SMARTCHAIN
SMART SOLUTIONS IN SHORT FOOD SUPPLY CHAINS

WP5

Integrative sustainability assessment

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Collaborating partners in WP 5

WBF / Agroscope (Switzerland) WP5-leader, Task leader 5.1, 5.2, 5.4
- Definition of systems and methods
- Environmental impact assessment
- Synthesis of environmental and socio-economic assessment and interpretation

AZTI (Spain) Task leader 5.3
- Definition of systems and methods
- Socio-economic assessment
- Involved in environmental and socio-economic results interpretation

CTCPA (France)
- Definition of systems and methods
- Environmental impact assessment

Gestiona Global (Spain)
- Quality control/critical review
- Socio-economic questionnaire about perception of producers

FoodDrinkEurope (Belgium)
- Feedback on LCA of Case Studies

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra
Federal Department of Economic Affairs, Education and Research EAER
Agroscope

AZTI
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

ctcpa CENTRE TECHNIQUE AGROALIMENTAIRE

gestiona global
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FOODDRINK EUROPE

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Content

- Objectives of WP 5
- Expected outcomes and current status
- Grouping of case studies
- Environmental assessment
  - Methodology, quick recap
  - Data collection
  - Preliminary results case study "Biofruits"
  - Preliminary results case study "Einkaufen auf dem Bauernhof – apples"
- Socio-economic assessment
  - Methodology, quick recap
  - Data collection
  - Complementary qualitative approach
  - Preliminary results – Qualitative data
- Next steps and timeline

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Objectives of WP5

- Assessing short food supply chains innovations from an **environmental perspective** in comparison to conventional food chain practices
- **Different environmental impacts** are considered (like global warming potential, eutrophication, water depletion, use of natural resources, …)
- **Evaluating the overall sustainability** from selected case studies taking into account the social and economic impacts related to the short food supply chains
- **Develop recommendations** for improvements in environmental and socio-economic impacts that are relevant for different cases studies and can be applied in other regions

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Expectations

- Statements are possible for selected, representative case studies compared to their specific reference situation
- No comparison between different case studies
- Broad range of different case studies covered (different products, distribution channels, business models….)
- Generalization will be a challenge

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Current status - Deliverables

- D5.1 : Selected sustainability impact categories and list of requirements of each one [12] ✓
- D5.2 : Definition of target system and methodology [12] ✓
- D5.3 : Detailed questionnaire for data collection is defined [12] ✓
- D5.4 : Value chain inventory (filled questionnaire) [12] ✓

- D5.5 : Environmental impact assessment for selected short food supply chains – final results [29?]
- D5.6 : Socio Economic impact assessment for selected short food supply chains – final results [29?]
- D5.7 : Recommendations for reducing the environmental impacts and optimizing sustainability [34]

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Grouping of Case Studies – final matrix

Final grouping of the 18 case studies according to the criteria

Type of	Type of final product																	
	Plant based							Animal based			Plant & animal							
	4	9	13	14	15	**16**	**17**	**5**	7	18	1	**2**	3	6	**8**	10	**11**	12
On-**farm** sale							x		x	x	x	x			x			x
Single off-**farm** sale					x		x	x	x	x	x	x			x			x
Shared collective / cooperative selling of **producers** (including non-farm companies)	x	x	x	x	x	x	x				x	x	x	x	x	x		
Intermediaries that focus on (processing and) distribution			x	x		x											x	
	3 selected CS							1 selected CS			3 selected CS							

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Selected CS and products

Selected case studies	Env	Soc-ec	Selected Products	Country
Einkaufen auf dem Bauernhof (CS2)	AGRO	AZTI	milk, bread, eggs, potato, apple	DE
ARVAIA (CS4)	AGRO	AZTI	wheat flour, tomato	IT
Natuurlijk Vleespakket (CS5)	AGRO	AZTI	beefburger	NL
Couleurs Paysannes (CS8)	CTCPA	AZTI	goat cheese, bread, apple	FR
Lantegi Batuak (CS16)	**AGRO/ CTCPA**	AZTI	salad, pumpkin, other vegetable	ES
Biofruits (CS17)	CTCPA	AZTI	apple, -juice, -dried, apricot, pear nectar	CH

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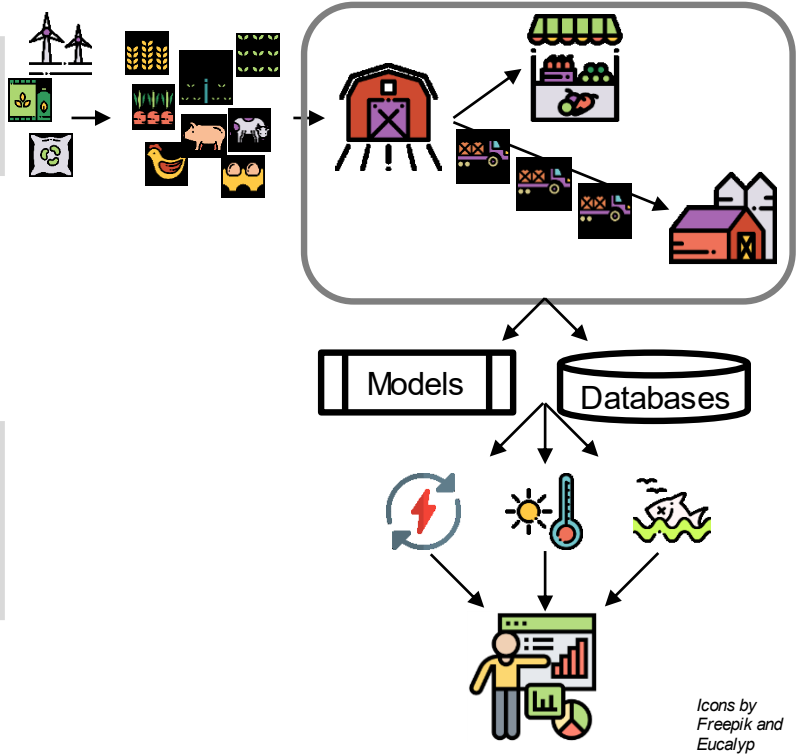
Environmental assessment

LCA – the 4 phases ISO-standards 14040 & 14044 (2006)

Phase I Goal and Scope definition	- *Scope* - *System boundaries*
Phase II Life Cycle Inventory	*Resources consumption and emissions from:* - *Production* - *Transport* - *Transformation* - …
Phase III Life Cycle Impact Assessment	- *Energy demand* - *Global warming potential* - *Aquatic ecotoxicity* - …
Phase IV Interpretation, Applications and Decision Support	- *Conclusions & Recommendations* - *Optimization of processes*



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Environmental assessment - Data Collection

- overall business structure

Along the entire value chain:
- transport (type, length, frequency, total load)
- packaging (material, weight, dimensions, lifetime)
- storage/rooms (electricity, other energy sources, consumables, …)
- other infrastructure

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Environmental assessment - selected impact categories and methods

LCIA impact categories	LCIA methods
Non renewable energy resources (CED)	ecoinvent 2007
Abiotic resource depletion	ILCD (CML 2001)
Water stress index	AWARE
Land competition	CML 2001
Climate change	GWP100a (with CC feedbacks, IPCC 2013)
Ozone formation	ILCD 2011
Ozone depletion	ILCD 2011
Acidification	ILCD (Accumulated Exceedance)
Eutrophication terr. (If applicable: normalized eutrophication (terr. + aq.): then EDIP (GLO) method.)	ILCD (Accumulated Exceedance) EDIP 2003 (GLO)
Eutrophication aq. N	EDIP 2003 (GLO)
Eutrophication aq. P	EDIP 2003 (GLO)
Aquatic ecotoxicity	UseTox 2.0 (Rosenbaum et al., 2008)
Human toxicity	UseTox 2.0 (Rosenbaum et al., 2008)

First preliminary results

- Case Study 17 - Switzerland – Biofruits
- Case Study 2 – Germany – Farm1: Apples

► *The aim is to show the types of insights that LCA applied to the CS can provide*

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CS 17 – Biofruits

Insights:

- Detailed environmental profile of the Biofruits SFSC: contribution of each life cycle stage for a selection of indicators
- Comparison of the SFSC with a reference situation with a LFSC
- Example of sensitivity analysis : influence of the « plant to shop » distance and of the « shop to consumer » distance

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CS 17 – Biofruits – Presentation

- Cooperative producing and selling its own products
- 3 shops for direct sales – 1 shop selected for the assessment (main shop located on the plant)
- Main products : fruits and vegetables, aromatic plants, dried fruits, juices, jams and vinegars and other local products complete the offer
- A press has been set up in order to add value to "non-compliant" fruits and vegetables into juices and nectars.

