EATING CITY
INTERNATIONAL PLATFORM
2010 - 2020

University
of Turin, Italy

DISAFA
Department of
Agriculture , Forestry
and Food Science

Eating City Summer Campus
UNITED 4 FOOD - For a Regenerative Food System
La Bergerie de Villarceaux
France – 12-19 August 2015

Measuring sustainability in public food service

Alessandro Kim Cerutti

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1. **Metrics for sustainability assessment**
2. **The basis of Life Cycle Assessment**
3. **A case study: ancient apple cultivars from Piedmont (Italy)**
4. **On the importance of transport**

5. **Modelling the catering service for the INNOCAT project**
6. **Examples of Carbon Footprint results for some GPP practices**
7. **Result of the full assessment and options for further improvements**
8. **Remarks on regenerative production systems**

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1. Metrics for sustainability assessment

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Metrics for sustainability assessment

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Environmental claims and declarations

BIODEGRADABLE!

ECO-FRIENDLY!

NATURAL!

SUSTAINABLE!

http://sinsofgreenwashing.org

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Environmental claims and declarations

1. Fluffy language

Words or terms with no clear meaning; e.g. 'eco-friendly'

2. Green products v. dirty company

Such as efficient light bulbs made in a factory which pollutes rivers

3. Suggestive Pictures

Green images that indicate a (un-justified) green impact e.g. flowers blooming from exhaust

4. Irrelevant claims

Emphasising one tiny green attribute when everything else is un-green

5. Best in class?

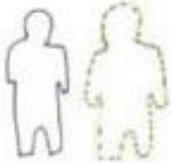
Declaring you are slightly greener than the rest, even if the rest are pretty terrible

6. Just not credible

'Eco friendly' cigarettes anyone? 'Greening' a dangerous product doesn't make it safe

7. Gobbledygook

Jargon and information that only a scientist could check or understand



8. Imaginary friends

A 'label' that looks like third party endorsement...except it's made up

9. No proof

It could be right, but where's the evidence?

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Environmental claims and declarations

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Environmental claims and declarations

According to ISO 14020 there are three levels of certifications based on the process of environmental assessment that is adopted

ISO 14021
Autodeclaration based on just one aspect of the production chain

ISO 14024
Multicriteria assessment verified by a third independent organization

ISO 14025
Environmental assessment based on the full life cycle of the product and verified by a third independent organization

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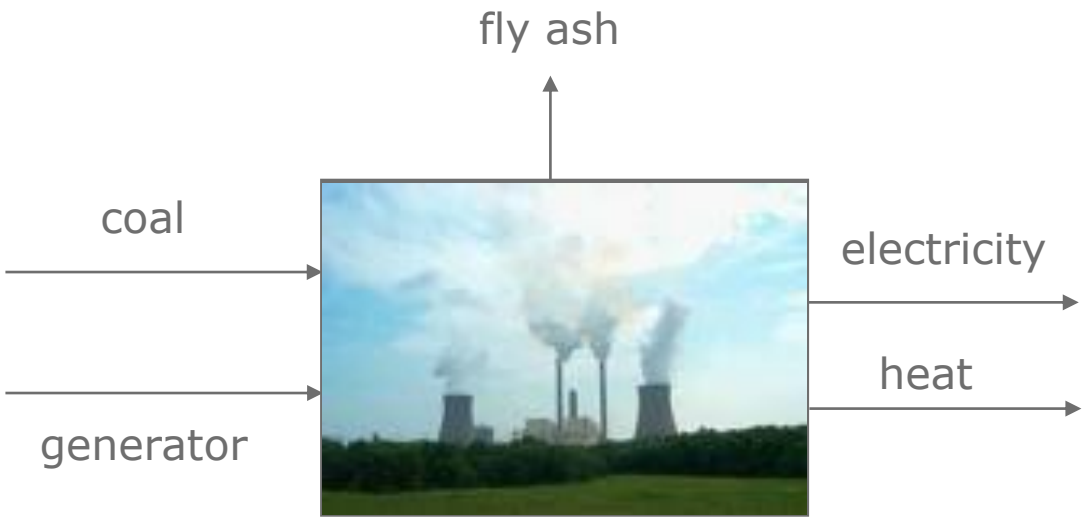
Types of environmental assessment methods



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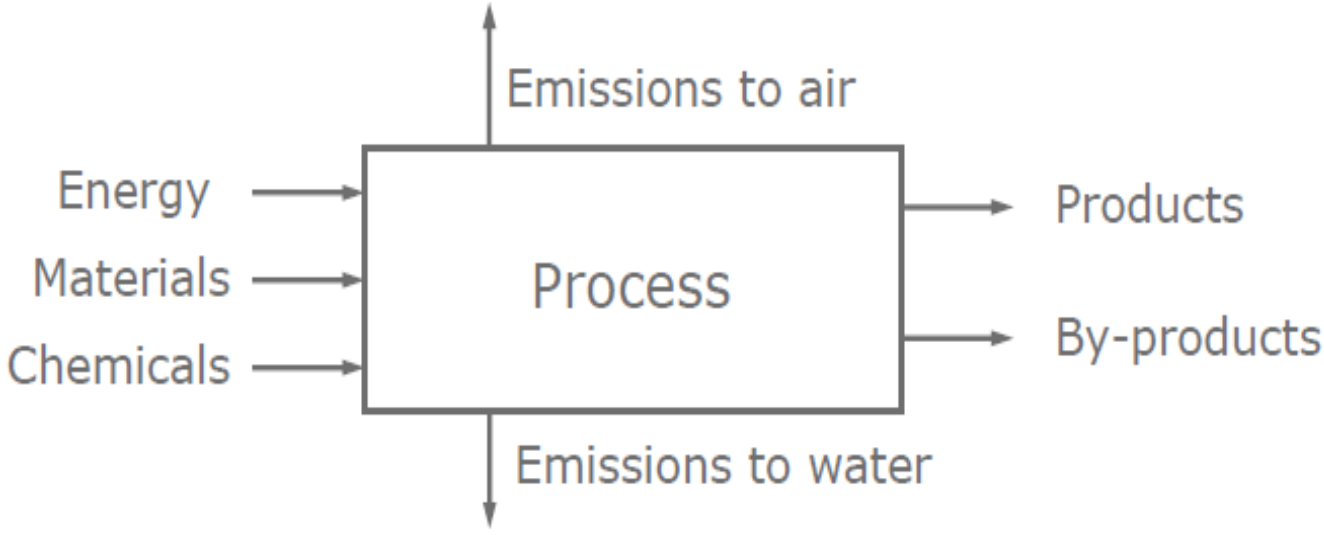

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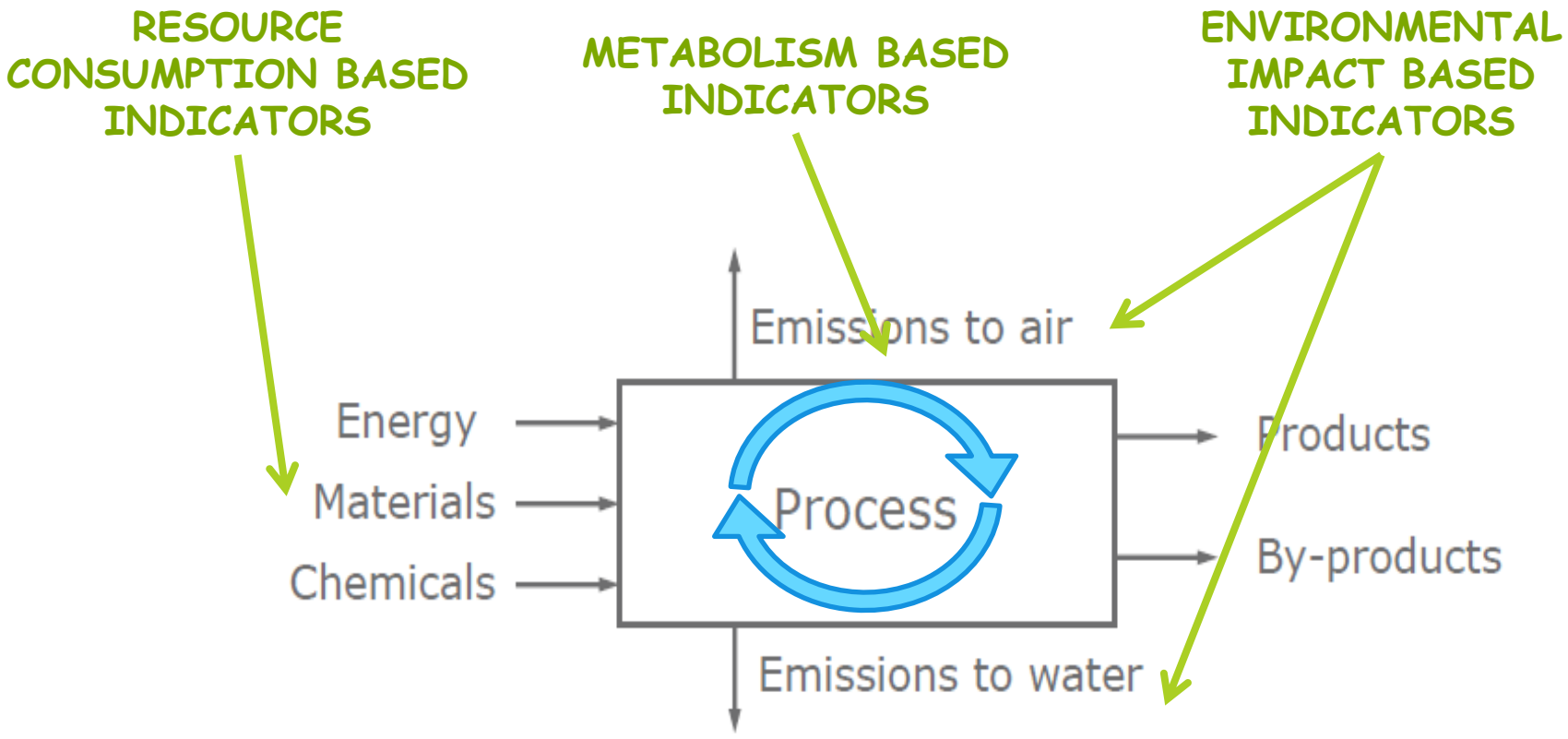

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Types of environmental assessment methods

RESOURCE CONSUMPTION BASED INDICATORS

Environmental space (Opshoor, 1995)

Ecological Footprint (Rees, Wackernagel, 1996)

Water footprint (Hoekstra, 2000)

NPP (Vitousek, 1986)

HANPP (IFF Austria)

METABOLISM BASED INDICATORS

Material Flow Analysis (Wuppertal Institut, 2000)

eMergy (Odum, 1996)

exergy (Jorgensen,1998)

Energy Flow Analysis (IFF)

ENVIRONMENTAL IMPACT BASED INDICATORS

Carbon footprint

Ecosystem damage potential

Human health damage

"If all you have is a hammer, everything looks like a nail"
Abraham Maslow

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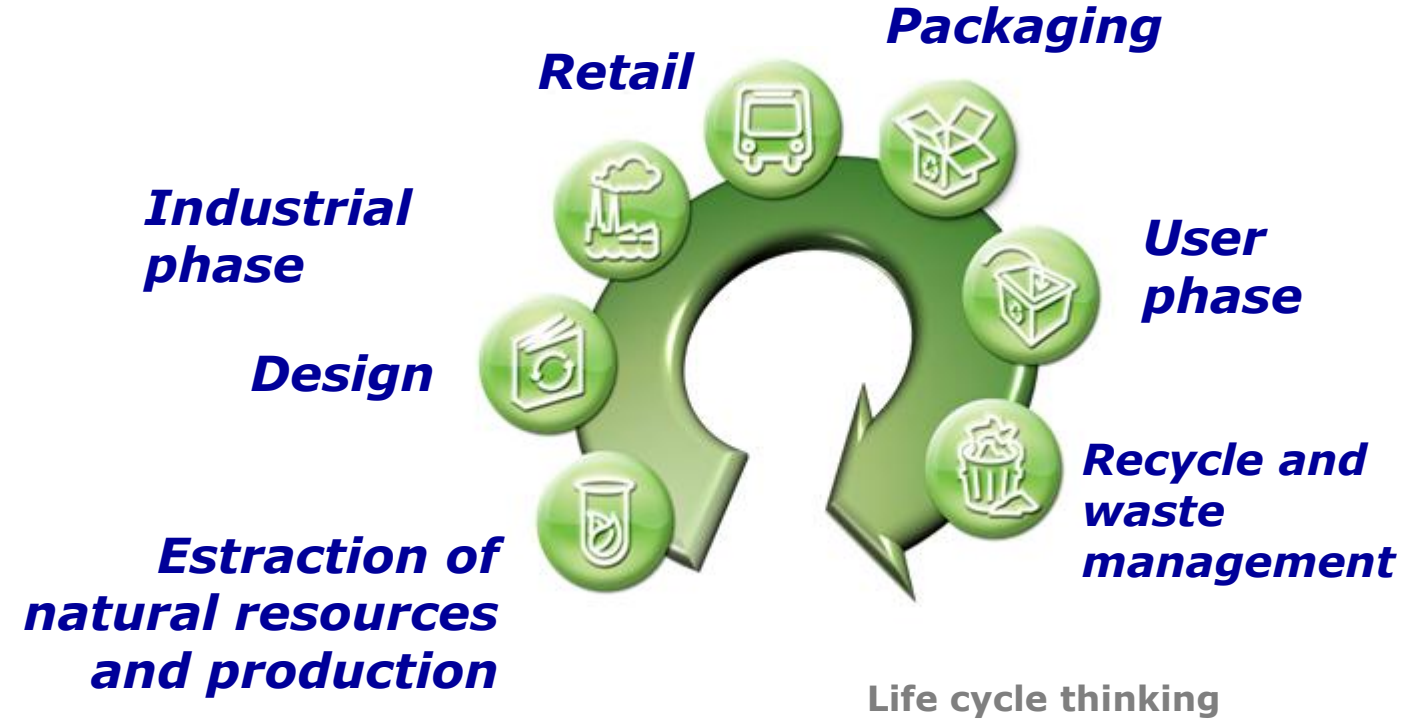
The Life Cycle approach



Life cycle thinking
http://eplca.jrc.ec.europa.eu/

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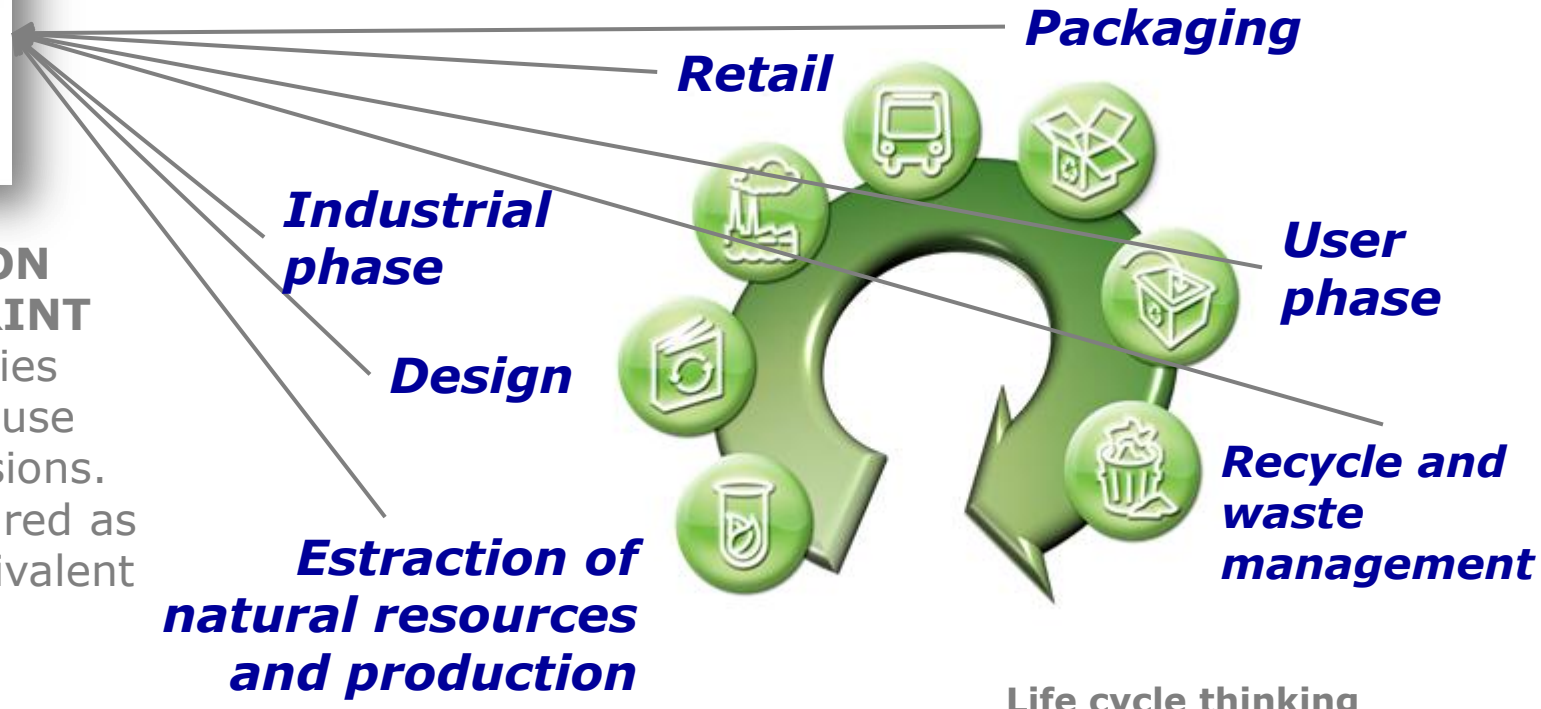
The Life Cycle approach

