LOVE FOOD REDUCE WASTE

Training of trainers
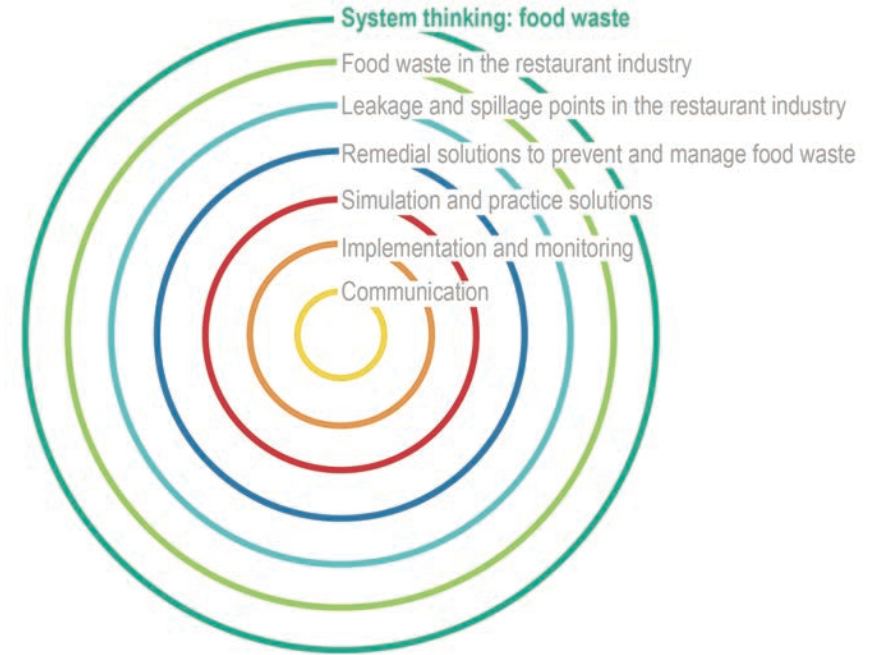Module n.3

11/02/2019

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University of Gastronomic Sciences
Università degli Studi
di Scienze Gastronomiche

System thinking: food waste
Food waste in the restaurant industry
Leakage and spillage points in the restaurant industry
Remedial solutions to prevent and manage food waste
Simulation and practice solutions
Implementation and monitoring
Communication

3. THE FOOD SYSTEM AND THE FOOD WASTE DILEMMA
(1 45 m) (N. Tecco)

1. Food and the food system
2. Major challenges of the world food system and SDGs
3. Figures, fact and definition (wastage, food loss, food waste)
4. Focus on EU context
5. Food waste: a error into the system & a system error
6. Systemic thinking (elements of the system approach applied into the food system)

1.Food and the food system
2. Major challenges of the world food system and SDGs

Eating is an Agricultural Act

...and the way we eat determines considerably how the world is used (Wendell Berry, 2015)

The food we eat and **how we produce** it will determine the health of **people** and **planet**, and major changes must be made to avoid both reduced life expectancy and continued environmental degradation
THE LANCET, JANUARY 2019 Food in the Anthropocene: the EAT –Lancet Commission on healthy diets from sustainable food systems

Every year around the globe 1.3 billion tonnes of food is **lost or wasted** throughout the agrifood supply chain
This equates to 1/3 of all food produced for human consumption (FAO, 2011)

88 million tonnes of food are wasted annually in the EU (estimate for 2012, FUSION data)
Modelling suggests if nothing is done, food waste could rise to over 120 million tonnes by 2020

The food resources being lost and wasted in Europe **would be enough to feed all the hungry people in the world two times over** ([European Commission 2015](#))

"Once our grandparents were very careful not to throw away any leftover food.

Consumerism has led us to become used to an excess and daily waste of food, to which, at times we are no longer able to give a just value.

"Throwing away food is like stealing from the table of the poor and the hungry."

(Pope Francis, 2013)

Together with moving to more sustainable diets and reaching major improvement in food production practices, **reducing food waste** both in and out of the home is the **most significant demand-side measure for reducing the carbon impact of the food system**.

	Assumptions
Dietary shift	Reference (table 1); vegetarian: meat-based protein sources replaced by a mix of plant-based proteins and fruits and vegetables (eggs and dairy consumed); vegan: all animal-based protein sources replaced by a mix of plant-based proteins and fruits and vegetables (no eggs and dairy consumed); pescatarian: meat-based protein sources replaced by a mix of seafood and fruits and vegetables (eggs and dairy consumed)
Improved production practice (PROD)	Standard level of ambition for improved food production practices including closing of yield gaps between attained and attainable yields to about 75%;[184,211] rebalancing nitrogen and phosphorus fertiliser application between over and under-applying regions;[184] improving water management, including increasing basin efficiency, storage capacity, and better utilisation of rainwater;[211] and implementation of agricultural mitigation options that are economic at the projected social cost of carbon in 2050,[212] including changes in irrigation, cropping and fertilisation that reduce methane and nitrous oxide emissions for rice and other crops, as well as changes in manure management, feed conversion, and feed additives that reduce enteric fermentation in livestock[213]
Improved production practice (PROD+)	High level of ambition for improved food production practices on top of PROD scenario, including additional increases in agricultural yields that close yield gaps to 90%;[184] a 30% increase in nitrogen use efficiency,[214] and 50% recycling rates of phosphorus;[215] phase-out of first-generation biofuels, and implementation of all available bottom-up options for mitigating food-related greenhouse-gas emissions[213]
Reduced food waste and loss (halve waste)	Food losses and waste reduced by half, in line with Sustainable Development Goals target 12.3

Table 4: **Measures considered for reducing environmental effects of food production**

THE LANCET, JANUARY 2019 Food in the Anthropocene: the EAT –Lancet Commission on healthy diets from sustainable food systems, vol 393, p.470.

This universal goal for all humans is **within reach** but will require adoption of **scientific targets** by all sectors to stimulate a range of actions from **individuals and organisations working in all sectors** and **at all scales.**

Reduce food waste presents a unique opportunity to **reduce business costs**, create **social and environmental benefit**, **inc**rea**se consumers' savings** working into the direction of the **Sustainable Development Goals** and in particular toward **Goal 12** "Ensure Sustainable consumption and production pattern", **target 3.1** **"Halve per capital global food waste at the retail and consumer level and reduce food losses along production and supply chains, including post-harvest losses"** and by cascading effect also the Goals 1, 2, 9, 10, 11, 13, 14 and 15

The SDG2 Advocacy Hub coordinates global campaigning and advocacy to achieve Sustainable Development Goal (SDG) 2: To end hunger, achieve food security and improved nutrition, and promote sustainable agriculture by 2030.

8 THEMATIC AREAS, aligned with the SDGs:

- Ingredients grown with respect for the earth & its oceans

- Protection of biodiversity & improved animal welfare

- Investment in livelihoods

- Value natural resources & reduce waste

- Celebration of local & seasonal food

- A focus on plant-based ingredients

- Education on food safety & healthy diets

- Nutritious food that is accessible & affordable for all

Chef's Manifesto of the SDG2 Advocacy Hub,

5 bonnes raisons de réduire son gaspillage alimentaire

1
Faire des **économies** sur les achats de denrées et sur la gestion de vos déchets.

2
Améliorer **l'équilibre alimentaire** des repas consommés par vos convives

3
Eviter de **nouvelles obligations réglementaires** en tant que « gros producteurs de déchets organiques »

4
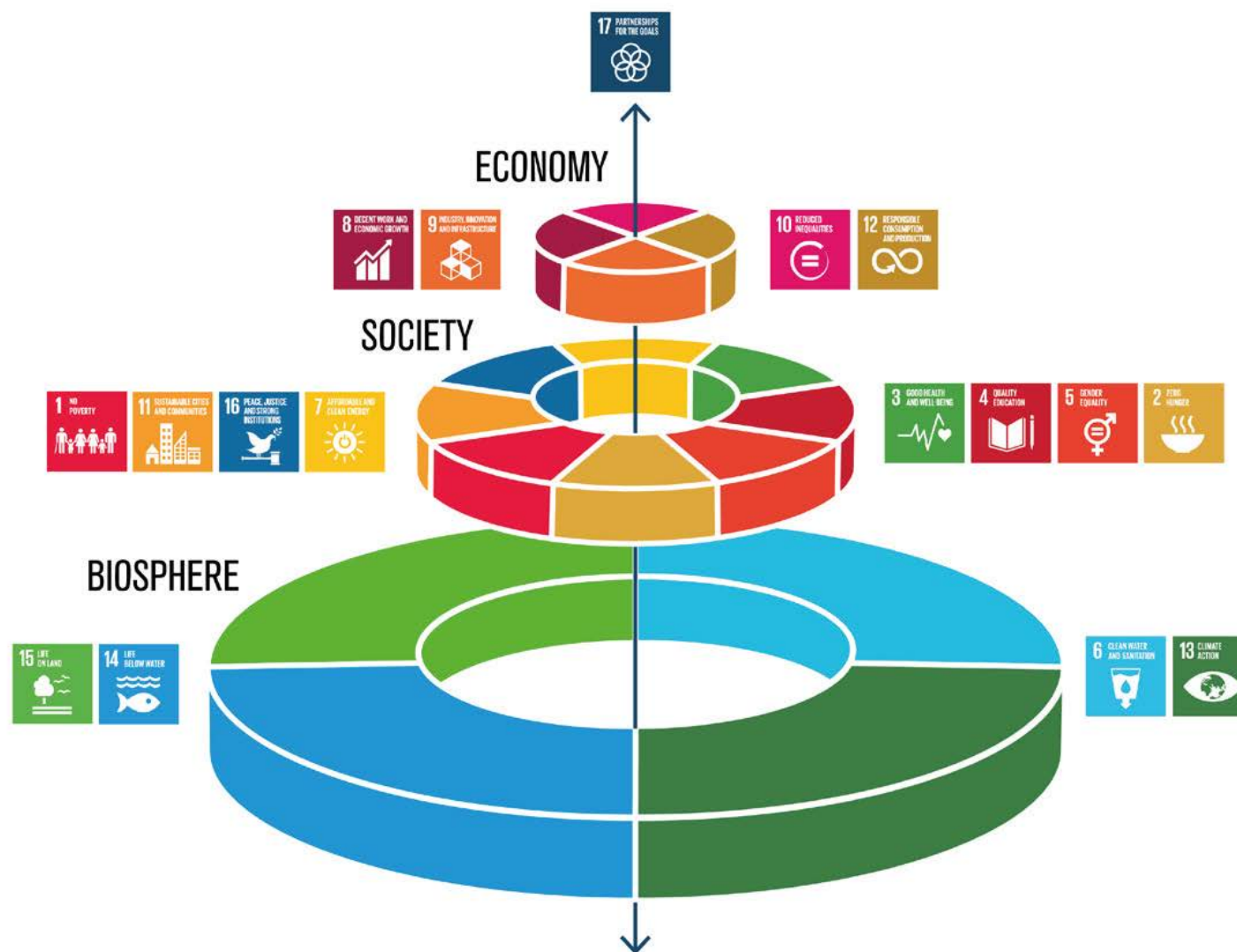Mettre en œuvre une **mobilisation interne** autour de projets liés à l'alimentation.