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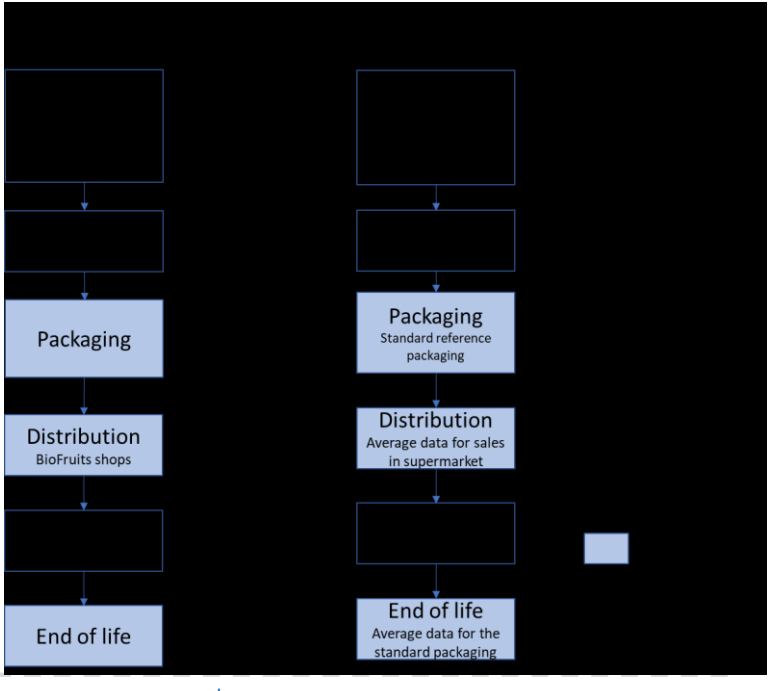
CS 17 – Biofruits – Presentation of the study (1/2)

Product	Functional unit
Apples	1kg of (packaged) apples sold
Apricots	1kg of (packaged) apricot sold
Apple juice	1L of packaged apple juice sold
Dried apple	100g of packaged dried apple sold
Pear nectar	1L of packaged pear nectar sold

These 5 products compose the average **food basket** of the case study



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CS 17 – Biofruits – Presentation of the study (2/2)

Exemple for juice apple		SFSC	LFSC
PACKAGING	Primary packaging	glass bottle	tetrapack
	Secondary packaging	cardboard	carbdoard
	Tertiary packaging	excluded	excluded
	Storage after packaging	90 days ambient	28 days ambient
DISTRIBUTION	Transport plant to shop	0km	400km
	Retail storage	30 days ambient	28 days ambient
	Transport shop to consumer	67% : 5km by car 33% : by foot/bike	67% : 5km by car 33% : by foot/bike

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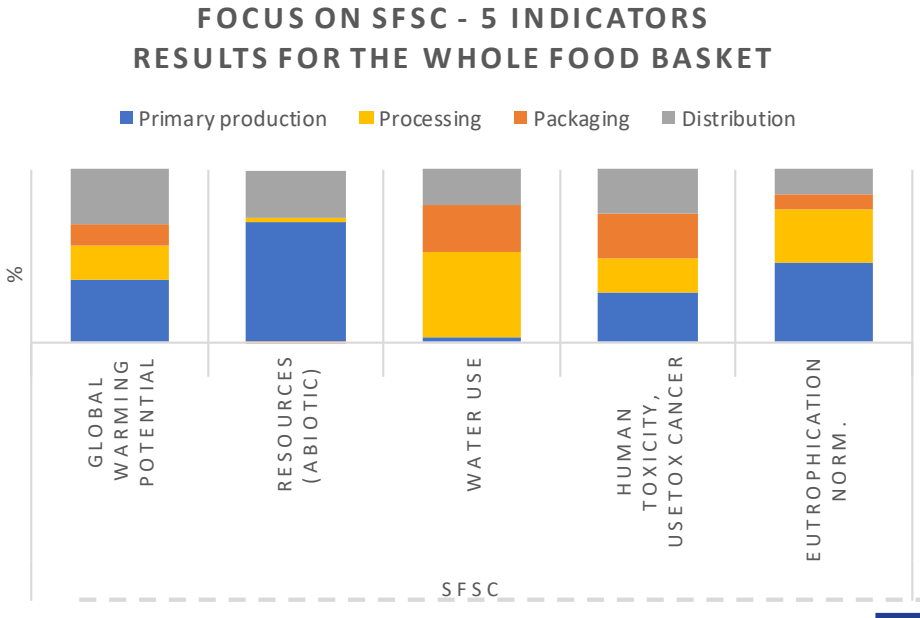
CS 17 – Biofruits – Focus on SFSC (1/2)



Analysis for the whole food basket

- **Primary production step :** large contribution to all the indicators (except water stress) and contribution for 70% to the abiotic resources indicator
- **Distribution step up to the consumer:** contribution for about 20% for 4 indicators
- **Processing step :** contribution for 50% to the water stress indicator
- **Packaging step :** contribution for about 30% to the human toxicity and the water stress indicators

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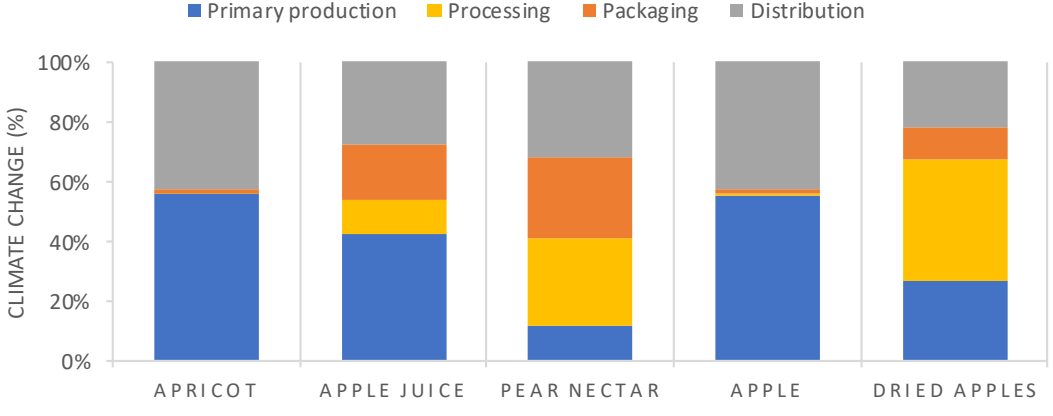
CS 17 – Biofruits – Focus on SFSC (2/2)

FOCUS ON SFSC – GLOBAL WARMING POTENTIAL – RESULTS EACH PRODUCT OF THE FOOD BASKET



- Different profile depending on the type of product : raw product vs. processed product
- **Raw products :** importance of the primary production and the distribution steps
- **Processed products** : the packaging represents between 10% and 30% of the global warming potential

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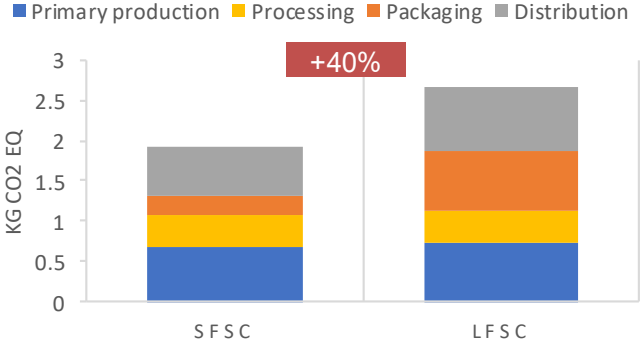
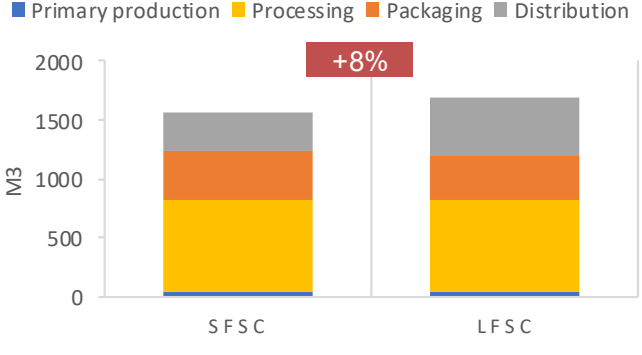
CS 17 – Biofruits – SFSC vs LFSC