CARBON FOOTPRINT
Quantifies greenhouse gas emissions. It is measured as kg CO_2equivalent



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The Life Cycle approach

WATER FOOTPRINT
Quantifies water consumption in all phases. It is measured in blue, green and grey water

Packaging

Retail

Industrial phase

User phase

Design

Recycle and waste management

Estraction of natural resources and production

Life cycle thinking
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The Life Cycle approach

ECOLOGICAL FOOTPRINT
Quantifies the consumption of bioproductive land in all phases. It is measured global hectares

Packaging

Retail

Industrial phase

Design

Estraction of natural resources and production

User phase

Recycle and waste management

Life cycle thinking
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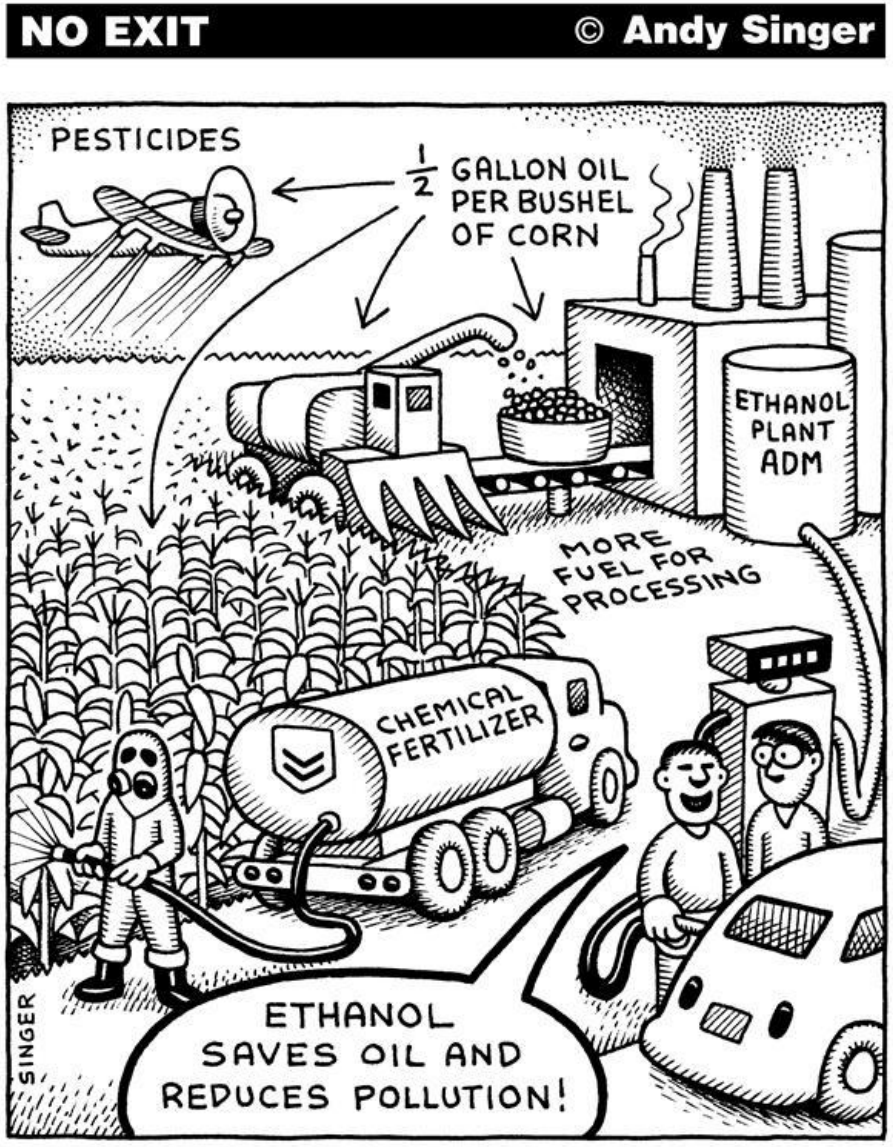
The Life Cycle approach

- Allows the identification of hot spots
- Avoids the 'burden shifting' effect



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The European Platform on LCA is a project of the European Commission, carried out by the Commission's Joint Research Centre, Institute for Environment and Sustainability in collaboration with DG Environment Directorate Green Economy.
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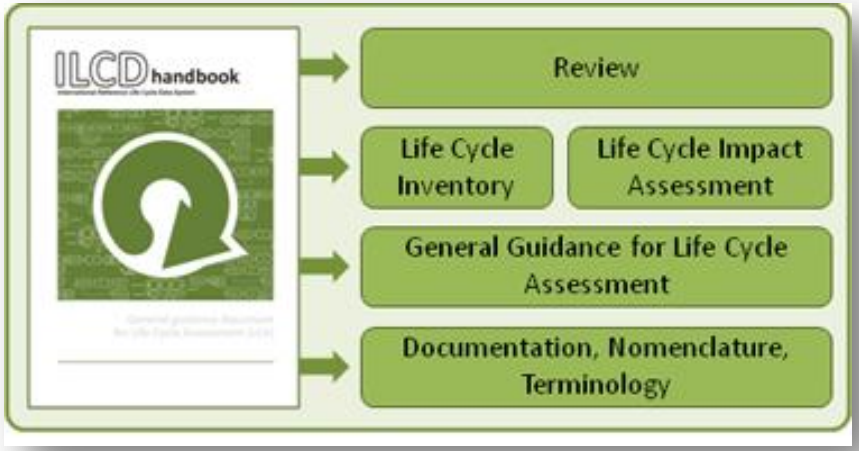

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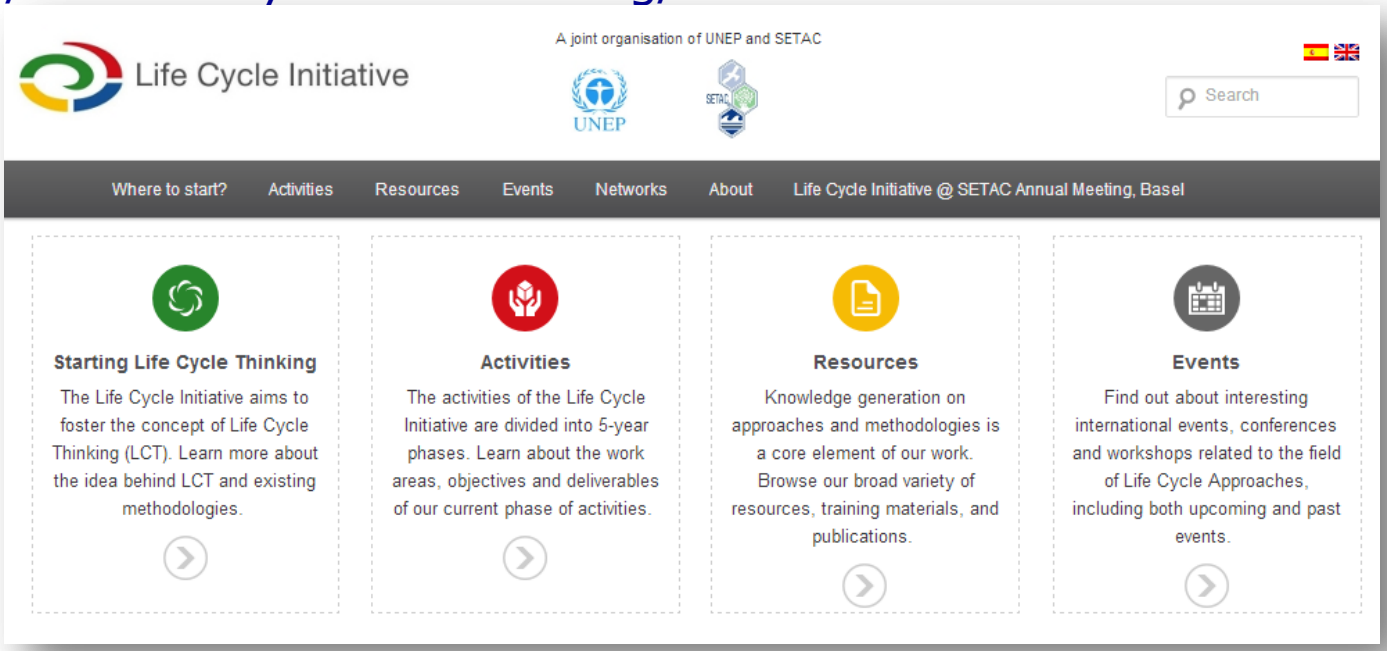
The United Nations Environment Programme (UNEP) and the Society for Environmental Toxicology and Chemistry (SETAC) launched in 2002 an International Life Cycle Partnership, known as the Life Cycle Initiative, to enable users around the world to put life cycle thinking into effective practice.
http://www.lifecycleinitiative.org/



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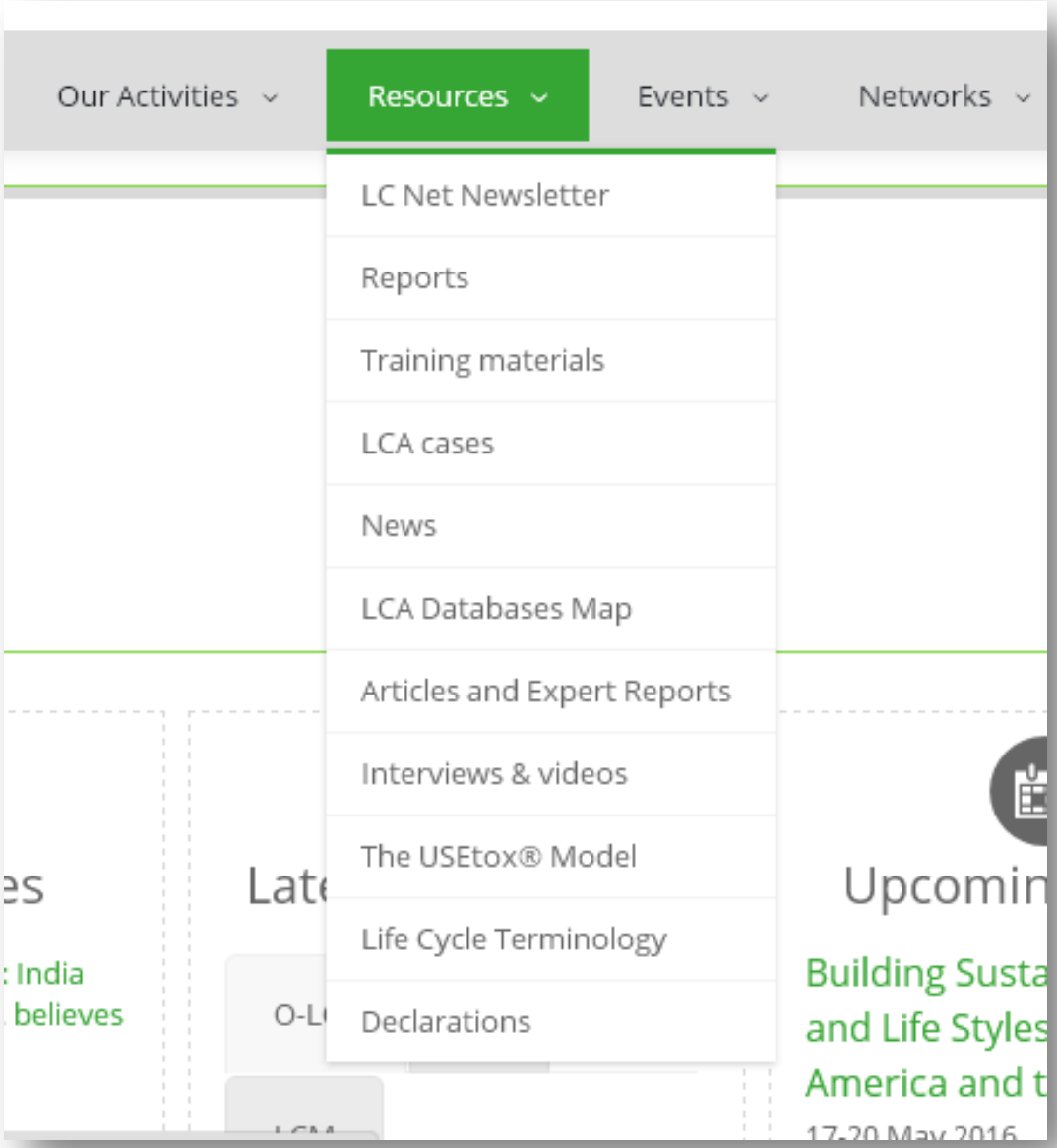
LIFE CYCLE INITIATIVE
http://www.lifecycleinitiative.org/

UNEP

SETAC

A joint organization of
UNEP and SETAC



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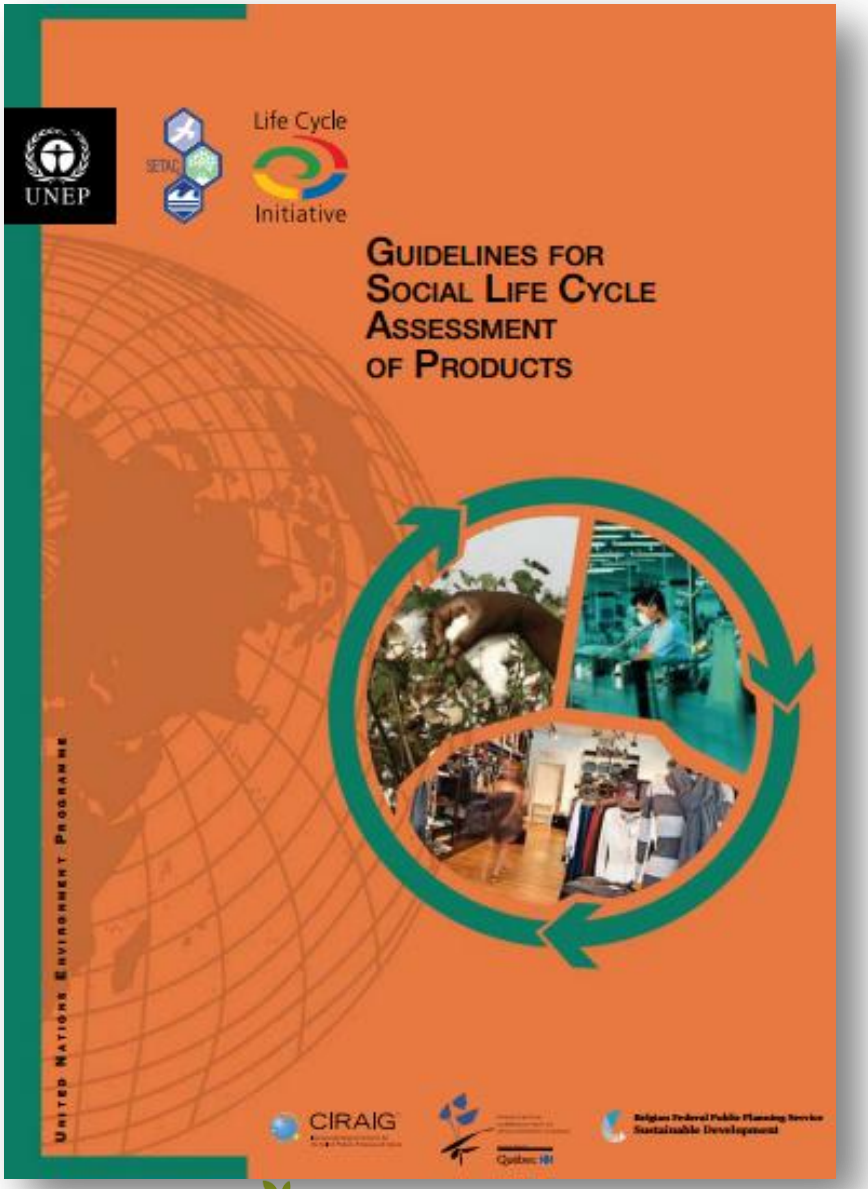

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2. The basis of Life Cycle Assessment

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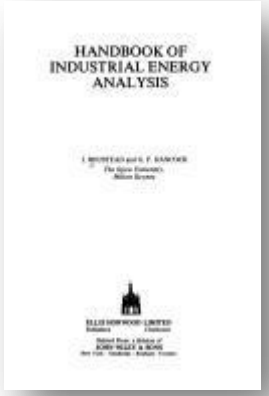
The basis of Life Cycle Assessment (LCA)

In the UK**, Ian Boustead** calculated the total energy used in the production of various types of beverage containers, including glass, plastic, steel, and aluminium.