5
Améliorer la qualité des produits proposés (locaux, de saison, bio...), grâce aux économies réalisées

The Food Waste Iceberg

what we see

Bill at producer price: $750 000 000 000
Bill at retail price: $1000 000 000 000

Bill from nature: $700 000 000 000

what we don't see

Eroded Land
GHG Emissions
Cleared Forests
Increase in Food Prices
Increased Water Scarcity

Loss of Wetlands
Loss of Biodiversity
Climate Change Damages

FAO Food and Agriculture Organization of the United Nations
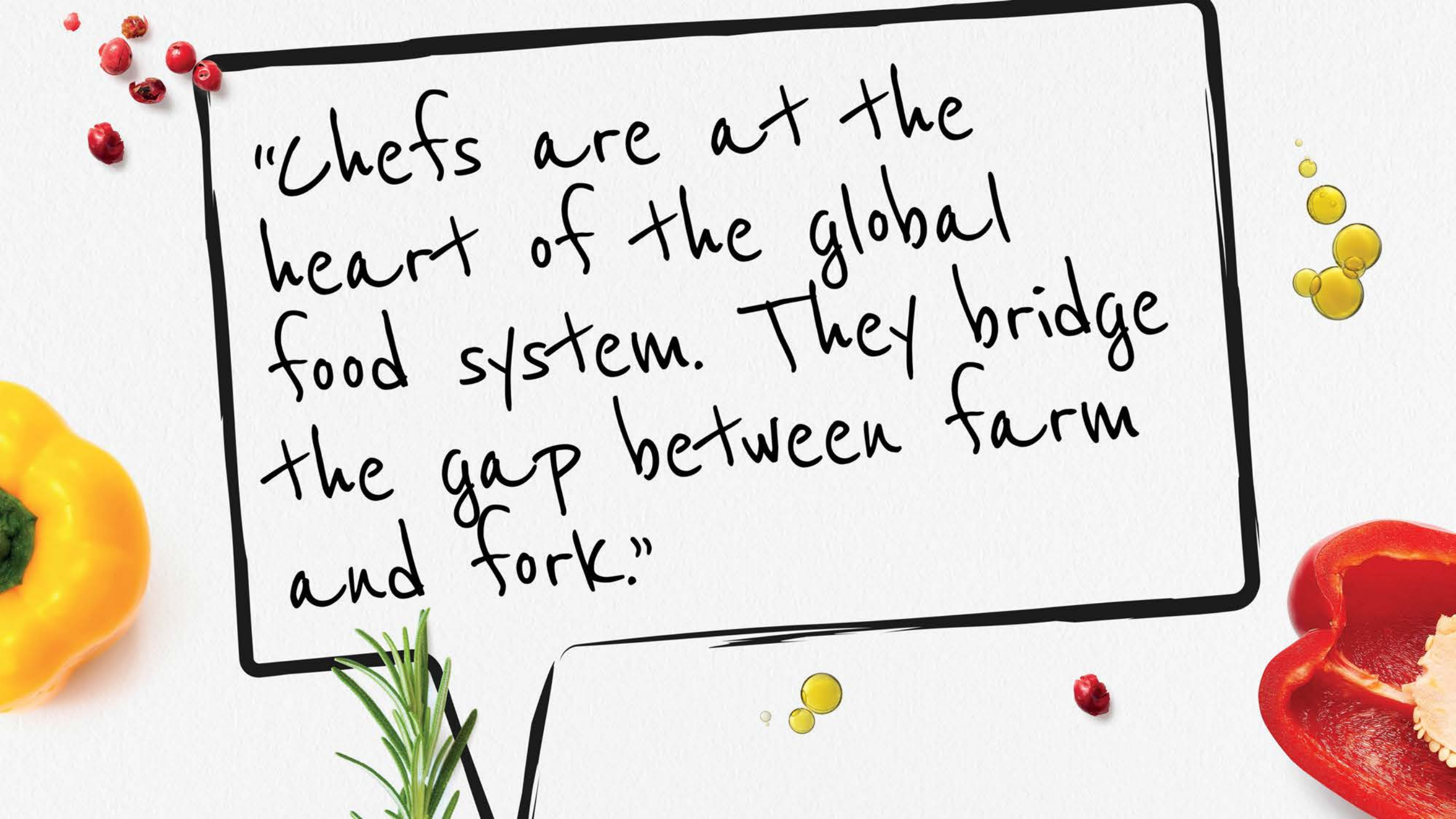
CREPAN, 2014, Reduire le GASPILLAGE ALIMENTAIRE en restauration collective

"Food has great power to transform lives and is the most inclusive tool to reach the largest number of people in need."

David Hertz, quotation

HOW FOOD CONNECTS ALL THE SDGs

Azote for Stockholm Resilience Centre
https://www.stockholmresilience.org/research/research-news/2016-06-14-how-food-connects-all-the-sdgs.html

"Chefs are at the heart of the global food system. They bridge the gap between farm and fork."

"At a time when the growing disconnect between production and consumption threatens, chefs have a unique opportunity to help reframe food system challenges in a way which **resonates with the general public"**

"They also have the power to curate a new global conversation about food. An inclusive, dynamic discussion that takes the economic, environmental and social issues which underpin the SDGs – climate change, agriculture, nutrition, **food waste** *- and translates them into accessible everyday actions in our kitchens, classrooms and communities"*
The SDG2 Advocacy Hub

"Chef as a activist is quite a new idea. They create fashion and new market, but **they have also the potential to get people to rethink their eating habit***s"*

"Today's, food culture has given chefs a platform to influence, including the power, if not the luxury to innovate. As arbiters of taste we can help **inspire a new way of eating that puts all together**"
Dan Barber, Third Plate

In city such as London and New York, **there is one restaurant every 30 people**

In 2015, research from US suggested consumers were, for the first time, **spending more in restaurants than in grocery stores**

In Italy, in 2018, 35% of the total expenditure on food consumption is related to the restaurant sector (COLDIRETTI, 2018). This data represent an historical record

BOX 5: WHAT IS THE ROLE OF RESTAURANTS IN A CIRCULAR URBAN FOOD SYSTEM?

One of the pleasures of urban living is the wide choice of restaurants available. In large cities such as New York and London, there is one restaurant or café for every 30 people. The evidence indicates that the popularity of restaurants is increasing steadily. In May 2015, research from the US suggested customers were, for the first time, spending more in restaurants than in grocery stores. This shift now applies globally with 50% of every dollar spent in the food industry being restaurant related. This shows that restaurants and chefs are hugely influential in deciding the type of food that enters cities and what is offered to citizens.

Restaurants are also significant producers of waste. According to a 2011 WRAP report, in the UK, approximately 1 million tonnes of waste is generated by restaurants each year, around 22% of which is organic waste. This represents a cost to the restaurant sector of £630 million (USD 1.1 billion).[90]

Chefs and menu designers for large franchises are key decision-makers when it comes to the meals that are served in restaurants, and therefore play a critical role in the transition to a circular economy for food. If these actors can design and popularise meals originating from ingredients that are created as by-products of regenerative farming methods, it is likely that, through their influence, such ingredients will be adopted more widely. Initiatives such as the SDG2 advocacy hub's **Chef's Manifesto** acknowledge this important role, as well as individual chefs, for example Dan Barber, who recognises that: "supporting the continual improvement of the whole system should be the goal, and this leads to better flavour".

Three restaurants in Helsinki are attempting to disrupt some of the entrenched linearity of the sector. Restaurant Ultima has tried to bring more food production into the city, by using its building both as a dining space as well as a laboratory for innovative growing systems such as hydroponic, aeroponic, insect farming, and algae production. Restaurant Nolla challenges existing waste management conventions by completely doing away with bins. Food waste is directed to an Oklin composting machine, transforming organic discards into soil-enhancing material, which is then handed back to suppliers to loop back to their farms. Interiors, crockery, glassware, and napkins have all been selected from suppliers using reused or recycled materials. Restaurant Loop takes a small proportion of the annual 65 million kg of perfectly edible food thrown away in Finland each year and transforms it into tasty meals and products. All of the raw ingredients are perfectly edible and tasty, but have been withdrawn from the supply chain due to aesthetics or labelling conventions.

Asked what makes a good circular economy restaurant, Carlos Henrique replies without hesitation: "Good food of course, then it has to make money and finally it has to be circular".

FIGURE 8: FOOD DESIGN AND MARKETING HAS THE POWER TO INFLUENCE WHAT WE EAT.

Food designers have the power to ensure their food products, recipes, and menus are healthy to both people and natural systems. Marketing activities can then be shaped to make these products attractive to people.

3. Figures, fact and definitions (wastage, food loss, food waste)

FOOD WASTE

A significant share of food intended for human consumption is lost or wasted from the farm to the fork

32%
of global food supply by weight

24%
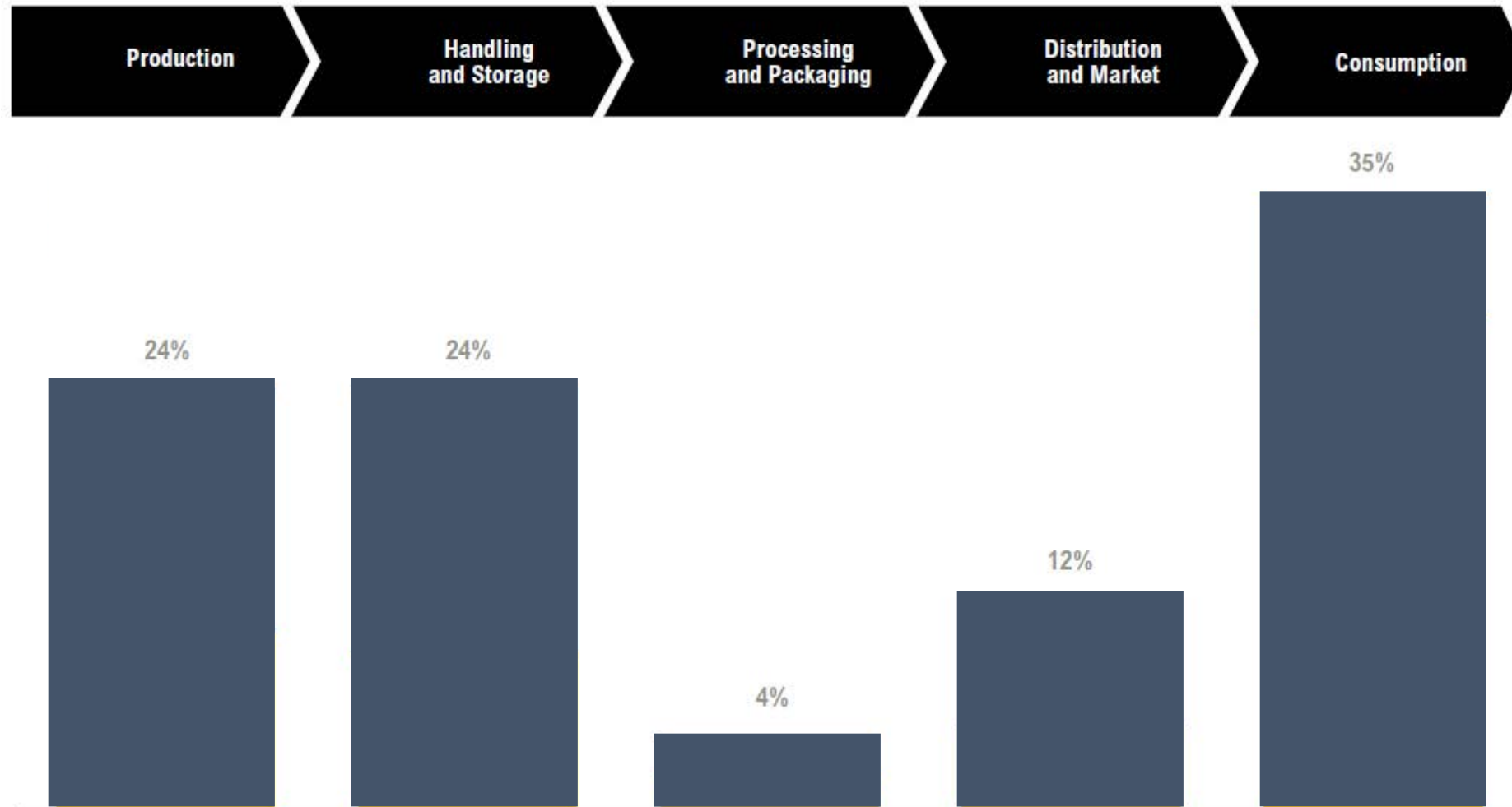of global food supply by energy content (calories)

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Food is lost or wasted along the entire value chain

Production	Handling and Storage	Processing and Packaging	Distribution and Market	Consumption
During or immediately after harvesting on the farm	After leaving the farm for handling, storage, and transport	During industrial or domestic processing and/or packaging	During distribution to markets, including at wholesale and retail markets	In the home or business of the consumer, including restaurants and caterers

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Food loss and waste occurs more 'near the fork' in developed regions and more 'near the farm' in developing regions

100% = 1.5 quadrillion kcal

Production	Handling and Storage	Processing and Packaging	Distribution and Market	Consumption

- Production: 24%
- Handling and Storage: 24%
- Processing and Packaging: 4%
- Distribution and Market: 12%
- Consumption: 35%