Results for the whole food basket

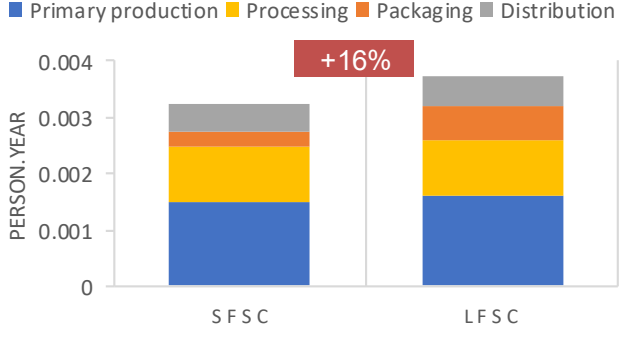
GLOBAL WARMING POTENTIAL



WATER STRESS



EUTROPHICATION



- The results show that the LFSC generates more potential impacts on the selected indicators than the SFSC based on the specific data and assumptions for this case study
- Differences
  Packaging and their end of life : more packaging, more plastics and overpack
  Distribution : plant to shop transport

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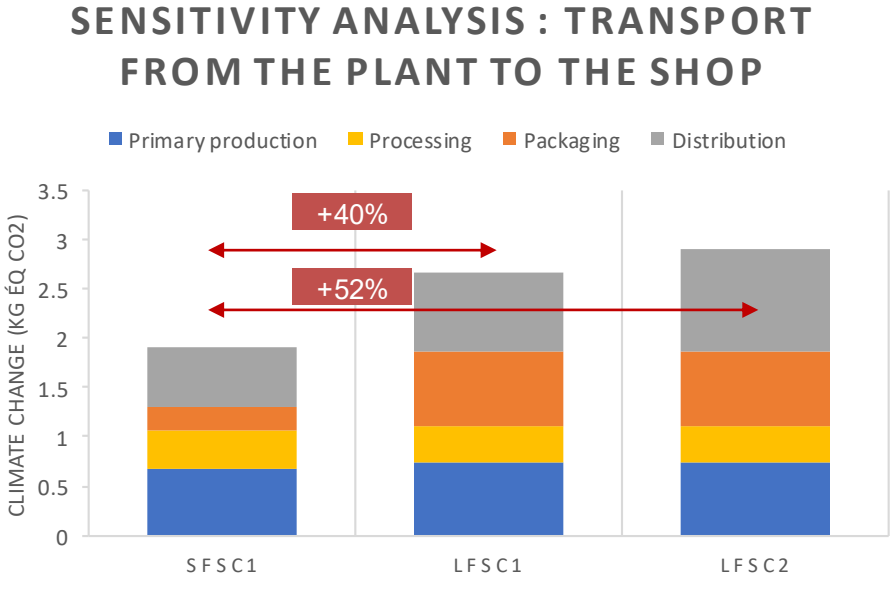
Biofruits – CS 17 – sensitivity analysis 1 : « **plant to shop** » **distance**

Plant to shop distance:

- SFSC : 0km
- LFSC 1 : 400km
- LFSC 2 : 1000km

→ The gain in terms of plant to shop distance for the SFSC is an important contributor to the environmental benefits obtained compared to LFSC for the carbon footprint



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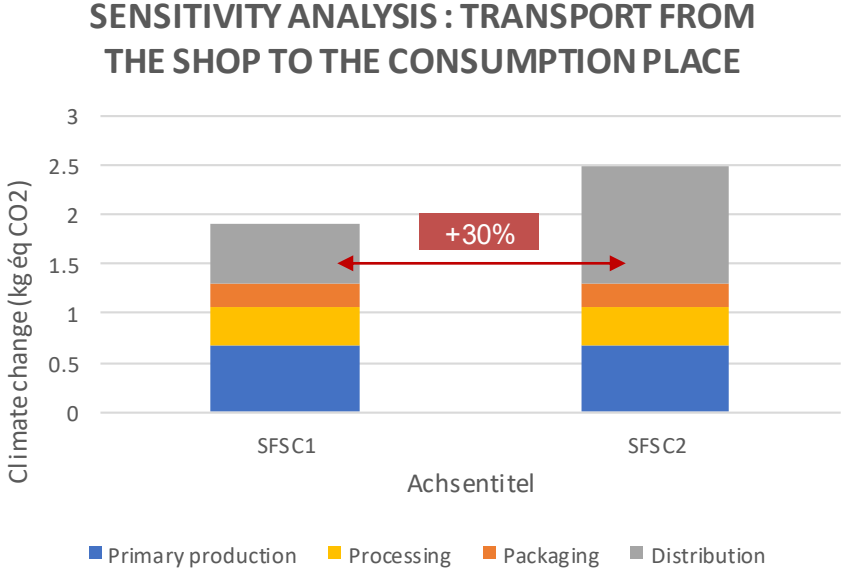
Biofruits – CS 17 – sensitivity analysis 2 : « **shop to consumer** » **distance**

Shop to consumer distance:

- SFSC 1 :
  - 67% : **5km by car**
  - 33% : by foot – no impact
- SFSC 2 : distances x2
  - 67% : **10km by car**
  - 33% : by foot – no impact

→ Consumer behaviour is a key parameter to limit the carbon footprint of the SFSC



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CS 2 – EADB Apples

Insights:

- Detailed environmental profile of the apples' short and long FSC.
- Absolute contribution of each life cycle stage and sub-stage for a selection of indicators
- Illustration of tradeoffs among the indicators through a representation fo the relative contribution for a selection of indicators
- Sensitivity analysis on consumer behavior, packaging and logistics

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CS 2 – EADB Apples – Presentation (1/2)

The CS2 is made up of several farms that operate independently and produce different products. Hence, they are treated seperately. Here, we are looking at the farm that produces apples:

- Family run business that has been in direct sales for the past 20 years
- 39ha of fruits and 41ha of agricultural crops, in terms of apples: 500t of apples produced and sold every year.
- The entire harvest is sold either on the farm through a farm shop, a wholesale store, through a bigger cooperative or through a local retail.
- Additionally, the farm produces part of their used electricity on farm thorugh photovoltaic

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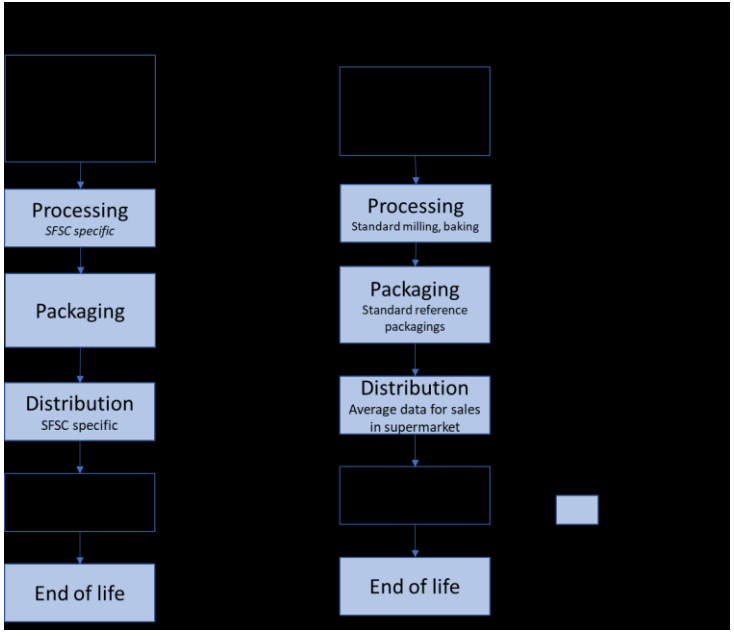
CS 2 – EADB Apples – Presentation (2/2)

Product	Functional unit
Apples	1kg of (packaged) apples sold



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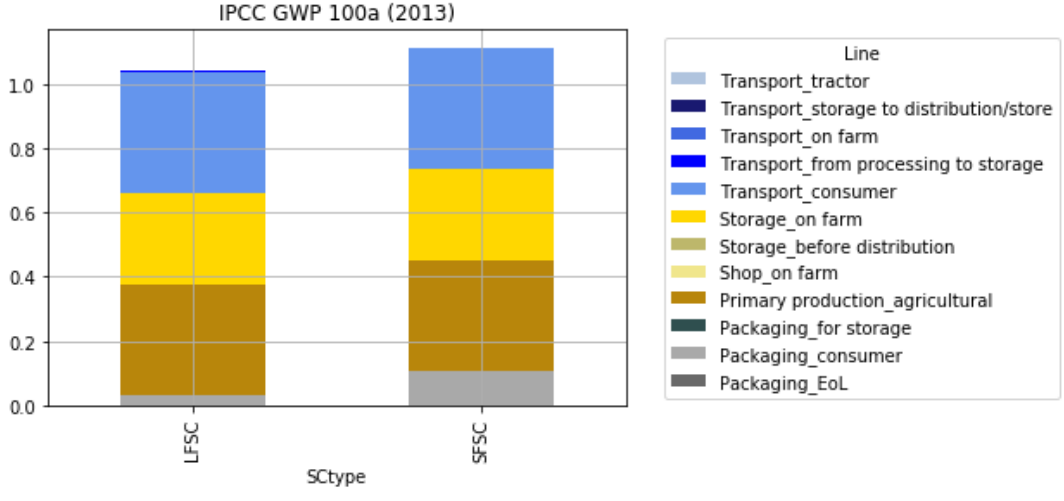
Global warming potential
[kg CO2eq.]