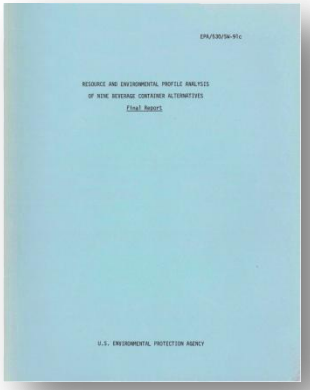


Boustead consolidated his methodology to make it applicable to a variety of materials, and published the **Handbook of Industrial Energy Analysis**.

1969 1972 1974 [...] 1979

The **Coca Cola Company** funded a study to compare resource consumption and environmental releases associated with beverage containers.

EPA produced the report "Resource and Environmental Profile Analysis of Nine Beverage Container Alternatives"



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UN Earth Summit there was a ground-swell of opinion that life-cycle assessment methodologies were among the most promising new tools for a wide range of environmental management tasks.

Wegener Sleeswijk et al (1996) published the first set of guidelines on methodological topics for LCAs of agricultural products in the Netherlands.

1980 [...] 1990 1992 1996 1997

Vis, J. C., Krozer, J., van Duyse, P. J. C., & Koudijs, H. G. (1992). Milieumatenstudie van margarines (p. 56). Rotterdam

Unilever

As the same need for agricultural specifications was also felt in other European countries, a number of European research institutes took concerted action to draw up a harmonised approach for use by European agricultural LCA practitioners (Audsley & Alber, 1997).

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LCA FOOD

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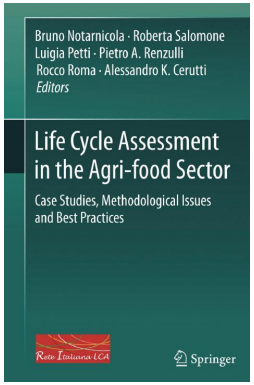
The basis of Life Cycle Assessment (LCA)

LCA in Agriculture, Agro-Industry and Forestry. Brussels, Belgium

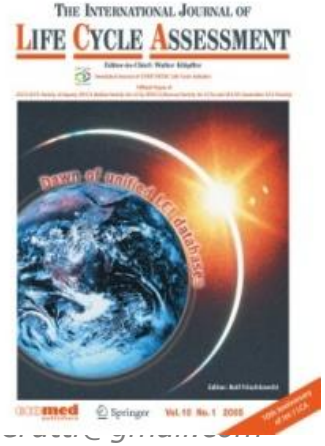
Notarnicola, B., Salomone, R., Petti, L., Renzulli, P. A., Roma, R., & Cerutti, A. K. (Eds.). (2015). *Life Cycle Assessment in the Agri-food Sector: Case Studies, Methodological Issues and Best Practices*. Springer.



1998 — 2015

1996 — 2002

International Journal of Life Cycle Assessment



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Food production systems (vs industrial systems)

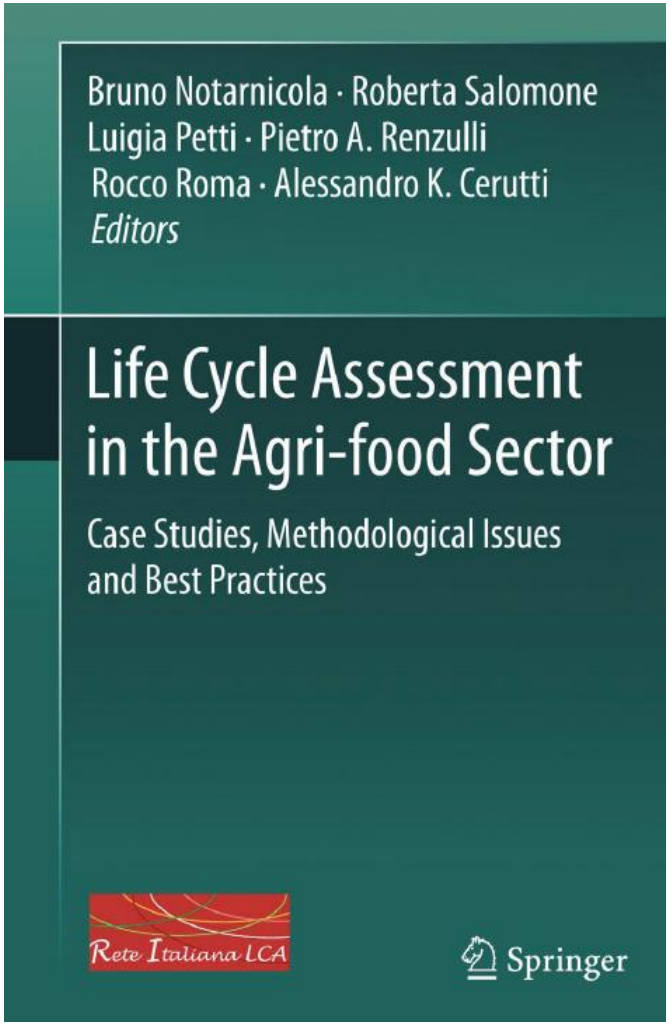
- Unproductive phases

- Yield not constant during the years

- Pluriannual productions (in perennial crops)

- Carbon sequestration

- Organic byproduct



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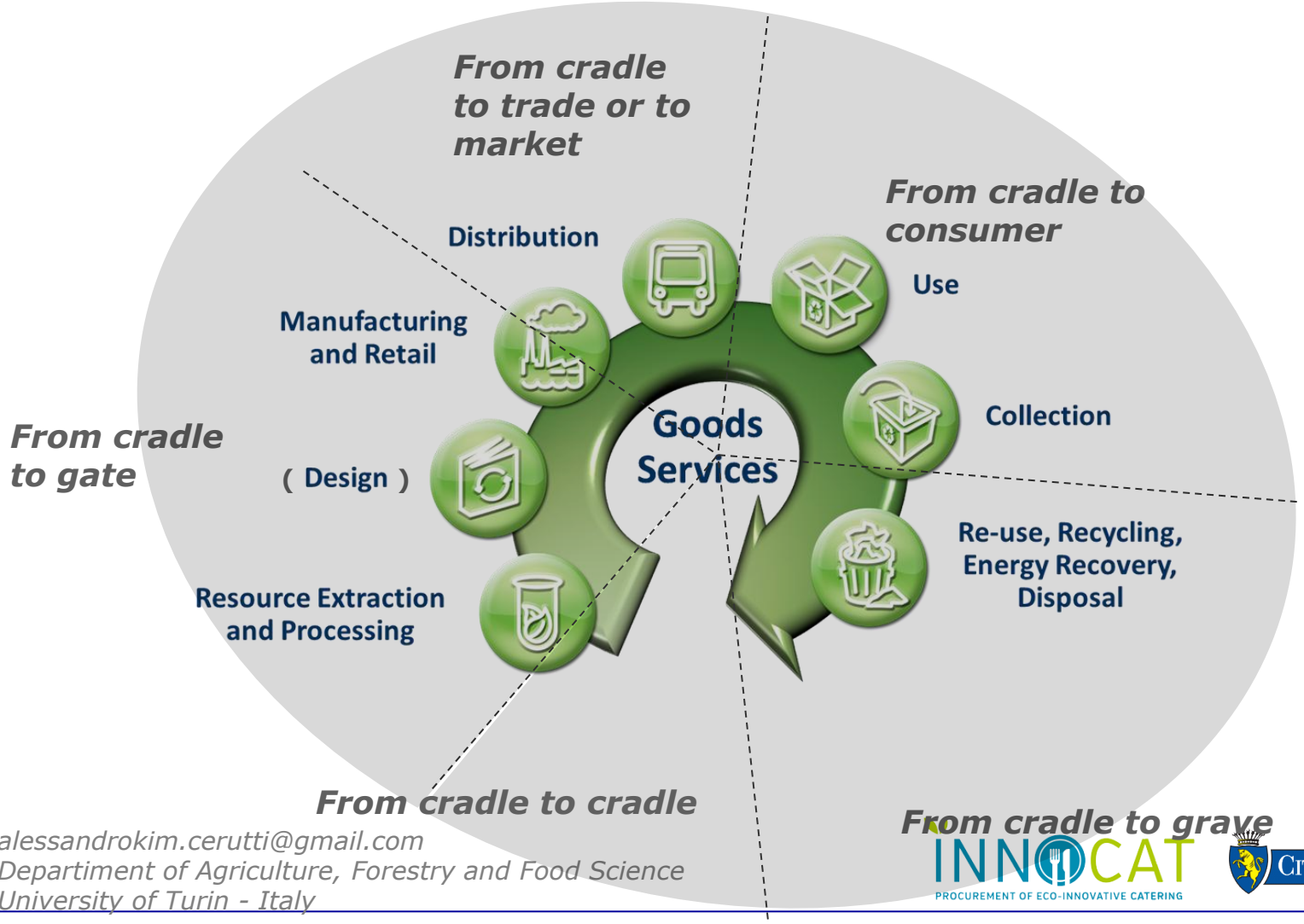
System boundaries

http://eplca.jrc.ec.europa.eu/



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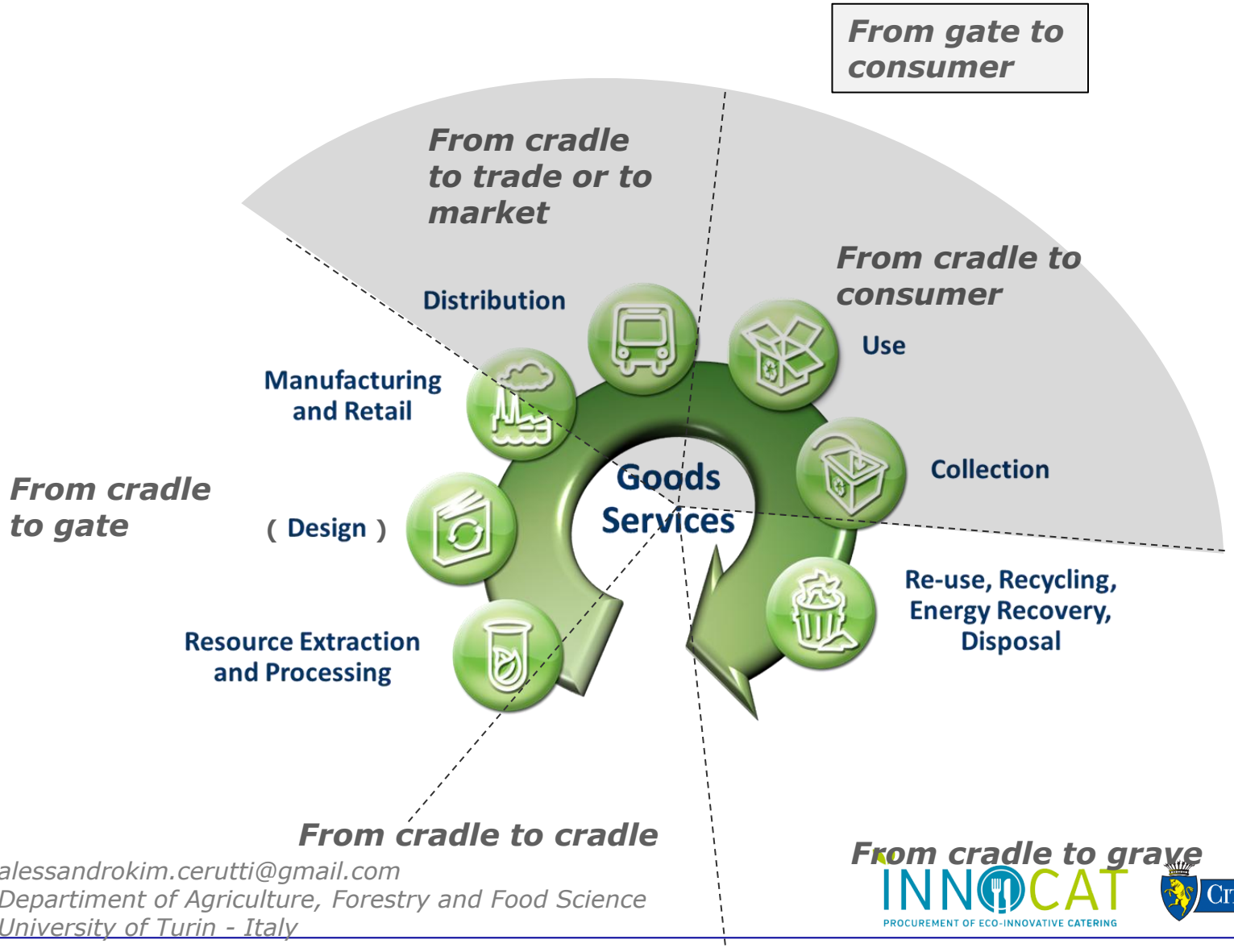

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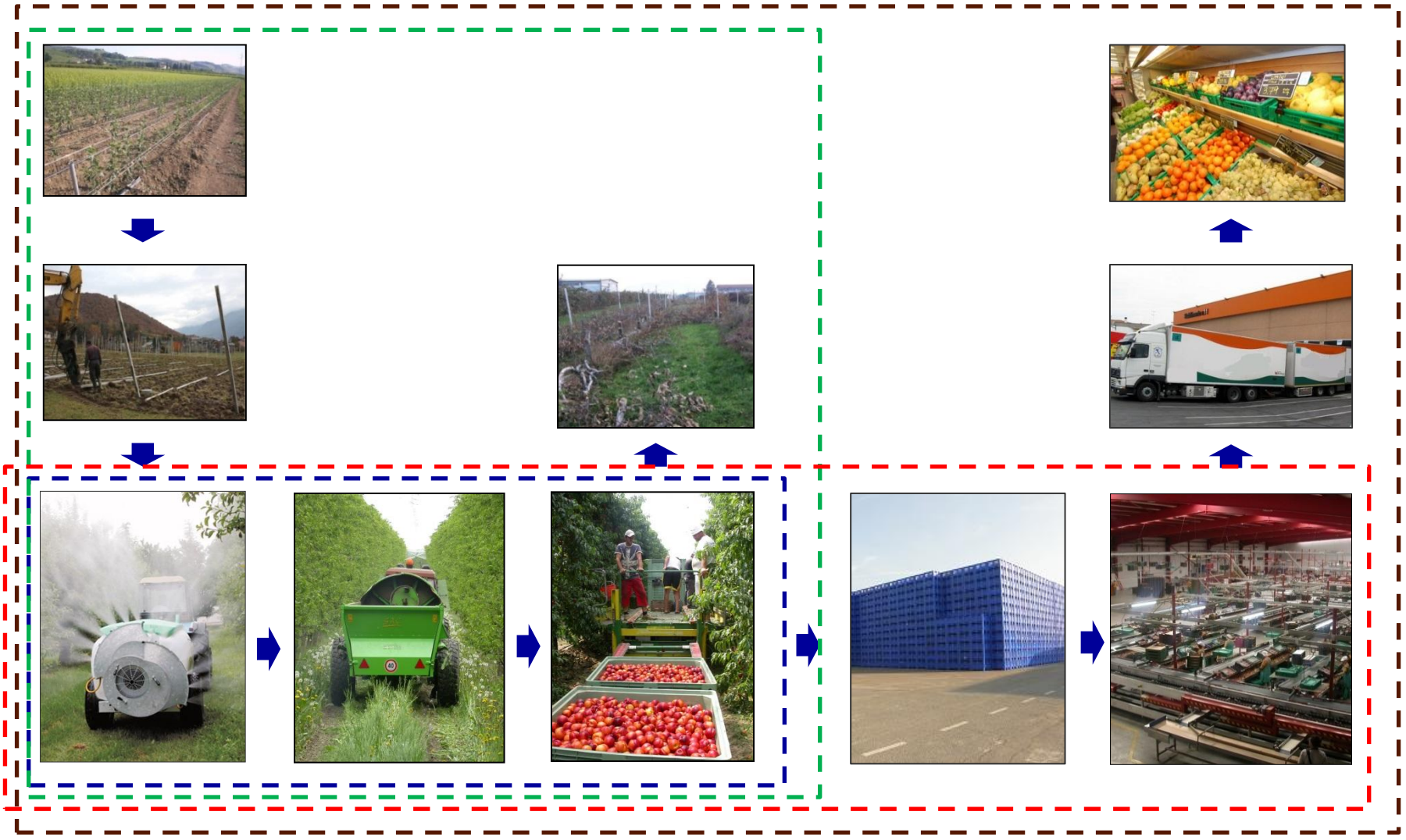
e.g. fruit products (system boundaries)



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e.g. fruit products (emission calculation)

Emissions CO_2-equivalent + **Emissions** CO_2-equivalent = **Total emission** CO_2-equivalent

- water →
- fertilizers →
- pesticides →
- fuel(s) →
- electricity →
- plastics →
- concrete →
- […] →

→ **t CO_2eq / t fruit**

Yield
mass of fruit

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e.g. fruit products (functional unit)

Emissions
CO_2-equivalent

Emissions
CO_2-equivalent

- water →
- fertilizers →
- pesticides →
- fuel(s) →
- electricity →
- plastics →
- concrete →
- […] →

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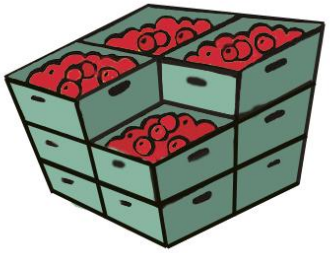
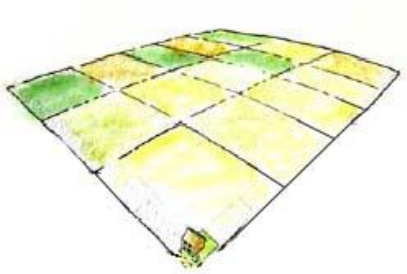
Functional unit

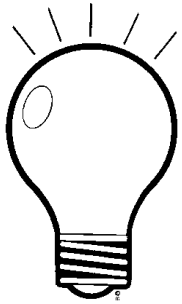
The unit to which all environmental impacts are referred



Mass

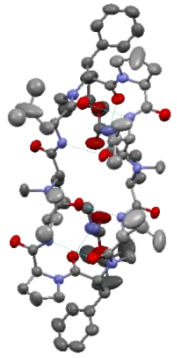


Surface



Energy content

Economy



Nutrient content

Problems:

- Non quantifiable functions
- More than one function
- Different results for different FUs

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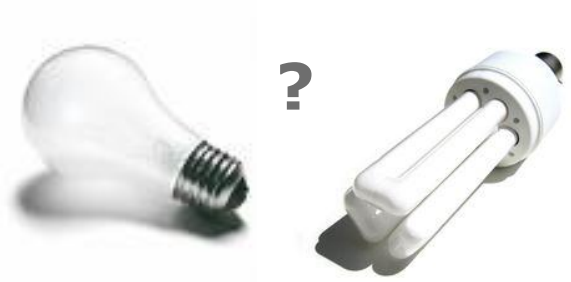
Functional unit



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3. A case study: ancient apple cultivars from Piedmont (Italy)

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A case study: ancient apple cultivars from Piedmont

Cerutti, A. K., Bruun, S., Donno, D., Beccaro, G. L., & Bounous, G. (2013). Environmental sustainability of traditional foods: the case of ancient apple cultivars in Northern Italy assessed by multifunctional LCA. *Journal of Cleaner Production*, *52*, 245-252.

