row below.

Do the supply chain stages happen in more than one country?*

No

Country of improvement intervention(s)*

South Africa

Figure 3: Single-country value chain

The user must then provide the appropriate commodity from the drop-down list.

Commodity*

Avocados

Production Type (*animal protein only*)*

Figure 4: Information on the commodity (non-animal protein)

For animal proteins only, an additional input on production type is required from the drop-down list. The Production type cannot be left blank, or else the results will not show up properly.

Commodity*	Cheese
Production Type (<i>animal protein only</i>)*	Aggregated (if type unknown) Grassland (mostly extensive grazing) Mixed (grazing and grains)

Figure 5: Information on the commodity and Production type (animal protein)

- If the value chain happens in several country: the user should select “Yes” to the question “Do the supply chain stages happen in more than one country?*”, and indicates the countries in the blue cells of the table below:

Supply Chain Stages	Country* (please indicate the country when known for each stage below)
Production (post-harvest)	Brazil
Transport 1	<i>Brazil</i>
Storage 1 (pre-processing)	
Transport 2	<i>Netherlands</i>
Processing	
Transport 3	<i>Netherlands</i>
Storage 2 (pre-retail)	
Transport 4	<i>Netherlands</i>
Retail	Netherlands

Figure 6: Multi-country value chain

When the user leaves a country cell blank, the tool assumes the following:

- For supply chain stages up until and including Storage 1, the country corresponds to one of the closest upstream stage
- For supply chain stages beyond Storage 1, the country corresponds to the one of the closest downstream stage.

The tool automatically indicates in the white cells the country corresponding to that stage following the logic above, unless the user indicates otherwise in the blue cells.

In the example in Figure 6 above, the country for Transport 1 and Storage 1 is assumed to be Brazil, and the country for Processing and Storage 2 is assumed to be the Netherlands. When known, it is strongly encouraged to indicate the country for each of the supply chain stage.

After indicating the countries, the user must then provide the appropriate commodity from the drop-down list. For animal proteins only, an additional input on production type is required.

Every time the user changes the answer to the question “Do the supply chain stages happen in more than one country?*” from “Yes” to “No” and vice-versa, the tool automatically resets all the values.

3.1.3 Post-improvement details

This section includes the key inputs that are needed by the tool to calculate food loss savings and emissions.

For each supply chain stage where there is an intervention, the user is required to provide the weight in tonnes.¹ This value refers to the typical amount produced, transported, stored, etc. after the improvement measure(s) under exam have been implemented.

Next, the user must provide the food loss rate observed after the improvements are implemented. The value must be reported as the percentage of food losses over the total amount. Both the quantity and the food loss rate after the improvements are required for the results to be calculated.

Similarly, the user should also provide the food loss rate observed before the improvements had been implemented, in order to calculate the food loss savings achieved (column in yellow in Figure 6 below). If this data is not available, the tool uses a default food loss rate based on food loss rates reported by the scientific literature and other food loss database (for more details see IFC Food Loss Tool Methodology).²

Supply Chain Stages	Country* (please indicate the country when known for each stage below)	Commodity amount after the improvement project (tonnes)*	Food loss rate before the project (%)	Food loss rate after the project (%)*
Production (post-harvest)	Brazil			
Transport 1	<i>Brazil</i>			
Storage 1 (pre-processing)				
Transport 2	<i>Netherlands</i>			
Processing				
Transport 3	<i>Netherlands</i>			
Storage 2 (pre-retail)				
Transport 4	<i>Netherlands</i>			
Retail	Netherlands	1000.00	3.0%	1.0%

Figure 7: Post-improvement details

¹ For milk, the tool assumes a one-to-one relationship between litres and kilos.

² For cotton, eggs, and flour the food loss rate before the project is mandatory as no reliable data on these commodities is available.