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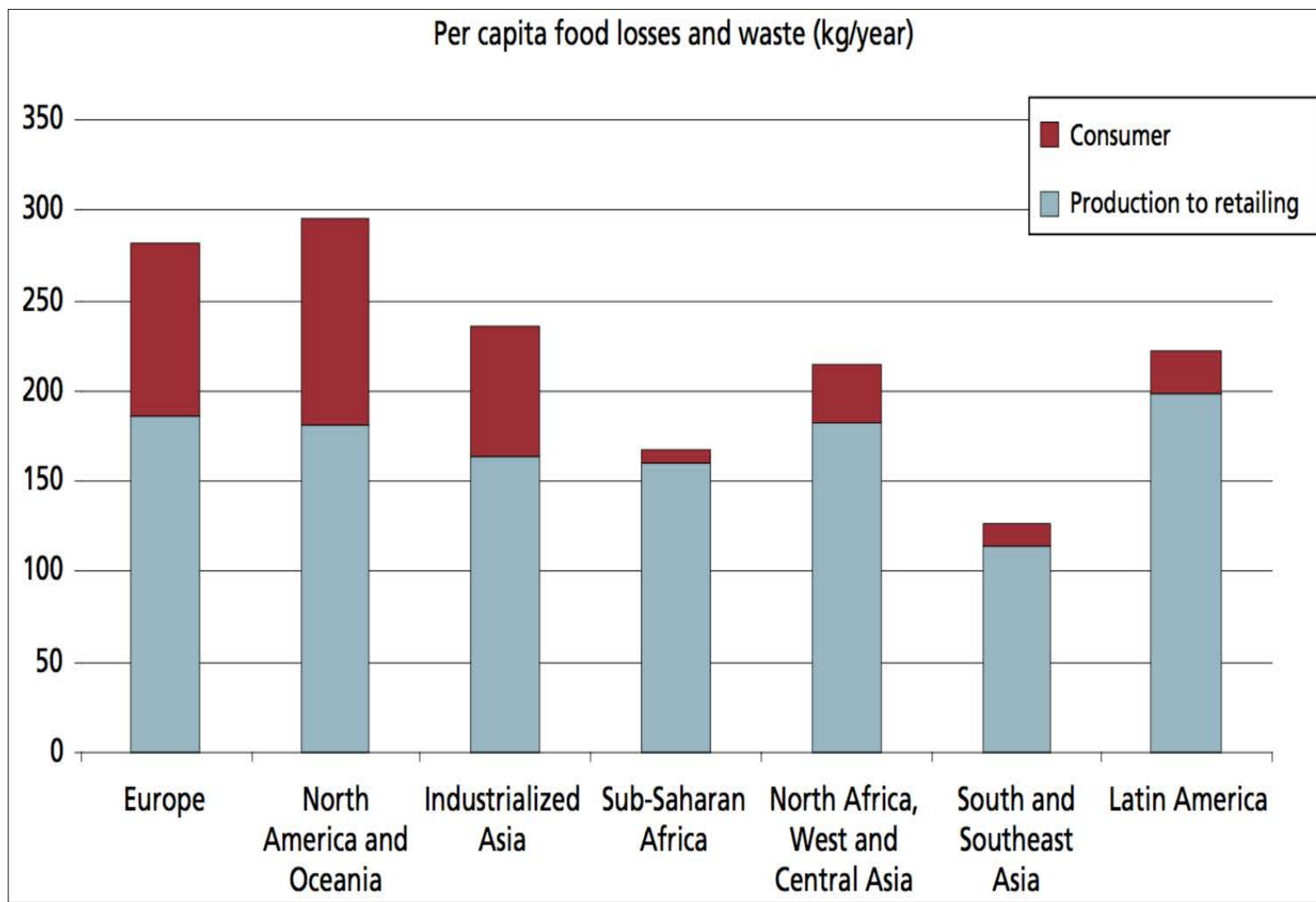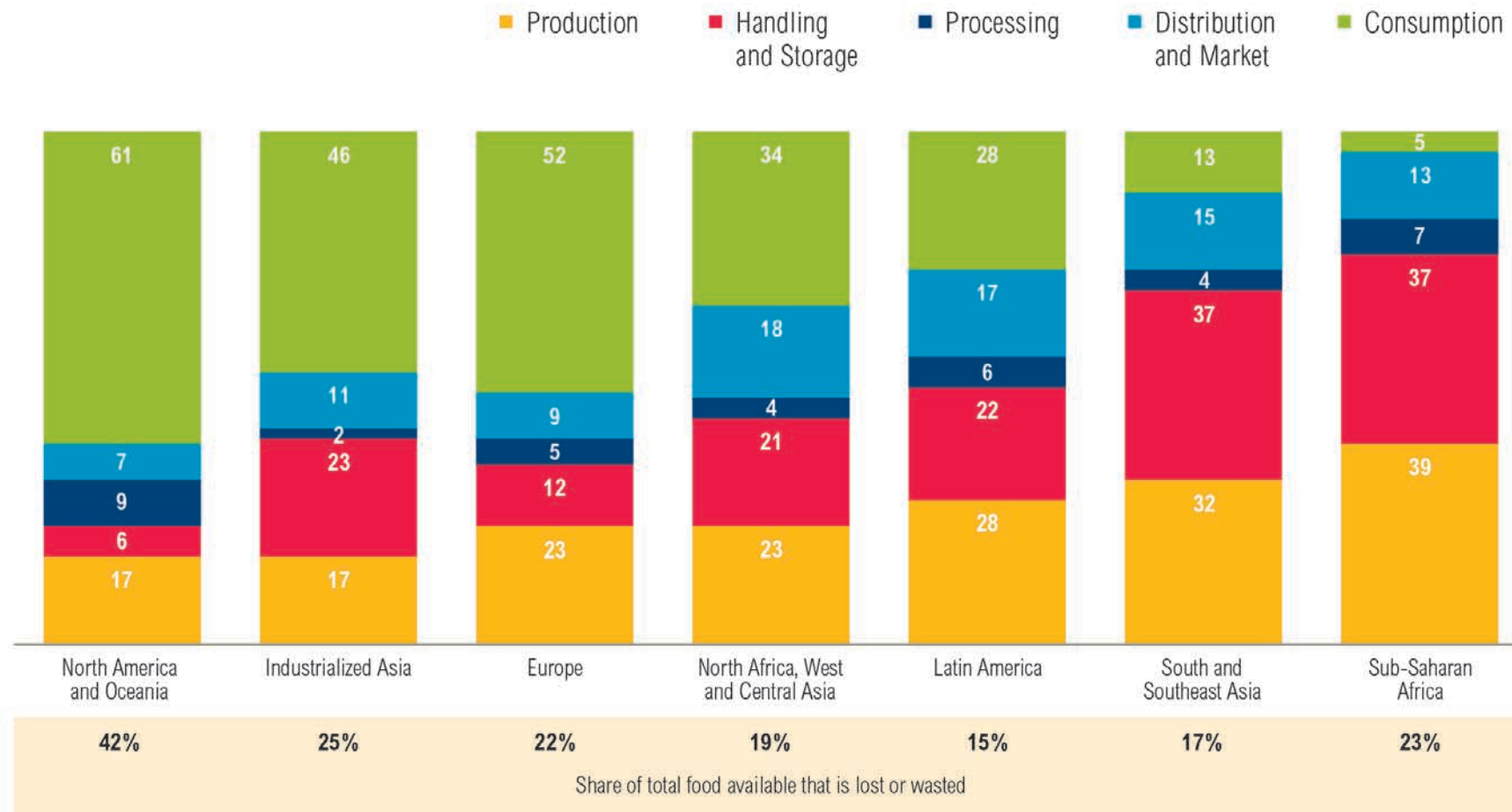
FAO. 2011. *Global food losses and food waste – extent, causes and prevention.* Rome: UN FAO.

Losses at production are more prevalent in developing regions while food waste at consumption is more prevalent in developed regions
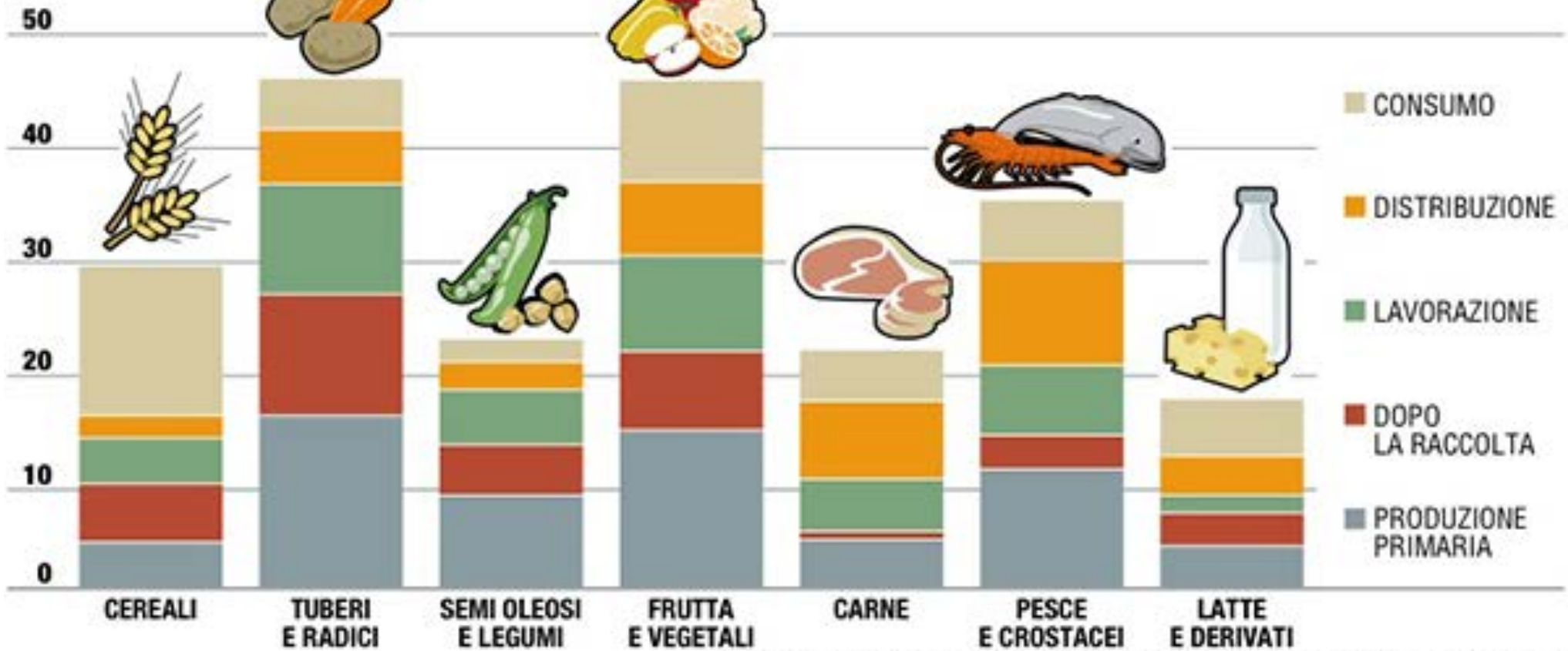## (Percent of kcal lost and wasted)

Legend: Production, Handling and Storage, Processing, Distribution and Market, Consumption

Stage	North America and Oceania	Industrialized Asia	Europe	North Africa, West and Central Asia	Latin America	South and Southeast Asia	Sub-Saharan Africa
Consumption	61	46	52	34	28	13	5
Distribution and Market	7	11	9	18	17	15	13
Processing	9	2	5	4	6	4	7
Handling and Storage	6	23	12	21	22	37	37
Production	17	17	23	23	28	32	39
Share of total food available that is lost or wasted	**42%**	**25%**	**22%**	**19%**	**15%**	**17%**	**23%**

Note: Number may not sum to 100 due to rounding.