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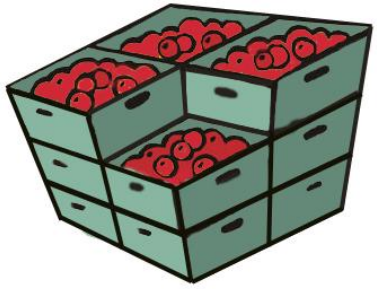
Table 1
Main agronomic properties of the cultivars studied.

Characteristics	Golden delicious	Grigia di Torriana	Magnana	Runsé
Origin	Clay county, West Virginia (United States)	Barge, Cuneo (Italy)	Bibiana, Torino (Italy)	Cavour, Torino (Italy)
Vigour	Medium-low	Medium-low	Medium	High
Flowering period	Early (2nd week of April)	Early (2nd week of April)	Early (2nd week of April)	Early (2nd week of April)
Harvest period	Early (end of September)	Medium-late (end of October)	Late (2nd week of November)	Late (2nd week of November)
Orchard design (cm)	400–450 * 80–100	450 * 150	450 * 180	500 * 200
Plants per hectare	2200–3000	1450	1230	1000
Yield (t/ha)	40	25	23	20
Wholesale fruit price in 2011 (€/kg)	0.40–0.80	0.60–1.00	0.60–1.00	0.60–1.00



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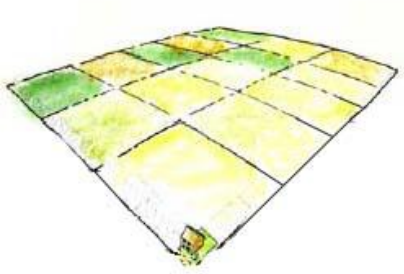

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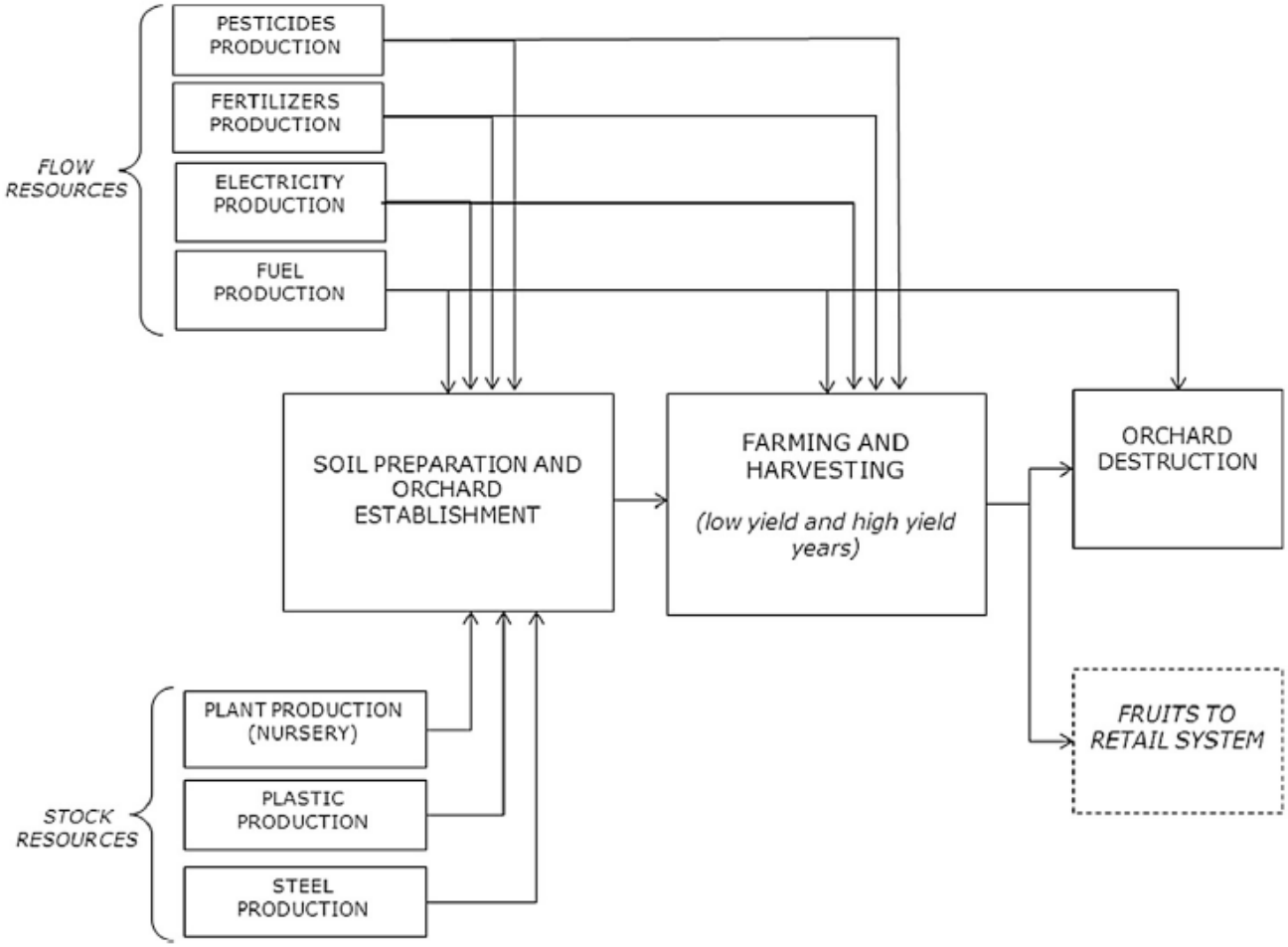
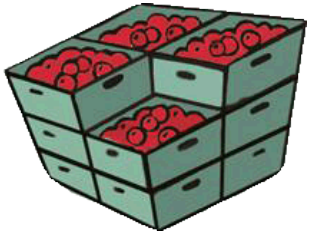
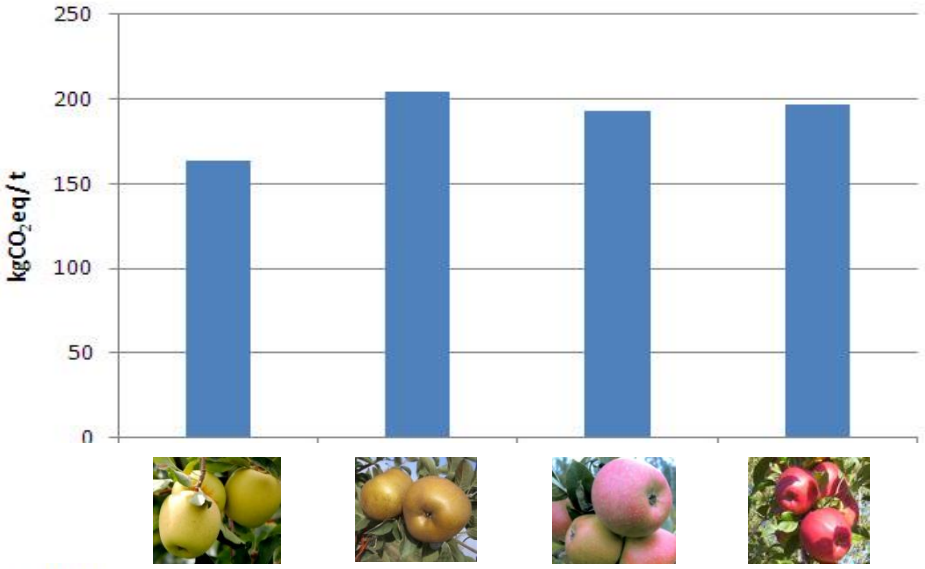


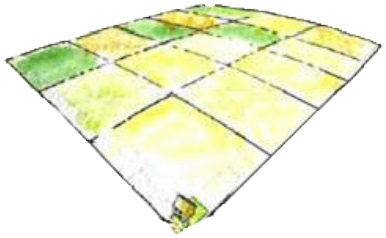
Fig. 1. System boundaries of the study. Dotted line box indicates processes not included in the assessment.

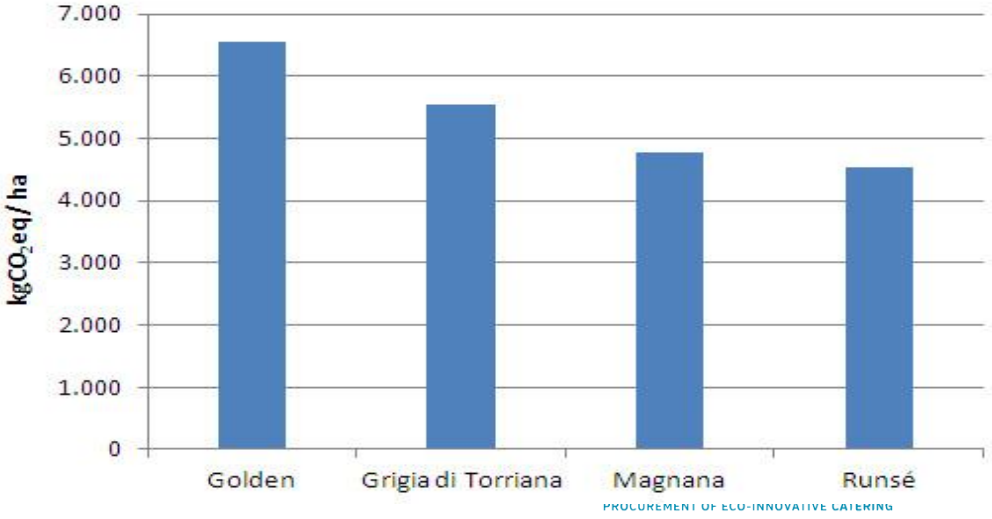
A case study: ancient apple cultivars from Piedmont

Cerutti, A. K., Bruun, S., Donno, D., Beccaro, G. L., & Bounous, G. (2013). Environmental sustainability of traditional foods: the case of ancient apple cultivars in Northern Italy assessed by multifunctional LCA. *Journal of Cleaner Production*, *52*, 245-252.









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About a third of world production of food for human consumption is lost or wasted throughout the food chain each year (FAO 2011); about 24% when measured in calories.

The percentage rises to 45% for the fruits and vegetables!

FAO 2011. Global Food Losses and Waste. Extent, Causes and Prevention, available at: http://www.fao.org/docrep/014/mb060e/mb060e.pdf

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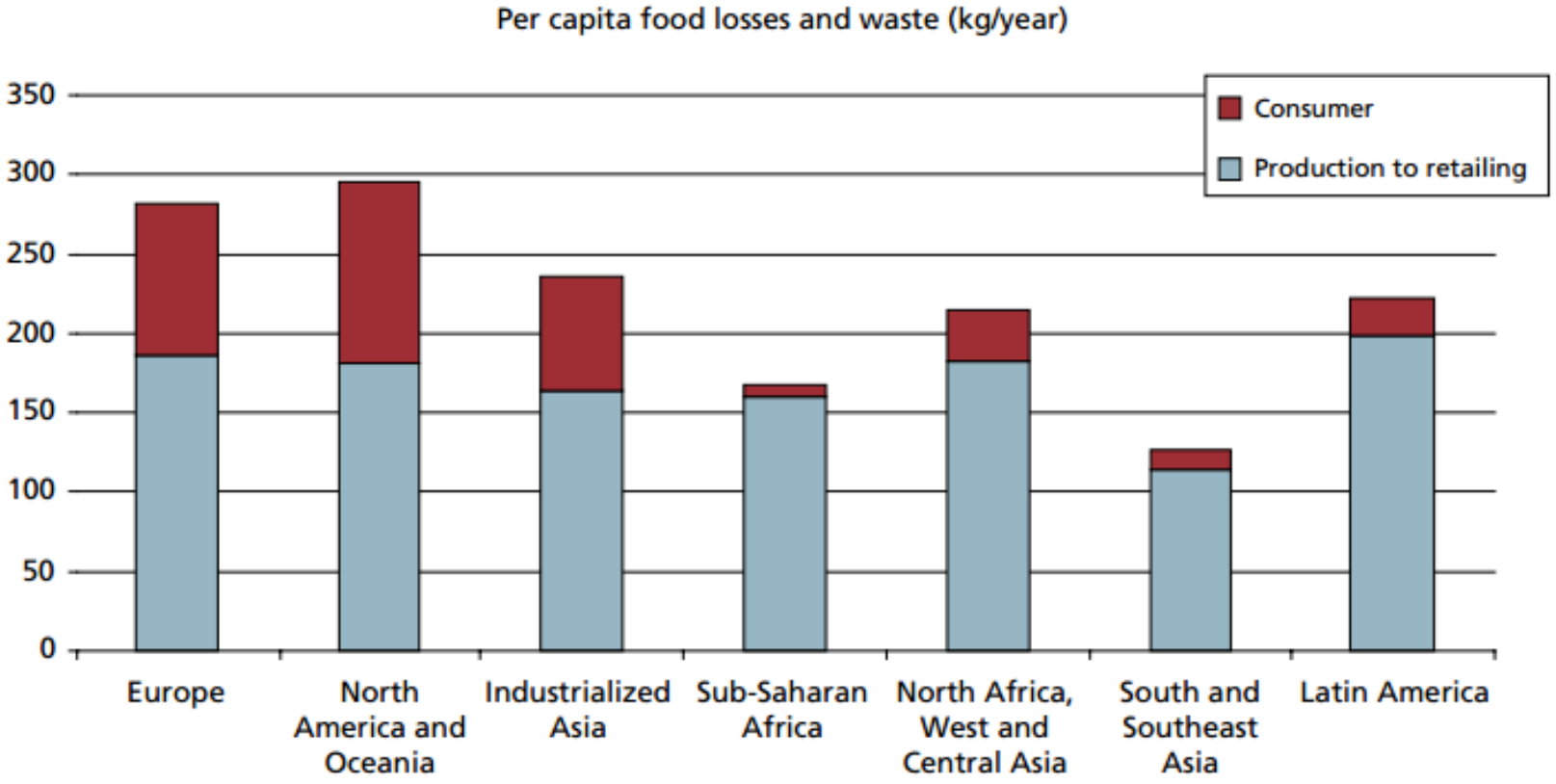
Figure 2. Per capita food losses and waste, at consumption and pre-consumptions stages, in different regions



FAO 2011. Global Food Losses and Waste. Extent, Causes and Prevention, available at: http://www.fao.org/docrep/014/mb060e/mb060e.pdf

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4. On the importance of transport