The user must also specify whether the amount(s) is reported as net of food losses (i.e., excluding food losses) or as gross (i.e., including food losses) in the cell C32 represented below.³

In cell range D21-D28, have the food loss quantities been subtracted from the reported commodity amount?*

Yes

Figure 8: Net or Gross Commodity amount

3.1.4 Improvement details

Next to the food loss rates, the tool provides a list of improvements that could be implemented to increase efficiency and/or reduce food losses, see the blue box in figure 9 below. Two sets of lists are provided depending on whether the user selects a crop or animal protein. The lists are not to be considered as a comprehensive enumeration but rather as an example of some the improvements that may be made across the supply chain. This section does not feed into any of the calculations and is therefore classified as optional.

Supply Chain Stages	Country (please indicate the country when known for each stage below)	Commodity amount after the improvement project (tonnes)*	Food loss rate before the project (%)	Food loss rate after the project (%)*	Select main improvement (crops-only)	Select main improvement (animal protein-only)	Other improvements
Production (post-harvest)	Brazil				drop-down	drop-down	
Transport 1	Brazil				drop-down	drop-down	
Storage 1 (pre-processing)					drop-down	drop-down	
Transport 2	Netherlands				drop-down	drop-down	
Processing					drop-down	drop-down	
Transport 3	Netherlands				drop-down	drop-down	
Storage 2 (pre-retail)					drop-down	drop-down	
Transport 4	Netherlands				drop-down	drop-down	
Retail	Netherlands	1000.00	3.0%	1.0%	Humidity control	drop-down	

Figure 9: Improvement details

³ Consider the case in which User A knows that, out of 100 tonnes produced at the production, 10 tonnes are lost during harvest, therefore resulting in 90 tonnes of clean product. In this case the user can either report 100 tonnes and select the “No” option to indicate that this refers to the gross amount, or report 90 tonnes and select the “Yes” option to indicate that this refers to the net amount.

3.1.5 Commodity price

The price of the commodity is an optional input that can be provided to measure the financial savings associated with a reduction in food losses.

Commodity Price (*optional*)

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 USD/t

Figure 10: Commodity price

3.2 Section 2 - Advanced User Inputs

This section includes all the optional inputs that can be provided by the user to improve the accuracy of the results by providing additional information.

3.2.1 Advanced Post-harvest Production details

At the production stage, the user can provide information on either: A) the emission factor associated with the production of the commodity (and the percentage of emissions coming from CH₄ or N₂O emissions); or B) the amount of synthetic nitrogen used during production (non-animal protein commodities only).

The former must include an equivalent scope of emissions as the default data (e.g. fertilizer manufacturing, fertilizer application, production fuel and crop residue treatment). Note that any values in the project-specific Nitrogen or yield boxes will be ignored if this option is used.

The latter is only available for crops and it is not visible for animal proteins. If the user knows how much synthetic fertilizer is used during the production and its composition this can be used as input here. Firstly, the user should input the Nitrogen amount contained within the fertilizer measured in kilograms (rather than the total amount of synthetic fertilizer used). Next, the user may select from a drop-down menu whether the amount of Nitrogen in the previous cell is per hectare or per tonne of production. Lastly, the user may input the crop yield as tonne per hectare.

For example, if 100kg of synthetic fertilizer is applied with the composition: 25:20:10, then the input would be 25kg of nitrogen. It is normally expected that either both are left blank or both are populated. If only one value is provided, the tool calculates the corresponding value for the other input based on the scientific literature available on the relationship between nitrogen and yield.

A) Emission factor

Emissions per tonne

% of CO₂e coming from CH₄

% of CO₂e coming from N₂O

1.300
0.21%
99.79%

 tCO₂e/tonne

B) Synthetic Fertilizer

Nitrogen applied as synthetic fertilizer	16.23	kg per year
Unit of measurement for nitrogen	<i>kg of Nitrogen per tonne of production (kg N/tonne)</i>	
Yield per year	13.11	tonnes/hectare

Figure 11: Advanced Post-harvest Production details

3.2.2 Advanced Storage (pre- and post-processing) details

At the storage stage, the user can provide information on either: A) the emission factor associated with the storage of the commodity; or B) details on temperature control; or C) additional information for the time in storage and associated energy consumption. The tool provides the default values used in the calculations in the absence of user inputs. These can be changed by simply populating the cells with a new input by typing a new value in the corresponding cell.