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GLI SPRECHI ALIMENTARI GLOBALI

Perdite in %

CONSUMO
DISTRIBUZIONE
LAVORAZIONE
DOPO LA RACCOLTA
PRODUZIONE PRIMARIA

CEREALI — TUBERI E RADICI — SEMI OLEOSI E LEGUMI — FRUTTA E VEGETALI — CARNE — PESCE E CROSTACEI — LATTE E DERIVATI
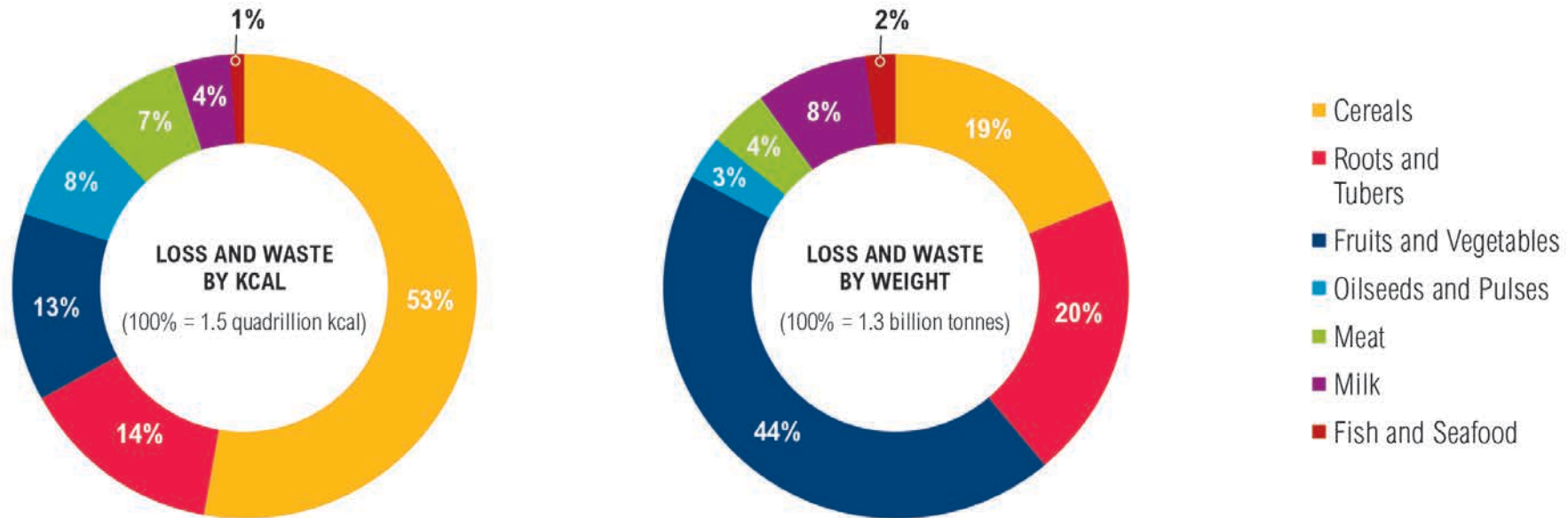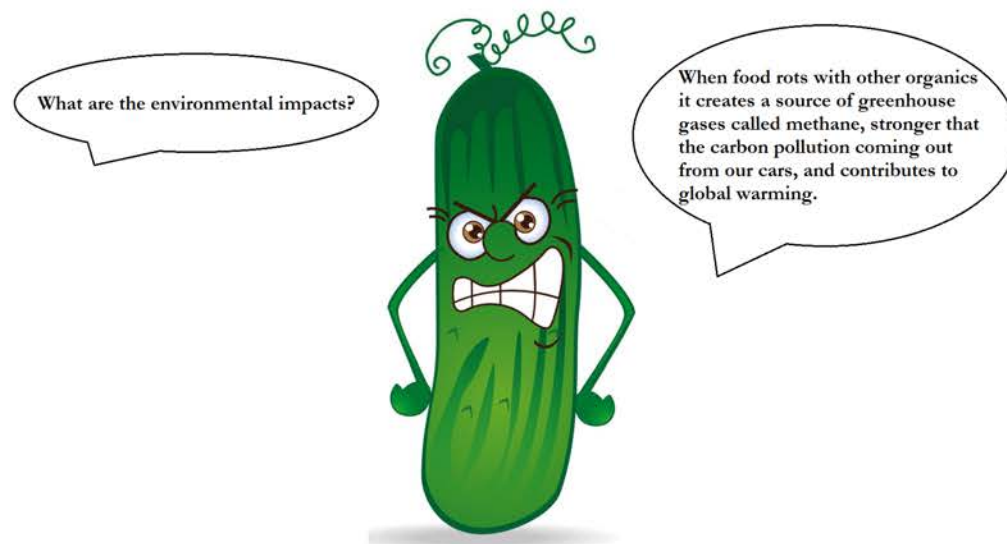
Fonte FAO 2011. Perdite e sprechi di cibo nel mondo. Dimensioni del fenomeno, cause e prevenzione

Cereals comprise the most loss and waste when measured by calories, while fruits and vegetables by weight

LOSS AND WASTE BY KCAL (100% = 1.5 quadrillion kcal): 53%, 14%, 13%, 8%, 7%, 4%, 1%

LOSS AND WASTE BY WEIGHT (100% = 1.3 billion tonnes): 19%, 20%, 44%, 3%, 4%, 8%, 2%

Legend: Cereals; Roots and Tubers; Fruits and Vegetables; Oilseeds and Pulses; Meat; Milk; Fish and Seafood

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FOSTER
*love food reduce waste*
LIFE17 GIE/IT/000579

FOOD WASTE =

- the amount of food lost or wasted translates into about a quarter of all water used by agriculture

- requires cropland equivalent to an area the size of China

- is responsible for an estimated 8 percent of global greenhouse gas emissions

What are the environmental impacts?

When food rots with other organics it creates a source of greenhouse gases called methane, stronger that the carbon pollution coming out from our cars, and contributes to global warming.

THROWING APPLE IS EQUIVA[L] FLUSHING THE TOILE[T] TIMES.

DON'T WASTE
DON'T WASTE

Environmental Impact

W • Water
  • Cleaning the trays, utensils, bins, uniforms, floors
A • Air Emissions
  • Methane from food waste, vehicle pollution
S • Solid Waste
  • Food scraps, packaging, pizza boxes
T • Toxins / Hazardous Waste
  • Cooking oils, cleaning chemicals
E • Energy
  • Ovens, heating/cooling, exhaust fans, freezers, lights

How much land is used to produce food that never gets eaten?

The land devoted to producing wasted food would be the second largest country in the world by area, roughly 5.4 million square miles.

Learn more at climate.universityofcalifornia.edu

UNIVERSITY OF CALIFORNIA

HOW MANY TIMES?   7

If Food Loss and Waste Were its own Country, it Would Be the Third-Largest Greenhouse Gas Emitter

| 10.7 | 5.8 | 4.4 | 2.9 | 2.3 |
| China | United States | Food loss and waste | India | Russia |
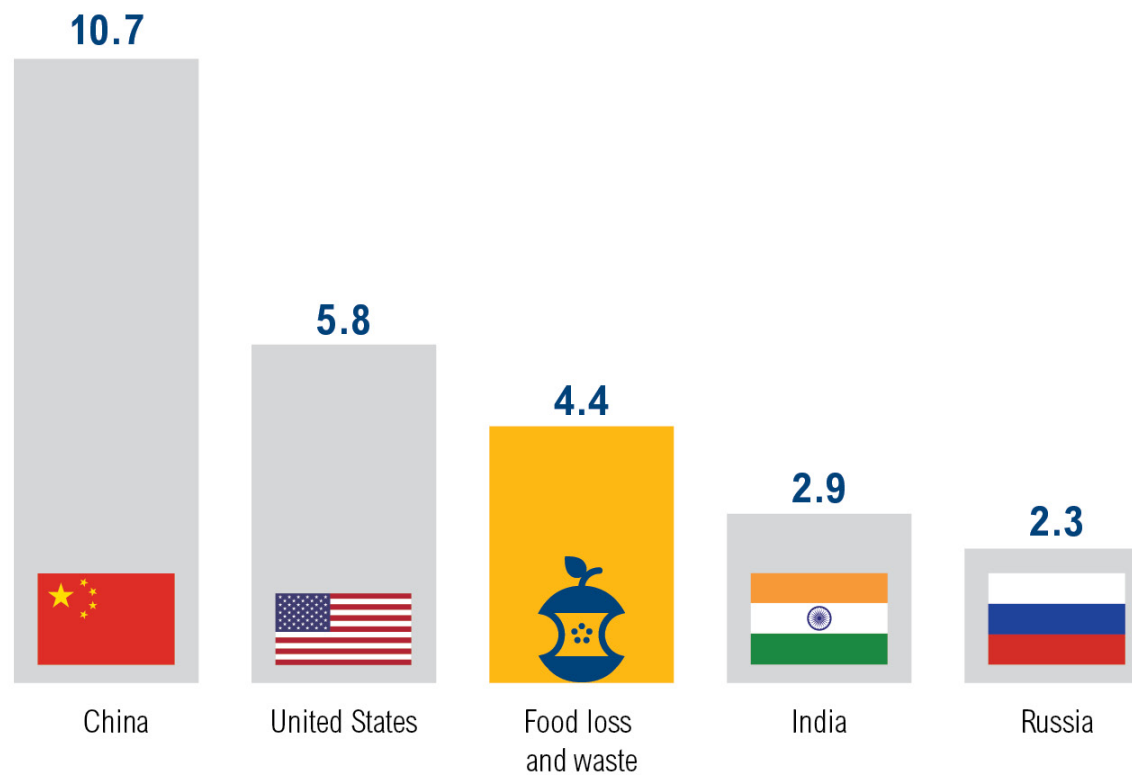
GT CO$_2$E (2011/12)*

* Figures reflect all six anthropogenic greenhouse gas emissions, including those from land use, land-use change, and forestry (LULUCF). Country data is for 2012 while the food loss and waste data is for 2011 (the most recent data available). To avoid double counting, the food loss and waste emissions figure should not be added to the country figures.

Source: CAIT. 2015; FAO. 2015. *Food wastage footprint & climate change*. Rome: FAO.

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UNEP

PERDITA E SPRECO: CAUSE E IMPATTI

● LE CAUSE

• Limite nelle tecniche agricole e infrastrutture per trasporto e stoccaggio
• Fattori climatici e ambientali
• Surplus produttivi
• Rispetto di normative e standard

• Limiti tecnici e dei processi di trasformazione e produzione

• Limiti nei sistemi distributivi
• Errori di previsione degli ordini e gestione delle scorte
• Deterioramento dei prodotti e degli imballaggi
• Strategie di marketing e di vendita

• Eccedenza degli acquisti
• Eccedenza delle porzioni preparate
• Difficoltà nella corretta interpretazione dell'etichetta
• Errori nella conservazione degli alimenti

PRODUZIONE E RACCOLTO
PRIMA TRASFORMAZIONE
TRASFORMAZIONE INDUSTRIALE
DISTRIBUZIONE
RISTORAZIONE
CONSUMO DOMESTICO

LE FASI DELLA CATENA ALIMENTARE

Perdite Alimentari (food losses)

Sprechi Alimentari (food waste)

● GLI IMPATTI

AMBIENTALI
• Emissione gas effetto serra
• Degrado del suolo
• Spreco di risorse idriche
• Consumo di energia

In Italia la frutta e gli ortaggi gettati via nei punti vendita comportano il consumo di più di 73 milioni di metri cubi di acqua

36,5 mld di bottiglie da 2 litri

ECONOMICI
• Costo/Valore del cibo sprecato
• Valore delle esternalità negative prodotte
• Costo-opportunità della superficie agricola

In media, negli USA una famiglia di quattro persone spreca cibo per un valore equivalente a 1.600 dollari l'anno

$4,4   4,4 dollari al giorno

Sufficienti per sfamare una famiglia in un Paese in via di sviluppo

ETICO/SOCIALI
• Spreco di cibo ⟷ Difficoltà di accesso al cibo
• Eccesso di alimentazione ⟷ Denutrizione
• Spreco di nutrienti ⟷ Carenze nutrizionali

In Italia, per persona si sprecano 146 kg di cibo

1/3 della produzione annua mondiale di cibo finisce nella spazzatura

1,3 mld di tonnellate

4. Focus on EU context

Food waste – latest estimate EU-28

EU-28 PRODUCES

88 MILLION TONNES of food waste per year

amounting to an estimated

143 BILLION EUROS

173 kg pro-capita food waste

La classifica
kg procapite di cibo sprecato

- Fino a 100
- da 101 a 200
- da 201 a 300
- da 301 a 400
- oltre 401

Fonte: Commissione Ue, Eurostat

1. Olanda (579)
2. Belgio (399)
3. Cipro (334)
4. Estonia (264)
5. Irlanda (250)
6. G. Bretagna (238)
7. Polonia (235)
8. Svezia (227)
9. Austria (225)
10. Lussemb.(207)
11. Finlandia (193)
12. Ungheria (184)
13. Spagna (176)
14. Lituania (171)
15. Italia (149)
16. Francia (144)
17. Portogallo (132)
18. Germania (126)
19. Danimarca (118)
20. Slovacchia (109)
21. Romania (105)
22. Lettonia (94)
23. Slovenia (89)
24. Bulgaria (87)
25. Rep. Ceca (71)
26. Malta (62)
27. Grecia (44)

Paese	kg/person
Paesi Bassi	541
Belgio	345
Cipro	327
Estonia	265
Polonia	247
Regno Unito	236
Irlanda	216
Svezia	212
Austria	209
Finlandia	189
Italia	179
Ungheria	175
Lussemburgo	175
Germania	149
Danimarca	146
Francia	136
Spagna	135
Portogallo	132
Lituania	119
Slovacchia	111
Lettonia	110
Bulgaria	105
Repubblica Ceca	81
Grecia	80
Malta	76
Romania	76
Slovenia	72

In terms of economic impacts, food waste represents high waste management costs and money wasted, given the considerable amount of edible food thrown away every year in the EU.

Such waste management costs include the **maintenance of landfills** (where food waste is most often disposed) as well as transport costs, operations costs in the treatment plants, and separation costs in some cases.