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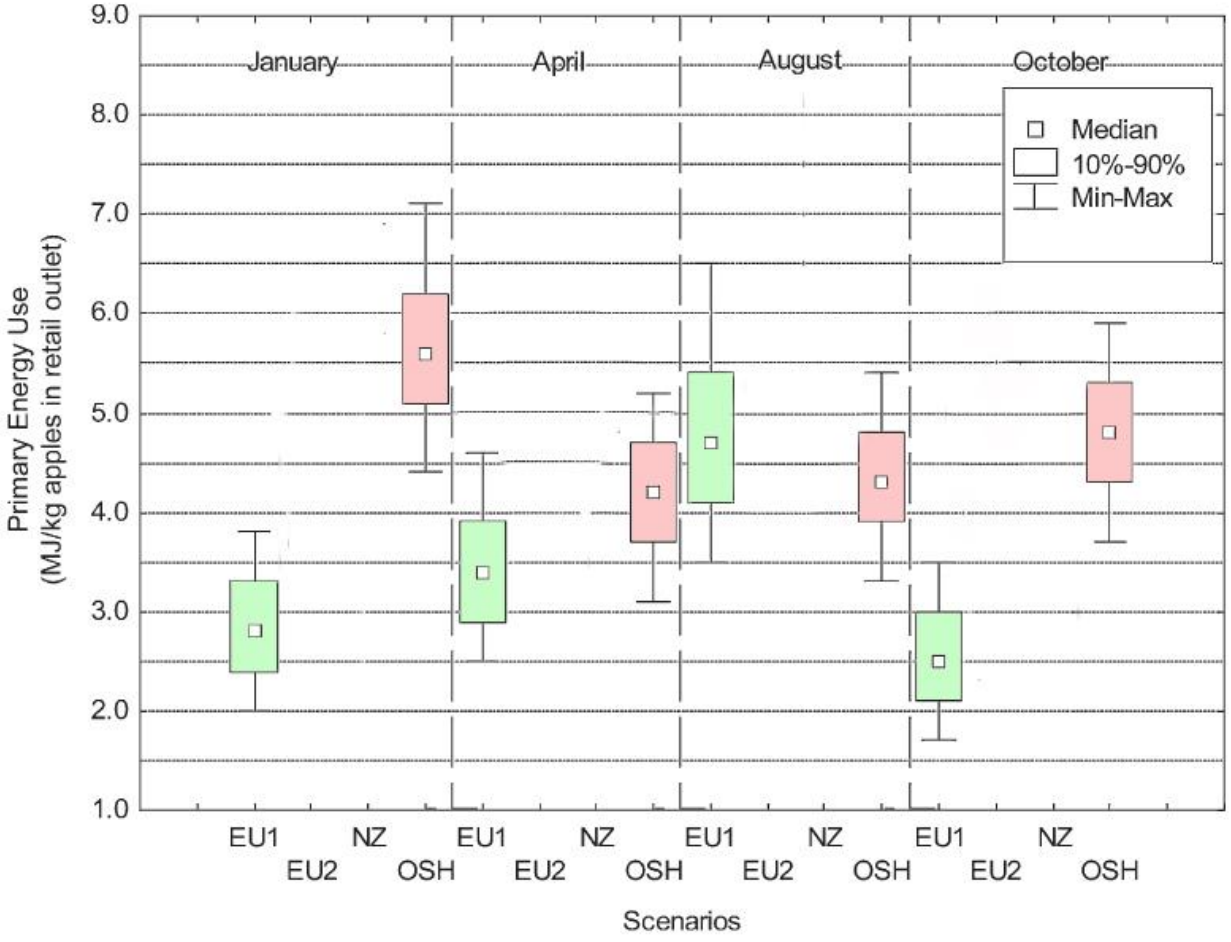
Mila i Canals L., Cowell S.J., Sim S., Basson L., 2007. **Comparing domestic versus imported apples: a facus on energy use.** Env. Sci. Pollut. Res., 14:338-344



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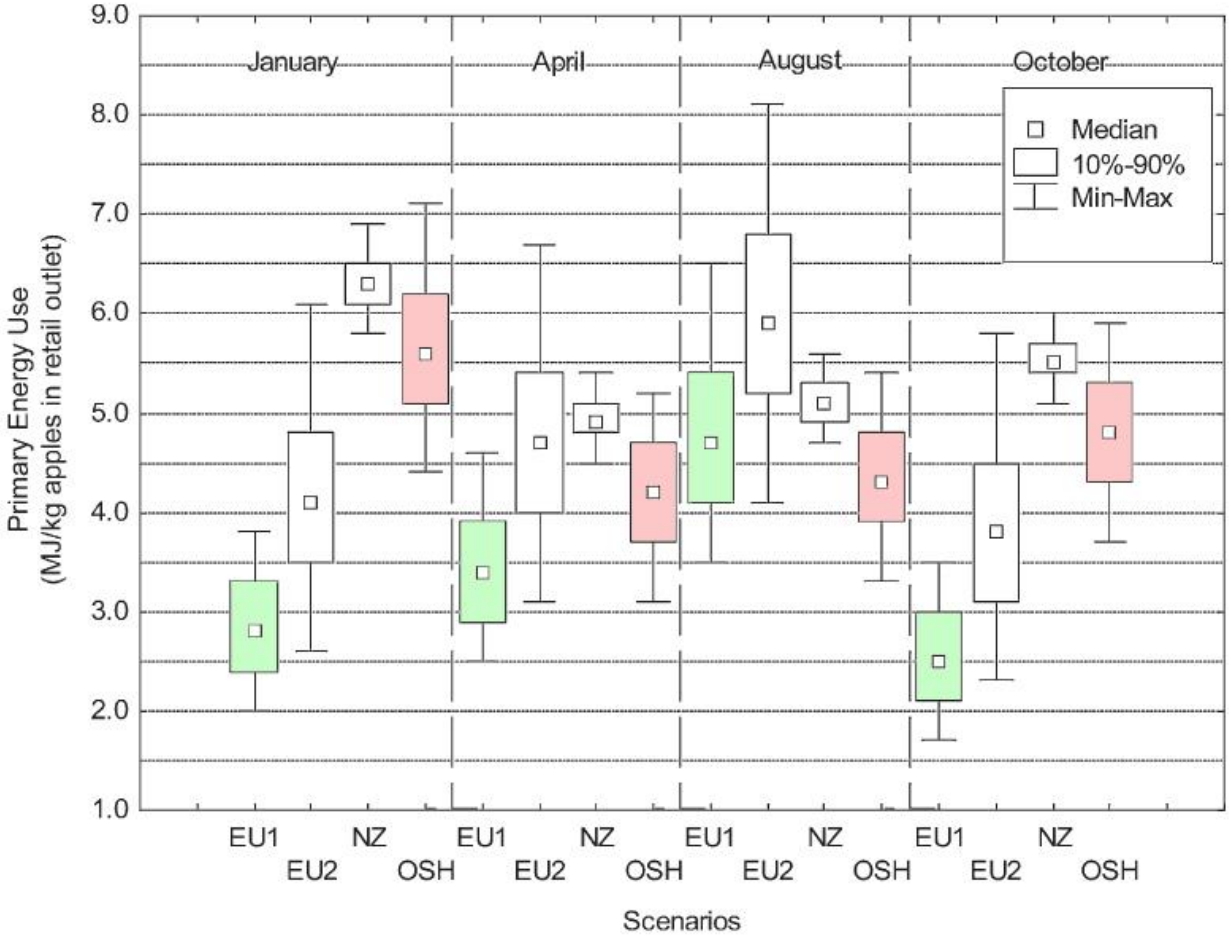
Mila i Canals L., Cowell S.J., Sim S., Basson L., 2007. **Comparing domestic versus imported apples: a facus on energy use.** Env. Sci. Pollut. Res., 14:338-344



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5. Modeling the catering service for the INNOCAT project

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INNOCAT
PROCUREMENT OF ECO-INNOVATIVE CATERING

www.sustainable-catering.eu

INNOCAT aims to bring together a group of public and private buyers to publish a series of tenders for eco-innovative catering products, services and solutions. The aim is to help encourage eco-innovation in the catering sector by providing a sizeable launch market for new solutions.


INNOCAT
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Sustainable Public Procurement of School Catering Services

A good practice report

August 2015

Authors: Caroline Chandler, Antoinette Franklin, Amalia Ochoa, Simon Clement (ICLEI – Local Governments for Sustainability)

Contributions and acknowledgements:
Flury Bastian (ETH Sustainability), Tamara Bruning (City of Ghent), Alessandro Cerutti (University of Turin), Antoine Gobin (City of Lens), Robin Gourlay (Scottish Government), Rossana Guglielmetti (City of Turin), Anya Hultberg (Copenhagen House of Food), Betina Bergmann Madsen (Municipality of Copenhagen), Mia Malin (City of Helsinki), Dr Leigh Mapledoram (WRAP), Maurizio Mariani (Risteco), Elina Ojala (Motiva), Roberta Sonnino (University of Cardiff), Carola Strassner (University of Münster), Richard Watts (Soil Association), Turin Chamber of Commerce

WWW.SUSTAINABLE-CATERING.EU

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PHASE 1

Calculation of greenhouse gas emissions of the food production stages

Life cycle thinking
http://eplca.jrc.ec.europa.eu/

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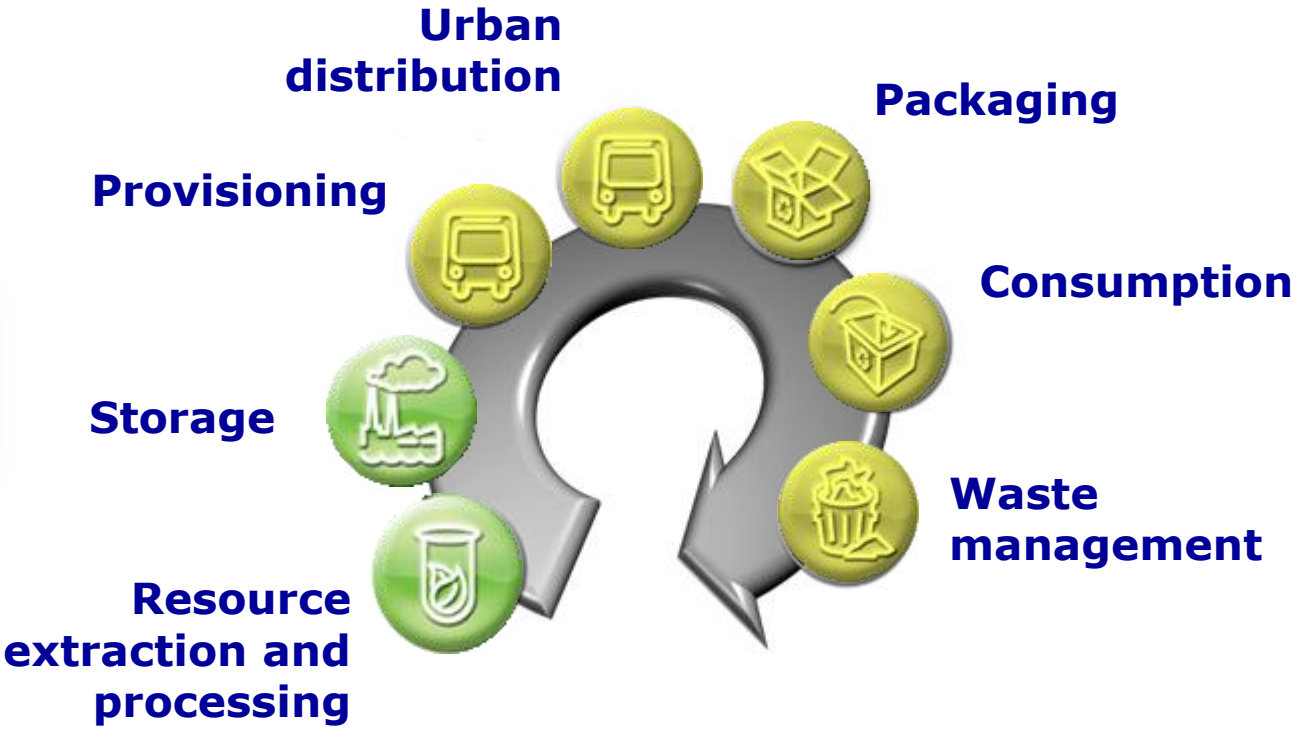
PHASE 1

Calculation of greenhouse gas emissions of the food production stages



Life cycle thinking
http://eplca.jrc.ec.europa.eu/

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PHASE 2

Calculation of greenhouse gas emissions of the food transport stages

Life cycle thinking
http://eplca.jrc.ec.europa.eu/

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PHASE 3

Calculation of greenhouse gas emissions of the food cooking and serving stages, including materials, energy and waste

Life cycle thinking
http://eplca.jrc.ec.europa.eu/

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PHASE 4

Testing the carbon footprint reduction occurred by the adoption of the GPP practices included in the INNOCAT project

Stage of the catering service	GPP Policy
Food production	Different production practices for food Change food component in the diet
Food transport	Local provisioning of food Improvements in local distribution of food
Cooking, storage and serving	Adoption of energy efficient appliances Certified electricity exclusively from renewable sources Electricity from photovoltaic panels
Waste management	Washable tableware Tableware in Mater-Bi® Tap water Optimization (80%) of the recycling of inorganic waste Optimization (90%) of the composting of organic waste

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6. Examples of Carbon Footprint results for some GPP practices

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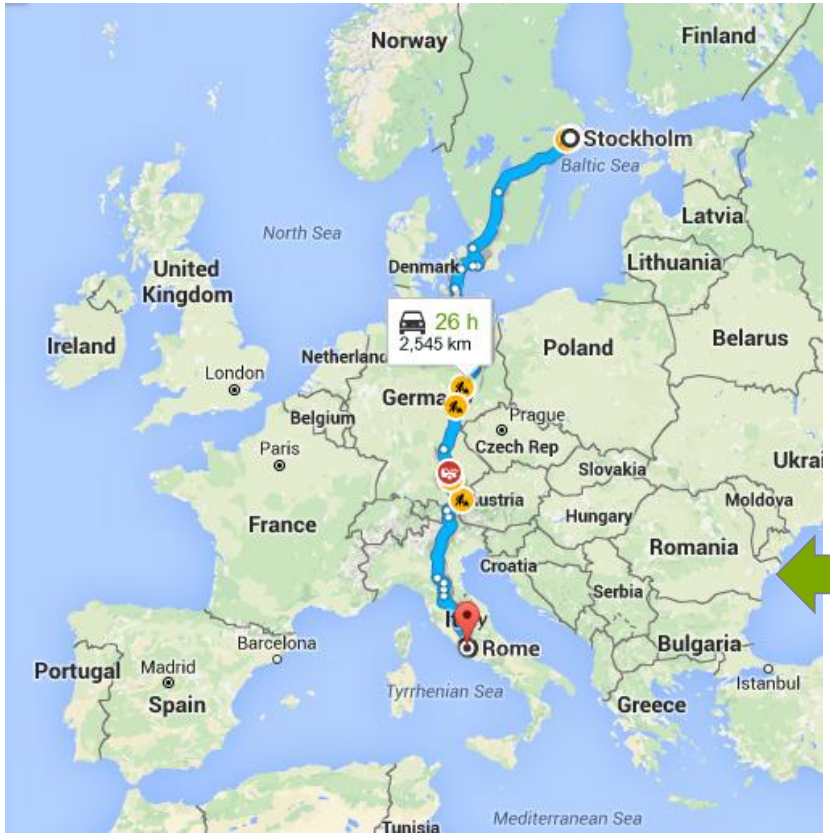
… just to give the idea



1 km = 200g CO_2 eq.

1 mile = 320g CO_2 eq.
1 mile = 0.64 pounds CO_2 eq.