The results are given in carbon dioxide equivalency, which describes the heat absorbed by the gases emitted by the processes as a multiple of the heat absorbed by the same mass of carbon dioxide.

From all the different transports, the only one of relevance appears to be the consumer's.

Preliminary Results



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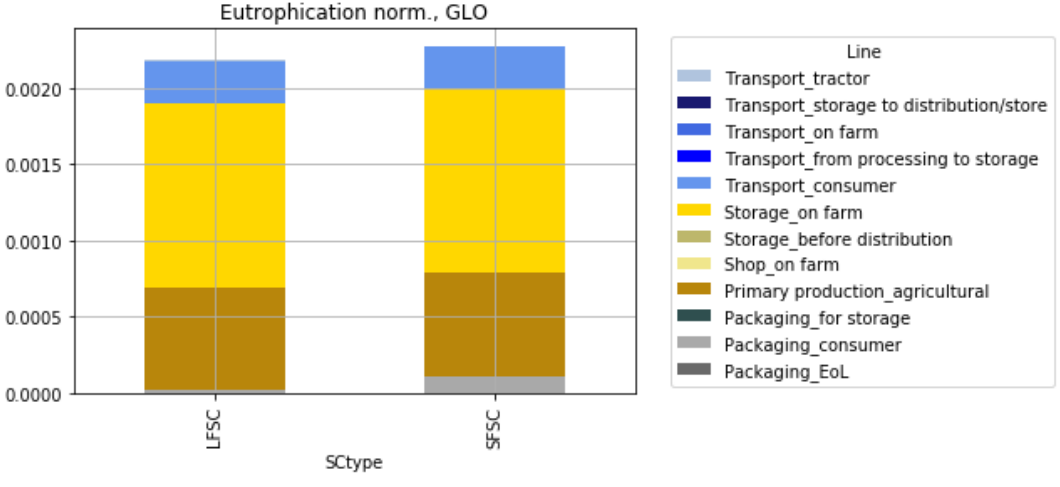
Eutrophication
[person.year]

The impact category describes the potential for natural bodies to become overly enriched with minerals and nutrients which in turn could, for example, induce excessive growth of algae.

Agricultural phase very prominent due to direct emissions and the background processes of energy and nutrient supply.

Preliminary Results



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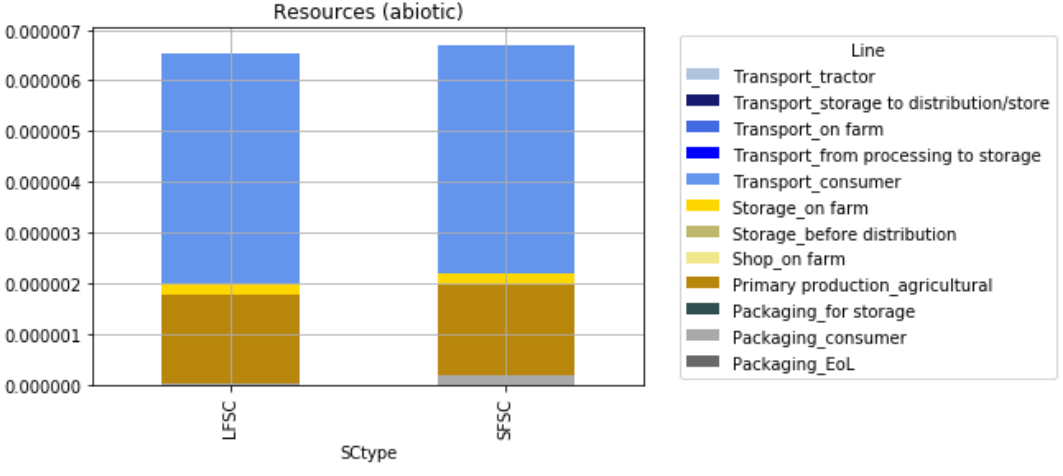
Resource use
[kg Sb eq]

The method characterizes current consumption and the available reserves of metals, minerals and other abiotic resources. Hence, the impact category is an indicator for their the scarcity.

Consumer's car travel most prominent due to fossil fuel consumption.

Preliminary Results



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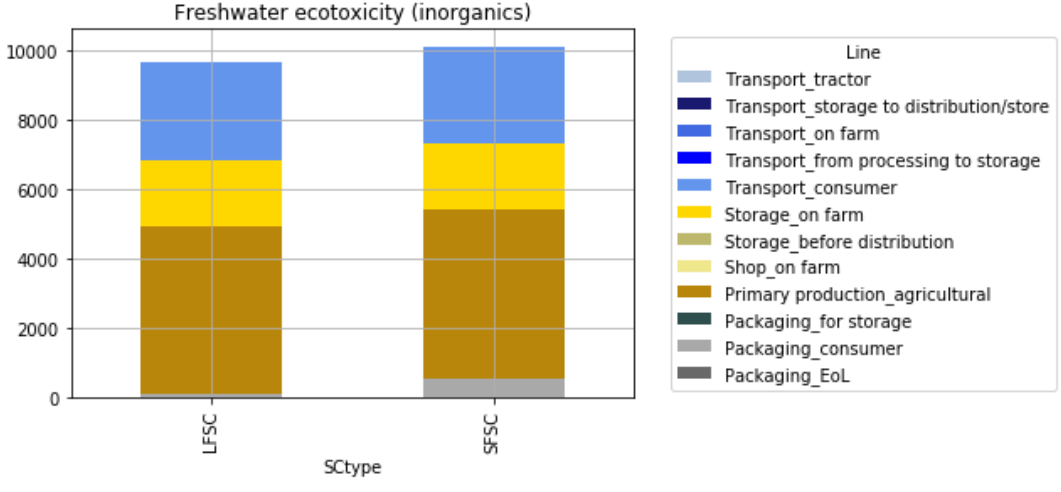
Aquatic Ecotoxicity
[PAF *m3*day]

*The indicator describes the ecotoxicity in aquatic bodies, the unit is the potentially affected fraction of species (PAF) *m3*day.*

The agricultural phase is prominent due to use of pesticides.

Preliminary Results



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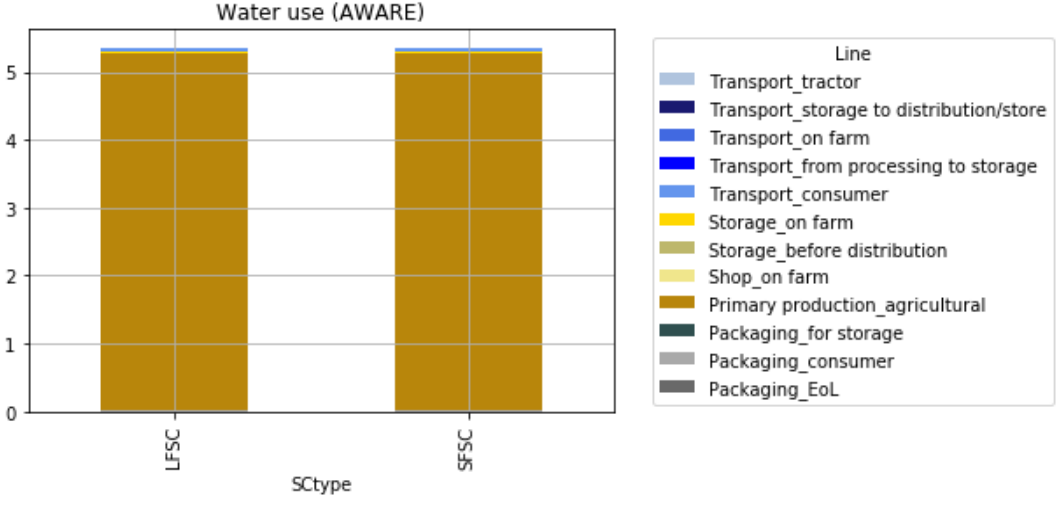
Water use
[m3]

The applied methodology describes the relative quantity of water that remains in a catchment area when the demands of society and aquatic ecosystems are met. Hence, it describes the potential for water scarcity.