Biogenic waste (food residues) **usually show a high water content and therefore low heat value**, heavily influencing the calorific value of the waste and therefore the energy efficiency of combustion plants.

WRAP estimates that the portion of food waste which can be avoided represents an average economic cost of £480 (€595) per household per year.
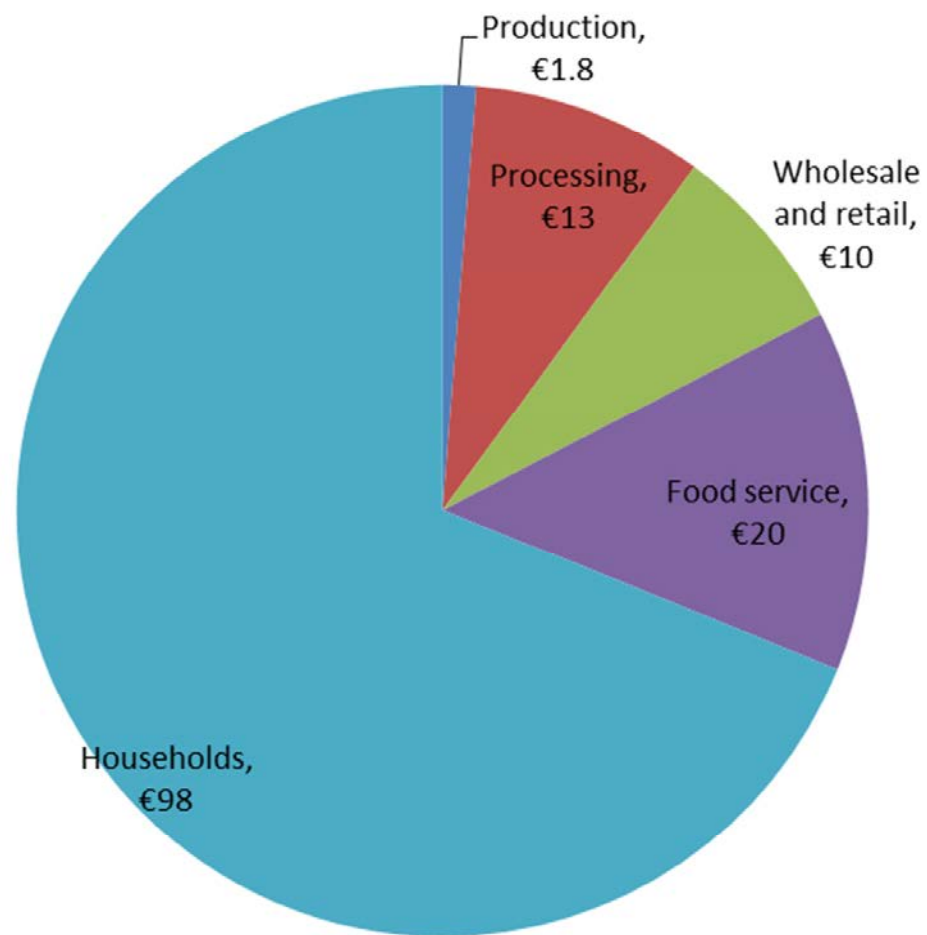
Figure 5. Costs associated with food waste by sector (values in billions of euros)

FUSION, 2016

ORGANIC WASTE IN EUROPE

TOTAL WASTE

TOTAL ORGANIC WASTE

POTENTIAL FOOD WASTE IN THE ORGANIC WASTE SECTOR

40%

60%

33,3%

66,6%
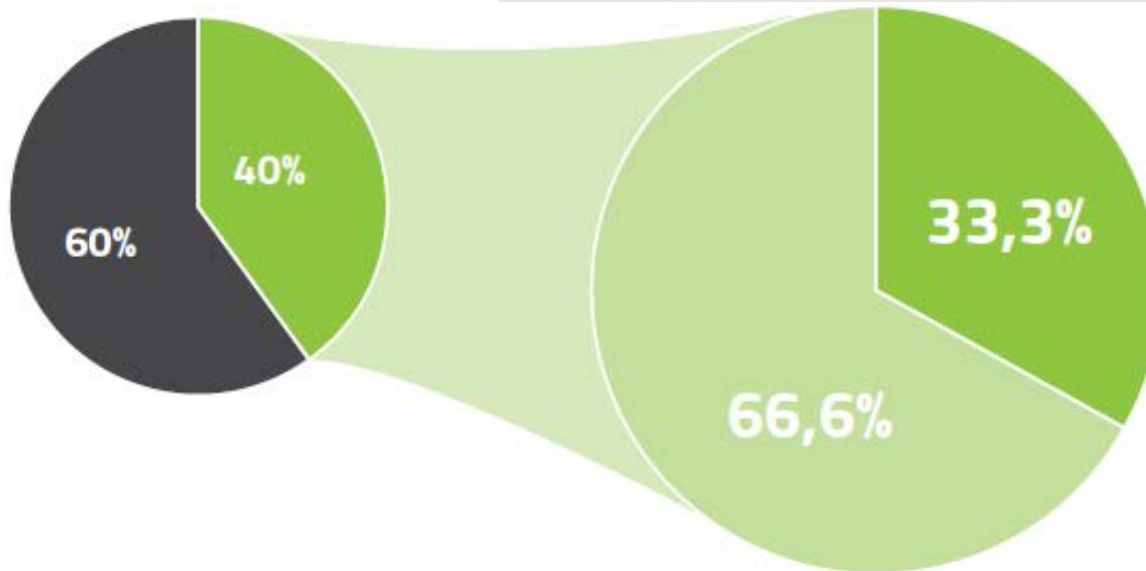
potential biowaste in MSW EU28 96 Mt pa

regular waste

utilized potential biowaste

non-utilized potential biowaste

**RURAL AREAS
1 JOB PLACE/1380 T ORGANIC WASTE**

**URBAN AREAS
1 JOB PLACE/4500 T R. ORGANIC
 WASTE**

The Global Warming Potential (GWP) of current food waste for EU in 2011 is estimated to **at least around 227 MT of CO$_2$-Equivalents** (Eq.). This is 16% of the total GWP of food utilization in EU in 2011.
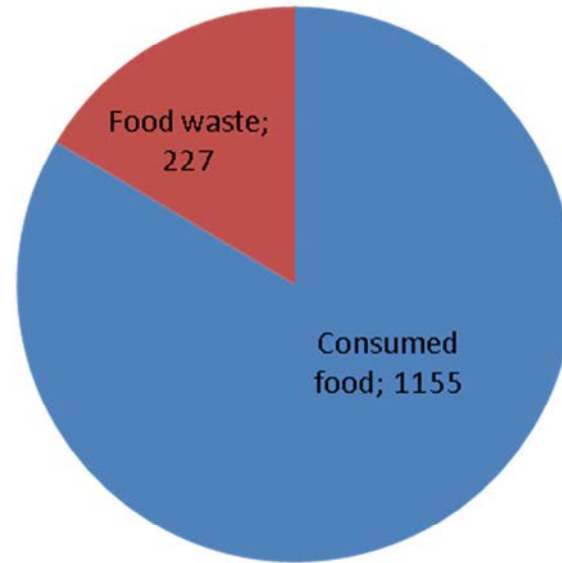
Figure 2. Estimation of Global Warming Potential (GWP) of current consumed and wasted food in EU in 2011 in MT CO$_2$-Equivalents

Food waste – latest estimate EU-28
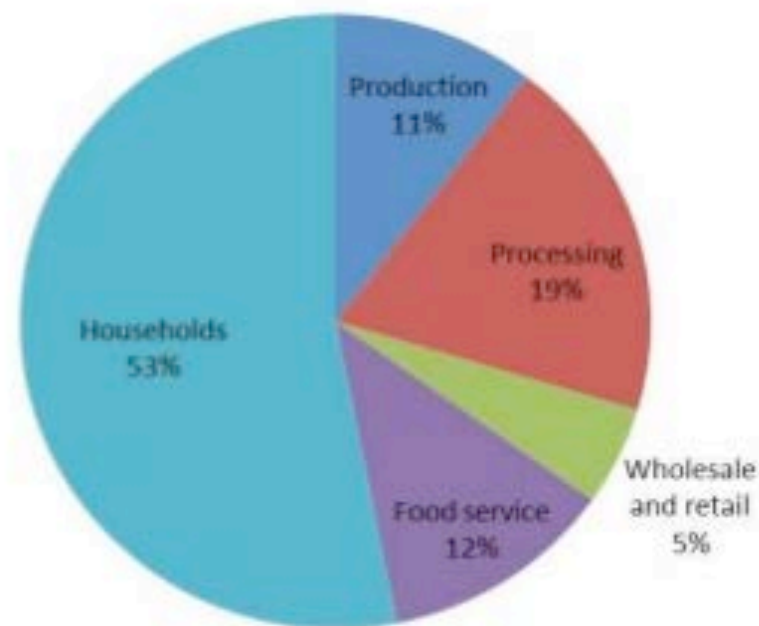
The collection and analysis of data from across Europe for this study generated an estimate of food waste in the EU-28 of 88 million tonnes.

This estimate is for 2012 and includes **both edible food and inedible parts** associated with food. This equates to 173 kilograms of food waste per person in the EU-28. The total amounts of food produced in EU for 2011 were around 865 kg /person , **this would mean that in total we are wasting 20 % of the total food produced.**

Table 1: Estimates of food waste in EU-28 in 2012 from this quantification study; includes food and inedible parts associated with food.

Sector	Food waste (million tonnes) with 95% CI*	Food waste (kg per person) with 95% CI*
Primary production	9.1 ± 1.5	18 ± 3
Processing	16.9± 12.7	33 ± 25
Wholesale and retail	4.6 ± 1.2	9 ± 2
Food service	10.5 ± 1.5	21 ± 3
Households	46.5 ±4.4	92 ± 9
Total food waste	**87.6 ± 13.7**	**173 ± 27**

Confidence interval

FUSION, 2016

The sectors contributing the most to food waste are **households** (47 million tonnes ± 4 million tonnes) and **processing** (17 million tonnes ± 13 million tonnes). **These two sectors account for 72 percent** of EU food waste, although there is considerable uncertainty around the estimate for the processing sector compared to all the other sectors.

Data collected with the FUSION project have a relatively **high uncertainty due to the limited number of underlying studies of sufficient quality available.**

However it should be acknowledged that FUSION was the first attempt to do something like this i.e. building on existing data, adjusting that to a common definition and then finding valid ways of upscaling and producing a EU-28 data set for food waste.
The estimates have been obtained using a combination of national waste statistics and findings from selected research studies.

Table 3. Number of countries from which information about the generated food waste amounts was collected.

Sector	Number of countries submitting data	Number of countries submitting data of sufficient quality	NACE codes
Primary production	15	6	NACE 01-03
Processing	19	4	NACE 10-11
Wholesale and logistics and Retail and Markets	18[1]	11[2]	NACE 46 and 47
Food service	18	8	NACE 55-56
Household	19	11	NA

1. 18 countries supplied data from either the wholesale and logistics or the retail and market sector. Of those, four countries only submitted data from the retail and market sector. The remaining 14 countries submitted data for both the two sectors or the two sectors as a whole.

2. Of the 11 countries submitting data of sufficient quality three countries only submitted data from the retail and market sector. The remaining eight countries provided sufficient data for both the two sectors or the two sectors as a whole.

* Data from Norway has been collected but not used since they are not part of EU-28.

FUSION, 2016

As the coverage of the data across the EU-28 countries was not complete, a process was required for each sector to scale up the data that were obtained to estimate food waste in the whole of the EU-28. As a first step, a review of on-line literature was undertaken to see if any estimates for food waste existed that were not provided previously.

Then for those countries where data were missing, these data gaps were filled in by calculating the 'normalised' level of food waste (e.g. food waste per person or food waste per produced amount), based on the countries that did supply data

Table 4. Normalisation factors used to fill in data gaps for the different sectors studied.