1 tCO_2 eq. = 5000 km

1 tCO2 eq. = 3125 miles
2204 lbsCO2 eq. = 3125 miles

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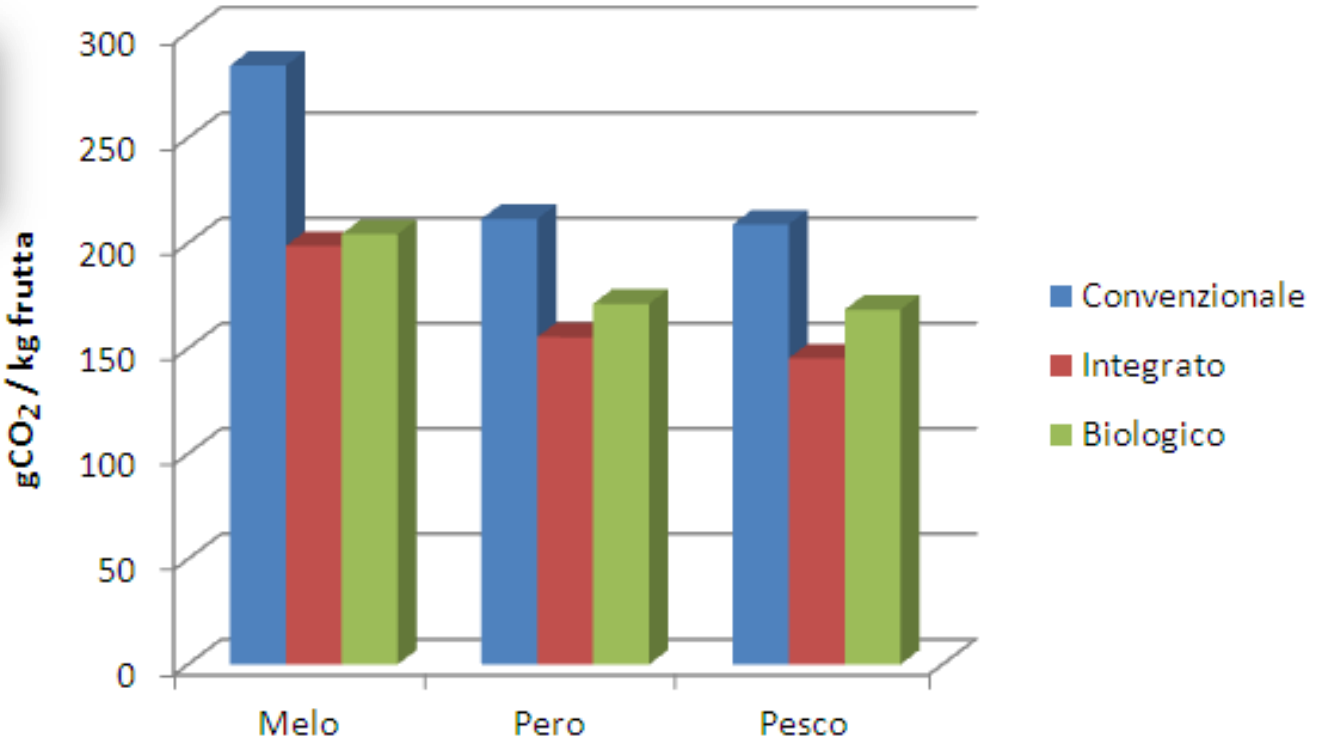
e.g. GPP1 - Different production practices for food



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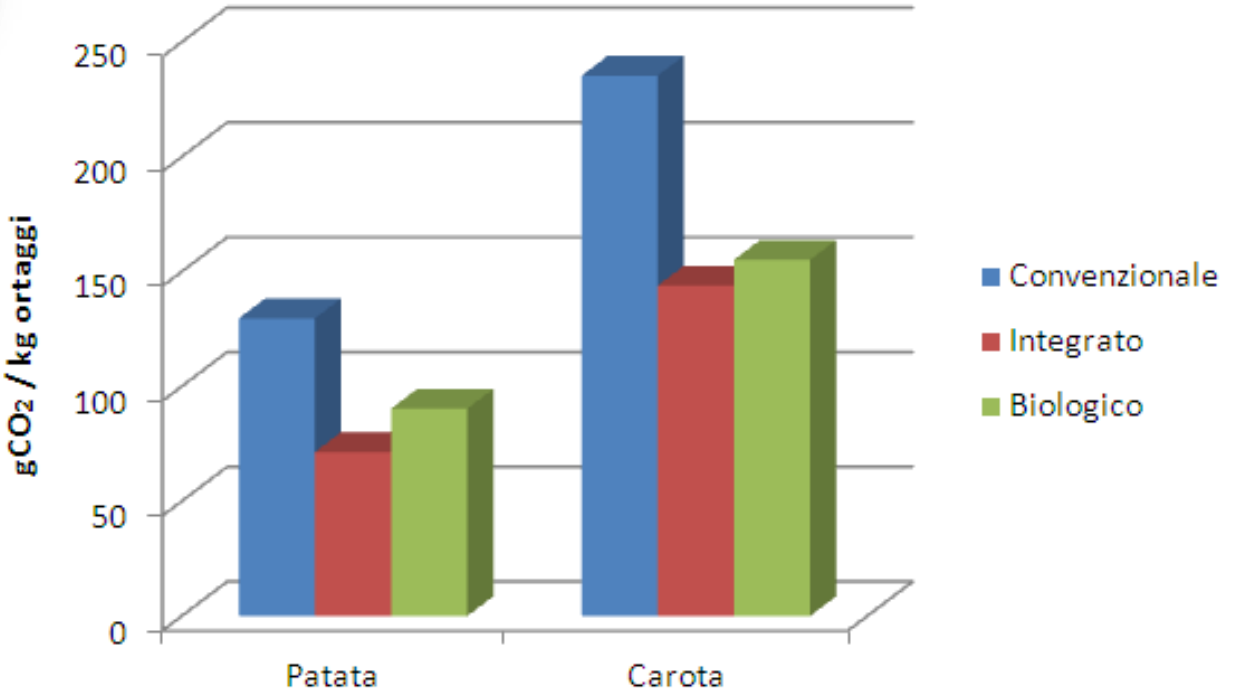
e.g. GPP1 - Different production practices for food



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e.g. GPP1 - Different production practices for food

	Conventional production systems		School year 2013/2014		Emission save	Variation
Product	Agro-technique	tCO_2 eq	Agro-technique	tCO_2eq	tCO_2 eq	%
Apples	Conventional	82.45	Organic / integrated	57.89	-24.56	-30%
Pears	Conventonal	12.69	Organic / integrated	9.48	-3.21	-25%
Peaches	Conventional	12.53	Organic / integrated	8.95	-3.58	-29%
Potatos	Conventional	70.61	Organic / integrated	43.73	-26.88	-38%
Carrots	Conventional	25.93	Organic / integrated	18.07	-7.86	-30%

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e.g. GPP2 – Local provisioning of food

Local acquisition deposit	→	National ditribution hubs	→	Italian distribution hubs	→	Turin distribution hubs
(Country of oring)		*(Country of oring)*		*(North Italy)*		*(Metropolitan areas of Turin)*

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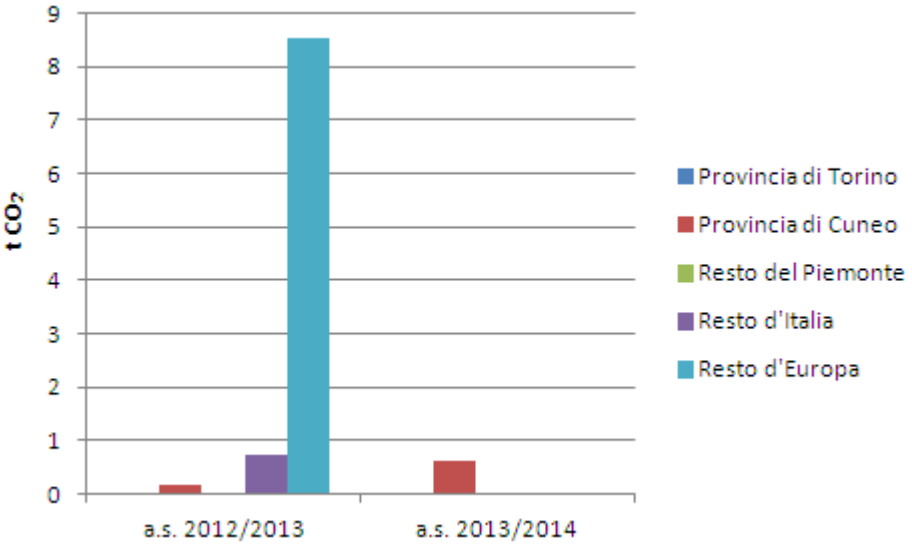
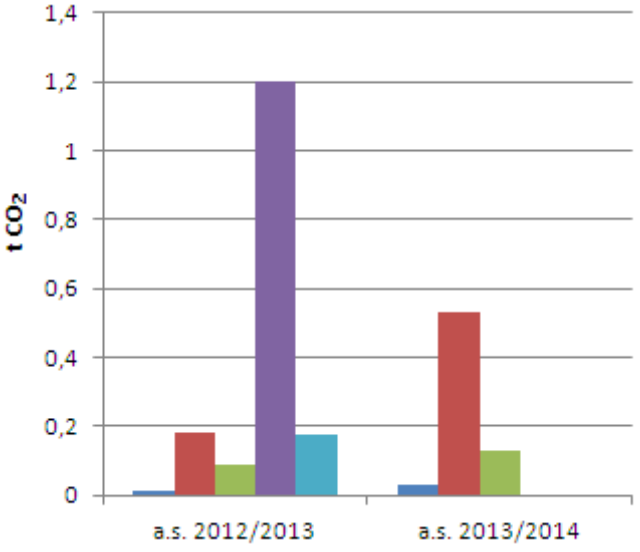
e.g. GPP2 – Local provisioning of food

Origin	2012/2013	2013/2014
	t fruit	t fruit
Torino Province	2.18	8.34
Cuneo Province	11.87	47.48
Piemonte (other Povinces)	3.95	4.17
Italy (other Regions)	33.48	0
Europe (other Nations)	8.52	0
Total	*60*	*60*



1.32 tCO_2 0.70 tCO_2

Origin	2012/2013	2013/2014
	t fruit	t fruit
Torino Province	2.64	7.24
Cuneo Province	14.1	40.27
Piemonte (other Povinces)	8.46	12.49
Italy (other Regions)	31.54	0
Europe (other Nations)	3.2	0
Totale	*60*	*60*



1.66 tCO_2 0.69 tCO_2

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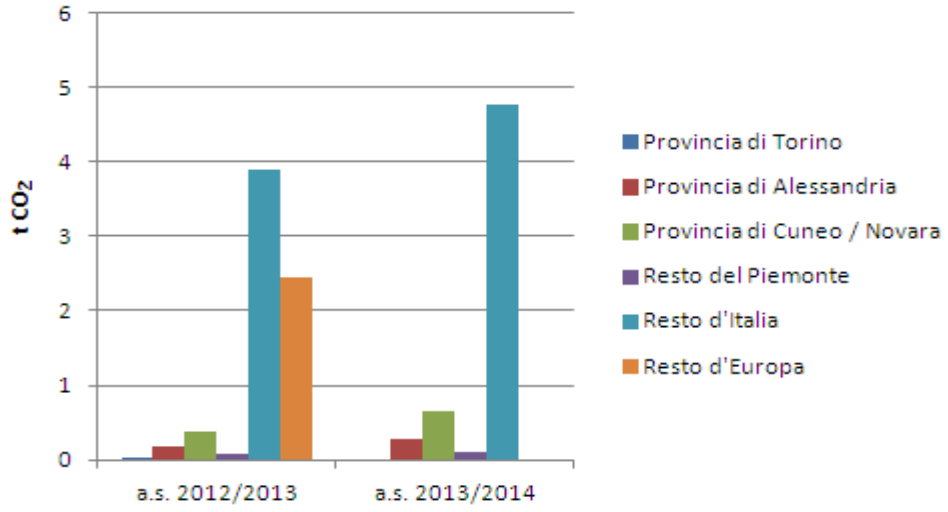
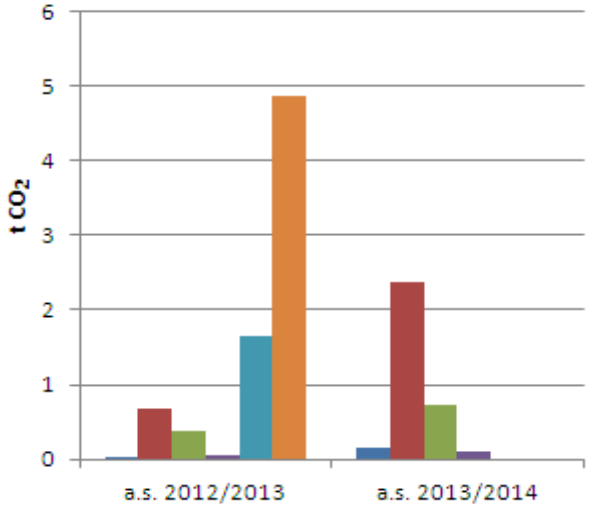
e.g. GPP2 – Local provisioning of food

Origin	2012/2013	2013/2014
	t carrots	t carrots
Torino Province	0.44	1.06
Novara Province	29.01	48.74
Alessandria Province	14.36	24.12
Piemonte (other Povinces)	6.19	7.88
Italy (other Regions)	147.49	118.19
Europe (other Nations)	2.52	0
Totale	*200*	*200*

Origin	2012/2013	2013/2014
	t potatoes	t potatoes
Torino Province	8.63	35.29
Alessandra Province	57.6	200.74
Cuneo Province	28.02	55.19
Piemonte (other Povinces)	4.75	8.77
Italy (other Regions)	110.43	0
Europe (other Nations)	90.57	0
Totale	*300*	*300*



6.92 tCO_2 5.80 tCO_2



7.60 tCO_2 3.32 tCO_2

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e.g. GPP2 – Local provisioning of food

	School year 2012/2013		School year 2013/2014		Emission save	Variation
Product	Origin	tCO_2 eq	Origin	tCO_2eq	tCO_2 eq	%
Apples	Piedmont	3.41	Piedmont	3.41	0.00	0%
Pears	UE supply-chain	1.32	Piedmont	0.70	-0.62	-47%
Peaches	UE supply-chain	1.66	Piedmont	0.69	-0.97	-58%
Potatos	UE supply-chain	7.60	Piedmont	3.32	-4.28	-56%
Carrots	UE supply-chain	6.92	Italy	5.80	-1.12	-16%

Comparison of total greenhouse gas emissions of the five supply-chains studied in the school year 2013/2014 and a scenario with the situation in school year 2012/2013

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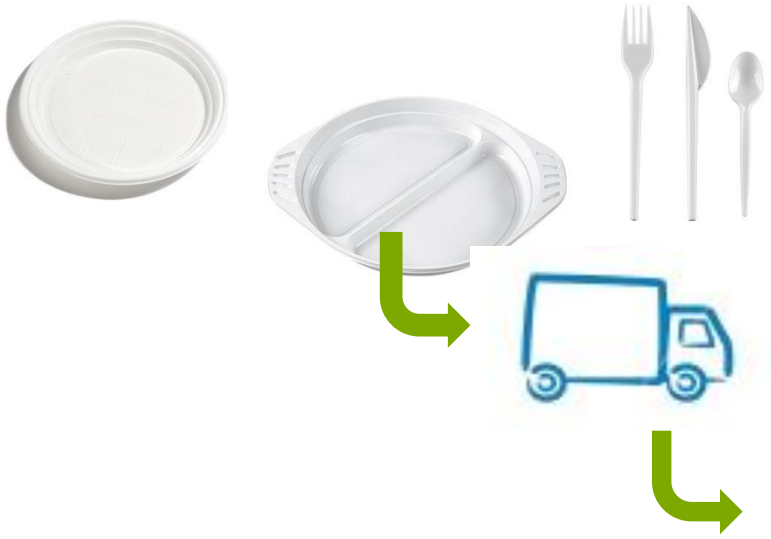
e.g. GPP3 – Washable tableware and Tableware in Mater-Bi®

Disposable tableware



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e.g. GPP3 – Washable tableware and Tableware in Mater-Bi®

Washable tableware

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e.g. GPP3 - Washable tableware and Tableware in Mater-Bi®

	Carbon Footprint [tCO_2 eq/anno]	
Disposable Tableware-Polypropylene Polystyrene	295.81	
Primary packaging Polyethylene	20.20	
Secondary packing (cardboard)	171.27	
DISPOSABLE TABLEWARE	**487.28**	
Production of melamine dishes	95.45	
Washing of plates and cutlery	42.55	
Washing of glasses	42.55	
WASHABLE TABLEWARE (EXCLUDING TRANSPORT)	180.55	**306,73 (-63%)**
Transport of tableware	107.32	
WASHABLE TABLEWARE (INCLUDING TRANSPORT)	287.87	**199,41 (-41%)**
Mater-Bi® life cycle		
COMPOSTABLE TABLEWARE	373.54	**113,74 (-32%)**

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7. Result of the full assessment and options for further improvements