A) Emission factor

Emissions per tonne	0.0055	tCO ₂ e/tonne commodity
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B) Temperature control

Is any dedicated storage temperature controlled (chilled)?	No
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C) Storage time and energy consumption

Time in Storage	5	days
Electricity consumption	1.8670	kWh/day/tonne
Natural gas consumption	2.4027	kWh/day/tonne

Figure 12: Advanced Storage (pre- and post-processing) details

3.2.3 Advanced Processing details

At the processing stage, the user can provide information on either: A) the emission factor associated with the processing of the commodity; or B) additional information on the energy consumption associated with processing activities.

A) Emission factor

Emissions per tonne

0.0940	<i>tCO₂e/tonne commodity</i>
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B) Energy consumption

Electricity consumption

0.1945	<i>kWh/tonne</i>
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Natural gas consumption

0.1331	<i>kWh/tonne</i>
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Figure 13: Advanced Processing details**3.2.4 Advanced Retail details**

At the retail stage, the user can provide information on either: A) the emission factor associated with the retail activities associated with the commodity; or B) additional information on the store type.

A) Emission factor

Emissions per tonne

0.0352	<i>tCO₂e/tonne commodity</i>
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B) Store type

Store type

<i>Superstore (1400 to 5000 m²)</i>
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Figure 14: Advanced Retail details**3.2.5 Advanced Food loss destination details**

In the Food loss destination section, the user can provide information on the percentage of food losses going to landfill (excluding losses used as animal feed or composting) for each process stage where there is a intervention (excluding transport stages) and either: A) the emission factor associated with a tonne of commodity going to landfill; or B) details on the food loss destination and climate zone. The tool provides the default values used in the calculations in the absence of user inputs⁴. These can be changed by using the drop-down lists provided.

⁴ Regarding the food loss destination type, the default value varies by country depending on the proportion of waste going to each treatment type specific to this country (or region when country-specific data is not available), extracted from the World Bank What a Waste Global Database.

	Food losses going to landfill or thrown away along the supply chain (%)	A) Emission factor Emissions per tonne of commodity going to landfill	B) Food loss destination and climate	
			Food Loss destination type	Climate Zone
Production (post-harvest)				
Transport 1				
Storage 1 (pre-processing)				
Transport 2				
Processing				
Transport 3				
Storage 2 (pre-retail)				
Transport 4				
Retail	57%	0.0277 <i>tCO₂e/tonne commodity</i>		<i>Temperate, wet</i>

Figure 15: Advanced Landfill details

3.2.6 Advanced Transport details

For each transport stage, the user can provide information on the distance travelled by the commodity and either: A) the emission factor associated with transport-related activities (either in terms of CO₂ emissions per tonne.km or fuel efficiency of the fleet); or B) additional details on the transport mode and conditions.

When the value chain includes only one country, then only the “Within Origin Country” sub-stage is available for the user to provide advanced details. When the supply chain covers several countries, then the user may input advanced details in the 3 sub-stages of each transport stage, i.e., Within origin country, Between origin and destination countries, and Within destination country.

The tool provides the default values used in the calculations in the absence of user inputs. These can be changed by simply populating the cells with a new input by typing a new value in the corresponding cell or using the drop-down lists provided.

When inputting data on B) Transportation mode, all the fields must be updated (transport mode, Fuel type, Category, Temperature control, Road Conditions).