Only the primary production has water use (in this case study) thus it's the most relevant in this impact category.

Preliminary Results



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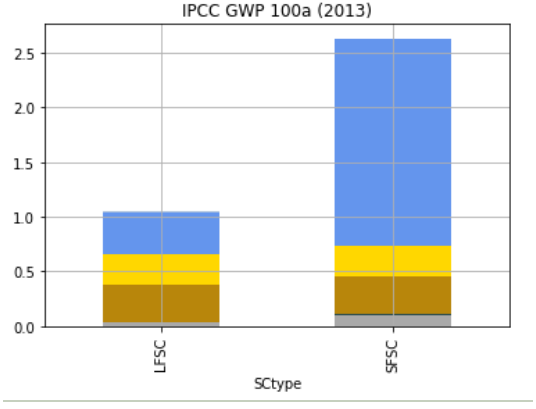
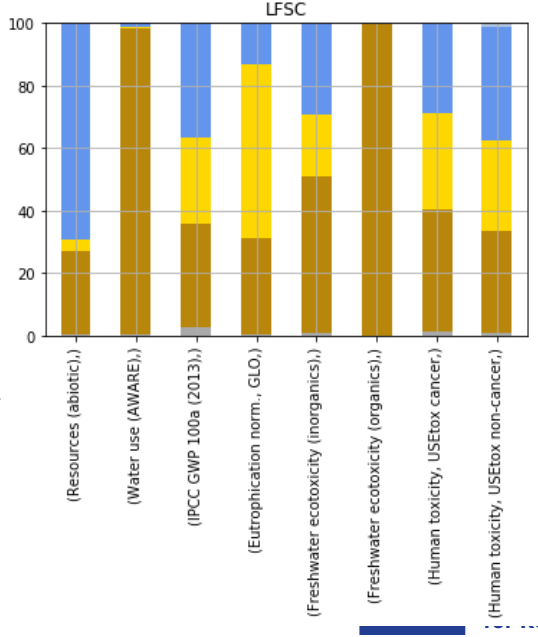
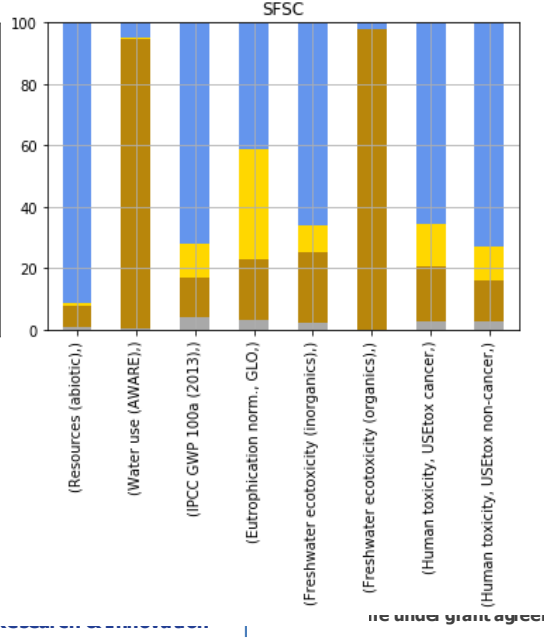
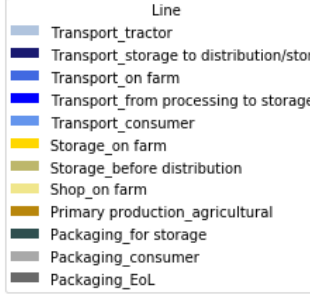
Thought experiment I - consumer

- SFSC: 6km per 1kg
- LFSC: 6km per 5kg >>1.2km/kg









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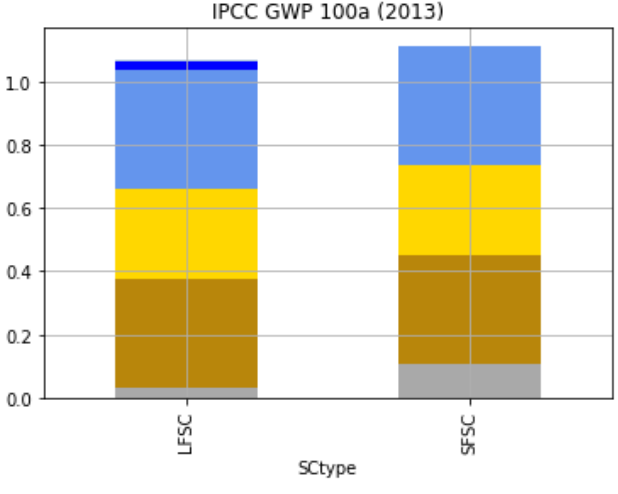
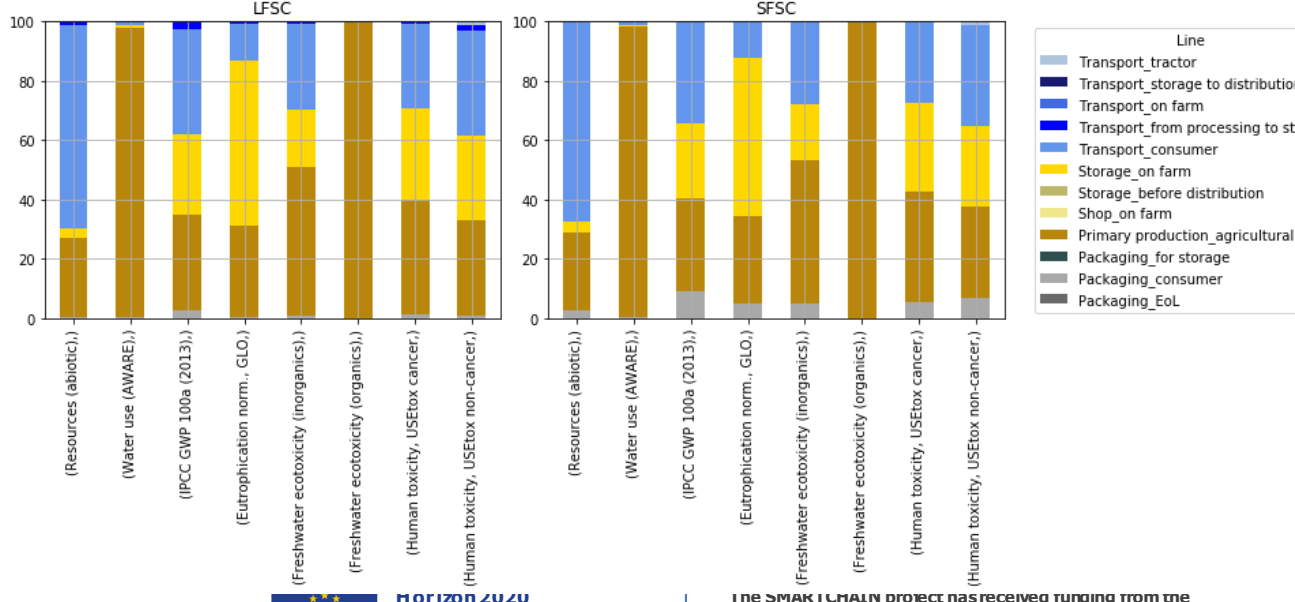
Thought experiment II - logistics