FUSIONS denominations	Normalisation factor used to fill in data gaps	NACE codes
Primary production	Produced food amounts in this sector	NACE 01-03
Processing	Produced food amounts in this sector	NACE 10-11
Wholesale and logistics and Retail and Markets	Population	NACE 46-47
Food service	Turnover number[1]	NACE 55-56
Household	Population	NA[2]

[1] *The turnover number for the sector which was adjusted by the purchasing power parity (PPP). This was because different countries have different price levels which if not considered will have a negative effect of the quality of the normalized food waste amounts.*
[2] *There is no NACE code for households.*

FUSION, 2016

Annex E: Countries providing data

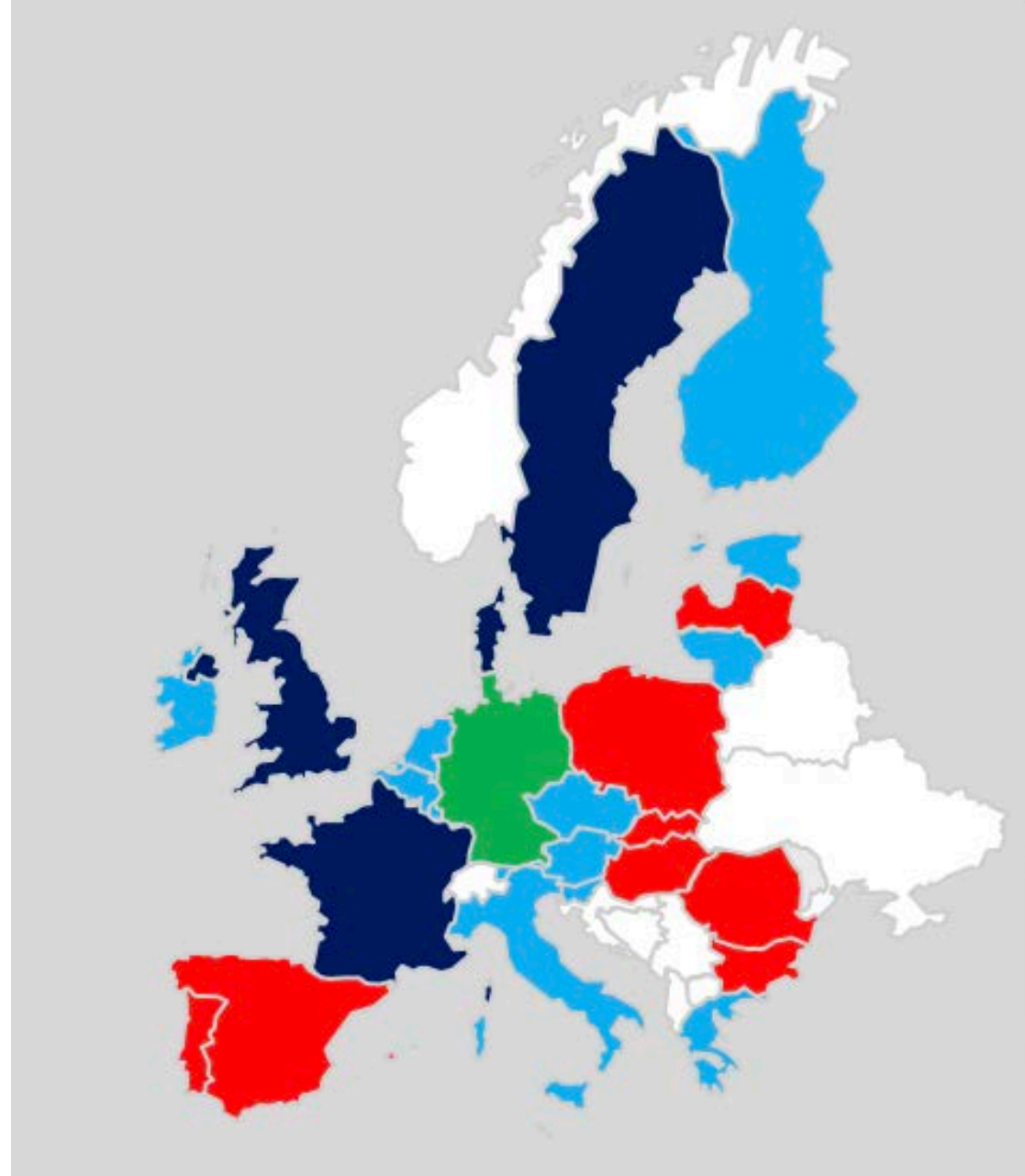The matrix below describe to what extent data was taken into account when estimating the total food waste amounts.

Table 14. Summarizing evaluation of data provided by member states.

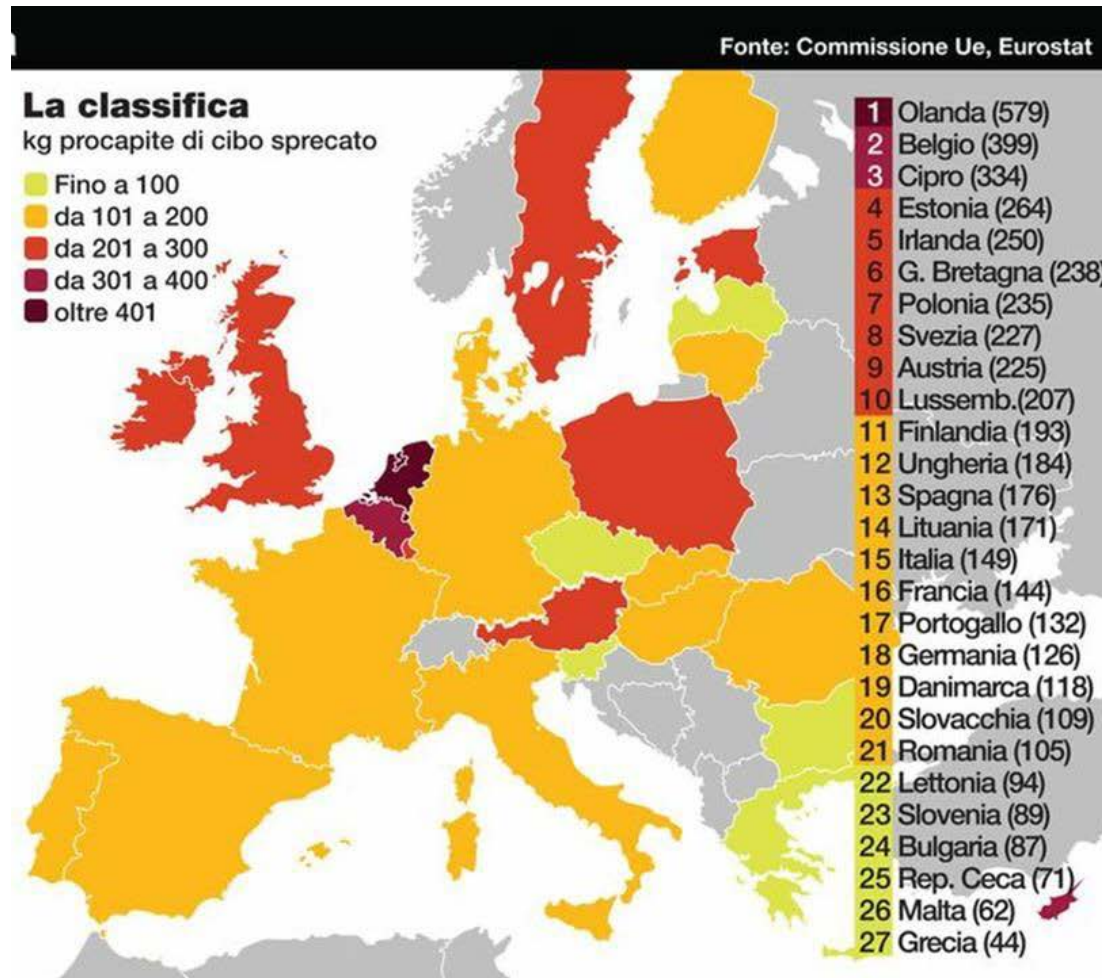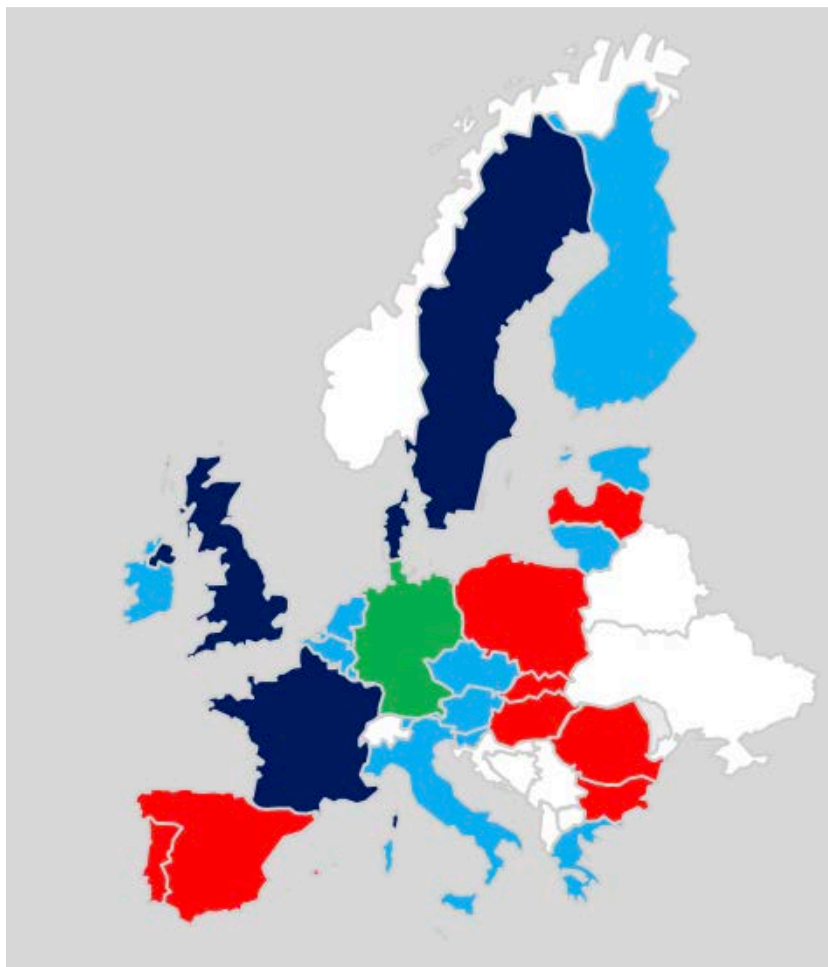| Country	1. Production (NACE 1-3)	2. Processing (NACE 10-11)	3. Wholesale and logistics (NACE 46)	4. Retail and markets (NACE 47)	5. Redistribution (food donation etc.)	6. Food service (NACE 56)	7. Household
Austria	No data available	Food waste data of low quality	No data available	Data of sufficient quality	Data has been submitted but no estimation of food waste amounts has been made.	Data of sufficient quality	Data of sufficient quality
Belgium	Food waste data of low quality	Food waste data of low quality	Food waste data of low quality	Food waste data of low quality	No data available	Food waste data of low quality	Food waste data of low quality
Bulgaria	No data available	No data available	No data available	No data available	No data available	No data available	No data available
Croatia	Low food waste amounts	Low food waste amounts	Low food waste amounts. Several or major waste flows not being covered.	Low food waste amounts. Several or major waste flows not being covered.	No data available	Low food waste amounts. Several or major waste flows not being covered.	Low food waste amounts. Several or major waste flows not being covered.
Cyprus	No data available	No data available	No data available	No data available	No data available	No data available	No data available
Czech republic	Low food waste amounts without any explanation given	Low food waste amounts	Food waste data of low quality	Food waste data of low quality	No data available	Lowfood waste amounts. No explanation on what was included.	Several or major waste flows not being covered.
Denmark	Data of sufficient quality	Data of insufficient quality as only edible food waste was reported.	Data of sufficient quality	Data of sufficient quality	No data available	Data of sufficient quality	Data of sufficient quality
Estonia	No data available	Low food waste amounts	Data of sufficient quality	Data of sufficient quality	No data available	Low food waste amounts	Data of sufficient quality
Finland	Data of sufficient quality	Data of insufficient quality as only edible food waste was reported.	No data available	High food waste amounts. No explanation on what was included.	No data available	Data of sufficient quality	Data of sufficient quality
France	Data of sufficient quality	Data of sufficient quality	High food waste amounts. No explanation on what was included.	High food waste amounts. No explanation on what was included.	No data available	Data of sufficient quality	No information on what was included was retrieved.
Germany	Data of sufficient quality	Data of sufficient quality	Data of sufficient quality	Data of sufficient quality	No data available	Data of sufficient quality	Data of sufficient quality
Greece	Low food waste amounts without any explanation given	High food waste amounts.	Data of sufficient quality	Data of sufficient quality	No data available	Low food waste amounts. No information on what was included was retrieved.	No information on what was included was retrieved.
Hungary	No data available	No data available	No data available	No data available	No data available	No data available	No data available