Origin 	Country	Supply Chain Stages	
	Destination 		
		Storage 1 (pre-processing)	
		Processing	
	Within origin country	Between countries	Within destination country
Distance (km)	183	10 110	88
A) Emission factor			
Emissions factor type	<i>Trip emissions (kg CO2e/tonne.km)</i>	<i>Trip emissions (kg CO2e/tonne.km)</i>	<i>Trip emissions (kg CO2e/tonne.km)</i>
Emissions factor value	0.12	0.02	0.12
B) Transportation mode			
Transport mode	<i>Truck</i>	<i>Ship</i>	<i>Truck</i>
Fuel type	<i>Diesel</i>	<i>Not applicable</i>	<i>Diesel</i>
Category	<i>Average (all trucks)</i>	<i>General cargo (average)</i>	<i>Average (all trucks)</i>
Temperature control	<i>No</i>	<i>No</i>	<i>No</i>
Road conditions	<i>Fair</i>	<i>Not applicable</i>	<i>Excellent</i>

Figure 16: Advanced transport details

4 IMPACT RESULTS

In the tab Impact Results, the tool provides the avoided food loss quantities and associated avoided GHG emissions. This tab also include additional indicators for context and support in decision making related to the avoided food losses and GHG emissions. These indicators do not feed into any of the GHG emissions results.

4.1 Results

Once all these inputs have been entered in the interface, the tool calculates the food losses and emissions avoided by the improvement for all supply chain stages for which the user has indicated an intervention project. The first column shows avoided food losses. To the right, the improvement is calculated as the percentage improvement between the ex-ante and ex-post loss rates.

After, the tool provides a summary with the breakdown of GHG emissions saved by the improvement. The values are reported for carbon dioxide, methane, and nitrous dioxide. All emissions data is reported in tCO₂e.

Finally, the last column explains how the food loss was estimated by the tool. The information reported depends on user inputs and data sources used in the calculation, and in particular:

- Which data source was used to estimate the amount of food losses saved (user input, FAO Food Loss database), and the level of granularity used (country/region and commodity/commodity group).
- If the ex-post loss rate is higher than the ex-ante loss rate, then amount of waste saved is reported as zero and a warning message is produced asking the user to provide a valid estimate.

	Country	Avoided food losses at each intervention stage (tonnes)	Food loss rate reduction (%)	Total GhG emissions saved (tCO ₂ e)	Total emissions disaggregated by GHG (tCO ₂ e)			Additional comments:
					Carbon Dioxide (CO ₂) Emissions saved	Methane (CH ₄) Emissions saved	Nitrous Oxide (N ₂ O) emissions saved	
Production (post-harvest)	Brazil							
Transport 1	Brazil to Brazil							
Storage 1 (pre-processing)	Brazil							
Transport 2	Brazil to Netherlands							
Processing	Netherlands							
Transport 3	Netherlands to Netherlands							
Storage 2 (pre-retail)	Netherlands							
Transport 4	Netherlands to Netherlands							
Retail	Netherlands	20.83	66.67%	35.28	7.88	0.39	27.02	The results above are calculated using food loss rates reported by the user.
Total		20.83		35.28	7.88	0.39	27.02	

Figure 17: Results table

The section below the results table reports the total amount of financial savings associated with the improvement (if the commodity price has been provided in section 1), the total equivalent land area saved (assuming that the increase in net product available due to the reduction in food losses would translate into less land needed to be cultivated) and the total avoided emissions from landfill.

Cumulative financial savings	\$ -	USD
Cumulative avoided emissions from landfill (tCO ₂ e)	0.33	tCO ₂ e

Figure 18: Additional results

4.2 Food security impacts and indicators

These indicators allow the user to understand:

1. how many people could have their (caloric) energy and protein needs met through the total avoided food loss from the intervention projects

Indicator - Number of people fed equivalent per day

The quantity of avoided food losses corresponds to the following number of people with their energy needs met:

Population group	Type	Number of people fed equivalent per day
Adult	Calories	12 392

Indicator - Number of people with their protein needs met per day

The quantity of avoided food losses corresponds to the following number of people with their protein needs met:

Population group	Type	Number of people with their protein needs met per day
Adult	Protein	6 248

Figure 19: Indicators on number of people per day having their caloric and protein needs met based on the avoided food loss quantities

Regarding the energy and protein needs, the tool assumes the default caloric requirements of 2000 kcal/person/day (minimum requirements) and the default protein requirement of 50 g/person/day. To better tailor to their target group, the user may over-ride these default values with their own in the Advanced Inputs option in the yellow cells:

Enter specific caloric and / or protein requirement to over-ride default data

Caloric requirement	1800	kcal/person/day
Protein requirement	40	g/person/day

Figure 20: Advanced inputs for caloric and protein needs

This will automatically adjust the number of people fed equivalent and the number of people that have their protein needs met.