Lorry transport: 10 times longer distance than in the standard LFSC scenario





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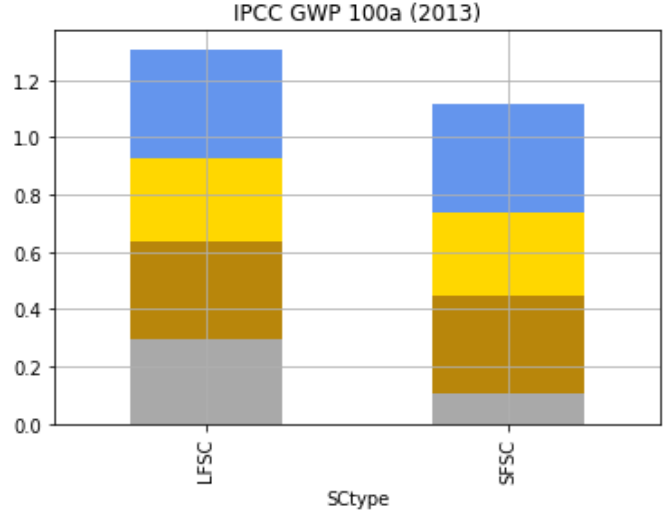
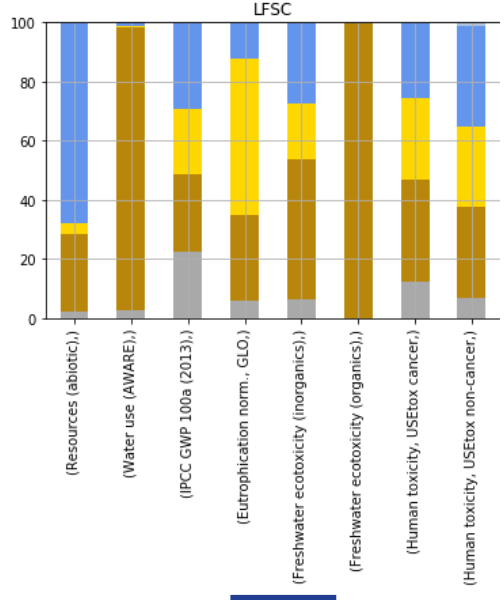
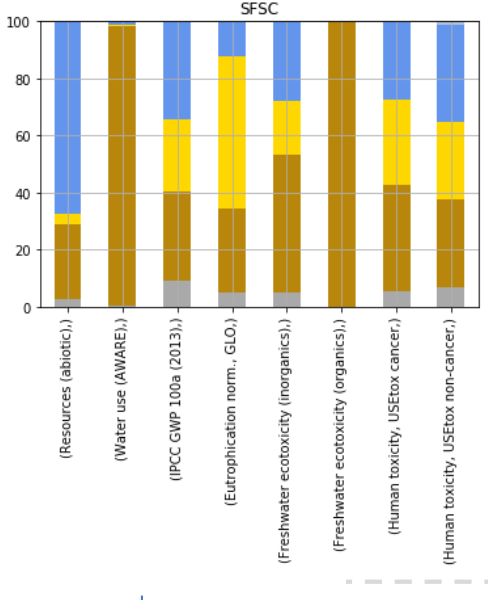
Thought experiment II - packaging

10 times more plastic packaging for the consumer in the LFSC.







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SMARTCHAIN
SMART SOLUTIONS IN SHORT FOOD SUPPLY CHAINS

Socio-economic assessment – selected impact categories

Methodology:
Social Life Cycle Assessment

Phase 1: Goal and scope definition

Phase 2: Life cycle inventory analysis

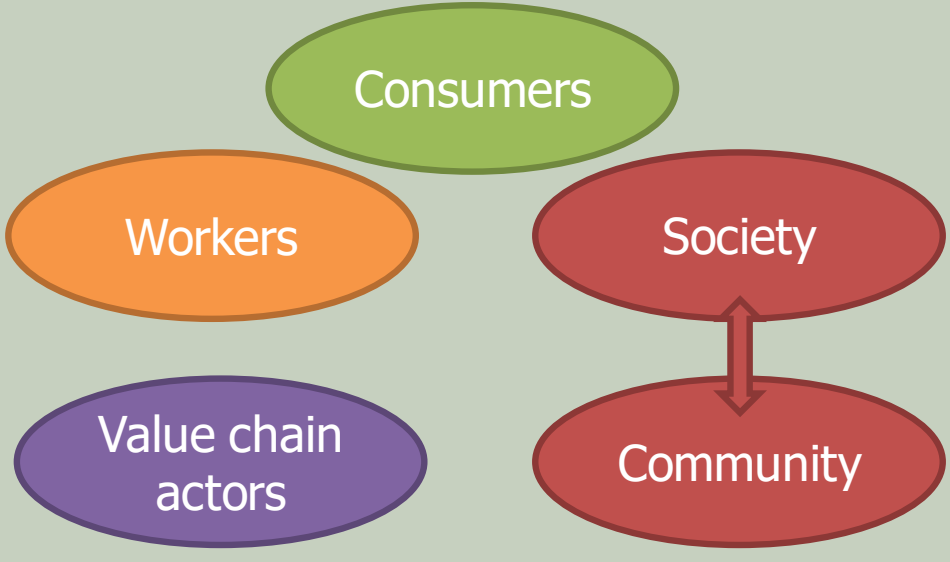
Phase 3: Life cycle impact assessment

Phase 4: Life cycle interpretation

Negative and positive impacts measured

«Quantitative and semiquantitative data»

5 impact categories based on SLCA guidelines of the UNEP



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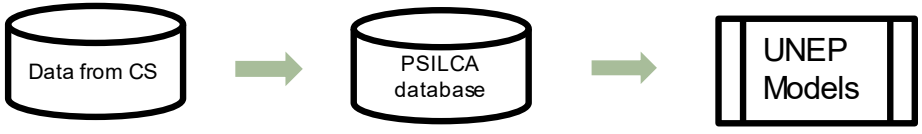
Socio-economic assessment - selected indicators



WORKERS
Fair salary / social equity
Type of contract
Working time
Gender Discrimination (= Equal opportunities/discrimination)
Health and safety
Social benefits, legal issues
Workers rights (= Freedom of Association and collective Berganing)
Business model robustness-resilience
Buying power
Equal opportunities/discrimination

VALUE CHAIN ACTORS
Fair competition
Promoting social responsability
Supplier relationship

CONSUMERS
Health and safety
Transparency and traceability
Feedback mechanism
Trust
Privacy
End-of-life responsibility

LOCAL COMUNITY AND SOCIETY
Contribution to economic development
Safe and Healthy living conditions
Access to material resources
Secure Living conditions
Local employment
Community engagement
Access to immaterial resources
Cultural heritage
Public commitment to sustainability issues
Technology development
Migration
Respect of indigenous rights
Corruption
Prevention and mitigation of conflicts

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SMART SOLUTIONS IN SHORT FOOD SUPPLY CHAINS

Socio-economic assessment – Data collection

VALUE CHAIN ACTORS		Unité ou précision	Réponse
Fair competition	N° of legal actions regarding anticompetitive behaviour	Qn	0
	Membership in alliances that behave in an anticompetitive way	Semi Qn (Yes/no)	No
	Documented statement or procedures to prevent engaging in anticompetitive behaviour	Semi Qn (Yes/no)	No
	Employee awareness of the importance of complaiance with competition legislation and fair competition	Semi Qn (Yes/no)	Yes
Promoting social responsability	Corporate Social Responsability (CSR) certification	Semi Qn (Yes/no)	Yes
	Membership in an initiative that promotes social responsibility along the supply	Semi Qn (Yes/no)	Yes
Supplier relationship	Absence of coercive communication with suppliers	Semi Qn (Yes/no)	No
	Sufficient lead time	*Scale from 1 to 5 : 1- insufficient 5-Suf*	
	Reasonable volume of fluctuations	*Unreasonable Reasonable*	
	Payments on time to suppliers	Semi Qn (Ye	
SOCIETY AND LOCAL COMMUNITY		Unité ou p	
Contribution to economic development	Contribution of the organization to economic progress (revenue gain, paid wages, R+D costs in relation to revenue)	Qn	given
Safe and Healthy living conditions	Management effort to minimize use of hazardous substances	*effort 5- consi effort*	
Access to material resources	Total water withdrawal/year	*Qn (m3/an)*	
	Strenght of organizational risk assessment with regard to potential for material resource conflict	*Scale from 1 to 5 : 1- Weak 5-Strong*	
	Certified environmental management system	Semi Qn (Yes/no)	Yes
Secure Living conditions	N° of legal complaints per year against the organization with regard to security concerns	Qn	0
	N° of casualties and injuries per year ascribed to the organization	Qn	1
Local employment	Percentage of workforce hired locally/regionally	Qn	100%
	Strength of policies on local hiring preferences	*Scale from 1 to 5 : 1- weak 5-strong*	3
	Percentage of spending on locally-based suppliers	Qn	90%
	Implementation of principles or other code of conduct on local employment	Semi Qn (Yes/no)	Yes
Community engagement	Strength of written policies of community engagement	*Scale from 1 to 5 : 1- weak 5-strong*	2
	Organizational support for community inicatives (N° of volunteer-hours)	Qn	0
Access to immaterial resources	Presence of community education initiatives	Semi Qn (Yes/no)	Yes
Cultural heritage	Presence of Organizational Program to include Cultural Heritage Expression in Product Design/Production	Semi Qn (Yes/no)	Yes
Public commitment to sustainability issues	Presence of public documents on sustainability issues	Semi Qn (Yes/no)	No
	N° of complaints issued related to the non fulfilment of promises	Qn	0
	Presence of mechanism to follow up the realisation of promises	Semi Qn (Yes/no)	No