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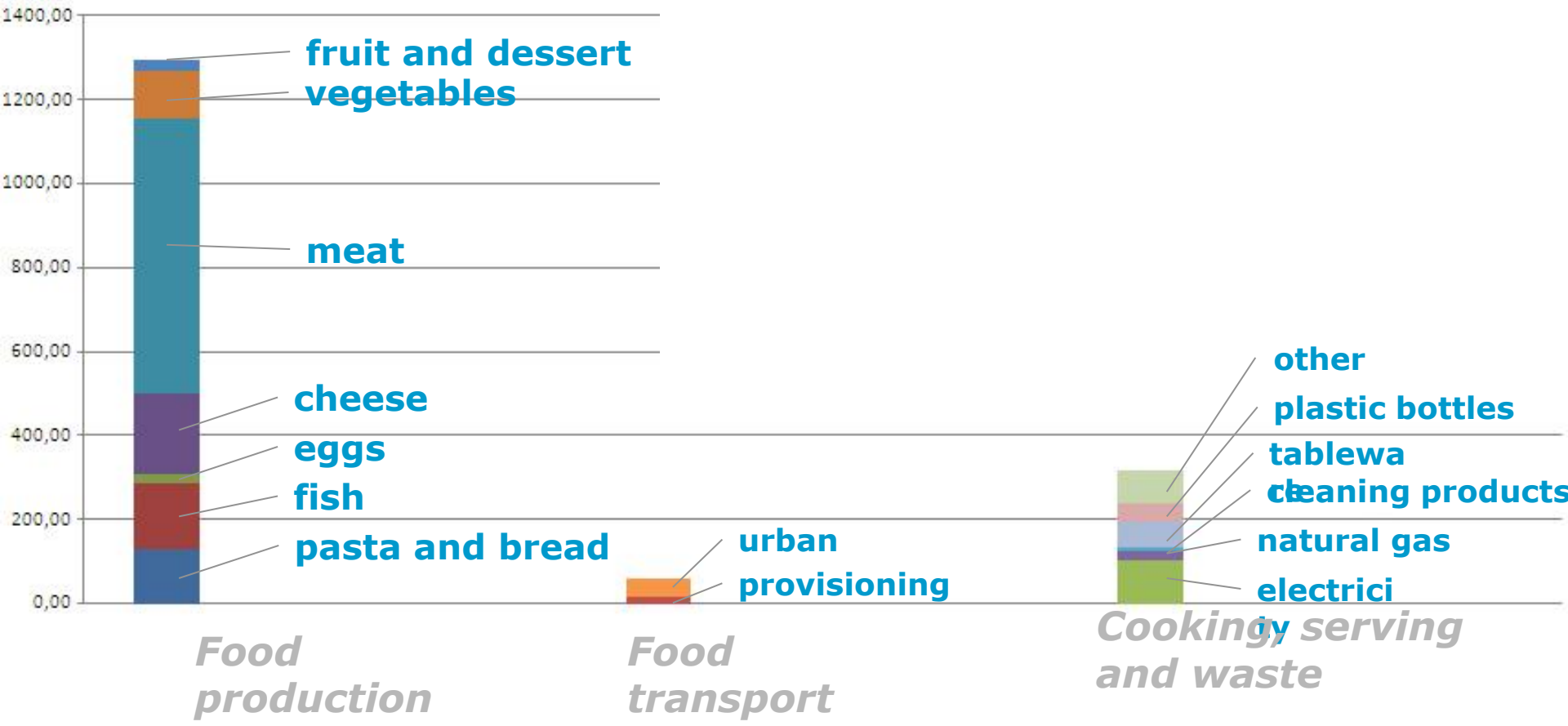
The Carbon Footprint of the full catering service

gCO_2 equivalent for the average meal



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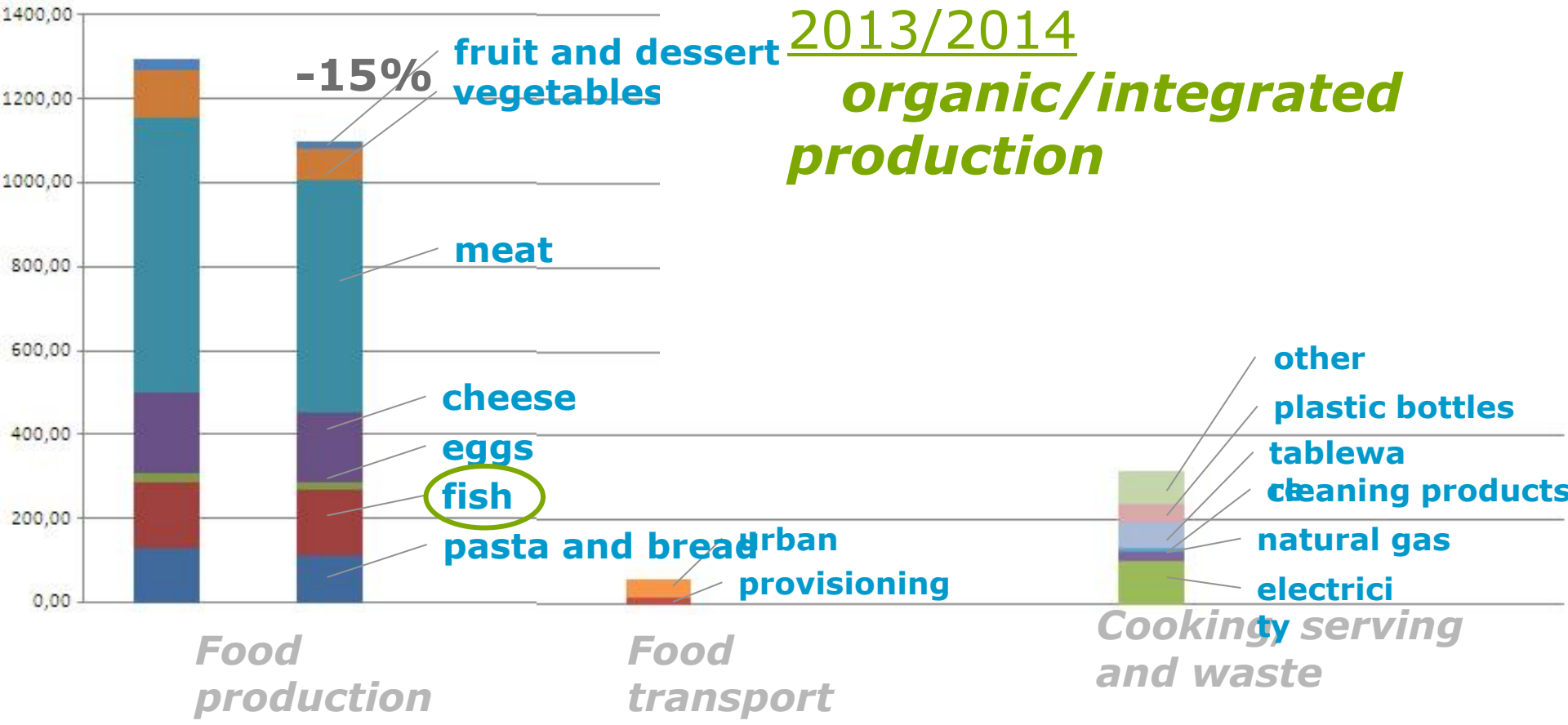
The Carbon Footprint of the full catering service

gCO_2 equivalent for the average meal



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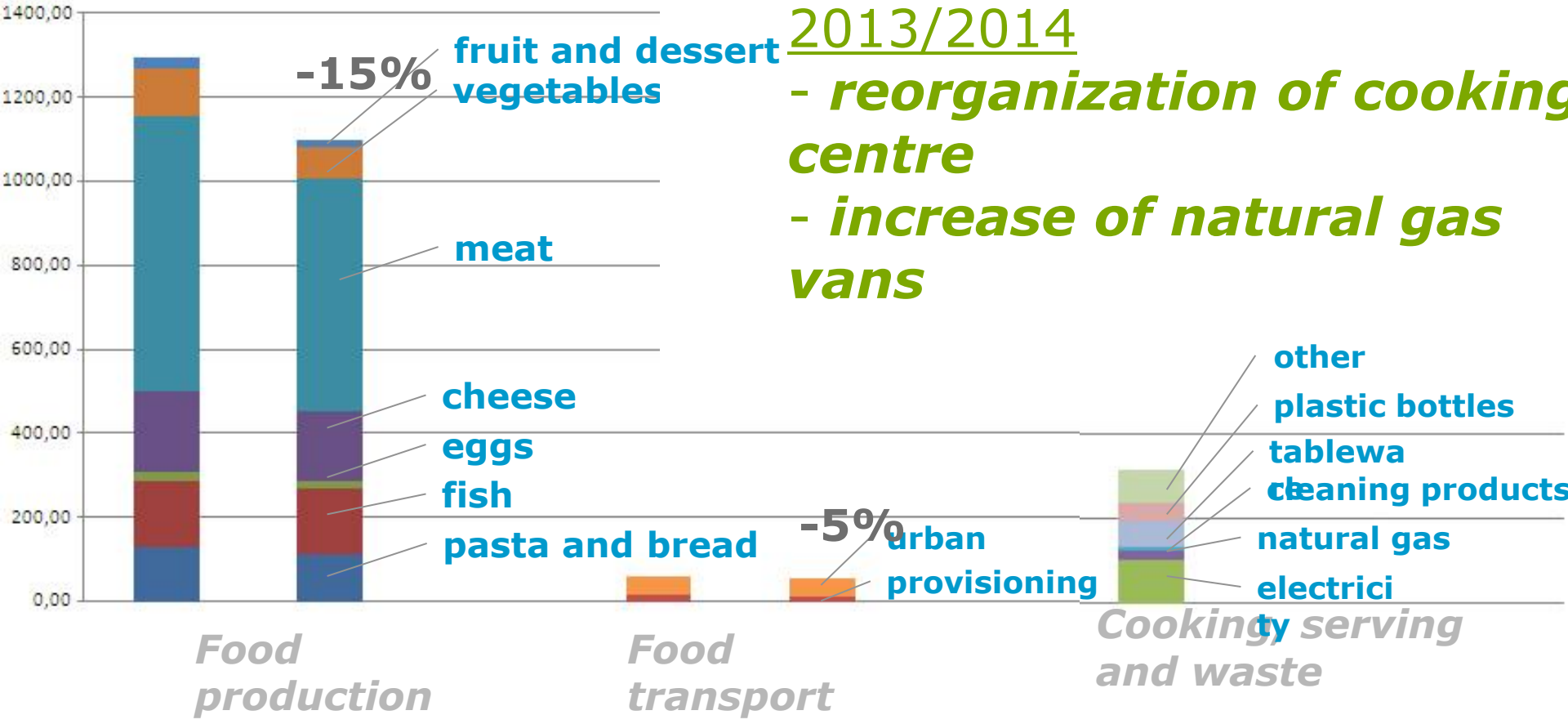
The Carbon Footprint of the full catering service

gCO_2 equivalent for the average meal



2013/2014

- ***reorganization of cooking centre***
- ***increase of natural gas vans***

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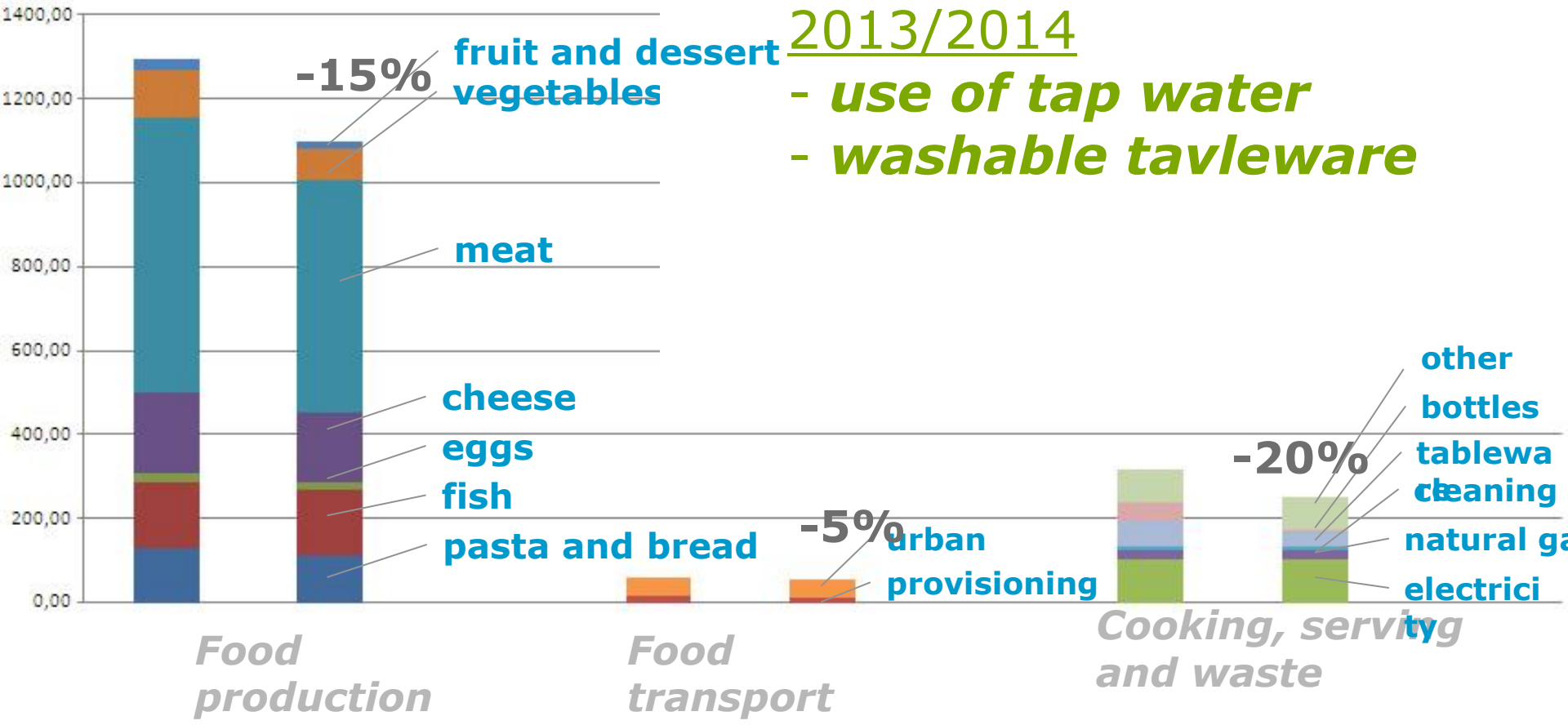
The Carbon Footprint of the full catering service

gCO_2 equivalent for the average meal



2013/2014

- ***use of tap water***
- ***washable tavleware***

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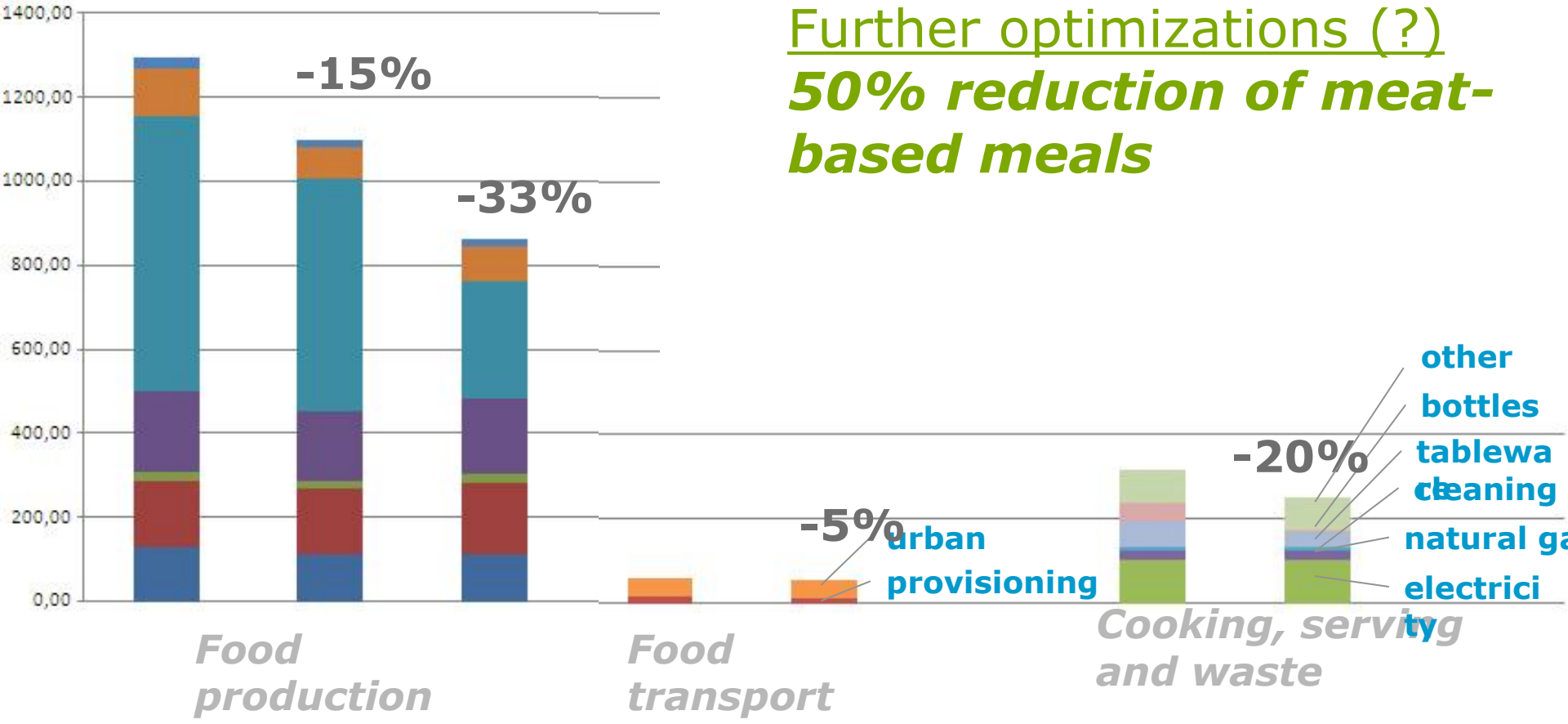
The Carbon Footprint of the full catering service

gCO_2 equivalent for the average meal



Further optimizations (?)