Country	1. Production (NACE 1-3)	2. Processing (NACE 10-11)	3. Wholesale and logistics (NACE 46)	4. Retail and markets (NACE 47)	5. Redistribution (food donation etc.)	6. Food service (NACE 56)	7. Household
Ireland	No data available	No data available	High food waste amounts. No information on what was included was retrieved.	High food waste amounts. No explanation on what was included.	Data has been submitted but no estimation of food waste amounts has been made.	Data of sufficient quality	Data of sufficient quality
Italy	Data of sufficient quality	Data of insufficient quality as only edible food waste was reported.	Data of sufficient quality	Data of sufficient quality	No data available	Data of insufficient quality as only edible food waste was reported.	No information on what was included was retrieved.
Latvia	No data available	No data available	No data available	No data available	No data available	No data available	No data available
Lithuania	Low food waste amounts	Data of sufficient quality	Data of insufficient quality.	Data of insufficient quality.	No data available	Data of insufficient quality.	No information on what was included was retrieved.
Luxembourg	No data available	Low food waste amounts without any explanation given	Data of sufficient quality	Data of sufficient quality	No data available	Low food waste amounts without any explanation given	Data of sufficient quality (excluding sewer and home composting)
Malta	No data available	Data of insufficient quality.	No data available	No data available	No data available	No data available	Data of sufficient quality (excluding sewer and home composting)
Netherlands	No data available	No data available	No data available	Data of sufficient quality	Data has been submitted but no estimation of food waste amounts has been made.	Several or major waste flows not being covered.	Data of sufficient quality (excluding home composting)
Poland	No data available	No data available	No data available	No data available	No data available	No data available	No data available
Portugal	No information on what was included was retrieved.	No information on what was included was retrieved.	No data available	No data available	No data available	No data available	No data available
Romania	No data available	No data available	No data available	No data available	No data available	No data available	No data available
Slovakia	Low food waste amounts. Several or major waste flows not being covered.	Several or major waste flows not being covered.	No data available	No data available	No data available	No data available	No data available
Slovenia	Low food waste amounts. Several or major waste flows not being covered.	No explanation of what was included in the amounts could be given.	Data of sufficient quality	Data of sufficient quality	No data available	Low food waste amounts. Several or major waste flows not being covered.	Park waste and non household MSW are included in the amounts
Spain	No data available	No data available	No data available	No data available	No data available	No data available	No data available
Sweden	Data of sufficient quality	Byproducts are included in the amounts.	No data available	Data of sufficient quality	No data available	Data of sufficient quality	Data of sufficient quality
United Kingdom	Data of insufficient quality.	Data of sufficient quality	Data of sufficient quality	Data of sufficient quality	No data available	Data of sufficient quality	Data of sufficient quality

FOOD WASTE DATA QUALITY ACROSS EUROPE

Data of not sufficient quality

Data of high quality

FUSION, 2016

La classifica
kg procapite di cibo sprecato

Fonte: Commissione Ue, Eurostat

Fino a 100
da 101 a 200
da 201 a 300
da 301 a 400
oltre 401

1 Olanda (579)
2 Belgio (399)
3 Cipro (334)
4 Estonia (264)
5 Irlanda (250)
6 G. Bretagna (238)
7 Polonia (235)
8 Svezia (227)
9 Austria (225)
10 Lussemb.(207)
11 Finlandia (193)
12 Ungheria (184)
13 Spagna (176)
14 Lituania (171)
15 Italia (149)
16 Francia (144)
17 Portogallo (132)
18 Germania (126)
19 Danimarca (118)
20 Slovacchia (109)
21 Romania (105)
22 Lettonia (94)
23 Slovenia (89)
24 Bulgaria (87)
25 Rep. Ceca (71)
26 Malta (62)
27 Grecia (44)

Data of not sufficient quality

Data of high quality

Training, education and communication to reduce food waste in the food service industry - *LIFE17 GIE/IT/000579*   **Life FOSTER**

Country Report Consultation on national food waste policy in Europe

https://www.eu-fusions.org/index.php/country-reports

13 Member States and EEA countries are already covered by the preliminary inventory. These countries include **Austria, Denmark, Finland, France, Germany, Greece, Hungary, Italy, Netherlands, Sweden, United Kingdom, Norway, Turkey, Ireland** and **Spain**. Data was gathered in EU Member and Associated States covered by the consortium, drawing on existing literature, the consultation sessions during the FUSIONS multi-stakeholder platform meetings and other publicly available information. The reports are now available below under Group A.

More detailed information is still missing for the remaining EU countries: **Belgium, Cyprus, Croatia, Czech Republic, Estonia, Latvia, Lithuania, Luxemburg, Malta, Poland, Portugal, Slovak Republic, Slovenia, Romania** and **Bulgaria** (GROUP B).

3. Definition (wastage, food loss, food waste)

A clear understanding of how food waste is defined it needed before a quantification study is undertaken (Fusion report, p.93)

Box 1 | Defining Food and Inedible Parts

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

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

[a]Adapted from *Codex Alimentarius Commission, Procedural Manual*, 2013.

What's considered "food loss and waste" varies widely and, without a consistent set of definitions or an accounting and reporting framework, it is difficult to compare data within or among entities over time and draw useful conclusions.

According to FUSIONS Definitional Framework for Food Waste (FUSIONS, 2014)
"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, bioenergy production, co-generation, incineration, disposal to sewer, landfill or discarded to sea)

In addition, **packaging is not included** in the food waste definition and shall not be taken into account in the food waste quantification.
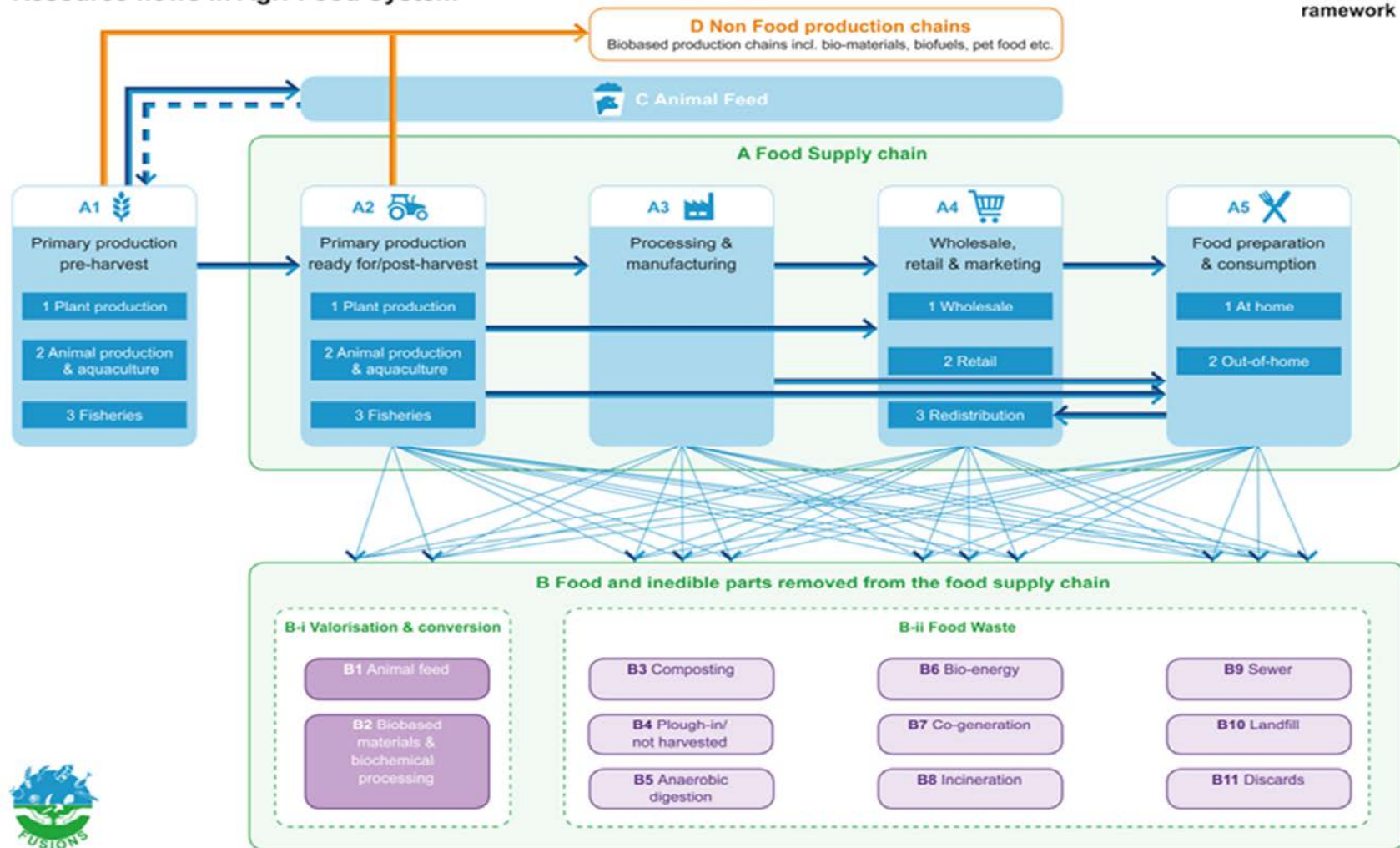
Figure 2 – The technical framework defining the Food supply chain and Food waste, on which the Manual builds[8].

Food Wastage

Food Loss
- Agricultural production and harvest
- Processing

Food waste
- Distribution & retail
- Restaurants & catering
- Domestic consumption

Efforts towards common terminology

Throughout supply chains in industrialized, emerging & DCs

Food loss and waste

Food loss
qualitative & quantitative

- Spilled, spoilt, lost (mass)
- Incurs reduction in quality (e.g. macro- & micronutrients)
- Unintended result of processes or institutional/legal framework

Food waste
- Discarded (mass)
- Fit for human consumption (from primary production to fork)
- Results from negligence or conscious decision

FOOD LOSS

Food loss refers to **all food produced for human consumption but not eaten by humans**.
Food loss is defined as "**the decrease in quantity or quality of food**" (FAO, 2014).
Food is lost throughout the supply chains; from primary production to final household consumption level. Significant loss occurs in industrialized regions as well as in low-income countries where food is lost during the early and middle stages of the food supply chain with lower levels of waste at consumer level.

FOOD WASTE

Food loss is defined as "the decrease in quantity or quality of food". **Food waste is part of food loss and refers to discarding or alternative (non-food) use of food that is safe and nutritious for human consumption along the entire food supply chain, from primary production to end household consumer level.** Food waste is recognized **as a distinct part of food loss** because the drivers that generate it and the solutions to it are different from those of food losses. (FAO, 2014)
Each year, an estimated one-third of all food produced for human consumption is lost or wasted world-wide

Food waste – global, multifaceted and systemic issue –

needs

coherent & coordinated responses at each stage of the food value chain
Engagement of all actors, from farm to fork

5. Food waste: an error into the system, an error of the system
&
a system error

Behind the failure to deal with food waste is a system error

The food systems keeps people from seeing or responding to waste because agriculture is modeled on extractive resourse industries, which take an inert material from one area and turn it into a product sold in another area, where it eventually breaks down and is dumped in yet another area– a linear assembly model.

Food is referred as a Fast moving consumer Good – a disposable product like any other.

Words used to describe food business – food industry, food production, packaged good industries, food processing and so on – **deny the biological nature of food and overlooked the web of life linking humans and food and food and environment**.