2. the population at risk of hunger in the commodity's production country and in the export country

	Country	% Population at risk of hunger
Country of Production	Brazil	2.04%
Assumed country of Export	Netherlands	0.00%
If the country of export is not the one listed above, please select the relevant country using the drop-down to the right:		

Figure 21: Indicator on percentage of population at risk of hunger

The user has the option to look up other countries using the drop-down in the yellow cell.

4.3 Avoided water consumption and Water risk profile of the production country

The first indicator in this section shows the water consumption saved at production stage (in the production country) for the specific commodity based on the total avoided food losses from all intervention projects indicated in the interface. This water footprint considers green, blue and grey water.

The second set of indicators show the water risk profile of the country of production. It is split between physical, regulatory and reputational risks. This water risk profile is based on the WWF Risk Filter Suite version 2.0.⁵ Each risk is given a risk score (Very Low to very high risk) and a country ranking (based on the risk score, where rank 1 represents the country or territory of least risk).

Those 2 sets of indicators rely on the information filled in by the user in the interface and do not require additional inputs.

4.4 Avoided land use and Biodiversity risk profile of the production country

This section includes 2 indicators. One is the avoided land use in the production country resulting from the avoided food loss. This indicator is in hectares and is available for crops only.

The second indicator is the biodiversity risk profile of the country of production. It covers Biodiversity Physical and Reputational risks. Similarly to the water risk profile, it is based on the WWF Risk Filter Suite version 2.0. Each risk is given a risk score (Very Low to very high risk) and a country ranking (based on the risk score, where rank 1 represents the country or territory of least risk).

Those 2 sets of indicators rely on the information filled in by the user in the interface and do not require additional inputs.

4.5 Land, fertilizer and fuel use indicators

The next section in the Impact Results tab shows two indicators on resources saved from the total avoided food losses:

- Avoided nitrogen use, in kg of Nitrogen (for crop commodity only)
- Avoided fuel use from transport, in equivalent liters of diesel. When the user selected 'Tuna' as a commodity, the additional avoided fuel from fishing are also added to the value.

Those indicators rely on the information filled in by the user in the interface (accounting for any Advanced inputs in the Interface as well) and do not require additional inputs.

⁵ WWF (2024) WWF Risk Filter Suite version 2.0. <https://riskfilter.org/>

4.6 Orphaned losses and emissions - additional upstream avoided food loss and emissions

This indicator provides the orphaned cumulative upstream avoided food loss quantities and emissions from a specific interventions. It account for the fact that losses occur between each supply chain stages and also that part of these losses end up in landfill. Consequently, for any given volume of commodity, a greater quantity of this commodity is produced upstream to obtain this specific volume.

E.g. A consumer buys 1kg of tomatoes at the supermarket. Because of the losses in the upstream stages from harvesting to retail, it corresponds in reality to 1.5kg of tomatoes produced at the farm. In this example, for each kg of tomato purchased at the supermarket, there is an additional 0.5kg of tomato needed produced on farm.

This logic applies as well for avoided food losses: for every kg of avoided food loss, it corresponds in reality to greater avoided quantities in the upstream stages based on the percentage loss rate between each supply chain stage, i.e. orphaned losses and emissions.

These additional avoided losses in the upstream supply chain stages, i.e. the orphaned losses, are captured in the last table of the Impact Results tab, along with their associated emissions.

This indicator relies on the information filled in by the user in the interface and do not require additional inputs.