71 questions

- CS2 Einkaufen auf dem bauernhof
  5 producers answers
- CS4 Arvaia
  1 producer answer
- CS5 Brandt & Levie
  1 producer-intermediary/salesperson answer
- CS8 Couleurs Paysannes
  2 producers and 1 supplier answers
- CS16 Lantegi Batuak
  1 processing company answer
- CS17 Biofruits
  1 producer answer

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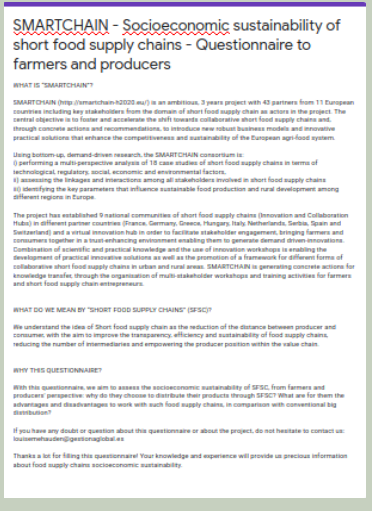
SMART SOLUTIONS IN SHORT FOOD SUPPLY CHAINS

Socio-economic assessment– Complementary qualitative approach

Complement to S-LCA methodology to assess the socioeconomic sustainability of SFSC, from **farmers and producers**' perspective, available in 9 languages

- Questions about

- Country	- Involvement in SFSC & retailing
- Profile	- Advantages of SFSC
- Work status	- Motivations to involve in SFSC
- Type of organization	- Activities developed
- Type of product	- COVID impact in their business
- Annual turnover	


SMARTCHAIN - Socioeconomic sustainability of short food supply chains - Questionnaire to farmers and producers

WHAT IS "SMARTCHAIN"?

SMARTCHAIN (http://smartchain-h2020.eu/) is an ambitious, 3 years project with 43 partners from 11 European countries including key stakeholders from the domain of short food supply chain as actors in the project. The central objective is to foster and accelerate the shift towards collaborative short food supply chains and, through concrete actions and recommendations, to introduce new robust business models and innovative practical solutions that enhance the competitiveness and sustainability of the European agri-food system.

Using bottom-up, demand-driven research, the SMARTCHAIN consortium is:
i) performing a multi-perspective analysis of 18 case studies of short food supply chains in terms of technological, regulatory, social, economic and environmental factors,
ii) assessing the linkages and interactions among all stakeholders involved in short food supply chains
iii) identifying the key parameters that influence sustainable food production and rural development among different regions in Europe.

The project has established 9 national communities of short food supply chains (Innovation and Collaboration Hubs) in different partner countries (France, Germany, Greece, Hungary, Italy, Netherlands, Serbia, Spain and Switzerland) and a virtual innovation hub in order to facilitate stakeholder engagement, bringing farmers and consumers together in a trust-enhancing environment enabling them to generate demand driven innovations. Combination of scientific and practical knowledge and the use of innovation workshops is enabling the development of practical innovative solutions as well as the promotion of a framework for different forms of collaborative short food supply chains in urban and rural areas. SMARTCHAIN is generating concrete actions for knowledge transfer, through the organization of multi-stakeholder workshops and training activities for farmers and short food supply chain entrepreneurs.

WHAT DO WE MEAN BY "SHORT FOOD SUPPLY CHAINS" (SFSC)?

We understand the idea of Short food supply chain as the reduction of the distance between producer and consumer, with the aim to improve the transparency, efficiency and sustainability of food supply chains, reducing the number of intermediaries and empowering the producer position within the value chain.

WHY THIS QUESTIONNAIRE?

With this questionnaire, we aim to assess the socioeconomic sustainability of SFSC, from farmers and producers' perspective: why do they choose to distribute their products through SFSC? What are for them the advantages and disadvantages to work with such food supply chains, in comparison with conventional big distribution?

If you have any doubt or question about this questionnaire or about the project, do not hesitate to contact us: louisemehauden@gaiotomagiobal.es

Thanks a lot for filling this questionnaire! Your knowledge and experience will provide us precious information about food supply chains socioeconomic sustainability.

- Our goal is to collect 250 responses, until now we have collected 132 responses

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SMARTCHAIN
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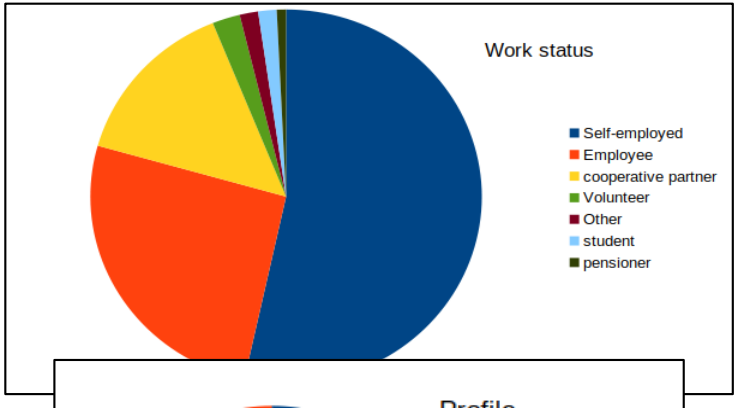
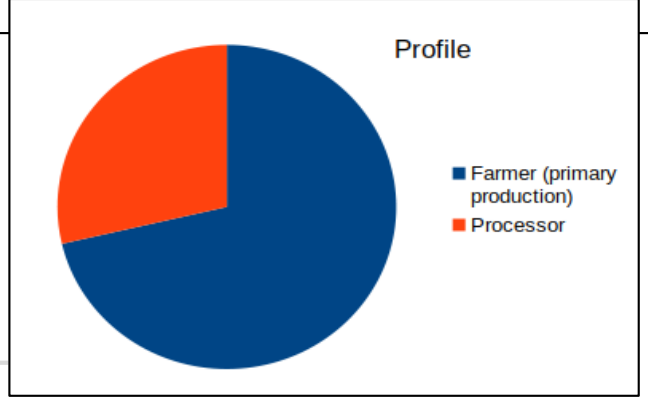
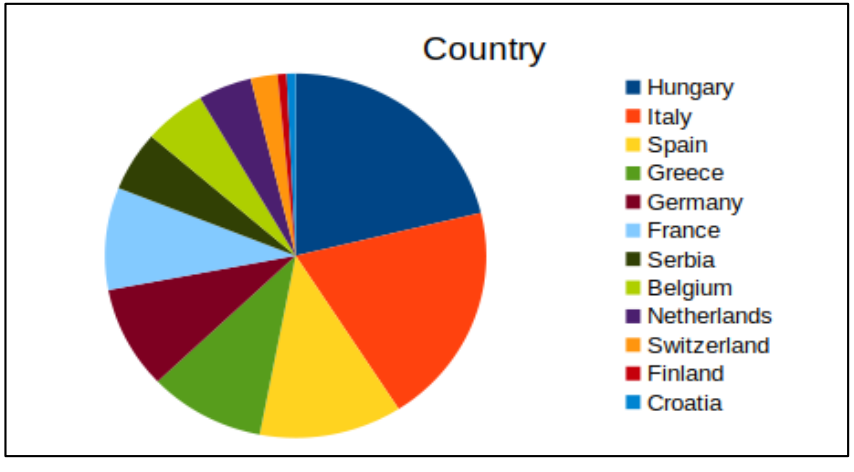
Preliminary results - Qualitative data





In terms of **geographical impact**, it seems that SMARTCHAIN is having significantly different repercussions according to the countries involved



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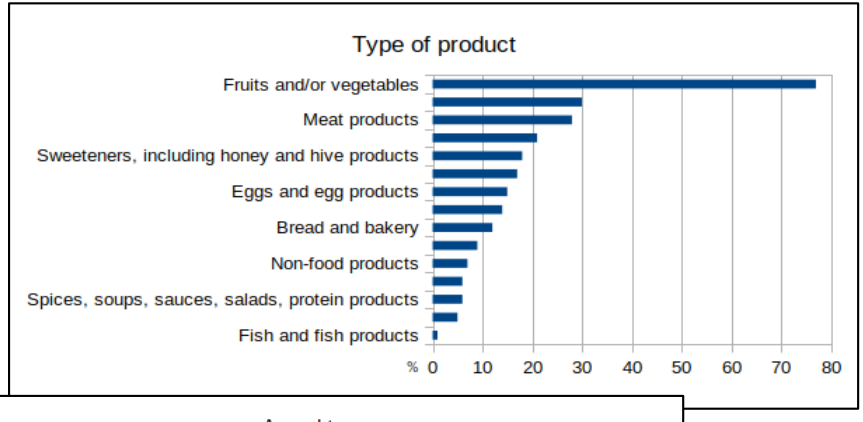