50% reduction of meat-based meals

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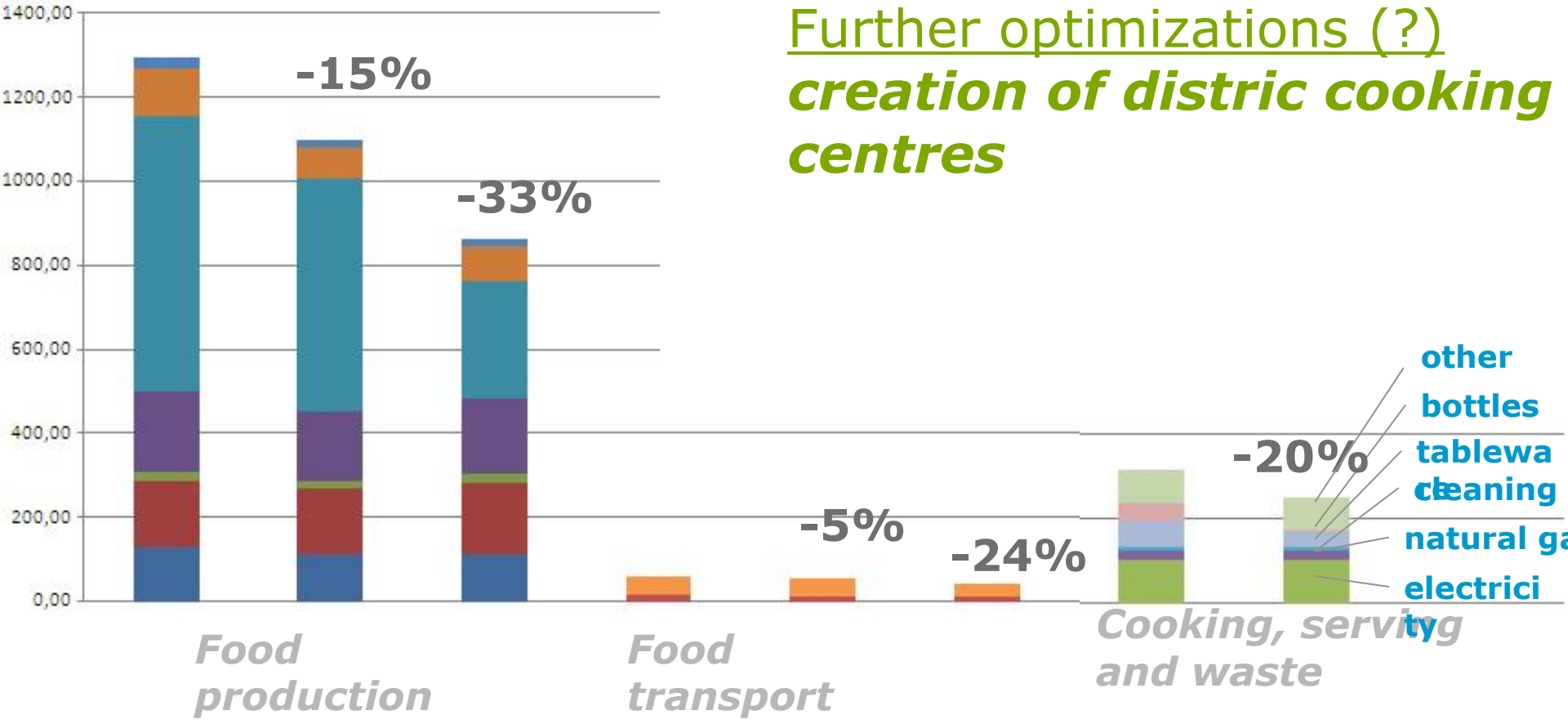
The Carbon Footprint of the full catering service

gCO_2 equivalent for the average meal



Further optimizations (?)

creation of distric cooking centres

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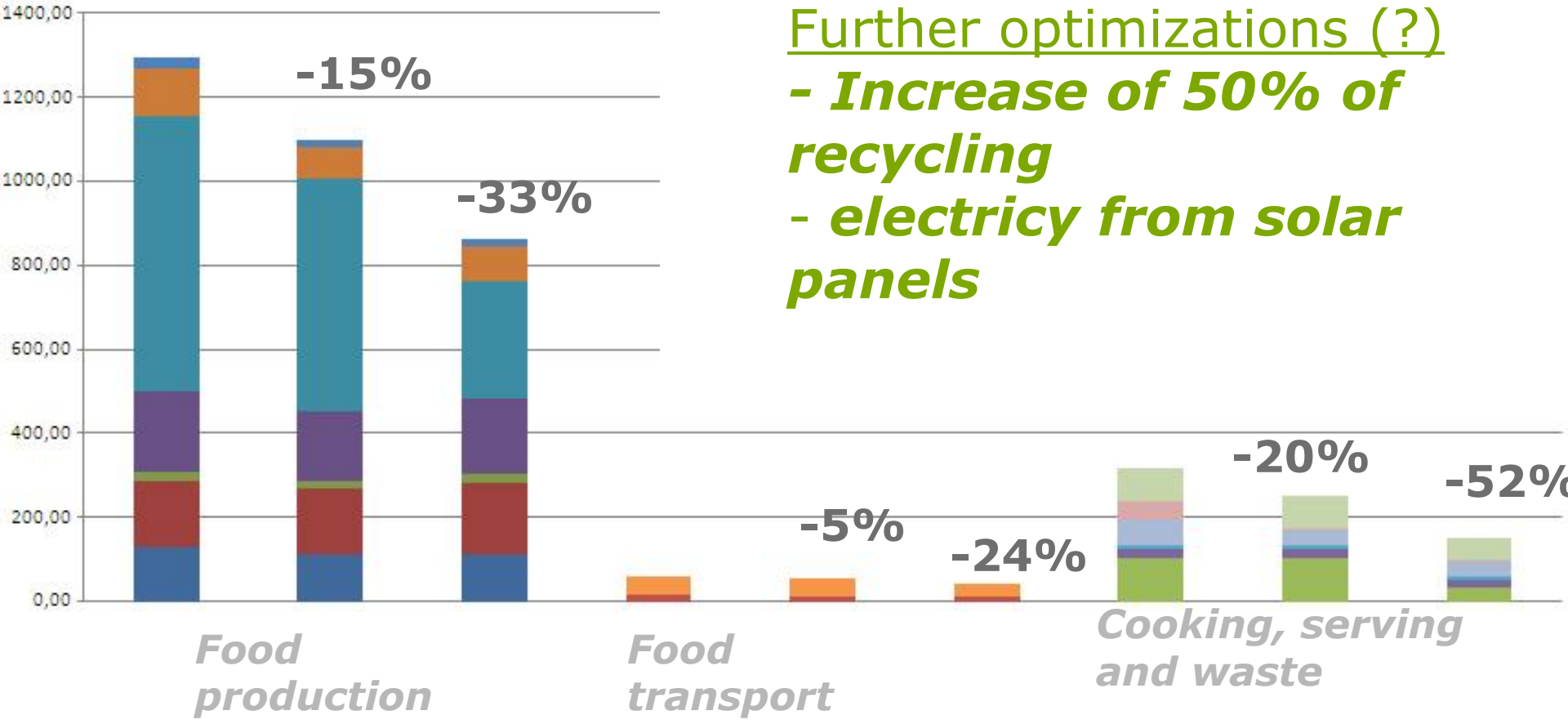
The Carbon Footprint of the full catering service

gCO_2 equivalent for the average meal



Further optimizations (?)

- Increase of 50% of recycling

- electricy from solar panels

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8. Remarks on regenerative production systems

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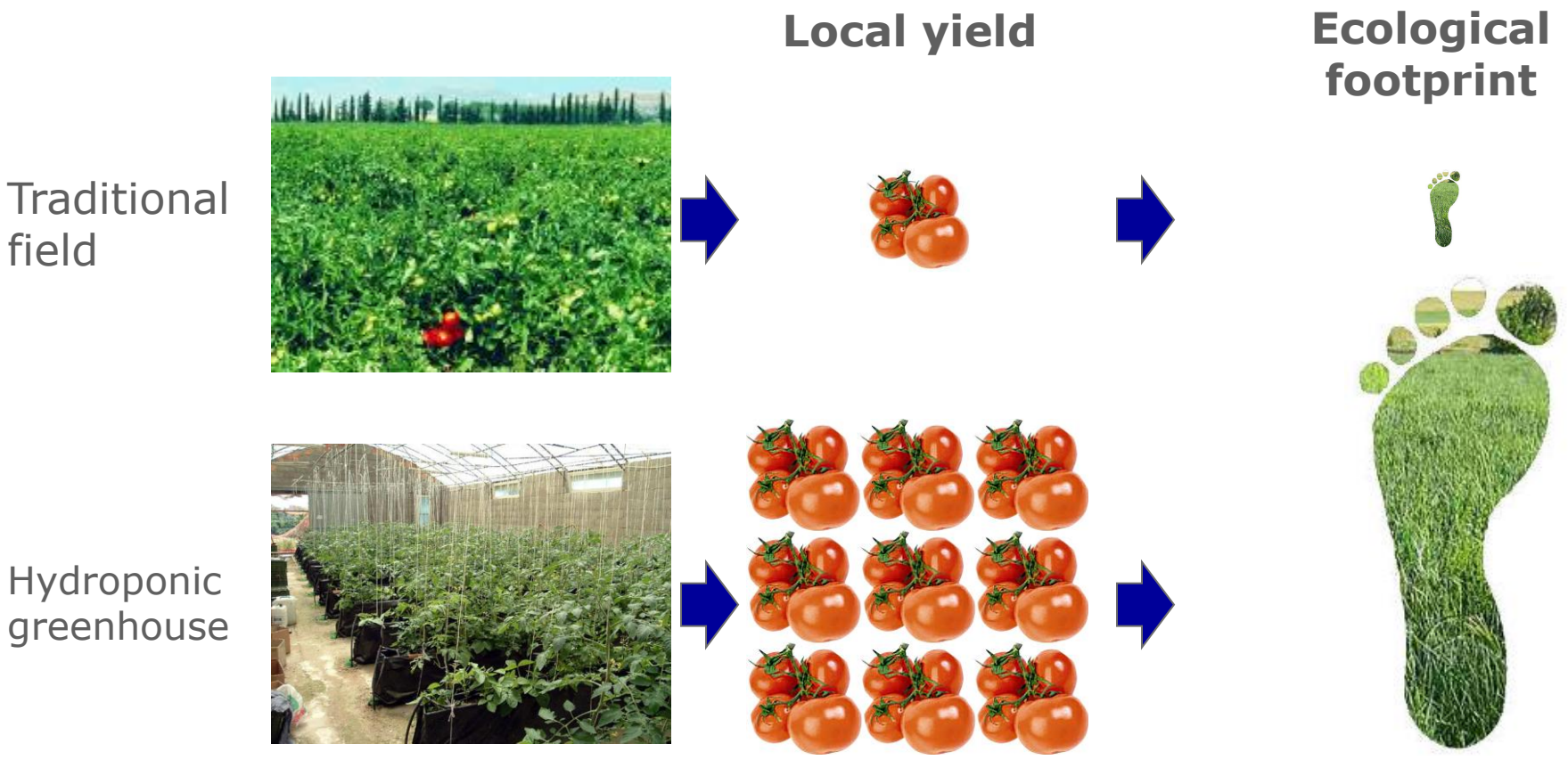
Wada, Y., 1993. **The appropriated carrying capacity of tomato production: comparing the ecological footprints of hydroponic greenhouse and mechanized field operations.** Ph.D. Thesis. University of British Columbia



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A matter of power!

In physics, **power** is the rate of doing work. It is equivalent to an amount of energy consumed per unit time.

↑ High power
↓ Low resilience

↓ Low power
↑ High resilience

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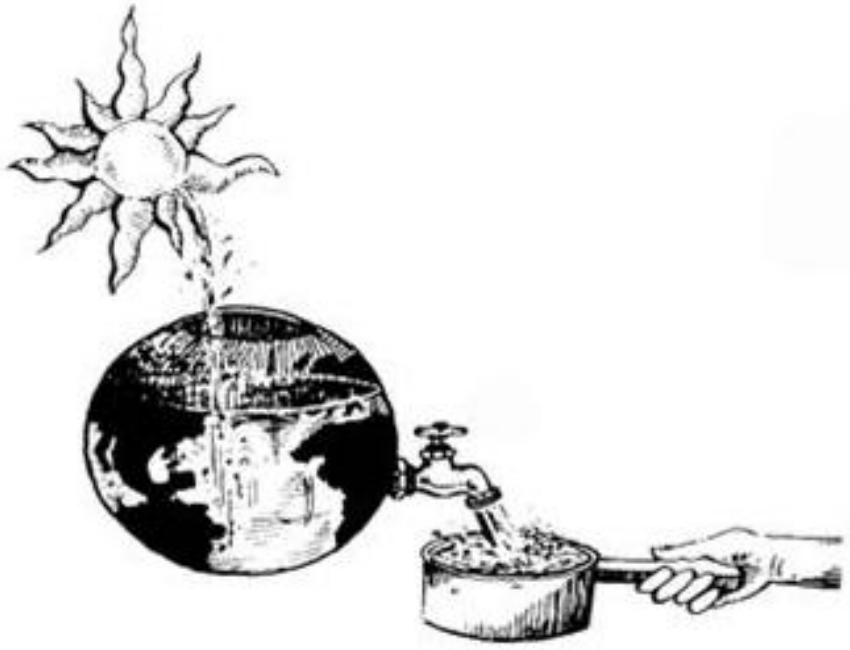
Themodynamic equilibrium

Stationay system



Transient system

Wackernagel, M., & Rees, W. (1998). *Our ecological footprint: reducing human impact on the earth* (No. 9). New Society Publishers.

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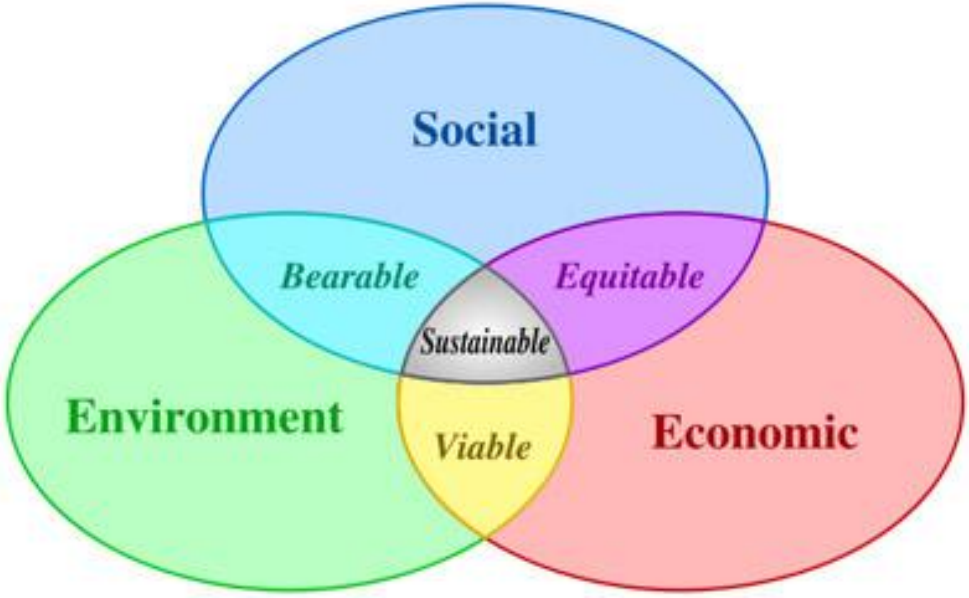
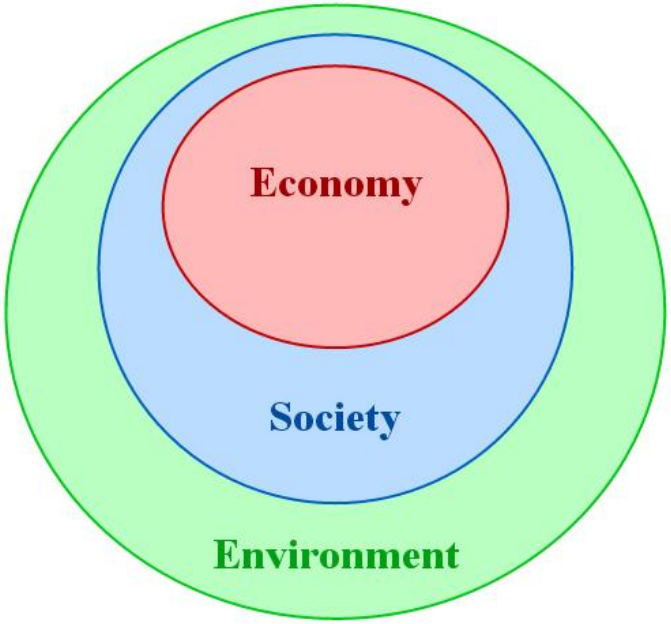
WEAK SUSTAINABILITY



STRONG SUSTAINABILITY



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WEAK SUSTAINABILITY		STRONG SUSTAINABILITY
Natural capital **can** be substituted by human capital	◆	Natural capital **cannot** be substituted by human capital
Technological approach	◆	Ecological approach
Reducing environmental impacts without changing lifestyles	◆	Mainining ecosystem resilience at any price

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WEAK SUSTAINABILITY

Improve resource use efficiency thorough machineries and materials development, but without changing consumption patterns.

STRONG SUSTAINABILITY

Investigate on productive systems in order to improve the resilience of the ecosystems and to lower the impact on environment even if solution would decrease yield.

Carbon credits

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http://www.stephaniemcmillan.org/codegreen/

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EATING CITY
INTERNATIONAL PLATFORM
2010 - 2020

University
of Turin, Italy

Department of
Agriculture , Forestry
and Food Science

Eating City Summer Campus
UNITED 4 FOOD - For a Regenerative Food System
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Thank you for the attention

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