That leads to a waste management system based on disposal of dead waste products, rather than a resource management system based on maintaining the circle of life

This is not a food problem or a food waste problem, but a system problem embedded deep in the unconscious of individual and entire economies

The problem has been invisibilized
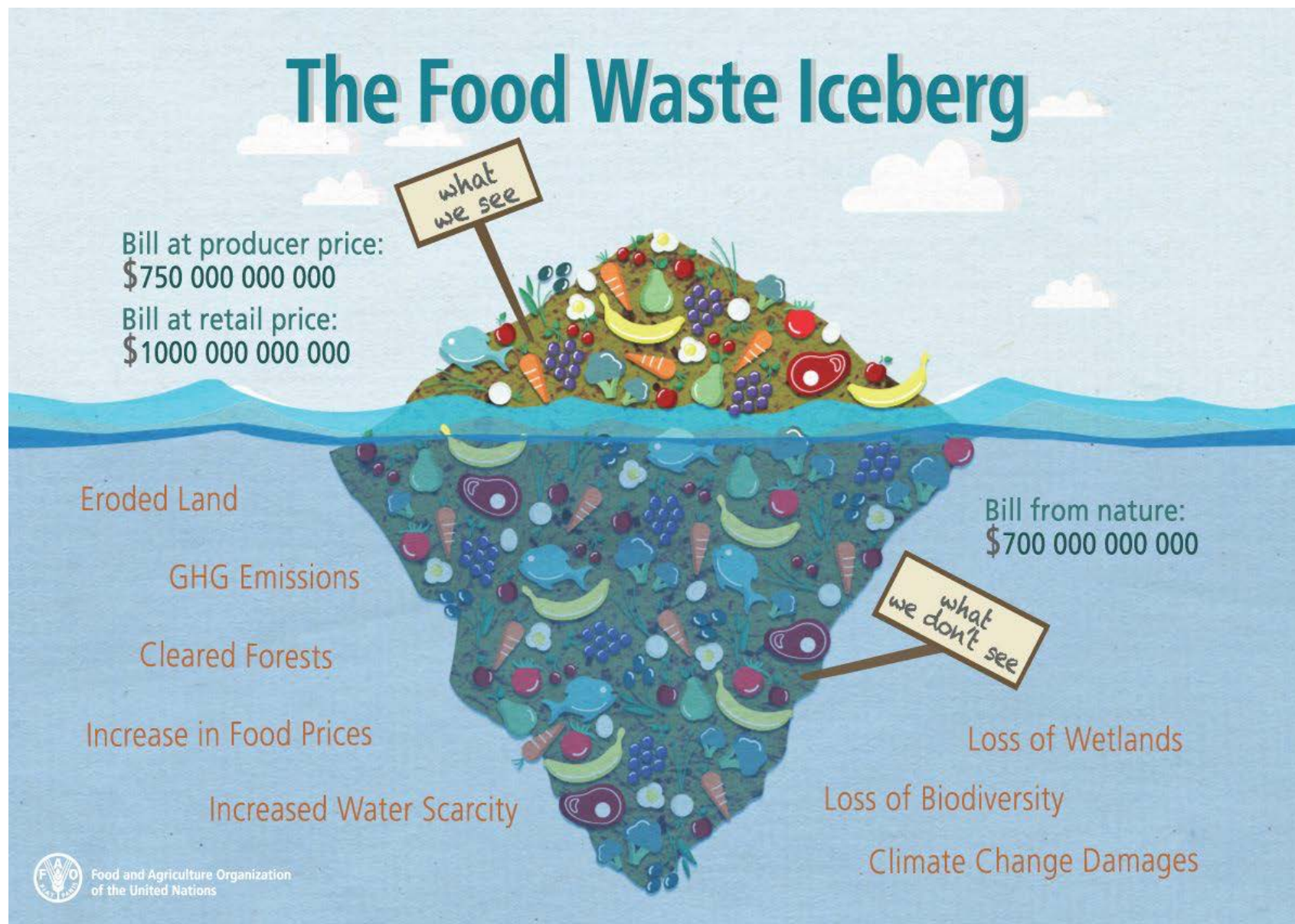
A warehouse to stock dead goods

https://www.youtube.com/watch?v=g-Am1qXgZT0
minute 1.24

System blindness is akin to fridge blindness, common among people who can't find a bottle of milk in the middle of the fridge because their preoccupied mind overlooks the obvious (Wayne Roberts)
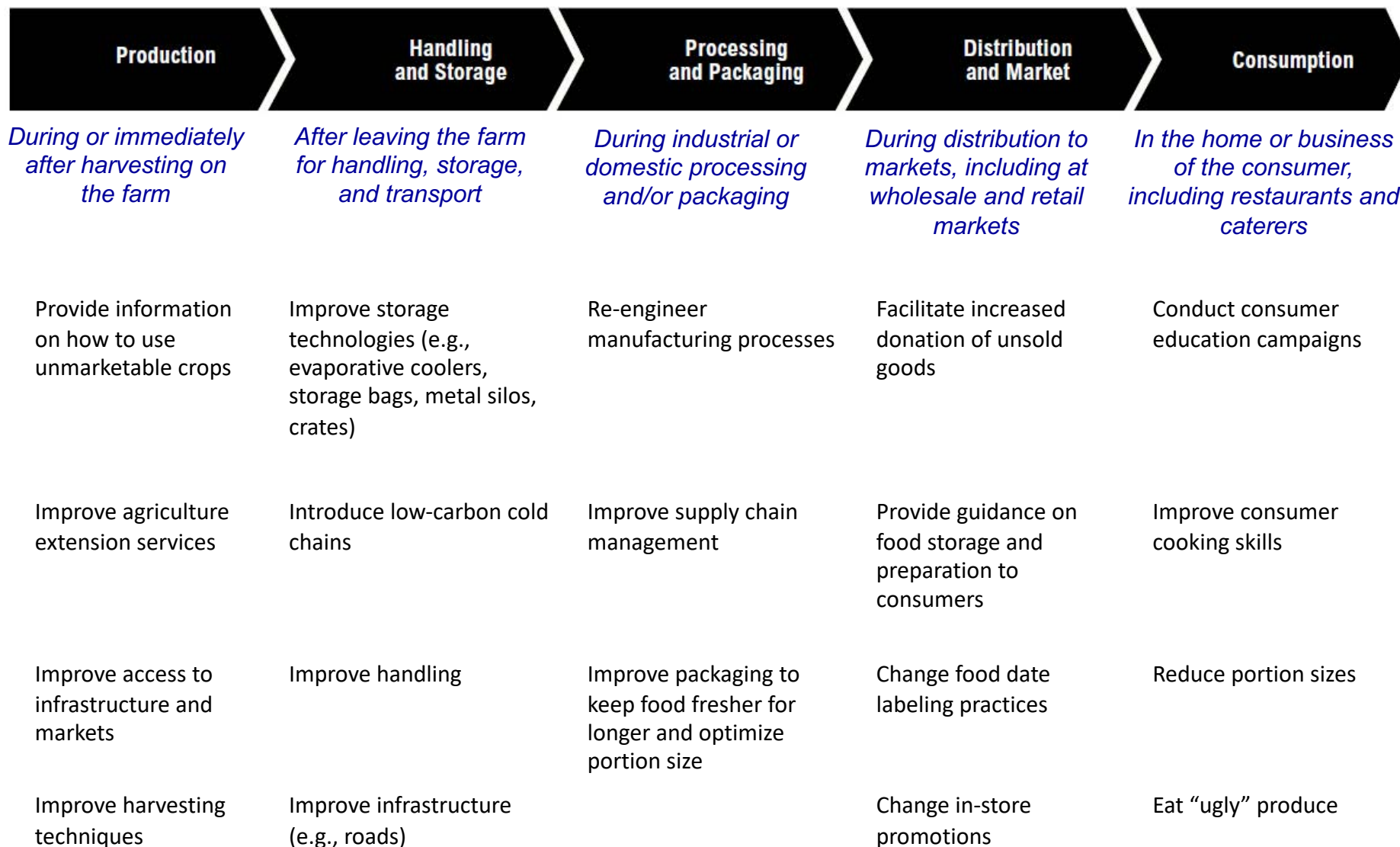
System blindness in a food context is due those not seeing that the food waste problem can be fixed by using food as a tool

FOOD IS A RESOURCE!

Possible approaches for reducing food loss and waste (not exhaustive)

Production	Handling and Storage	Processing and Packaging	Distribution and Market	Consumption
During or immediately after harvesting on the farm	*After leaving the farm for handling, storage, and transport*	*During industrial or domestic processing and/or packaging*	*During distribution to markets, including at wholesale and retail markets*	*In the home or business of the consumer, including restaurants and caterers*
Provide information on how to use unmarketable crops	Improve storage technologies (e.g., evaporative coolers, storage bags, metal silos, crates)	Re-engineer manufacturing processes	Facilitate increased donation of unsold goods	Conduct consumer education campaigns
Improve agriculture extension services	Introduce low-carbon cold chains	Improve supply chain management	Provide guidance on food storage and preparation to consumers	Improve consumer cooking skills
Improve access to infrastructure and markets	Improve handling	Improve packaging to keep food fresher for longer and optimize portion size	Change food date labeling practices	Reduce portion sizes
Improve harvesting techniques	Improve infrastructure (e.g., roads)		Change in-store promotions	Eat "ugly" produce

"Science teach us that the answer to understanding the complexity of something is to break into component parts.

Like classical cooking, it insists that things needs to be precisely measured and weighted. But interactions and relationship –cannot be measured or weighted…..

What we refer as the beginning and end of the food chain – a field on a farm at one end, a plate of food at the other, isn't really a chain at all*. The food chain is actually **more like a set of the Olympic rings**. **They all hang together***. *Which is how I came to understand that the right kind of cooking and the right kind of farming are one and the same. **Our belief that we can create a sustainable diet for ourselves by cherry-picking great ingredients is wrong***. *Because it's to narrow minded. We can't think about changing parts off our system .*

We need to think about redesign the system.

Dan Barber, Third Plate

www.todayiateorainbow.com

5. Systemic thinking (elements of the system approach applied into the food system)

System

Thinking about systems that are related to each other, emerges as a tool to create a new design and connection of the particular to the general, the micro to the macro, of what comes first to what comes after, of short to long term, of economy to the environment and society.

Garbage is a "system error" (the result of a **technical processes** that is defined at the source and **reinforced through cultural practices (Error of the system).**

It is therefore necessary to start again from reconsidering the **system's function and acting on its structure to modify its behavior**. (**Meadows,** 2008).

" A system is a set of related components that work together in a particular environment to perform whatever functions are required to achieve the system's objective. "

~Donella Meadows

@unschools | @leylaacaroglu

UNSCHOOL

Systems thinking is an approach to analysis that focuses on the way that a system's constituent parts interrelate and how systems work over time and within the context of larger systems.

The systems thinking approach contrasts with traditional analysis, which studies systems by breaking them down into their separate elements. Systems thinking can be used in any area of research and has been applied to the study of medical, environmental, political, economic, human resources, and educational systems, among many others.

"Systems Thinking enables you to grasp and manage situations of complexity and uncertainty in which there are no simple answers. It is a framework **for seeing interrelationships rather than things**, for seeing patterns rather then static snapshots. It's a way of learning your way to effective action by looking at connected wholes rather than separate parts. It is sometimes called practical holism."

According to systems thinking, **system behavior results from the effects of reinforcing and balancing processes.** A reinforcing process leads to the increase of some system component. If reinforcement is unchecked by a balancing process, it eventually leads to collapse. A balancing process is one that tends to maintain equilibrium in a particular system.

- **STARTING POINT**: Ownership of the food is the starting point

- **END POINT:** The end point is when the food provided by the food service business is actually put in a bin. Food waste may be generated during preparation and/or storage by the food service business as well as during the consumption stage (serving of food).
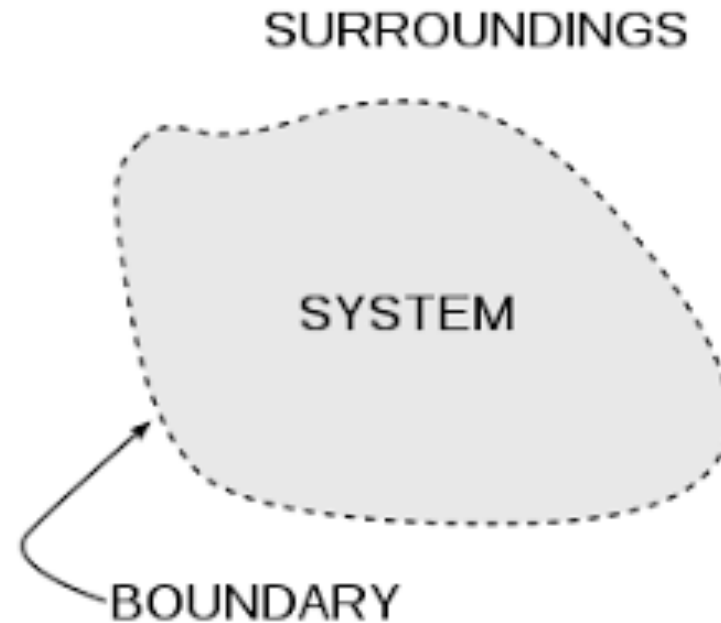
Table 2.2 Food waste away from home. The conceptual framework

	Responsibilities	FW Reduction Behaviours	FW Reuse or Redistribution Behaviours
Kichen food waste Food wasted during the preparation phase, due to overproduction, peeling, cutting, expiration, spoilage, overcooking, etc.	**Restaurant's managers and chefs**	Careful ordering and menu planning; Avoiding spoilage waste by monitoring used by dates and storage ; Offering different portion sizes. Educate the client to carefully order to avoid leftovers.	Reuse edible food items for making other recipes; Donation of surplus food; Offering a doggy bag to the client.
Client food waste Food wasted by the client after the food has been served to them	**Restaurant's clients**	Avoid leftovers	Doggie bag adoption

Author elaboration based on an idea by Principato, Pratesi, Secondi, 2017