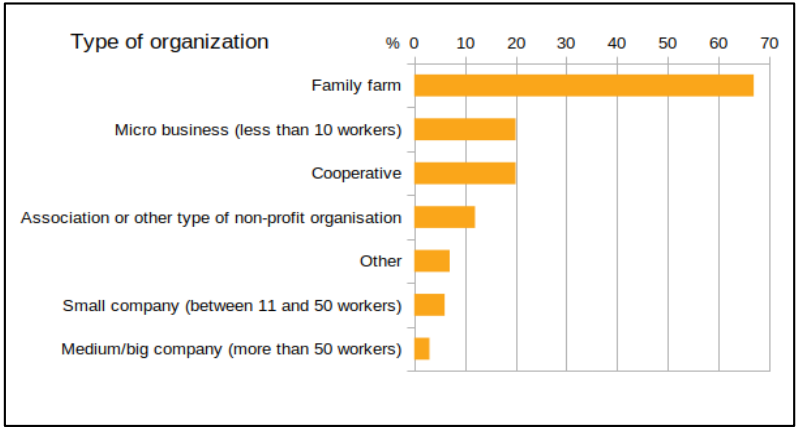

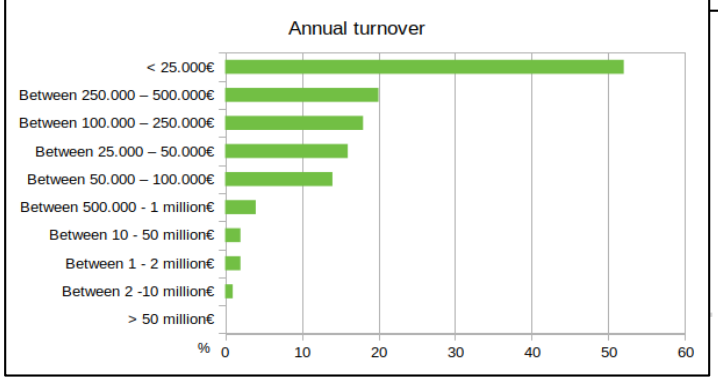

The most represented **profile reached** is farmers, self-employed, that owns a family business, mainly sells fruits and vetegables and has an annual turnover of less that 25.000€

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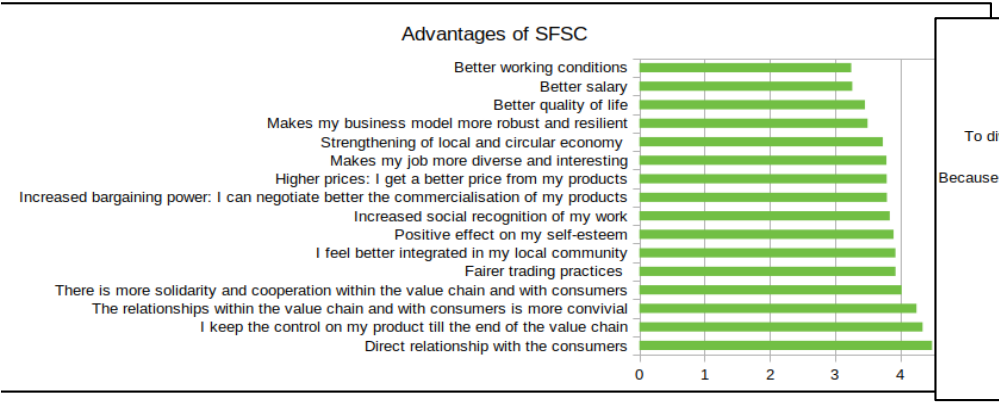

- 3 main **advantages** to involving in SFSC are to keep the control on the product till the end of the value chain, the relationships within the value chain and with consumers is more convivial and the solidarity and cooperation within the value chain and with consumers

- 3 main **reasons** to involve in SFSC are to create a direct relationship with the consumers of my products, to keep my product under control until the end of the value chain, to get involved in my local community and economy

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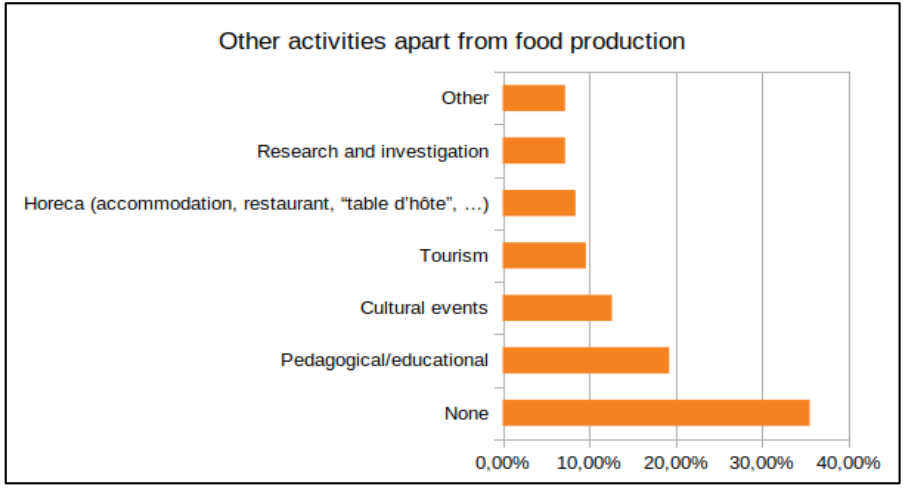
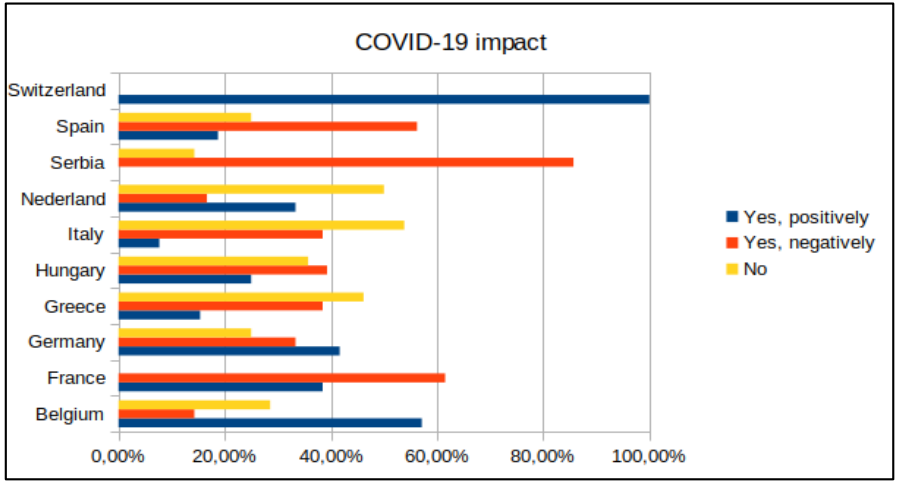
Preliminary results - Qualitative data





- 64 % of respondents develop **other activities** on their farm/business apart from food production, mainly pedagogical, cultural and tourism
- **COVID 19** have had a very different impact regarding the different countries reached, 33 % not affected

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SMART SOLUTIONS IN SHORT FOOD SUPPLY CHAINS

Preliminary results - Qualitative data

Continue spreading the questionnaires in all countries is important, **share the link, please!**

- ENGLISH https://forms.gle/Jy1Mr34pGdeZAcaB8
- DUTCH https://forms.gle/zxH5Sq6wboEXcV4E7
- GERMAN https://forms.gle/do749SxLBjdTwkkr7
- SPANISH https://forms.gle/C3PyE4Vn2j2pQfn47
- ITALIAN https://forms.gle/SvqgFm614VDTZAn58
- GREEK https://forms.gle/49eq9MX8QE2SMLzX9
- HUNGARIAN https://forms.gle/pAvvTGL2x22LcEg87
- FRENCH https://forms.gle/wAsC43SeDz7vm9Ke6
- SERBIAN https://forms.gle/uECsVNY4tgGJz3EW7

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Next steps

- Environmental assessement :
  - Modelling of environmental impacts for other case studies
  - Iterative questions for case study leaders and hub managers
- Modelling of socio-economic impacts
  - Analyze the situation of each CS
  - Compare CS data with LFSC (reference situation)
  - Selection of indicators that give most relevant information
- Interpretation and recommendations

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Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of Economic Affairs, Education and Research EAER
Agroscope

AZTI
MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE

ctcpa CENTRE TECHNIQUE AGROALIMENTAIRE

Thank you

Discussion

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